

PRESENTING MEDICAL RESEARCH FINDINGS:
A STUDY OF AUTHOR ENGAGEMENT
IN ENGLISH AND GERMAN
SCIENTIFIC ARTICLES AND POPULARISATIONS

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Abstract

Scientific discourse, commonly associated with a detached and factual style, has come to be regarded as not merely serving the purpose of conveying neutral ‘facts’, but also as a means of pursuing interpersonal aims within the scientific community by writers whose position is not a reflection of a given reality but socially determined (e.g. Gilbert & Mulkay 1984, Charles 2006). This thesis is concerned with the linguistic choices made in imparting medical research results to different audiences, namely those of English and German research papers and popularisations. The focus of this study is on the realisation of epistemic (e.g. Palmer 2001) and evidential meanings (Chafe & Nichols 1986) and their role in enabling authors to position themselves towards the medical research findings they are presenting and towards their readership without using overtly attitudinal language. Special emphasis is placed on the way epistemic and evidential expressions are used to model different sources of knowledge claims (cf. e.g. Field 1997, Yang 2013). Moreover, attention is paid to the question of whether propositional content is presented as either open or closed to discussion by the use of these features (cf. e.g. Martin & White 2005, White 2012). Using corpus-linguistic methods, the analysis builds on research into register variation and contrastive linguistics to conduct monolingual and contrastive analyses of English and German corpora (Biber 1995, Teich 2003, Hansen-Schirra et al. 2012, Neumann 2014). The study adopts the interpersonal orientation of Appraisal (Martin & White 2005), which is based on the dialogic view proposed by Bakhtin (1981) and Vološinov (1986). The Appraisal framework is adapted to a fine-grained analysis of linguistic exponents of epistemic and evidential meanings in a bilingual English and German corpus. The thesis contributes to the understanding of the language-specific use of these features as ‘interactive’ resources in research publications. Moreover, it offers insights into how the presentation of medical knowledge is geared towards the readers of popularisations in the two languages.

Deutschsprachige Zusammenfassung

Gegenstand dieser korpuslinguistischen Untersuchung ist die Wahl sprachlicher Ausdrucksmittel bei der Vermittlung medizinischer Forschungsergebnisse in unterschiedlichen kommunikativen Konstellationen. Das Augenmerk der Studie liegt dabei auf Unterschieden zwischen der Wissensvermittlung unter Wissenschaftlern und der Darstellung von medizinischen Erkenntnissen in populärwissenschaftlichen Publikationen auf Englisch und Deutsch.

Das Verständnis von Wissen hat sich im Laufe der Zeit hin zu einer Sichtweise verändert, nach der Wissen zusehends als gesellschaftliches Konstrukt gesehen wird (vgl. z.B. Polkinghorne 1997:6f, Whitley 1985:6, 11f). Wissenschaftlicher Fortschritt beruht in wesentlichem Maße auf der Verbreitung neuer Erkenntnisse, durch die der bestehende Forschungsstand in Frage gestellt oder revidiert wird (vgl. z.B. Myers 1989). Die Rolle der Sprache für die Wissenskonstruktion wurde insbesondere im Rahmen soziolinguistischer Forschungsansätze behandelt (vgl. Halliday & Martin 1993, Hunston 1994, Iedema et al. 1994). Die traditionelle Wahrnehmung von Wissenschaftssprachen als von einem objektiven, sachlichen Stil geprägte Diskursformen ist in den letzten Jahren einer Sicht gewichen, der zufolge wissenschaftliche Diskurse nicht mehr als Spiegelung gegebener Realitäten betrachtet werden (vgl. Iedema et al. 1994, Gilbert & Mulkay 1984, Hunston 1994, Körner 2000). Wissenschaftler müssen ihre Leserschaft von der Gültigkeit ihrer Erkenntnisse überzeugen und ihre Stellung in ihrem jeweiligen wissenschaftlichen Milieu festigen (Swales 1990, vgl. auch Myers 1989, Polkinghorne 1997, Hyland 1998a, b). Zugleich wird von ihnen erwartet, dass sie sich als Diener der Wissenschaft präsentieren (vgl. auch Myers 1989:4). In der sprachwissenschaftlichen Erforschung von Wissenschaftsdiskursen liegt ein starker Fokus auf subjektiven Aspekten des wissenschaftlichen Diskurses und sprachlichen Darstellungsformen sozialer Strategien, die wissenschaftliches Schreiben prägen; diese umfassen zum Beispiel Ausdrucksformen von Bescheidenheit und Vermeidung offener Kritik bei der Gestaltung des Verhältnisses zwischen Autor und Leserschaft (vgl. z.B. Hyland 1998a, Poudat & Loiseau 2005). Die sprachliche Darstellung von Emotionen und Meinungen bildet den Gegenstand zahlreicher sprachwissenschaftlicher Arbeiten (eine Übersicht findet sich z.B. bei Charles 2006:492). Dieser Bereich wird unter anderem unter dem Stichwort *stance* behandelt. Diese Kategorie wird von Biber und Finegan (1989:124) auf die lexikalischen und grammatischen Ausdrucksformen von Einstellungen, Gefühlen und Wertungen im Hinblick auf den propositionalen Gehalt einer Äußerung bezogen. Hunston und Thompson (2000) befassen sich unter dem verwandten Begriff *evaluation* mit dem Ausdruck von Einstellungen, Meinungen oder Empfindungen des Sprechers oder Schreibers im Hinblick auf Entitäten oder

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Propositionen. Diese Einstellungen können sich auf den Gewissheits- oder Verpflichtungsgrad, die Wünschbarkeit oder andere Wertungen beziehen (Hunston & Thompson 2000:5). Eine Reihe von Arbeiten beschäftigt sich mit spezifischen Ausdrucksformen von Sprechereinstellung: Dazu zählen die Untersuchungen von Biber und Finegan (1988) sowie von Conrad und Biber (2000:56ff) zu adverbialen Indikatoren. Hunston und Sinclair (2000) behandeln die evaluative Verwendung von Adjektiven und Nomen, während Field (1997) auf die Rolle faktiver Prädikate eingeht. Dieser Bereich umfasst somit sowohl den Ausdruck emotiver als auch epistemischer Dispositionen (Biber und Finegan 1989, Ochs und Schieffelin 1989, Ochs 1990, vgl. Field 1997:800). Erstere beinhalten Gefühle, Stimmungen und Einstellungen in Bezug auf Propositionen, während epistemische Dispositionen zum Beispiel die Wissensquelle oder den Sicherheitsgrad von Wissen betreffen (Ochs 1990:296, vgl. Field 1997:800). Diese Aspekte stehen in Zusammenhang mit dem Konzept der Evidentialität (z.B. Chafe & Nichols 1986), die sich auf die Informationsquellen bezieht, auf denen Aussagen fußen (Dendale & Tasmowski 2001:340). Evidentialität steht wiederum in engem Zusammenhang mit epistemischer Modalität (z.B. Lyons 1977, Palmer 1986, Coates 1983, Stubbs 1996, Simon-Vandenbergen 1996, Nuyts 2001, vgl. auch Hunston & Thompson 2000:3). Lyons' (1977:797) Definition zufolge fallen hierunter jegliche Äußerungen, durch die der Sprecher seine Festlegung auf den Wahrheitsgrad einer Proposition modifiziert. Dies kann sowohl explizit verbal als auch durch prosodische oder paralinguistische Mittel erfolgen (Lyons 1977:797).

Eine Fülle sprachwissenschaftlicher Arbeiten ist vom Höflichkeitsmodell von Brown und Levinson (1987) beeinflusst und widmet sich dem verwandten Konzept sprachlicher Hecken (*Hedges*) (vgl. auch Charles 2006:492). Besonderes Augenmerk gilt dabei häufig deren Verwendung in akademischen und wissenschaftlichen Zusammenhängen (z.B. Prince et al. 1982, Salager-Meyer 1994, Skelton 1997, Hyland 1998a, 2000). Hyland (1998a:1) zufolge bezieht sich *hedging* auf sprachliche Ressourcen, die signalisieren, dass der Autor sich nicht uneingeschränkt auf den Wahrheitswert der Proposition festlegen oder zumindest die Festlegung darauf nicht kategorisch formulieren möchte. In solchen Ansätzen wird Lakoffs (1972) ursprüngliche prototypenbasierte Definition somit stark erweitert, sodass Ausdrucksmittel sowohl emotionaler Wertungen als auch des angenommenen Wahrheitsgrades eingeschlossen werden und der Begriff sich auf den Bereich der in Zusammenhang mit *stance* erwähnten Evidentialität erstreckt (vgl. z.B. Skelton 1997:45, Markkanen und Schröder 1997:7, Martin und White 2005:39). Wie im Falle der epistemischen Modalität besteht auch bei *hedging* kein Konsens über den Bedeutungsumfang des Konzepts (Markkanen und Schröder 1997:6, Kärkkäinen 2003:18).

Dieser kurze Überblick verdeutlicht die Überlappungen zwischen den einzelnen Forschungsgebieten (vgl. Charles 2006:492f). In *stance*-bezogenen und umfassenden *hedging*-orientierten Ansätze werden mitunter emotive Bedeutungen einbezogen, die jedoch in der vorliegenden Arbeit ausgeklammert werden. Diese Untersuchung widmet sich hingegen sprachlichen Mitteln, durch deren Verwendung Erkenntnisse in einer für die Wissenschaftssprache als typisch empfundenen objektiven und sachlichen Weise dargelegt werden (vgl. Charles 2006, Hunston 1993a, Körner 2000) und konzentriert sich dabei auf epistemische und evidentielle Wertungen.

Das Verständnis von Wissen und die Wissenskonstruktion unterscheiden sich in den wissenschaftlichen Disziplinen und Sprachen (vgl. z.B. Clyne 1991, Becher und Trowler 2001:36, Charles 2006:493). In der Literatur zu interkulturellen Unterschieden im akademischen Diskurs wird das Deutsche im Vergleich zum Englischen als stärker autorenorientiert und weniger kooperativ beschrieben, während das Englische als interaktiver und leserorientierter gilt (vgl. z.B. Clyne 1991, Galtung 1985, House & Kaspar 1981). Das Interesse der vorliegenden Arbeit gilt dem medizinischen Diskurs, dessen gesellschaftliche Bedeutung in einer Vielzahl philosophischer und soziologischer Arbeiten diskutiert wird (z.B. Foucault 1963, Goffman 1963). In der vorliegenden Studie wird untersucht, wie medizinisches Wissen unterschiedlichen Rezipientengruppen vermittelt wird. Angesichts der gesellschaftlichen Relevanz wissenschaftlichen Fortschritts im Bereich der Medizin wird ebenfalls untersucht, wie medizinische Inhalte für die allgemeinere Leserschaft populärwissenschaftlicher Publikationen aufbereitet werden (vgl. z.B. Myers 1989). Die Medizin scheint in Bezug auf Popularisierung eine besondere Stellung innezuhaben; so deutet Varttala (2001:267) Untersuchung zu Hecken in englischen wissenschaftlichen und in populärwissenschaftlichen Texten darauf hin, dass in medizinischen populärwissenschaftlichen Veröffentlichungen stärkere Anpassungen vorgenommen werden als in Popularisierungen in den Bereichen Wirtschaft und Technologie.

Das Augenmerk der Analyse liegt auf der Bedeutung epistemischer und evidentieller Sprachmittel für die Ausformung des Verhältnisses zwischen Autor und Lesern. Während in traditionellen Arbeiten zu epistemischer Modalität (z.B. Palmer 1986) und Evidentialität (z.B. Chafe und Nicols 1986) sowie Beiträgen zur Heckenforschung (vgl. z.B. Markkanen und Schröder 1997) der Schwerpunkt eher auf dem individuell-subjektiven Blickwinkel des Autors liegt (Martin und White 2005:104ff), wird im Rahmen von *appraisal* eine interpersonale Perspektive eingenommen. In der vorliegenden Arbeit wird dieser funktionale Ansatz übernommen und untersucht, wie Autoren sich selbst und ihre Leserschaft gegenüber den vermittelten Inhalten und der bisherigen Forschung positionieren. Dabei ist

insbesondere die Kategorie *engagement* relevant, die durch die von Bakhtin (1981) und Vološinov (1995) entwickelten Konzepte des Dialogismus und der Heteroglossie beeinflusst ist (Martin und White 2005:38ff, 92ff). Dieser Sichtweise zufolge sind alle sprachlichen Äußerungen dialogisch, da sie sich stets auf zuvor Gesagtes oder Geschriebenes beziehen und zugleich zukünftige Reaktionen von Rezipienten antizipieren (Martin und White 2005:92). Im Rahmen von *engagement* wird betrachtet, in welchem Maße die potentielle Existenz alternativer Positionen sprachlich einbezogen wird (*heterogloss*) oder ob durch die unmodifizierte Formulierung von Propositionen (P) die potentielle Existenz abweichender Stimmen und Standpunkte außer Acht gelassen wird (*monogloss*) (ibid.). Heteroglossische Formulierungen untergliedern sich in solche wie # *I think that P*¹, durch deren ‚expansive‘ Wirkung (*dialogic expansion*) alternativen Standpunkten Platz eingeräumt wird, und Formulierungen wie # *we have shown that P*. Ausdrucksweisen der letzteren Art verringern durch ‚dialogische Kontraktion‘ (*dialogic contraction*) den Raum, der abweichenden Positionen zugestanden wird (vgl. Martin und White 2005:102). Die *engagement*-Kategorien werden zur Entwicklung eines Analysemodells für die detaillierte Klassifizierung von register- und sprachspezifischen Unterschieden bei der Verwendung sprachlicher Mittel im Englischen und Deutschen adaptiert.

Zusammenfassend formuliert geht es in der vorliegenden Untersuchung somit um die Frage, wie Autoren ihre Ansicht ausdrücken, dass etwas der Fall ist. Dabei wird analysiert, ob Inhalte als Fakten dargestellt oder der Leserschaft eher als tentative Informationsangebote unterbreitet werden. Hierzu wird insbesondere die Wahl sprachlicher Mittel zur Bezugnahme auf unterschiedliche Informationsquellen beleuchtet. Der Schwerpunkt liegt auf der Frage, wie fremde und eigene Positionen in Texte eingebracht werden. Dabei wird betrachtet, ob Autoren ihre Verantwortung für den so dargestellten propositionalen Gehalt unterstreichen oder abschwächen (vgl. z.B. Field 1997, Charles 2006). Neben grammatikalisierten und lexikalisierten epistemischen und evidentiellen Markern wie Modalverben, Adjektiven oder Adverbien, befasst sich die Untersuchung mit dem Beitrag von Mitteln der Redewiedergabe für die Bezugnahme auf externe Informationsquellen (vgl. z.B. Thompson und Ye 1991, Malmström 2008). Auch die Verwendung kognitiver Verben sowie von Verben, die den Nachweis von Sachverhalten ausdrücken, wird behandelt (Halliday und Matthiessen 2014:721). So wird P beispielsweise durch Formulierungen wie # *X has proven that P* von Autoren als Tatsache dargestellt (vgl. Vendler 1980, Karttunen 1971a, b). Die Bezugnahme auf verschiedene Informationsquellen bei der Darstellung von Forschungserkenntnissen wird im Rahmen der Kategorie *attribution* untersucht. Dabei wird analysiert, wie

¹ Erfundene Beispiele sind durch ein vorangestelltes # gekennzeichnet.

propositionaler Gehalt durch Matrixstrukturen (z.B. # *X believes/has shown/said that P*) unterschiedlichen Akteuren oder Entitäten zugeordnet wird. Mit der Unterkategorie *attribution to identified source* wird auch untersucht, ob Autoren sich durch Selbsterwähnung in den Text einbringen oder ob durch Formulierungen wie # *data show that P* bei der Vermittlung von Erkenntnissen auf unbelebte Entitäten verwiesen wird (vgl. Yang 2013). Durch entsprechende passivische und nominale Formulierungen (z.B. # *it has been shown that/the belief that P*) lässt sich die Präsenz der Autoren oder anderer Quellen bei der Darstellung von Inhalten verschleiern (vgl. z.B. Thompson und Ye 1991, Malmström 2008). Die durch unpersönliche Formulierungen erzielte Zuordnung von Propositionen zu nicht-spezifizierten Quellen wird im Rahmen der Unterkategorie *attribution to unidentified source* näher betrachtet. Während in der *appraisal*-Analyse der Schwerpunkt eher auf Bedeutung im Kontext von rhetorischer Wirkung liegt als auf grammatischen Formen (Martin und White 2005:94), erfolgt in der vorliegenden Analyse die Klassifizierung der sprachlichen Vorkommnisse von *engagement* somit auf zwei Achsen: Neben einer Kategorisierung der dialogischen Eigenschaften von *engagement*-Markern wird auch deren jeweilige sprachliche Form betrachtet.

Die in dieser Arbeit durchgeführten monolingualen und kontrastiven Analysen bauen auf korpuslinguistischen Methoden und Arbeiten zur Registervariation und kontrastiven Linguistik auf (Biber 1995, Hansen-Schirra et al. 2012, Neumann 2014). Ausgehend von kulturellen Unterschieden zwischen den stilistischen Konventionen des englischen und des deutschen akademischen Diskurses (z.B. House und Kasper 1981) erfolgt ein Vergleich der Sprachmittel, die in englischen und deutschen wissenschaftlichen Artikeln zur Vermittlung der oben beschriebenen Bedeutungen verwendet werden. Ein entsprechender kontrastiver Vergleich englischer und deutscher populärwissenschaftlicher Artikel wird ebenfalls durchgeführt. In beiden Sprachen erfolgt zudem eine sprachinterne Gegenüberstellung der Fachaufsätze und der populärwissenschaftlichen Artikel, um die Wirkung der Popularisierung (vgl. z.B. Gotti 2011) auf die Verwendung der hier betrachteten Ausdrucksmittel in beiden Sprachen zu vergleichen. In diese Betrachtung werden auch Referenzkorpora einbezogen, die sich jeweils aus englischen bzw. deutschen Texten aus unterschiedlichen Registern zusammensetzen und somit eine Vergleichsgrundlage für die registerspezifischen Korpora bilden.

Die Arbeit gliedert sich in zwei Teile: Im ersten Teil wird ein Überblick über die theoretische Einordnung der Arbeit und die wesentlichen Forschungsbereiche gegeben, die mit den zuvor erwähnten Themen befasst sind. In Kapitel 2 werden zunächst Eigenschaften der englischen und deutschen Wissenschaftssprachen dargestellt. Die Bedeutung der grammatischen Metapher (Halliday 1993a, b) und die Rolle von Nominalisierungen und passivischen Formen

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als Begleiterscheinungen dieses Phänomens werden dabei hervorgehoben. Des Weiteren wird auf die Popularisierung von Forschungserkenntnissen und deren sprachliche Implikationen eingegangen (vgl. z.B. Niederhäuser 1999). Kapitel 2 widmet sich weiterhin der Forschung zu sprachlichen Hecken und höflichkeitsbezogenen Gesichtspunkten des wissenschaftlichen Diskurses (Myers 1989). In Kapitel 3 wird das Thema Modalität vertieft und dessen Bedeutung für die Gestaltung des Autor-Leserverhältnisses erörtert. Darüber hinaus werden die Abgrenzung von Modalität zu anderen sprachlichen Kategorien sowie unterschiedliche Kategorisierungsansätze diskutiert. Auch das Verhältnis von epistemischer Modalität und Evidentialität wird näher betrachtet. Besonderes Augenmerk gilt kontrastiven Unterschieden bei der Umsetzung dieser Bedeutungen im Englischen und im Deutschen. Kapitel 4 widmet sich *appraisal* (Martin und White 2005) und vermittelt eine Übersicht über die drei Hauptbereiche *attitude*, *graduation* und *engagement* (Martin und White 2005). Letztere Kategorie wird vertiefend behandelt, da sie, wie eingangs erwähnt, Bereiche wie Modalität, Evidentialität, Hörensagen und Hecken betrifft, die für die vorliegende Arbeit besonders relevant sind. Kapitel 5 gibt einen kurzen Überblick über den Begriff der Faktitivität (Kiparsky und Kiparsky 1971) und verwandte Konzepte, um die Kriterien für die Kategorisierung der dialogischen Wirkung von *engagement*-Markern darzulegen.

Im zweiten Teil der Arbeit wird die Korpusanalyse vorgestellt. Zunächst wird die Operationalisierung des *appraisal*-Rahmenkonzepts für die Analyse von *engagement* in einem bilingualen Korpus vorgenommen. Zudem werden die analytische Vorgehensweise und das Korpusdesign beschrieben (Kapitel 6). Darauf folgen die Darstellung und Diskussion der Analyseergebnisse in Kapitel 7. Die Arbeit schließt mit einer Zusammenfassung, einer kritischen Diskussion der verwendeten Methodologie und einem Forschungsausblick (Kapitel 8).

Die Anwendung des Analysemodells auf das Korpus ergibt ein nuanciertes Bild: So finden sich im deutschen Teil des Korpus insgesamt weniger Hinweise auf *engagement* als im englischen. Hinsichtlich der intersubjektiven Wirkung der *engagement*-Marker (vgl. Martin und White 2005:38ff, 92ff) deutet diese Beobachtung darauf hin, dass die Autoren im englischen Teil des Korpus zumindest für die hier betrachteten Kriterien stärker mit ihrer Leserschaft ‚interagieren‘ als die Autoren im deutschen Korpus. Dennoch lassen sich auch Parallelen beobachten: In beiden Sprachen enthalten die populärwissenschaftlichen Artikel die jeweils größte Anzahl an *engagement*-Markern. Die populärwissenschaftlichen Texte weichen in dieser Hinsicht signifikant von den jeweiligen Referenzkorpora ab, während die Anzahl der Merkmale in den Wissenschaftspublikationen diejenige in den jeweiligen Referenzkorpora nicht signifikant übersteigt. Die Wissenschaftsjournalisten scheinen demnach ihre Texte dialogischer zu gestalten als die in den entsprechenden Wissenschafts-

und Referenzkorpora vertretenen Autoren. Wenngleich die Anzahl der enthaltenen Vorkommnisse weder in den deutschen noch in den englischen Forschungsartikeln signifikant vom jeweiligen Referenzsubkorpus abweicht, ist die Zusammensetzung des Aufkommens eine andere. Zwar ist dialogische Expansion in allen Teilen des Korpus häufiger als Kontraktion, jedoch werden im Wissenschaftskorpus vergleichsweise häufiger kontraktive Formulierungen gewählt als in den anderen Subkorpora. Die im Forschungskorpus repräsentierten Wissenschaftler scheinen demzufolge in beiden Sprachen die Inhalte vergleichsweise ‚absoluter‘ zu formulieren als die Autoren der Texte in den Referenzkorpora und die Wissenschaftsjournalisten. In den deutschen Popularisierungen und den Referenztexten schlägt sich zudem die Verwendung des Konjunktivs als Mittel der Redewiedergabe nieder. Infolgedessen sind dort signifikante kontrastive Unterschiede in der Verwendung von grammatikalisierten und lexikalisierten Formulierungen im Vergleich zu der Zuordnung von Proposition zu Quellen durch oben beschriebene Matrixgefüge zu verzeichnen. Die Forschungsartikel hingegen enthalten in beiden Sprachen den jeweils geringsten Anteil an grammatikalisierten und lexikalisierten Mitteln. Die Ergebnisse deuten daher darauf hin, dass die auf Deutsch verfassten Forschungspublikationen den englischen in diesen wesentlichen Punkten entsprechen. Dem Englischen kommt im Bereich der medizinischen Wissenschaftssprache eine vorrangige Bedeutung zu (Baethge 2008). Die beobachteten Ähnlichkeiten lassen daher zumindest teilweise auf einen stilistischen Einfluss des Englischen auf das Deutsche in diesem Bereich schließen. Aufgrund der internationalen Vorrangstellung des Englischen ist zu vermuten, dass Inhalte von Deutschen oftmals auf Englisch rezipiert werden. Dies könnte zur Folge haben, dass es unter dem Eindruck anglophoner Veröffentlichungen in deutschsprachigen Artikeln zu einer sprachlichen Annäherung an die englischsprachigen Publikationen kommt.

Die Journalisten sind in beiden Sprachen stärker als die Forscher geneigt, Inhalte durch expansive Formulierungen als verhandelbar darzustellen. Im Deutschen scheint sich Popularisierung allerdings unter diesem Gesichtspunkt etwas schwächer auszuwirken: Während der kontraktive Anteil am Gesamtaufkommen von *engagement*-Markern in den deutschen und englischen Wissenschaftstexten vergleichbar ist, verwenden die deutschen Journalisten in Fällen, in denen *engagement* vorkommt, häufiger kontraktive Formulierungen als die englischsprachigen Journalisten. Eine Gemeinsamkeit der englischen und deutschen Popularisierungen besteht in der Vermeidung von Selbsterwähnung, sodass die Journalisten sich als unbeteiligte Vermittler von Informationen positionieren (siehe Gotti 2011). In den Fällen, in denen ATTR auftritt, dient diese Form des *engagement* sowohl in den englischen als auch in den deutschen Popularisierungen im Korpus am häufigsten dem Verweis auf externe Personen.

Unterschiede betreffen indes die Weise, wie *engagement* formuliert wird: Die sprachliche Kodierung der Redewiedergabe unterscheidet sich kontrastiv deutlich. Während in den deutschen Popularisierungen ein Schwerpunkt auf der zuvor erwähnten Verwendung des Konjunktivs liegt, tritt in den englischen populärwissenschaftlichen Artikeln *engagement* häufiger in Form der zuvor beschriebenen einleitenden Matrixstrukturen auf. Dies hat eine vermehrte Erwähnung der Wissenschaftler in Form eines Narrativs zur Folge, sodass deren Rolle als Handelnde und Erzähler hervorgehoben wird. In den deutschen Popularisierungen wird unterdessen eine breitere Palette von Ausdrucksmitteln ausgeschöpft, um Inhalte bestimmten Informationsquellen zuzuordnen. Somit zeichnen sich die deutschsprachigen populärwissenschaftlichen Artikel in dieser Hinsicht durch einen abwechslungsreicheren Stil aus. Dieser rührt auch von der Verwendung einer größeren Bandbreite unpersönlicher Formulierungen her. Die Variationsbreite ist in den deutschen Popularisierungen auch größer als in den deutschen wissenschaftlichen Veröffentlichungen. Die stilistische Variationsbreite der deutschen Popularisierungen wird nicht zuletzt durch die Verwendung lexikalisierte oder grammatikalisierte Mittel wie Partikeln zum Ausdruck von *engagement* erweitert.

Des Weiteren verwenden die englischen und deutschen medizinischen Forscher im Korpus unterschiedliche Mittel, um auf sich selbst zu verweisen. Die deutschen Forscher nutzen deutlich häufiger als die englischsprachigen die als *ATTR to unidentified source* kategorisierten unpersönlichen Formulierungen. Diese Beobachtung scheint mit der Verwendung eines numerischen Zitierstils in Zusammenhang zu stehen, durch den sich externe Positionen ohne Verwendung sprachlicher Mittel in den Text einbringen lassen. Den deutschen Wissenschaftler scheint die Kombination von *ATTR to unidentified source* mit fehlenden bibliographischen Indizes unter anderem als Mittel der Selbstreferenz zu dienen. Anders als im englischen Wissenschaftskorpus finden sich im deutschen Wissenschaftskorpus Fälle, in denen sich Autoren in der dritten Person auf sich selbst beziehen. Ferner treten im deutschen Wissenschaftskorpus im Verhältnis zum Gesamtaufkommen von *engagement* weniger Fälle auf, in denen durch Formulierungen des Typs # *Daten belegen, dass P* bei der Darstellung von Erkenntnissen auf unbelebte Entitäten verwiesen wird. Dies scheint in Zusammenhang mit der geringeren semantischen Vielseitigkeit der Subjektposition im Deutschen zu stehen (vgl. Teich 2003). Zudem unterscheiden sich die englischen und deutschen Forschungspublikationen in der Verwendung von unpersönlichen Formulierungen in Kombination mit präpositionalen oder pronominalen Adjunkten, die auf unbelebte Entitäten verwiesen wird (# *in Studien/hier wurde gezeigt, dass P*, vgl. Doherty 1996). Diese indirekte Form des Verweises auf Quellen findet sich deutlich häufiger in den deutschen als in den englischen Forschungsartikeln.

Überdies scheinen Fälle von ATTR, die deiktische Verweise enthalten, neben ihrer dialogischen Rolle zusätzlich zur Textkohäsion beizutragen (vgl. Halliday und Hasan 1976). Die Ergebnisse der Studie deuten folglich darauf hin, dass sowohl sprachtypologische als auch registerspezifische Einflüsse auf die Umsetzung von Engagement durch grammatikalisierte und lexikalisierte Ausdrucksmittel sowie die zuvor beschriebenen Matrixstrukturen einwirken.

Die Ergebnisse der Untersuchung liefern somit Einblicke in die sprachspezifische Verwendung epistemischer und evidentieller Ausdrucksmittel als ‚interaktive‘ Ressourcen bei der Darstellung medizinischer Forschungsergebnisse in unterschiedlichen Autor-Leserkonstellationen. Die Studie trägt insbesondere zum Verständnis der Gestaltung des Autor-Leserverhältnisses durch dialogische Ressourcen in der Wissenschaftspublizistik und sprachspezifische Anpassung an die Wissensvermittlung durch Popularisierungen bei.

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List of abbreviations

| | |
|----------|-------------------------------|
| ASCR | Ascription |
| ATTR | Attribution |
| BIBL REF | Bibliographic referencing |
| EPOP | English popularisation corpus |
| EREF | English reference corpus |
| ESCI | English scientific corpus |
| GPOP | German popularisation corpus |
| GRAM_LEX | Grammaticalised/lexicalised |
| GREF | German reference corpus |
| GSCI | German scientific corpus |
| POP | Popularisation corpus |
| REF | Reference corpus |
| SCI | Scientific corpus |

1. INTRODUCTION

1.1 Research objective and motivation

This study is largely concerned with the way medical knowledge is communicated; it is essentially intended to investigate the lexico-grammatical choices made in imparting research results in different communicative settings. More specifically, its aim is to explore the question of how different audiences are addressed by medical researchers or scientific journalists in English and German ‘high-brow’ and popularised publications.

The notion of what constitutes knowledge has undergone change over time (Polkinghorne 1997:6f): It is more and more seen as a social construct in that it is regarded as being open to “reinterpretation and change” (Whitley 1985:6, 11f). Scientific progress thus largely depends on the presentation of new knowledge claims, which inherently challenge and supplant previous knowledge claims put forward by other researchers (Myers 1989). The way in which knowledge claims are presented is intrinsically reflective of “epistemological commitments” (Polkinghorne 1997:6). Hence, knowledge may be understood as “the best map or description of reality about which the community has reached consensus” (Polkinghorne 1997:7¹).

The role of language in the construction of knowledge has been discussed widely in socio-linguistic research veins (e.g. Halliday & Martin 1993, Hunston 1994, Iedema et al. 1994). Commonly associated with a detached and factual style, scientific discourse has, in recent years, come to be regarded as not merely serving the purpose of conveying neutral ‘facts’, but also as a means of pursuing interpersonal aims within the scientific community by writers whose position is not a reflection of a given reality but socially determined so that, consequently, there is no clear dichotomy between fact and opinion (Iedema et al. 1994, cf. also e.g. Gilbert & Mulkay 1984, Latour 1987, Hunston 1994, Körner 2000, Luukka 2001, Charles 2006). Researchers are in a position where they have to convince readers of the validity of their knowledge claims and achieve ‘distinction’ in their area of research (Swales 1990, see also e.g. Myers 1989, Polkinghorne 1997, Hyland 1998a, b). At the same time, they are required by social conventions to present their work in an adequate manner that is acceptable to other researchers in their field of work and to present themselves as “humble servants of the discipline” (Myers 1989:4, cf. also Charles 2006:493). Much focus has been

¹ This quote specifically refers to Habermas’ (1979) concept of knowledge.

placed on the subjective aspects of scientific discourse and the linguistic expressions of the social strategies at work in research writing, such as the avoidance of straightforward criticism and modesty in shaping the author-reader relationship (e.g. Myers 1989, Swales 1990, Hyland 1998a, Poudat & Loiseau 2005). The manner in which authors express emotions and opinions is dealt with in a host of literature (cf. e.g. Charles 2006:492 for an overview). This field has been studied under a range of different headings including “stance”, which by Biber’s and Finegan’s terms refers to “the lexical and grammatical expression of attitudes, feelings, judgements, or commitment concerning the propositional content of a message” (1989:124) and regarding other participants in the discourse (Field 1997:800). There is no consensus on what constitutes stance (cf. e.g. Englebretson 2007:4), and this diverse cluster of linguistic elements has also been investigated in connection with “evaluation” (cf. e.g. Charles 2006:492). Hunston and Thompson’s² seminal definition refers to evaluation as:

the broad cover term for the expression of the speaker or writer’s attitude or stance towards, viewpoint on, or feelings about the entities or propositions that he or she is talking about. That attitude may relate to certainty or obligation or desirability or any of a number of other sets of values. (Hunston & Thompson 2000:5)

Lexical and grammatical features conveying stance have been analysed extensively both by corpus linguists and systemic functional linguists (cf. e.g. Englebretson 2007:17). The role of individual devices, specifically that of adverbial indicators of stance, has been attended to, for example, by Biber and Finegan (1988) and Conrad and Biber (2000:56ff); evaluative uses of adjectives and nouns have, for instance, been explored by Hunston and Sinclair (2000), and Field (1997) is concerned with factive predicates encoding epistemic stance. It is apparent from this brief overview that this phenomenon touches on a vast set of linguistic research issues.

Stance may thus be described as comprising “affective” as well as “epistemological dispositions” (Ochs 1990:296, cf. also Field 1997:800). The former aspect concerns “feelings, moods, and attitudes of participants toward some proposition” (Ochs 1990:296). The epistemological type deals with the source of knowledge or the speaker’s or writer’s beliefs or state of knowledge (ibid., cf. also Field 1997:800). According to Hunston and Thompson

² See, for example, Hunston & Thompson (2000:1ff) and Englebretson (2007:15ff) for an overview of evaluation and stance.

(2000:3), value judgements in terms of good or bad generally relate to opinions about entities, which tend to be realised lexically as exemplified below:

- (1) Previous studies generally report a good correlation between echocardiographic, szintigraphic and invasive quantitative methods [...]. [ESCI]

By contrast, opinions relating to likelihood largely concern propositions and tend to be realised by more grammaticalised features such as modal auxiliaries (ibid.):

- (2) [...] their presence may contribute to disease pathogenesis via the production of ACPA. [ESCI]

Connected to the notion of stance is “hedging” (cf. Charles 2006:492), which has been treated extensively in a vast body of literature, much of which draws on the notion of “politeness” (Brown & Levinson 1987), often with particular attention being paid to the use of hedges in academic and scientific contexts (e.g. Prince et al. 1982, Salager-Meyer 1994, Skelton 1997, Hyland 1998a, 2000). There being no consensus as to the precise scope of the term (cf. e.g. Crompton 1997), its woolly nature has been criticised (e.g. Skelton 1997). By Hyland’s widely cited definition, hedging refers to linguistic formulations signalling “a lack of complete commitment to the truth value of an accompanying proposition” or “a desire not to express that commitment categorically” (1998a:1). Under such broad definitions, the initial prototype-based notion of hedges proposed by Lakoff (1972) is extended considerably to comprise a diverse array of linguistic items conveying not only emotional value judgements but also judgements about truth-value, extending into the domain of evidentiality (cf. e.g. Skelton 1997:45, Markkanen & Schröder 1997:7, Martin & White 2005:39). Evidentiality, a further related area of research interest, “centers around the sources of information or sources of knowledge behind assertions” (Dendale & Tasmowski 2001:340). Chafe (1986:262f), for instance, distinguishes between different “sources of knowledge” – evidence, language and hypothesis – and different “modes of knowing” – belief, induction, hearsay, deduction – and ensuing degrees of reliability. Evidentiality, in turn, is thus linked to the notion of epistemic modality (see e.g. Chafe & Nichols 1986). While a wealth of literature examines the notion (e.g. Palmer 1986, Coates 1983, Stubbs 1996, Simon-Vandenberg 1996, Nuyts 2001), epistemic modality remains a blurry concept, similar to the case of hedging, with various, even disparate definitions covering different ranges (Markkanen & Schröder 1997:6, Kärkkäinen 2003:18). This aspect of modality may be described broadly as relating to expressions of assessments concerning knowledge and belief (cf. e.g. Palmer 2001:8, Kärkkäinen 2003:18). Lyons, for instance, advocates a fairly wide definition, which extends beyond formal criteria to encompass

[a]ny utterance in which the speaker explicitly qualifies his commitment to the truth of the proposition expressed by the sentence he utters, whether the qualification is made explicit in the verbal component [...] or in the prosodic or paralinguistic component, is an epistemically modal or modalized utterance. (Lyons 1977:797)

The cursory overview presented above has identified areas of overlap between the different domains of research (cf. also Charles 2006:492f). Whereas stance-oriented work and comprehensive approaches to hedging also consider affective meanings, the present research spotlights the role of resources employed to write about research findings in a seemingly objective style (e.g. Charles 2006:492f). We start from the notion that evaluation takes place implicitly in the research community and is based on joint values (e.g. Charles 2006:492f). The present analysis highlights the role of items which contribute to the apparently unimplicated style commonly associated with scientific writing and its seeming emphasis on ideational meanings; it is interested in linguistic vehicles which help maintain an appearance of objectivity by avoidance of expressions of personal attitude or opinion (e.g. Hunston 1993a, Körner 2000). Explicitly emotive formulations being excluded in the present context, the current study is broadly concerned with those areas often treated in terms of the epistemic and evidential areas of stance. More specifically, it aims to examine the linguistic choices made by authors to reference the source of knowledge or of the proposition they are putting forward and to signal the degree of commitment and reliability accorded to it. Their role in engaging with the presumed readership³ and persuading it of the validity of the research findings and their contribution to what is generally perceived as an impersonal style are focal to the subsequent analysis. In very general terms, its emphasis is on the manner in which authors introduce viewpoints into a text and the manner in which they call attention to or downplay their responsibility for the propositions put forward (cf. e.g. Charles 2006:492).

Perceptions of knowledge and the manner in which knowledge is construed appear to vary across disciplines (e.g. Becher & Trowler 2001:36, Charles 2006:493). The present analysis narrows the focus of attention to the domain of medical discourse, which has been selected on account of the immediate relevance of medical progress to society. The role of medical discourse as a social construct which constitutes a powerful means of social control has been discussed widely from philosophical and social viewpoints (e.g. Foucault 1963, Goffman 1963). In the Foucauldian vein, medical discourse has been described as a means of

³ See also White (2003:275f) on the construal of the intended readership on the basis of assumptions made in a text regarding the readers state of knowledge and value positions; see also Eco (1984:7ff) for a discussion of the "model reader".

constituting the world through the ways we have to know and talk about it. [...] [D]iscourses do not describe or represent “the real”; they bring realities (including who we are) into being. [...] [T]he discourse of medicine brings people into being as doctors and as patients, ascribes to them certain interests (health matters), and positions them in specific relationships, including relationships of power, by virtue of that. (Miller 2008:252⁴)

The present research is interested in the way authors interact with their intended audiences in communicating medical research to specialists, which boils down to the question of how medical researchers express that they believe that something is the case. In rough terms, it is concerned with the linguistic choices made by writers in situating themselves both with regard to their readership and with regard to the propositional content they are presenting and how they align their readership in these regards (Martin & White 2005). Moreover, given the evident need for enhancing public understanding of medical issues, it looks at how medical research results are presented to a more general public (cf. e.g. Myers 1989). Medicine appears to occupy a special position in this respect as Varttala’s (2001:267) research into hedging in English research writing and popularisations has observed a more pronounced popularisation-induced shift in the medical domain than in economics and technology.

In addition to its focus on register variation, the present analysis adopts a cross-linguistic perspective, which is inspired by contrastive research on modality in English and German (e.g. Becker 2011, Celle 2006) and works on cross-cultural differences in the stylistic conventions of English and German academic discourse (e.g. House & Kasper 1981, Galtung 1985, Clyne 1991, House 1996, Kreutz & Harres 1997). In culturally-oriented research traditions, German academic writing is often described as being characterised by author-orientation as well as an emphasis on the presentation of knowledge and on the establishment of the author’s authority in the discipline. English academic discourse, by contrast, is often viewed as being marked by reader-orientation and greater openness to dialogue than the German academic style, which is regarded as being less co-operative (Kreutz & Harres 1997:181).

1.2 Goals

The present work aims to analyse the role of expressions widely associated with a factive style in shaping the author’s presence in the text and engaging with readers in medical

⁴ Here Miller (2008:252) refers to the work of Arney and Bergen (1984:4ff) and Foucault’s (1980) notion of medical discourse and its relation to knowledge and power.

research writing. The analysis sets out to explore how authors signal their own positions regarding the propositions they are advancing or how they ascribe stances to other parties (e.g. Sindair 1986, Field 2006) without taking recourse to explicitly attitudinal means. It seeks to investigate if they make their presence felt in the text or “hide” behind facts and data (cf. Skelton 1997:55), whether they appear assertive or cautious when putting forward knowledge claims. The present study aims to operationalise these research topics by breaking them down into quantifiable parameters. In order to do so, the use of lexicalised and grammaticalised epistemic or evidential markers such as modal auxiliaries signalling the author’s assessment of the reliability of knowledge or indicating the source of knowledge will be explored (e.g. Chafe 1986:267f). The study hence highlights items often described in terms of what Skelton describes as “mitigations of responsibility and/or certainty to the truth value of a proposition” (1997:45) in a hedging-related perspective. In a stance-oriented approach, it is thus concerned with the areas of stance which deal with epistemicity or commitment (Ochs 1989, cf. also Englebretson 2007:17). Special emphasis, however, will be on less grammaticalised linguistic formulations used by authors to reference the origin of the knowledge statements they are presenting by attributing propositions to different sources (Charles 2006, Yang 2013). The analysis considers the linguistic choices made by authors to express that they think something is the case; a distinction is made between obvious options involving explicit references to the authors themselves (3)⁵ and less direct formulations involving references to inanimate entities such as (4):

- (3) We believe that HF specialists purposefully altered their NTproBNP estimation as a result of this knowledge enabling them to guess correctly. [ESCI]
- (4) (...) evidence suggests that serial FMD measurements do not affect subsequent FMD outcomes [...]. [ESCI]

Furthermore, the study looks at the different ways external animate sources – other individuals or groups as in example (5) – are referenced to convey that authors believe that something is the case. Attention is also paid to cases where such sources are brought into play without an obvious indication being provided as to whether this opinion is shared by the

⁵ While my main focus is on features contributing to an apparently uninvolved style, the present research will take into account reporting structures involving expressions such as *I think*, which, having evolved into grammaticalised epistemic markers (e.g. Thompson & Mulac 1991, Halliday & Matthiessen 2014), also reference the author as the source of the proposition so as to provide a contrasting background for formulations which obscure the role of the author putting forth the proposition.

authors as in example (6) (e.g. Sinclair 1986, Hyland 1999a, Hunston 2000, Charles 2006, Fløttum et al. 2006, Malmström 2008):

- (5) Troughton et al. demonstrated that titration of therapy guided by NT-proBNP levels in symptomatic HF patients decreased hospital re-admission rates [...]. [ESCI]
- (6) Scientists think weakened immunity in the aftermath of cancer surgery might promote recurrence later. [EPOP]

Inspired by research on reporting verbs in academic writing and their role in conveying evaluative meanings (e.g. Thompson & Ye 1991, Thomas & Hawes 1994, Charles 2006, Malmström 2008), the present research thus highlights the attribution of propositions to sources by explicit or implicit reporting of speech or thought. The present focus being on the ‘objective’ style deemed characteristic of scientific writing, it should still be noted that the very choice of the sources cited and the ‘framer’ used in reporting add a subjective dimension to the account (Calsamiglia & López Ferrero 2003:149, Charles 2006:494). The analysis seeks to shed light on the use of different types of framing verbs used in crediting propositions to different sources; these include communicative (*say, report* etc.) and cognitive verbs, e.g. *believe* (3) or *think* (6), (e.g. Malmström 2008, Thomas & Hawes 1994). It is interested in how writers use these verbs to invoke epistemic (Palmer 2006) or evidential (Chafe 1986) meanings (cf. Malmström 2008) and how these choices may impact on their readership. This touches on the use of “verbs of proving” (Halliday & Matthiessen 2014:721) such as *show* or *demonstrate* in example (5), where the content expressed in the complement clause is presented as being held to be true from the writer’s point of view (cf. Vendler 1980, Kiparsky & Kiparsky 1971, Karttunen 1971a, b, Field 1997).⁶ The study examines the use of these verbs in matrix structures involving inanimate agencies as exemplified in example (4), i.e. *evidence*, and their role as metaphorical realisations of internal causal relations in the presentation of subjective opinion as objective certainty (Halliday & Matthiessen 2014:721).

The thesis specifically addresses cases where the source of the opinion is not as straightforwardly obvious. Also in this vein, the backgrounding of the author by the removal of the actor through what Brown and Levinson (1987) term “nouniness” will be spotlighted, e.g.:

⁶ The distinction between formulations conveying emotional attitudes and expressions relating to truth value also crops up in the literature on factivity, which also discerns between epistemic predicates (*find out, know* etc.) and affective predicates (e.g. *be surprised*) (Hooper & Thompson 1973, Hooper 1975, Shankland 1981, cf. also Field 1997:802, see chapter 5).

- (7) The demonstration that ACPA are concentrated at this site supports the possibility that ACPA might be generated. [ESCI]

Moreover, evidential formulations along the lines of example (8), which, as observed by Myers, enable the authors of scientific texts to “present themselves as merely speaking for their materials and instruments” (1989:4), will be a focal point:

- (8) Our results suggest that the slope of the shear stress-FMD regression line is different between the 2 populations of distinct cardiovascular risk [...]. [ESCI]

Cases where the source is left unidentified by means of passive uses of these verbs as in example (9) will also be attended to (cf. e.g. Brown & Levinson 1987, Thompson & Ye 1991, Caldas-Coulthard 1994, Malmström 2008):

- (9) Feeding infants with breast milk has been shown to improve baby health [...]. [EPOP]

The study will also take into account how these linguistic features are used by writers to reference other authors solely by means of bibliographic citation through numerical referencing (i.e. [13] in the following example):

- (10) Low wall shear stress, especially when blood flow is turbulent, is said to play important role [sic] in the pathogenesis of the atherosclerotic plaque [13]. [ESCI]

The present analysis aims to look more closely at the different lexico-grammatical choices occurring in actual register-specific language use. In the present context, emphasis will be placed on the role of these features in convincing the reader of the authority of the research outcome presented. Whereas many traditional accounts of epistemic modality (e.g. Palmer 1986), evidentiality (e.g. Chafe & Nichols 1986) and some hedging-oriented approaches (cf. e.g. Markkanen & Schröder 1997) focus on aspects relating to the writer’s subjective perspective (cf. White 1998:261, Martin & White 2005, Hood 2004:206), the present analysis seeks to shift the focus away from the individual author-centred point of view and adopt a wider social perspective, emphasis being on the potential impact of such formulations on the construal of the author’s stance and its implications for the alignment of the readership in scientific medical reporting (cf. Martin & White 2005).

Furthermore, the study sets out to analyse how medical popularisations aimed at the dissemination of medical knowledge to a non-specialist readership compare to medical journal articles in this respect. The thesis is intended to investigate whether popular scientific publications use the linguistic resources mentioned above differently in relaying knowledge claims to a non-specialist readership so as to ‘enlighten’ it (cf. e.g. Myers 1989, Niederhäuser 1999, Calsamiglia & López Ferrero 2003). Assuming that popularisations deal with a

comparable subject matter, but follow different communicative goals, the present research aim specifically involves examining how authoritatively and assertively medical research results are presented to a general readership and exploring whether authors tend to ‘offer’ knowledge to their readers or ‘impose’ it on them. Popular scientific reporting represents an area of journalism of Anglo-American origin which has become an established feature of the German journalistic field (Ruß-Mohl 1985, Hömberg 1990, Niederhäuser 1999). Adopting a cross-linguistic perspective, the present research endeavours to verify whether the assumed shifts resulting from different author-reader constellations in popular scientific writing impact differently on the use of relevant features across the two languages (cf. Myers 1989).

The study attends to differences in the use of the respective linguistic resources in English and German in the construction of knowledge as reflected in qualitative and quantitative usage patterns in the social context of medical research writing where scientists situate their own work within a research context (cf. e.g. Hyland 2005). It draws on research into the different resources provided by the English and the German language systems to reference the source of a proposition and mitigate the author’s accountability for or his commitment to the truth value or significance of a proposition (Hawkins 1986, Doherty 1996, Teich 2003). The analysis sets out to test the validity of the previously mentioned observations regarding different stylistic conventions considered characteristic of English and German academic discourse on an empirical basis as reflected in the linguistic phenomena outlined above. The present thesis thus aims to operationalise a comprehensive social perspective by considering the semantic potential of these features in terms of their potential pragmatic effect on the intended audiences. It seeks to model non-overlapping, fine-grained categories suitable for classifying inter-register shifts in English and then to apply these to the respective German registers to this effect.

1.3 Methods

In order to conduct monolingual and contrastive analyses of English and German corpora, the study uses corpus linguistic methods and builds on research into register variation and contrastive linguistics (Biber 1995, Hansen-Schirra et al. 2012, Neumann 2014). A crosslinguistic register-specific comparison of English and German medical research reports published in specialist journals will be made. Similarly, the English and the German medical popularisations will be compared. Moreover, the research publications will be contrasted with the journalistic articles in each language to investigate the strength of the assumed effect of popularisation on the use of the features analysed here in both languages. Mixed reference corpora in English and German provide a backdrop for contrasting the register-specific use of

these features with a range of different registers in each language. While much focus will be on quantities of occurrence, the present analysis requires contextual factors to be taken into account to determine the precise function of potentially relevant individual formulations in a corpus with an overall size of 194,884 tokens.

In order to classify inter-register shifts and conduct a cross-linguistic assessment of the impact of popularisation, the present analysis adopts the interpersonal perspective of Appraisal (White 2012, Martin & White 2005). Appraisal, which is embedded in Systemic Functional Linguistics (henceforth referred to as SFL) (e.g. Halliday & Matthiessen 2004), will be assessed in view of its suitability for providing a comprehensive approach to the systematic examination of the linguistic items mentioned above as implicit resources for shaping the author-reader relationship. The Engagement section of the Appraisal framework is particularly relevant as it is directly concerned with a wide range of linguistic items considered elsewhere in connection with phenomena relevant to the present research including modality, evidentiality, attribution, hearsay and hedging (Martin & White 2005:92ff, White 2003:260, White 2012). In Appraisal, these resources are also considered in view of their function in construing the position of the author's voice in relation to other stances (Martin & White 2005:2). The functional take adopted in Appraisal is based on the concepts of "dialogism" and "heteroglossia" proposed by Bakhtin (1981) and Vološinov (1995) (Martin & White 2005:92ff). According to this perspective, all verbal communication is innately dialogic in that it always responds to what has been said or written previously and anticipates the addressee's response. Linguistic features are hence categorised according to the extent to which the potential existence of alternative viewpoints is acknowledged or suppressed. The present research employs this interpersonal orientation in exploring the use of these resources within the social environment of medical reports published in scientific journals and carrying out a comparison with popularised articles in both languages. Moreover, the Framework will be adapted to enable the categorisation of register- and language-specific differences in the use of the features considered here in English and in German. In Appraisal, context-dependent meanings and rhetorical impact are highlighted (Martin & White 2005:94). In the present analysis, however, instances of Engagement will be categorised along two axes: according to their potential dialogic impact and according to the way these meanings are expressed.

1.4 Outline

The first part of the study gives an overview of the main research areas concerned with the topics outlined above and presents the theoretical foundations on the basis of which the

analysis is to be conducted. It begins with chapter 2, which provides a brief synopsis of the general characteristics of English and German scientific discourse, emphasis being on the role of grammatical metaphor in the construction of “technicality” (Halliday 1993a, b, Steiner 2004). The role of nominalisation and passive expressions as corollaries of grammatical metaphor is highlighted in this context. The next part of the chapter turns to the popularisation of medical knowledge and its linguistic implications. Chapter 2 then proceeds to examine the subject of hedging in medical discourse and the interrelated areas of epistemic modality, evidentiality as well as the attribution of propositions to different sources and aspects of impersonalisation. It comprises a description of formal and functional characterisations and a critical review of selected classifications of hedges as proposed, for example, by Skelton (1997), Prince et al. (1982) and Hyland (1996b, 1998a). Moreover, it examines politeness-related implications of hedging in scientific discourse (Brown & Levinson 1987, Myers 1989).

Chapter 3 picks up on this theme and focuses on the domain of modality. The relationship between the domains of epistemic modality and evidentiality is considered in more detail. Additionally, further types of modality, proposed classifications and the relation of modality to other linguistic categories are discussed, special attention being paid to similarities and differences between English and German.

Chapter 4 is concerned with Appraisal (Martin & White 2005, White 2012). It contains an outline of three main areas of the Appraisal framework: Attitude, Engagement and Graduation, with a special focus being on the Engagement section (Martin & White 2005:92ff, White 2003:260). Chapter 4 concludes with a summary and a critical assessment of the applicability of Appraisal to a cross-linguistic analysis of features expressing epistemic and evidential meanings.

Chapter 5 gives a brief insight into the notion of factivity (Kiparsky & Kiparsky 1971) and related concepts in order to set out the criteria applied in categorising the potential dialogic impact of the Engagement features considered in the present study (cf. Martin & White 2005:92ff).

The second part of the thesis is dedicated to the analysis, beginning with the modelling of the framework for the analysis of the English and German subcorpora and an outline of the analytical procedure and the corpus design (chapter 6). This is followed by a presentation and a discussion of the results in chapter 7. The findings are discussed in terms of subsets based on the relevant categories described in or derived from the Engagement category

formulated within Appraisal with regard to epistemic meanings, formulations making reference to evidence and attribution to other sources.

The thesis finishes with a conclusion and an outlook for future research work in chapter 8, which reviews the findings of the study and evaluates the methodology adopted in this analysis.

PART I
THEORETICAL FOUNDATIONS

2. SCIENTIFIC DISCOURSE

2.1 Introduction

The present research looks at the way language use varies in the transmission of medical research findings to different audiences. The context-oriented approach to the description of registers, that is language use specific to a particular purpose or social setting was introduced by Halliday et al. (1964) and was further developed by Halliday within systemic functional register theory (Halliday & Matthiessen 2014). Halliday uses the term register, i.e. “a particular functional variety”, to describe variation of language which arises from its use in different situations (Halliday & Matthiessen 2014:4), this context-dependent variation being an essential property common to all languages (Halliday 1978:31ff, see also Neumann 2014:1ff, 14ff on the concepts of register and register variation). The choice of linguistic resources being governed by the type of social context, conventions determine that a certain kind of language is adequate to a certain use (Halliday et al. 1964:87). Systemic functional register theory examines these linguistic varieties in view of the contextual variables “field”, “tenor” and “mode”, which construct the situational framework for language use (Halliday et al. 1964, Halliday 1978, Halliday & Hasan 1989). Mode deals with the realisation of textual meanings and is concerned, among other things, with the organisation of information in theme-rheme sequences and the channel of communication, that is, for instance, speech or writing (Halliday 1978:222ff). Field refers to the “subject matter” dealt with and the nature of the social action in which the participants are engaged (Halliday 1978:143ff). Language, however, not only varies depending on the social action in which a text serves a particular function, it also varies according to the interpersonal relationship between the interactants. This notion is referred to as “tenor”, which also concerns the level of formality or technicality: The language used in communication between experts and laymen, for instance, will differ from the language used in the communication taking place between laymen or between experts (Halliday 1978:222).

In the systemic functional view, these socio-semiotic variables determine the type of situation which enables the linguistic features that will be used in this context to be predicted with a certain degree of probability (Halliday 1978:32). In this vein,

‘a register’ is a tendency to select certain combinations of meanings with certain frequencies, and this can be formulated as the probabilities attached to grammatical systems, provided such systems are

integrated into an overall system network in a paradigmatic interpretation of the grammar. (Halliday 1991:33)

Halliday uses the term “scientific English” to refer to

a generalized functional variety, or register, of the modern English language. To label it in this way is not to imply that it is either stationary or homogeneous. The term can be taken to denote a semiotic space within which there is a great deal of variability at any one time, as well as continuing diachronic evolution. The diatypic variation can be summarized in terms of field, tenor and mode: in field, extending, transmitting or exploring knowledge in the physical, biological or social sciences; in tenor, addressed to specialists, to learners or laymen, from within the same group (e.g., specialist to specialist) or across groups (e.g., lecturer to students); and in mode, phonic or graphic channel, most congruent (e.g., formal ‘written language’ with graphic channel) or less so (e.g., formal with phonic channel) and with variation in rhetorical function – expository, hortatory, polemic, imaginative and so on. (Halliday 1993a:54)

Halliday also differentiates in terms of a vertical organisation according to levels of technicality, which, as mentioned above, concern tenor:⁷

three ‘brows’, high, middle and low (learned journals, college textbooks, and magazines for the general public). (Halliday 1993a:54)

He nonetheless points out that specialist writing can vary considerably, but texts belonging to this category will, nonetheless, display a level of similarity that enables language users to recognise them as scientific texts (Halliday 1993a:54). The present analysis is concerned with medical discourse and its role as a specific domain of scientific discourse, focussing on high brow articles, i.e. research publications, and low brow journalistic texts, i.e. popularisations.

Medical discourse has received a great deal of research attention and has been explored from different angles, e.g. linguistic perspectives as well as socio-linguistic and -historical viewpoints (Gotti & Salager-Meyer 2006:11). Discourse may be defined as “a coherent way of describing and categorizing the social and physical worlds” (Lupton 2012). According to Gotti and Salager-Meyer,

Medicine is both an *area of knowledge* (of body systems, their diseases and treatments) and the applied practice of that knowledge to medical *praxis*. (Gotti & Salager Meyer 2006:9, authors’ emphases)

As pointed out in the introduction, the domain of medical discourse is linked to the key sociological notions of power and stigma (Goffman 1963, cf. Vihla 1999:12). The relationship between physicians and patients may also be considered in terms of social power (Gotti & Salager-Meyer 2006:11, referring to Foucault 1963). This entails, for instance, physicians’

⁷ The German literature (e.g. Hoffmann 1985, Kalverkämper 1988) distinguishes between vertical and horizontal categories. The latter classification roughly refers to domain-specific language use.

control of drug prescription (Gotti & Salager-Meyer 2006:11). Sociological accounts include Lupton (2012), who observes

an increasing dependence upon medicine to provide answers to social as well as medical problems, and the mythology of the beneficent, god-like physician remains dominant. [...] Medical views on health, illness, disease and the body dominate public and private discussions. (Lupton 2012:vii)

Medical discourse covers an array of different types of texts including textbooks, hospital documentation, self-help literature, TV programmes, medical journal articles, popularisations, internet blogs, websites and social media pages on medical matters as well as transcribed oral physician/patient communication and researcher/subject interviews (Lupton 2012:3). Communication in medical contexts is, however, not limited to written discourse: In an anthropological perspective, Wilce (2009:199ff, referring to Heath 1986, 2002, 2006, Ruusuvuori 2001) notes that medical interaction is also manifested in non-verbal forms, including gesture and posture in the communication between patients and physicians, for instance, with patients averting their gaze

while making their subjectivity a clinical resource, e.g. demonstrating pain and its location [...]. (Wilce 2009:200, citing Heath 2006)

Moreover, body and spoken language may be used to prompt and manage actions in medical teamwork contexts and physician/patient interactions (Wilce 2012:200, referring to Hindmarsh & Pilnick 2002). Physician/patient interaction has also been examined from different linguistic points of view, e.g. from ethical (e.g. Barton 2006), cross-linguistic and cross-cultural (e.g. Guido 2006, Roberts 2006) as well as from gender-oriented perspectives (e.g. Menz & Lalouschek 2006). Works on healthcare interpretation include Meyer's (2004) study, which is concerned with community interpreting in hospital settings.

Further linguistic accounts of medical discourse include Maher's (1986) study of English as "an international language of medicine" and Salager-Meyer (1992) on verb tense and modality.⁸ The use of modality in medical writing is also explored by Vihla (1999) and Vold (2006). Moreover, Pahta's (2006) corpus study, which examines amplification in written medical discourse, and MacDonald (1994, 2002), who is concerned with the social construction of medical discourse, are further examples of recent works in the field. Drawing on Halliday's systemic linguistics, MacDonald's (1994) analysis focuses on the genres of medical research reports ("production"), medical interviews ("reproduction") and textbooks ("recontextualising") in view of shifts concerning tense, transitivity, process and modality.

⁸ Masri-Eberhard (2012), for example, provides an overview of works on the "Rhetoric of Health and Medicine".

The “production and reproduction of medical knowledge” are also dealt with by Atkinson, who explores “evidentiality and the construction of professional responsibility” (1999:80). Atkinson (1999) discusses features which are also a key interest of the present research, albeit in a different professional setting, i.e. in spoken English medical discourse among physicians in hospital contexts. He observes that

embedded accounts, descriptions and opinions [...] inscribe the expert and social division of labour among the medical profession. Some elements construct the phenomena as *factual*, while others are otherwise marked as *uncertain*, or are attributed to the *interpretations* of others. (Atkinson 1999:98, author’s emphases)

The use of discursive framers as markers of “reliability” of reported content, e.g. “what ‘they’ ‘said’”, “what ‘they’ ‘saw’” or “what they were ‘afraid’ of” in the discussion of prior external diagnoses in clinical contexts is examined by Atkinson in this connection (1999:97). The mention of external sources touches on the notion of evidentiality. Drawing on Chafe and Nichols’ (1986) notion of evidentiality, Atkinson describes evidentiality as being concerned with

the diverse ways in which the relative credibility of reported events, acts or statements is conveyed in language. (Atkinson 1999:98)

As mentioned in the introductory chapter, the domains of hedging and evidentiality are linked. Expressions discussed by Atkinson in this context include features such as the following, which are considered hedges by Atkinson:

‘I *think* so I think so but I think they were going to do another approach...’ [...]. (Atkinson 1999:97, author’s emphasis)

The interpersonal implications of the use of such framers in transmitting knowledge claims in written contexts will be a recurring theme in this study and take us to the choice of expressions used by authors in positioning themselves with regard to the content being presented, towards their readership and the question of how they situate themselves with regard to prior research (e.g. Martin & White 2005, Martin & Rose 2007, White 2012). Fryer (2013) investigates evaluative language use in English medical research writing and adopts the Engagement framework of Appraisal (Martin & White 2005, White 2003). As noted by Fryer (2013), the findings obtained from his analysis of English medical research articles

suggest a variety of heteroglossic engagement patterns across and within medical RAs, patterns that may be more easily discerned using a corpus-based approach than by the analysis of individual texts or text segments alone (see comments in Martin and White 2005: 260). These possible patterns and their relations with the rhetorical purposes of the medical RA need to be explored further, as do the effects of variations in the scope of heteroglossic features. (Fryer 2013:201)

Further Appraisal-based approaches include Hood's (2004, 2010) work on Appraisal in research writing and Herrando-Rodrigo (2010) on Engagement and self-mention in medical research articles and electronic popularisations. Pérez-Llantada (2011) also adopts a heteroglossic perspective in exploring the construction of dialogic spaces in academic writing. In her cross-linguistic analysis of English, French and Norwegian articles from the fields of medicine, economy and linguistics, Fløttum (2006:266) examines these texts in view of expressions of polyphony:

[T]he author may set up a polyphonic play signalling the presence of his / her own voice and the voices of others. Different voices are given the floor, if not explicitly (for example, by citation), then by some distinctive mark signalling polyphony. This is a play which the author of course sets up in his / her own way and which represents a subtle way of interaction, where the source of the different voices or points of view is not necessarily explicit. (Fløttum 2006:253)

She observes that medical articles differ from articles from the fields of economics and linguistics. Thus, for example, overtly "personal" expressions occur less often, with the author being less present and interacting less with the readership (Fløttum 2006:265f). Moreover, as regards citation, names are mentioned less often in medical articles than in economics and linguistics (ibid.). Whereas framers involving verbs such as *argue* or *claim* occur in the linguistic articles, medical authors use *find* or *show* according to Fløttum. Notwithstanding the relative avoidance of overtly personal expressions, argumentation is not absent in medical writing, it is however more "subtle" and less explicit than in linguistics (Fløttum 2006:266). The concepts of heteroglossia, polyphony and dialogism are also relevant to this study, which intends to explore the use of linguistic resources by authors in invoking or obscuring different sources of knowledge in medical research articles and will be taken up again in chapter 4. The English research articles analysed in view of the occurrence of this type of Engagement were taken from *PLoS Medicine*, *The Journal of Immunology*, *Journal of Vascular Research* and *Stroke*. Moreover, the present research, adopting a cross-linguistic perspective, is also interested in the use of corresponding features in German medical discourse. As noted by Neumann (2014:2ff), languages are traditionally compared in view of the possible choices available in a language system (cf. e.g. König & Gast 2012). Yet, this potential is exploited differently in different registers by actual language users. This appears to be particularly true in the case of non-native authors/speakers, who may express themselves in a comprehensible but inaccurate fashion (Neumann 2014:3). Corpora reflect actual language use and, for reasons outlined in the following, the issue of non-native English is especially relevant to the analysis of English medical research articles.

It transpires from the overview of the linguistic literature on medical discourse that much emphasis is placed on English. Baethge (2008:37) observes that English is used as a lingua franca in medical discourse, playing “a leading role as the international language of medicine” – similarly to Latin during Renaissance (cf. also e.g. Niederhäuser 1999:111ff on the dominance of English in the sciences, Wiese 2006:275ff and Weinreich 2010:84ff on the anglicisation of medical journals). As noted by Egger et al. (1997), German authors tend to publish important findings in English journals, while “statistically insignificant” findings are published in German journals, resulting in a “language bias” (Baethge 2008:40). The prevalence of English in medical journals is reflective of the important role of impact factors (IF), which are a measure of how frequently articles are cited (Baethge 2008:39, cf. also Wiese 2006:280 and Weinreich 2010:78ff). German authors thus write in English with a view to reaching an international audience, which is necessary in order to achieve a high impact factor (Baethge 2008:37). The pressure to publish in a foreign language has implications concerning the linguistic quality of the articles written in English by German authors, many of whom may have difficulties in expressing themselves in English and might also find it difficult to read English publications and understand all the nuances of the texts (Baethge 2008:39). In addition to this, the transmission of knowledge to the German medical audience is also hampered by a lack of access to English journals (Baethge 2008:39).

Although key topics are debated in the major English publications and a large number of German journals have switched to English, there are also medical journals which are published in the national languages, which mostly deal with education or culturally embedded research (Baethge 2008:38f). Medicine is, therefore, not completely dominated by English-language works (Baethge 2008:39). The website of *Deutsches Ärzteblatt*, for instance, includes German articles and English translations (Baethge 2008:40), *Deutsches Ärzteblatt* being the source of four of the articles included in the corpus analysed in the present study. In addition to these, the German research section of the corpus includes scientific articles from *Phlebologie*, *Hämostaseologie*, *Kinder- und Jugendmedizin* and *Nuklearmedizin*.

The following section provides an overview of features widely associated with written scientific discourse, focussing on nominalisation and passivisation. These features are generally associated with the impersonal, objective style considered typical of scientific writing, enabling propositional content to be ‘removed’ from sources (cf. e.g. Chafe 1982:45f, Chafe & Danielewicz 1987:105ff). In addition to cross-linguistic register-specific variation, the present study is, furthermore, interested in intralingual variation regarding the occurrence of these features in medical popularised journalism. Therefore, the concept of

popularisation will be examined in section 2.4, before the notion of hedging in scientific discourse is highlighted in section 2.4.

2.2 Characteristics of scientific discourse

Scientific progress inherently entails the introduction of new terminology (Sager et al. 1980:230). Hence, the use of terminology constitutes an obvious feature of scientific discourse (cf. e.g. Halliday 1993b:70, see also Sager et al. 1980:230 ff, Gotti 2011:25ff on the lexical characteristics of specialised discourse). The pervasive use of medical jargon in the corpus examined in the present analysis is illustrated below:

- (11) Synovial samples were obtained from an additional 25 patients with RA (the same extra 25 mentioned above). Each specimen was divided into 2 parts; one was formalin fixed and paraffin embedded for immunohistology and the second was stored in a 10:1 v:v of RNA-later (Ambion) at -80 °C for RNA extraction and QT-PCR analysis. Histological characterization of the RA tissue was carried out as described above. Total RNA was extracted from the remaining portion of synovial tissue, using the RNeasy Mini Kit (Qiagen), with on column DNase I digestion to avoid genomic DNA contamination. [ESCI]

Yet, the use of terminology is not the sole defining aspect of scientific discourse, and it is not immediately relevant to the present study. Though grammatical, syntactic and textual characteristics of scientific writing are also defining properties of specialist language, these points had been neglected for a long time (Sager et al. 1980:230). In more recent years, however, the role of grammatical and syntactic features such as nominalisation or the use of the passive voice has received growing research attention, notably from corpus-based research into register variation, and will be considered more closely in the following.

It was mentioned earlier that the concept of register refers to a non-random co-occurrence of related features (Halliday 1993a:54). Early studies into intralingual variation concerned with academic discourse include Chafe's (1982) and Chafe and Danielewicz's (1987) analyses of English written and spoken discourse, academic papers and informal spoken language being considered "maximally differentiated styles" (Chafe 1982:36). These are analysed in view of two dichotomic parameters: "fragmentation" versus "integration" (Chafe 1982:38ff) and "involvement" versus "detachment" (Chafe 1982:45ff, Chafe & Danielewicz 1987:105ff). A fragmented style is marked, for example, by an absence of connectives and is considered typical of spoken language whereas written language is characterised by an integrated style involving an increased tendency to package information into an "idea unit" (Chafe 1982:39).

In involved forms of discourse, subjects tend to refer to actual people engaged in an activity or persons who are in some "concrete state" (Chafe & Danielewicz 1987:108). Chafe and

Danielewicz (1987:105) distinguish between three types of speaker involvement: “involvement with the audience”, “involvement with himself” and “involvement with the concrete reality of what is being talked about”. “Involvement” is reflected in the use of first-person pronouns, frequent reference to the audience, emphatic particles, fuzziness and direct quotes (Chafe 1982:45ff, Chafe & Danielewicz 1987:106). Like fragmentation, it is considered to be linked with spoken discourse.

Involvement is distinguished from “detachment”, which is regarded as a typical feature of written language. “Detachment” refers to features which “serve to distance the language from specific concrete states and events” (Chafe 1982:45). It is marked by an avoidance of reference to the author or the readership and entails impersonal expressions instead.⁹ Chafe and Danielewicz (1987:106f) argue that pronominal reference to self rarely occurs in academic texts. Unlike involved forms of language, academic discourse is considered to deal with concepts which are “not tied to specific people, events, times, or places, but which are abstract and timeless” (Chafe & Danielewicz 1987:108). It is thus characterised by the use of nominalisations as a means of “abstract reification” (Chafe 1982:46) and the passive voice which enables writers “to avoid mentioning any concrete doer, [...]” (Chafe & Danielewicz 1987:108f). According to Chafe and Danielewicz (1987:109), detachment also involves the use of “academic hedges”. These refer to markers of probability, but the examples cited, *normally*, *primarily*, *principally* and *virtually*, do not relate to probability as traditionally discussed within the context of epistemic modality (e.g. Palmer 1990). Rather, they seem to concern Halliday and Matthiessen’s (2014:691f) modal category of “usuality” and features serving to scale meanings as discussed, for example, in terms of “graduation” by Martin and White (2005:135ff). These issues will be left aside for the moment, but will be taken up again in the following chapters.

The notions of involvement and hedging are also considered in Biber’s (1995) cross-linguistic, corpus-based analysis of register variation. Biber’s work has been a major influence in corpus linguistics (cf. Neumann 2014:24ff and McEnery & Hardie 2012:111ff for a critical appraisal of Biber’s work). Biber (1995) builds on the methodology developed in Biber (1988) for the investigation of spoken and written discourse in English and applies it to cross-linguistic and diachronic analyses. Biber’s aim is to categorise the different ways in which different languages (English, Korean, Somali and Tuvalu) vary. To this end, Biber

⁹ See also Luukka and Markkanen’s (1997) politeness-oriented treatment of “impersonalization as a form of hedging”, which they regard as being akin to the notion of “detachment” (Chafe 1982 and Chafe & Danielewicz 1987).

(1995:141ff) carries out a factor analysis in view of the absence, frequency and co-occurrence of linguistic features selected on the basis of criteria identified from pertinent literature in order to identify registers and position them along seven dimensions of register variation: “involved versus informational production”; “narrative versus non-narrative”; “situation-dependent versus elaborated reference”; “overt expression of argumentation”; “abstract versus non-abstract style”; “on-line informational elaboration”; “academic hedging”. Dimension 1 “Involved versus informational production” grades registers on a scale ranging from „careful, dense, integration of information“ on the negative end to „fragmented, generalised packaging of content with an affective, interpersonal focus“ on the positive end (Biber 1995:145). Located at the negative end of the scale, academic prose reflects the combined impact of a marked informational focus and maximum opportunity for elaborate text production, displaying features which signal a highly succinct, precise and informational style. This sets it apart from, for instance, telephone conversations, the latter

reflecting direct interaction, focus on the immediate circumstance and personal attitudes or feelings, fragmentation or reduction in form, and a less specific, generalized content. (ibid. 143)

The high informational content, succinctness and precision distinctive of registers assigned to “informational production” are associated with a high frequency of occurrence of nouns. Nouns are seen as the main device employed to convey referential meaning (Biber 1991:141, Halliday 1966:58), a high frequency of nominal features being regarded as indicative of “a high (abstract) informational focus” (Biber 1988:227). A German example of the noun-heavy style of the research corpus analysed here is given below:

- (12) In Abwägung von Aufwand und Aussagekraft ist die Wertigkeit der Knochenmarkuntersuchung als positiver Krankheitsnachweis zumindest fraglich. [GSCI]

The following sentence from the English research corpus illustrates the tendency to express meanings by means of nominalised features in scientific writing:

- (13) The similarity between adjusted and unadjusted results provides methodological justification for our meta-analysis of unadjusted data from published studies, the results of which confirmed and strengthened the findings from this study. [ESCI]

Nominalisations such as *justification* or *findings* in the example shown above are widely recognised as a distinctive trait of specialised language use in English and other languages (e.g. Biber 1995:141ff, Gotti 2011:58). They are characteristic of the detached style of written discourse and integrated forms of language (Chafe 1982:39, 46), but their use also has syntactic implications. The presentation of syntactic units in a nominalised form in scientific writing is linked to the notion of “grammatical metaphor” introduced by Halliday (e.g. 1993a:56ff, 1993b:79). It relates to a certain manner of presenting processes which has

evolved and established itself in scientific writing. In rough terms, it entails the substitution of one grammatical class with a denser, more compact variant. Grammatical metaphor is characterised by a tendency of lexical units to form nominal clusters, complex phenomena being packed into a single semiotic unit (Halliday 1993b:77). Halliday provides the following example from *Scientific American* to illustrate this effect:

The atomic nucleus absorbs and emits energy only in quanta, or discrete units. Each absorption marks its transition to a state of higher energy, and each emission marks its transition to a state of lower energy. (Halliday 1993b:81)

In the second sentence, each clause is composed of a “taken for granted” component and a new element. Moreover, informational content from the preceding sentence (i.e. „the atomic nucleus absorbs (...) energy“) is expressed nominally („each absorption“), with „the atomic nucleus (...) emits energy“ becoming „each emission“. The new element is, in turn, taken up again and expressed nominally (i.e. „its transition to a state of higher energy / lower energy “) (Halliday 1993b:81). In many cases, information provided previously in the text is summarised in this way. Complex phenomena are thus condensed and phrased as a semiotic unit which is integrated into the clause (Halliday & Martin 1993:60). According to Chafe,

[a] nominalization allows a notion which is verbal in origin to be inserted into an idea unit as if it were a noun. Such an element then plays the role of a noun in the syntax of the idea unit, acting as one of the arguments of the main predication. Thus it adds another, intrinsically predicative, element to the idea unit in the guise of a nominal one. (Chafe 1982:39)

Hence, grammatical metaphor enables processes to be phrased along the lines of “this event caused that event” instead of being described by means of expressions such as “this happened so that happened” (Halliday 1993b:81). In scientific discourse, this style of presentation has established itself as an efficient means of describing processes and procedures in steps,

with a constant movement from ‘this is what we have established so far’ to ‘this is what follows it next’ [...]. (Halliday 1993b:81)

This notion will be taken up again in the present research in connection with the concept of “conceptual shells” (Schmid 2000), which is illustrated below by *this concept*:

- (14) Despite this limitation, the topographical proximity of ACPA-producing plasma cells to AIDp follicular structures and the close association between the level of ACPA production in the mouse serum and higher levels of AID within the same tissue strongly suggest that autoreactive plasma cells can be generated within ectopic lymphoid tissue. This concept is in agreement with the significantly higher levels of synovial ACPA recently demonstrated in synovial tissues containing lymphoid aggregates [55]. [ESCI]

By reintroducing notions in thematic position, nominalisation facilitates the sequencing of new and given information, thereby helping the development of a text (Gotti 2011:59f). In broad terms, the theme element commonly refers to old, “given” information and normally occurs in sentence-initial rather than in sentence-final position (Quirk et al. 1985:1361, Bußmann 1990 s.v. *Thema*). New information, on the other hand, is presented as rheme and constitutes the communicative focus of the message, which is usually placed in sentence-final position, unless followed by adverbial elements, and represents the most important part of a message (Quirk 1985:1362, see Teich 2003:11ff for a detailed contrastive account of theme/rheme and given/new in English and German). In unmarked cases, theme and given correspond, and rheme and new are equivalent (Halliday 1993a:60). If the thematic element expresses given information, it is shifted to the background, while the new element is given prominence:

The New is the element that constitutes the point of information for the message; this is signalled, in English, by nuclear prominence in the tone group. Provided the informational element is also Rheme (i.e. non-Theme), the rhetorical effect is that of foregrounding. (Halliday 1993a:60)

The frequent use of nominalisations in written scientific discourse is thus linked with the thematic progression of scientific texts. Moreover, the thematisation of information by means of nominalisation contributes to text cohesion and the hierarchical organisation of scientific texts (Buhl 1999:129f, Halliday 1993a:60ff, 68, Gotti 2003:79).

Grammatical metaphor is, furthermore, interlinked with other linguistic phenomena considered characteristic of scientific writing. While grammatical metaphor concerns the deep underlying structures of language, i.e. the switching of grammatical structures, its surface impact can concern the lexical and grammatical level of language, e.g. „glass crack rate“ instead of „how quickly cracks in the glass grow“ (Halliday 1993b:79). As was noted above, this effect is associated with a frequent use of nominalisations, which can, in turn, result in a high lexical density (Halliday 1993a:56ff, 79ff, Gotti 2011:61ff). According to Halliday’s (1993a:67) definition, lexical density is the number of lexical words occurring in a clause (cf. also Halliday & Matthiessen 2014:726ff).¹⁰ A high lexical density is considered characteristic of written discourse which is marked by an absence of hesitation phenomena. Written discourse is less redundant than spoken language, which is less planned by comparison (Gotti 2011:61, Chafe & Danielewicz 1987:83ff). The use of elaborate nominal phrases in specialist discourse is characterised by frequent pre- and postmodification (Gotti

¹⁰ We may note in passing that lexical density is defined in terms of a percentage by Gotti (2011:61), according to whom it is a measure of the proportion of content words in relation to the total number of lexemes in a text.

2011:59, see Teich 2003:125 for a contrastive account of the nominal phrase in English and German and Hansen-Schirra et al. 2012 on pre- and postmodification in English and German scientific texts and popularisations). The modification of nominal referents by adjectival attributes, postnominal clauses or prepositional phrases contributes to informational density by enabling large amounts of information to be presented in relatively few words compared with predicative adjectives or relative clauses (Biber 1995:141f, Sager et al. 1980:219 ff, Chafe 1982:40f). Examples of pre- and postmodified nominalisations in the medical research articles contained in the corpus analysed in the present study are given below:

- (15) Finally, the survival and proliferation of functional B cell niches was associated with persistent overexpression of genes regulating ectopic lymphoneogenesis. [ESCI]

Expressions of this type are also illustrative of the syntactic ambiguity of scientific texts (Halliday 1993b:77). Though grammatical metaphor is associated with increased lexical density and more intricate nominal complexes, the structure of the sentence and the clause is more straightforward as a result (Halliday 1993a:67). It is relatively plain in the example shown above, consisting of three noun phrases, each of which contains a nominalisation (i.e. *survival*, *proliferation* and *overexpression*) and a verbal phrase (*was associated with*). The connection between the noun phrases expressed by the verbal phrase in the example is vague as this type of structure could be interpreted as a causal or symptomatic relation (cf. Halliday 1993b:77ff). This kind of syntactic ambiguity is linked to the high frequency of polysemantic verbs occurring in English scientific writing such as *mean* or *be associated with* in the example above (Halliday 1993b:78). The tendency of syntactic units to occur in a nominalised form in written scientific discourse thus results in a loss of semantic content according to Halliday (1993b:77ff). Like the high lexical density typical of scientific writing, ambiguity also derives from grammatical metaphor (Halliday 1993b:79).

The extensive use of nominalisations is not merely due to their role in the sequencing of information in terms of theme and rheme structures, but also appears to have other implications. On a stylistic note, it enables authors to present their view in an objective manner (Gotti 2003:79). This is in line with Sager's (and Gerr's) observations on the syntax of scientific texts:

The basic units between which relationships are established are frequently complex nominal groups formed by [...] various techniques [...] representing mental categories, phenomena or operations. This tendency to concentrate content in the nominal group weakens the function of the verb and reduces its free collocability to a limited number of subjects and objects, or even further to a fixed phrasal unit. The relationships expressed are concerned with such objectives as precise qualification of states, processes or results, quantification by measurement in absolute or relative terms within subject specific schemes, declaration of new phenomena, definitions or logical procedures, e.g. cause and effect, condition,

instrument, deductions, consequences. Relationships are depersonalised and objectified which in the sentence leads to the suppression of personal and situational reference and to the absence of agentives, Gerr (1942). (Sager et al. 1980:86)

The suppression of agents resulting from a preference for passive structures is thus described as a corollary of the tendency to present informational content in a condensed nominal form. This link has been observed both in English and in German (e.g. Biber 1995:143, Fluck 1996:55f). The pervasiveness of passive forms in specialised discourse has been the subject of extensive research (Gotti 2003:96, Gotti 2011:74). The following example illustrates their use in the medical research papers analysed in the present study:

- (16) This growth factor has been postulated to play an important, though largely undefined, role in vascular proliferative processes [23]. [ESCI]

A corresponding example taken from the German research corpus is shown below:

- (17) Der TLR3-Defekt und der UNC93B1-Defekt können bei einer verminderten Produktion von IFN- β oder IFN- λ in Fibroblasten nach Stimulation mit TLR3-Agonisten vermutet werden. [GSCI]

There appears to be virtual unanimity of view among linguists that passive sentences are an important characteristic of both English and German technical writing (Beier 1980:77, see also e.g. Beneš 1971:128, Huddleston 1971:119ff, Biber 1995:143). The frequent occurrence of passives in specialist discourse is attributed to several factors: As mentioned in the previous section, its use is considered to be associated with a nominal informational style and seen as aiding an integrated packaging of information (Biber 1995:143). Biber (1995:164) treats passive main clauses – both agentless and *by*-passives – and dependent clause passive constructions (namely adverbial and postnominal clauses as contained in the following example) as typical features of the abstract style of writing characteristic of academic prose and technical and engineering prose.

- (18) [...] the remodelling observed in the presence of hypercholesterolemia could be initiated by oxidative stress that is involved in several processes of atherogenesis and this remodeling is more pronounced in the presence of turbulent blood flow/low wall shear stress. [ESCI]

In the following example from the German research corpus, a similar effect is created by the premodification of the head of the noun phrase by a participle clause:

- (19) Die in der bisher vorliegenden Literatur beschriebene 30-Tages-Letalität nach Katheterklappenimplantation von 9 bis 18 % (8–10, 13, 14) fand sich auch im eigenen Kollektiv mit 11,8 %. Sie ist niedriger als die mittels Risikoscores antizipierte Letalität eines konventionellen Aortenklappenersatzes von 24 %. [GSCI]

Passive constructions differ from their active counterparts in terms of their communicative structure (Beier 1980:79). As illustrated in examples (16) and (17), the patient is promoted and the agentive subject is deleted in agentless passive expressions (Biber 1995:164, Quirk et al. 1985:1390 on the English passive and Steiner & Teich 2004:142f on diathesis in German). Hence, the affected element becomes the point of departure of a message as it is shifted to sentence-initial position, unless it is preceded by an adverbial phrase, and placed before the finite verb (Beier 1980:78f, Sager et al. 1980:209, Gotti 2003:96ff). The patient thus becomes theme, which, as pointed out in the previous section, generally refers to the first part of a message (Quirk et al. 1985:1361). The thematic presentation of processes, facts or actions referenced in a preceding sentence achieved by the use of the passive voice adds to a well-organised information flow (Gotti 2003:96, 2011:75). The action expressed by the participle and/or an adverbial phrase represents the informational focus in most cases, i.e. the new element of information, which, as mentioned earlier, is usually presented as the rheme element (cf. Gotti 2003:96ff, Quirk 1985:1362).

In the case of *by*-passives, the performer of the action expressed by a *by*-phrase is presented as the rheme, which usually constitutes at least part of the new information provided (Beier 1980:79, cf. Quirk et al. 1985:1361ff). This effect is illustrated by the following example taken from the English research corpus:

- (20) The concept of FMD normalization to shear stress has largely been promoted by Pyke and Tschakovsky [6]. In 2007, the same authors [9] provided experimental evidence leading to the conclusion that the shear stress area under the curve, but not the peak shear, was the critical determinant of the FMD response, and recommended it to be used for normalization purposes. [ESCI]

As a consequence, *by*-passives enable end focus to be placed on the agentive. Communicative aspects are thus also seen as factors motivating the preference for a passive sentence over an active sentence containing the same elements (Beier 1980:78f). Hence, similarly to nominalised features, the use of passive structures is an important means of organising theme-rheme sequences in the development of texts and contributes to the integration of individual utterances into a cohesive text (Beier 1980:79, Sager et al. 1980:209, Gotti 2003:96ff).

It appears, however, that purely syntactic reasons cannot solely account for the use of the passive voice instead of an active structure either (Gotti 2003:97). To return to agentless passive forms: Their use allows authors to avoid a stylistically undesirable repetition of the subject if a series of actions is carried out by the same person (Sager et al. 1980:209, Gotti 2003:96, Gotti 2011:74). According to data obtained by Beier (1977) in an early corpus-based

survey of American and British English chemistry texts, the vast majority of the passive sentences do not specify the agent (see also Gotti 2003:96). This observation is in line with Biber's (1995:163) findings obtained from his analysis of academic prose, according to which the agent of the passive structures is typically an animate referent who, being of little relevance to the discourse, is deleted in many cases. Moreover, the use of the passive or the active voice can vary according to the section of the text, the methods section containing more passives and the discussion of the literature containing more active forms according to Gotti (2011:75). In the latter case, the authors' work is considered within the context of existing research, their role is highlighted by means of active forms (Gotti 2011:75). In the "methods section", by contrast, emphasis is placed on procedures by the use of the passive form (Gotti 2011:75). Therefore, the passive voice is widely regarded as a major device for depersonalisation in specialised discourse since, as noted above, it enables the performer of an action to be omitted so as to emphasise the outcome or effect of a process (Gotti 2003:96ff, 2011:74).

As noted earlier, the use of the passive voice plays a key role both in English (Biber 1995:143, Sager et al. 1980:209) and in German scientific writing (Fluck 1997:55f, Beneš 1981:196). Nonetheless, the use of passive structures differs in English and in German due to systemic and language-typological reasons (see Doherty 1996:593ff, 636ff, Hawkins 1986:37, Teich 2003:68ff and König & Gast 2012:151ff for detailed contrastive accounts of voice in English and German). Sager et al. (1980:209f), for example, note that German uses a range of features such as reflexive verbs in impersonal active expressions as shown in the following example:

- (21) Im Vergleich zeigte sich, dass die Personen, die auf eine Schilderung der verstörenden Erlebnisse verzichtet hatten, später sogar oft weniger starke Probleme mit posttraumatischem Stress entwickelt hatten. [GPOP]

The frequent use of the passive voice in English specialised writing is often attributed to a lack of alternative means of achieving an impersonal style (Sager et al. 1980:209f, Gotti 2003:96):

English has no equivalents apart from a few impersonal constructions, since anything more than occasional use of the impersonal pronoun *one* makes even a text written in formal style sound stilted. In English therefore, the impersonal quality so characteristic of technical writing is achieved largely by the use of the passive. (Sager et al. 1980:209f)

The contribution of the passive voice to what is perceived as an objective, impersonal style and its pragmatic implications will be taken up again in section 2.4, which is concerned with hedging in scientific writing. The range of features distinctive of scientific language use is, of

course, not limited to the characteristics described in this section.¹¹ However, the use of nominal(ised) features and passive expressions is of particular interest to the present research, which is concerned with the way authors interact with readers by making their presence felt or backgrounding their own role, by referring to other actors or by foregrounding evidence. As mentioned initially, the central concern of this study is the way the presentation of knowledge is geared to different audiences, namely the readership of medical research journals, on the one hand, and popularisations, on the other. Though Sager et al. (1980:210) argue that the use of modals in special uses of English does not differ considerably from that in general language use, they note that modal verbs tend to be used to express possibilities rather than capacity or permission. As will be seen later, modality plays a critical role in the alignment of readers (cf. Martin & White 2005:104ff). Similarly to the use of passive forms, the domain of modality has received much attention in the literature on hedging and will be considered in more detail in section 2.4. Yet, before the pragmatic implications of the characteristic features of academic discourse are considered within the context of hedging, the next section turns to popularisations.

2.3 Popularisation

In rough terms, the primary communicative goal of popular scientific writing is frequently described as being to impart specialist knowledge to non-specialists (cf. Gotti 2011:179ff, Varttala 2001:179). Popularisations thus involve shifts concerning the participants involved in an action and may therefore be described as concerning notions subsumed under “tenor” in SFL, namely “institutional”, “status” and “contact roles” (Halliday & Matthiessen 2014:33). According to Gläser (1990:147), the central task of popular scientific writing is to make scientific and technological knowledge accessible to interested laypeople. In the 1980s, Biezunski observed that popularisations were commonly considered

as a positive means of transmitting knowledge from those knowing something to those knowing less.
(Biezunski 1985:183)

In this vein, Whitley (1985:6) notes that traditional accounts of popularisation tended to discern between an elite of “knowledge producers” involved in the “‘truth’ production process” and a “diffuse mass of ignorant knowledge consumers”. This perception, however, fails to take account of the faceted composition of the “scientific community” and the readership of popularisations, which, contrary to the traditional view, is not limited to a general lay audience (cf. Whitley 1985:6f). Rather, the readership of popularisations is a

¹¹ An extensive overview of special languages in English is given in Sager et al. (1980), for example.

heterogeneous audience including scientists operating in other research areas (Whitley 1985:6f). Moreover, researchers working in similar veins of research will pay attention to popularised publications, too (Myers 1986). Consequently, the communication of scientific results and notions to a non-specialist audience

is a more complex phenomenon, involving a variety of actors and audiences, that impinges upon the research process and cannot be totally isolated from it. (Whitley 1985:4)

As noted earlier, “truth” is increasingly seen as a social construct, “facts” being open to “reinterpretation and change” (Whitley 1985:5ff, 11). The audience of popularisations, though traditionally viewed as playing a passive part, represents a powerful factor influencing the production of knowledge (Whitley 1985:8). Biezunski notes:

When there is no consensus, the usual scheme of popularization cannot be applied: it is no longer a neutral means of transmission of knowledge: popularization becomes a part of the struggle to make the new ideas accepted. In most cases this process is limited to scientific circles. Nevertheless it sometimes happens that the debates take place among the public at large. (Biezunski 1985:183)

The rephrasing of knowledge claims inherent in gearing their presentation to a wider group of addressees entails their modification (cf. Whitley 1985:7). The adaptations taking place in popularisation have been described in terms of “translation from one system of discourse to another” (Whitley 1985:7, cf. Gotti 2011:180). This also has implications regarding the “feedback from popularisation to knowledge production and validation” (Whitley 1985:8).

Gotti (2011:180) observes that the linguistic “redrafting techniques” occurring in popularisation have not received much research attention. Popularisations are described as enabling a selective treatment of a subject matter, which is presented in an entertaining style (Gläser 1990:147). The description of experimental procedures or mathematical lines of argumentation, for instance, are generally simplified or omitted altogether (Gläser 1990:147, Gotti 2011:179). Popularisations use a language that is closer to everyday language use (Gotti 2011:180). The lower level of technicality entails a reduced use of technical terminology and definitions (Gotti 2011:180ff, see also Niederhäuser 1999 on the use of terminology in popularisations). Moreover, Gotti (2011:182) notes that self-referential expressions such as “I argue that” or “my contention is” generally lack in popularisations since expressions of this type are linked with an argumentative style which highlights the novelty of the author’s contribution to the stock of knowledge in a research field. Furthermore, definitions are given in a different manner: In texts intended for a peer audience, knowledge of terminology is presupposed so that merely new terminology is defined (Gotti 2011:182). Definitions are less frequent in popularisations and often involve the use of impersonal expressions, periphrases

and features such as “that is”, “known as”, “meaning” or “called” (Gotti 2011:182ff) as illustrated below:

- (22) In the presence of these drugs tumors grow faster and develop more extensive networks of the blood vessels they rely on to feed their expansion – a process called angiogenesis, says Jonathan Moss, an anesthesiologist at the University of Chicago (U. of C.) Medical Center. [EPOP]

The source of a definition may also be indicated in unspecific terms by referencing general groups of specialists (Gotti 2011:184), as in:

- (23) Like many other candidates now in testing, it was designed to coax the immune system’s disease-killing T cells into attacking the virus more aggressively. Experts say that such a vaccine is unlikely to prevent HIV infection. [EPOP]

The mention of human referents is particularly relevant to the present analysis as it is seen as contributing to a more concrete, active style highlighting the role of humans in the construction of knowledge (see also Niederhäuser 1999:198ff on personalisation as a strategy employed in the transfer of knowledge in popularisations as opposed to the impersonal style of research articles). The way definitions are presented in popularisations is modified, for example, by the use of items such as *so-called* or *in other words* indicating reduced precision:

- (24) Biochemist Michael Aviram of the Rambam Medical Center in Haifa, Israel, suggests another alternative. His research focuses on pomegranates. In a recent study, he found that mice bred to have blockages in their arteries and developed fewer blockages in their arteries after they were fed parts of pomegranates. Because such blockages can cause heart attacks and strokes, he says his studies suggest antioxidants work against such events. And although earlier studies found that vitamin E – another antioxidant – didn’t clear such blockages, he found that the kinds of antioxidants in pomegranates do. His theory: there are many sources of oxidative stress – viruses, toxins, physical strain – and each antioxidant might be effective against a particular type of stress, but not the others.

In other words, it depends whether the antioxidants you’re taking are fighting against the good, normal oxidation in your body or the bad oxidation. [EPOP]

A similar German example is shown below:

- (25) Weltweit haben etwa eine Milliarde Menschen einen zu hohen Blutdruck. Da diese sogenannte Hypertonie zu Herz-Kreislauf-Erkrankungen und Schlaganfall führen kann, ist es wichtig, hohem Blutdruck entgegenzuwirken. [GPOP]

Furthermore, definitions may involve approximators such as *like* or *sort of* which serve to signal an awareness of the reduced precision of definitions which are rephrased for the readership of popularisations (Gotti 2011:187). This point touches on the notion of hedging

(Lakoff 1972), which also applies to expressions of epistemic modality such as *perhaps* in the following example (e.g. Hyland 1998a):

- (26) But whereas some, or perhaps many, nostrums are no more likely to improve longevity, alertness and athletic performance than the cure-alls of old were to ward off dropsy or nervous agitation, not all can be so easily dismissed. [EPOP]

Such features enable a guarded presentation of content and shape the audience's reading of the information thus provided (Gotti 2011:189). In her cross-linguistic corpus-based analysis of register variation in English and German, Neumann (2014:142) observes an increased use of modal items in English popularisations compared to the other registers contained in her corpus, which include essay, fiction, public speeches, instructional texts and tourism brochures. This score relates to modal verbs such as *may* or *might* and modal lexis such as *perhaps* in the example shown above. The German popularisations, too, were marked by an increased use of modal lexis. Though higher scores were obtained for the German instructive texts and the reference corpus, the use of modal verbs was still found to be relatively high in the German popularisations (Neumann 2014:196). The epistemic use of modals in the popular scientific articles is interpreted as an expression of academic hedging (ibid.), that is "a specialised form of acting out the social roles between peers in academia" (Neumann 2014:143). Neumann's (2014) results do not discern between deontic and epistemic forms of modality. This distinction is, however, central to the present research and will therefore be considered in more detail in chapter 3. As mentioned earlier, the use of modal expressions in scientific discourse has been highlighted in the research on hedging (e.g. Hyland 1998a), which will be discussed in the following section.

2.4 Hedging in medical discourse

The phenomena grouped under the label of hedging have been analysed from linguistic and pragmatic perspectives as well as from logical, semantic and philosophical viewpoints (Schröder & Zimmer 1997:249). In general terms, hedges concern the "avoidance of personal commitment" (Szymańska 2013:6). The notion refers to strategies also treated in connection with evidentiality (e.g. Chafe 1986), "mitigation" (e.g. Stubbs 1983), "tentativeness" (e.g. Holmes 1983), "vagueness" (e.g. Myers 1996) and "politeness" (e.g. Brown & Levinson 1987) (cf. e.g. Schröder & Zimmer 1997:249, Hyland 1995:33, Varttala 2001:10). In the literature on hedging, hedges are frequently distinguished from boosters such as *in fact*, *definitely* or *clearly* which accentuate the writer's confidence in a claim (Szymańska 2013:6) as illustrated by the following example from my data:

- (27) Clearly, experiments should be designed to dissect the impact of delayed responsiveness from reduced responsiveness to shear stress. [ESCI]

Phenomena discussed in connection with the notion of hedges or hedging are also treated in terms of “stance markers” (e.g. Atkinson 1999), “understatements” (e.g. Hübler 1983), “downtoners” (Quirk et al. 1985) or “downgraders” (e.g. House & Kaspar 1981) (cf. Varttala 2001:4). The linguistic use of the term hedge is generally attributed to George Lakoff (1972), according to whom “natural language concepts have vague boundaries and fuzzy edges [...]” (Lakoff 1972:183). Lakoff uses the label to refer to the modification of predicates with regard to category membership.¹² His focus is not on the communicative implications of their use, instead he is concerned with “words whose job is to make things fuzzier or less fuzzy” (Lakoff 1972:195). Items such as *loosely speaking* or *sort of* in the following example are included under “hedges and related phenomena” by Lakoff (1972:195):

- (28) There also might be a sort of long-term feedback loop, in which women who were breastfed as infants would be more likely to breastfeed their own children, thus benefiting from both their own early breast milk diet and the effects of lactating themselves, as Schwarz has pointed out. [EPOP]

Lakoff’s concept is largely based on Zadeh’s (1965) fuzzy set theory and experimental research conducted by Rosch (1973, cf. Clemen 1998:18). His theory builds on the view that utterances will often be neither entirely true nor absolutely false, but instead more or less true or false (Lakoff 1972:183). In this vein, category membership is generally considered as a matter of degree, with robins, for instance, being perceived as central, that is prototypical members of the category ‘bird’, whereas a penguin, for example, is “sort of a bird” (1972:195), the function of *sort of* and similar features being to express graded category membership. The notion of hedges proposed by Lakoff remains a key influence on various subsequent research approaches to the exploration of hedging (see e.g. Markkanen & Schröder 1997:3ff and Clemen 1998:17ff for a detailed account of the development of the concept).

Similarly to Lakoff’s definition, Chafe uses the term hedge in a narrow sense to refer to features signalling that “the match between a piece of knowledge and a category may be less than perfect” (Chafe 1982:270). In later years, however, the notion of hedges moved away from the initial model proposed by Lakoff’s semantic formal-logical approach (Clemen

¹² While Lakoff is widely credited for initiating and popularising the concept in linguistic research, it appears that Weinreich described the phenomenon in terms of “metalinguistic operators” before him (cf. Clemen 1997:235, Fraser 2010:16), stating “that for every language ‘metalinguistic operators’ such as English *true*, *real*, *so-called*, *strictly speaking*, and German *eigentlich*, and the most powerful extrapolator of all - *like* - function as instructions for the loose or strict interpretation of designata” (Weinreich 1966:163).

1997:244). As a result, the notion has extended into the pragmatic-functional and discourse-semantic area (Martin & White 2005:40). Fraser (1975), for instance, is concerned with the use of modals and semi-modals to attenuate the illocutionary force of performative verbs. The line of research treating the area of hedged performatives has had a considerable impact on the research tradition in the field of hedging (Markkanen & Schröder 1997:4). However, a glance at the corpus analysed in the present study confirms Crompton's (1997:273) observation that the area of performative hedging is not directly pertinent to academic writing, and it appears that the speech acts in academic writing tend to state propositions.

Moreover, the scope of the notion of hedges has expanded to cover phenomena modifying commitment to the truth value of propositions as a whole (e.g. Prince et al. 1982, Hyland 1998a). In a comprehensive sense, it is defined by Schröder and Zimmer in terms of

one or more lexico-syntactic elements that are used to modify a proposition, or else, as a strategy that modifies a proposition. (Schröder & Zimmer 1997:249)

This view of hedging comprises the use of hedges to conceal the writer's attitude (Markkanen & Schröder 1997:5). This pragmatic approach results in a vast concept according to which the label 'hedge' represents an umbrella term which covers almost any linguistic device (Markkanen & Schröder 1997:6). The context-dependence of hedging devices has evolved as a defining criterion in identifying hedges since, as Markkanen and Schröder put it,

no linguistic items are inherently hedgy but can acquire this quality depending on the communicative context or cotext. (Markkanen & Schröder 1997:6¹³)

Similarly, Mauranen points out the polyfunctionality of hedges:

[E]xpressions which are typically used as hedges have also other uses, and their potential for acting as hedges is only realised in some contexts, in interaction with other linguistic features. (Mauranen 1997:119)

As noted earlier, the use of hedges in scientific discourse has been the subject of considerable research interest (e.g. Meyer 1997, Salager-Meyer 1994, Kreutz & Harres 1997, Hyland 1998a, b), the topic being considered from a range of different angles. For example, the use of hedging in scientific writing has been approached from a text-internal perspective in view of the distribution of hedges across text sections (e.g. Salager-Meyer 1994, di Marco & Mercer 2004, Falahati 2007). For instance, di Marco and Mercer (2004:2) observe that the use of hedges varies in the different parts of scientific articles and their pragmatic function differs

¹³ Cf. also Clemen 1997:243f.

according to the sections in which they occur: They appear to serve a dual function in the introductory section by positioning the results within a wider research environment and underscoring the importance of new contributions (di Marco & Mercer 2004:2). In the results section, hedges appear to add to a persuasive presentation and interpretation of findings (ibid.).

The extensive body of literature on the topic furthermore includes accounts exploring gender-specific usage of hedges, gender being regarded as an essential aspect of hedging (cf. Farr & O’Keeffe 2002:27). Szymańska (2013:13), for example, observes an increased use of hedges indicating doubt in linguistic articles written by female authors compared with male authors, whom she found to be more prone to express certainty. Since the present study is concerned with cross-linguistic and register-specific variation, these areas of research are, however, less relevant than cross-linguistic and register-oriented accounts. In recent years, the study of variation in the use of hedges across different scientific disciplines has received much attention (e.g. Varttala 2001, Falahati 2007, Vázquez & Giner 2008). Varttala (2001) compares the communicative functions of hedging in English research writing and in popular scientific articles from the fields of medicine, economics and technology. Interestingly, his study observes a more pronounced popularisation-induced shift in the medical domain than in the two other fields, with the popularisations containing considerably more hedges than the research articles (Varttala 2001:267). This is attributed to the “delicate nature” of the subject matter, which may cause writers to present information in general terms so as to avoid alarmism, a further motivation being the guardedly optimistic presentation of positive news (ibid.). Varttala argues that the field of medicine occupies a special position compared to the other two domains due to the public perception of medical experts as “more or less omniscient” (2001:268). As a result of this, authors seem to need to protect themselves from consequences in case of their claims or recommendations being proven incorrect (ibid.).

In cross-linguistic studies, emphasis has been placed on variation resulting from cultural influences (cf. e.g. Clyne 1991, Kreutz & Harres 1997, Markkanen & Schröder 1997). The function of devices such as downtoners, mitigators and politeness markers is, however, not only culture-specific but also influenced by specific linguistic constraints (Kreutz & Harres 1997:184). For instance, impersonal passives and reflexive structures as exemplified below do not have “proper” equivalents in English as argued by Kreutz and Harres (1997:198):

- (29) Untersucht man hingegen die falsch negativen Befunde, so zeigt sich, dass mit der konventionellen Diagnostik mehr als dreimal so viele Patientinnen (19 von 116, 16,4%) nicht als metastasiert erkannt wurden als mit der FDG-PET (5 von 119, 4,2%). [GSCI]

They do, however, concede that this does not necessarily equal an absence of functional equivalents. Moreover, Kreutz and Harres (1997:184) note that while modal verbs are used both in English and in German to express epistemic modality, German is also characterised by the use of downtoning particles (*ja, wohl, eigentlich*) and English by its preference for adverbs such as *perhaps* or *actually* (Kreutz & Harres 1997:198). Markkanen and Schröder (1997:13) argue that a proficient use of hedges constitutes a domain of linguistic competence, which, if lacking in a foreign language, may cause mistakes graver than grammar mistakes as they are less obvious than, for instance, syntactic mistakes. The consequences of an awkward use of hedges may be more serious since the language user may sound either more brusque or more timid than intended (Markkanen & Schröder 1997:13). The cultural conventions pertaining to the use of hedges can be of particular relevance to translation-specific language use. Markkanen and Schröder (1997:14) underscore the importance of gearing the use of hedges to the norms of the target culture:

If the cultural norms have caused the writer of the original text to use a lot of hedging and the translator has not reduced their amount to suit the norms of the target culture, the result may be an irritatingly tentative, uncertain text. The opposite can of course also happen: the translated text may sound too assertive to people used to more 'hedgy' texts. This is a real problem in the case of scientific texts, which must often be translated into a foreign language, most frequently into English, the text should conform to the 'Anglo-American' cultural norms. (Markkanen & Schröder 1997:14)

As mentioned earlier, the topic of non-native English in research articles will be taken up again later in this study as some of the papers in the corpus analysed in this study appear to be at least co-authored by non-English speakers.

Though hedging has been described to feature regularly both in English and German academic discourse (Kreutz & Harres 1997:185), much research on intercultural differences in academic styles between German-speaking authors and Anglophones regarding the use of hedges starts from the assumption of a more author-oriented, less co-operative style in German academic discourse as opposed to what is perceived as a more co-operative, interactive, reader-oriented style in English (cf. e.g. Clyne 1991, Galtung 1985, House & Kaspar 1981). Clyne (1991), for instance, compares academic texts written by German scholars both in their native tongue and in English with texts authored by Anglophones. His study involves the analysis of features which serve to

reduce the weight or certainty of the propositions and to relieve authors of some of the responsibility for statements they are making. (Clyne 1991:57)

The analysis of hedges thus defined examines the use of a wide range of features, i.e. modals, verbs referred to as “parenthetical” by Clyne (1991:51) (i.e. *seem, appear, guess*), impersonal

pronouns (German *man* and English *one, anybody*), impersonal intransitive uses of verbs (*überraschen, to surprise, befriedigen, to satisfy*), phrases (*there can be no doubt, it is clear*) and German reflexive structures as illustrated in example (29). The range of expressions furthermore includes agentless passives and “passive infinitives” (*it is to be hoped, es ist zu hoffen*) (Clyne 1991:58, cf. also Clyne 1994:161ff). These features were found to be used more often by German scientists as compared with their English-speaking colleagues, with German writers appearing to adhere to their native German culture when writing in English (Clyne 1991:63).

Like Clyne (1991), Clemen’s (1998) contrastive study of hedges in English and German economic communication takes into account a vast range of features which includes epistemic items alongside expressions of quantification, e.g. *about, around* or *approximately*, and interpersonally motivated hedges, which include markers of affective meanings such as *regrettably, luckily, important*. Moreover, epistemic and evidential items such as *certainly, clearly* and *obviously* are categorised as “intensifiers” and included in the category of interpersonally motivated hedges, which also comprises impersonal expressions such as agentless passives (Clemen 1998:98f).

It transpires that the array of features consigned to this vast category varies considerably, both in terms of linguistic form and in terms of semantics. This diversity may hamper the cross-linguistic comparability of categories and data. In the hedging-oriented literature, the heterogeneity of these features has been addressed by proposing different taxonomies. The following section aims to provide a brief overview of different approaches to the categorisation of hedges, emphasis being on their use in scientific writing.

2.4.1 THE CATEGORISATION OF HEDGES

Adopting a discourse-analytical perspective in their empirical research into paediatric physicians’ spoken discourse, Prince, Fraser and Bosk (1982) draw a dichotomous distinction between two types of fuzziness as reflected in two central categories: “approximators” and “shields”. Shields introduce fuzziness

in the relationship between the propositional content and the speaker, that is in the speaker’s commitment to the truth of the proposition conveyed. (Prince et al. 1982:85)

Shields are further divided into two subcategories “plausibility shields” and “attribution shields”. Plausibility shields such as *I think, maybe* or *it seems* indicate a degree of doubt on the part of the speaker as exemplified below by the use of *probably*:

- (30) Because HCV prevalence is low in the U.S., testing a vaccine's ability to prevent infection would probably require thousands of U.S. volunteers or conducting the trial in high-incidence areas such as China, India or Egypt. [EPOP]

This type of shield is thus related to the area of modality which concerns probability, namely epistemic modality. Attribution shields ascribe an opinion to an external source (Prince et al. 1982:89), as in:

- (31) Cardiologist Robert Dowling, writing in the Journal of Thoracic and Cardiovascular Surgery during the clinical trials, estimated the life span of the hydraulic membrane – the part that expands into the ventricles to make them pump – at a year or more. The actual pump and switching valve – the only real moving parts in the heart – could last three to five years, according to Dowling. [EPOP]

In the case of attribution shields, the speaker's level of commitment can merely be inferred indirectly according to Prince et al. (1982:89). They imply the referencing of sources of information and are thus related to the domain of evidentiality (e.g. Chafe & Nichols 1986), which will be discussed in the following chapter.

Approximators, by contrast, "affect the propositional content [...]" (Prince et al. 1982:93). Whereas shields are considered a pragmatic phenomenon, approximators are thus considered in terms of a semantic phenomenon (Prince et al. 1982:86). Approximators render the meaning of a word or a phrase more fuzzy or imprecise and "affect the truth conditions of the propositions associated with them" (Prince et al. 1982: 86). They fall into two subcategories: "Adaptors" such as *sort of*, *somewhat* or *a bit*, which adapt "a term to a non-prototypical situation" (Prince et al. 1982:93) as illustrated below:

- (32) It's easy, of course, to second-guess quarter-century-old decisions, but many cardiologists today feel that implanting the Jarvik-7 was a mistake – premature given the primitive state of knowledge at the time. Visionaries were seduced by the simplicity of the natural organ's design – which really is just a four-chambered pump – and somewhat naive about its dynamic complexity. [EPOP]

Adaptors thus correspond to Lakoff's (1972) hedges (Prince et al. 1982:87). The other subcategory concerns items such as *approximately* or *about*, which Prince et al. refer to as "rounders". Such features commonly accompany quantitative measurements to signal "that some term is a rounded-off representation of some figure" (Prince et al. 1982:93), as in:

- (33) Approximately one-quarter of ischemic strokes are lacunar, presumed to result from occlusion, or perhaps leakiness,¹ of one of the perforating arteries supplying the deep, subcortical areas of the brain. [ESCI]

While the distinctions drawn by Prince et al. (1982) have been criticised for failing to account for actual language use and contextual factors (cf. Skelton 1988:38, Markkanen & Schröder 1997:5, Varttala 2001:11f), they have been widely influential on subsequent work in the field

(Crompton 1997:272f). Hübler (1983), for instance, draws a similar distinction between understatements (e.g. *a bit*), which – similarly to approximators as defined by Prince et al. (1982) – serve to express “phrastic” indetermination regarding the propositional content of a sentence, while hedges such as *I suppose*, *perhaps* or *might* express “neustic” indetermination. Neustic refers to

that part of the illocution which expresses the attitude of the speaker to the hearer regarding the proposition. (Hübler 1983:11)

Relating to the validity of the proposition (as a whole) as claimed by the speaker, the latter thus resemble Prince et al.’s shields (cf. Markkanen & Schröder 1997:5, Nikula 1997:190). Both types serve to express indetermination, thereby increasing the acceptability of sentences and thus their chances of ratification (Hübler 1983:23).

Though Prince et al.’s observations are limited to a narrow context of spoken discourse, their proposed classification narrows down the scope of the concept and adopts a systematic approach to the investigation of hedges. The distinction between different types of shields proposed by Prince et al. (1982) will be considered against a more comprehensive backdrop in modelling the categories for the present analysis (chapter 6), where this distinction will be assessed in more depth in view of the linguistic expressions involved and the interpersonal implications of the use of the different types of shields described by these authors. Specifically, the concept of attribution shields will be taken up and elaborated in view of these points.

Salager-Meyer (1994) focuses on written medical discourse, namely research papers and case reports, and takes into account formal and functional aspects in her classification of hedging (cf. Crompton 1997:277). In her taxonomy, she discerns between five categories: Shields include a host of features ranging from modal verbs (*may*, *could*) and lexical verbs such as *suggest*, *estimate*, *indicate* and *appear* to modal nouns (e.g. *assumption*, *claim*, *possibility*) as well as adverbs (e.g. *probably*, *likely*) and corresponding adjectives. The category of shields as defined by Salager-Meyer includes epistemic and evidential items located at different linguistic levels and corresponds to Prince et al.’s (1982) plausibility shields (Salager-Meyer 1994:154). Similarly to “academic hedges” as described by Chafe and Danielewicz (1987:109), the category of “approximators” indicates vagueness and includes adverbs relating to degree, quantity, frequency and time such as *somewhat*, *quite*, *roughly*, *often* or *occasionally* and thus covers a range of meanings entailing Halliday’s modal category of “usuality” (2014:691f) and features discussed, for example, by Martin and White (2005:135ff) in connection with “graduation”. The two categories are intended to provide formal characterisations of the functional distinction put forward by Prince et al. (1982)

(Crompton 1997:279). They are distinguished from “expressions of the authors’ personal doubt and direct involvement” (Salager-Meyer 1994:154), exponents of which include *I believe, to our knowledge, it is our view that* and “emotionally charged intensifiers” such as *extremely interesting* or *surprisingly* in the following example:

- (34) Surprisingly, we found that a prior NTproBNP measurement was the only factor significantly associated with the accuracy of physician estimation. Age>65 years, female gender, elevated BMI (>25 kg/m²), renal dysfunction (eGFR <60 mL/min./1.73m²), NYHA class I or II were not associated with accurate NT-proBNP estimations. [ESCI]

Both categories appear to relate to the notion of politeness (Crompton 1997:279), which will be taken up later in this chapter. Moreover, compound hedges refer to clusters of hedges such as *it could be suggested that*. As pointed out by Varttala (2001:99), there are a number of limitations to this categorisation. These concern, for example, the separation of shields and expressions of the “authors’ personal doubt and direct involvement” (Salager-Meyer 1994:154, cf. Varttala 2001:99). It seems that merely overtly self-referential features are seen as expressions of the author’s doubt and his involvement in Salager-Meyer’s account (Varttala 2001:99). The inclusion of compound hedges consisting of individual hedging features as a separate category seems problematic (*ibid.*). The treatment of co-occurring individual hedges as clusters does not seem particularly helpful in studies involving the comparison of quantitative data. In the present study, such clusters will, therefore, be broken down into the smallest comparable units (*cf.* chapter 6).

In his study of medical articles dating from the 19th and 20th centuries, Skelton (1997:42ff), who is concerned with “commentative” language, distinguishes between “truth judgements” and “value judgements”. He proposes a limited definition of hedges, according to which they are seen as forming part of the “commentative potential of a language” (1997:45). Skelton’s restricted use of the label merely refers to a subgroup of what is often included in this category, namely “mitigations of responsibility and/or certainty to the truth value of a proposition” such as “I suspect the moon is made of green cheese” (Skelton 1997:45). This narrower definition excludes attitudinal value comments such as “It is good to hear the moon is made of green cheese” (*ibid.*), as included in broader approaches to the notion of hedges, for instance by Salager-Meyer (1994) or Clemen (1998) in her contrastive study of English and German economic writing.

Skelton (1997:42ff) distinguishes between three ways of adjusting the force of a proposition, all of which have been treated in terms of hedges in the relevant literature: The first type concerns qualification by ‘*sort of*’ type approximations as described by Lakoff (1972), while the second relates to the denial of accountability through the use of expressions along the

lines of “*it is said* the world is round” (Skelton 1997:43, author’s emphasis). The latter type of comment avoids commitment to a proposition and enables the author to maintain a certain guardedness by placing “disclaiming marks around the proposition” (Skelton 1997:43). The third group includes expressions of the *I’m not sure*-kind (1997:43f), which are suggestive of an element of doubt but may also be seen as being motivated by politeness considerations according to Skelton.

Moreover, truth judgements are subdivided into “minor”, on the one hand, and “major truth judgments” or just “truth judgments”, on the other. Minor truth judgements refer to items such as *quite*, which modify domains located below clause level (Skelton 1997:46), as in:

- (35) In the poststenotic segment, aortas from operated group showed intima delicate quite similar to the intima in the sham-operated, except for focally distributed neointimal plaques similar to those observed in the prestenotic segment but many of them larger in size (Fig. 3E). [ESCI]

Major truth judgments govern propositions which modify a clause or more, such as matrix structures involving expressions such as *it is possible that* in the following example:

- (36) “It is possible that previous reports of short stature with anorexia were from studies in children with a prolonged duration of anorexia and delayed diagnosis,” the researchers say. [EPOP]

Items such as the above concern assessments of probability and thus relate to the notion of epistemic modality. This distinction is however not elaborated further and the precise linguistic nature of the items falling under each category is not specified in further detail either. Nonetheless, Skelton’s definition provides a useful distinction between emotive comments and comments on truth value. However, Skelton (1997:46) sees certain formulations such as “*This (...) interesting/surprising/incredible (...) line of argument...*” as expressions of both truth- and value-judgemental meaning. I will return to this issue in chapter 4, since the present research requires lucid defining criteria for discerning between emotive evaluations and values concerned with non-affective truth judgements.

Moreover, Skelton (1997:46) points out that in cases in which authors write about external work it is sometimes not clear whether expressions such as “Smith (1993) said that x was the case” (ibid.) are motivated by the author’s desire to hedge the truth value accorded to the proposition, whether the author merely wishes to communicate a fact or whether this is mentioned to provide corroborating evidence to substantiate the author’s own position. This difficulty of discerning between different uses of such structures will be picked up and discussed in the present corpus analysis.

The works cited in this section do not provide an exhaustive outline of the vast body of literature on hedging rather, the aim was merely to give a brief overview of the development

from the notion initially proposed by Lakoff (1972) to a discourse semantic concept. Hyland's (e.g. 1996b, 1998a) numerous works on the subject will be taken up later in this chapter as they adopt a different approach to the classification of hedges than those covered in this section. It appears that the different approaches to the categorisation of hedges differ in the range of phenomena included under the label and that the internal structures of these taxonomies vary. Nevertheless, it transpires that much of the literature on hedging (e.g. Prince et al. 1982) draws on Brown and Levinson's (1987) work on universals in politeness. Therefore, the notion of politeness will be considered in more detail in the following section.

2.4.2 *POLITENESS IN SCIENTIFIC WRITING*

The politeness theory developed by Brown and Levinson has been influential in much work on pragmatics (Cutrone 2011:61). They argue

for a shift in emphasis from the current pre-occupation with speaker identity, to a focus on dyadic patterns of verbal interaction as the expression of social relationships [...]. (Brown & Levinson 1987:2)

The notion of a "model person" (Brown & Levinson 1987:58) is central to their anthropological concept of politeness. It relates to

a wilful fluent speaker of a natural language, further endowed with two special properties – rationality and face. (Brown & Levinson 1987:58)

The concept of "face" roughly concerns a person's "self-esteem" (Brown & Levinson 1987:2) and was originally put forward by Goffman, who defines it as regarding:

the positive social value a person effectively claims for himself by the line others assume he has taken during a particular contact. Face is an image of self delineated in terms of approved social attributes [...]. (Goffman 1967:5)

According to Brown and Levinson, it relates to "the public self-image that every member wants to claim for himself [...]" (1987:61).¹⁴ They distinguish between "negative" and "positive" face, with the latter referring to

his perennial desire that his wants (or the actions/acquisitions/values resulting from them) should be thought of as desirable. (Brown & Levinson 1987:101)

Whereas positive face concerns an assumed desire for appreciation and approval in social interaction, the negative aspect of face relates to liberty of action and "freedom from imposition" (Brown & Levinson 1987:61). This can be reformulated in terms of negative face

¹⁴ Cf. e.g. Watts (2003:103ff) for a detailed comparison of Goffman's as well as Brown and Levinson's concepts of face.

wants which, in general terms, deal with an individual's desire that others may not interfere with his actions (ibid. 62). It relates to

the basic claim to territories, personal preserves, and rights to non-distraction – i.e. the freedom of action and freedom from imposition [...]. (Brown & Levinson 1987:61)

Within the context of the model proposed by Brown and Levinson any form of action or speech act presents a potential Face Threatening Act (FTA), threatening the speaker's or the hearer's negative or positive face. Politeness is described by Brown and Levinson in terms of actions intended to redress such potential face threats, a distinction being drawn between three main politeness strategies – both verbal and non-verbal – for saving the speaker's or the other's face: positive, negative and "off-record" strategies (1987:2). Positive politeness strategies signal recognition of the addressee's positive face wants (Brown & Levinson 1987:101ff). They relate to solidarity, while negative politeness deals with the "expression of constraint" (Brown & Levinson 1987:2). The latter serves to redress threats to the addressee's negative face by avoidance of imposition by means of the attenuation of speech acts such as requests or orders which may represent potential threats to the hearer's negative face wants (Brown & Levinson 1987:129ff). Negative politeness may thus be described as concerning respect and social distance (Nikula 1997:192). For instance, a request uttered by the speaker poses a potential threat to the speaker's positive face as this action may be viewed as a kind of humiliation on the speaker's part. However, the same request may pose a threat to the hearer's negative face by inconveniencing him and putting him under pressure to react. According to Brown and Levinson:

In our culture, negative politeness is the most elaborate and the most conventionalized set of linguistic strategies for FTA redress [...]. (Brown and Levinson 1987:130)

Negative politeness strategies described by Brown and Levinson include impersonalisation of speaker and hearer (ibid. 190ff), for instance by means of passive expressions, expressing FTAs as a general rule and nominalisation (ibid. 206ff).

Furthermore, FTAs may also be done "off-record" so as to avoid "unequivocal impositions" (Brown & Levinson 1987:2), whereas "bald on record" refers to cases in which face concerns are outweighed by other factors so that the FTA is not redressed by politeness strategies (Brown & Levinson 1987:94ff). This applies

whenever S wants to do the FTA with maximum efficiency more than he wants to satisfy H's face [...]. (Brown & Levinson 1987:95)

Brown and Levinson argue that politeness on the part of the speaker is influenced by three social factors: relative power of the hearer over the speaker, social distance between the

speaker and the hearer and “the ranking of the imposition (R) involved in doing the face-threatening act (FTA)” (Brown & Levinson 1987:15). The model person is assumed to make rational choices in considering these three variables in view of the highest pay-off and the least face loss (cf. also Myers 1989:2).

Myers (1989) transfers Brown and Levinson’s model to the context of scientific writing to account for the motivation for and effects of the use of hedges and other characteristic features of (mainly English) scientific writing. Additionally, comparisons with popular scientific journalism, which is considered to be characterised by a different writer-reader relationship, are carried out. Myers stresses that “while writing does not involve face to face contact, it is a form of interaction” (1989:30). Myers holds that the social parameters described in Brown and Levinson’s (1987) politeness framework - social distance, power and significance of the FTA - are equally relevant to scientific writing, where certain FTAs inherently arise in social interactions. As noted by Crompton, the social aims of academic authors may roughly be described as “making a name for themselves”, threats to the face of other researchers and the need to save one’s face being intrinsic to the process (Crompton 1997:275). In this vein, the use of passive structures, nominalisations and hedges are considered as exponents of “rational strategies for dealing with the social interactions involved in publishing an article” (Myers 1989:2).

The composition of the audience of popularisations was discussed previously in section 2.3. The readership of scientific reports is seen by Myers as mainly consisting of two audiences: On the one hand, there is the general (“exoteric”) community of scientists, and, on the other hand, there is another (“esoteric”) audience consisting of researchers working in parallel research areas, who “overhear” (1989:3). The authors of scientific articles are, at once, researchers and writers. The picture is further complicated by a complex reviewing process in the case of multiple authorships (Myers 1989:4). Myers describes the scientific subculture as being characterised by significant social distance separating individuals. Moreover, despite a supposedly minor difference in power between its members - any such difference must never be expressed openly in published scientific writing according to Myers -, the power of the community as a whole is regarded as being greater than that of any individual researcher. Any personal relations with other scientists must not be made explicit, and authors may even write about themselves in the third person. As a consequence of this constellation, researchers “must present themselves as equally humble servants of the discipline” (ibid.). While new knowledge claims add to the progress of science and knowledge, the proposal of such claims is considered to represent a potential threat to negative face since they refute or supplant previous claims put forward by other researchers (Myers 1989:5). Similarly, the

naming of new discoveries may be considered an FTA in that it can be seen as an attempt to claim pre-eminence (Myer 1989:6). Moreover, face threats may also result from speculation, which can be seen as an attempt to gain undue advantage over other researchers (ibid.).

As mentioned above, the range of politeness strategies available for handling such tensions includes positive politeness strategies, which serve to attenuate claims and the denial of claims according to Myers (1989:7). This can be done, for example, by the use of first-person reference to include oneself in criticism or the use of emotional features in order to signal solidarity (ibid.). However, the majority of devices regarded as being characteristic of scientific writing, i.e. hedges, impersonal expressions, the phrasing of assertions as general rules, represent instances of negative politeness according to Myers (1989:12).

On the grounds of a presumed large degree of social distance between individual members of the scientific community, Myers attempts an explanation of many of the conventional characteristics of scientific writing such as hedging in terms of negative politeness. Against this background, hedging is defined as:

a politeness strategy when it marks a claim, or any other statement, as being provisional, pending acceptance in the literature, acceptance by the community – in other words, acceptance by the readers. (Myers 1989:12)

The linguistic nature of the items grouped under this label is not elaborated in further detail, hedges being defined rather vaguely as

any device suggesting alternatives [...] – anything but the statement with a form of *to be* that such and such is the case. (Myers 1989:13)

The range of features considered as forms of hedging appears to correspond largely to items traditionally treated in terms of hedges as discussed in the previous section, i.e. modal verbs serving as markers of conditional statements and evidential verbs such as *suggest* and *appear* as well as epistemic items, notably matrix structures of the '*it is unlikely that*' type (Myers 1989:13). However, the role of self-referencing as a form of negative politeness is emphasised, e.g.:

(37) Although this was not confirmed by any alternative measure of endothelial function, we believe that this supposition can be reasonably accepted. (ESCI)

Within the context of scientific writing, these are seen as a means of marking a viewpoint as “personal”, thereby leaving it up to the reader to form his own opinion (Myers 1989:14, 16). Moreover, Myers emphasises the role of the attribution of claims to impersonal agencies as illustrated below as an instance of negative politeness:

- (38) Recent studies suggest that dopamine may have deleterious effects on the intestinal mucosal cells related to redistributing blood flow away from the intestinal mucosa or by decreasing directly the cell redox state [24]. [ESCI]

In Myers' view, they are not per se manifestations of the "impersonality of science"; instead, the use of such structures is explained in light of the social interactions taking place in scientific discourse, where attribution to impersonal agencies is the most frequent means of stating a claim according to Myers (1989:17). We may note in passing that items such as *suggest* differ from features such as *show* since expressions like the one in example (38) allow the author to leave

room for the opinions of the audience as well as to shield himself against potential criticism in case of being proven wrong. (Varttala 2001:71)

The distinction between expressions which present propositional content as 'proven' knowledge and items such as *suggest* which do not present claims as 'facts' relate to the notion of factivity (Kiparsky & Kiparsky 1971, Vendler 1980). The issue of the semantic differences between such features as well as the interpersonal implications ensuing from their use in presenting knowledge claims will be pursued further in the present research.

Moreover, impersonalisation may be used in questioning external positions (Myers 1989:18). It was mentioned earlier that the negative politeness strategies described by Brown and Levinson (1987:206) involve the phrasing of an FTA as a general rule. According to Myers, this also holds for scientific writing, with linguistically diverse expressions such as "the idea that (...)" and impersonal uses of *one* being offered as examples of this form of politeness. Indicators of the falsifiability of claims as illustrated below are seen as further markers of negative politeness:

- (39) Alternatively, these data may suggest that the use of occlusion times shorter than the traditional 5-min could be employed to simplify FMD studies. Evidently, further research is needed to determine the diagnostic accuracy and prognostic value of FMD normalization to shear stress. [ESCI]

Similarly to the other expressions of negative politeness, they are considered to "show the writers' deference before the community of researchers [...]" (Myers 1989:19). Myers (1989:20) notes that many FTAs would be expected to be done baldly in view of the traditional perception of scientific writing as being characterised by impersonality and factuality. However, given the presumed large degree of social distance, statements of claims or criticism rarely occur without redress in scientific writing according to Myers (1989:20f). Moreover, "off-record" expressions of FTAs, which merely imply the FTA, tend to be used to attenuate criticism directed at other researchers in Myers' view (1989:22). Instances of this

strategy discussed by Myers include the successive use of passive formulations resulting in an “echoic language” (Myers 1986:25). Finally, the FTA may be avoided altogether in cases where the significance of the imposition, the power or the social distance is such that the FTA cannot be mitigated by a politeness strategy. Such cases are, however, hard to detect since there is per definition no indication of the FTA. If the FTA is hinted at and not avoided completely, this would be considered an instance of off-record politeness (ibid.).

In the case of popularisation, the variables power and social distance differ from those identified for research articles. As noted earlier, the latter are considered to be marked by considerable social distance between the members of the scientific community, with no – openly acknowledged – difference in power between individual members, but significant discrepancy in power existing between the researchers as individuals and the scientific community in its entirety (Myers 1989:28). In the case of popularised journalistic articles, the subject matter is the same and often the same authors are involved, yet the reader/writer constellation is different: Where journalistic articles written by the scientists themselves are concerned, the FTAs resemble those arising in scientific journals, but claims do not need to be made or denied anymore according to Myers (ibid.). In cases where the roles of the author and the researcher do not coincide, the author occupies an intermediary position between the scientists and the readership. Hence, there are no conflicting roles in the latter case, and the authors merely have to consider a general readership. They do not, however, have to take account of the interests of other researchers working in the same field of research, though those scientists are still likely to take note of the article (ibid.). Nonetheless, any insult to the readership is to be avoided and readers should be made to feel part of the scientific community, while appropriate respect for the scientific community is to be maintained at the same time (ibid.). As a result of this shift, different politeness strategies are involved. Thus, even open praise is deemed acceptable since the journalists are merely writing about work which has already been acclaimed by the relevant scientific circles (Myers 1989:29). However, the authors of popular scientific articles need to create a connection between the scientists and the general “exoteric” audience (ibid.). Popularisations are not only intended to convey propositional content, but also to entertain and to exert a certain emotional impact on the reader (Markkanen & Schröder 1997:9, Schröder 1998:265). They are thus characterised by a “personal” style: Writers may even refer to researchers by nicknames, list institutions and use certain syntactic means (Myers 1989:29). The latter appear to refer to syntactic structures which foreground the active role of researchers as mentioned earlier in connection with the “personalisation” strategies described by Niederhäuser (1999:198ff).

It may be remarked in passing that the referencing of concrete people dealt with by Myers as a form of positive politeness appears to correspond to the concept of “involvement” as defined by Chafe (1982) and Chafe and Danielewicz (1987), which was described earlier in section 2.2. While Chafe and Danielewicz (1987:110) argue that involvement is absent in written discourse, it was noted above that features such as passive structures and abstract subjects – regarded by Chafe and Danielewicz as exponents of detachment – are considered indicators of the author’s awareness of his audience in Myers’ (1987) politeness-oriented view. Thus, according to Crompton (1997:275), Myers’ approach proves that scientific discourse is guided by the same principles as any other form of communication (cf. also Varttala 2001:71). From this point of view, hedging is seen as a key politeness strategy which serves to facilitate the acceptance of claims and indicate consideration for potentially diverging views held by readers (Varttala 2001:71). Therefore, Myers’ approach offers “an alternative, more dialogic perspective within the hedging literature” (White 1998:281). Myers’ politeness-oriented account thus provides a new take on the examination of hedging, taken up for example by Salager-Meyer (1994), whose categorisation was presented in the previous section (cf. also Varttala 2001:71).

Varttala (2001:72) argues that, despite its merits, Myers’s politeness-centred account represents one, but not the only, way of looking at hedging in scientific writing. Problems arising out of the application of Brown and Levinson’s politeness model to hedging in scientific discourse are also mentioned by Hyland (1998a:67ff), whose approach to the classification of hedges will be outlined in the following section (cf. also Varttala 2001:72). Hyland (1998a:69) argues that Myers’ and Brown and Levinson’s politeness-oriented approach fails to recognise fully the importance of the norms prevailing in the discourse community and criticises Myers’s view of scientific discourse, according to which this type of communication is “a fundamentally dangerous and antagonistic endeavour” (Hyland 1998a:67). In Hyland’s view, the application of Brown and Levinson’s politeness model does not account for the “exercise of power and conformity in the discourse community” by placing an overly strong emphasis on

the instrumental aspects of language use at the expense of the normative, under-estimating the importance of the scientific peer group in maintaining standards, judging merit and evaluating reputations. (Hyland 1998a: 68, cf. also Varttala 2001:72)

Furthermore, Varttala (2001:72), based on Hyland’s criticism, remarks that one of the main difficulties of applying the politeness-oriented approach to hedges in research writing arises from its focus on the rapport between the sender and the audience and the face wants of the parties concerned. Therefore hedging is not mainly triggered by politeness, rather, it is also a

strategy aimed at “*communal acceptance*” (Varttala 2001:73, author’s emphasis). His study provides an interesting point of departure for the present analysis in that it explores variation in the use of hedges between English academic research articles and popular scientific articles in view of the use of epistemic items and their communicative function in the two registers. Varttala (2001:177ff) observes that whereas hedges primarily indicate “textual precision” and serve as markers of negative politeness in research articles, they may indicate both imprecision and precision and serve as exponents of positive politeness in popular scientific writing.

Nikula (1997:192), however, points out that the distinction between the two types of politeness may not always be clear-cut, their functions being closely connected. As pointed out by Goffman (cf. also Nikula 1997:192), “[o]ne’s own face and the face of others are constructs of the same order [...]” (Goffman 1967:6).

It was mentioned previously that the cross-linguistic aspect of the present analysis is to investigate whether German displays different usage preferences. Although the rationale of politeness outlined by Brown and Levinson (1987) and applied to academic contexts by Myers (1989) is based on a “universal” notion of politeness, their concept of politeness has been criticised as being based on an Anglo-Saxon notion of a model person (cf. e.g. Cutrone 2011:1). The concept of politeness may, however, be subject to cross-cultural variation, and hedging may work differently in different cultures (Nikula 1997:193). Moreover, it was pointed out above that Hyland (1998a:68f) argues that face-oriented approaches neglect the negative social consequences of a refusal to comply with linguistic conformity concerning the display of self-confidence and the expression of the author’s regard for viewpoints held by others in an environment where the manner in which writers express their opinions is crucial to their career. In the following, Hyland’s distinction between reader- and writer-oriented hedges will be examined more closely.

2.4.3 WRITER- AND READER-ORIENTED HEDGING

A different perspective is adopted in Ken Hyland’s numerous contributions on interaction and the reader-author-relationship in academic writing and related areas (e.g. Hyland 1995, 1996a, b, 1998a, b, 1999a, 2001, 2000, 2003, 2008). Hyland argues that all claims are refutable and require ratification by the reader. Consequently, authors need to take into account their readership in construing claims. Mitigation is, therefore, deemed to be vital to academic writing since it indicates the writer’s awareness of his addressees’ potential refusal to accept a claim (Hyland 1996b:436). Drawing on Bakhtin (1986), Hyland argues that scientific authors need to position themselves in a larger discourse context, which “locates

the writer intertextually within a larger web of opinions [...]” (Hyland 2005:176). Writers deal with these interactions by means of the two overlapping elements “stance” and “engagement” (Hyland 2005:176). The latter roughly refers to the acknowledgment and the inclusion of the readership in the discourse as expressed, for example, by pronominal reference to the reader, directives or questions (Hyland 2005:177f). In this perspective, stance refers to expressions of “a textual ‘voice’ or community recognized personality [...]” (Hyland 2005:177). Stance involves expressions of the author’s viewpoints and “commitments” and relates to the ways authors enter into the text or play down their presence. It concerns “writer-oriented features” and

the ways academics annotate their texts to comment on the possible accuracy or credibility of a claim, the extent they want to commit themselves to it, or the attitude they want to convey to an entity, a proposition, or the reader. (Hyland 2005:178)

Stance, as defined by Hyland (2005:178), comprises three major elements: “evidentiality”, “affect” and “presence”. The first component, evidentiality, is concerned with the author’s

expressed commitment to the reliability of the propositions he or she presents and their potential impact on the reader [...]. (Hyland 2005:178)

While affect roughly covers expressions of the writer’s attitude, including emotive judgments, presence is defined as relating to the author’s intrusion into the text (Hyland 2005:178).

Stance is expressed by four main resources: Hedges, boosters, attitude markers such as *unfortunately* or *remarkable* and self-mention (Hyland 2005:178ff). Examples of hedges given by Hyland include epistemic items such as *possible*, *might* and *perhaps*, by means of which informational content is marked as a personal opinion instead of being presented as proven knowledge. However, evidential expressions (e.g. *Our results suggest that*) and *at least* and *usually* are also treated as hedges by Hyland (2005:179). Boosters, by contrast, convey certainty, examples offered include evidential adverbs such as *clearly*, *obviously* and the lexical verb *demonstrate* along with expressions such as “this seems highly dubious” (ibid., author’s emphasis). They are seen as indicating the author’s “involvement with the topic and solidarity with their audience” (ibid.). However, it seems that, especially in the case of *demonstrate*, this effect would depend on the way these items are used, i.e. agentless passive forms as opposed to combined uses with first-person subjects or cases in which propositions are sourced to third-person subjects. Moreover, the separation of boosters and hedges seems to require further clarification, with evidential expressions cropping up in both categories. Nonetheless, the domain of hedges is considered within a wider pragmatic context in this account. In earlier works (1996b, 1998a), Hyland proposes a detailed classification of hedges, which are defined as dealing with the presentation of

a proposition as an opinion rather than a fact: items are only hedges in their epistemic sense, and only when they mark uncertainty. (Hyland 1998a:5)

Hyland's (1996b, 1998a) taxonomy differentiates between the two main categories of "content-oriented" and "reader-oriented" hedges. Content-oriented hedges

serve to mitigate the relationship between propositional content and a non-linguistic mental representation of reality; they hedge the correspondence between what the writer says about the world and what the world is thought to be like. (Hyland 1996b:439, 1998a:162)

The category of content-oriented hedges is further divided into the subcategories "accuracy-oriented" and "writer-oriented" as illustrated in fig. 1:

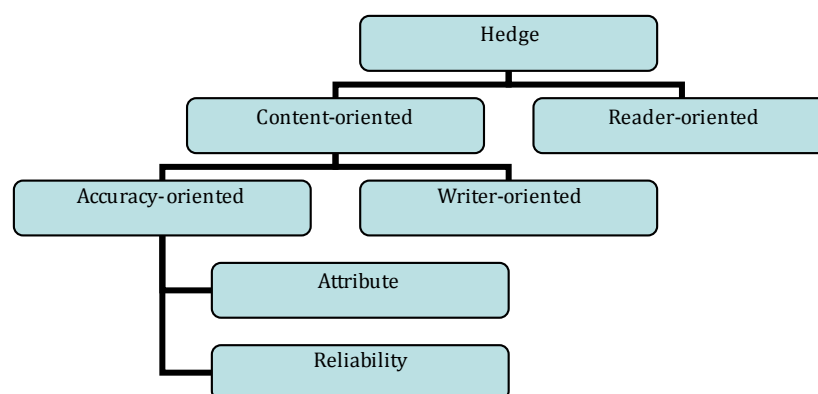


Fig. 1: Categorisation of hedges based on Hyland (1996b, 1998a)

The use of accuracy-oriented hedges is intended to contribute to a precise manner of expression by indicating a deviation from an ideal situation or by signalling that the proposition is not proven knowledge, but was arrived at by reasoning or deduction (Hyland 1998a:162f). As can be seen from the illustration shown above, accuracy-oriented hedges are further divided into the categories "attribute" and "reliability" (Hyland 1998a:162). The attribute type signals that

results vary from the assumed ideal of how nature behaves and allows a better match with familiar descriptive terms. (Hyland 1998a:164)

Approximately, usually or generally as in the following example represent typical instances of this category:

- (40) There is a sex difference in the incidence of type 1 diabetes that could account for a rate ratio of 1.10 [15] if all the vaccinated children were of one sex and the un-immunized of another sex. However, since there is generally only a small sex skewing with immunization, the attributable rate ratio would be negligible, around 1.02, if there were a 20% skewing of gender in the groups. [ESCI]

Attribute hedges thus resemble Prince et al.'s (1982) "rounders", signalling that the content presented in this manner "is true or accurate within certain limits" (Hyland 1998a:164, 187).

Whereas the use of attribute hedges increases exactitude, reliability hedges indicate uncertainty of knowledge (Hyland 1998a:166ff). Reliability hedges signal

a conviction about propositional truth as warranted by deductions from available facts, relying on inference, deduction, or repeated experience. They refer to present states and are usually in the active voice without writer agentivity. (Hyland 1998a:169)

Epistemic modal verbs, auxiliaries, adjectives, adverbs and nouns are considered the main exponents of this type of hedge. Whereas accuracy hedges mainly deal with precision, writer-oriented hedges are defined such that their use is motivated by the author's aim to avoid "consequences of negatability by limiting personal commitment" (Hyland 1998a:170). They are related to Prince et al.'s "shields" in that they indicate the author's reservations about the validity of a proposition (Hyland 1998a:171). A major formal characteristic of this form of hedging is the lack of author agentivity as manifested in the use passive constructions and the avoidance of explicit reference to the author, e.g.:

- (41) A statistically significant dosing effect was seen with the polio vaccine and a non significant trend was seen with the whole cell pertussis vaccine, the hemophilus vaccine, and the combined diphtheria, tetanus, and inactive polio vaccine. [ESCI]

Moreover, Hyland (1998a:173) highlights the role of what he terms "epistemic lexical verbs" such as *suggest*, *assume* or *indicate* in expressions involving "abstract rhetors" in the following example.

- (42) These data identify AID as a potential therapeutic target in RA and suggest that survival of functional synovial B cell niches may profoundly influence chronic inflammation, autoimmunity, and response to B cell-depleting therapies. [ESCI]

He argues that this type of verb presents data as if they were "vested with agentivity", removing the author from the content (1998a:172f). Used in this way, they foreground the inanimate results, shifting the responsibility away from the writer towards the research outcome. This topic will be taken up again and discussed within the context of process types marking relationships between entities, which are discerned from verbs which express more action-oriented types of processes as described by Halliday and Matthiessen (2014:211ff). Further exponents include evidential lexical verbs as in:

- (43) Designing experiments that allow the establishment of a hydrodynamic milieu to study how hemodynamic forces interplay with risk factors appears to be a very useful strategy. [ESCI]

Hyland considers epistemic modality as comprising the domain of evidentiality (1998a:47). However, we note in passing that the treatment of evidentiality as a subcategory of epistemic

modality is not uncontroversial. This issue is left aside for the moment, but will be discussed in the next chapter, which focuses on modality.

To summarise, the core difference between Hyland's two subcategories of content-oriented hedges is that writer-oriented hedges mainly relate to the author's presence in the text in that they reduce the author's involvement and enable him to distance himself from the propositions by playing down his role in the text. With writer-oriented hedges, emphasis is thus placed on scientific procedures and outcome (Hyland 1998a:174ff). Accuracy-oriented hedges, by contrast, are mainly motivated by the author's aim for meticulousness; in this regard, they resemble hedges as described by Lakoff (1973, cf. Varttala 2001:82).

Reader-oriented hedges, accounting for "an awareness of interpersonal factors" (Hyland 1996b:436),

mark claims as provisional, they invite the reader to participate in a dialogue. Hedges solicit collusion by addressing the reader as an intelligent colleague capable of participating in the discourse with an open mind. (Hyland 1996b:446, 1998a:178)

They are considered to be motivated by two aims: an interpersonal aspect which concerns the aim for approval and entails the inclusion of the readership in the discourse and a "normative" aspect. The latter requires adherence to stylistic conventions as dictated by scientific etiquette. This type of hedge can be expressed by a diverse range of linguistic resources. However, like writer-oriented hedges, the reader-oriented type is mainly expressed by epistemic lexical verbs (Hyland 1998a:182, 186). Yet, while judgemental and evidential lexical verbs play down the role of the author in writer-oriented hedges, the use of what Hyland terms "judgemental" and "deductive" verbs entails overt self-reference in reader-oriented forms of hedging. This type of use is illustrated in the following example:

- (44) In this digital era, the spectra border has already been digitized, we can expect integration of these formulas (8a) and (8b) to an Echo machine will enable a simple and effective derivation of Tau and LAP immediately after we get a mitral regurgitation continuous-wave Doppler spectrum. [ESCI]

The subjectivity of an opinion is underscored so that it is marked as one possible point of view which is presented as open to debate (Hyland 1998a:182). Whereas evidential verbs such as *suggest* or *seem* represent potential realisations of writer-oriented hedges, they do not occur in reader-oriented hedges due to their incompatibility with first-person subjects (Hyland 1998a:182). Hypothetical conditionals are also regarded as possible exponents of this category, e.g.:

- (45) We further hypothesized that if in fact, it is this relationship between shear stress and FMD that represents vascular function, the dose-response profile of the shear stress-FMD regression line

(slope and/or y-intercept) should also be altered in a population with impaired endothelial function.
[ESCI]

Furthermore, questions (which are absent in the English and German research subcorpora examined in this study) and expressions involving the readership in the reasoning process are considered to serve this function, as in:

- (46) In fact, one could argue that the improvement in measurement sensitivity when normalizing FMD to shear stress area under the curve could be merely explained by discrepancies in time-to-peak dilation. [ESCI]

Finally, reader-oriented hedges signal an awareness of the “falsifiability” of claims, which was mentioned earlier in this chapter in connection with Myers’ (1986) politeness-oriented approach to hedging.

Hedges are thus seen as one facet of the interpersonal area of language (Hyland 1998a:5). Hyland’s treatment of hedges adopts a functional perspective, placing much emphasis on niche-specific social effects, and thus provides a valuable point of departure for this study. However, Hyland, in drawing a distinction between content-oriented and writer-oriented hedges, concedes that

often they convey more than one function and a complex overlap of usage suggests that a precise motivation for employing a hedge may not always be clear. (Hyland 1996b:438)

Hence, it would seem difficult to define clear-cut criteria for assigning linguistic instantiations to these broad functional classes, specifically in cases involving less standardised manifestations of these meanings.

2.5 Summary

In conclusion, academic discourse is not only characterised by a rational, neutral style, the importance of interpersonal linguistic strategies discussed in the hedging-oriented literature being increasingly acknowledged as an important feature of academic discourse. It was noted that different resources are used to different ends in research papers and in popularisations (Myers 1986, Varttala 2001). Drawing on previous research into the differences distinguishing English and German pragmatic choices (e.g. House 2002), the present analysis highlights differences in the interpersonal strategies adopted by English and German research authors and by science journalists writing on medical matters. The present study assumes that Germans and English speakers use resources treated in terms of hedges differently as argued by Clyne (1991). However, an application of the vast concept of hedging does not appear to be entirely unproblematic. The literature on hedging provides valuable

insight into the register-specific motivation for and the interpersonal implications of the use of the features considered in the present study. Yet, despite extensive research carried out into the subject, it remains a vague concept lacking clear boundaries. It transpires from the outline given in this chapter that the field of research concerned with hedging is marked by considerable taxonomic and terminological diversity. While there is no agreed definition of hedges, the label is often used as a cover-all term to refer to various means of mitigating the author's responsibility for the truth value or significance of a proposition and his attitude towards a proposition (Markkanen & Schröder 1997). It encompasses an array of different linguistic devices which make messages more indeterminate, that is,

they convey inexactitude, or in one way or another mitigate or reduce the strength of the assertions that speakers or writers make. (Mauranen 1997:115)

In a hedging-related perspective, they are regarded as a resource for conveying vagueness and enabling the author to present scientific claims with caution and in a strategically polite fashion, with much emphasis being placed on their role in shaping the author-reader relationship (e.g. Hübler 1983, Hyland 1995). Farr and O'Keeffe conclude:

Fundamental to the problem of definition is the divergence in approach to the nature and realisation of hedging. (Farr & O'Keeffe 2002:26)

Considered from a hedging-oriented perspective, it appears impossible to compile an exhaustive list of hedges since they are widely regarded as constituting an "open-ended category" given the context- and situation-dependence of the phenomenon (Nikula 1997:190, cf. also e.g. Mauranen 1997:116, Markkanen & Schröder 1997:6, Clemen 1997:236). Serving as a kind of catch-all term covering a wide range of linguistic and even non-linguistic features, the classifications do not lend themselves easily to the present research tasks as they fail to offer characterisations that are capable of being organised into unambiguous categories enabling the intralingual and interlingual comparisons to be conducted in the present research.

It was mentioned in the introductory chapter that this study highlights non-emotive means used by authors in interacting with their readership in presenting medical news to different audiences. Therefore, the focus of the present thesis is narrowed down to the domains of epistemic modality and evidentiality, leaving aside openly attitudinal markers of stance. It transpires from the overview provided in this chapter that these domains are recognised as focal interpersonal resources serving different author-centred and reader-related purposes in the hedging-related literature (e.g. Hyland 1998a:162ff). The present analysis takes up the social dimension of this domain and intends to take a closer look at the different linguistic resources employed to express these meanings in different communicative settings, both in

English and in German. As noted previously, the relationship between expressions of tentativity, commitment and detachment and the domain of modality are also discussed by Hyland, who considers hedging a facet of epistemic modality (1998a:44). Modality is regarded as effectively being

concerned with a writer's standpoint judging the truth of statements in terms of possibility, probability or certainty. (Hyland 1998a:44)

Modality is seen as being characterised both by “non-factivity” and “subjectivity” from this point of view (Hyland 1998a:44). He argues that “non-factive predicators” such as *believe* or *suggest* do not express commitment to the validity of a proposition, whereas “unmodalised” utterances generally do (Hyland 1998a:44f). Subjectivity relates to the origin of a proposition: Epistemic evaluations, in his view, can be attributed to the author as in example (47) or they may be presented as “evidential” in example (48), “intertextual” in example (49) or “non-explicit” in example (50):

- (47) In conclusion, we found that heart failure specialists are fairly accurate at predicting NT-proBNP levels in heart failure patients only if a prior NT-proBNP measurement is available and the prior level was < 4999 pg/mL. [ESCI]
- (48) These results suggest that AIDp GC-like structures within rheumatoid synovial tissue can support the local differentiation of ACPA-producing plasma cells. [ESCI]
- (49) Redfield et al. found in a recent study that BNP increased significantly with age and was higher in women than men [24]. [ESCI]
- (50) Recently, it has been suggested that a patent ductus arteriosus (PDA) itself may be associated with SIP [3, 12]. [ESCI]

Such resources are capable of concealing the origin of an epistemic evaluation and playing down the author's involvement (Hyland 1998a:45). This study aims to explore how these sources are brought into play or hidden. Not only will the presence or absence of different types of sources involved in the presentation of a proposition be considered, but the way in which these are linked to the propositional content will also be examined. To this end, the study will address the difference between ‘assertive’ verbs such as *demonstrate* and less ‘vigorous’ features such as *think* or *believe*. The different linguistic resources available for expressing these meanings in English and German and the pragmatic implications of the different semantic nuances of these resources will be explored. As will be seen later, these strategies may involve more intricate, less formulaic linguistic structures than those contained in the examples shown above. Hence, this type of analysis requires clear-cut categories suitable for cross-linguistic comparisons. To this end, the functional framework

put forward by Appraisal (Martin & White 2005) will be described in greater detail in chapter 4. However, before the outline of Appraisal, the notion of modality will be considered in the following chapter and the relationship between epistemic modality and evidentiality will be examined more closely.

3. MODALITY

3.1 Introduction

It was mentioned in the introductory chapter that there is a vast body of literature dedicated to the domain of modality, and while modality represents one of the fundamental concepts in the semantic study of language, controversy remains as to the definition and characterisation of modality (as discussed for example in Nuyts 2005:5, Nuyts 2006:1f). At its most basic, exponents of modality may be characterised as not presenting “situations as straightforward facts” (Depraetere & Reed 2006:269). In traditional terms, modality is essentially considered to convey “the speaker’s opinion or attitude towards the proposition that the sentence expresses or the situation that the proposition describes” (Lyons 1977:452) by specifying the proposition, for example, in terms of likelihood, possibility, necessity or desirability (cf. e.g. Dury s.a.). As noted in the introduction, evidentiality is a further related field of research interest since it concerns “the sources of information or sources of knowledge behind assertions” (Dendale & Tasmowski 2001:340). The interactional implications of the use of epistemic and evidential features in academic writing will be highlighted in section 3.2. A brief glance at the relationship between modality and other linguistic domains in section 3.3 will be followed by an overview of the different notions generally subsumed under this label, and a brief summary of different approaches to categorising them will be given in 3.4. After this general outline, section 3.5 returns the concepts of epistemic modality and evidentiality in order to examine the relation between these domains in greater detail.

3.2 The role of modality and evidentiality in shaping the author/reader relationship

The present analysis focuses on the role of language in the construction and negotiation of knowledge in medical discourse and the adaptations taking place in tailoring the style of presentation to non-academic journalistic publications. In a constructivist perspective, knowledge constitutes

a compilation of human-made constructions. Such constructions are heuristic fictions useful for understanding the world. (Raskin 2002:4)

Hermeneutic constructivism, in particular, highlights the role of language in the development and maintenance of knowledge, viewing it as a “product of the linguistic activity of a community of observers” (Raskin 2002:4). Drawing on this perspective, the present study is interested in

whether the role of the researchers is highlighted or played down or whether emphasis is placed on 'content'. It deals with the way epistemic judgements are presented and evidence is brought into play to 'guide' different readerships in their reception of knowledge claims.

Hill and Irvine argue that evidentiality serves "the manipulation of responsibility for knowledge" (1993:17). Referring to du Bois (1986) who criticises "personalist" accounts which view evidentiality from a cognitive or epistemological perspective only, Hill and Irvine advocate a view of knowledge as "a social phenomenon, an aspect of social relations between people" (Hill & Irvine 1993:17).

Whorf discusses the impact of language on our understanding of the world as follows:

We dissect nature along lines laid down by our native languages. The categories and types that we isolate from the world of phenomena we do not find there because they stare every observer in the face; on the contrary, the world is presented in a kaleidoscopic flux of impressions which has to be organized by our minds – and this means largely by the linguistic systems in our minds. We cut nature up, organize it into concepts, and ascribe significances as we do, largely because we are parties to an agreement to organize it in this way – an agreement that holds throughout our speech community and is codified in the patterns of our language. The agreement is, of course, an implicit and unstated one, but its terms are absolutely obligatory; we cannot talk at all except by subscribing to the organization and classification of data which the agreement decrees. (Whorf 1940:213f)

In Lemke's terms:

Science speaks the language of truth, [...]. More generally, the discourses of science are those that are concerned with the truth of propositions about how the world, including the human world, 'is' in some objective sense. They include the discourses of philosophy and the social sciences, [...] all the academic discourses, all the technical discourses of our community. They are the discourses we are meant to assent to; their power is the power to compel belief in the truth of what they say. (Lemke 1995:151)

From a semiotic point of view, Chandler (2004:64) argues that the styles of representation perceived as "realistic" have evolved as an "aesthetic code". The content conveyed by the methods of production which become established within a medium or genre over time is considered to reflect reality. Texts perceived as realistic emphasise the 'content', while the role of style is played down:

As in the dominant mode of 'scientific' discourse, the medium and codes are discounted as neutral and transparent and the makers of the text retreat to invisibility. Consequently, 'reality' seems to pre-exist its representation and to 'speak for itself'; what is said thus has the aura of 'truth'. (Chandler 2004:64)

Academic writing – one of the prestigious forms of discourse of our community – is widely considered to be marked by rational and objective reasoning (Lemke 1995:178, Hyland 2008:2). In scientific writing, authors generally aim to minimise their role so as to place emphasis on the facts presented (Hyland 2008:15). Nonetheless, even representations experienced as highly realistic always involve a subjective point of view (Chandler 2004:73). As will be seen later, many traditional accounts do not take into regard the interpersonal

implications of the use of modal devices (cf. White 2003:261). Yet, Hyland (2001), whose hedging-related work was discussed in the previous chapter, considers the use of modality in academic writing in terms of communicative strategies and investigates the representation of self and others in research and its implications for persuasion, interaction and knowledge construction. From this point of view, authors generally do not use language solely to convey propositional contents, “they use language to acknowledge, construct and negotiate social relations” (Hyland 2008:4). Academic authors are required to locate themselves and their work in a disciplinary context of ongoing research:

Interaction in academic writing essentially involves ‘positioning’, or adopting a point of view in relation to both the issues discussed in the text and to others who hold points of view on those issues. (Hyland 2005:175)

Authors need to anticipate their audience’s views, expectations and processing requirements (Hyland 2008:4). For example, while the adverbial phrase *of course* is generally regarded as an epistemic feature, Hyland emphasises its role in shifting the focus of the discourse away from the writer to “shape the role of the reader” or “recruit the reader as a partner in the argument by pointing to some expected knowledge” (2001:567f). This is illustrated below:

(51) Of course, the best way to handle HCV infection is to prevent it altogether. [EPOP]

Moreover, an objective style of writing is aided, for instance, by the use of modal verbs instead of cognitive verbs such as *think* or *believe*, as modals can readily be combined with inanimate subjects, allowing the role of the author to be played down (Hyland 2008:15), e.g.:

(52) In addition, after the return of pressure to the level of enddiastolic pressure, passive viscoelastic properties may be of importance and its effect on the evaluation of Tau should be modeled. [1] [ESCI]

Authors may, however, refer to themselves openly in presenting propositions as illustrated below:

(53) We suggest that the up-regulation of these key cytokines within RA synovial tissue allows differentiation and maintenance of FDC networks within T/B cell aggregates to form functional microanatomical immunological units, and hence, allow the up-regulation of AID and subsequent production of ACPA. [ESCI]

By qualifying their commitment in this manner, authors open up room for the reader to contest their claims:

Explicit reference to the writer seems to mark the statement as an alternative view rather than a definitive statement of truth, indicating a personal opinion awaiting verification [...]. (Hyland 1995:35)

This type of self-referential feature is discussed in terms of “self-reporting” evidentials by Yang (2013). His account is concerned with the evaluative aspects of what he terms

“reporting evidentials” in English research articles from the field of applied linguistics. His approach provides a valuable point of departure for this study as it adopts a comprehensive perspective, which, similarly to Chafe’s (1986) account, treats evidentiality as a semantic rather than a grammatical concept and considers a range of distinction criteria concerning the type of source referenced. In line with the systemic functional perspective, different realisations of meanings are taken into account (Yang 2013:119), the interpersonal orientation of evidentiality and its role in the negotiation of relations between the information conveyed, the author and the reader being underscored. A distinction is made between “self-reporting” and “other-reporting” evidentials, the former being concerned with indications of information relating to the author’s own research and the participants in the experiments whereas the latter relate to external sources (Yang 2013:120). In the present cross-linguistic analysis, the options available for expressing these meanings in English and in German will be examined in greater detail in the outline of the analytical framework in chapter 6. Yang argues that evidentials involving reference to self such as *I think* and *in my opinion* are infrequent in academic genres. The present analysis addresses potential popularisation-induced shifts impacting on self-mention in cases in which the scientists’ ‘voice’ is rendered by science journalists, both in English and in German. Other-reporting evidentials signal that information stems from external sources (Yang 2013:120) as exemplified below:

- (54) In contrast, Hviid [14] found that the hemophilus vaccine, after adjustments, was associated with a rate ratio of 0.99. [ESCI]

The distinction between human or non-human information sources as well as specified versus unspecified as discussed by Yang (2013:120) will also be examined more closely. This involves expressions used by authors to foreground their research (e.g. *data* in the following example), while at the same time signalling the writers’ own involvement (*our*):

- (55) Our data suggest that unadjusted FMD is less sensitive to modest differences in cardiovascular risk, which may account for unanticipated negative studies [20–25]. [ESCI]

While “facts speak for themselves” (Yang 2013:122) in such cases, another strategy for presenting informational content as reliable is by referencing human information sources and thus underscoring their role as witnesses and “experiencers” (ibid.).

Yang also highlights the role of citation markers as evidentials and their potential impact on readers: The precise indication of sources involving year of publication and reference to pages is considered to add to the perceived reliability of information and the credibility of the author and thus contributes to a persuasive style (Yang 2013:122). As will be seen later, a

numerical citation style prevails in the medical research papers examined in the present study, e.g.:

- (56) Circular transcripts are known to be specifically associated with AID expression and exclusively detectable in B cells undergoing CSR, but not by plasma cells, which have already undergone CSR [50].
[ESCI]

The communicative impact of this type of bibliographic reference will, therefore, be taken into account in view of its interplay with exponents of epistemic and evidential formulations.¹⁵ As noted earlier, the choice of reporting verbs has a discourse-related impact in that it indicates the author's judgement of the evidential status of propositional content (Yang 2013:123). These issues will be taken up again later and examined both from a register-oriented perspective and from a cross-linguistic angle.

3.3 Modality and its relation to other linguistic categories

In the linguistic literature, a distinction is generally made between mood and modality (cf. Smirnova 2006:87). The term mood is used to refer to linguistic phenomena belonging to different strata: On the one hand, it is used with regard to the distinction between the interrogative, declarative, imperative or optative choices (Nuyts 2006:8). In this sense, mood is expressed at clause level concerning the functional categories of statements, questions and commands (Benwell & Stokoe 2006:112). On the other hand, the term mood is used to refer to the indicative/subjunctive and the realis/irrealis distinctions (cf. e.g. Nuyts 2006:8, Dollinger 2008:156, von Fintel 2006:7). In the latter view, mood thus covers a formal grammatical category relating to verbal inflection, i.e. morphological properties of the verb, by means of which modal meanings are encoded (cf. e.g. Palmer 1990:11, Bybee & Fleischmann 1995:2, Collins 2009:11, Smirnova 2006:87¹⁶, Depraetere & Reed 2006:270¹⁷). Modality is thus understood as an extensive semantic notion, under which mood is subsumed as one means of expressing modality (Palmer 1990:12, Smirnova 2006:87).

Modal systems and mood constitute the two basic grammatical resources for expressing modality according to Palmer (2001:4). Latin, Greek and contemporary European languages such as German, Italian, Spanish or French, all of which are highly inflectional languages,

¹⁵ See also Salager-Meyer (1999) on referencing in scientific writing.

¹⁶ Smirnova (2006:87) contains a detailed list of accounts treating mood as a formal grammatical category represented by the inflectional verbal paradigm by means of which modality is expressed.

¹⁷ Depraetere and Reed (2006:270) treat the English imperative as an inflectional mood alongside the subjunctive and the indicative.

make strong use of mood (von Fintel 2006:7). German has two resources for expressing modality, namely a paradigm of modal verbs and a mood system with the subjunctive (*Konjunktiv*) and the indicative (Palmer 1990:12, 2001:4). In English, the distinction between the indicative and the subjunctive is expressed by a more limited verb morphology (Hawkins 1986:219), though, according to Palmer (1990:12), what is sometimes referred to as the English subjunctive form actually relates to past tense forms serving as markers of unreality, for example in conditional sentences, or formal uses in subordinate clauses (Palmer 1990:12, Depraetere & Reed 2006:271). Inflectional resources are thus rarely employed to encode modal meanings, while the modal verb system represents a central means of expressing modality in English (Palmer 2001:4, von Fintel 2006:7, Depraetere & Reed 2006: 270).

Modality is also linked to temporality, which is generally divided into the domains tense and aspect (von Fintel 2006:1). Modality, tense and aspect all concern “the event or situation reported by the utterance” and are usually, but not necessarily, expressed by the verbal element (Palmer 2001:1). Tense and mode are linked by their referential function (Zifonun 2000:315): Tense specifies temporal location while mode specifies the location of a proposition in a ‘world’ by signalling whether the proposition should be interpreted against the present, past or future real world or a possible world (Zifonun 2000:315f).

Aspects are defined by Comrie as “different ways of viewing the internal temporal constituency of a situation” (1976:3). The latter category thus concerns the speaker’s subjective view of a situation as shown in the corpus example provided below:

- (57) “What we’re really doing is looking to see if there is a relevant way to adapt that for sexual and blood-borne transmission,” says Mitchell Warren, executive director of the AIDS Vaccine Advocacy Coalition. [EPOP]

While the progressive thus adopts an “internal view”, regarding the situation as something “ongoing, in progress”, the use of the non-progressive expresses an external viewpoint, with “no explicit reference” being made to “any internal phase or to any feature of the temporal flow” (Huddleston & Pullum 2002:117). Aspect hence concerns the “nature of the event”, referring directly to characteristics of the event described (Palmer 2001:1, cf. also König & Gast 2012:80ff on tense- and aspect-related contrasts between English and German). Tense and aspect are seen as forming the temporal “counterpart” of modality (von Fintel 2006:1). Together, temporality and modality represent central linguistic devices enabling language users to speak about “affairs beyond the actual here and now” (von Fintel 2006:1). Nuyts (2005:5), however, argues that modality should not be considered as being on a par with tense and aspect, instead it should be treated in terms of a “higher order category”.

As noted earlier, special emphasis will be placed on epistemic modality and the related notion of evidentiality in the present analysis. However, before zooming in on these focal areas, the following account aims to provide a brief general overview of key concepts traditionally examined within the wider context of modality.

3.4 Categorising modality

As mentioned initially, modality is regarded as a semantic notion covering a wide range of meanings such as ability, potentiality, hypotheticality, necessity or obligation, which can be broken down into different subtypes (Smirnova 2006:87, Depraetere & Reed 2006:269). In Bybee and Fleischmann's terms, modality

covers a broad range of semantic nuances [...] whose common denominator is the addition of a supplement or overlay of meaning to the most neutral semantic value of the proposition of an utterance, namely factual and declarative. (Bybee & Fleischmann 1995:2)

The area of linguistics concerned with modality is based on the language-philosophical branch of modal logic, a discipline which examines the linguistic conception of representations of possibility and necessity. In modal logic, the concept of possible worlds is a central notion, with different modal meanings being regarded as corresponding to different sets of possible worlds (Kratzer 1981, 1991, cf. von Stechow 2006:3).

Linguistic approaches to the notion of modality are strongly influenced by the work of the linguist Otto Jespersen, who discerns between "moods containing an element of will" and "moods containing no element of will" (Jespersen 1924:320ff, cf. e.g. Wratil 2005:16, van der Auwera & Zamorano Aguilar (forthcoming) on the history of the concepts modality and mood). In the linguistic literature on modality, a distinction is frequently made between two essentially different types of modality as illustrated by the uses of the modals *may* and *must* in the following examples (cf. also Palmer 1990:5):

- (58) Opioids also may make blood vessels leaky, [...]. [EPOP]
- (59) That her mother was still preoccupied with the photos of her missing boys came as no surprise to Ruth, nor did the fact that Marion must have obsessed on the subject of what Thomas and Timothy would have looked like as grown men – and what their lives would have been like, had they lived. [EREF]
- (60) Alternatively Requests for Tender documentation may be made in writing (letter or facsimile) to Keith Russell PNG Contracts Services, AusAID, GPO Box 887, Canberra ACT 2601, facsimile (02) 6206-4885. [EREF]
- (61) Management must therefore ensure that QA staff have ready access to the Master Schedule. [EREF]

The first two examples shown above basically relate to evaluations of probability whereas example (60) concerns permission and an obligation is imposed by an external authority in example (61) (cf. also Palmer 1990:5). The first type of modal meaning is generally referred to as epistemic modality. The epistemic domain is typically described as dealing with

the speaker's attitude towards the factuality of the situation, the speaker's judgment of the likelihood that the proposition on which the utterance is based is true [...]. (Collins 2009:21)

The meanings expressed in the last two examples, i.e. (60) and (61), are commonly categorised as exponents of deontic modality, which

is concerned with the necessity or possibility of acts performed by morally responsible agents. (Lyons 1977:823)

Deontic and epistemic modality are two of the four categories described by the philosopher von Wright (1951): deontic, epistemic, alethic and existential¹⁸ (cf. Palmer 1990:6).¹⁹ The modal system proposed by von Wright has had seminal influence on the field, with many later categorisations being based on the four major “modes”²⁰ described in his *Essay in Modal Logic* (cf. Wrátil 2005:16). Palmer describes the epistemic and the deontic type as “the two most semantically fundamental kinds of modality” (Palmer 1990:2). He posits a general binary distinction between the “propositional” type, on the one hand, and “event” modality, on the other (2001:8). Propositional modality is defined by Palmer (2001:8) as comprising the two major subcategories epistemic and evidential modality. Both are concerned “with the speaker's attitude to the truth-value or the factual status of the proposition [...]” (Palmer 2001:8). Event modality embraces the two main subcategories deontic and dynamic modality in Palmer's frequently cited system.²¹ Dynamic modality concerns willingness or ability (Palmer 2001:9f) as exemplified below:

¹⁸ The existential category as set forth by von Wright (1951:2) concerns “universal”, “existing” and “empty” and deals with the scope of the proposition (cf. also Vihla 1999:24). However, these concepts are generally treated within the context of quantification theory rather than in a modal logic context (von Wright 1951, cf. also e.g. Gazo 1974:97, Vihla 1999:25) and will therefore not be considered in greater detail in this overview.

¹⁹ The philosopher Rescher (1968:24ff) proposes a wider-ranging notion of modality comprising temporal, boulomaic, evaluative, causal and likelihood modalities in addition to the alethic, epistemic and deontic types of modality (cf. Perkins 1983:9). Affective meanings are thus considered in this account by the inclusion of the evaluative category. Moreover, likelihood modalities such as *it is likely that* are distinguished from the epistemic set.

²⁰ The terms ‘modality’ and ‘mode’ are used interchangeably by von Wright (cf. van der Auwera & Zamorano Aguilar forthcoming:17).

²¹ Palmer (2001) uses the terms “deontic”, “epistemic” and “dynamic” as proposed by von Wright (1951).

- (62) Still, the global fight against polio is far from over. About 1,000 cases occur each year worldwide, costing the global economy \$700 million – and Bari knows just how quickly one or two isolated incidents can mushroom into dozens. [EPOP]

Hence dynamic modality differs from deontic modality in that it concerns conditions that are intrinsic to the individual referred to. Nonetheless, dynamic and deontic modality both

refer to events that are not actualized, events that have not taken place but are merely potential [...].

(Palmer 2001:8)

Palmer's main categories may be depicted as follows:

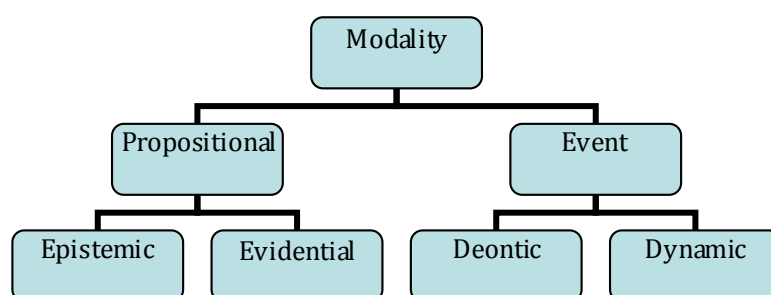


Fig. 2: System of modal categories based on Palmer (2001)

Palmer's basic twofold classification between propositional and event modality thus largely corresponds to Jespersen's (1924) aforementioned distinction between categories "containing no element of will" and those "containing an element of will" (Palmer 2001:8).

In von Wright's (1951) definition, deontic modes cover "obligatory", "permitted", "indifferent" and "forbidden" (*deon* means 'duty' in Greek, cf. e.g. von Fintel 2006:2). Deontic modality, is described by Lyons as being "concerned with the necessity or possibility of acts performed by morally responsible agents" (Lyons 1977:823). Traditional accounts such as Lyons' (1977:823) often treat deontic modality in terms of the two key categories permission and obligation (cf. e.g. van Linden 2012:16, Boland 2006:70). The obligation-type was illustrated by the use of the modal auxiliary *must* in example (61); *may* expresses permission in example (60). In addition to the obligative and the permissive type, the deontic category also comprises a commissive type in Palmer's (2001:9f, 22) system. Commissive modality is realised by *shall* in the following example:

- (63) You shall leave tomorrow (example taken from Palmer 2001:10)

In German, deontic modality is typically expressed by the modal auxiliaries *dürfen* and *sollen* (Diewald 1999:74), as in:

- (64) Dennoch ist die klinische Unterscheidung bei jungen Kindern nicht immer ganz einfach (Tab. 1). Diese Unterscheidung darf jedoch nicht dazu verleiten, Zystitiden als harmlose Harnwegsinfektionen einzustufen. [GSCI]
- (65) Die Urinmikroskopie, am besten per Phasenkontrastmikroskop, sollte in der Diagnostik einer Harnwegsinfektion immer eingesetzt werden. [GSCI]

The range of exponents of deontic modality is, however, not limited to modal verbs and also includes deverbal adjectives and participles such as *allowed* or *required to* (Perkins 1983:83f)

- (66) Sometimes, of course, the court will be required to decide upon issues which cannot be resolved in other ways or where decisions are urgently needed. [EREF]
- (67) Our 'watershed' policy is based on the belief that parents must take some responsibility for what their children are allowed to view after 9 o'clock. [EREF]

Deontic features are performative in that they are used to allow, order or prohibit an action (Vihla 1999:23). Deontic modality has an exogenous source relating to some form of external authority such as embodied by laws or rules or a person who grants permission or imposes an obligation (Palmer 2001:9f). This authority represents a "felicity condition" on which the validity of the order, request or permission relies (Searle 1969:66, Lyons 1977:733, cf. Vihla 1999:23). Successful deontic features affect the addressee's behaviour and thus have a perlocutionary impact (Austin 1962, cf. Vihla 1999:23).

Another point to be considered is that there is no consensus as to whether "volition" and "intention" fall under the label of deontic modality (Nuyts 2005:10, 2006:9). Volition, as exemplified below by the use of *wants*, generally relates to a person's desires (Nuyts 2005:10):

- (68) McDonald's team also wants to determine whether this technique distinguishes between ovarian and other types of malignancies. [EPOP]

Whereas volition concerns wishes, intention appears to be closer to the implementation of an action (cf. Nuyts 2005:10, 2006:9). This is illustrated by *will* in the following example:

- (69) And Mr Roy Peddie, a former chairman of the North Staffordshire LVA and now the national organisation's president-elect, said: "We will be lobbying the conference to drive home the fact that the Government is not doing enough to protect licensees." [EREF]

In German, typical expressions of volition include the modal verbs *wollen* and *mögen* (Diewald 1999:75), as in:

- (70) Eine weitere gute Nachricht aus dem Bereich Kryokonservierung kommt für Krebspatientinnen. Wer hier vor einer Chemo- oder Strahlentherapie Eizellen gewinnen und einfrieren möchte, um sich die Chance auf eigene Kinder auch nach einer solchen Behandlung noch zu erhalten, der stand bislang vor einem Problem: [...]. [GPOP]

Palmer classifies “volitive” modality as a subcategory of dynamic modality. As mentioned earlier, dynamic modality and deontic modality constitute the two major types of Palmer’s event modality, both forms of event modality referring to non-actualised, potential events (Palmer 2001:8f). Yet, while deontic modality originates from an external source and impacts on the “first-argument participant” (Nuyts 2005:13), dynamic modality is internal to the participant (Collins 2009:22).

Quirk et al. (1985:219ff) include volition under the label “intrinsic” modality along with deontic “permission” and “obligation”. Intrinsic modality entails “human control over events” and is distinguished from “extrinsic” modality, which is the label used by Quirk et al. (1985:219) to refer to judgments of likelihood.

Expressions of wishing and desiring are sometimes considered under the heading “boulomaic” modality (cf. Nørgaard et al. 2010:116). Perkins (1983:15) draws a clear distinction between the boulomaic and the deontic type, arguing that the semantics of features such as *want* or *desire* differ from those of deontic features such as *order* or *demand*. This type of modality, which is also referred to as “bouletic” modality (von Stechow 2006:2), is not conveyed by modals but by lexical features such as the verb *hope* in the example shown below:

- (71) The Stafford MP, who is spear-heading the fight to halt the amalgamations, said: “I hope the Government will listen. These are important matters which go to the heart of this country and the defence of the realm.” [EREF]

Other exponents of boulomaic meanings include adverbs and adjectival, participial or nominal structures as exemplified below (cf. Nørgaard et al. 2010:116):

- (72) It followed that, in proceedings for contempt of court under section 8(1), a defence must be open if the juror was motivated by a genuine desire to remedy a miscarriage of justice, irrespective of whether the complaint was of intrinsic or extrinsic misconduct. [EREF]

It was mentioned above that Palmer (2001:9f) distinguishes between two types of dynamic modality, namely inclination-related “volitive”, on the one hand, and the “abilitive” type, on the other hand. The abilitive type of dynamic modality is expressed by *able to* and *can* in the following example:

- (73) Often the parties will be able to negotiate these between themselves or their solicitors in the usual way. Sometimes they will benefit from the help of a neutral conciliator or mediator who can help them to resolve their disputes and to reopen lines of communication between them in their children’s interests. [EREF]

In Palmer's (2001:9f) system, dynamic modality is internal to a person, yet, the scope of the ability-type is not limited to a person's mental and physical capability, but also extends to non-deontic circumstances impacting on that person²², as in:

- (74) "You can cure a lot of cancers in mice," he says, "and not necessarily have any effect in humans."
[EPOP]

A different classification of these meanings is proposed by Bybee et al. (1994:177f), who discern between "speaker-oriented" and "agent-oriented"; the latter deals with

internal or external conditions on an agent with respect to the completion of the action expressed in the main predicate. (Bybee et al. 1994:177)

Agent-oriented modality thus covers ability, which concerns agent-internal circumstances relating to the action referred to by the predicate in Bybee et al.'s (1994:177) terms. Ability thus "indicates a condition *on the agent of the event*, not a condition on the event expressed" (Frawley 1992:426, author's emphasis). In addition to agent-internal ability, the label agent-oriented also includes a broad range of areas comprising "obligation" stemming from "external, social conditions" and "necessity" relating to physical factors (Bybee et al. 1994:177ff), as in:

- (75) On the flip side, "if you're genetically predisposed to have [a higher] chance, maybe you only need eight to 12 weeks [on therapy]," McHutchison says. [EPOP]

Furthermore, agent-oriented modality includes desire, which is linked to intention and willingness in this account.

Bybee et al.'s (1994:179) "speaker-oriented" modality, by contrast, refers to directives and formulations by means of which permission is granted by the speaker. Included in this category are imperatives, prohibitives, optatives, admonitives etc. It is thus closely linked to deontic obligation and permission (Nuyts 2005:13). Both agent- and speaker-oriented modality are set apart from epistemic modality, which will be considered in more detail in the following section.

Epistemic modality, as mentioned initially, concerns assertions and commitment to the truth of a proposition (e.g. Bybee et al. 1994:179). Epistemically unmarked cases express full

²² The modal category relating to this type of circumstance-specific possibility and necessity is also referred to as "circumstantial" modality (von Stechow 2006:2).

commitment whereas epistemic expressions qualify the speaker's commitment to the truth of a proposition (Bybee et al. 1994:179) as exemplified below by the modal auxiliary *may*:²³

- (76) Our study does have some limitations. First, our early stroke recurrence rates were lower than those of previous similar studies.⁵ This may partly reflect our recruitment of patients several days (median, 9) after stroke onset, excluding some patients who had already had a very early recurrence and so underestimating the very high recurrence rate in the first few days after nonlacunar (mainly large artery) ischemic stroke and diminishing the apparent difference in early recurrence risk between nonlacunar and lacunar stroke. [ESCI]

The following definition summarises the basic notion of epistemic modality as an indication of an assessment of probability in terms of a

(linguistic expression of) an evaluation of the chances that a certain hypothetical state of affairs under consideration (or some aspect of it) will occur, is occurring, or has occurred in a possible world [...]. (Nuyts 2001:21)

It was pointed out earlier in this chapter that von Wright (1951) distinguishes between epistemic and alethic modes. The epistemic modes are also referred to as “modes of knowing” by von Wright, the term epistemic being derived from *episteme*, the Greek word for knowledge (von Fintel 2006:2). In von Wright's (1951) classification, the epistemic category covers the levels “verified (known to be true)”, “undecided (neither known to be true nor known to be false)” and “falsified (known to be false)”. As to the alethic type of modality, von Wright (1951) discerns between “necessary”, “possible”, “contingent” and “impossible”. The alethic modes are also referred to as “modes of truth” by von Wright (1951), the term alethic being derived from Greek *aletheia* (‘truth’) (von Fintel 2006:2). While epistemic modality may be described as dealing with the “truth in an individual's mind” (Nuyts 2001:28), the alethic type is concerned with the “necessary or contingent truth of propositions” (Lyons 1977:791) or “truth in the world” (Nuyts 2001:28), that is as considered from a detached logical, absolute point of view (cf. e.g. Facchinetti 2009:57, Nuyts 2006:8f). Initially introduced by von Wright (1951) in a modal logic context, the concept of alethic modality has also been a subject of analysis in formal semantics (Nuyts 2006:8). Yet it has been noted, for instance by von Fintel (2006:2), that persuasive realistic examples of this type of modality are difficult to find, and thus it seems that the concept of alethic modality is barely taken up in linguistic semantic approaches (Nuyts 2006:9). In Coates' (1983:22) and Lyons' (1977:391) accounts, for instance, epistemic and alethic modality are treated jointly (cf. Diewald 1999:73). Palmer sees

²³ The examples provided in this chapter are limited to a small number of illustrative corpus examples. The range of options available in English and German for expressing relevant modal meanings will be examined in greater detail in the outline of the analytical framework (chapter 6).

no grounds for recognising alethic modality as a category in its own right, i.e. distinct from epistemic modality, pointing out that

there is no distinction between [...] what is logically true and what the speaker believes, as a matter of fact, to be true. (Palmer 1986:11)

Consequently, according to Palmer,

there is no formal grammatical distinction in English, and, perhaps, in no other language either, between alethic and epistemic modality. (Palmer 1986:11)

Hence, any examples of alethic uses of modals may also be regarded as expressing epistemic modality (cf. also von Stechow 2006:2). This perspective is reflective of the subjectivity of knowledge as discussed in the introductory chapter and will also be adopted in the present analysis.

Moreover, Palmer (2001:24ff) distinguishes between three epistemic subcategories, namely “Speculative”, “Deductive” and “Assumptive”. The speculative subcategory concerns expressions of uncertainty as illustrated below:

- (77) Peters worries that lycopene’s lackluster performance to date may mean that it never progresses to clinical trials [...]. [EPOP]

The deductive subcategory relates to “the only possible conclusion” (Palmer 2001:6, 25), e.g.:

- (78) Barney Clark’s 112 days must have been extremely unpleasant, with his body constantly jostled by a clattery machine. [EPOP]

Although *must* is treated in connection with deductive epistemic modality in Palmer’s account, he points out that *must* normally indicates that an inference is founded on evidence (Palmer 2001:8). As pointed out by Coates:

In its most normal usage, Epistemic MUST conveys the speaker’s confidence in the truth of what he is saying, based on a deduction from facts known to him (which may or not be specified). (Coates 1983:41, author’s emphasis)

Thirdly, Palmer’s assumptive subtype of epistemic modality refers to inferences obtained from what is generally known (2001:8f, 25). Assumptive judgements express a “reasonable conclusion”, as in:

- (79) Our Teacher BY DENNIS K. TACKLEY, BA, BD, MED, SHERBORNE, DORSET Visual aids: A school exercise book, a children’s slate, and a pointed stick to represent a stylus. I expect you will know what this is (Hold up the exercise book). You must use books like this every day at school. But in ancient times paper was much too expensive for children to use. [EREF]

As regards the linguistic realisation of modal meanings, much emphasis has been placed on modal verbs in the literature (e.g. Müller & Reis 2001 on German modal verbs, Coates 1983, Palmer 1990, Collins 2009 on English modals). The polyfunctional nature of modals in English and other Germanic languages is well-recognised in the literature (Narrog 2012:48). Their use in non-epistemic functions was highlighted in the previous section. There is, however, no full agreement as to which modals and quasi-modals are expressions of epistemic modality (Collins 2009:21). In addition to *may*, *must* and *will* included in the above examples, the category of English central modals includes *can*, *shall*, *could*, *might*, *would* and *should* (Depraetere & Reed 2006:272). According to Coates (1983:18f) *must*, *should* and *ought* as well as *may*, *might*, *could* and *will* can serve as epistemic modals. Out of these, *may*, *might*, *could* and *will* concern judgements of possibility and are categorised as non-inferential by Coates. *Must*, *should* and *ought* are regarded as relating to assumption and classified as inferential epistemic modals. Negated *must* merely occurs in non-evidential meanings, this gap being filled by negative *can't* (Coates 1983:19). Positive uses of *can* are never epistemic according to Coates (1983:19).

It is, however, a matter of debate whether *will* and *shall* are modals. The status of *will* as a modal is queried, for instance, by Kissine (2008), and Coates (1983:244) regards *will*, *shall* and *would* as merely occupying a marginal epistemic status. *Will* and *shall* (as well as *would* and *should*) do not seem to fully fit the notions of “either possibility or necessity of the truth of a proposition” (Depraetere & Reed 2006:277, authors’ emphasis). While prediction typically entails an assessment of likelihood, it can be difficult to decide whether this relates to necessity or possibility (Depraetere & Reed 2006:277). Moreover, while modal meanings can usually be expressed by different modals, some uses may be deemed less acceptable in certain registers according to Depraetere and Reed (2006:277).

Could, *might*, *would* and *should* are referred to as “past tense forms” by Coates (1983:6f), while Perkins (1983:28) terms them “secondary” modals (in contrast to *can*, *may*, *must*, *will* and *shall*, which he labels “primary” modals 1983:29, including *ought to*). *Could*, *might*, *would* and *should* occur in hypothetical contexts involving conditional clauses (Dury s.a.), e.g.

- (80) However, since there is generally only a small sex skewing with immunization, the attributable rate ratio would be negligible, around 1.02, if there were a 20% skewing of gender in the groups. [ESCI]

They may, however, also express hypotheticality in cases where they are not accompanied by conditional clauses (Dury s.a.), as in:

- (81) In addition, our results might also explain the fall in ACPA levels resulting from the dual blockade of TNFa and LTa with etanercept [59], and the blockade of TNFa by infliximab [11] in patients with RA. [ESCI]

Similarly, the status of the quasi-modals *be going to*, *be to*, *be about to* is uncertain (Collins 2009:22).

In German, the six modal verbs *dürfen*, *können*, *mögen*, *müssen*, *sollen* and *wollen* play a key role in the expression of modality (Diewald 2004:231, cf. also Mortelmans 2002:395 on German modals and mood). All six can occur both in epistemic and deontic uses (Droessiger 2010:12). Apart from *sollen* and *wollen*, which serve as evidentials, these modal verbs typically express deductive and speculative meanings according to Palmer (2001:9), as in the following example which includes a form of *mögen*:

- (82) Die hier untersuchten Patienten entsprechen dem Kollektiv eines tertiären Zentrums. Die Prävalenz im ambulanten Bereich oder in Häusern der Grund- und /oder Regelversorgung mag abweichen. [GSCI]

As in the case of the English modals, different modals are associated with different epistemic values in German (Smirnova 2011:105). *Müssen*, for instance, expresses a high degree of certainty or conviction (Droessiger 2010:13f), e.g.:

- (83) Irgendwann gab es eine Zeit vor der Globalisierung – und damals muss, denkt der Europäer, doch bestimmt der Australier der isolierteste Mensch der Welt gewesen sein. [GPOP]

Dürfte, as exemplified below, has a lower value than *müssen* (Smirnova 2011:105):

- (84) [...] aufgrund seiner biologischen Wirkung ist davon auszugehen, dass Leptin, wenn überhaupt, dann nicht spezifisch nur bei ITP-Patienten erhöht sein dürfte. [GSCI]

Können conveys lack of certainty (Droessiger 2010:14):

- (85) „Sogar kurzzeitige Veränderungen des Essverhaltens können ausgedehnte Effekte auf die Gesundheit haben“, fasst Ernersson zusammen. [GPOP]

The German modals are considered to have a less grammaticalised status than the English modals (Mortelmans 2002:395). Unlike English modals, they inflect for tense and person and have infinitive and past forms (Mortelmans 2002:395). German epistemic modals generally do not permit non-finite forms or past tense inflection, marking for mood is, however, obligatory (Mortelmans 2002:397ff). Epistemic modals thus take either the indicative or the subjunctive II form, with subjunctive II forms of the German modal *können* conveying reduced commitment to truth value compared to the corresponding indicative forms (Droessiger 2010:14), as in:

- (86) Probleme könnten hier im Bereich des Abdomens und des Beckens auftreten, da es hier zu Überlagerungen durch die Aktivität in [sic] Bereich der Organe und Weichteilen [sic] kommen könnte. [GSCI]

This also applies to the subjunctive form of *müssen* (Droessiger 2010:14):

- (87) Gemittelte Aktivitätsmuster ganzer Zellverbände geben dem Gehirn verlässlicher Auskunft als die Signale einzelner Neurone. Doch auch hier müssten eigentlich Probleme auftreten, die das Rauschen in neuer Gestalt durch die Hintertür wieder hereinlassen. [GPOP]

According to Diewald (1999:15), the encoding of the relation between the speaker (i.e. the “origo”) and the situation referred to is the defining characteristic of the meaning of German epistemic modals (cf. also Mortelmans 2002:396). Epistemic modals indicate that the speaker refuses to assign a definitive factuality value to the proposition (Diewald 1999:206, cf. Mortelmans 2002:397).

It was noted previously that much focus has been on modal verbs as expressions of modality in the relevant literature (e.g. Müller & Reis 2001 on German modal verbs, Coates 1983, Palmer 1990, Collins 2009 on English modals). This also holds for epistemic modality, which has traditionally tended to be discussed in terms of modal verbs (e.g. Coates 1983, Palmer 1979, cf. also Kärkkäinen 2003:20). Perkins (1983:89), for example, notes that English modal adverbs mainly convey epistemic meanings (cf. also de Haan 2006:37). Yet, as in the case of deontic modality, the expression of epistemic modality is not limited to grammaticalised means (de Haan 2006:37). Stubbs (1996), for instance, suggests the inclusion of other devices used by speakers or writers to modify the degree of attachment to a proposition – or lack thereof – in the category of modality (cf. White 2003:260). The range of expressions covers modal phrases and lexical verbs, epistemic adjectives, adverbs and nouns as well as participial features (Kärkkäinen 2003:20). In German, additional exponents of epistemic modality include subjunctive forms and modal future constructions (Droessiger 2010:14). Moreover, modal particles represent a further means of expressing modality (de Haan 2006:39, Droessiger 2010:14). They are not frequent in English, but appear to be becoming more common in American English according to de Haan (2006:38):

- (88) There is so a Santa Claus! (Example taken from de Haan 2006:38)

Modal particles are, however, a frequent phenomenon in German (de Haan 2006:39), as in:

- (89) Zumindest sollte der Gruppenleiter informiert sein, falls sich der Herr Gemahl über das Ansinnen der Polizei entrüsten würde, und damit war wohl zu rechnen. Also konnte es Ärger geben! [GREF]

As is apparent from the overview given in this section, the variety of modal expressions is not limited to grammatical resources such as verb mood or modals but also includes lexical, morphological and syntactic means as well as intonation (Lyons 1977:79, Smirnova 2006:88, Depraetere & Reed 2006:270) and differs in English and German. According to the extensive definition offered by Lyons (1977:79) cited in the introductory chapter, the speaker’s commitment may even be qualified by paralinguistic means. Prosodic and non-linguistic

resources are, however, not pertinent to the present study, which is concerned with written language.

According to Palmer, modality represents “a valid cross-language grammatical category that can be the subject of a typological study” (2001:1). Yet, in her analysis of epistemic uses of German modals, Droessiger (2010:13) remarks that complex empirical analyses are relatively rare in this field and attributes this to the heterogeneous nature of the exponents of epistemic meanings, which appear to complicate this type of analysis.²⁴ Moreover, the meaning of modal features, in particular that of modal verbs, is affected by contextual factors (Kärkkäinen 2003:21). These factors also bear implications for the current analysis and impact on the corpus size and the analytical procedure adopted in this study. The range of potential expressions of epistemic and evidential meanings in English and German will be taken up again and examined in more detail in connection with the outline of the analytical procedure in chapter 6.

Out of the four types of modality described by von Wright (1951), the epistemic and deontic categories thus appear to remain the most pervasive concepts in the literature on modality (cf. e.g. van der Auwera & Zamorano Aguilar forthcoming:17). Many authors (e.g. Lyons 1977, Palmer 2001) adopt the distinction between epistemic and deontic modality and propose further subtypes. In some accounts, e.g. Hofmann (1976), Sweetser (1990) and Coates (1983), the term *root modality* is used as a collective label for non-epistemic types of modality (cf. e.g. Nuyts 2005:12, Kiefer 2009:186). The notion of root modality occurs frequently in the Anglo-American literature (cf. Nuyts 2005:12), but there seems to be no agreed definition of the concept (cf. Collins 2009:22). In her corpus-based analysis of English modals, Coates (1983:21) observes that the different types of root modals share semantic and syntactic commonalities which distinguish them from epistemic modals (cf. Depraetere & Reed 2006:278). These common characteristics involve an animate subject, the use of agentive verbs and the passive voice. Furthermore, Coates (1983:21) observes prosodic differences between epistemic and root uses of English modals. Collins (2009:22) remarks that the most usual type of root modality is deontic modality, which as mentioned previously, concerns cases in which the realisation of an event is influenced by factors relating to some kind of authority. However, as pointed out by Collins, not all instances of root modality are to

²⁴ Contrastive translation-oriented accounts include e.g. Kranich (2009, 2011), who is concerned with epistemic modality in popular scientific publications and their German translations.

be considered deontic (ibid.). Root modality comprises root necessity and root possibility (Depraetere & Reed 2006:274). Non-deontic root necessity concerns necessity that is not due to an authority, that is a deontic source, but to general conditions as illustrated below:

- (90) “Even though you have two patients with the same kind of lymphoma, the immunological signature is different. You have to treat each patient’s tumor cells individually,” he adds. [EPOP]

Expressions of root necessity are thus paraphrasable by “it is necessary (for) ... to” (Depraetere & Reed 2006:274). In Bybee et al.’s definition root possibility concerns

general enabling conditions and is not restricted to the internal condition of ability, but also reports on general external conditions, such as social or physical conditions. (Bybee et al. 1994:178)

Instances of root possibility as exemplified below are paraphrasable as “it is possible (for) ... to” (Depraetere & Reed 2006:274):

- (91) Toner likens his new system to the way AIDS patients have their viral load and T cells measured so that their medication can be adjusted. [EPOP]

Depraetere and Reed (2006:274) note that ability and volition are usually considered separately within root modality. The concepts of ability and volition were taken up previously in section 3.3. It was pointed out in connection with the category of dynamic modality that possibility and necessity may not be due to some form of extrinsic authority, but instead factors internal to the participant referred to, such as ability or volition, may come into play (Collins 2009:22). The ability-type of modality is illustrated below by *could*:

- (92) She was standing near a lamp post, but I could see her face. [EREF]

Here, the use of *could* appears to indicate both physical capacity in terms of eyesight and an absence of external obstructions to the view.²⁵ As noted before, Palmer deals with this by discerning between a dynamic category, which comprises both ability and willingness, and a deontic category, which are, in turn, bundled under the umbrella term event modality (2001:9).

Van der Auwera and Plungian (1998) distinguish between “participant-internal” and “participant-external” modality. Participant-internal modality entails possibility and necessity which are “internal to a participant engaged in the state of affairs” (1998:80). Participant-external modality deals with circumstantial factors external to the

participant, if any, engaged in the state of affairs and that make this state of affairs either possible or necessary. (Van der Auwera & Plungian 1998:80)

²⁵ Cf. also Coates (1983:113ff) on *could* as a past tense form of root uses of *can*.

While these notions roughly resemble Palmer's (2001) event categories, van der Auwera and Plungian include non-deontic root possibility under participant-external modality, which falls under ability, i.e. the dynamic category, in Palmer's (2001) system; and, unlike Palmer, they do not consider volition as a modal category (cf. Collins 2009:22).

Quirk et al. (1985:219ff) put forward a different categorisation, discerning between intrinsic modality and extrinsic modality in their classification which was mentioned previously in this section. Intrinsic modality entails "intrinsic human control over events" and encompasses deontic modality and volition (cf. Collins 2009:23). Extrinsic modality relates to "human judgement of what is or is not likely to happen" (Quirk et al. 1985:219); it encompasses epistemic modality and non-deontic root possibility and necessity as well as prediction and ability (cf. Collins 2009:22). Though ability as expressed by *can* in the next example usually involves "human control over an action", Quirk et al. (1985:221) argue that it should be regarded as a special type of possibility and treated as extrinsic, that is as entailing a judgment of likelihood (cf. also Collins 2009:23):

- (93) Although some companies can manufacture the customized vaccines, getting volumes up to an efficient level has been a challenge so far. [EPOP]

An assessment of ability involves a judgement of the probability of the situation referred to being actualised in Quirk et al.'s definition; their treatment of ability as a form of extrinsic modality is based on this nuance of ability (Depraetere & Reed 2006:278).

Moreover, Quirk et al. point out areas of overlap concerning the use of *will*, noting that volition and prediction are merged in uses of *will* such as

- (94) I'll see you tomorrow then (example taken from Quirk et al. 1985:219)

A threefold system is proposed by Huddleston and Pullum (2002), who discern between epistemic, deontic and dynamic modality, with the latter covering ability, volition, and non-deontic root modality (cf. Collins 2009:23). This account differs from Palmer's (2001) categorisation in that deontic and dynamic modality are not assigned to an overarching category (cf. Depraetere & Reed 2006:279). This may be interpreted in the sense that the link between deontic and dynamic is not substantially closer than the connection between the dynamic and epistemic categories (Depraetere & Reed 2006:279, cf. also Collins 2009:23).²⁶

²⁶ On a historical note, epistemic modality is considered to have evolved from root modality (cf. Narrog 2012:224, Krause 2007:7). Nuyts (2001:14) points out that there seems to be a – general cross-linguistic – "path" running from dynamic to epistemic via deontic meanings.

While traditional accounts as outlined above, e.g. Lyons (1977), are mainly concerned with “individualistic” approaches to the concept of modality (White 2012b, cf. also White 1998:14ff, Martin & White 2005:104f), modality is considered from a social perspective with emphasis being placed on the role of modality as an interpersonal resource in SFL (Halliday & Matthiessen 2014:686ff, see also Butler 2003:492ff for a summary of modality and polarity in Halliday’s SFL). Formal linguistic works tend to consider epistemic modality in terms of discrete modality; in functional linguistics, however, there appears to be agreement on the scalability of epistemic modal meanings (cf. Nuyts 2005:10f). Modality is tied to polarity, that is the “choice between yes and no”, with the modal system being defined as covering “the region of uncertainty that lies between ‘yes’ and ‘no’” (Halliday & Matthiessen 2014:176). In the systemic functional perspective, a major bipartite distinction is made between “modulation”, on the one hand, and “modalisation”, on the other. Modulation is outside the focus of the current research as it relates to proposals, which concern the exchange of goods and services (Halliday & Matthiessen 2014:177f). In the case of proposals, intermediary degrees are located between the negative pole “don’t do it” and the positive pole “do it”. There are two types of intermediate degrees depending on whether commands or offers are concerned. Commands cover the domains of obligation and permission (cf. also Butler 2003:492) with different intermediate levels as in “allowed to” (low), “supposed to” (median) or “required to” (high) (Halliday & Matthiessen 2014:177f, 694), e.g.:

- (95) Patients who receive drug-coated polymer stents are generally required to take Plavix or another anticoagulant for at least a year after an angioplasty, in addition to the medicine dispensed by the stents. [EPOP]

In offers, there are corresponding intermediary degrees of inclination, as in *willing to*, *anxious to* or *determined to*, e.g.:

- (96) Determined to find a treatment, his parents poured over research on myelin formation, eventually treating him with a regimen of olive and rapeseed oils designed by a U.K. chemist to supply their son with the fat he theoretically needed to manufacture the missing myelin. [EPOP]

Commands relate to the deontic concepts outlined previously, that is they involve some form of external authority; the inclination type appears to correspond to meanings discussed previously in this chapter in connection with the volitive category. Exponents of modulation are, for example, modal operators (“I’ll help them”) and passive constructions (Halliday & Matthiessen 2014:178) such as:

- (97) Poliomyelitis – a viral disease that wreaks havoc on motor neurons, often paralyzing sufferers for life – was supposed to be banished from the planet a long time ago. [EPOP]

The adjectival expression *anxious to* in the following example is a further typical expression of modulation (ibid.):

- (98) I believe that Paul was anxious to learn from one who had known Jesus intimately over a period of time; to have his hearsay information ‘filled in.’ [EREF]

Modulation also comprises potentiality (Halliday & Matthiessen 2014:179). This type of meaning was discussed earlier in terms of dynamic or non-deontic root possibility, as in:

- (99) “But we now know a lot more about HIV. And we’ve been able to use that technology not only to develop very effective treatment strategies but also to help reduce the onward transmission of HIV.” [EPOP]

Modalisation, by contrast, concerns the range of uncertainty between the two poles “it is” and “it isn’t” (Halliday & Matthiessen 2014:691ff). Probability attaches different degrees of likelihood to propositions, i.e. “certain”, “probable”, “possible”. As in the case of modulation, there are thus different “values” of modal meanings: high, median, low. This notion of probability largely corresponds to the concept of epistemic modality as outlined earlier in this section. However, within the category of modalisation, Halliday and Matthiessen further distinguish between probability, on the one hand, and usuality, on the other. Different degrees of usuality are “sometimes”, “usually” and “always”, as in:

- (100) Risks for cardiovascular disease in lactating versus non-lactating mothers seem to be firm regardless of BMI, which is usually a factor for both conditions. [EPOP]

As noted by Halliday and Matthiessen, usuality is generally not included in approaches to modality (2014:692). In the present research, usuality will not be examined in greater detail either as it is regarded a means of scaling meanings (see also chapter 6).

In SFL, modality is thus described along a number of dimensions, resulting in an intricate system network (Halliday & Matthiessen 2014:182). In addition to the classification according to the modalisation versus modulation distinction, the categorisation takes into account the “orientation” of modal features. Orientation concerns two criteria: the distinction between subjective versus objective modality, on the one hand, and implicit versus explicit, on the other. Subjective expressions present the judgment as a subjective assessment (Halliday & Matthiessen 2014:181). This is illustrated below:

- (101) Fourth, there was substantial heterogeneity between studies in our meta-analysis of recurrent stroke subtypes, attributable to results of 1 study,¹³ which may have underestimated the extent to which recurrent stroke subtypes breed true. [ESCI]

Features such as *probably*, by contrast, objectify the modal assessment as in:

- (102) This poor immunogenicity is probably part of the reason, Liang says, that HCV is the only RNA virus (though HIV has an RNA genome, it is considered a retrovirus) that is able to persist in the host and cause chronic infection. [EPOP]

As to the distinction between implicit and explicit expressions, the latter involve an explicit indication of the source of the modal assessment. In this perspective, the statement is – expressly – presented as being objective in cases such as the following:

- (103) It is likely that endothelial cell [sic] respond to hypertensive stress with augmentation of eNOS and iNOS expression as a compensatory mechanism aiming to increase production of nitric oxide (NO). [ESCI]

An example of explicit subjective modalisation involving a mental verb projection (cf. Halliday & Matthiessen 2014:448ff) is provided below:

- (104) We have people from all different racial and ethnic backgrounds. We have people from all different religious heritages. And I think America's military is stronger because we try to get everybody's talents and put everybody's talents to the best possible use – not weaker. [EREF]

To express explicitly that the probability is subjective, or objective, speakers phrase their propositions as projections such as *I think* or *it is probable*. Forms construed as prepositional phrases (e.g. subjective *in my opinion*, objective *in all probability*) occupy a position between clausal and non-clausal status and are considered as having intermediate status between the explicit and the implicit ends of this scale (Halliday & Matthiessen 2014:688).

It was mentioned earlier that “value”, i.e. “high”, “median”, “low”, is a further simultaneous criterion for classification proposed by Halliday and Matthiessen (2014:693ff, cf. also Butler 2003:494). The outer values, i.e. high and low, respond differently to negation than do the median values. This concerns the classification according to “polarity”. In the case of the median value the negative can be moved freely from the proposition to the modality without affecting the (median) modal value, as in

- (105) it's likely Mary doesn't know

as opposed to

- (106) it isn't likely Mary knows (both examples taken from Halliday & Matthiessen 2014:693)

In the case of the outer values this is not so:

- (107) It's certain Mary doesn't know

versus

- (108) It isn't certain Mary knows (both examples taken from Halliday & Matthiessen 2014:693)

Here, the transferral of the negative from the proposition to the modality results in a change in modal value from high to low (Halliday & Matthiessen 2014:694). Yet, as noted by Halliday and Matthiessen, even high modal values are less definite than polar expressions: The high-value modalised form “that’s certainly John” is less definite than the indicative, unmodalised form “that’s John” (Halliday & Matthiessen 2014:177). This argument has implications for the presentation of knowledge claims as either negotiable or as closed to debate and will be taken up in the present research.

One further point before concluding this outline of the systemic approach to modality: Halliday and Matthiessen (2014:178f) note that certain types of texts have a propensity for either modalisation or modulation. The obligation-type as exemplified by the use of modals as modulation features is a typical characteristic of regulatory texts:

- (109) Alternatively Requests for Tender documentation may be made in writing (letter or facsimile) to Keith Russell PNG Contracts Services, AusAID, GPO Box 887, Canberra ACT 2601, facsimile (02) 6206-4885. The name and office address of the requesting organisation and the name of the project for which documentation is required should be clearly given. Closing Date: Tender submissions must be addressed to the attention of Keith Russell PNGCS and placed in the AusAID Tender Box, Ground Floor, AusAID House, 62 Northbourne Avenue, Canberra ACT 2601, no later than 2.00 pm (Canberra time) on 10 July 2000. [EREF]

Modalisation, on the other hand, is preferred in explicatory and descriptive contexts which entail assessments of the certainty of knowledge (Halliday & Matthiessen 2014:178f).

- (110) Because shear stress is individually calculated for the duration of time-to-peak dilation after cuff release, utilization of FMD normalization may be advantageous in that the time-to-peak dilation is indirectly considered. Individuals with longer time-to-peak dilation accumulate greater shear stress area under the curve, making the FMD:shear stress ratio lower. Because longer time-to-peaks may be associated with reduced vascular function [14, 26], the indirect integration of this timecourse factor into the final outcome variable may improve the sensitivity of the FMD measurement. [ESCI]

This area of modality is, therefore, particularly relevant to the present analysis with its emphasis on text types aimed at the dissemination of medical news. Following this brief survey of the different domains considered to belong to or to be linked to the concept of modality, the next section focuses on the connection between epistemic modality and the related domain of evidentiality.

3.5 Epistemic modality and evidentiality

It was mentioned earlier that epistemic modality is one of the two main subcategories of propositional modality as defined by Palmer (2001:8), evidential modality being the other key

subcategory grouped under this label. Both deal with “attitude to the truth-value or the factual status” (Palmer 2001:8). Yet,

[t]he essential difference between these two types is that [...] with epistemic modality speakers express their judgements about the factual status of the proposition, whereas with evidential modality they indicate the evidence they have for its factual status. (Palmer 2001:8)

The area of evidentiality merits further discussion in the present research context since as noted by Aikhenvald:

The linguistic categorization of information source has a direct bearing on human cognition, communication, types of knowledge, and cultural conventions. (Aikhenvald 2004:xi)

The notions of evidentiality and epistemic modality are generally considered to be linked (cf. e.g. de Haan 1999:2, Diewald & Smirnova 2010:75); there is, however, a degree of controversy as to the exact nature of the connection and the boundaries between the concepts (cf. Traugott 1983:32, Nuyts 2005:11, Marín-Arrese 2009:240). As noted previously, epistemic modality is widely regarded as relating to the subjective judgement of the truth-value of a proposition, i.e. matters of individual knowledge or belief (Lyons 1977:793). It thus

relates to an interference by the speaker, and is not simply concerned with ‘objective’ verifiability [...]. (Palmer 1990:7)

Evidentiality differs from epistemic modality in that it is essentially defined as an implicit or explicit referencing of the “sources of the information” (Nuyts 2006:11) (cf. also e.g. Aikhenvald 2004:4, Palmer 2001:8). Evidential markers signal that the assessment of factivity is based on evidence and may also provide an indication of the perceptual source on which the judgement is based (Hundt 2003:348, cf. also Nuyts 2006:11). Additionally, evidentiality may also serve to characterise the “state of affairs” in view of “its compatibility with the general epistemological background of the ‘issuer’” (Nuyts 2006:11). According to de Haan, epistemic modality and evidential features both concern evidence, but

Evidentiality and epistemic modality differ in their semantics: Evidentials assert the nature of the evidence for the information in the sentence, while epistemic modals evaluate the speaker’s commitment for the statement. (de Haan 1999:83)

Hence, in de Haan’s view, evidentials do not entail an interpretation of evidence, while epistemic features do not make explicit the evidence on which this commitment is based.

As in the case of epistemic modality, a wealth of literature addresses the domain of evidentiality and, once again, the terminology used is diverse (cf. White 1998:14), but it appears that the evidential system set forth by Willett (1988) underlies most classifications (Diewald & Smirnova 2010:54). Willett discerns between direct and indirect sources of information: Firstly,

direct evidence signals that the speaker has witnessed an event immediately, the speaker and the event being simultaneously present in the same deictic field (Diewald & Smirnova 2010:4). Direct evidence, in this definition, includes a visual, an auditory and a sensory category (Willet 1988:96). In the case of indirect sources of information, the event was not witnessed immediately by the speaker. Indirect evidence, in turn, comprises the two subcategories “Reported” and “Inferring”. Willet’s (1988:57, 96) reported category covers second- and third-hand evidence as well as evidence from folklore. Second-hand evidence concerns cases in which, according to the speaker, information about a situation was obtained from a direct witness (Palmer 2001:40). Third-hand evidence relates to cases in which, according to the speaker, information was given to him by somebody who did not witness the situation himself either. Thirdly, evidence from folklore concerns information which is claimed by the speaker to be part of traditional lore (Palmer 2001:40). Inference is further subdivided into inference from results and inference from reasoning (Willet 1988:96).

Palmer’s (2001:35ff) evidential system is based on Willett’s (1988) categorisation and is further divided into the two main types “Reported” and “Sensory” (2001:9, 35, 56). The sensory type is associated with evidence obtained through sensory perception and comprises three subtypes: “Visual”, “non-Visual” and “Auditory” (Palmer 2001:9). The sensory category appears to be discussed mainly in terms of grammatical markers occurring in non-Indoeuropean languages. German *wollen* and *sollen*, however, convey evidential meanings according to Palmer and represent instances of his reported evidential category (Palmer 2001:9, 40, 42, cf. also Smirnova & Diewald 2013 for a detailed discussion of *sollen* as a “reportive” evidential marker). The following example illustrates this usage of *sollen*:

- (111) England ist die Geburtsstätte der tea-totaler, und das aus gutem Grund: Wer getrunken hat, was bei einem englischen Bankett hintereinander geboten wird, und nicht schwankt, muß mit dem Teufel im Bunde sein. Bei der Mittsommernacht in Schweden soll man sogar auf Festen des Königs Gäste mit schwerer Zunge erlebt haben. [GPOP]

Sollen marks the proposition thus framed as reported content in this type of context, indicating utterances made by unspecified external parties. By contrast, *wollen* as used in the following example, denotes a claim made by the subject of the sentence, i.e. *Er* (Palmer 2001:9, 42):

- (112) Er will eine Mosquito abgeschossen haben (example taken from Palmer 2001:9)

Hence, *sollen* and *wollen* both involve deictic reference to a third party in the above examples (Hundt 2003:344). Cases in which information about an event is conveyed by others are also referred to as “quotatives” (de Haan 2001:203, Hundt 2003:344). In the above examples, the speaker asserts that somebody else has issued an epistemic judgement, while the speaker

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himself refrains from issuing an epistemic assessment (Hundt 2003:346). This may be interpreted in terms of an indifferent attitude on the part of the speaker, yet it may also convey an implicit judgement implying the speaker's doubt as to the reliability of the proposition (Hundt 2003:346).²⁷

Epistemic modality and evidentiality are thus treated as separate, albeit related subcategories, which, as noted earlier, are captured under the same heading, i.e. propositional modality, in Palmer's classification (2001). The relation between epistemic modality and evidentiality is, however, treated differently by different authors. Dendale and Tasmowski note that essentially three types of approaches can be distinguished:

Disjunction (where they are conceptually distinguished from each other), inclusion (where one is regarded as falling within the semantic scope of the other), and overlap (where they partly intersect). (Dendale & Tasmowski 2001:341f)

Diewald and Smirnova (2010:76), for instance, regard evidentiality and modality as distinct, albeit overlapping notions. According to van der Auwera and Plungian (1998:86) these areas of overlap concern inferential evidentiality and epistemic necessity (cf. also Marín-Arrese 2009:21). Evidentiality is included under the category of epistemic modality by Hundt (2003:348); it is excluded from the area of modality for example by Bybee et al (1994, cf. Nuyts 2006:11), Halliday and Matthiessen (2014:677) and Aikhenvald (2004:7). Yet, as pointed out by Nuyts (2012:12) evidentiality generally concerns evidence, which in turn provides the basis for epistemic judgements. Hence, even those authors (e.g. de Haan 1999, Palmer 2001) who regard epistemic modality and evidentiality as distinct concepts concede that complex interrelations exist between the two notions (cf. Bednarek 2006:185).

In an extensive perspective, evidentiality refers to the "status of knowledge" (Gray & Biber 2012:16). In this vein, Chafe (1986) examines "attitudes towards knowledge" and proposes a wide-ranging definition of evidentiality which covers information source and reliability and may thus be characterised as a more comprehensive approach. He posits that evidentiality, in a narrow sense, concerns the identification of the source of knowledge (Chafe 1986, cf. Aikhenvald 2004:5), evidentiality in a broad sense, however, covers "any linguistic expression of attitudes toward knowledge" according to Chafe (1986:271). This comprehensive definition is not limited to evidence proper but comprises estimations of reliability devoid of source indication (cf. Simon-Vandenberg & Aijmer 2007:25). Chafe's

²⁷ It should be noted that the corpus does not contain instances of this type of use of *wollen*, which will, therefore, not be considered in further detail.

(1986:262) broad notion comprises a wide range of formulations including features along the lines of *I think* and *I suppose* as in the following example:

- (113) Incidentally (gentleman that he was) my brother had never said a word to me about our friend's involvement with Diana. I suppose he felt it to be beyond my comprehension when I was younger and none of my business when I was older. [EREF]

Urmson (1952:480ff) labels verbs such as *know*, *believe* and *suppose* “parenthetical verbs”. The term denotes verbs whose first-person forms can occur not only in sentence-initial position followed by *that*, but can also be inserted at the end or in the middle of an indicative sentence, as in:

- (114) “What about seeing naked revellers having an orgy? That might have flipped an unstable mind into sex and violence, though it doesn't explain the disappearance of Joanna. She'd have been assaulted and raped, I suppose, in which case one would have expected to find her body at the site as well,” Brenda suggested. [EREF]

Further verbs included under this label are *deduce*, *infer*, *presume* as well as verbs involving an emotive component such as *regret* and *rejoice* (Urmson 1952:485). Urmson (1952:595f) argues that the actual assertion is included in the clause accompanied by the parenthetical structure whereas parenthetical verbs do not serve the description of any activities or events but

rather function as signals guiding the hearer to a proper appreciation of the statement in its context, social, logical, or evidential. [...] They help the understanding and assessment of what is said rather than being a part of what is said. (Urmson 1952:495)

Features such as *I think*, *I guess* and *I believe* thus display signs of grammaticalisation in that they behave similarly to modal adverbs and are discussed in terms of “modal tags” by de Haan (2006:38). As will be seen in the following chapters, this type of feature is highly pertinent to the present research. While the group of items discussed by Urmson comprises a fairly heterogeneous cluster as regards the semantics of these verbs, the present analysis aims to take a closer look at the way the readership is aligned with regard to a proposition by means of such framing structures (e.g. Martin & White 2005:102ff), the focus being on non-emotive expressions.

Moreover, Chafe (1986:271) looks at how different lexical and grammatical features with modal meaning convey different degrees of uncertainty. It was mentioned in the introductory chapter that Chafe discerns between different “sources of knowledge”, namely evidence, language and hypothesis, and different “modes of knowing”, i.e. belief, induction, hearsay and deduction. In this perspective, induction is based on evidence, while language as a source of knowledge relates to hearsay as a mode of knowing. Hypothesis as a source of knowledge is

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associated with deduction as a mode of knowing (Chafe 1986:266ff, cf. Simon-Vandenberg & Aijmer 2007:25f). In the case of belief, expressed by features such as *I think* or *I guess*, the role of evidence is less salient (Simon-Vandenberg & Aijmer 2007:25). The different sources of knowledge are considered to be associated with varying degrees of reliability by Chafe (1986:262f). Evidence marked as obtained via hearsay is generally felt to be less reliable than what has been perceived visually and directly and generally implies a lower degree of probability. Yet, information obtained through hearsay may be presented as being highly reliable in certain cases in which the opinion of experts is reported (Nuyts 2005:12, Martin & White 2005:116). This type of usage is illustrated in the next example:

- (115) “These drugs inhibited XMRV at lower concentrations when two of them were used together, suggesting that highly potent ‘cocktail’ therapies might inhibit the virus from replicating and spreading.” Raymond Schinazi, a professor of pediatrics and chemistry at Emory University’s Center for AIDS Research, said in a prepared statement. “This combination of therapies might also have the added benefit of delaying or even preventing the virus from mutating into forms that are drug-resistant.” [EPOP]

In her analysis of modality in English medical writing, Vihla underscores the importance of epistemic expressions to “interpretative” argumentation. She notes that modal features represent an important resource for the justification of arguments and observes that “authoritative” sources are referenced to corroborate “quotative” argumentation (Vihla 1999:4, 104ff).

It was noted in the introduction that the areas of epistemic modality, evidentiality and stance are connected. Gray and Biber (2012:16) underscore the relevance of research into the domains of affect and evidentiality to the present understanding of stance. Affect is used in a wide sense by Ochs and Schieffelin

to include feelings, moods, dispositions, and attitudes associated with persons and/or situations. (Ochs & Schieffelin 1989:7)

These areas concern emotive meanings and will not be considered in further detail in this analysis. Yet, Biber and Finegan (1988, 1989) observe that the same grammatical resources are used in English to express evidential and affective meanings and, therefore, subsume these two domains under the label stance, which covers both emotive expressions and judgements of knowledge (cf. Gray & Biber 2012:17). Corpus-based research into the area of stance has been conducted on a multilingual basis by Biber (1988, 1995, cf. Gray & Biber 2012:17), whose work was outlined earlier in chapter 2.2. A more in-depth corpus-based study of stance is included in Biber and Finegan’s (1988, 1989) research, which discerns between affective and evidential

features and comprises indicators of certainty or doubt (cf. Gray & Biber 2012:17). Biber et al. describe the notion of stance as follows:

In addition to communicating propositional content, speakers and writers commonly express personal feelings, attitudes, value judgements, or assessments: that is they express a 'stance'. (Biber et al. 1999:966)

They distinguish between three types of stance: epistemic and attitudinal stance as well as an additional category, i.e. "style of speaking", which relates to "comments on the communication itself" (Biber et al. 1999:975, cf. also Gray & Biber 2012). Epistemic stance is understood to comprise both markers of certainty (and of precision and limitation) and expressions signalling source of knowledge such as *according to* or "X claimed that" (cf. Gray & Biber 2012:17).

The term evidentiality is thus used to cover different ranges by different authors, with some authors considering it in terms of a semantic category that may be realised by a range of expressions including not only grammatical, but also lexical or paraphrastic resources (Mushin 2001:17). This broad approach will be adopted in the present research and applied to a cross-linguistic analysis of register variation in English and German. Yet, while there seems to be some consensus in the literature on evidentiality that every language has means for specifying the origin of information (cf. e.g. Aikhenvald 2004:10, 132, Diewald & Smirnova 2010:41), it should nonetheless be noted that there are accounts which treat evidentiality in terms of a small grammatical notion occurring in a limited number of languages. Aikhenvald (2004), for instance, regards evidentiality and modality as distinct notions, as pointed out above. Aikhenvald defines evidentiality in a restricted sense, treating it as a grammatical class which does not occur in all languages. She argues that, although lexical expressions of source specification are probably available in most languages, not all languages have grammatical resources for coding evidentiality (Aikhenvald 2006:10). In her (2004:6) view, European languages tend to be "modality-oriented". English, for instance, has no grammatical markers according to de Haan (2006:57); lexical exponents of evidentiality, however, include verbs such as *seem*, as in:

- (116) Therefore, the applicability of the proposed method could be inadequate under some circumstances. So a simple and accurate method seems indispensable for an efficient and effective measurement of the parameter Tau in clinic. [EPOP]

It should be noted that the German verb *scheinen* + infinitive, which is a close translation of English *seem* – is treated as a grammaticalised evidential feature along with *versprechen* + *zu* +

infinitive and *drohen* + *zu* + infinitive²⁸ by Diewald and Smirnova (2010:41):

- (117) Im Gegensatz zur GC-Konzentration allein scheint das Verhältnis von GC-Konzentration zu aktueller Thrombozytenzahl (der so genannte GC-Index) eine bessere Diskriminierung zwischen Patienten mit und ohne ITP zu erlauben. [GSCI]

Further English lexical markers of evidentiality include the adverbs *reportedly* or *evidently* (de Haan 2001:203, Aikhenvald 2004:10), e.g.:

- (118) "Omega-3" simply refers to a double bond in the third position from the end of the carbon tail. Starting with alpha-linolenic acid (ALA, an essential nutrient common in many nuts and vegetable oils), our bodies can synthesize all the omega-3 fatty acids they need to build cell membranes and carry out a host of cellular functions.

But evidently we could stand to make a lot more of at least a couple of them. [EPOP]

As noted by Halliday and Matthiessen (2014:677), features such as *reportedly* signal that the proposition is presented as someone else's assessment, indicating its evidential status. The closest logically corresponding features are expressions along the lines of "people say/they say that" or "I hear that" (ibid.) Evidentiality, thus defined, is connected to verbal and mental clauses which typically involve a syntactic structure involving a hypotactic structure referred to as "projection" in systemic terms (Halliday & Matthiessen 2014:676). Reporting by "projection nexuses" (ibid.) is exemplified by the use of *say* and *add* in the following example:

- (119) Petricoin says the findings are not yet ready for the doctor's office, however. "Most of the samples they used came from women with later stages of cancer. Clinically, a technique that distinguishes late-stage cancer from controls is not that useful." He adds that a more immediate application may be in tests for women with an elevated risk of developing ovarian cancer or for cancer recurrence in women who have already undergone treatment. [EPOP]

It was mentioned previously that *guess* and *say* are discussed in terms "parenthetical verbs" by Urmson (1952:480ff, cf. Aikhenvald 2004:6). While Chafe (1986) includes this type of expression in his broad definition of evidentials, Aikhenvald (2004:10) categorises parenthetical expressions such as "I guess" or "they say" as "evidentiality strategies". Though a resemblance to evidentials is acknowledged by Aikhenvald (2004:132), she distinguishes between evidentiality strategies and evidentials in a strict sense, i.e. grammaticalised evidential

²⁸ *Drohen* and *versprechen* will not be taken into consideration in the present analysis since their semantics involve an emotive element which is absent in the semantics of *scheinen*: In the case of *drohen* this may be described in terms of an evidential assessment accompanied by a negative attitudinal assessment. Conversely, in the case of *versprechen* this accompanying emotive assessment is positive. Evidential uses of *drohen* and *versprechen* were not found in the corpus analysed in the current study.

features. From a chronological perspective, evidentiality strategies frequently evolve into evidentials (Aikhenvald 2004:11, 205). Evidentiality strategies thus defined include reported speech, which, as pointed out above, signals that information was obtained from somebody else (Aikhenvald 2004:132ff). Speakers may use verbatim quotes to report someone else's speech (see also Halliday & Matthiessen 2014:512ff), e.g.:

- (120) After the failure of the Nigerian campaign the WHO overhauled its vaccination strategy. Previous campaigns had been run at a national level with a top-down structure, but WHO officials started taking a more piecemeal approach, getting to know prominent opinion-makers within smaller communities before beginning vaccination drives. "We overcame the problem by working with the local populations – traditional leaders and religious leaders," says WHO spokesperson Sona Bari. "There is a leadership structure that predates the modern nation-state, which the people trust much more." [EPOP]

The above example of reported speech involves a paratactic relationship between the projecting and the projected clause, which is signalled by quotation marks in written language (Halliday & Matthiessen 2014:512). However, quotes may, as remarked earlier, be reformulated using indirect speech which involves the adaptation of all deictic features to the reporter's viewpoint (Aikhenvald 2004:132). Key characteristics of indirect speech concern shifts in pronominal reference and tense (Aikhenvald 2004:132, see also Halliday & Matthiessen 2014:515ff on indirect speech). In the following example these deictic implications concern the use of personal pronouns (*he*) and verb tenses (*was*, (*should*²⁹), *did*, *had*):

- (121) Mr Hughes in evidence said that he was desirous of moving current stock and considered whether he should discuss the availability of a 2001 model but did not feel obliged to do so as he had none in stock and it would take some time to procure one, and because the two models are 'virtually identical'. [EREF]

Yet, not all languages have an indirect speech option, direct speech quotes being the sole means of phrasing reported speech in some languages (Aikhenvald 2004:132). In the following German example, the subjunctive form *sei* signals that an utterance is reported material stemming from an external source (Palmer 2001:42).

- (122) Neugeborene offenbaren in ihrer ersten Windel die Rauchgewohnheiten ihrer Mütter während der Schwangerschaft. Das haben US-Wissenschaftler herausgefunden, als sie die Ausscheidungen von mehr als 300 Babys untersuchten. Sie fanden Abbauprodukte von Tabak anhand derer sie die Dauer und Intensität des mütterlichen Rauchens beziehungsweise Passivrauchens feststellen konnten. Besonders beim Nachwuchs aktiv rauchender Müttern [sic] waren die Werte deutlich erhöht und die

²⁹ *Should* is maintained in indirect speech (cf. Quirk et al. 1985:1031).

Neugeborenen wogen bis zu 200 Gramm weniger. Mit der Untersuchung des Babystuhls sei es in Zukunft auch möglich, andere Umweltgifte zu erkennen, denen Ungeborene ausgesetzt waren. [GPOP]

The above instance of the subjunctive (*sei*) occurs in a sentence which lacks a reporting verb and is illustrative of German “free indirect speech” (Aikhenvald 2004:107). The last sentence is thus not asserted by the journalist, but marked by the journalist as stemming from the scientists (*US-Wissenschaftler*) by the use of the subjunctive I form of *sein* (cf. Palmer 2001:42, Aikhenvald 2004:107). The German subjunctive is also considered as a marker of indirect evidentiality by de Haan (2001:204).

According to Diewald (1999:245), the German moods (indicative, subjunctive I and subjunctive II) and epistemic modals both serve the same function in that they assign a “speaker-based factuality value to a state of affairs” (Mortelmans 2002:397). The indicative is considered unmarked by Diewald as it functions to embed the state of affairs in the speaker’s epistemic realm (cf. Mortelmans 2002:397). By contrast, the subjunctive forms and the epistemic modals are marked; used as an indicator of indirect speech, subjunctive I denotes a “shift” in relation to the “origo” while subjunctive II usually conveys “nonfactuality” (cf. Mortelmans 2002:397).

According to Wunderlich (1972:167), the use of the subjunctive creates a distance from the source of the reported material (cf. also ten Cate 1996:202). Using this linguistic resource, the author does not warrant for the correctness of the reported content (Aikhenvald 2004:108). Starke argues that:

In journalistic language, Konjunktiv I is mainly used to distinguish reported speech from utterances by the reporter, [...]. When the reported speech contains viewpoints which are considered correct and adequate by society as a whole, the indicative is preferred. In this way, the journalist expresses approval of the content of the speech he reports. (1985:165, translated by ten Cate 1996:202)

Yet, according to ten Cate (1996:202) maximum detachment is achieved by direct quoting as in:

- (123) Allerdings belastet eine Hyperthermiebehandlung den Kreislauf, so dass sie sich kaum für Patienten mit Herz-Kreislauf-Problemen eignet. „Auch Patienten mit Metallimplantaten im Körper wie künstlichem Hüftkopf oder Herzschrittmacher müssen ausgeschlossen werden“, erklärt Wessalowski. „Die Metallimplantate beeinflussen die Ausbreitung der elektromagnetischen Wellen in unvorhersehbarer Weise.“ [GPOP]

Ten Cate (1996:202f) argues that the combination of direct and indirect speech, which is marked by the use of both indicative and subjunctive, creates variation in terms of directness and hence remoteness as illustrated below by the subjunctive I (*machte*) and subjunctive II forms (*wäre*) as well as the use of quotation marks to indicate direct speech:

- (124) Die Wissenschaftler merken an, dass diese Veränderung der Fettmasse größer war, als zu erwarten gewesen wäre. Das machte es schwer abzunehmen und ein neues Gewicht zu halten. „Sogar kurzzeitige

Veränderungen des Essverhaltens können ausgedehnte Effekte auf die Gesundheit haben“, fasst Ernersson zusammen. [GPOP]

However, it seems that while the author makes it clear that external informational content stemming from outside sources is brought into play in a neutral fashion, no indication as to his own stance towards the position presented is provided. Their use thus seems to result in less detachment than uses of the German modals *sollen* and *wollen*, which, as mentioned earlier, serve to distance the author from the content presented (Šipova 2010:216). This effect is illustrated below:

- (125) Spekulationen gibt es zur Genüge – so soll in den Menschen dort unten zum Beispiel ein Rest einer früheren Homo-erectus-Population genetisch aufgegangen sein und den charakteristischen Typ mit geprägt haben. [GPOP]

Reported speech may be used to avoid responsibility by referencing further sources instead of serving to increase the strength of an utterance (Hill & Irvine 1993:7). Viewed from this perspective, reported speech represents a means of presenting an utterance as previously “co-constructed” (Hill & Irvine 1993:7). Goffman (1974, 1979, also Levinson 1988) discerns between different realisations of speakers (Hill & Irvine 1993:11): “animator”, “addressing self”, “principal” and “figure” which may be conflated or divided (Hill & Irvine 1993:11). The animator physically communicates an utterance, but is not necessarily responsible for phrasing or “intent”. The author formulates the utterance, but is not necessarily responsible for its content. The “figure” is a “protagonist in drama”. The “principal” represents “a legally committed entity, ‘responsible’ in some sense for the position attested to by the utterance’s content” (Hill & Irvine 1993:11). Reported speech appears to play an important role in the construal of intricate participant configurations (ibid.). The significance of reporting structures to this study is apparent given its focus on the sources of knowledge referred to in mediating knowledge claims in scientific journalism. We may surmise that the shifts taking place in gearing medical news to a broader, non-technical audience impact on the realisation of the speaker. Moreover, cross-linguistic divergences in the realisation of reported speech will be examined in view of their implications for the construction of the participants. This matter will therefore be a recurring topic throughout the following chapters of this book.

3.6 Summary

The above outline of the different accounts of modality does not aim at completeness. The attention throughout has been to provide an overview of this vast notion and shed light on the relevance of modality to the present research. From this overview it appears that it remains unclear to date not only which linguistic areas are to be included under this label,

but also what constitutes the different subcategories, how they are to be labelled and how they are interrelated. As mentioned previously, this may be interpreted as reflecting the lack of clarity as to the scope of the term and the fuzzy boundaries between different types of phenomena grouped under this label (cf. Zifonun 2000:324, van Linden 2012:12). However, cross-linguistic accounts of modality frequently fail to distinguish sufficiently between form and function (Bowern 1998). This shortcoming is particularly relevant to cross-linguistic comparisons: A functional – instead of a formal – definition of modality is required to account for the fact that modal devices such as the subjunctive form do not readily lend themselves to a cross-linguistic comparison as they convey different meanings (Bowern 1998).

Moreover, the – controversial – cut-off point between epistemic and evidential types will be neglected in favour of a functional distinction based on the potential impact of their use on the audience. The approach set forward by Appraisal (Martin & White 2005) will be examined more closely in order to develop a framework geared to a systematic analysis of this cluster of features. According to many traditional accounts of modality, including Palmer (1986) and Lyons (1977), the only function of epistemic modality and similar modal devices is to express the “speaker/writer’s state of mind or knowledge” and indicate tentativeness on the part of the speaker regarding the truth value of the proposition (White 2003:261). While, as mentioned earlier, such accounts are mainly concerned with individualistic approaches to the concept of modality, this domain is considered from a social perspective in Appraisal, with emphasis being placed on the role of modality as an interpersonal resource (White 1998:14ff). Appraisal draws on SFL (Halliday & Matthiessen 2004) and the systemic notion of modality which was outlined in the previous section. From an interpersonal viewpoint, the author actively signals the existence of alternative opinions and positions his proposition in a diverse communicative context by using such features (White 2003:267). White thus proposes a different perspective of epistemic modals and related devices:

We no longer see truth-value as the primary motivation. Rather we see modality as a semantics by which the textual voice maps out its relationships with the various value positions brought into communicative play by the text. (White 2003:280f)

Appraisal considers the meanings discussed in connection with epistemic modality and evidentiality under the label Engagement (cf. also Gray & Biber 2012:18). This category is

concerned with the ways in which resources such as projection, modality, polarity, concession and various comment adverbials position the speaker/writer with respect to the value position being advanced and with respect to potential responses to that value position – by quoting or reporting, acknowledging a possibility, denying, countering, affirming and so on. (Martin & White 2005:36)

In the following, the functional approach set forth by Appraisal will be singled out and examined in more detail in order to develop a framework suitable for an application to a bilingual corpus.

4. APPRAISAL

4.1 Introduction

As spelt out in the previous chapters, a number of linguistic accounts offer helpful points of departure for exploring the way researchers report findings and comparing this with the way journalists ‘relay’ medical research outcome to non-expert readers. Following the previous outline of work dealing with certain relevant aspects of language highlighted in the present study, we now turn our attention to Appraisal.³⁰ Its framework will be set out in the following and assessed in view of its suitability for addressing the questions posed here. In a nutshell, these concern the way sources are referenced in the presentation of medical knowledge claims and assessments of probability are expressed. Appraisal deals with the interpersonal aspect of language which, as will be explained in the following, comprises the linguistic areas that are of concern to the present study and places them in a larger theoretical context. It looks at the linguistic formulations adopted in construing the writer’s³¹ presence in the text and in taking up a position in relation to the content matter presented. Appraisal is relevant to the present research in that it deals with the way writers position themselves with regard to their readership in expressing opinions and how these attitudes are negotiated so as to align the intended readership (Martin & White 2005:1, cf. also e.g. White 1998, White 2012). It is thus concerned with the construal of both the author’s persona in the text and of the actual or potential readership.

Appraisal explores the linguistic means used to construe communities of shared emotions, preferences and norms. Drawing on concepts developed within SFL (cf. e.g. Halliday & Matthiessen 2004), particular emphasis is placed on the systemic concept of interpersonal meaning. Appraisal describes the negotiation of social relationships by evaluations of oneself, other human beings or inanimate entities and phenomena (Martin & Rose 2007:26).³² It represents one of the three main discourse semantic resources for the construction of

³⁰ The following account of Appraisal is mainly informed by Martin and White (2005), White (2012), Martin and Rose (2007); the present overview mostly uses the categories and terminology as set out in Martin and White (2005) and White (2012). ‘Technical’ Appraisal terms are demarcated by capital letters.

³¹ While Appraisal also accounts for spoken discourse, this aspect will be left aside in view of the present focus on written language.

³² A more detailed description of the relation of Appraisal and SFL is given in Martin and Rose (2007:3ff).

interpersonal meaning, the other two being negotiation and involvement (Martin & White 2005:34f). As mentioned before, aspects relating to the latter area will crop up in the present research, which aims to adopt a slightly modified perspective by taking into consideration the impact of involvement and detachment in the creation of interpersonal meaning in the investigation of the features analysed in this study. The role of impersonalisation will be highlighted in connection with the relevant categories where applicable.

Appraisal provides an extensive account of linguistic resources for the construction of the interpersonal mode of meaning. In line with the focus of this thesis, aspects relating to areas widely dealt with in terms of epistemic modality and evidentiality as well as the attribution of propositions to different sources as discussed in the previous chapters are highlighted in the following outline. In the present research, focus will be placed on implications in terms of author positioning with regard to readers and viewpoints held by other parties. Appraisal explores the potential of the linguistic resources for acknowledging or suppressing actual or potential alternative opinions (Martin & White 2005:7ff). It draws on insights from other work concerned with evaluation (Martin & White 2005:38ff). A notable point of departure is provided by the evaluation-centred approach formulated by Hunston and Thompson (2000) mentioned in the introductory chapter. In their view, evaluation serves both the expression of opinion and the construction and maintenance of writer (speaker) and reader (hearer) relations. Moreover, a distinction is made between opinions concerning entities, which, in general terms, are realised lexically as assessments of value, and opinions about propositions, namely epistemic comments, which are, by and large, realised grammatically (cf. Martin & White 2005:38f, cf. chapter 1). According to Hunston and Thompson (2000:25), evaluation takes place along four parameters: “good-bad”; “certainty”; “expectedness” and “importance”. The dichotomy between comments on likelihood and evaluations of entities in terms of “good” or “bad”, which was also mentioned previously in connection with Skelton’s (1997) criticism of the notion of hedging (chapter 2.4.1), is taken up within the Appraisal system. Hedging-oriented literature taken into account by Appraisal notably includes Hyland’s (e.g. 1998a) work, which, as described in chapter 2.4, adopts a broad approach to the notion of hedging, comprising the area of evidentiality and commitment (Martin & White 2005:39). As opposed to some of the hedging-related works, Appraisal discerns between the way standpoints are adopted towards propositions and attitudinal meanings are attributed to different sources, on the one hand, and the way they are intensified or downscaled, on the other. An array of linguistic resources is thus subsumed under the label Appraisal, which distinguishes between the central domains Attitude, Engagement and Graduation operating in evaluative language use (Martin & White 2005:34ff, Martin & Rose 2007:25ff).

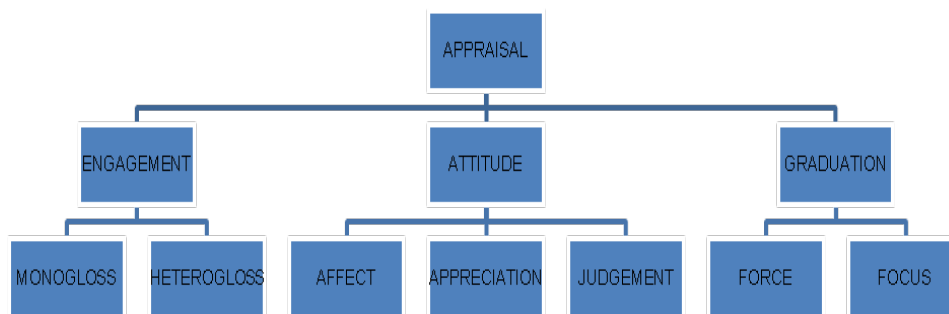


Fig. 3: Appraisal framework based on Martin and White (2005:38)

These domains and the respective subsets as illustrated in fig. 3 will be described in the following, particular emphasis being placed on Engagement. Merely a thumbnail sketch will be given of Attitude and of Graduation, those areas being less directly relevant to the present analysis. The outline of the framework is concluded with a critical summary of Appraisal in the final section of this chapter.

4.2 Appraisal Framework

4.2.1 ATTITUDE

Attitude relates to meanings which indicate the speaker's positive or negative assessment of people, things or goings-on (Martin & White 2005:42ff, Martin & Rose 2007:26ff, White 2012). Broadly speaking, it concerns value judgements or evaluation in terms of "good" or "bad" as described by Hunston and Thompson (2000). It is, therefore, not as central to this study as other areas of the Appraisal network. Yet, Attitude constitutes an integral aspect of the Appraisal framework, interacting and overlapping with the other two categories, which cannot be assessed in isolation either. Therefore, the subcategories of Attitude, namely Affect, Judgment and Appreciation, will be described in brief terms in the following.

Affect deals with resources for the expression of positive or negative emotive reactions (White 1998:101ff, Martin & White 2005:35, 42ff), as illustrated by the emotive assessment conveyed by *rosy* in the example shown below:

- (126) The outlook is not quite so rosy for all the early candidates for nutraceutical stardom, however. [EPOP]

Judgement is related to the semantic area of ethic and morality concerning resources for the construction of attitudes towards other people and the assessment of their behaviour or character on the basis of social norms (e.g. White 1998:103ff, Martin & White 2005:52ff, Martin & Rose 2007:32ff). It covers the area of Social Esteem as exemplified by the item *prominent* which signals the elevated status of the source of the statement in the following corpus extract:

- (127) “We believe that modern-day Hitlers have deliberately adulterated the oral polio vaccines with antifertility drugs and...viruses which are known to cause HIV and AIDS,” prominent physician Datti Ahmed told journalists at the time. [EPOP]

While Judgment relates to the assessment of humans and their personality or demeanour, Appreciation, the third subcategory of Attitude, covers our evaluation of things – both concrete and abstract (Martin & White 2005:56, Martin & Rose 2007:37ff):

- (128) The God-given heart is a dynamically balanced, finely tuned organ, with the capacity to generate force, raise and lower pulse. [EPOP]

Here, the attributes *dynamically balanced* and *finely tuned* express the author’s ‘admiration’ of the qualities of the human heart. Judgement extends to the evaluation of things made by people as well as peoples’ performance (Martin & White 2005:52ff). It appears that defining the borders between Judgement and Appreciation is not always a straightforward task. The fuzzy nature of this boundary is exemplified by the evaluation of *previous studies* in the following example:

- (129) Although previous studies have suggested a lower early recurrence rate among patients with lacunar ischemic stroke,⁵ and a tendency for recurrent stroke subtypes to breed true, their reliability was limited by small numbers of events, variable and sometimes biased definitions of recurrent stroke, [...]. [ESCI]

While *studies* refers to an action or process, it is evident that these studies were conducted by humans. The assessment of their performance, conveyed by *their reliability was limited by* etc., refers to the product of the activities carried out by the researchers in charge of the studies concerned, albeit indirectly. Hence, in this example, the evaluation of a thing implicitly concerns the researchers’ competence (cf. also Martin & White 2005:59ff, White 1998:107). The connection between inanimate nouns and the responsible actors may be described in terms of a metonymical relation in certain contexts.³³ While the Attitude subset does not constitute a focal area in the present analysis, the transition from Judgement to Appreciation is still relevant since it enables scientific authors to avoid potential direct criticism of other researchers when commenting on external work. It allows them to talk about things instead of people, enabling them to avoid addressing other researchers directly. Thus we can surmise that the choice between these two Attitude options has interpersonal implications reflected in the conventions typically associated with scientific discourse.

³³ See e.g. Ruiz de Mendoza Ibáñez and Díez Velasco (2003) and Stålhammar (2006) on the relation between metonymy and grammatical metaphor. The latter concept was introduced in chapter 2.2 and will be taken up again in connection with the Engagement category.

Attitude comprises very intricate and open-ended sets of linguistic phenomena that do not lend themselves readily to the methods and procedures adopted in this thesis. It also seems less immediately relevant to the investigation of the resources commonly associated with an uninvolved, rational style of writing (cf. e.g. Fluck 1996, Halliday 1990, Halliday & Martin 1993) due to the emotive aspect inherent in this category. Following this brief account of Attitude and its role in enabling the construction of feelings in texts, the next section gives an overview of the Engagement system.

4.2.2 ENGAGEMENT

Engagement explores the way attitudes are sourced and alternative standpoints are introduced into a text and interacted with. It is thus concerned with the linguistic elements serving to negotiate interpersonal positioning (cf. e.g. White 1998:78ff, White 2003:259ff, White 2012a, b, Martin & Rose 2007:48ff, Martin & White 2005:92ff, Körner 2000:129ff, Hood 2004:206ff). The category provides an umbrella term for the resources by means of which intersubjective stance is realised (White 2003:260). As noted previously, a wide range of linguistic devices discussed elsewhere in connection with modality, evidentiality, attribution, hearsay, concession, polarity, hedging, boosting and metadiscursivity are subsumed under this heading (Martin & White 2005:92ff, White 2003:260, White 2012a, b). Among other features, the range of linguistic phenomena considered under this heading includes items by means of which external, e.g. *researchers* (130), and internal, e.g. *we* (131), sources of knowledge are referenced explicitly as illustrated below:

- (130) After testing 28 approved drugs on XMRV cultures, researchers found that four of the medications (raltegravir, L-000870812, Zidovudine (AZT) and tenofovir disoproxil fumarate) were able to stop XMRV from replicating. [EPOP]
- (131) Using immunohistochemistry (IHC) and quantitative Taqman real-time PCR (QT-PCR) in synovial tissue from 55 patients with RA, we demonstrated that FDC ϕ structures invariably expressed AID with a distribution resembling secondary lymphoid organs. [ESCI]

As noted in the introduction, these items are considered in view of their potential to modify or negotiate the arguability of a proposition or proposal on the basis of their context-dependent meanings and rhetorical effect. This perspective is relevant to the present research which aims to look at the way researchers respond to knowledge claims presented previously, how they anticipate reactions to their own claims by positioning themselves vis-à-vis their own findings and towards those presented by others. Engagement builds on the notion put forward by Stubbs (1996:196f) according to which all utterances simultaneously convey both propositional information and the author's point of view or attitude

(1996:197).³⁴ Appraisal takes up Stubbs' proposal to expand the category of modality to take into account all formulations enabling the speaker or writer to modulate the level of attachment accorded to the proposition or detachment from it (White 2003:260). This approach to modality encompasses a range of modal meanings expressed by features located at various linguistic levels (Stubbs 1996:197). Stubbs' concept of modality builds on the diversity of linguistic options available for expressing the same meaning, this view being in line with the systemic notion of language as a system of options (e.g. Halliday & Matthiessen 2014). Emphasis is on the selection of one way of phrasing a certain meaning which is chosen over possible alternative formulations conveying the same propositional content, or, in Körner's terms, on "what did a speaker say in relation to what could have been said" (Körner 2000:131). Thus the linguistic choices made in phrasing propositional content simultaneously encode a standpoint (Stubbs 1996:197).

Engagement, drawing on the works of Lemke (1992), Fairclough (1992), Thibault (1997) and Fuller (1998), is informed by Bakhtin's (1981, 1986) and Vološinov's (1995) concepts of dialogism and glossia, which refer to "another's speech in another's language, serving to express authorial intentions but in a refracted way" (Bakhtin 1981:324). This perspective focuses on the implications of individual utterances with regard to what White (2012) terms "dialogic positioning". An instance of verbal action is not considered in terms of an isolated phenomenon, but rather as an instance of social interaction. It is also informed by Vološinov's (1995) perspective on verbal interaction, according to which all communication – whether in written or in spoken form – is viewed as dialogic in nature since it does not function in isolation and always responds to what has been said or written before while anticipating the recipient's response:³⁵

The actual reality of language-speech is not the abstract system of linguistic forms, not the isolated monologic utterance, and not the psychological act of its implementation, but the social event of verbal interaction implemented in an utterance or utterances.

Thus, verbal interaction is the basic reality of language.

Dialogue [...] can also be understood in a broader sense, meaning not only direct, face-to-face, vocalised verbal communication between persons, but also verbal communication of any type whatsoever. A book, i.e., a verbal performance in print, is also an element of verbal communication. It is calculated for active perception, involving attentive reading and inner responsiveness, and for organised printed reaction in

³⁴ It should be noted that this distinction is not always, as readily conceded by Stubbs (1996:197), a clear-cut one.

³⁵ Cf. White (1998:17 ff) for a more detailed account of the influence of Bakhtin's (1981) work on heteroglossia and on the intertextual perspective adopted in Appraisal.

the various forms devised by the particular sphere of verbal communication in question [...] [A] verbal performance of this kind also inevitably orients itself with respect to previous performances in the same sphere, both those by the same author and those by other authors. It inevitably takes its point of departure from some particular state of affair involving a scientific problem or a literary style. Thus the printed verbal performance engages, as it were, in ideological colloquy of a large scale: it responds to something, affirms something, anticipates possible responses and objections, seeks support, and so on. (Vološinov 1986: 139)

This stands in contrast to more traditional accounts of modality (e.g. Lyons 1977, Coates 1983, Palmer 1986, cf. chapter 3) and those hedging-oriented approaches which primarily regard modal features and comparable items as indicators of the author's uncertainty and his reluctance to commit himself to the "truth value of the proposition" (White 1998:261, cf. chapter 2.4). Whereas many of those works focus on individualistic aspects in terms of language as a means of expressing oneself, Appraisal highlights social context (White 1998:17ff, Martin & White 2005:105, White 2012a, b, Hood 2004). In the heteroglossic perspective adopted in Appraisal, these resources are explored in view of their role in conveying willingness to negotiate propositional content (White 1998:19). They are classified according to their role in including alternative meanings in the present discourse and in modifying the way in which utterances engage with other – past, present or future – communicative exchanges. As a consequence, the semantics of these linguistic resources are remodelled and their function in terms of construing speaker commitment is revised (White 1998:75ff).

The two-fold classification of glossia as proposed by Bakhtin (1981) distinguishes between monoglossic and heteroglossic options. The former construe an "undialogised" communicative setting where the existence of potentially diverging views is ignored, e.g.:

(132) An acute increase in blood flow exerts an amplified tangential force or shear stress on the endothelial surface causing the vessel to dilate. [ESCI]

In contrast to the above unmodalised formulation, a communicative context construed as heteroglossic evokes a potentially diverse setting (Martin & White 2005:99). By modalising the example shown above, for instance by framing it as follows, the view presented is marked as a subjective opinion, and hence it is left open to the reader to agree or disagree:³⁶

(133) # We believe that an acute increase in blood flow exerts [...].

³⁶ Modified examples from the corpus are marked with the symbol #.

The precise wording to which this heteroglossic nature is owed will be outlined in the following. The dichotomy established between heteroglossic and monoglossic options is also insightful in that it refutes the common perception of positive declaratives which associates these with neutrality and objectivity (White 1998:84ff, Martin & White 2005:98ff). More formal semantic accounts concerned with truth value tend to view simple positive declaratives as a kind of default-mode, or in White's terms, as a kind of "lexico-grammatical base-line" (1998:84). The rationale adopted by Appraisal, however, highlights the interpersonal impact of their use as declarative forms, which, in contrast to heteroglossic options, do not recognise possible diverse viewpoints and presume a homogeneous readership sharing common positions.

The concepts of heteroglossia and dialogism are thus central to the Engagement system and the classification of linguistic formulations conveying intersubjective stance (Martin & White 2005:92ff, Martin & Rose 2007:48ff, White 2003:261, White 2012). As noted earlier, the Engagement system distinguishes between heteroglossic and monoglossic options (see fig. 3). The following diagram provides a visual summary of the heteroglossic Engagement system:

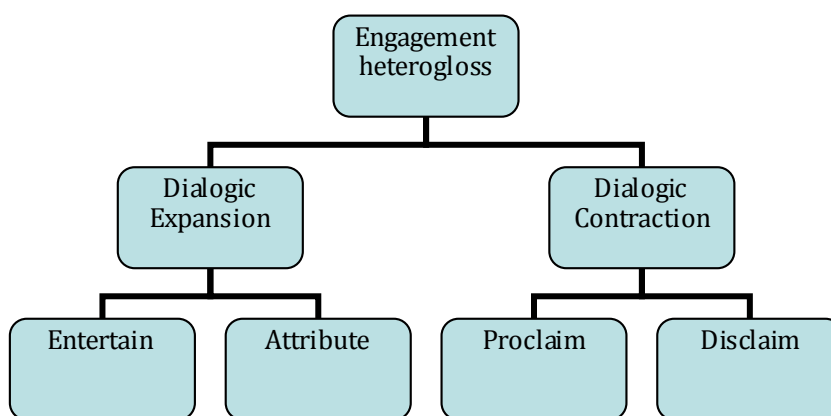


Fig. 4: The heteroglossic Engagement system based on Martin and White (2005:134)

As can be seen in the diagram shown above, heteroglossic Engagement options are divided into two main subcategories: linguistic resources by means of which the existence of a potentially diverging standpoint is recognised but which nonetheless restrict the space allowed for these alternative points of view ("Dialogic Contraction"), on the one hand, and formulations which acknowledge the potential existence of alternative voices and also create space for alternative viewpoints ("Dialogic Expansion"), on the other (White 2012a, b, Martin & White 2005:102ff, White 2003:268, Hood 2004:13). Giving room to potential dialogic alternatives, Expansive options present claims as contentious or uncertain. This notion is important to the present research in that it concerns the selection of resources which present

medical knowledge claims either as ‘authoritative’ by challenging or fending off diverging opinions or as less ‘imposing’ statements. This point takes us back to the selection of certain linguistic options and their role in expressing stance (Stubbs 1996:197). Moreover, by starting from the size of the dialogistic space created by certain formulations, Appraisal offers an interesting take on what has been described, for example, by House (1997) in terms of “orientation towards other” and “addressee” in English versus “orientation towards self” and “orientation towards content” in German (cf. also e.g. Becker 2011). The Expansive and the Contractive sets will be described in the following, beginning with Dialogic Expansion.

4.2.2.1 DIALOGIC EXPANSION

This area covers a set of options by means of which the author’s voice is represented as allowing room for potential alternative positions. It is again divided into the two main subcategories Entertain and Attribution (Martin & White 2005:102ff, White 2003:273). The two subcategories of Dialogic Expansion will be attended to in the following sections, beginning with Entertain.

4.2.2.1.1 ENTERTAIN

The features discussed under this heading enable the author to signal that the viewpoint presented is merely one possible position, thereby leaving room for dialogic alternatives, which are thus “entertained” (Martin & White 2005:104). Entertain covers a set of linguistic categories traditionally considered in terms of epistemic (e.g. Palmer 1986, Coates 1983) and evidential (e.g. Chafe & Nichols 1986) values (cf. Martin & White 2005:105f), which are termed Likelihood and Evidence in White 2012a.³⁷ These two sets will be outlined in the following beginning with Likelihood:

Likelihood

The Likelihood-related subset spans a range of grammatical categories which comprise subjective implicit assessments of probability conveyed by epistemic uses of auxiliaries (e.g. *may*), objective implicit realisations such as modal adjuncts (e.g. *perhaps*) expressing judgements of probability as well as circumstantial adjuncts in the form of prepositional phrases (e.g. *to our knowledge*) (Martin & White 2005:104ff, cf. also Halliday & Matthiessen 2004:613ff, see chapter 3.4). Their interplay in marking a knowledge claim as embedded in the author’s subjectivity and thereby recognizing potentially diverging dialogistic positions is illustrated in the following corpus example:

³⁷ Evidence and Likelihood are grouped under Probabilise in White (2012a), with Probabilise also including Hearsay.

- (134) To our knowledge, we are the first group to establish that perhaps initial but not routine NT-proBNP measurements may be useful in outpatients whose initial measurements were 4999 pg/mL. [ESCI]

Dialogistic alternatives may also be entertained by means of explicit objective modal attribute projections which reduce the association with the author, as in:

- (135) It is likely that endothelial cell [sic] respond to hypertensive stress [...]. [ESCI]

Further realisations include a range of first-person mental verb projections expressing explicit subjective assessments of probability (cf. Halliday & Matthiessen 2004:626ff on interpersonal metaphor):

- (136) “I think we have to be cautious with the way we use traditional Chinese medicines and other herbal remedies.” [EPOP]

As noted in chapter 2.2, reference to self expressed by first-person structures has been described as a manifestation of an author’s involvement with his readership (cf. Chafe 1982:46). Appraisal underscores the potential of such features to position an opinion within a heteroglossic setting (Martin & White 2005:105). By including such forms of first-person attribution along with formulations traditionally considered as modal markers, Appraisal follows Halliday and Matthiessen’s (2004:614) and Palmer’s (1986) account (cf. Martin & White 2005:105). Such items are considered to communicate modal assessments similarly to modal adjuncts such as *probably* or *perhaps*, rather than conveying informational content (Martin & White 2005:105,159, cf. also chapter 3.3.3).³⁸ As was mentioned in chapter 2.4.2, their main functionality is not seen as being concerned with epistemic considerations in Myers’ (1989:15) politeness-oriented view either, instead, the repercussions of their use on the writer-reader-relation are highlighted. It was noted that Myers (1989:15f) acknowledges that passive and impersonal formulations play an important role in scientific writing. However, he also emphasises the role of first-person subjects as a means of attributing a claim to oneself and thereby suggesting that it is personal weakens it since, in science, knowledge is presumed to be “universal” (Myers 1989:14).

Realisations involving first-person attribution are also taken into account in the present analysis. Starting from hypotheses on and research into different cross-linguistic register conventions (e.g. House 2000), it may be assumed that, although the German language system offers this option, it is not chosen as often as other less explicitly subjective means of marking a position as entertaining dialogistic alternatives.

³⁸ Cf. also Fløttum et al. (2006) on academic voices and first-person references.

Before proceeding to the evidential subset of Engagement, brief mention should be made of the way certain emphasising formulations expressing “assessments of high probability” such as *must* in the following example (Martin & White 2005:133) are categorised in Appraisal:

- (137) Further study about this relationship between (t1-t3)/(t1-t2) and LAP and [sic] must be very exciting and fruitful. [ESCI]

Though traditionally treated as boosting devices in the literature on hedging (e.g. Hyland 2000, cf. chapter 2.4) on the grounds of their functioning to express the author’s assessment of heightened probability, they are considered to belong to the area of Entertain in Appraisal. Notwithstanding the author’s apparent investment, this form of modality marks the author’s assessment as a subjective opinion arrived at through deductive reasoning, thereby acknowledging the potential presence of dialogistic alternatives (Martin & Rose 2007:54, Martin & White 2005:133). It thus creates a heteroglossic setting for a text which puts forward positions that may be at odds with those held by other parties (Martin & White 2005:133). This is in line with Halliday’s observation “that we only say we are sure when we are not” (Halliday & Matthiessen 2004:625). In a similar vein, Zifonun et al. note:

Schon die Tatsache, dass die Frage der Wahrscheinlichkeit aufgeworfen wird, bringt ein gewisses Maß an Unsicherheit ins Spiel. Wer verspricht, **ganz bestimmt** zu kommen, räumt damit bestehende Zweifel nicht unbedingt aus, vor allem nicht, wenn er das ohne Not tut. (Zifonun et al. 1997:363, authors’ emphasis)

Following the overview of the likelihood-related area of Entertain, the next section discusses the role of evidential resources in the Appraisal framework.

Evidence

The range of linguistic categories subsumed under Entertain includes evidence- and appearance-based features comprising adverbs (*apparently*) as well as copular and impersonal constructions with lexical verbs such as *seem* and *appear* (White 2012a, b, Martin & White 2005:105, 109f, cf. chapter 3.5 on evidentiality):

- (138) Designing experiments that allow the establishment of a hydrodynamic milieu to study how hemodynamic forces interplay with risk factors appears to be a very useful strategy. [ESCI]

Appearance-based formulations such as the following example are also grouped under the same heading:

- (139) A raft of studies in laboratory animals, molecular models and cancer patients suggest that pain drugs given during and after cancer surgery stimulate the growth and spread of certain tumors. [EPOP]

In the perspective adopted within the Appraisal framework, evidential items are seen as a means of presenting the proposition as a conclusion drawn from a process of deductive reasoning or deduced by surmise. Their potential to present a proposition as one possible option among other possible alternatives is thus underscored (Martin & White 2005:109f, White 2012a, b). Compared to the Likelihood-options, however, it does seem that by referencing evidence authors strengthen their claim by implying that it is based on ‘hard facts’.

The present research is specifically concerned with such evidential expressions by means of which propositions are attributed to inanimate entities as in the previous example (i.e. *A raft of studies*). The (inanimate) noun *studies* is represented as having an ‘autonomous’ status. In systemic terms such expressions are classified as relational clauses of the intensive identifying type (Halliday & Matthiessen 2004:648). The lexico-grammatical status of the noun enables the process of studying to be presented as a thing, the responsibility for the conclusion being shifted away from the author and presented as being outside the author’s scope and responsibility. Moreover, the use of the inanimate noun *studies* enables the participants in the process of researching to be left implicit, this being a frequent effect of metaphorical uses of nominal groups. By contrast, the author is visible in the text as the senser in first-person mental verb projections, e.g.

(140) [...] we believe that this supposition can be reasonably accepted. [ESCI]

By way of this subjective involvement, he associates himself with the conclusion drawn, even if the outcome of the deduction process is presented in a tentative fashion. However, ‘research suggests’ type structures using *suggest*, *indicate* or *imply* along with other “verbs of proving” (Halliday & Matthiessen 2014:721) such as *show* or *demonstrate*³⁹ serve as metaphorical realisations of “internal” causal relations expressing the meaning of “x so I think/say y” (Halliday & Matthiessen 2014:721). Whereas subjective metaphors such as *I think* or *I’m sure* can express different values of probability while simultaneously marking the proposition as a personal opinion, most “objectifying” metaphors convey high probability (Halliday & Matthiessen 2014:698, cf. section 3.4 on the systemic notion of modalisation).

In a politeness-oriented vein, Brown and Levinson note

³⁹ The role of these ‘stronger’ verbs of proving will be discussed separately in section 4.2.2.2.1, which deals with Proclaim.

Intuitively, the more nouny an expression, the more removed an actor is from doing or feeling or being something [...]. (Brown & Levinson 1987:208)

The potential face threatening effect of the action is reduced:

with the progressive removal of the active 'doing' part of an expression, the less dangerous it seems to be [...]. (Brown & Levinson 1987:208 ⁴⁰)

This effect is illustrated below

- (141) Although previous studies have suggested a lower early recurrence rate among patients with lacunar ischemic stroke,⁵ and a tendency for recurrent stroke subtypes to breed true, their reliability was limited by small numbers of events, [...]. [ESCI]

In the above example, such a face threat could arise from the remark about the limitations of previous research conducted by other researchers. Yet, the metaphorised status allows the author to avoid direct reference to third parties, namely the authors who conducted the studies concerned, so as to attenuate potential face threats in academic writing (cf. Myers 1989:17).

On the grounds set out above, formulations of the '*research suggests*' type play an important role in constructing stance in academic contexts and will be taken up again in connection with Attribution. In addition to the items discussed above, the present research will also take into account the use of evidential structures of the following type:

- (142) Our results suggest that angiographic grades 2 and 3 do not reliably differentiate groups with different hemodynamically active regurgitant volume. [ESCI]

Here the nominal source *results* is, in turn, marked as originating in the author by the first-person possessive determiner *our* (see also Myers 1989:4). Thus phrased, the conclusion appears to rely entirely on scientific evidence, enabling the author "to hide behind the figures" (Skelton 1997:55). These formulations are particularly pertinent as they remove the actor from concrete research activities (cf. Chafe 1982), enabling the author to 'enter' into the nominal, abstract element of the statement, thereby shifting the focus of his involvement to a more conceptual plane.

Considered from a "topological" perspective (Körner 2000:142ff, cf. also White 2012a, Hood 2004) Engagement features can be arranged on an axis stretching from "open" to "close", depending on their modal value, i.e. high, medium, low (Körner 2000:144, cf. chapter 3.4).

⁴⁰ On a similar note, they regard passive structures as occupying a "roughly adjectival status" between verbs and nouns (Brown & Levinson 1987:208).

Whereas typological approaches highlight dissimilarities so as to enable fine-grained differentiation, emphasis is placed on “similarity and continuity” in a topological view (Körner 2000:145). Topological perspectives thus enable heteroglossic features to be mapped on a gradient. High values of modality such as *must* in the following example open up less dialogistic space than low values (Körner 2000:144).

- (143) And if cramming pituitary, prostate and pancreas extracts into a single pill doesn't count as overkill, then surely another product containing vitamins, minerals and most of the biochemical intermediates of the cellular Krebs cycle must. [EPOP]

Low values such as *may* are closer to the “open” end of the cline, e.g.:

- (144) Cancer cells may produce unique metabolic profiles, in part because they grow very rapidly and have metabolic activity very different from normal cells. [EPOP]

An intermediate position is occupied by features such as *probably*, as in:

- (145) This poor immunogenicity is probably part of the reason, Liang says, that HCV is the only RNA virus (though HIV has an RNA genome, it is considered a retrovirus) that is able to persist in the host and cause chronic infection. [EPOP]

We can conclude from the above outline of the Likelihood-related and the Evidence subcategory that there appears to be a gradient in terms of the level of abstraction achieved by the use of either more nominal or more verbal structures. Moreover, expressions may be categorised according to the degree of author involvement on the basis of different sources referenced by objective formulations as opposed to expressions involving first-person pronouns which attribute propositions to the author himself. As described above, the features subsumed under Engagement comprise a heterogeneous array of items if considered from a formal point of view. They range from epistemic uses of modals such as *may*, that is grammaticalised expressions of modality, to lexicalised evidential markers as in:

- (146) Cancer seems to thrive on exposure to opioids, [...]. [ESCI]

In addition to these, expressions such as the following, which may be described in terms of ‘semanticised’ expressions of evidentiality, also fall into this category:

- (147) Second, it is possible that repeated episodes of ischemia-induced hyperemia influenced the conventional outcome measure of endothelial function following the 5-min occlusion; however, evidence suggests that serial FMD measurements do not affect subsequent FMD outcomes [15]. [ESCI]

The different formal status of these features will be taken into account in examining the dialogic impact of the features concerned in view of their Expansive versus Contractive effect.

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Whereas Appraisal emphasises its focus on functional aspects concerning dialogic impact, the present research also aims at a fine-grained analysis of the different expressions of modal and evidential values grouped under the Entertain label and other relevant areas of the Engagement section of the framework. Their precise status in terms of grammaticalised or lexicalised coding versus semantic forms of coding is a key – formal – concern in this research context. The analytical framework will thus be modelled accordingly to accommodate both formal and functional aspects. Corresponding German linguistic options (cf. also Becker 2011) will be examined in the outline of the framework in chapter 6. We note in passing that the heterogeneous features included in the Entertain set also include certain “expository questions” and deontic modals (Martin & White 2005:109ff). These are, however, excluded in this analysis as they are not considered to be central to the ‘epistemological’ focus of the present study.

4.2.2.1.2 *ATTRIBUTE*

As discussed in the previous section, Entertain options encourage heteroglossic diversity by blending it with the author’s own utterances by means of modalisation (e.g. *may*) or evidential items (e.g. *it appears that*), presenting the author as the source (Intra-vocalise⁴¹). It is, however, also possible to create a heteroglossically diverse setting by overtly introducing external voices into a text (Extra-vocalise) (Martin & White 2005:111ff, White 2003:273ff, White 2006:16ff, White 2012a, b, Körner 2000:134). Attribute deals with the dissociation of the author’s voice from the proposition by quoting or referencing external sources. It is essentially concerned with the area of “intertextual positioning”, which, in broad terms, deals with the way writers reference words or thoughts of others, and thus represents a subcategory of “dialogistic positioning” (White 2012a). The Attribute section is divided into the two subcategories Acknowledge and Distance (Martin & White 2005:112ff). The former type, that is Acknowledging (Martin & White 2005:112) or “non-endorsing (neutral)” (White 2012a), will be discussed in the following.

Acknowledge

In contrast to Entertain options which express the author’s subjective perspective, Acknowledging formulations create a heteroglossic communicative setting by introducing and engaging with positions external to the author’s voice. They convey the subjective nature of the proposition thus framed by presenting it as merely one individual viewpoint, that is as

⁴¹ White (2012a, b) uses the term Intra-vocalisation to refer to linguistic means which mark the heteroglossic diversity as internal to the text. Intra-vocalisation features thus convey the subjectivity of the authorial voice. Extra-vocalisation resources signal that the source of the proposition is external. They represent a means of construing a text as integrating a multitude of views.

one option of a range of potential opinions, and open up dialogic space by anticipating divergent opinions (White 2003:273f, White 2006, Martin & White 2005:113). The subset comprises adverbial adjuncts along the lines of *according to* or *in X's view*, which have been discussed from a hedging-centred perspective, for instance, by Prince et al. (1982:89). As noted in chapter 2.4.1, Prince et al. refer to them as “attribution shields” in view of their functioning to “attribute the belief in question to someone other than the speaker” (1982:89).

Attribution is realised by means of directly or indirectly reported speech and thought involving communicative or mental process verbs such as *say*, *report*, *announce* or *think* (Martin & White 2005:111ff):

- (148) The scientists report today in the journal Cell Stem Cell that the finding could bring them closer to finding a treatment for incurable neurological conditions, [...]. [EPOP]

This type of feature, referencing a ‘source of knowledge’, i.e. *the scientists*, takes us back to what was previously referred to as semanticised coding of evidential meanings. As noted earlier, such reporting structures are referred to as projections in systemic terms (Halliday & Matthiessen 2014). Projections link matrix clauses containing a verbal or mental process type verb and the projected clause which encodes the proposition. In addition to verbal reporting formulations corresponding nominalisations of verbal and mental processes (*X's belief/assumption* etc. *that...*) are also included in this subset.

As pointed out by Martin and White (2005:13), there exists a vast body of literature on reported speech in academic discourse.⁴² In Sinclair's (1986) frequently cited work a distinction is made between “averal” and “attribution”. To aver something means to “assert that something is the case” (Sinclair 1986:44) and thus assume responsibility for the statement. Attribution can therefore also be described as a reporting of external averals (cf. also Charles 2006:494).⁴³ Attribution in Sinclair's (1986) sense largely corresponds to the

⁴² Thompson and Ye (1991), for instance, are concerned with evaluation conveyed by reporting verbs in academic papers from various fields with particular focus on author commitment to or detachment from the material presented and on usage by non-native speakers. Thompson and Hawes (1994) address the use of reporting verbs in academic medical journals; their study is, however, limited to verbal structures. Malmström's (2008) account is concerned with “knowledge-stating verbs” in linguistic and literary academic contexts. Hedging-oriented works on the subject include, for instance, Varttala (2001), Hyland (1998) and Salager-Myer (1994), cf. also chapter 2.4.

⁴³ Charles (2006), incorporating Sinclair's (1986, 1988) distinction between “averal” and “attribution”, explores the role of reporting verbs in the construction of stance in different academic disciplines. She is concerned with the different types of sources to which propositions are attributed (Charles refers to the 1987 manuscript of the article, which was published in 1988). See also Tadros (1993) on the pragmatic aspects of averal and attribution in written academic texts and Thompson (2005), who specifically focuses on the role of averal and attribution in PhD theses.

Appraisal notion of Attribution as it refers to the crediting of propositions to external parties by means of which responsibility for the proposition is delegated to this individual or entity. However, whereas Sinclair's distinction is retrospective in that it underscores the origin of the propositions in a text, Appraisal highlights the prospective dialogistic impact of such items (Martin & White 2005:135).

The features included in the neutral subset of Attribute provide no (obvious) hint as to the author's position with regard to the proposition advanced. Yet, it has been argued that the selection of sources and the incorporation of certain material or the exclusion of other sources and materials are inherently subjective choices (Charles 2006:494, referring to Hunston 1993b, 2000). Moreover, it should be mentioned in this connection that implicit mechanisms exist which enable the author to attribute meanings to external sources and indirectly signal the author's standpoint with regard to the external viewpoint and implicitly position the reader vis-à-vis this view (cf. also White 2006:3f). As noted previously in connection with the outline of evidentiality (chapter 3), a position can, for instance, be presented as highly reliable by attributing it to an external source which is held out as having expertise and high standing in the field concerned or by the use of plural forms to reference a large group of people (specifically experts) as the source of information (Martin & White 2005:116, Hood 2004:89, White 2006:17), as in:

- (149) Sleep researchers believe that genes – although the precise ones have yet to be discovered – determine our individual sleeping patterns. [EPOP]

This effect is even achieved in cases where “neutral” acknowledge-type formulations are used (White 2006:17). On a similar note, White (2012a), building on work by van Leeuwen (1996), considers the specification of sources with regard to the kind of “social actor” to whom content is attributed. This classification categorises sources according to Identification and Personalisation.⁴⁴ The categorisation according to Identification distinguishes between Unidentified and Identified, that is Named sources, such as *Cheng* in the following excerpt:

- (150) Cheng thinks that PHY906's multitude of effects can be explained through its different chemical constituents, and hopes that his team can identify which chemical is responsible for which change. [EPOP]

Attribution to Unidentified comprises unnamed sources such as *Sleep researchers* in example (149) and Generalised sources such as:

⁴⁴ The other categories, which are left aside in the present study, are Status, Specification (e.g. specified individuals/groups versus general classes) and Grouping (individuals versus groupings of people).

- (151) Many weight-loss drugs now on the market are designed to increase serotonin levels, but they were believed to work by stemming appetite; the new research shows they may also work by speeding metabolism m. [EPOP]

Unidentified sources include a further subcategory termed Anonymous comprising features along the lines of “informed sources indicate ...” (White 2012a).

Another distinction turns on Personalisation, which refers to the representation of the source as either human (Personalised) or Impersonalised. Personalised specification can be subdivided according to whether a specific individual or group of people is referenced, e.g.:

- (152) “This is a new paradigm of drug development,” says Yung-Chi Cheng, a pharmacologist at Yale and head scientific adviser to PhytoCeutica. [EPOP]

Or an Institutional source is referred to, as in:

- (153) The National Cancer Institute estimates that at least 21,000 new cases of ovarian cancer will be diagnosed in the U.S. in 2010, [...]. [EPOP]

Impersonalised representation, that is non-human, is illustrated below:

- (154) A study of fat swimming and running rats indicated that exercise induces brain chemistry changes that decrease appetite [...]. [EPOP]

This latter subcategory appears to correspond to the formulations involving inanimate agencies discussed above in connection with the evidential Entertain options. It will be taken into account in the present research design, which will also draw on this classification by grouping institutional and individual sources together to set these apart from non-human sources such as *analysis, research* etc. While institutional sources do not directly reference concrete persons, they differ from other non-human sources in formulations along the lines of *A study of fat swimming and running rats indicated that [...]*, which merely create a relatively indirect, metonymical link with human agents.⁴⁵ The relationship between individual human beings and institutions appears to be more immediate in that it may be described in terms of a totum-pro-parte relationship.

Moreover, the present focus is more on whether people, i.e. the authors or third parties, are visible or whether emphasis is placed on propositional content. Therefore, Generalised sources will be kept apart from other Attribution forms as they appear to enable the author

⁴⁵ See e.g. Ruiz de Mendoza Ibáñez and Díez Velasco (2003), Stålhammar (2006) as mentioned at the outset of this chapter.

to signal that he is reporting, thereby transferring responsibility to another human being, albeit without 'ascribing' it to a specific source (cf. e.g. Charles 2006).

The referencing of Generalised sources, as illustrated above in example (151) (i.e. *Many weight-loss drugs [...] were believed to work* etc.), touches on the notion of Hearsay. Hearsay features are categorised as an Acknowledge-type Attribution option by Martin and White (2005:112). Hearsay spans across a range of grammatical categories from the inclusion of voices by means of formulations such as *reportedly* to attributive uses of *reported* and metaphorical structures along the lines of *I hear that*, *it's said* or *there is an argument that* (White 1998:94, Martin & White 2005:112). Attribution to an unspecified source as in the following example does not mention sources, but the existence of a human source from which the statements initially stemmed is still implied and marked as external to the author:

- (155) Low wall shear stress, especially when blood flow is turbulent, is said to play important role [sic] in the pathogenesis of the atherosclerotic plaque [13]. [ESCI]

Such formulations will be treated accordingly and examined in view of register-specific uses in the present analysis,⁴⁶ and, analogously, nominalisations of both communicative and mental process types that are not attributed to a source as exemplified below will also be considered accordingly:

- (156) The assumption that body weight is simply a consequence of behavior is not exactly correct, he says.
[EPOP]

In exploring agentless formulations and analogous nominal structures, this study will also take into consideration possible Attribution to sources which are merely identifiable through co- and contextual clues.

⁴⁶ While the Appraisal network as proposed by Martin and White (2005) divides the dialogically expansive Engagement category into the Attribute and Entertain subsets, White's (1998:93ff, 2012a) distinguishes between Intra-vocalise and Extra-vocalise heterogloss options. White (1998:88) describes a trichotomy of Open Intra-vocalise options. As mentioned earlier, the Open Intra-vocalise options encompass the subsets Probabilise, Appearance and Hearsay. These are set apart from Extra-vocalise options such as *according to X* or *X said*, which reference external sources to construe a heteroglossically diverse setting (White 1998:85ff). In Martin and White (2005), hearsay items are grouped under the Attribute label (Martin & White 2005:111ff) along with formulations which specify the source of information such as *X argues that*. This dissimilarity, however, is relevant to the present research, which highlights the role of impersonalisation versus overt author interpolation and the explicit referencing of external sources. Therefore, the present analysis discerns between Engagement strategies which enable the author to code the utterance as a form of reported information without explicitly stating its source and those options which explicitly reference the source of information. Referring to Halliday (1994), White (1998:94) points out that there are grammatical reasons for viewing the Hearsay set, expressed for example by *it's said that*, as a third Engagement option alongside Probability and Appearance. In Martin and Rose (2007), the heterogloss Engagement options are subdivided into the categories: Projection, Modality and Concession.

Schmid (2000) provides an insightful take on the properties and usage contexts of a category of abstract nouns functioning in the way *assumption* acts in the above example and *belief* and *conception* work in the following example:

- (157) Contrary to the belief that impaired brachial artery FMD is due to structural/functional abnormalities in the microcirculation resulting in reduced upstream hyperemic shear forces [27, 28], our data support the conception that the atherosclerotic disease process indeed occurs at the level of the conduit artery. [ESCI]

These are termed “shell nouns” on the grounds of their potential to function as “conceptual shells for complex, proposition-like pieces of information” (Schmid 2000:4). Serving as linguistic vehicles for bundling up complex propositional content, they constitute “versatile and powerful linguistic and conceptual tools” (ibid. 7). This category comprises many nominalisations of a large number of items relevant to the present research context. In addition to the above features, these include, for instance, *acknowledgement*, *comment*, *conclusion* and *remark* as well as evidential nouns (e.g. *evidence*, *proof*). The mental shell noun *belief* along with, for instance, *knowledge*, *understanding*, *supposition* is regarded as implying a rational origin and presenting “beliefs as coming from the brain” (ibid. 198). Nouns such as *feeling* or *hope*, which would be classified as falling in the Attitude category in Appraisal and are left aside in the present analysis, are described as representing beliefs as “coming from the heart, or the stomach” (ibid. 198). Schmid observes that Western cultures have a tendency to associate weak beliefs with an emotional base and stronger ones with a rational base.

Based on work by van Leeuwen (1996), Bernstein (1970) and Bourdieu (1986), White (2012a) argues that abstract, generic or unnamed references enable the author to remain uninvolved by detaching himself from any specific context whereas the author presents himself as engaging “concretely and directly with some specific here-and-now” by means of referencing specified individuals (cf. also Chafe 1982 on the dichotomy between “detachment” and “involvement” as described in chapter 2.2). The type of source referred to thus impacts on the “textual persona” created by authors and the way they position themselves vis-à-vis other viewpoints (White 2012a). Moreover, some of the above examples include instances of citation by numeric indices; the implications of this type of academic referencing will be taken into consideration (cf. e.g. Tadros 1993, Thompson 2005, Charles 2006), e.g.:

- (158) The presence of such antibodies, particularly ACPA, has been shown to be a poor prognostic factor linked with a higher erosive burden [9,10], while ACPA titres have been reported to fall in line with clinical response to biological therapies [11]. [ESCI]

This form of citation, the Vancouver citation system, enables the author to reference the work of other author's – or his own work – by inserting numbers in square brackets to refer to the bibliographic information in the list of references at the end of the article (Browner 2006:131). Since such abbreviated citation formats enable authors to insert external material without marking it as cited material stemming from external sources by means of linguistic resources, the present analytical framework needs to be tailored accordingly to account for their linguistic impact (chapter 6).

Acknowledging Attribute resources thus represent a key factor in the construal of alignment and solidarity (Martin & White 2005:114ff). The outline given in this section highlights the importance of Attribute features to the construction of the author's stance towards their own and others' work as well as their readership. In Appraisal, Acknowledging expressions are regarded as contributing to an objective, uninvolved style and as being typical of "highbrow" news reporting. This area of journalism is characterised by a seeming absence of authorial investment, news being presented in a style perceived as unbiased (Martin & White 2005:115). Acknowledging expressions enable the author to

remain aloof from any relationships of either alignment or disalignment. They present the writer as some sort of 'informational fair trader' who simply conveys the views of others and who is therefore unimplicated in any relationship of solidarity which the reader may enter into with the quoted source whose viewpoint is being reported. (Martin & White 2005:115)

This is seen as being particularly relevant to the journalistic domain of "hard news" reporting, where the overt expression of evaluative meanings is restricted and, instead, preference is given to a neutral and objective style (Martin 2006:3), whereas academic articles are seen by Martin and White (2005:115) as constituting more "argumentative" texts in which alignment and solidarity is more apparent. In the present context, however, we start from the assumption that the construction and the perception of what constitutes knowledge varies across academic disciplines. In the "impersonal, value-free" "hard" sciences, authors present their work as building on the basis provided by other researchers' work (Becher & Trowler 2001:36). The "personal, value-laden" "soft" sciences, by contrast, are characterised by a recursive approach to the construction of knowledge (Becher & Trowler 2001:36, cf. also Charles 2006:493). External viewpoints are presented and authors position their own views in relation to previous work by others (Charles 2006:493). In line with Charles (2006:493), we expect that other linguistic means are exploited to construct author stance in a way that meets the ideological and epistemological requirements of the discipline. This notion, in a sense, captures the view mentioned initially in the introductory chapter, according to which

evaluation and writer stance are dependent on the social context and values shared by a research community (cf. e.g. Hunston 1993a, 1994).

From the above outline of the Acknowledging Attribute subcategory, it appears that the line between certain Entertain (namely evidential options) and Attribute options of the Engagement set can be a blurry, albeit an important one. It was noted that Appraisal discriminates between Attribute-type expressions such as

- (159) The study's authors suggest that exposure to an artificial sweetener may undermine the brain's ability to track calories and to determine when to stop eating. [EPOP]

and evidential-type Entertain options such as

- (160) [...] the divergence in slopes suggests that the observed differences following the conventional 5-min forearm occlusion reflect an overall impairment in response to shear stress, [...]. [ESCI]

In the above example, experimental evidence occupies the subject position, although it is not given the same kind of grammatical agency as the human sources referenced in example (159) (*the study's authors*) (cf. also Hyland 1998a:172f). The latter type of combination, for instance, allows progressive forms (*person X is suggesting* versus ? *finding X is suggesting that*, cf. also Halliday & Matthiessen 2014 on process types). However, the evidence feature in example (160) appears to bear not only a formal resemblance to the Attribute-set. Though it is not attributed to a person as in the case of the Attribute set as defined in the Appraisal framework, the propositional content thus presented is 'externalised' by attributing it to an inanimate entity (i.e. *the divergence in slopes*).

On these grounds, this type of evidential formulation will be treated as a form of Attribution to inanimate source in the present research (cf. chapter 6). Such expressions enable a neutral style of presentation, the conclusion drawn being attributed to experimental evidence. The role of the author in the deductive process becomes implicit and is thus backgrounded. The dialogic effect achieved by such evidential constructions is therefore different from modalising expressions involving explicit author interpolation such as # *Given the divergence in slopes we think* etc., which would signal the author's involvement overtly (cf. e.g. Chafe 1982:46).

Following the description of Acknowledging Attribute options, the next section briefly considers distancing Attribute framers.

Distance

This Attribute-subset explicitly detaches the author's voice from the external voice cited (White 2003:273f, Martin & White 2005:113ff, White 2012a):

- (161) The AbioCor is made from titanium and a polyurethane blend called Angioflex, which is produced by a secret process that Abiomed claims makes it very pure and slick – much less susceptible to clotting. [EPOP]

Similarly to the Acknowledging formulations introduced above, Distancing items such as *allege* or *claim* in the above example attribute the proposition to an external source and mark it as an individual, subjective proposition. Like Acknowledging formulations, distancing items are thus dialogically Expansive. Yet, they differ from Acknowledging features in that they signal that the author is not willing to accept responsibility for the proposition thus framed, thereby opening up maximum room for dialogistic alternatives (White 2003:273f, Martin & White 2005:114). By inviting alternative stances, they function to reduce the “interpersonal cost” incurred by anyone who should put forward an alternative opinion (Martin & White 2005:103). Distancing items such as the above appear to be only of peripheral interest to the present research although they bear both a formal and a functional similarity to the Attribute formulations outlined above. This study is mainly interested in “subtle” (cf. Fløttum 2006:266) means of Engagement; distancing framers, however, distance the author’s voice from the voice cited rather overtly and thus appear to convey at least a slightly more openly attitudinal flavour of distrust. Without forestalling the discussion of the data retrieved from the present corpus, the English and German scientific subcorpora contain no instances of *claim* and similarly *behaupten*.⁴⁷

4.2.2.2 DIALOGIC CONTRACTION

The following section provides an overview of the Engagement formulations grouped under the label Dialogic Contraction, which relates to the reduction of space for dialogic alternatives and comprises the subsets Proclaim and Disclaim (Martin & White 2005:117ff, White 2003:268ff, White 2012a).

4.2.2.2.1 PROCLAIM

Proclaim formulations convey the author’s increased personal investment, thus restricting the room for dialogistic alternatives by increasing the interpersonal cost involved in expressing dissent (White 2003:269ff, Martin & White 2005:121, White 2012a). This subset is again divided into Endorse, Pronounce and Concur, which will be outlined in turn in the following.

⁴⁷ A brief mention should, however, also be made of the compatibility of certain sources used in Attribution structures and the corresponding human origin pointed out previously in connection with the specification of source types. It appears that there are different semantic restrictions for the use of *claim* than those that apply to Acknowledge-type structures using, for example, the framer *say*. While a combination such as *the data say* appears to be unproblematic, the combination *the data claim that* would appear to be less usual. Perhaps this impression is a result of *claim* presupposing that the source is endowed with a consciousness and will.

Endorse

Endorsements, like Expansive Attributions, serve to ascribe propositions to external sources (e.g. Martin & White 2005:126f, White 2003, White 2006:17ff, White 2012a). However, in contrast to dialogically Expansive formulations, Endorsements maximise the validity of the proposition, as in:

- (162) Moss has shown that animals lacking these receptors do not develop lung cancer when injected with cancer cells. [EPOP]

This subcategory includes verbs such as *show*, *prove*, *find*, *point out* or *demonstrate*⁴⁸ and their nominalised forms which

portray certain acts of semiosis as providing the grounds for the speaker/writer to presuppose this warrantability. (Martin & White 2005:126)

These features have been discussed in connection with concepts of “factivity” (e.g. Kiparsky & Kiparsky 1971, cf. Martin & White 2005:126).⁴⁹ The notions of factivity and presupposition are left aside for the moment, but will be addressed in more detail in the following chapter to delineate the criteria to be applied in the present analysis in distinguishing between Expansive and Contractive features. Endorsements are used by the author to react to and substantiate prior utterances of others – in this respect they are retrospectively dialogic. Marking the proposition as the author’s subjective assessment and using reported speech structures, they resemble Expansive Attributions (Martin & White 2005:126, White 2003:270). Yet, while Attributions separate the proposition from the author, this dissociation does not come into play where Endorsements are used. Endorsements expressed by verbs such as *show* in example (162) present the proposition in the subordinate clause as being true and correct.⁵⁰ The author thus aligns himself with the source of the proposition by their use. While still dialogic in that they acknowledge the potential existence of different points of view, they nevertheless reduce the space for these alternative positions by presenting propositions as maximally valid. Endorsements are prospectively dialogically Contractive in that the likelihood of the author’s viewpoint being challenged is reduced by signalling his heightened investment and referencing an external source to substantiate the position being advanced (Martin & White 2005:103, 126f, White 2003:268ff). This dialogic line of reasoning resembles the logic underlying the politeness framework as proposed by Brown and

⁴⁸ Cf. also Malmström (2008:35ff) on “knowledge-stating verbs” and their role in conveying accountability.

⁴⁹ Field (1997:801ff) gives an overview of the research on factivity.

⁵⁰ Cf. also Leech’s (1983) categorisation of reporting verbs according to their factive and non-factive status.

Levinson (see chapter 2.4.2) but adopts a heteroglossic perspective. According to Martin and White, it is the

authorial voice which does the rhetorical heavy lifting, [...], intervening in the meaning making to construe the proposition as 'proven', [...]. (Martin & White 2005:127)

The author's presence, however, appears to be more prominent in mental verb projections along the lines of # *We have shown that*, which are classified as belonging to the Pronounce set which will be discussed in the next section. In examples of Endorsement provided by the authors, i.e. "five studies **demonstrate that**" and "a report which **shows that** (...)" (Martin & White 2005:126, authors' emphases), inanimate sources are referenced. A certain friction between the sayer and the process is created as a result of inanimate sources being referred to instead of human ones, as in, for instance, # *researchers showed/demonstrated that* (cf. also Halliday & Matthiessen 2004:656ff). As outlined in connection with the evidence- and appearance-based set of Entertain options involving inanimate agencies, such constructions, viewed in the light of grammatical metaphor (Halliday & Matthiessen 2014), are an effective means of creating a neutral, apparently unbiased form of presentation by backgrounding the role of the author and rendering implicit the role of the human source behind the studies or the report. The introductory chapter mentioned the notion shared by different strands of linguistic research into scientific writing which sees scientific knowledge as a social construct and accords an important role to language in its construction (Körner 2000:90). This is characterised by the interplay of interpersonal and ideational meanings required in reconciling the potentially rivalling demands of persuasiveness and neutrality (Körner 2000:90). As noted earlier, researchers, while having to draw attention to their contribution, are also required by social conventions to deliver claims in a humble manner (e.g. Myers 1989:4, Charles 2006:514). As a result of these conditions, they need to emphasise the novelty and importance of the work and insights they are contributing. Yet, at the same time, they are required to reconcile potential tensions between their research and existing work in the field. To meet these interpersonal ends, the author's persona may, for example, be construed by a more personal style as realised, for instance, by the use of first-person pronouns or modality – as discussed previously in connection with the Expansive set – to convey solidarity (cf. Myers 1989, Körner 2000:90). However, a text may also emphasise ideational meanings to achieve a persuasive style. In such cases, the avoidance of explicit expressions of attitude and evaluation may lend an air of objectivity to a scientific account (Körner 2000:90). Seemingly matter-of-fact statements such as the following help present an assessment as correct (cf. also Hunston 1993a:65):

- (163) These results demonstrate that the presence of lymphoid aggregates and ongoing GC reactions in RA synovium is a phenomenon considerably more common than has recently been proposed [30,37,38]. [ESCI]

The commonly perceived dichotomy between fact and evaluative meanings can, therefore, not be maintained (see also Körner 2000:89ff) since the principles underlying the evaluation are not made explicit and depend on the values and aims shared by the scientific community. These need to be known in order to recognise and appreciate the evaluation implied in seemingly objective statements (Hunston 1993a:57ff, 1994:191ff, cf. also Körner 2000:90f).

Consequently, locutions along the lines of those described above are highly relevant to this study on the grounds of their contribution to a seemingly factive style in writing about one's own research. Whereas Endorsement is defined in Appraisal as relating to items for sourcing propositions to outside sources, the present research aims to take into consideration features which are somewhat located on the outskirts of this group in this context, taking us closer to the Proclaim set which involves overt author interpolation along the lines of *we have shown that* and will be discussed in the next section. As in the case of items of the '*our research suggests*' type discussed in connection with the Expansive evidential subset, this thesis will specifically look into the use of inanimate nouns such as *research*, *results* or *data* ascribed to the author by first-person possessive determiners and combined with verbs of proving as illustrated below:

- (164) In conclusion, our work demonstrates that ectopic GC-like structures are not only functional in rheumatoid synovitis, but that their presence may contribute to disease pathogenesis via the production of ACPA. [ESCI]

Their use as a means of underscoring the role of hard facts in writing about scientific content matter and enabling the interpolation of the author at the same time will be analysed in greater detail.⁵¹ This resource appears to provide a valuable resource to authors, allowing them to 'step back' behind procedures and data – and thus let their achievements stand for themselves – while at the same time making clear their involvement in novel contributions to

⁵¹ Charles (2006:500ff) describes different types of "non-human subjects" in "self-sourced reports" as a form of "hidden avertal" enabling the author to background their role as originator of the proposition. She distinguishes between linguistic nouns (e.g. *thesis*, *section*), graphic illustrations (e.g. *figure*, *table*), nouns relating to research processes (e.g. *analysis*) or research outcome (e.g. *result*), material entities (e.g. *cell*) or abstract notions (e.g. *predominance*). It appears that these sources are likely to occur in different constellations, for instance, the meaning of *show* in combination with *illustration* differs in meaning to uses in combination with, for example, research nouns as in *results show that*. The latter seem to represent a more immediate alternative to formulations which directly reference the human source of a proposition.

an area of research. As mentioned above, overt author presence in Contractive structures will be taken up again in connection with Pronounce.

Summarising the above accounts of both the Expansive Attribute set and the Contractive Endorse category, it can be concluded that reported speech plays a crucial role in these areas of Engagement (Martin & Rose 2007:49ff, Martin & White 2005:133ff). As pointed out in connection with the Acknowledge subset, “retrospective” approaches such as Sinclair’s (1986), for instance, underscore the way sources are presented as internal or external. In Appraisal, by contrast, the impact on the author’s position in relation to his audience is highlighted (Martin & White 2005:135). Despite this emphasis on “prospective” effects, Martin and White (ibid.) concede that the rhetorical impact of the concepts of aural and attribution is significant as the way sources are referenced bears on the degree of responsibility assumed by the author or passed to an external source. A classification resembling Sinclair’s (1986) categorisation according to internal versus external source is thus contained in White’s (1998:88, 2012a, b) distinction between Intra-vocalise and Extra-vocalise heterogloss options of the Engagement system (Martin & White 2005:135, cf. also Körner 2000) mentioned in connection with Attribute (cf. chapter 4.2.2.1.2). This aspect will be taken into account in the present research by considering how external propositions are marked as such and whether Engagement resources occur inside quoted items or whether they are internal to the author’s voice since this aspect has implications for the linguistic construal of Engagement. As in the case of Acknowledge options (cf. section 4.2.2.1.1), the present analysis will also take into consideration analogous nominal structures which do not involve explicit reference to external sources and cases involving sources which are merely retrievable through co- and context. Moreover, the nature of the sources referenced or invoked will be taken into account since it is argued here that the Attribution of propositions to external humans, that is responding to others working in the field, inherently has an impact on the way writers engage with their anticipated audience as it can be assumed that there is at least some degree of overlap with the different external sources referenced and the prospective readership (see e.g. Myers 1989).

Pronounce

The Pronounce subset deals with formulations which express strong authorial investment and confront contrary opinion (White 2003:269f, Martin & White 2005:127ff, White 2012a, b). The expressions included in this category are highly diverse in lexico-grammatical terms. The features supplied as typical examples of Pronounce comprise projecting formulations such as *I contend*, *You must agree that* or intensifying items with clausal range such as *indeed*. Here the author openly intervenes to emphasise the validity of the position put forward. They

thus imply the potential presence of contrary positions, but at the same time they reduce the dialogic space for alternative views, which are directly challenged. This contracting property distinguishes them from dialogically Expansive Entertain features such as *I think*. Pronouncements do not function to entertain alternative views. Hence, they are grouped under the dialogically Contractive heading in Appraisal. Though there are a small number of instances of *indeed*, items such as *really* or *the facts of the matter are*, which are further typical examples of this category, are absent in the English scientific subcorpus. Yet, the verbs included in the Endorse category discussed in the previous section such as *prove* or *demonstrate* do occur in combination with first-person pronouns in the corpus analysed here, for example:⁵²

- (165) We demonstrated that circulating ACPA from synovial grafts were produced at a significantly higher level in AID_pgrafts, while ACPA were negligible in the serum of animals transplanted with AID_pgrafts (Figure 6C). [ESCI]

Locutions of the above type directly interpolate the author's persona, overtly signalling the author's heightened personal investment and thus appear to meet the definition criteria of Pronounce. Such formulations involving relatively 'strong' verbs of proving and first-person pronouns mark comparatively strong knowledge claims which are at the same time expressly grounded in the author's subjectivity. They open up less space for potential dialogic alternatives than vaguer Entertain locutions of the '*we believe*' type since they imply that the material presented is based on the observation of hard facts.

Following this overview of the Pronounce set, a quick treatment will be given to the Concur subset in the next section.

Concur

Concur-features align the author with his readership, which is constructed as sharing the same views, thereby suppressing alternative positions (Martin & White 2005:122ff). This subset comprises "affirming" items such as evidential *obviously* or *of course* in the following example, that is resources widely discussed in terms of "boosters" (e.g. Myers 1989, Hyland 2000, cf. chapter 2.4):

- (166) All major surgery carries infection risk, of course, and the installation of an artificial heart is a long, complicated operation. But most of the infections that plagued Jarvik-7 recipients came later, as a result of its design. [EPOP]

⁵² Cf. also Charles 2006 on self-sourcing.

However, the items included here vary considerably in formal and semantic terms, comprising formulations such as *not surprisingly*, which may be interpreted as encoding both truth- and value-judgemental meanings (cf. Skelton 1997:46, see chapter 2.4). Also included in the Concur-category are “conceding” items such as *admittedly* as well as certain rhetorical questions which take for granted a certain response (Martin & White 2005:122f). The latter forms are thus outside the focus of the present study, which is on the expression of epistemic and evidential meanings.

4.2.2.2.2 DISCLAIM

Disclamation, either in the form of Denial (negation) or Counter, directly rejects or contradicts dialogic alternatives (Martin & White 2005:118ff, White 2003:271). From the dialogistic point of view, positive polarity brings into play one voice whereas negative polarity as realised below by the negator *not* is heteroglossic in that it implies a positive alternative position, thereby recognizing its potential existence, to then refute it, e.g.:

- (167) The mere fact that the evidence is inadmissible does not mean that there is anything improper or unlawful about the juror’s action in bringing it to the attention of the court. On the contrary, the juror may well be acting from the very best of motives in an effort to avoid what he regards as a miscarriage of justice. [EREF]

Here, by means of negation (*not*), the text constructs readers or third parties who believe or are disposed to believe that there is something *improper or unlawful about the juror’s action* (cf. White 1998:89ff, Martin & White 2005:119). Counter, the second Disclaim subtype, is realised by adversative conjunctions and connectives such as *although* in example (168):

- (168) Although normalization of brachial artery flow-mediated dilation (FMD) to individual shear stress (FMD:shear stress ratio) has been proposed to improve this measure of endothelial function, the clinical utility of FMD normalization has not yet been demonstrated. [ESCI]

It often acts in combination with Denials such as *not* to counter the expectation invoked by the proposition thus introduced (Martin & White 2005:120f). Further realisations of Counter include comment adjuncts or adverbials such as *surprisingly* which, as noted previously, may be interpreted as also conveying a value-judgemental nuance of meaning (cf. Skelton 1997:46). The Disclaim subcategory will, therefore, not be dealt with in any greater detail here since it provides relatively explicit means of taking a stance. It is, therefore, not central to the analysis of the more implicit, seemingly uninvolved resources for engaging with the reader save for instances in which negation directly affects the dialogic space opened up by the Engagement features considered in this analysis. Consider by way of illustration the interaction of the modal Entertain feature *may* and negation through *not*:

- (169) The apparent overlap of individual slopes between groups suggests that the individual dose-response regression line may not be a robust outcome measure for clinical purposes. [ESCI]

In the above example, *not* refutes an alternative standpoint, while a different position is simultaneously invoked by the use of *may*; thereby dialogic space is reduced initially and then expanded again (cf. Körner 2000:151). In this interplay of open and close features, Contractive Denial and Expansive meanings do not obliterate each other out, but instead open up dialogic space (Körner 2000:151). The treatment of negation will be taken up again in connection with the overview of factivity-related notions in the following chapter and the outline of the analytical framework in chapter 6. The next section is concerned with the Graduation subset, which is not central to the present research either, but will be set out briefly for the sake of completeness.

4.2.3 GRADUATION

Dealing with the scaling of meanings, the Graduation dimension is a system which, in rough terms, can be characterised as providing resources for adjusting the vigour of an evaluation (White 1998:26ff, Martin & Rose 2007:42ff, Martin & White 2005:135ff, cf. also Körner 2000:99ff, Hood 2004:58, 77ff). Graduation, discerning between Force and Focus, distinguishes options for either upgrading or attenuating the intensity of meanings (Intensification), on the one hand, and for scaling according to amount (Quantification), on the other hand. Assessments of intensity comprise items traditionally considered in terms of “intensifiers”, “amplifiers”, “boosters”, “emphatics” or “emphasizers” such as *slightly*, *a bit*, *rather*, *quite*, *really* or *very* (cf. e.g. Quirk et al. 1985:583ff):

- (170) Preventing people from getting the virus would save millions of lives as well as greatly reduce health care costs associated with treatment. [EPOP]

Force is lowered by Graduation resources such as *a little*, *fairly* or *somewhat* in the following example:

- (171) “If it works as a gel, undoubtedly it will work as an oral drug,” predicts De Lay. Subsequent production of the drug for prophylaxis would be expected to happen somewhat faster than for the gel, since it wouldn't need to be newly manufactured. [EPOP]

Intensification thus applies to the grading of qualities and processes, whereas Quantification concerns the imprecise measurement of entities in terms of number, size, weight and so forth (Martin & White 2005:140ff):

- (172) A few people, when infected with HIV, spontaneously generate antibodies that can fend off the virus for decades. [EPOP]

Focus, by contrast, represents a resource for scaling meanings in terms of prototypical or marginal membership of semantic categories (Martin & White 2005:137ff). Focus is typically applied to, but not limited to, categories which are non-scalable in experiential terms and whose members fulfil a certain combination of membership requirements (Martin & White 2005:37, 137ff, Martin & Rose 2007:42ff). Sharpening devices denote prototypical membership and have traditionally been viewed in terms of intensifying, boosting or amplifying devices (Martin & White 2005:138). In the following example, *real* scales up the prototypicality of the desired impact of the breakthrough in question:

- (173) To translate this breakthrough into something with real public-health impact, researchers need to confirm the findings and address a long list of new questions introduced by them: [...]. [EPOP]

Category boundaries are softened by items such as *kind of*, *sort of* or *of sorts* which signal marginal membership as opposed to prototypical category membership:

- (174) MacDonald's approach, which effectively monitors 20,000 biomarkers in the form of metabolites, represents a culmination of sorts in recent thinking in biomedicine. [EPOP]

As discussed in chapter 2.4, these softening items have been treated in terms of hedges (Lakoff 1972, cf. Martin & White 2005:138) and approximators as described by Prince et al. (1982).

4.3 Summary

The Appraisal framework offers a theory-driven, functional approach to the description of devices for the construction of interpersonal meaning (Martin & White 2005:34). On the grounds of its social take it appears to be a suitable starting point for the kind of cross-linguistic examination conducted here. Therefore, an Appraisal-based approach will be applied to the sphere of medical research and the language used by scientists operating in it to position their own work within the wider theoretical and research domain. Moreover, comparisons will be drawn with the way these means are used in medical journalism.

The comprehensive approach adopted in Appraisal enables questions raised, for example in the literature on hedging (cf. e.g. Skelton 1997:46, see chapter 2.4), to be approached more systematically by distinguishing between the construction of feelings in texts, which is dealt with in connection with Attitude (Martin & White 42ff), and the way stances are adopted towards positions referred to in a text and towards anticipated positions. The latter type of meanings are dealt with in the Engagement category (Martin & White 2005:92ff). The way meanings are scaled is considered separately in connection with Graduation (Martin & White 2005:135ff).

From the outline given in this chapter, it seems that some network options of the Appraisal system are particularly pertinent to the investigation of the phenomena highlighted in this research context. Whereas Attitude and Graduation are of peripheral interest here, certain areas of the Engagement set are immediately relevant to the present study. This specifically applies to the dialogically Expansive Entertain and Acknowledge subsets as well as certain aspects of the Proclaim category. A diverse array of lexico-grammatical resources is placed within a wide discourse-semantic context in the Engagement section of the framework, focus being on their dialogic function. Appraisal offers an insightful view of epistemic modality, evidentiality and the attribution of meanings to different sources by analysing relevant realisations against the background provided by the concepts of dialogism and heteroglossia as proposed by Bakhtin (1981) and Vološinov (1995). These features are considered as means of constructing the author's persona and introducing additional voices into the text, their role in acknowledging the potential presence of differing views being explored. Modal features, for instance, may be perceived as signalling "limited" knowledge; such an interpretation does not conflict with the dialogistic potential of such utterances in the perspective proposed by Appraisal (Martin & White 2005:107). By shifting focus away from epistemic function, the role of such features as indicators of explicit subjectivity is highlighted. When faced with the task of categorising epistemic or evidential elements within the context of a corpus-based analysis, this argument provides a ground for focussing on the dialogistic function of certain elements.

As indicated in the previous sections, the three Appraisal categories Attitude, Graduation and Engagement constitute discourse-semantic categories, which are realised through diverse grammatical systems (Hood 2004:13). While examples of grammatical and lexical realisations of the respective categories are supplied, the relationship between grammatical form and dialogic function does not seem to be a primary concern in Appraisal and, consequently, is not always fully explicated since dialogic functionality appears to take precedence over the precise nature of the linguistic realisations. As Martin and White (2005:94) themselves point out, their perspective highlights the role of context-dependent meanings and rhetorical impact. While this study is concerned with functional aspects in that it looks at the potential dialogic effect of these resources on the audience, too, it also aims to detect (subtle) inter-register shifts in the linguistic realisation of Engagement. The meanings subsumed under the relevant subsets of the Engagement label will therefore be considered in greater detail in view of different linguistic realisations. These include the expression of epistemic and evidential meanings via grammaticalised features such as modals and lexicalised features, as in

- (175) The dose-response profile of the shear stress-FMD relationship appears to differ between populations of distinct cardiovascular risk. [EPOP]

Moreover, they concern forms of semanticised propositional coding via referencing of various source types, including inanimate referents as in:

- (176) The results from this finding indicate that a child with a sibling with type 1 diabetes may be 70 to 150 times more likely to develop diabetes from the hemophilus vaccine than to benefit from the vaccine. [ESCI]

The different options for expressing these meanings will be explored in more detail in the description of the analytical framework in chapter 6. Particular emphasis will be placed on the way sources are referred to in the presentation of propositions. Here verbal structures such as illustrated in example (177) will be considered separately from more nominal structures as in the case of the light verb and noun combination in example (178):

- (177) [...] we demonstrated that AID expression supports the expression of Ic-CI circular transcripts in the RA synovial grafts, [...]. [ESCI]
- (178) [...] we provide, to our knowledge, the first demonstration that AID is invariably expressed within rheumatoid synovial T/B cell aggregates containing CD21⁺ FDC networks, [...]. [ESCI]

While the examples discussed in the previous sections of this chapter represent prototypical instances of the respective categories, the corpus mirrors actual language use. As a consequence, the expression of Engagement is slightly more intricate and characterised by the interplay of different features which do not always correspond to the model uses as described in the previous sections of this chapter, especially in cases where evidence is invoked which is then ascribed to another source as illustrated below:

- (179) Our additional finding of a lower risk of MI after lacunar vs nonlacunar ischemic stroke provides further epidemiological evidence to suggest that many lacunar ischemic strokes are caused by a distinct, nonatherothrombotic, small vessel arteriopathy. [ESCI]

The above example includes a cluster of Engagement items, which involves interweaved features located at various levels (cf. also Mauranen 1997:122f on the “clustering of hedges”). The nominal item *finding*, which is ‘ascribed’ to the author (*our additional finding*) in the above example, is in turn inserted into another Engagement feature consisting of a light verb and noun combination (*provides further epidemiological evidence*). This is then integrated in a further – verbal – Engagement feature (*to suggest that* etc.). The treatment of such complex structures will be taken up again in chapter 6, which sets out the analytical procedure and remodels the framework to gear it to the present research focus. Furthermore, this analysis aims to take into consideration structures entailing implicit reference to sources and sources

which are merely retrievable through co- and context. To meet the present research requirements, the categories need to be broken down into distinct, fine-grained lexico-grammatical realisations to describe even subtle inter-register shifts in the two languages.

In this research framework the first criterion taken into account thus concerns the Expansive versus Contractive dichotomy. This study discerns between ‘open’ formulations along the lines of *it has been suggested that* etc. versus ‘closed’ structures such as *it has been demonstrated that* etc. before these features are categorised according to their precise lexico-grammatical status. As noted earlier in this chapter, the classification of an item as either Expansive or Contractive is related to concepts dealt with in connection with “factivity” (e.g. Kiparsky & Kiparsky 1971, cf. Martin & White 2005:126). The notion is, however, not entirely straightforward and has inspired extensive research and controversial debate. A brief digression is necessary to render transparent the criteria used to determine the dialogic status of uses of Engagement in the present analysis.

5. FACTIVITY AND RELATED NOTIONS

5.1 Introduction

The following account of factivity and related concepts is by no means exhaustive, rather, it is intended to set forth the factors taken into consideration in the classification of Engagement features according to their Contractive or Expansive status and highlight potential difficulties in determining their dialogic properties. As noted by Williams (2004:250), the fundamental difference between “factive” and “non-factive” verbs is basic to “reporting other people’s words”. According to Williams (2004:250), this distinction was first dealt with by the Kiparskys (1970), but not in connection with reporting speech. The concept of factivity as set forward by the Kiparskys (1970) relates to the speaker’s assessment concerning the content of a complement clause and is, roughly speaking, associated with the use of certain matrix predicates or predicators which presuppose the truth of the proposition presented in the complement clause (cf. also Chrzanowska 1986:129). The label “presupposition” was introduced by Strawson (1952, 1956), but the concept has a long history as a subject of philosophical reflection (Schulz 2003:39). The following example sentence is used by Stalnaker to explain the difference between presupposition and assertion:

(180) the Queen of England is bald (Stalnaker 1974:47)

A speaker who utters this sentence asserts that this queen is bald and, at the same time, presupposes that England has one single queen. Presupposition, in this sense, is defined as follows:

Q is presupposed by an assertion that P just in case under normal conditions one can reasonably infer that a speaker believes that Q from either his assertion or his denial that P. (ibid.)

Hence, a person who denies that the Queen of England is bald presupposes that England has *one* queen, just like the person who claims that this queen *is* bald. There are two approaches to explaining how presupposition works (Stalnaker 1974:48): The first one relates to formal, truth-conditional factors. In a formal, truth conditional perspective presupposition may be defined as follows:

a proposition that P presupposes that Q if and only if Q must be true in order that P have a truth-value at all.
(Stalnaker 1974:48)

In this definition, the truth of the presupposition is the prerequisite for the truth of the assertion (Stalnaker 1974:48). Such formal-logical truth-oriented approaches consider presupposition to be external to the speaker or hearer (e.g. Strawson 1954, Kempson 1975, cf. Field 1997:801).

The second, pragmatic approach to defining presupposition views it as relating to the taken-for-grantedness of opinions in a situational context (Stalnaker 1974:47). The Kiparskys' ⁵³ notion of factivity can hence be described as a pragmatic, speaker-oriented concept (cf. Field 1997:801).

Typical examples of factives mentioned by the Kiparskys include: *regret*, *take into consideration/into account*, *ignore*, *deplore* and *resent* (Kiparsky & Kiparsky 1971:347). The following example from the English reference corpus is illustrative of a factive predicate thus defined, i.e. *be aware of*:

- (181) Richardson (who had first choice of leading roles) at once selected Cyrano for himself. Olivier, aware that Richardson had set his heart on King Lear for a future season and confident that he would immediately agree to exchange roles, countered by choosing Lear. [EREF]

The predicate *aware* presents the proposition *Richardson had set his heart on King Lear for a future season* as being presupposed to be true from the speaker's point of view (Kiparsky & Kiparsky 1971, Karttunen 1971a, b, Hooper & Thompson 1973, Hooper 1975, Shankland 1981, cf. Field 1997:801). According to the definition proposed by the Kiparskys (1971), in the case of factives such as *aware* in the above example, *the fact* could reasonably be inserted. This is illustrated in the following altered version of example (181):

- (182) # Richardson (who had first choice of leading roles) at once selected Cyrano for himself. Olivier, aware of the fact that Richardson had set his heart on King Lear for a future season and confident that he would immediately agree to exchange roles, countered by choosing Lear.

As can be seen below, factive propositions in the sense defined above also retain their factive status under negation (Strawson 1956, Kiparsky & Kiparsky 1971:351):

- (183) # Olivier, who was not aware that Richardson had set his heart on King Lear for a future season [...], countered by choosing Lear.

Factivity may also be tested by applying certain presupposition tests such as polar questions (Fillmore 1971, Kiparsky & Kiparsky 1971:351, cf. Schultz: 2003:9), e.g.:

(184) # Was Olivier aware that Richardson had set his heart on King Lear for a future season?

Factives as defined by the Kiparskys (1971:347) also permit gerundial paraphrases, e.g.:

(185) # Olivier, aware of Richardson having set his heart on King Lear for a future season [...], countered by choosing Lear.

The label “true factive” was later introduced by Karttunen (1971b) to refer to predicates such as *regret* which retain their factive status under certain grammatical constraints additional to those described by the Kiparskys (Hooper & Thompson 1973, Hooper 1975, Shankland 1981, cf. also Chrzanowska 1986:131f, Field 1997:802). Thus, the presupposition in example (181), namely *that Richardson had his heart set on King Lear for a future season*, remains intact in modalised or conditional contexts as illustrated below:

(186) # Richardson may regret having set his heart on King Lear for a future season [...].

(187) # If Richardson regrets having set his heart on King Lear for a future season, [...].

Non-factives do not presuppose the factivity of the proposition presented in their complement, typical examples of non-factives as defined by the Kiparskys (1971:347) include *likely, sure, possible, true, false, seems, appears, assume* or *believe*, e.g.:

(188) “We believe that modern-day Hitlers have deliberately adulterated the oral polio vaccines with antifertility drugs and [...] viruses which are known to cause HIV and AIDS,” prominent physician Datti Ahmed told journalists at the time. [EPOP]

Vendler (1980:278 ff) formulated a number of syntactic tests for distinguishing between factive and non-factive predicates: In addition to the possible insertion of *fact* (or *truth*) as a means of testing factivity as shown above, the most dependable indicator of factives, according to Vendler (1980:280), is their ability to co-occur with *wh*-complements, such as *why, who* or *what* in the following example:

(189) “I know – I know what you're going to say. I've already said it all to Patterson. [...],” Duncan smiled bleakly. [EREF]

Non-factives, by contrast, do not combine with *wh*-complements, e.g.:

(190) Lindquist believes that early-stage non-small cell lung cancer patients treated with targeted, high-dose radiation delivered in three or four treatments can have the same, if not better, chance of survival as patients undergoing surgery. [EPOP]

⁵³ Cf. e.g. Schulz (2003:10f) for a critical account of the notion of factivity as put forward by Kiparsky and Kiparsky (1971).

- (191) ?# Lindquist believes why early-stage non-small cell lung cancer patients treated with targeted, high-dose radiation delivered in three or four treatments can have the same, if not better, chance of survival as patients undergoing surgery.

The insertion of *fact*, *truth* etc. is not possible with non-factives either:

- (192) ?# Lindquist believes the fact that early-stage non-small cell lung cancer patients treated with targeted, high-dose radiation delivered in three or four treatments can have the same, if not better, chance of survival as patients undergoing surgery.

Moreover, according to Vendler (ibid. 285) adverbs such as *falsely*, *wrongly*, *incorrectly* cannot be meaningfully combined with factives; this is illustrated in the following modified version of a corpus excerpt:

- (193) ?# Researchers wrongly found that levels of lead in the blood correlated with the risk of committing crimes [...].

The effect is different in the following case of Attribution, which involves the non-factive predicate *believe*:

- (194) Lindquist believes that early-stage non-small cell lung cancer patients treated with targeted, high-dose radiation delivered in three or four treatments can have the same, if not better, chance of survival as patients undergoing surgery. [EPOP]

Obviously, the meaning changes altogether if *falsely* is inserted, but the resulting statement would still be acceptable:

- (195) # Lindquist falsely believes that early-stage non-small cell lung cancer patients treated with targeted, high-dose radiation delivered in three or four treatments can have the same, if not better, chance of survival as patients undergoing surgery.

It follows that factives cannot be combined with manner adverbials of the *wrongly/falsely/incorrect* type, whereas non-factives can. Furthermore, factives do not permit negation of the proposition encoded in the *that*-complement:

- (196) ?# Researchers found that levels of lead in the blood correlated with the risk of committing crimes [...], which is not true.

The list of full factives thus determined by Vendler (1980:287) includes *know*, *find out*, *discover*, *notice*, *realize* and *remember*. Features categorised as non-factive by Vendler comprise *think*, *believe*, *assume*, *say*, *assert*, *claim*, *declare*, *affirm*, *contend*, *maintain* and *insist* (Vendler 1980:285, 287).

From a pragmatic perspective, it has been pointed out that certain circumstances seem to affect the status of some factives (Karttunen 1971b, Shankland 1981, cf. Field 1997:802). Such items appear to be located somewhere in between factives and non-factives in that they do not meet all the criteria for factives, but it is precisely this group of items which appears to be relevant to the issues explored here. The characteristics of these features will be set out in further detail in the following.

5.2 Semi-factives and half-factives

Karttunen (1971b) terms features such as *discover*, *find out*, *see*, *notice* and *realize* “semi-factives”. Semi-factives or “epistemic factives” convey “the subject’s state of knowledge” (Shankland (1981), e.g.:

- (197) The researchers realized that CTCs, though rare, offer a potential window into the real-time dynamics of a tumor’s biology. [EPOP]

Similarly, verbs of perception which indicate “the manner in which the subject came to know the truth” (Hooper & Thompson 1973) as illustrated below are also included in this category:

- (198) In a study of adults with a history of heart attack, researchers observed that 5 consecutive days of colder weather lead to increased blood levels of two markers of inflammation (C-reactive protein, or CRP, and interleukin-6). [ESCI]

Semi-factives have been contrasted with “affective” or “true factives” such as *regret*, *resent*, *be sorry*, *be surprised* or *be happy*. Items belonging to this group are outside the focus of the present analysis as they “express some emotion or subjective attitude about a presupposed complement” (Hooper & Thompson 1973:479, cf. Field 1997:802) as illustrated below:

- (199) But then my birth must have been an inconvenience anyway, as Michael met a woman soon after we were married who was astounded that I was alive and well, because my mother was so reluctant to have me that she was high diving almost until the day of my arrival. [EREF]

While true factives retain their factive status in modalised and conditional contexts as mentioned above (Hooper & Thompson 1973, Hooper 1975, Shankland 1981, cf. Field 1997:801f), semi-factives appear to lose their factive status in hypothetical or modalised settings (Karttunen 1971a, Shankland 1981). Returning to example (198), it thus seems that the modified version becomes ambiguous when *if* is inserted as shown in the following example:

- (200) # If researchers observed that 5 consecutive days of colder weather lead to increased blood levels of two markers of inflammation, [...].

One plausible interpretation of the above version in which *observe* is embedded in a conditional context would be that the proposition (i.e. *5 consecutive days of colder weather lead to increased blood levels* etc.) is still valid, the only question being whether the researchers will come to notice this or not. It may, however, also be interpreted in the sense that *# researchers may not observe that 5 consecutive days of colder weather lead to increased blood levels* etc. because this is not the case, i.e. *# 5 consecutive days of colder weather do not lead to increased blood levels* etc. The following modalised version of example (197) may also be interpreted in a similar way (cf. e.g. Nicholas 1998:117):

- (201) # The researchers may realize that CTCs, though rare, offer a potential window into the real-time dynamics of a tumor's biology.

Moreover, as opposed to true factives, epistemic factives become open to ambiguous readings when subjected to the polar question test (Karttunen 1971b, cf. Nicholas 1998:117):

- (202) # Did the researchers realize that CTCs, though rare, offer a potential window into the real-time dynamics of a tumor's biology?

It follows that epistemic factives may be described as being less factive than true factives (cf. Nicholas 1998:118).

Items such as *tell*, *predict*, *state*, *report*, *guess*, *inform*, *admit* and *warn* are termed “half-factives” by Vendler (1980:285). Full factives are capable of being combined with *wh*-clauses and the noun *fact*, but they are incompatible with *falsely*-type adverbs (i.e. *falsely*, *wrongly*, *incorrectly*). According to this definition, half-factives combine with *wh*-complements and *fact*, too, but they differ from full factives in that they are compatible with manner adverbs of the *falsely* type, e.g.:

- (203) The English-language newspaper Shanghai Daily reported, for instance, that 31-year-old migrant worker Chen Weiming in Guangzhou, who earns just \$145 (1,000 yuan) a month, had to borrow money from his family to scrape up \$245 (1,700 yuan) for his four-year-old daughter's funeral. [EPOP]
- (204) # The English-language newspaper Shanghai Daily wrongly reported, for instance, that 31-year-old migrant worker Chen Weiming in Guangzhou, [...].

Vendler points out that deverbal nominalisations of half-factives such as *statement* or *report*, which would be considered as grammatical metaphors in a systemic perspective (Halliday & Matthiessen 2004), are always non-factive since facts may be reported, but even so the report remains a report (albeit the report of a fact); it does not become a fact by virtue of the nominalisation (Vendler 1980:287).

The following matrix illustrates the applicability of the criteria formulated by Vendler (1980):

| | Combinability with <i>wh</i> -clause | Combinability with <i>fact</i> | Rejection of <i>falsely</i> |
|--------------|---|-----------------------------------|--------------------------------|
| Full factive | + | + | + |
| Half-factive | + | + | ./. |
| Nonfactive | ./. | ./. | ./. |

Fig. 5: Classification of full factives, half-factives and nonfactives based on Vendler (1980)

The scope of the concepts of semi-factives as described by Karttunen (1970) and the notion of half-factives as defined by Vendler thus differs, with most of the features categorised as semi-factives falling into Vendler's full-factive category (cf. Chrzanowska 1986:133).

The Kiparskys (1971:360f) also mention two vague categories which they label "indifferent" and "ambiguous". Indifferent predicates are compatible both with factive and non-factive complements, there is no indication as to whether the speaker presupposes the complement to be factive. Indifferent features include *anticipate*, *acknowledge* and *report*, which fall into Vendler's half-factive category (cf. Chrzanowska 1986:134), e.g.

- (205) Glass acknowledges that the jump in breast cancer could be attributed to more women getting mammograms, because the test can find cancers that might otherwise go undetected until the disease has progressed. [EPOP]

Other items categorised as ambiguous by the Kiparskys such as *think* would be considered non-factive by Vendler, and *remember* would even be classified as full factive (cf. Chrzanowska 1986:134).

The ambiguous category as defined by the Kiparskys includes two items: *explain* and *understand*; these may be interpreted as factive or non-factive depending on whether a presupposition is encoded in the complement clause or not:

- (206) Cold air temperature boosts inflammation in the body, a finding that may help explain why cardiovascular-related deaths increase in the winter months, researchers report. [EPOP]

In the above example a factive interpretation appears to be plausible as the proposition *cardiovascular-related deaths increase in the winter months* is presented as being presupposed, the presupposition being produced by the use of *why*. In the following example, by contrast, it seems that *explain* could plausibly be replaced by a reporting verb such as *say* or *write* and would therefore be classified as Expansive on the basis of its non-factive status:

- (207) During normal puberty, levels of growth hormone (GH) and insulin-like growth factor-1 (IGF-1) rise, triggering a growth spurt, Prabhakaran and colleagues explain in the journal Pediatrics. Growth slows and eventually stops as estrogen levels rise. [EPOP]

Moreover, the verb *know* requires special mention in this context: Despite its seemingly factive semantics, *know* and *realise* are classified as non-factive by the Kiparskys (1971:348) on the grounds of their syntactic behaviour (*turn out* and *it is true/false* being similar cases cf. Chrzanowska 1986:134). Thus “**I know the fact that John is here*, **I know John’s being here*” would not be deemed acceptable, whereas propositional expressions such as “*I know him to be here*” would (Kiparsky & Kiparsky 1971:348), e.g.:

- (208) “We believe that modern-day Hitlers have deliberately adulterated the oral polio vaccines with antifertility drugs and...viruses which are known to cause HIV and AIDS,” prominent physician Datti Ahmed told journalists at the time. [EPOP]

The example shown below includes the corresponding noun *knowledge*, which is embedded in a circumstantial feature, i.e. *to our knowledge*. It is illustrative of the ‘biased’ nature of knowledge:

- (209) In this study we provide, to our knowledge, the first demonstration that AID is invariably expressed within rheumatoid synovial T/B cell aggregates containing CD21⁺ FDC networks, with a distribution closely recapitulating that seen in secondary lymphoid organs, providing direct evidence that ectopic GC-like structures represent a functional tertiary lymphoid organ capable of activating the molecular machinery necessary to sustain SHM and CSR within the synovial membrane. [ESCI]

The use of the possessive determiner *our* to qualify the noun *knowledge* underscores the subjectivity of knowledge. Yet, *know* and *realize* are fully factive by Vendler’s definition (1980:287). Kryk (1982), in her analysis of English and Polish predicates and their complements, suggests that the rigorous dichotomy between factives and non-factives on the basis of formal truth conditions be omitted in favour of a more pragmatic, scalar approach and introduces the label “not-so-factive” (ibid. 107) for predicates such as *know* or *see*. This is symptomatic of the slightly fuzzy boundaries between the concepts.

5.3 Presupposition vs. assertion

As mentioned previously, the Kiparskys (1971:348) argue that factivity hinges on presupposition, and not on assertion. In the example shown below the proposition that seven people turned out to have had HIV at the start of the trial is asserted, but not presupposed to be true.

- (210) It is evident that some knowledge of the data of these issues is indispensable, even if it is often not as adequate as we would like. [EREF]

Thus, if we follow the Kiparskys’ (1971:349) line of argumentation, the following modified versions of the above corpus example would not be considered acceptable:

(211) # Some knowledge of the data of these issues being indispensable is evident.

(212) # The fact of some knowledge of the data of these issues being indispensable is evident.

The following modified versions, by contrast, would be deemed acceptable (ibid.):

(213) # It is odd that some knowledge of the data of these issues is indispensable, [...].

(214) # I regret that some knowledge of the data of these issues is indispensable, [...].

The author presupposes that some knowledge of the data of these issues is indispensable in the modified examples. The concept of assertivity is taken up by Hooper (1975): In addition to the distinction between true factives and semi-factives, Hooper also discerns between non-assertive and assertive verbs. In this view, true factive verbs such as *regret*, *forget*, *amuse*, *suffice*, *bother*, *make sense*, *be odd*, *interesting* are non-assertive, they presuppose the truth of the complement without asserting it (cf. also Nicholas 1998:118). Semi-factive assertive verbs, e.g. *find out*, *know*, *learn*, *notice*, *realise*, *remember*, *reveal*, *see* (Hooper 1975:92, cf. also Nicholas 1998:120), which represent typical items classified as Contractive in the present analysis, differ from non-assertive factives in that they do not presuppose factivity of the complement, instead they

imply in one manner or another that the speaker or subject of the sentence has an affirmative opinion regarding the truth value of the complement proposition. (Hooper 1975:95)

As indicated above, assertive predicates are, in turn, divided into strong and weak assertives on the grounds of the strength of the assertion (cf. Nicholas 1998:119). Hence, *I think* is weaker than *I insist* or *I argue*. From a syntactic point of view, assertive predicates can, at least in English, follow the complement. This syntactic behaviour is illustrated by the syntactic acceptability tests carried out in the following examples taken from Nicholas (1998:118):

He's coming to the party, I think.

He's coming to the party, I admit.

He's coming to the party, I notice.

*He's coming to the party, it's likely.

*He's coming to the party, I doubt.

*He's coming to the party, I regret.

According to Hooper, this does not apply to non-assertive non-factive items such as *it's likely*, *I doubt* or factive *I regret*. However, as in the case of categorisations of factive versus non-factive items on the basis of acceptability tests, assertivity appears to constitute a semantic

factor and, therefore, the boundaries between the classes, again, seem blurry (cf. Nicholas 1998:120). The distinction between strong and weak assertives will however not be outlined in greater detail since the distinction between semi-factives and non-factives is deemed sufficient for the present research purposes. In the present research context, the line will thus be drawn between “full-factives” as defined by Vendler (1980), which roughly correspond to Karttunen’s semi-factives (cf. Chrzanowska 1986:133), on the one hand, and “half-factives” and “nonfactives”, which present propositions as negotiable, on the other.

5.4 Summary

As outlined above, the criteria for distinguishing between different factive statuses largely rely on acceptability tests which inherently involve a degree of subjectivity. Notwithstanding this potential drawback, they are useful tools for a systematic categorisation of the phenomena analysed in this study and can readily be applied to the categorisation of Engagement features occurring in the German section of the corpus. The adverb criterion and possible denial of the proposition (Vendler 1980:285) are considered crucial discerning factors; it is argued here that by presenting a claim in a manner that permits subsequent negation dialogic room is opened up. Whereas “full factives” as defined by Karttunen appear to be less central to the present analysis given the emotive semantics of many of the features falling into this category, it is argued here that “full factives” as defined by Vendler (1980) are sufficiently ‘assertive’ to close down dialogic space and will thus be classified as Contractive in the present study. “Half-factives” and “nonfactives” in the sense defined by Vendler (1980), by contrast, will be categorised as ‘Expansive’ in the analytical framework, the structure of which will be outlined in the following chapter.

PART II
ANALYSIS

6. MODELLING OF THE ANNOTATION FRAMEWORK AND ANALYTICAL PROCEDURE

Following the outline of the theoretical background, this chapter sets out to remodel the Engagement framework (Martin & White 2005) so as to gear it to the present research requirements and outline the analytical procedure. After the outline of the framework, the corpus design will be described as well as the annotation tool used to carry out the analysis. The statistical procedures for assessing the significance of the results thus obtained will be detailed in the final section of this chapter.

6.1 Framework

In the remodelled framework, the first criterion considered in categorising Engagement features concerns the dialogic properties of an item and will be described in the following.

6.1.1 DIALOGIC STATUS

In the present analysis, the criteria for distinguishing between different factive statuses of Engagement features rely on the acceptability tests described in detail in the previous chapter. It was pointed out that the adverb criterion and possible denial of the proposition (Vendler 1980:285) are considered crucial discerning factors. “Full factives” as defined by Vendler (1980) are classified as ‘contractive’, while “half-factives” and “nonfactives” in the sense defined by Vendler (1980) are classified as ‘expansive’ in the EXPANSION VS. CONTRACTION section of the system which deals with the DIALOGIC STATUS of an item. The following screenshot depicts an abridged version of the scheme generated for the annotation of the English section of the corpus. It should be noted that curly brackets represent simultaneous options whereas square brackets stand for mutually exclusive ‘or’-choices:

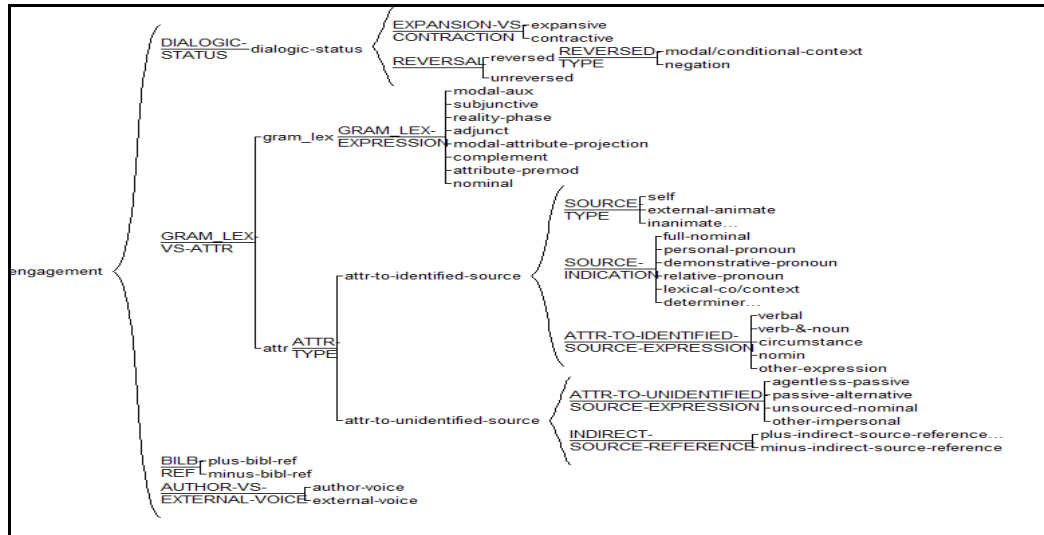


Fig. 6: Screenshot abridged annotation scheme

As can be seen from the illustration, the category DIALOGIC STATUS contains a second set of features, i.e. REVERSAL, which picks up on the impact of modalisation or conditional settings as mentioned in the previous chapter (cf. Karttunen 1971a). The present analysis thus takes into account whether the epistemic or evidential value of individual Engagement features is impacted by modalised or conditional surroundings ('modal/conditional-context'). Considered in isolation, *find*, for instance, would be categorised as a Contractive item, but the Contractive effect is cancelled out by the use of the Expansive feature *seem*:

- (215) Studies of men and women in similarly responsible and demanding jobs do seem to find a reduction in the substantially lower mortality rates among women (e.g. Detre et al., 1987). [EREF]

Find is therefore categorised as 'expansive' and 'reversed' by 'modal/conditional_context'. The second option in this set of features relates to cases of 'negation' which affect the factive status and hence the dialogistic potential of a feature as illustrated below:

- (216) No significant correlation was found between RF by either method and angiographic grades. [ESCI]

Here, *found* is negated and thereby reversed to Expansive since, although the authors report that they did not find such a correlation, they are not denying that such a connection may nonetheless exist.

In the next example, the opposite effect is created by negation:

- (217) Perhaps significantly, there is something casual and cursory about the purely physical comedy of the scene in which Falstaff robs the Kent travellers, only to be unrobbed by Hal. Certainly, there is no doubting the finesse of the teasing post-mortem that follows, or of their next encounter: the prince and his favourite wittily play-acting his impending confrontation with the king. There is much play-acting her e. [EREF]

While the mental verb *doubt* would be categorised as ‘expansive’ in non-negated contexts such as # *X doubts that Y is the case*; the negation closes down the room for dialogistic alternatives and thus causes a reversal to Contractive.

However, it is also possible for the dialogic impact of a feature to remain constant under negation, as in the following case, in which the Engagement feature *seem* retains its Expansive status under negation:

- (218) There does not seem to be any significance in the place of origin of those who supported the coup and those who opposed it. [EREF]

In addition to insertion in an *if*-clause, ‘modal/conditional-context’⁵⁴ also takes into account the impact of subjunctive forms. Conditional context and modalisation by the use of the subjunctive are simultaneously present in the example shown below:

- (219) Before passage, he and other scientists were concerned that consumers would not take advantage of new genetic tests out of fear that insurers and employers would discriminate against them if they turned out to have genetic risk factors. [EREF]

While the item *turn out* on its own would be considered a Contractive feature, embedding in a conditional clause and subjunctive form alter its Contractive status.

Following the above overview of the criteria applied in determining the dialogic status of an Engagement item, the next section is concerned with the linguistic resources used to construe Engagement in the corpora explored here.

6.1.2 GRAM_LEX VS. ATTR

Whereas the first distinction deals with the pragmatic function of features in terms of their dialogic impact, GRAM_LEX VS. ATTR categorises Expansive and Contractive options according to their linguistic form. This classification discerns between lexicalised and grammaticalised realisations of epistemic and modal meanings, ranging from modal auxiliaries to nominal expressions, on the one hand, and propositional realisations involving lexical resources, on the other hand. The example shown below contains an instance of each:

- (220) The key actors here likely are mu-opioid receptors, molecules on cell membranes that allow opioids to bind to them and interact with the cell itself, he says. [EPOP]

⁵⁴ REVERSAL will not be examined in further detail in the discussion of the results in the next chapter. The area of the scheme relating to the factors which trigger reversal is presented here to illustrate the procedure adopted in the classification of Engagement features as either Expansive or Contractive. The discussion will, however, focus on the dialogic status determined in this manner.

While the adverb *likely* would be classified as falling into the lexico-grammatical category (GRAM_LEX), *he says* is exemplary of an Attribution feature (henceforth referred to as ATTR). These features represent a means of expressing evidential meanings by means of semantic resources. Similar features were discussed in connection with the Expansive Attribute set and the Contractive Pronounce and Endorse sets of the Appraisal framework outlined in the previous chapter. It should be noted that the present analysis will depart from the Appraisal terminology and simply use the labels ‘expansive ATTR’ and ‘contractive ATTR’ to refer to features which attribute propositions to sources by means of such framing structures.

The Appraisal framework is thus adapted and remodelled along two axes, the first being functional in that it concerns the presentation of a proposition as either Contractive (e.g. *P knows that X*) or Expansive (e.g. *P believes that X*) according to the criteria set forth above. The second axis concerns the linguistic form of the Engagement features considered in the present analysis, that is by means of GRAM_LEX resources (*perhaps, may, seem to* etc.) or by means of ATTR (e.g. *P thinks that X*).

The ‘basic’ categories outlined in the following apply equally to the application of the scheme to the English and the German subcorpus. However, certain areas of the scheme dealing with the linguistic realisation of Engagement need to be geared to potentially different realisations in the two languages. Language-specific adaptations in the scheme for the annotation of the German section of the corpus will be pointed out and detailed. As mentioned above, the first distinction in this system is concerned with whether the Engagement feature is realised by grammaticalised or lexicalised means or whether propositional content is attributed to ‘sources’ using verbs of proving, i.e. relational processes of the “intensive” “identifying” type, mental processes of perception or cognition or verbal process types as discussed in the previous chapter in connection with the Appraisal framework (cf. Halliday & Matthiessen 2014:245ff). The following section specifies the features grouped under the label GRAM_LEX, which refers to the expression of Engagement by means of grammaticalised and lexicalised expressions. The features considered here comprise linguistic markers described in chapter 3.3.4 in connection with the domains of epistemic modality and evidentiality.

6.1.2.1 GRAM_LEX

The features categorised as GRAM_LEX comprise implicit subjective modalisation expressed via modal auxiliaries conveying epistemic meaning (*may, might, should* etc., cf. also Halliday & Matthiessen 2014) as mentioned in connection with the Likelihood subset of Entertain in the Appraisal framework (see chapter 4.2.2), e.g.

- (221) Still, many researchers are convinced that the trial has provided plenty of data to run with. “This contributes more evidence that an AIDS vaccine may be possible,” says Jerome Kim of the Walter Reed Army Institute of Research and co-author of the Thai trial study (which appeared in the *New England Journal of Medicine* in October). [EPOP]

A feature grouped under the corresponding German category is exemplified by *muss*:

- (222) Außerdem gehen die Forscher davon aus, dass diese Mutation bei einem einzigen gemeinsamen Vorfahren vor wenigstens 16 Generationen aufgetreten sein muss. [GPOP]

The German category also includes subjunctive II forms of modal auxiliaries in epistemic uses:

- (223) Gemittelte Aktivitätsmuster ganzer Zellverbände geben dem Gehirn verlässlicher Auskunft als die Signale einzelner Neurone. Doch auch hier müssten eigentlich Probleme auftreten, die das Rauschen in neuer Gestalt durch die Hintertür wieder hereinlassen. [GPOP]

As can be seen from fig. 6, the next category considered at this level concerns subjunctive verb forms such as *were* in the following example:

- (224) “In general, cancers like pancreatic cancer that almost always have a *KRAS* gene mutation have been quite refractory. That would of course change overnight if there were a promising way to molecularly target *KRAS* abnormalities,” says Daniel Haber, director of the MGH-East Cancer Center. [EPOP]

Here, *were* is a corollary to the conditional *if*-structure. As mentioned in the previous section, *if*-conditionals are only taken into account in cases in which they affect the dialogic space opened up by an Engagement feature. Thus merely their impact in terms of resulting uses of epistemic modal auxiliaries (i.e. *would* in the above example) and subjunctive uses is considered here.⁵⁵

Subjunctive forms of lexical verbs represent a further feature grouped under the GRAM_LEX heading. While the corresponding sections of the English and the German scheme both include a category for the classification of subjunctives, the uses of the subjunctive mood differ in English and German (cf. chapter 3.2). The German scheme additionally distinguishes between subjunctive I (*Konjunktiv I*) and subjunctive II (*Konjunktiv II*) forms (cf. e.g. Zifonun et al. 1997:1731ff for a detailed account of the German subjunctive mood).

⁵⁵ In addition to uses in hypothetical contexts, the English subjunctive mood may also occur in mandative uses (Quirk et al. 1985:156f), e.g. “I demand(ed) that the committee *reconsider* its decision” (Quirk et al. 1985:156). Such uses are however not considered to be relevant to the present study. The same applies to formulaic subjunctives, e.g. “*Suffice* it to say that we won” (example taken from Quirk et al. 1985:157, authors’ emphases).

Probably the most common use of the subjunctive I form occurs in indirect speech or thought as illustrated below (cf. e.g. Kürschner 1997:139f):

- (225) So zumindest interpretieren die beiden Hirnforscher die Scannerdaten: Die linke Hälfte halte die Motivation für Aufgabe eins im Hintergrund parat, während ihr rechtes Pendant die Ausführung der zweiten Aufgabe vorantreibe [1]. [GPOP]

However, subjunctive I is not limited to this function, it may also mark non-factive meanings as illustrated in the following example from the reference corpus:

- (226) Der Bruder fragt ihn, ob er den Weg zur SS-Kaserne kenne. Einen recht langen Augenblick regt sich der Mann nicht, als habe er nichts gehört, dreht sich dann langsam um und sagt: Da. Der Mond lacht. [GREF]

Here, the use of *habe* is triggered by the conjunction *als* and marks the situation described in the subordinate clause as unreal. Subjunctive II forms and *würde*-subjunctives, as illustrated below, are grouped under the second category for the classification of subjunctive features:

- (227) Weil aber 0,83 Kilokalorien ein Kilogramm Körpergewicht um ein Grad Celsius aufheizen, würde ein Zehn-Kilometer-Lauf ohne Kühlmechanismen tödlich enden: Die Körpertemperatur eines 70 Kilogramm schweren Läufers stiege auf 46 Grad Celsius. [GPOP]

The subjunctive II form (i.e. *stiege*) signals non-factivity in the example provided above. Subjunctive II forms may, however, also be used in cases in which there is no formal difference between the subjunctive I form and the corresponding indicative form (cf. e.g. Kürschner 1997:140). This is illustrated below by the subjunctive II form *verblieben*, the corresponding subjunctive I form (i.e. *verbleiben*) being formally indistinguishable from the indicative present form:

- (228) Das Bundesverfassungsgericht ist bei seiner Entscheidung im Jahr 1994 hinsichtlich der Wirkungen des Cannabiskonsums auf der Grundlage des damaligen Erkenntnisstands zu dem Ergebnis gelangt, daß „nicht unbeträchtliche Gefahren und Risiken“ verblieben. [GREF]

Würde-subjunctives occur in cases in which the subjunctive II form is ambiguous as in example (227), in which the corresponding subjunctive II form would be *endete*, which is formally identical to the indicative imperfect form. *Würde*-subjunctives may also serve as politeness markers (Kürschner 1997:140), e.g.:

- (229) # Ich würde meinen, dass [...].

The next item in this set of features concerns expressions of reality-phase (Halliday & Matthiessen 2014:569ff, 580f) such as *seem to*, which would be classified as belonging to the

(Expansive) Entertain category in Appraisal. Reality-phase features can, however, also serve to express Contractive meanings as exemplified below:

- (230) This category of approval is reserved for devices and drugs that have proved beneficial, [...]. [EPOP]

The German set of features includes a category for reality-phase, too. A corresponding German example is shown below:

- (231) Eine Abweichung von der Orientierung an den gängigen Taillengrenzen (102 cm für Männer, 88 cm für Frauen) scheint unumgänglich. [GSCI]

Moreover, epistemic adverbials fall under this heading, e.g.:

- (232) Probably the best known of the nutraceuticals, the omega-3 fatty acids, are also the most intensively studied. [EPOP]

The following example of an epistemic adverbial illustrates a Contractive instance of implicit objective probability grouped under this label:

- (233) These open incisions were constantly vulnerable to infection, and in fact autopsies revealed considerable bacterial growth in the recipients following death. [EPOP]

Also included in this feature are adjuncts conveying evidential values such as *apparently* in the example below:

- (234) For example, most people will not mind waiting a few extra minutes in a hospital waiting room if they know that the doctor has been called away to deal with an emergency. They will not put up with simply being left without being told the reason for being apparently let down. [EPOP]

Such adverbials are grouped under the Entertain set in Appraisal (Martin & White 2005 2005:104ff, see chapter 4). The present analysis categorises these and other features according to their Contractive or Expansive function and then according to linguistic status so as to enable a 'traceable' assignment to clear-cut categories.

The excerpt shown below is illustrative of the features grouped under the corresponding German category for the classification of adverbials. It contains Contractive (i.e. *tatsächlich*) and Expansive (i.e. *vielleicht*) objective implicit assessments of modality expressed by adverbials, e.g.:

- (235) Nun selektierten sie aus 1200 neuartigen Synthesesubstanzen tatsächlich einen Wirkstoff heraus, der vielleicht einmal nebenwirkungsarm gegen Alzheimerdemenz wirken könnte und sich auch als oral verabreichtes Medikament eignen würde [1]. [GPOP]

The next feature concerns projected structures as exemplified below:

- (236) Unwahrscheinlich ist, dass Leptin als Biomarker der ITP diagnostische Relevanz erlangt. [GSCI]

The next subcategory deals with epistemic and evidential adjectives such as *apparent* serving as premodifying attributes, which would also be grouped under the Entertain set in Appraisal, e.g.:

- (237) Its apparent safety and success also bodes well for other up-and-coming ARV-based prevention therapies such as pre-exposure prophylaxis. [EPOP]

A similar item included in the corresponding German category for epistemic and evidential adjectives serving as attributes is shown below, e.g. *offenkundigen*:

- (238) Ein Problem – neben der offenkundigen Kurzlebigkeit des Implantats [sic] – sind zum Beispiel Leckagen des neuen Deckgewebes, so die Wissenschaftler: [...]. [GPOP]

Additionally, GRAM_LEX includes a category for complement uses, e.g.:

- (239) He is chief scientific officer at Abiomed, a Danvers, Mass.-based company created specifically to solve the many problems that were glaringly apparent in the Jarvik-7 experiments. [EPOP]

Below is an example of a feature falling under the corresponding German category:

- (240) In Abwägung von Aufwand und Aussagekraft ist die Wertigkeit der Knochenmarkuntersuchung als positiver Krankheitsnachweis zumindest fraglich. [GSCI]

The next feature included under this heading comprises nominal epistemic expressions. Such “nouns of modality” or “chances” (e.g. *chance*, *possibility*, *probability* or *likelihood*) correspond to formulations along the lines of “it may be (the case) that ...” (Halliday & Matthiessen 2014:536ff). Their use in the corpus is exemplified below:

- (241) The people who bear the least likelihood of responding to the current treatment, those of African-American descent, may want to hold off for more promising treatments like telaprevir. [EPOP]

Here, the nominal expression *likelihood*, which, together with *bear the least* forms part of a relational process, can be paraphrased by epistemic or evidential formulations listed above such as, for instance, # *the people who are least likely to respond to* etc. or *the least likely people to respond to* etc. Similarly, the Contractive feature *fact* is included in the nominal GRAM_LEX category:

- (242) This overlap is caused by the fact that the angiographic grades comprise a continuum of values of regurgitant volume without sharp border between grades. [ESCI]

Items such as *fact* would be classified as “nouns of simple fact” in systemic terms (Halliday 1994:266, Halliday & Matthiessen 2004:471). Contractive *Wahrheit* is an example of a corresponding German nominal expression of epistemic or evidential meaning:

- (243) Dieser Trend aber hält in der Moderne nicht, wie das bedenkliche Resultat von Fiedlers und Hubers Analyse zum Verpaarungsverhalten von rund 10 000 Schweden aussagt: Männer, so die unbestechliche Wahrheit, hatten ihre größten Fortpflanzungserfolge mit einer gerade mal 5,92 Jahre jüngeren Durchschnittsfrau, Frauen den ihren mit einem 3,97 Jahre älteren Modellmann [2]. [GPOP]

The German scheme incorporates categories additional to those in the English section (see chapter 3). One of these concerns the classification of modal future II features expressing assessments of likelihood (Kürschner 1997:139), e.g.:

- (244) Und die Daumen wird er dem Erzrivalen um die Meisterschaftstrophäe nicht unbedingt gedrückt haben. [GREF]

Furthermore, the German framework takes into account the potential realisation of epistemic meanings by particles such as *wohl* or *kaum*:

- (245) Zu viele Teilungsschritte könnten dazu führen, dass männerspezifische Gene nicht mehr abgelesen würden, erklärt Palermo. Mehr als acht Klone aus einem Spermium wären daher wohl kaum zu gewinnen. [GPOP]

While the area of the scheme outlined in this section mainly deals with implicit and explicit expressions of modality expressed by largely grammaticalised and lexicalised means, the following section moves on to the classification of features used in attributing informational content to different entities by means of certain framing expressions.

6.1.2.2 ATTR

In rough terms, the area of the annotation scheme outlined in the following explores the different types of participants or entities brought into play in the construction of knowledge. It is concerned with matrix structures involving, for example, verbs of proving, as discussed in connection with the Appraisal framework in the previous chapter, e.g.:

- (246) Orum's group demonstrated that a type of RNA molecule called a microRNA could be that kind of target in a study that was published December 3 in *Science*. [EPOP]

As mentioned in the outline of the Appraisal framework, these would be considered in terms of “intensive identifying relational” clauses in SFL (Halliday & Matthiessen 2014:721). The entities brought into play, such as *Orum's group* in the example shown above will be referred to as ‘sources’. In this connection, a key area of interest is the referencing of sources by means of quoting or reporting as exemplified below:

- (247) “We need a dramatic increase in the prevention agenda to get down to our goal of 1 to 1.5 million new global infections every year,” says Paul De Lay, deputy executive director of the Joint United Nations Program on HIV/AIDS (UNAIDS), adding that the pandemic’s annual global growth is currently stabilized at close to 3 million new infections. [EPOP]

The excerpt contains a quote, namely an instance of direct speech, framed by *says Paul De Lay* as well as an instance of reported (or indirect) speech with *adding that* acting as the matrix structure. While there are differences between these realisations (Halliday & Matthiessen 2014:508ff),⁵⁶ these will not be examined in further detail in the present analysis since the referencing of a source is the main criterion considered here.

In addition to realisations involving verbal process types, the present analysis also considers uses of mental processes of perception or cognition used in framing structures (cf. Halliday & Matthiessen 2014:515ff):

- (248) Cheng thinks that PHY906’s multitude of effects can be explained through its different chemical constituents, and hopes that his team can identify which chemical is responsible for which change. [EPOP]

In addition to such verbal formulations the present analysis also takes into account corresponding nominal formulations involving verbal or mental process nouns. The different linguistic realisations of ATTR items will be explored in more detail in connection with the respective areas of the annotation scheme. Moreover, ATTR is also concerned with structures which ‘source’ propositional content to inanimate entities:

- (249) Our results suggest that the slope of the shear stress-FMD regression line is different between the 2 populations of distinct cardiovascular risk, thus further validating the utility of FMD: [...]. [ESCI]

Whereas the example provided above explicitly mentions evidence (i.e. *results*), which functions as the source of the ATTR feature, the present study also takes into consideration cases in which the presence of a source is implied, but not made explicit as in the following example:

- (250) These findings are in contrast to our results in that we found no statistical difference in FMD between MR and LR groups, but differences were found when normalizing FMD to shear stress. [ESCI]

⁵⁶ White (1998:85ff) distinguishes between “insert” and “assimilate” extra-vocalise features, the former refer to instances of direct speech. External positions are thus included in the text without adaptations taking place in the case of insertion. In the case of assimilation, they are fused with the author’s position to a certain extent, for example by the use of projection (e.g. *adding that the pandemic* [...] in example (247)) or circumstantial features.

The first classification criterion in this section of the scheme thus discerns between ATTR to identified source and ATTR to unidentified source. Mention should be made that the range of ATTR features described in the following can serve to express Contractive and Expansive meanings. The following section describes the scheme section for the annotation of ATTR features involving source-mention.

6.1.2.2.1 ATTR TO IDENTIFIED SOURCE

As mentioned above, this area of the scheme centres on the use of certain verbs that may potentially be used in reporting scientific insights, either within the context of scientific medical writing or popular scientific journalism.⁵⁷ It was mentioned earlier that the entity to which propositional content is attributed is referred to as the ‘source’ and typically takes the subject position in the framing structure, it may, however, also be conveyed by *by*-adjuncts in passive expressions (see chapter 2.2). In German, corresponding *von*-adjuncts as in the example shown below are taken into account as well as certain non-instrumental *durch*-adjuncts:

- (251) Eine Assoziation zwischen Vorhofflimmern und zentraler, schlafbezogener Atemstörung wurde von Leung et al. beschrieben. [GSCI]

The following excerpt shows the section of scheme which relates to annotation of ATTR features involving identified sources:

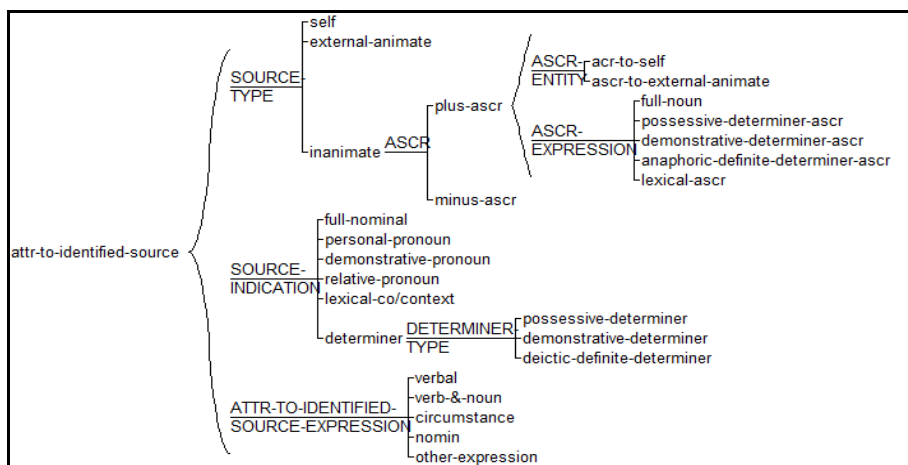


Fig. 7: Screenshot scheme section ATTR to identified source

The realisations represented in the scheme will be described in the following, beginning with the categorisation of the type of source mentioned in an ATTR item.

⁵⁷ Since this section of the scheme largely corresponds in both languages, the English and the German versions will not be described separately and examples from both the German and the English section will be used.

SOURCE TYPE

As shown in the screenshot depicted above, the subcategory regards the type of source referenced by ATTR to identified source. The scheme discerns between ATTR to self, external animate and inanimate sources. The following example taken from the English research subcorpus illustrates ATTR to self realised by the first person personal pronoun *we*:

- (252) If lacunar stroke is mainly caused by a distinct nonatherothrombotic arteriopathy, then we would also expect a lower early recurrent stroke rate [...]. [ESCI]

A corresponding example of ATTR to self taken from the German research corpus is shown below:

- (253) Interessanterweise konnten wir vor kurzem zeigen, dass eine ähnliche Interaktion zwischen allgemeiner und abdomineller Adipositas auch für das Mortalitätsrisiko besteht (22). [GSCI]

It should be noted that features involving explicit self mention in Expansive framers are classified as ATTR features despite their quasi-grammaticalised status (cf. Halliday & Matthiessen 2004:614).

- (254) The research is still evolving, however, and Stuebe is not sure we have found all of the reasons breastfeeding should be a no-brainer health choice when it is an option. "I think there are going to be many answers," she says. [EPOP]

In contrast to the other explicit expressions of modality such as *it's likely/certain that* (ibid.), such items formally resemble ATTR items which reference external human sources as in the following example:

- (255) Other researchers, however, think that a geographical explanation would be "baffling," as noted by a group, led by Valerie Courgnaud, of the Institut de Génétique Moléculaire de Montpellier, Centre National de la Recherche Scientifique [sic] in France, in a commentary published in the same issue of *PNAS*. [EPOP]

Expressions of the '*I think*' type thus differ from other subjective and objective expressions of modality in that the author 'enters the stage' and will, therefore, be treated in analogy to ATTR features which bring other human or inanimate sources into play.

The next feature relates to the sourcing of propositional content to external animate entities, e.g. *Maisel et al.* in the following example:

- (256) Maisel et al. in the Rapid Emergency Department Heart Failure Outpatient Trial (REDHOT) study found that BNP is a potent predictor of the 90-day combined event rate [...]. [ESCI]

Following the description of the categories for the classification of animate sources, the next category deals with ATTR features which involve non-animate sources. An example of the type of feature included in this category is provided in the following excerpt:

- (257) Further support for causation is derived from the fact that the temporal delay of 24-48 months between immunization and the rise in the rates of diabetes is consistent with earlier papers showing a two-to-four year delay between mumps infections and increases in type 1 diabetes [8-11]. [ESCI]

Sources such as *papers* in the above example appear to represent a kind of metonymic realisation of ATTR to self since, in strict terms, it is not the papers that have shown a two-to-four year delay, but the scientists conducting the research.

Moreover, this category includes a range of nouns such as *proof*, *indication*, *confirmation* and *evidence* acting as sources; they are referred to as “proofs” or “nouns of indication” by Halliday (1994:267) and Halliday and Matthiessen (2014:536ff). Such “proofs” correspond to “caused modalities” in the sense of “this proves/implies (i.e. makes it certain/probable that)” (Halliday & Matthiessen 2014:537). In the following example, *our findings* could be rephrased along the lines of *we found that* etc.:

- (258) Our findings suggest that increased circumferential wall tension due to hypertension plays a key role in the remodeling through biomechanical effects on oxidative stress and increased TGF- β expression; the remodelling observed in the presence of hypercholesterolemia could be initiated by oxidative stress that is involved in several processes of atherogenesis and this remodeling is more pronounced in the presence of turbulent blood flow/low wall shear stress. [ESCI]

The nominal expression *our findings* appears to highlight the result of the research, thereby removing the thing (*finding*) from the scientists who conducted the research which resulted in findings. In a sense, such uses of proofs may thus be interpreted as condensed ATTR features in their own right, which are, in turn, embedded in another ATTR feature. The ‘embedded’ ATTR feature thus serves as the source of the ATTR feature into which it has been inserted. In the above example, *findings* thus represents the source of the ATTR feature *our findings suggest that*. As noted above, the possessive determiner provides a link between the findings and the human agents involved in the research. This kind of ‘secondary ATTR’ will be referred to as ascription (ASCR) in the following. As mentioned above, ASCR refers to the use of an inanimate agency in an ATTR feature which, in turn, is realised such that the involvement of another human agency is signalled as in the following example:

- (259) [...] our data support the conception that the atherosclerotic disease process indeed occurs at the level of the conduit artery. [ESCI]

Here the source *data* is ascribed to the author by means of the first-person possessive determiner *our*: This corpus example resembles the evidential items discussed in connection with the Entertain set of the Appraisal framework in chapter 4.2.2.1.1. In the example shown above, the scientists thus appear to ‘step back’ behind their research, their association with the study is merely expressed by the possessive determiner qualifying the nominal head *data*.

Whereas the above Engagement feature is categorised as an inanimate source involving ‘ascribed to self’, sources may also be ascribed to external animate entities:

- (260) But as Schwarz points out, “not all body fat is created equal.” The fat that tends to accumulate during pregnancy is in part visceral fat, which sits around organs in the midsection and can put people more at risk for heart and other types of diseases. Their CT study also found that, of the 351 women aged 45 to 58, those who had children and not breastfed had 28 percent more visceral fat than those who had consistently breastfed. [EPOP]

As can be seen from fig. 7, the annotation scheme includes categories for the classification of different realisations of ASCR. This section of the scheme (ASCR EXPRESSION) is concerned with whether the entities to which a source is ascribed are made more or less explicit. The following extract contains an explicit instance of ASCR by means of full nominal reference:

- (261) This over adjustment explains why almost all of the vaccine manufacturer’s results showed that vaccines were associated with a rate ratio close to 1. [ESCI]

Here, the entity to which the source *results* is ascribed is overtly signalled via premodification by means of the genitive *vaccine manufacturer’s*. In the following example, the source *related research* is also ascribed via full nominal reference (*Kim Cecil of Cincinnati Children’s Hospital Medical Center*), however, the ASCR occurs in the postmodification of the source, namely the by-structure qualifying the source *related research*.

- (262) Related research by Kim Cecil of Cincinnati Children’s Hospital Medical Center published with this study in PLoS Medicine found that 157 of the subjects with the highest lead levels had the smallest brain sizes compared with normal adults, providing a possible mechanism for lead’s effect on behavior. [EPOP]

As mentioned earlier, sources may also be ascribed by means of possessive determiners. The inanimate source *genetische Analyse* in the following example is ascribed by means of the third-person possessive determiner *ihre*:

- (263) Nach Meinung der Autoren lässt ihre genetische Analyse vermuten, dass die Mutation möglicherweise bereits vor 16 Generationen (mehr als 3 Jahrhunderte zuvor) bei einem einzigen Vorfahren aufgetreten ist. [GPOP]

Similarly to full nominal reference, ASCR by means of possessive determiners is considered to provide a stronger indication of human involvement since these are generally marked for gender and number of the ‘possessor’ both in English and in German. ASCR by means of full nominal reference and ASCR by means of possessive determiners are thus considered to be more direct forms of ASCR since they establish a more transparent connection with any humans linked to the source than realisations which rely more heavily on co- and contextual clues.

The annotation scheme also includes categories for slightly more opaque realisations which involve the use of demonstrative determiners creating a deictic link between the inanimate source and the human agency involved. The example shown below is illustrative of this less immediate form of ASCR:

- (264) In conclusion, our work demonstrates that ectopic GC-like structures are not only functional in rheumatoid synovitis, but that their presence may contribute to disease pathogenesis via the production of ACPA. These data elucidate the mechanism of production of ACPA in the synovial membrane and thereby provide evidence of a pivotal role for AID in the pathogenesis of RA. [ESCI]

Data is categorised as the source in the ATTR item *these data [...] provide evidence of a pivotal role for AID in the pathogenesis of RA*. The referent of *these* can be retrieved from the embedded clause in the preceding sentence i.e. *ectopic GC-like structures are not only functional* etc. This proposition is attributed to the inanimate source *work*, which in turn is ascribed to the author by means of the possessive determiner *our*.

Similarly, the demonstrative determiner *dieses* in the German example below qualifies the inanimate source *Ergebnis*:

- (265) In der vorliegenden Arbeit wurde der Median als Grenze zwischen großem beziehungsweise kleinem Taillenumfang gewählt. Obwohl diese Grenze unter den gängigen Risikogrenzen liegt (Männer: 102 cm; Frauen: 88 cm), konnten die Autoren für Personen mit hohem Taillenumfang ein deutlich erhöhtes Diabetes-Risiko feststellen. Dieses Ergebnis stützt Resultate anderer Studien, die zeigen, dass bereits Taillenumfänge unterhalb der gegenwärtigen Grenzwerte mit einem erhöhten Diabetes-Risiko assoziiert sind (e1, 23). [GSCI]

The noun parcels up the proposition presented in the sentence immediately preceding it (i.e. *Bei Personen mit hohem Taillenumfang besteht ein deutlich erhöhtes Diabetes-Risiko*), which is attributed to the authors themselves (*konnten die Autoren [...] feststellen*). The cohesive link between the proposition and *Ergebnis* is established by the anaphoric use of the demonstrative determiner *dieses*. The above excerpt also illustrates an anaphoric use of the definite article *die* (acting as a determiner in *die Autoren*). By taking into account co- and

contextual factors, *die Autoren* can be identified as a form of ASCR to self, similarly to the use of the definite article *the* in the following example (*The results showed*), which requires the surrounding context, specifically *the results of this study are consistent with [...]*, to be taken into account in order to enable readers to identify the authors as the origin of the research outcome taken up again by *the results*.

- (266) The results of this study are consistent with previous studies showing an association between vaccines and type 1 diabetes with relative risks ranging from 1.1 to greater than 2 depending on the vaccine and the time interval [1, 2]. The results showed vaccines were associated with an [sic] statistically increased risk of type 1 diabetes in 12 of 21 endpoints in the general population, while there were no endpoints that showed vaccines associated with a decreased risk of type 1 diabetes. [ESCI]

A further example of implicit ASCR realised by means of deictic reference is shown below:

- (267) Diskussion

Diese Arbeit zeigt an einem experimentellen Modell, dass die durch bFGF induzierte Angiogenese und ihre therapeutische Beeinflussung mit COX-2-Inhibitoren mittels ^{99m}Tc-markierter Erythrozyten dargestellt werden kann. [GSCI]

The inanimate source is indirectly attributed to the authors via the demonstrative determiner *diese* in the German example. This indirect link is supported by contextual knowledge, with the headline *Diskussion* indicating that *diese Arbeit* refers to the authors' own research.

While the use of pronouns and determiners represents a form of ASCR realised via grammaticalised markers, ASCR may also be expressed via lexical items as in the example shown below:

- (268) In conclusion, the findings of the present study are novel in that they provide clinical evidence supporting the utility of FMD:shear stress ratio as an index of endothelial function. [ESCI]

Here, *findings* is categorised as the source of a Contractive ATTR item, namely *the findings [...]* *provide clinical evidence supporting the [...]*, which involves ASCR via postmodification (i.e. *of the present study*). A comparable German example of this type of ASCR is provided in the example below:

- (269) Die vorliegende Studie zeigt, dass bei Patienten mit VHF neben dem bekannt hohen Anteil an OSA auch ein hoher Anteil an ZSA/CSR zu finden ist. [GSCI]

The source is ascribed to the authors by the attributive participle *vorliegende* instead of a first-person possessive pronoun.

In addition to the categories for the classification of ATTR features which entail ASCR as in the case of the examples discussed above, the framework also includes a category for the annotation of inanimate sources lacking ASCR, e.g. *findings* in the following example:

- (270) The results from this paper (Table 1) show that the three doses of the hemophilus vaccine were associated with a rate ratio of 1.23 ($p=0.03$) after approximately eight years of follow-up, which is nearly identical to findings that four doses of the hemophilus vaccine were associated with a relative risk of 1.26 ($p=0.03$) after seven years of follow-up in a clinical trial, and consistent with results from several smaller case control studies (2). [ESCI]

Following the overview of the different types of sources referenced in ATTR features, namely self, external animate and inanimate, the next section of the scheme deals with the way these sources are brought into play.

SOURCE INDICATION

The subcategory of the scheme dealing with the identification of sources (SOURCE INDICATION) is concerned with the manner in which the source is brought into play in ATTR features which involve specified sources. Similarly to cases of ATTR which involve ascribed inanimate sources, different options are available for bringing into play the source of an ATTR feature. As in the case of ASCR, an external animate entity may be marked explicitly as the source of ATTR feature by means of full nominal reference as in the example shown below:

- (271) "There are still a huge number of uncertainties surrounding this trial," says Dennis Burton, an immunologist at the Scripps Research Institute in La Jolla, Calif. [EPOP]

The source of the proposition (i.e. *there are still a huge number of uncertainties surrounding this trial*) is made fully overt by means of explicit nominal referencing (i.e. *Dennis Burton, an immunologist at the Scripps Research Institute in La Jolla, Calif.*). It should be noted that items of the following type are also assigned to this category:

- (272) But the extracted tissue began producing insulin, glucagon and other hormones after the newly identified cells were added, indicating that they were indeed progenitors capable of differentiating into all the islet cell types, including beta cells. [EPOP]

Here, the evidence functioning as the source of the ATTR feature is not realised by means of a nominal feature, instead it is expressed by a whole clause: *the extracted tissue began producing insulin, glucagon and other hormones after the newly identified cells were added* instead of a noun.

The next option concerns instances in which the source is referred to by personal pronouns, which enable the source of the ATTR feature to be retrieved by means of a relatively explicit deictic link. The personal pronoun *he* refers to an animate source (i.e. *Kim*) and *it* to an inanimate source (*That vaccine test*) in the following example:

- (273) “We’ve taken a very small step,” Kim says. “It’s not a home run, but it opens the door to future work.”
Vaccine proponents also point to the lessons learned from the failed Merck STEP trial. That vaccine test, halted in 2007, got only as far as phase II, but even so it did not leave researchers back at square one. It suggested, he notes, how some HIV strains could be blocked from infecting cells and offered data that could help in the interpretation of the Thai results. [EPOP]

In the German example provided below, an external animate source is specified in a similar manner by means of the third-person personal pronoun *sie*:

- (274) Eine Assoziation zwischen Vorhofflimmern und zentraler, schlafbezogener Atemstörung wurde von Leung et al. beschrieben. Sie konnten in einer Gruppe von 60 Patienten mit ZSA einen Anteil an Vorhofflimmern von 27 % nachweisen (9). [GSCI]

The referent of *sie*, i.e. *Leung et al.* can be retrieved from the preceding context. As in the case of the ASCR of sources, the way sources are referenced may be more or less explicit. Hence, slightly less direct forms of ATTR are also included. This concerns sources which are realised, for instance, by demonstrative pronouns such as *dies* in the following example (cf. also Halliday & Matthiessen 2014:722):

- (275) Zuvor erschienene Studien hatten jedoch gezeigt, dass bei vielen Patienten wichtige neuronale Verbindungen im Gehirn überraschend stark erhalten bleiben. Dies, so argumentieren die Forscher, deute darauf hin, dass wichtige Funktionen im Gehirn mit Hilfe einer therapeutischen Behandlung womöglich wieder aktiviert werden könnten. [GPOP]

Dies in combination with *deute darauf hin, dass* is categorised as ATTR to identified source, with *dies* acting as a ‘dummy’ source linking the proposition to the actual source. The referent of this deictic element is the research outcome described in the proposition presented in the context preceding the ATTR feature (i.e. *dass bei vielen Patienten wichtige neuronale Verbindungen im Gehirn überraschend stark erhalten bleiben*), which forms part of another, separate ATTR feature (i.e. *zuvor erschienene Studien hatten jedoch gezeigt, dass* etc.).

In addition to demonstrative or possessive pronouns, relative pronouns such as *which* in the corpus example provided below represent a means of referencing the source of verbal ATTR features:

- (276) Causation is supported by a large prospective randomized clinical trial, which demonstrated statistically significant clusters of extra cases of diabetes occurring between 36 to 48 months after immunization. [ESCI]

Here *a large prospective randomized clinical trial* is marked as the source of the ATTR feature by means of the relation signalled by the relative pronoun *which*. Similarly, in the German example shown below, the relative pronoun *was* enables the content of the preceding clause to be identified as the source of the ATTR item *was nicht ausschließt, dass* etc.:

- (277) Damit wurde erstmals seit knapp einem Jahr der Erreger wieder offiziell in Deutschland nachgewiesen, was aber nicht ausschließt, dass er latent in hiesigen Vogelbeständen vorkommt. [GPOP]

The next option included in this set concerns cases such as the one shown below, in which the authors write about themselves in the third person. Whereas the features described above rely on grammatical markers, contextual knowledge is required even more to recognise that the authors are actually talking about themselves:

- (278) Schlussfolgerung

Die Autoren konnten ein gehäuftes Vorkommen von schlafbezogenen Atemstörungen bei Patienten mit VHF zeigen. [GSCI]

Cases in which sources can be identified on the basis of lexical items such as *vorliegende* are also taken into account in this connection:

- (279) Dennoch konnten auch die Autoren der vorliegenden Untersuchung eine ähnliche Prävalenz feststellen. [GSCI]

Again, the authors are referring to themselves in the third person (*die Autoren*) in the above example. The head *Autoren* is qualified by means of a postmodification (i.e. *der vorliegenden Untersuchung*), which signals that the authors are, in fact, referring to themselves.

Whereas demonstrative pronouns as described above might plausibly be expected to occur as sources in verbal ATTR features, sources realised by means of demonstrative determiners appear to be pertinent to nominal ATTR features. The linguistic realisation of ATTR features specifically concerns the realisation of the process element of an ATTR feature, which will be explored in greater detail in the next section. However, brief mention should be made of the realisation of sources invoked in nominal ATTR features as in the example shown below:

- (280) Moss has shown that animals lacking these receptors do not develop lung cancer when injected with cancer cells. "If they don't have the receptor they don't get the tumor," adds Moss, whose group

presented its findings at a cancer meeting last November and is now submitting them for publication. [EPOP]

In the above instance of a nominal ATTR feature (*its findings*), the deictic link created by the use of the possessive determiner *its* enables *group* to be identified as the source of *findings* (*findings* would be interpreted as condensing the proposition *if they don't have the receptor they don't get the tumor*). The nominal ATTR feature is thus interpreted as corresponding to a verbal formulation such as *Moss's group found that animals lacking these receptors* etc.

Similarly, demonstrative determiners appear to be potential, albeit slightly less direct, means of indicating the source of nominal ATTR features.

- (281) "Part of the reason for that," McDonald says, "is that cancer is not a single disease – there's a lot of variability. A given patient may have more of one protein, while another won't."

MacDonald's approach, which effectively monitors 20,000 biomarkers in the form of metabolites, represents a culmination of sorts in recent thinking in biomedicine. "This finding follows the general theme, emerging over the past decade, of identifying patterns of biomarkers in [bodily] fluids such as blood, saliva and tears," says Emanuel Petricoin, co-director of the Center for Applied Proteomics and Molecular Medicine at George Mason University, who was not involved in the study. [EPOP]

The issue of referencing by demonstrative determiners was raised previously in connection with ascribed inanimate sources. It should be kept in mind that the use of demonstrative determiners occurring in ASCR serves to 'link' the inanimate source of an ATTR feature to a human being. In cases of ASCR they thus qualify inanimate sources which are integrated in an ATTR feature as in the example shown below:

- (282) Women who had taken medication to suppress lactation also seemed to have a lower risk of developing breast cancer compared with women who gave birth but did not breastfeed, according to recent research by Stuebe and colleagues (though these drugs have questionable safety records). These findings hint that the changes in breasts that become engorged with milk that is not expressed could up the chances for breast cancer down the road. [EPOP]

In example (281), by contrast, *this finding* does not act as the source of an ATTR feature, instead it represents an ATTR feature in itself. Here, *this finding* corresponds to an ATTR feature along the lines of # *McDonald found that part of the reason for that is that cancer is not a single disease* etc. *Finding* acts as a "conceptual shell" (Schmid 2000), which takes up the proposition thus presented in the preceding ATTR feature. The demonstrative determiner enables *McDonald* to be identified as the initial source of *finding*. *This finding* is thus, in a sense, retrospective, in that it condenses the claim presented in the ATTR feature preceding it, i.e. "*Part of the reason for that,*" McDonald says, "*is that cancer is not a single disease – there's*

a lot of variability. A given patient may have more of one protein, while another won't." The semantics of *finding* implies a cognitive process involving a conscious entity. However, compared with SOURCE INDICATION by possessive determiners, the proposition referenced by the nominal ATTR appears to be more removed from any human agents since, as mentioned in connection with ASCR, the use of possessive determiners may be interpreted as creating a tighter link with human or inanimate sources than the use of demonstrative determiners.

The next type of item included in this category of features relies even more on contextual clues. This type of SOURCE INDICATION is illustrated below:

- (283) "We believe that modern-day Hitlers have deliberately adulterated the oral polio vaccines with antifertility drugs and...viruses which are known to cause HIV and AIDS," prominent physician Datti Ahmed told journalists at the time. Part of the suspicion traces back to the late 1990s, when U.S.-based drug company Pfizer showed up to administer a test of its experimental drug Trovan in the wake of a meningitis epidemic. [EPOP]

In the case of this shell use (i.e. *the suspicion*) the source of the proposition condensed in *suspicion* can be retrieved due to the anaphoric use of the definite determiner *the* preceding *suspicion*. The use of the definite article enables *the suspicion* to be interpreted as taking up the proposition *modern-day Hitlers have deliberately adulterated the oral polio vaccines with antifertility drugs and...viruses which are known to cause HIV and AIDS*. This proposition is attributed to *we* in the quote. The personal pronoun *we* can be identified as referring to the author of the inserted material (i.e. *prominent physician Datti Ahmed*).

As mentioned above, the topic of SOURCE INDICATION by means of determiners is related to the realisation of the process element in the ATTR features, which will be examined in more detail in the following section.

ATTR TO IDENTIFIED SOURCE EXPRESSION

Typical instances of ATTR involve verbal features used in reporting speech or thought as described previously. Here, the verbs occur in matrix structures involving projections which encode the proposition qualified by the matrix structure, e.g.:

- (284) For years scientists have thought that metabolites might be a good way to detect disease, says biologist John McDonald, co-author of the study, but "the technology is what has been holding people back." [EPOP]

A German example of a verbal ATTR item is provided below:

- (285) Retrospektiv wiesen Gami et al. zudem bei 3 542 Personen ein erhöhtes Risiko für das erstmalige Auftreten von Vorhofflimmern bei Unter-65-Jährigen durch eine bestehende OSA nach (19). [GSCI]

In addition to such verbal expressions, this set also includes a category for the annotation of verb-noun combinations, which typically involve relational structures involving nouns of indication (cf. Halliday & Matthiessen 2004:471) as described previously, e.g.:

- (286) Arnold Kriegstein, director of the Institute for Regeneration Medicine at the University of California at San Francisco, says the research is proof that stem cell transplants may prompt proper myelin production. [EPOP]

Or cognitive nouns as included in the following example:

- (287) [...] our data support the conception that the atherosclerotic disease process indeed occurs at the level of the conduit artery. [ESCI]

The postmodification of the items considered here typically encodes the proposition. Below is an example of a light verb-noun combination (*zum Ergebnis kommen*⁵⁸) assigned to the corresponding German category:

- (288) Es ist nicht überraschend, dass Vergleichsberechnungen zum Ergebnis kommen, dass die Einbuße von 3,5 QALYs (quality adjusted life years), die für ein Kind mit isolierter Thrombozytopenie anzusetzen sind, durch die Knochenmarkuntersuchung lediglich um irrelevante vier Tage verbessert werden (5). [GSCI]

Circumstantial adjuncts realised via prepositional phrases are also taken into consideration, e.g.:

- (289) Consumer sales reached an estimated \$818 million for glucosamine and chondroitin sulfate in 2006, according to the Nutrition Business Journal. [EPOP]

German offers a comparable means of expressing ATTR by means of prepositional phrases serving as circumstantial adjuncts, e.g.:

- (290) In Deutschland gab es nach Angaben des Robert Koch-Instituts (Stand: 25. 09. 2009) 20 068 Fälle der Neuen Influenza A (H1N1/09) bei 6 073 autochthon erworbenen Infektionen (e5). [GSCI]

The German version of the scheme additionally takes into account circumstantial items realised by means of ATTR items expressed through elliptical means, which typically involve the conjunction *so*, e.g.:

⁵⁸ This type of structure is typically referred to as *Funktionsverbgefüge* in German (cf. e.g. Zifonun et al. 1997).

- (291) Die Sehkraft der meisten Patienten habe sich in ähnlichem Maß verbessert, wie es bei Verpflanzung einer Spenderhornhaut zu erwarten gewesen wäre, so Griffith und Kollegen. [GPOP]

A further example of verbal ellipsis is shown below:

- (292) Berens: „Wir vermuten, dass die Nervenzellen so verdrahtet sind, dass Korrelationen kaum auftreten.“ [GPOP]

The next category in this set of features is concerned with nominalised forms of the relevant verbal and mental process types:

- (293) Spurred by the rising sales of antioxidant supplements, Pom Wonderful, makers of pomegranate juice, now makes an antioxidant supplement that they claim has “extraordinary health benefits.” This proclamation is echoed by numerous health supplement ads in health food stores and on the Internet. [EPOP]

Moreover, “nouns of indication” (Halliday & Matthiessen 2014:537) are also grouped under this heading, e.g.:

- (294) If lacunar stroke is mainly caused by a distinct nonatherothrombotic arteriopathy, then we would also expect a lower early recurrent stroke rate compared with nonlacunar ischemic stroke (attributable to a lower frequency of active sources of thromboemboli); a tendency for recurrent stroke subtypes to “breed true” (ie, a further lacunar ischemic stroke would be more likely after a lacunar than a nonlacunar ischemic stroke); and a lower risk of MI among patients with lacunar vs nonlacunar ischemic stroke. We tested these hypotheses in a large, prospective, hospital-based cohort of well-characterized ischemic stroke patients. [ESCI]

These were mentioned above in connection with inanimate sources, where it was pointed out that they are capable of serving as sources in ATTR to identified source features. The noun *hypotheses* in the above example does not, however, act as the source of an ATTR feature, instead it is treated as an ATTR feature in its own right since it is considered as a nominal form of a corresponding verbal ATTR feature. As outlined previously, the above nominal items can also be considered in terms of conceptual shells (cf. Schmid 2000). Verbal paraphrases along the following lines would thus seem plausible:

- (295) # Pom Wonderful, makers of pomegranate juice, proclaimed that the antioxidant supplement had extraordinary health benefits.

- (296) # We hypothesised that if lacunar stroke [...].

The following German example contains a nominalised mental process of perception (i.e. *Beobachtung*):

- (297) Die hier dargestellten klinischen Daten deuten darauf hin, dass es sich bei der Infektion mit der Neuen Influenza A (H1N1/09) bis Mitte September 2009 um ein eher mildes Krankheitsgeschehen handelte, das vorwiegend im Ausland akquiriert wurde. Diese Beobachtung gilt auch für die erkrankten Kinder. [GSCI]

Moreover, it should be noted that nominalised items such as the *demonstration* in the following example would be categorised as nominal ATTR features if they occurred in isolation. In the example, however, it is, in turn embedded in an ATTR features, i.e. *provides strong evidence*:

- (298) Our demonstration that FDC β follicular units invariably express AID and are surrounded by ACPA-producing plasma cells provides strong evidence that ectopic lymphoid structures in the RA synovium are functional and support autoantibody production. [ESCI]

It would thus be classified as the source of this ATTR feature, which modalises the proposition *ectopic lymphoid structures in the RA synovium are functional and support autoantibody production*.

In systemic terms, *demonstration* represents a “proof”, that is a type of “fact noun”. As was mentioned in connection with the outline of source types, “proofs” correspond to “this proves/implies (i.e. makes it certain/probable that)” (Halliday & Matthiessen 2004:471, Halliday & Matthiessen 2014:537). It should be noted that *demonstration*-type nouns are treated differently from the other “fact nouns” in the present analysis. *Fact* and the other nominal modal items (i.e. “chances”, e.g. *likelihood*, *probability*, *certainty* etc.) can plausibly be paraphrased by means of other GRAM_LEX items, e.g. “it is (the case) that” or, respectively, “it may be (the case) that” (cf. Halliday & Matthiessen 2004:470ff on the syntactic behaviour of fact nouns). These are categorised as GRAM_LEX items. In the present analysis, however, *demonstration*-type nouns will be treated as ATTR features in cases where they can be rephrased as corresponding ATTR features involving framers of the kind described further up (e.g. # *we demonstrated that FDC β follicular units* etc.).

A further feature includes miscellaneous items such as the predicated theme in the following example (cf. Halliday & Matthiessen 2004:95ff) which convey epistemic or evidential meanings, but do not fall under the labels listed above:

- (299) Upon infection, the virus in the blood and semen are often nearly identical, but over time, previous studies have shown, the different populations become varied, making it “clear that the virus in the blood does not always represent the virus at the site of the transmission,” Jeffrey Anderson and Li-Hua Ping, both of the Center for AIDS Research at the University of North Carolina, noted in an e-mail to *Scientific American*. [EPOP]

The following relational item is another example of an item categorised as ‘other realisation’:

- (300) Infectious disease experts cautioned that the goal was overly optimistic. They were right. [EPOP]

Following the above description of the part of the scheme for the annotation of ATTR to identified source, the next section turns to the ATTR of propositions to unidentified sources.

6.1.2.2.2 ATTR TO UNIDENTIFIED SOURCE

The category dealing with the annotation of items classified as ATTR to unidentified source is divided into two further subcategories. Its structure is illustrated in the screenshot of the annotation scheme shown below:

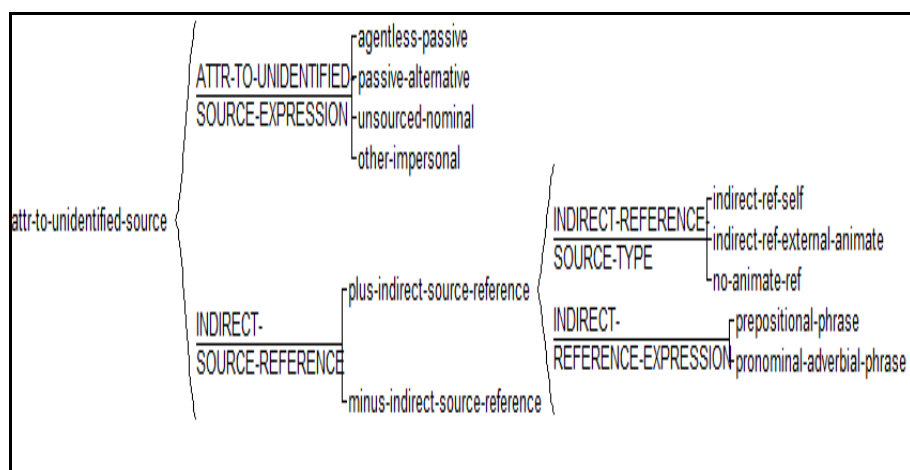


Fig. 8: Screenshot scheme section ATTR to unidentified source

The first criterion deals with the way items categorised as ATTR to unidentified source are expressed (ATTR TO UNIDENTIFIED SOURCE EXPRESSION). The different linguistic realisations considered in the present analysis will be outlined in the following.

The first category concerns the use of agentless passives as exemplified below:

- (301) Although normalization of brachial artery flow-mediated dilation (FMD) to individual shear stress (FMD:shear stress ratio) has been proposed to improve this measure of endothelial function, the clinical utility of FMD normalization has not yet been demonstrated. [ESCI]

A German example of ATTR to unidentified source expressed by means of an agentless passive is provided below:

- (302) Frühere Studien beschreiben eine hohe Prävalenz insbesondere der ZSA/CSR bei systolischer Herzinsuffizienz (7, 8), jedoch ist auch eine Assoziation zum VHF berichtet worden (9). [GSCI]

In addition to agentless passives, passive alternatives are also taken into consideration. In the English scheme, uses of the general pronoun *one* in impersonal formulations (cf. Halliday & Matthiessen 2004:325) involving relevant verbs are taken into account:

- (303) In fact, one could argue that the improvement in measurement sensitivity when normalizing FMD to shear stress area under the curve could be merely explained by discrepancies in time-to-peak dilation. [ESCI]

The resources available in English and German differ as regards passive alternative options (see chapter 2.2). Whereas impersonal *one* expressions are the only passive alternative considered in the English version of the scheme, the German category is subdivided to cover a range of realisations. These include *sein* + *zu* + infinitive, e.g. (304), and modal participle structures, e.g. (305):

- (304) Es ist zu erwarten, dass die Zahlen der autochthon erworbenen Infektionen und die der Todesfälle im weiteren Verlauf deutlich ansteigen werden. [GPOP]
- (305) Das zu erwartende Erregerspektrum und die Resistenzlage sind von verschiedensten Faktoren abhängig: [...]. [GPOP]

Impersonal reflexive structures are also taken into consideration, e.g.:

- (306) Allerdings zeigte sich eine Abhängigkeit der Ergebnisse vom Alter der Patienten. [GPOP]

Moreover, *lassen* + *sich* + infinitive items, e.g. (307), *man* formulations, e.g. (308), and *bar-* suffixed adjectives, e.g. (309), are included:

- (307) Sie sind ebenso gesund und munter wie Kinder aus ICSIs oder IVFs mit frischen Ei- und Samenzellen, und es ließen sich keine erhöhten Fehlbildungsraten feststellen, berichten Anja Pinborg von der Universität Kopenhagen und ihre Kollegen [2]. [GSCI]
- (308) Genau diese Reaktionen zeigt auch echtes Lungengewebe, wie man weiß – allerdings erst nach einer Reihe von Tierversuchen. [GPOP]
- (309) Qi und Meridiane entzogen sich allerdings bislang erfolgreich jeder wissenschaftlichen Bestätigung – während die tatsächliche Wirksamkeit von Akupunktur dagegen durchaus nachweisbar ist. [GPOP]

Impersonal light verb and noun combinations are also included in this category, e.g.:

- (310) Immerhin aber ist nun prinzipiell der Beweis erbracht, dass der neu programmierte Zelltyp „alles kann, was traditionelle embryonale Stammzellen auch können“. [GPOP]

In addition to passive alternatives, the German scheme also includes a further subcategory for the classification of formulations involving the impersonal expressions *gelten als* (311) and *heißt es* in (312)

- (311) Ganz anders war es dagegen um die beidseitigen, direkt hinter der Stirn liegenden Abschnitte des Präfrontalkortex bestellt, des so genannten frontopolaren Kortex. Er gilt gemein hin als ranghöchstes Entscheidungsorgan und demonstrierte dies auch im aktuellen Experiment. [GPOP]
- (312) Mit Blick auf den Verschluss der Luftwege war ein Joint zwischen 2,5 und 5 Mal so gefährlich wie eine Zigarette, heißt es in der Studie. [GPOP]

Both items may be paraphrased using Engagement features corresponding to instances of ATTR mentioned above, the first one, for instance, by using the passive voice (e.g. # *Gemeinhin wird behauptet, dass er das ranghöchste Entscheidungsorgan darstellt* etc.). In the case of example (312), a paraphrase along the lines of # *die Studie besagt, dass mit Blick auf den Verschluss der Luftwege ein Joint zwischen 2,5 und 5 Mal so gefährlich wie eine Zigarette war* seems plausible. Hence they seem to represent alternative means of expressing ATTR to unidentified source. It should be noted here that similar manifestations of this type of Engagement are conceivable, these are however not included in the present scheme since the scheme was geared to the actual features occurring in the corpus.

Returning to the features common to both languages, this area of the framework also comprises a feature for the categorisation of nominalised forms of the verbal, relational and mental processes (cf. Halliday 1994:263) considered here. An example of a feature falling into this category is provided by *assumption*, which is not attributed to a source:

- (313) First, the interpretation of the results is based on the assumption that the (actual) endothelial function of the MR group is lower than that of the LR group. [ESCI]

Similarly, the excerpt shown below contains a nominal formulation which is not attributed to a source (i.e. *der Gedanke, dass*). This expression is illustrative of items falling under the corresponding German subcategory.

- (314) Trost oder Hoffnung spendet da höchstens der Gedanke, dass die Aussicht auf Erfolg nach einem teilweise sehr aufwändigen und belastenden Prozedere sich inzwischen wenigstens mit Mutter Natur messen kann: Nach IVF und ICSI, so meldeten die behandelnden Kinderwunschzentren für das Jahr 2005, wurden etwa dreißig Prozent der Frauen tatsächlich schwanger. [GPOP]

The last feature grouped under ATTR TO UNIDENTIFIED SOURCE EXPRESSION provides a category for the small number of miscellaneous items which do not match the categories listed above. The following example illustrates the type of feature included in this group:

- (315) With the clinical successes of the simpler devices in the 1990s, it became apparent that many people with heart failure could get by with VADs alone. But the jury is still out on this: a fair number of patients with VADs later require right ventricular support as well. Some believe that a total heart

replacement, because it is better at controlling overall circulation, will lead to less kidney and liver failure. [ESCI]

Formally, the expression corresponds to ATTR to identified source, the proposition is, however, sourced to *some*. Due to this vague form of reference by means of an indeterminate pronoun no specific group of people can be identified as the source.

An example of a miscellaneous feature from the German subcorpus which fits the functional criteria outlined above, but which does not meet the formal criteria of the features is provided below:

- (316) Bemerkenswert ist die Analyse der Varianzen, die eindeutig eine Korrelation zwischen gutem Therapieergebnis und dem Alter des Patienten zeigte (Abb. 4). Dabei fiel auf, dass Patienten, die älter als 50 Jahre sind, bessere Erfolgsraten nach der einmaligen Sklerosierung hatten. [GSCI]

The second criterion considered in this context, i.e. INDIRECT SOURCE REFERENCE, concerns the indirect mention of sources via referencing of inanimate entities through prepositional adjuncts as exemplified below:

- (317) The transmission electron microscopy of sham-operated aortas did not differ from that reported in the literature [15,17,24]. [ESCI]

It concerns features which enable sources to be brought into play in such a way that the relationship between the proposition and the sources is not as immediate as in the cases of ATTR to identified source in which inanimate entities function as sources as exemplified below:

- (318) A new study in Science says the human brain links persons, places and things (think: nouns) with their associated actions. [EPOP]

Moreover, and similarly to the case of ASCR outlined in connection with ATTR to identified source, inanimate entities occurring in such prepositional adjuncts may in turn be linked to an animate entity by means of pre- or postmodification. This type of usage is exemplified below:

- (319) While birth asphyxia was reported in a quarter of their group of SIP in the study by Holland et al. [5] we did not find any association between low APGAR scores and SIP. [ESCI]

The above instance of ATTR to unidentified source involves indirect referencing by means of a prepositional phrase. It could be rephrased as # *Holland et al. found that* etc., which would correspond to ATTR to identified source, namely an external animate source. In example (319), however, the animate agencies (*Holland et al.*) are moved to the background.

As in English, INDIRECT SOURCE REFERENCE can also be realised via prepositional adjuncts in German, e.g.:

- (320) In Studien (2, 11) wurde gezeigt, dass der histologische Tumortyp einen Einfluss auf die Detektionsrate der FDG-PET hat. [GSCI]

Human involvement is signalled through modification of the inanimate noun *Studie* in the following German instance of INDIRECT SOURCE REFERENCE:

- (321) Diese Ergebnisse werden durch die Untersuchungen von Ohta und Kollegen (21) bestätigt, wohingegen in der Studie von Cook et al. (8) gezeigt werden konnte, dass die Sensitivität von FDG-PET und Skelett -szintigraphie durch die Art der Knochenmetastasen beeinflusst wird. [GSCI]

Writers may use this option to enter the scene as in the following example, in which the authors bring themselves into play via a deictic link:

- (322) In dieser Studie zeigte sich die FDG-PET insbesondere im Nachweis von Lungenmetastasen und mediastinalen Lymphknotenmetastasen dem Röntgen-Thorax überlegen. [GSCI]

In this instance of ATTR to unidentified source, researchers appear to be demoted to the role of ‘witnesses’ instead of being presented as active protagonists. This aspect touches on cross-linguistic differences concerning the semantic versatility of the entities capable of occupying the subject position (Doherty 1996, Teich 2003).

Similarly, but even more indirectly, the use of pronominal adjuncts such as *hier* enables entities to be brought into play, e.g.:

- (323) Für die hier untersuchten 150 Patienten mit Vorhofflimmern zeigte sich in der ZSA/CSR-Gruppe eine Tendenz zu höherem NT-proBNP. Ebenso konnte im Gegensatz zu entsprechenden Studien mit herzinsuffizienten Patienten (7, 13) keine Differenz der NYHA-Klasse nachgewiesen werden. [GSCI]

The example shown above includes numerical indices. The treatment of this type of bibliographic referencing will be described in the following section.

6.1.3 BIBL REF

This classification concerns the presence of numerical bibliographic referencing (BIBL REF) as illustrated below:

- (324) Approximately one-quarter of ischemic strokes are lacunar, presumed to result from occlusion, or perhaps leakiness,¹ of one of the perforating arteries supplying the deep, subcortical areas of the brain. The underlying arterial pathology is poorly understood, but in most cases it is thought to be an intrinsic small vessel disease distinct from the atherothromboembolic processes causing most other ischemic strokes.^{1,2} [ESCI]

The presence of this type of indexing will be taken into account in cases where Engagement features are concerned. Here, ATTR to unidentified source (i.e. *presumed to, is thought to*) co-occurs with numerical bibliographic references (i.e. 1; 1,2). The two propositions presented (*Approximately one-quarter of ischemic strokes are lacunar etc.* and, respectively, *the underlying arterial pathology is an intrinsic small vessel disease distinct from etc.*) are presented without explicit mention of sources.

As will be seen in the following chapter, which discusses the results of the corpus analysis, the combination of Engagement features with BIBL REF is relevant to the scientific corpora analysed in the present research context. The fact that propositions can thus be attributed to human sources without the use of linguistic markers will be taken into consideration. In the above excerpt, there is no linguistic indication of whether the propositions presented in this manner are supported by the authors or not. As noted by Skelton (1997), such forms of citation often do not provide any indication of the authors' stance toward the propositional content presented. Determining any overlap in the authorship of the articles included in the corpus and the articles cited by means of this type of bibliographic indexing would be a taxing endeavour given the fact that the majority of the articles explored in the present study are multi-authored papers. The present analysis will, however, take a closer look at the type of Engagement features used in combination with this form of citation.

6.1.3 AUTHOR VOICE VS. EXTERNAL VOICE

The final set of features located at this level deals with whether an Engagement feature is attributable to the author's voice or to an external voice. This distinction is illustrated below:

(325) Indeed, Georgetown physicians found that CyberKnife could not only treat brain tumors but also prostate, neck and other cancers, Collins says. [EPOP]

The proposition *the Georgetown physicians found that CyberKnife could not only treat brain tumors but also prostate, neck and other cancers* is presented as factive by Collins, there being no indication of doubt as to the validity of this proposition on his part. By contrast, the author of the article, adopting a neutral position towards this proposition in citing Collins, inserts it into an Expansive framer (*Collins says*), thereby providing no hint as to his stance towards the truth value accorded to this statement. Therefore, the Engagement features in the segment *Indeed, Georgetown physicians found that CyberKnife could not only treat brain tumors but also prostate, neck and other cancers* is treated as 'external voice' while the superordinate Engagement feature *Collins said* stems from the author and is categorised as 'author voice'.

Following the outline of the schemes, the next section moves on to the design of the corpus to which the schemes will be applied.

6.2 Corpus Design

In this study, English research reports published in medical journals will be compared with medical articles from English popular scientific publications; and, analogously, German research articles will be contrasted with German popularisations to investigate the strength of the assumed effect of popularisation on the use of the features analysed here in both languages. Moreover, the different expressions of Engagement will be compared cross-linguistically. Furthermore, reference corpora in English and German containing a mix of different registers in each language provide a backdrop for comparing register-specific occurrences of Engagement. The reference subcorpus is part of the CroCo-corpus (Hansen-Schirra et al. 2012), and the medical research subcorpus is an extended version of Hansen-Schirra (2011).⁵⁹ The corpus explored in the present analysis has an overall size of 194,884 tokens. The following panel details the composition of the corpus:

| English corpus section | German corpus section |
|---|---|
| Research publications ESCI: 29,716 tokens | Research publications GSCI: 29,780 tokens |
| Popular scientific prose EPOP: 32,599 tokens | Popular scientific prose GPOP: 30,650 tokens |
| Reference corpus EREF: 35,703 tokens | Reference corpus GREF: 36,436 tokens |

Fig. 9: Corpus design

Together, the English and the German research subsections of the corpus will henceforth be referred to as SCI. POP stands for the English and the German popular scientific prose subsections and REF denotes the English and German reference subsections of the corpus. The results presented in the following chapter are scaled up or down in relation to a ‘norm’ size of 30,000 tokens of the individual subsections.

⁵⁹The bibliographical details of the medical corpus and the popularisations are provided in the list of references.

6.3 Annotation Tool

The corpus analysis was conducted using the UAM Corpus Tool 2.8.12 (O'Donnell 2008) for the manual and semi-automatic corpus annotation of text segments⁶⁰ and statistical feature analysis. The UAM corpus tool enables users to create network-like schemes for the annotation of corpora. The following screenshot shows the entire English scheme, fragments of which were presented and discussed in the previous sections.

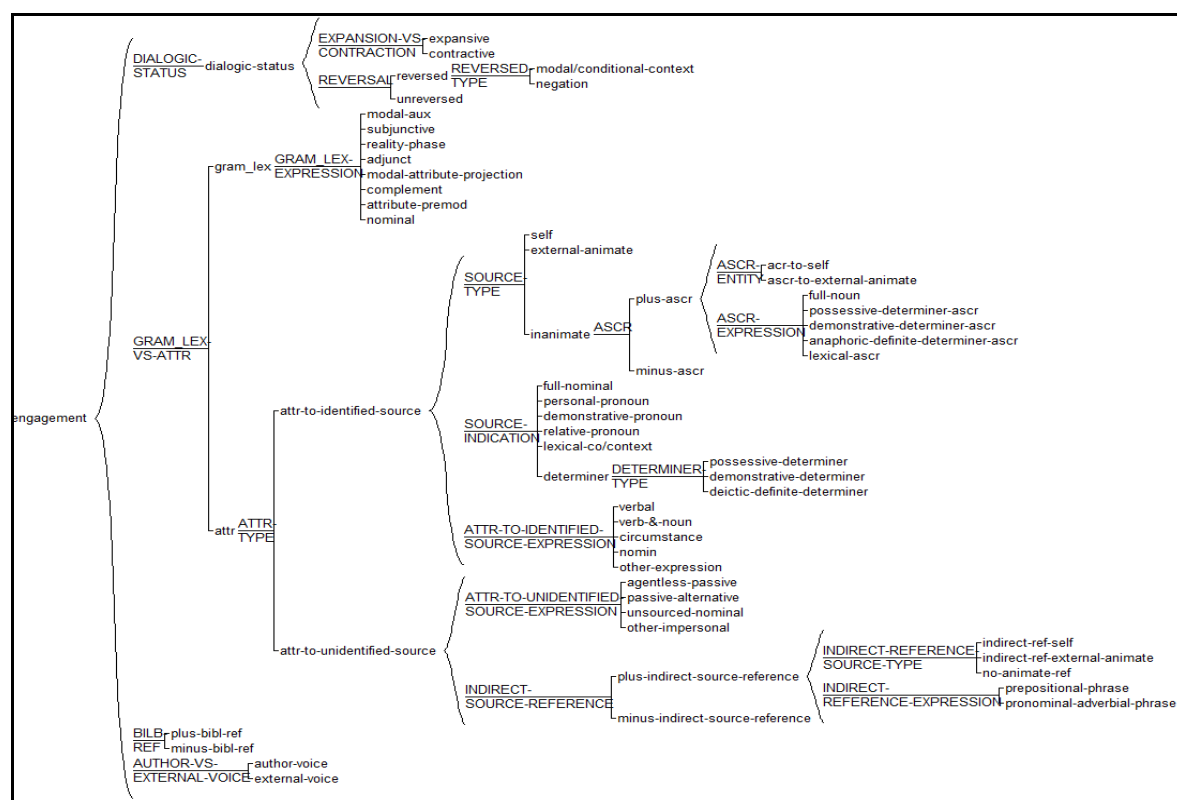


Fig. 10: Screenshot annotation scheme (English)

As pointed out in the previous section, the network options are either linked by curly brackets, which stand for simultaneous choices, or square brackets, which stand for mutually exclusive ‘or’-choices. Curly brackets connect “systems” such as DIALOGIC STATUS and GRAM_LEX VS. ATTR which deal with choices relating to properties which ‘coexist’ in a segment selected for annotation. Systems may be subdivided into further systems or comprise mutually exclusive categories, which are termed “features” in the UAM Corpus Tool. They represent potential realisations, which may again be subcategorised into further systems or features.

⁶⁰ In addition to segment annotation, the annotation of entire documents is supported as well as Automatic Grammar Analysis and Rhetorical Structure Analysis. Cf. also O'Donnell (2012) for a detailed introduction to the UAM corpus tool.

It should be noted in passing that the corpus tool allows the scheme to be altered even after the annotation has begun. This proved helpful since the scheme was created to include potential realisations developed on the basis of the Appraisal framework and the discussion of epistemic and evidential resources. As the analysis went along, however, further candidates were found in the corpus, requiring additions to the scheme.

6.4 Significance Testing

The significance of the results obtained by the application of the scheme was assessed by means of chi-square testing. Chi-square is a nonparametric test which measures the statistical significance of differences between actual observed results and theoretical distributions which would be expected to occur according to an assumption or if the distribution were due to chance (cf. e.g. Key 1997, [1]). Such a distribution would correspond to the null hypothesis (H_0).

Two types of chi-square were employed in the present study: The “One-Way Classification” or “Goodness-of-fit” statistic was used to determine the significance of the distribution of a single Engagement feature across different categories (Key 1997), i.e. individual subcorpora. If we assume an equal distribution of the total number of a given feature found in the corpus (i.e. the “observed frequency”) (cf. Key 1997, [2]), the frequency of occurrence expected to occur in each subcorpus would thus correspond to the arithmetic mean. The chi-square value (χ^2) is calculated as follows (formula retrieved from Key 1997⁶¹):

$$\chi^2 = \sum \frac{(\text{Observed frequency} - \text{Expected frequency})^2}{\text{Expected frequency}}$$

H_0 can be rejected if the critical value (cv) is exceeded by χ^2 , which is the case if the following applies (formula retrieved from Faes 2013):

$$\chi^2 > \chi^2_{1-\alpha}(k-1)$$

α represents the level of significance, i.e. the probability level p ; $k-1$ refers to the degrees of freedom (df) (Faes 2013). In the present analysis, the tests were conducted for the determined level of significance $p=0.05$, meaning that the probability of the χ^2 values occurring by chance is 5 percent. The degree of freedom (df) is calculated by subtracting 1

⁶¹ The χ^2 -values presented in the following are rounded to two decimals.

from the number of categories considered. If the critical value⁶² thus computed is exceeded by the chi-square value, H_0 is rejected, suggesting that factors other than chance are at work as regards the distribution of the given feature across the categories considered.

Additionally, chi-square can be used to test the differences observed between two or more samples (cf. Key 1997). Two-way chi square testing is used to assess the significance of differences between the actual frequencies of occurrence observed in two or more categories comprising two or more distinct groups (e.g. Expansive vs. Contractive features) (Key 1997). The expected frequencies (Fe) used in the chi-square formula are computed as follows (formula retrieved from Key 1997):

$$Fe = \frac{\text{Row Subtotal} \times \text{Column Subtotal}}{\text{Total}}$$

If the use of Expansive or Contractive Engagement were left to chance, we would expect there to be no difference in the use of these two types of features in the subsections of the corpus ($=H_0$). As in the case of the goodness-of-fit statistic, H_0 is rejected if the critical value is exceeded by χ^2 . In the following analysis, the significance of the results was computed using the online statistical calculation tool provided by Preacher (2001), which also yields the applicable degree of freedom (cf. Key 1997 on the computation of the degrees of freedom applicable to Two-Way classifications).

Following the outline of the analytical procedure adopted in the present analysis, the next chapter presents and discusses the results obtained by the application of the framework to the corpus described above.

⁶² The critical values were retrieved from an online statistical reference resource [2].

7. DISCUSSION OF RESULTS

7.1 Introduction

The following discussion of the results obtained by the corpus analysis largely follows the structure of the annotation scheme as outlined in the previous chapter. The overall frequency of Engagement features found in the corpus by applying the analytical procedure described in the preceding chapter amounts to $n=3903$.⁶³ These features may consist of individual lexical items or even morphological features, but they may also include paratactic structures comprising several lexemes, which are however treated as one Engagement unit. In cases where relevant features ‘overlap’ in a lexical item or a larger unit, each feature counts as a separate item. An example of coexisting or clustered Engagement items is provided below:

- (326) Alternatively, these data may suggest that the use of occlusion times shorter than the traditional 5-min could be employed to simplify FMD studies. [ESCI]

The matrix structure *these data may suggest that* would thus be considered as a relevant feature, and *may*, which serves as a further modal qualification, would be treated as an additional feature.

Taken together, the German subcorpora were found to use fewer Engagement features as defined in the previous chapter than the corresponding English subcorpora in absolute terms, namely $n=2322$ in the English section and $n=1581$ in the German section. The German section thus contains 31.91% less comparable features on the whole than the English section, which hints that the German subcorpora are less dialogised in general as regards the features considered in the present study. The following bar chart gives an overview of the distribution of Engagement features:

⁶³ Again, it should be noted that the absolute data discussed here and in the remaining chapter are scaled to a ‘norm’ size of $n=30,000$ tokens of the individual subsections to ensure comparability of the figures. The absolute figures presented in the following have been rounded to zero decimal places, the percentages have been rounded to two decimal places.

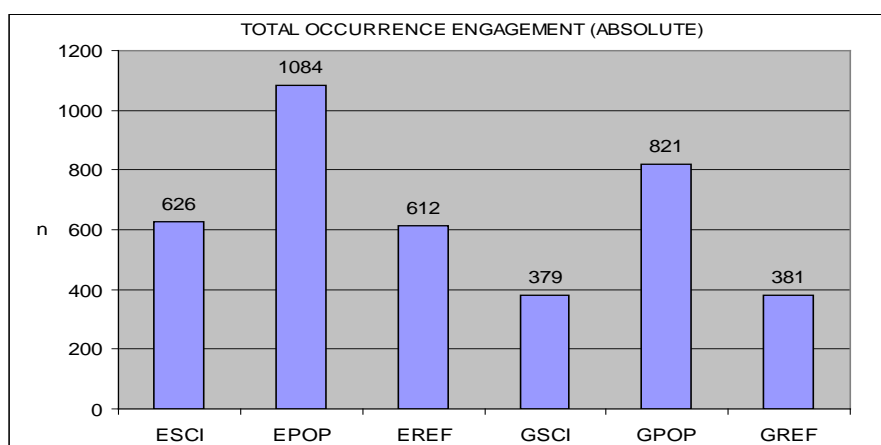


Fig. 11: Total occurrence Engagement (absolute)

Although each English subsection contains more Engagement features than the corresponding German subsection in absolute terms, the use of Engagement features appears to spread across the English and German registers following a relatively similar pattern at this general level. The data indicate that Engagement is most pervasive in the POP subcorpora in each language. It seems that the authors of both the English and the German POP articles analysed in the current study display a stronger tendency to construe a heteroglossically diverse setting (cf. Martin & White 2005) than the SCI authors. The SCI subsections appear to be close to the REF sections in this respect.

The statistical relevance of these data should be examined before an interpretation of these results is attempted. Therefore, the counts presented above were subjected to significance testing to examine whether the divergences observed across the registers and the two languages might be due to chance or whether other influencing factors need to be considered. Adopting a global perspective, H_0 postulates that there are no register-specific or language-specific preferences for the use of Engagement features. We would thus assume an equal distribution of the overall number of Engagement features observed in the corpus (i.e. $n=3903$). Consequently, a frequency corresponding to the arithmetic mean, i.e. 650.5 ($=3903/6$), would be expected to occur in each of the six groups, that is the three subcorpora in the two languages (cf. Preacher 2001, Key 1997, Faes 2013).

| | ESCI | EPOP | EREF | GSCI | GPOP | GREF |
|------------|--------|------|------|------|------|------|
| Engagement | 626 | 1084 | 612 | 379 | 821 | 381 |
| χ^2 | 561.75 | | | | | |
| cv (5 df) | 11.07 | | | | | |

Table 1: Significance: Engagement (global)

As can be seen from the table, the critical value is exceeded by a long way by the chi-square value. Therefore, H_0 is rejected, which suggests that factors other than chance are at work,

affecting the distribution of Engagement features across the registers and the two languages. In order to narrow down the focus to the data obtained for each language, the scope of H_0 is reduced such that the distribution of Engagement features in each language is not impacted by register-specific influences. The reformulated null hypothesis H_0 posits that the total number of Engagement features is distributed evenly across the English and the German subcorpora. Again the expected frequencies correspond to the arithmetic means of the frequencies of occurrence observed in each language. This is tested separately for each language:

| | ESCI | EPOP | EREF | GSCI | GPOP | GREF |
|------------|--------|------|------|--------|------|------|
| Engagement | 626 | 1084 | 612 | 379 | 821 | 381 |
| χ^2 | 186.37 | | | 246.03 | | |
| cv (2 df) | 5.99 | | | 5.99 | | |

Table 2: Significance: Engagement (intralingual general)

In both languages, the chi-square values by far exceed the critical value $cv=5.99$ applying to 2 df. Since H_0 can, therefore, also be rejected in this case, the distribution of Engagement features across the subcorpora in English and in German once more appears to be influenced by factors other than chance. The level of intralingual variation appears to be even more marked in the German section of the corpus than in the English part of the corpus.

Focussing on the data relating to register-specific cross-linguistic divergences, the chi-square tests yielded the following results:

| | ESCI vs. GSCI | | EPOP vs. GPOP | | EREF vs. GREF | |
|------------|---------------|------|---------------|------|---------------|------|
| | ESCI | GSCI | EPOP | GPOP | EREF | GREF |
| Engagement | 626 | 379 | 1084 | 821 | 612 | 381 |
| χ^2 | 60.71 | | 36.31 | | 53.74 | |
| cv (1 df) | 3.84 | | | | | |

Table 3: Significance: Engagement (cross-linguistic & register-specific)

The chi-square values obtained by this calculation exceed the hypothetical values for the cross-linguistic divergences concerning each register. The results suggest that there are statistically significant cross-linguistic differences as regards the use of Engagement features in each one of the registers considered in the present analysis. These are, however, particularly pronounced in the case of the SCI subsections and less prominent in the REF subsections and least marked in the case of the POP subsections.

Finally, the perspective was shifted by considering the results discussed above by looking at language-internal shifts. To this end, each SCI and POP subsection was contrasted with the corresponding REF subsection, H_0 assuming that there is no register-specific bias in the use of the features examined:

| | ESCI vs. EREF | | EPOP vs. EREF | | GSCI vs. GREF | | GPOP vs. GREF | |
|------------|---------------|------|---------------|------|---------------|------|---------------|------|
| | ESCI | EREF | EPOP | EREF | GSCI | GREF | GPOP | GREF |
| Engagement | 626 | 612 | 1084 | 612 | 379 | 381 | 821 | 381 |
| χ^2 | 0.16 | | 131.36 | | 0.00 | | 161.07 | |
| cv (1 df) | 3.84 | | | | | | | |

Table 4: Significance: Engagement (intralingual)

In neither language does the observed distribution of features deviate from the expected distribution in a statistically significant manner as regards the comparison of the SCI and the REF subsections. Yet, as regards the divergences observed between the POP and the REF subsections in each language, there appear to be considerable differences from the expected values so that H_0 is rejected in both cases. The results corroborate the impression that while the German authors use significantly less Engagement on the whole, there appears to be a somewhat similar language internal-pattern, with the POP subsections using significantly more Engagement features than the REF subsections. The latter are closer to the SCI subsections in both languages as regards the overall use of Engagement features.

The data thus suggest that the POP authors are more prone to acknowledge the presence of a potentially diverse communicate setting (cf. Martin & White 2005) in presenting medical news. We may hypothesise that the marked deviation of the POP subsections from the REF subsections can, at least in part, be explained by the function of popular scientific journalism. One would surmise that the dissemination of information by journalists involves a frequent use of reporting structures such as those defined in terms of the relevant Engagement structures described in the previous chapter. Furthermore, although the English and the German POP subsections differ significantly as regards the creation of a heteroglossically diverse background (cf. Martin & White 2005) by means of the Engagement features considered in the present analysis, it appears that they differ less in this respect than do the SCI and the REF subsections from a crosslinguistic perspective. While there appears to be a general difference regarding the use of Engagement features, this – significant – crosslinguistic divergence appears to be reduced in the case of the POP subsections. This may be interpreted as being slightly reflective of the Anglo-American origins of popular scientific journalism (cf. e.g. Ruß-Mohl 1985, Hömberg 1990, Niederhäuser 1999).

Moreover, the closeness of the respective SCI and REF subsections in both languages seems slightly surprising given the technicality of the texts contained in the SCI subsections as opposed to the linguistic cross-section represented in the REF subcorpora. This seeming similarity will be considered in more detail in the following to determine if there is variation concerning the linguistic expression of Engagement and the dialogic function of the resources

used – despite the general resemblance regarding the overall frequency of Engagement features observed between these two registers.

The following discussion of the results sets out to explore the role of register- and language-specific influences as factors potentially impacting on the distribution of the Engagement features considered in the present study. Following the above overview of the results, the next section takes a closer look at the data and examines the results relating to the Contractive or Expansive properties of the features, before moving on to the linguistic realisation of Engagement in the corpus. It should be noted that the assignment of features to the categories outlined in the previous chapter involves interpretation and the consideration of contextual factors, hence there are practical limitations to the corpus size. Given the exploratory nature of the study, realisations of Engagement additional to those discussed in the present analysis may be found or different distributions may be observed in larger corpora. The statistical significance of the counts obtained in the present study is, therefore, merely tested for categories located at broader levels of analysis. The discussion of specific results relating to granular areas of the categorisation is largely example-based.

7.2 Expansive and Contractive Engagement: Overview

The following illustration considers the general data presented in the previous section more closely by looking at the percentages of Contractive and Expansive features in relation to the overall frequency of Engagement items in the respective subcorpora:

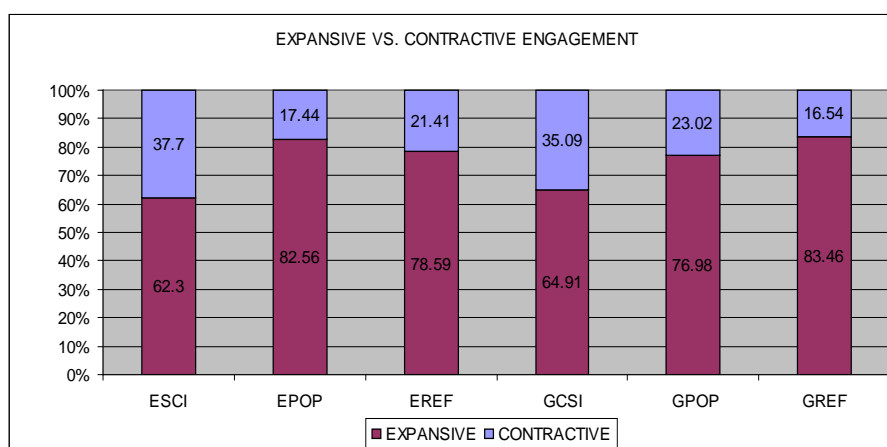


Fig. 12: Expansive vs. Contractive Engagement

On the whole, Expansive Engagement is more frequent than Contractive Engagement in each one of the subsections, but on closer inspection the picture that emerges from the data is somewhat more nuanced: Contractive Engagement features seem to be more common in the SCI subsections than in the POP or REF subsections in either language. The statistical

relevance of the data presented above will be considered in the following before they are interpreted.

The statistical significance of the results relating to the use of Expansive and Contractive features in the individual subcorpora was assessed by means of the two-way chi-square test. If the use of Expansive or Contractive Engagement were left to chance, we would expect there to be no register-related difference in the use of these features. This situation, namely an even distribution of Contractive and Expansive Engagement in the categories compared, i.e. the registers in the two languages, would thus correspond to H_0 .

| Expansive vs. Contractive | ESCI | GSCI | EPOP | GPOP | EREF | GREF |
|---------------------------|--------|------|------|------|------|------|
| Expansive | 390 | 895 | 481 | 246 | 632 | 318 |
| Contractive | 236 | 189 | 131 | 133 | 189 | 63 |
| χ^2 | 129.49 | | | | | |
| cv (5 df) | 11.07 | | | | | |

Table 5: Significance: Expansive vs. Contractive (global)

The applicable critical value is exceeded by far. Therefore, H_0 is rejected so that the distribution of Expansive and Contractive features across the subcorpora in the two languages appears to be impacted by factors other than chance.

A narrower focus was adopted by looking at the individual registers and assessing the validity of the null hypothesis that there is no language-specific variation in the use of Expansive and Contractive Engagement features:

| Expansive vs. Contractive | ESCI vs. GSCI | | EPOP vs. GPOP | | EREF vs. GREF | |
|------------------------------|---------------|------|---------------|------|---------------|------|
| | ESCI | GSCI | EPOP | GPOP | EREF | GREF |
| Expansive | 390 | 246 | 895 | 632 | 481 | 318 |
| Contractive | 236 | 133 | 189 | 189 | 131 | 63 |
| χ^2 | 0.70 | | 9.16 | | 3.54 | |
| cv (1 df) | 3.84 | | | | | |

Table 6: Significance: Expansive vs. Contractive (cross-linguistic & register-specific)

It appears that H_0 can be accepted for the comparison of ESCI and GSCI and the English and the German REF subcorpora. It is, however, rejected for the POP subsections, where the critical value is exceeded so that language-specific preferences do appear to affect the use of Expansive or Contractive features.

In a final step, an intralingual perspective was adopted, with the data relating to the differences between each SCI and POP subsection and the corresponding REF subcorpus being assessed for significance:

| Expansive vs. Contractive | ESCI vs. EREF | | EPOP vs. EREF | | GSCI vs. GREF | | GPOP vs. GREF | |
|------------------------------|---------------|------|---------------|------|---------------|------|---------------|------|
| | ESCI | EREF | EPOP | EREF | GSCI | GREF | GPOP | GREF |
| Expansive | 390 | 481 | 895 | 481 | 246 | 318 | 632 | 318 |
| Contractive | 236 | 131 | 189 | 131 | 133 | 63 | 189 | 63 |
| χ^2 | 39.40 | | 4.03 | | 34.19 | | 6.61 | |
| cv (1 df) | 3.84 | | | | | | | |

Table 7: Significance: Expansive vs. Contractive (intralingual)

The difference concerning the Engagement-related behaviour observed between ESCI and EREF is statistically significant as the results depart considerably from the expectation formulated in H_0 . The counts relating to EPOP also differ from those obtained for EREF in a statistically significant manner, but to a far lesser degree than in the case of ESCI and EREF.

Moving on to the German section of the corpus, the result for GSCI versus GREF is highly significant, albeit slightly less so than in the case of ESCI versus EREF. In the case of GPOP versus GREF, the critical value is also exceeded, but not to the same extent as in the case of GSCI versus GREF. Thus, the SCI subcorpora in both languages differ more from the corresponding REF subsections than do the POP subsections. The results indicate that Expansive Engagement is generally more frequent than Contractive Engagement in each one of the subcorpora in either of the two languages. This observation hints that Expansive Engagement appears to be a kind of default option in the sense that in cases in which a heteroglossically diverse setting is evoked by the use of Engagement features, these resources tend to open up dialogic diversity rather than to reduce dialogic space (cf. Martin & White 2005:104ff, see chapter 4). However, it seems that the preference for Expansive Engagement is more marked in the POP subcorpora than in the SCI subcorpora. The data suggest that the SCI authors in both languages ‘dialogise’ less in general; yet, when they do use Engagement features to interact with their readership, they are more inclined to use Engagement features to close down dialogic space than are the POP journalists. Consequently, the authors represented in the SCI subsections seem to be more prone than the POP writers to present propositional content in a rigid fashion which ‘defies’ contradiction as in the example provided below:

- (327) Therefore delineating its expression pattern has allowed us to establish that B cells activate the molecular machinery responsible for production of affinity matured antibodies in follicular structures within the RA synovial membrane. [ESCI]

The POP journalists, conversely, seem to display a stronger tendency to use Engagement features which serve to present propositional content as negotiable as illustrated in the following example, which contains an Expansive feature used by the author in addition to an Expansive expression occurring in the cited material:

(328) “To get rid of hot flashes and to make it through the night, it’s probably a reasonable thing,” Berry says. “But don’t count on it having any long-term beneficial effects.” [EPOP]

It was pointed out in the previous section that the SCI and the REF subsections contain a similar number of Engagement features on the whole. Despite this quantitative similarity observed at a general level, the use of Engagement resources in the SCI subsections appears to differ from that observed in the corresponding REF subsections in terms of qualitative composition: The English and the German SCI subsections resemble each other in that they both contain significantly more Contractive features than the respective REF subsections. The register-specific influence thus appears to affect the dialogic nature of the Engagement resources employed. In both languages, these tend to be used to close down dialogic space in the SCI subsections more than is the case in the REF subsections.

As was noted earlier, both POP subcorpora contain fewer Contractive Engagement items than the corresponding SCI subsections. Yet, since GSCI differs less from GREF than ESCI differs from EREF, GSCI and GPOP appear to be slightly closer to each other in this regard than ESCI and EPOP. This observation suggests that a less pronounced register shift takes place between GSCI and GPOP than between the corresponding English subsections as regards the distribution of Expansive and Contractive features.

Following this general overview of the results relating to the dialogic effect created by the Engagement features occurring in the corpus, the next section turns to formal aspects regarding the linguistic expression of Engagement. This concerns the realisation of epistemic and evidential meanings by means of lexicalised and grammaticalised resources (GRAM_LEX), on the one hand, and ATTR features, on the other hand. We may recall that the latter serve to qualify propositions by means of framing structures involving the use of certain relational, verbal or mental process types. Issues relating to the use of dialogically Expansive or Contractive properties of the features will be taken up again where relevant and considered in connection with the specific realisations of Engagement.

7.3 Linguistic realisation of Engagement: overview GRAM_LEX VS. ATTR

The following chart compares the proportion of GRAM_LEX with the proportion of ATTR features:

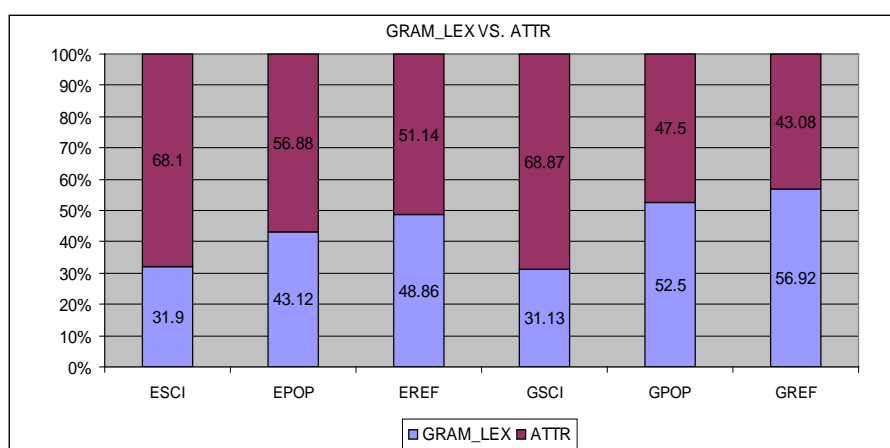


Fig.13: GRAM_LEX VS. ATTR

As can be seen from the diagram, each one of the English subcorpora contains a higher proportion of ATTR than GRAM_LEX features. In the German section, by contrast, this only applies to GSCI, GPOP and GREF containing a higher proportion of GRAM_LEX than of ATTR. Whereas GSCI and ESCI are thus similar in that the frequency of ATTR features exceeds the number of GRAM_LEX Engagement features, EPOP and GPOP as well as EREF and GREF differ in this respect.

Again, chi-square tests were performed to assess the significance of the counts obtained for the general distribution of GRAM_LEX and ATTR features. According to H_0 , there is no language- or register-specific bias as regards the frequency of occurrence of GRAM_LEX as compared with ATTR features:

| GRAM_LEX VS. ATTR | ESCI | EPOP | EREF | GSCI | GPOP | GREF |
|-------------------|--------|------|------|------|------|------|
| GRAM_LEX | 200 | 467 | 299 | 118 | 431 | 218 |
| ATTR | 427 | 616 | 313 | 261 | 390 | 165 |
| χ^2 | 118.49 | | | | | |
| cv (5 df) | 11.07 | | | | | |

Table 8: Significance: GRAM_LEX VS. ATTR (global)

The critical value is exceeded by far, indicating that the cross-linguistic and register-specific results are not a result of chance.

Zooming in on the data relating to the register-specific cross-linguistic divergences, the chi-square tests yielded the following results:

| GRAM_LEX VS. ATTR | ESCI vs. GSCI | | EPOP vs. GPOP | | EREF vs. GREF | |
|----------------------|---------------|------|---------------|------|---------------|------|
| | ESCI | GSCI | EPOP | GPOP | EREF | GREF |
| GRAM_LEX | 200 | 118 | 467 | 431 | 299 | 218 |
| ATTR | 427 | 261 | 616 | 390 | 313 | 165 |
| χ^2 | 0.06 | | 16.47 | | 6.14 | |
| cv (1 df) | 3.84 | | | | | |

Table 9: Significance: GRAM_LEX VS. ATTR (cross-linguistic & register-specific)

The chi-square value does not exceed the hypothetical value for the divergence between ESCI and GSCI, suggesting that there is no statistically significant cross-linguistic difference as regards the use of GRAM_LEX or ATTR features observed in the English and the German SCI subsections. This supports the previous observation that the use of GRAM_LEX versus ATTR largely corresponds in these two subcorpora. Yet, there appears to be a significant level of cross-linguistic divergence concerning the POP subsections. This also seems to apply to the REF subcorpora, albeit to a lesser degree.

Finally, the results concerning the use of GRAM_LEX and ATTR were considered from a language-internal perspective, H_0 assuming that there is no register-specific bias in the use of the features examined here. The following results were obtained for the comparison of the SCI and the POP subsections with the corresponding REF subsections in each language:

| GRAM_LEX VS. ATTR | ESCI vs. EREF | | EPOP vs. EREF | | GSCI vs. GREF | | GPOP vs. GREF | |
|----------------------|---------------|------|---------------|------|---------------|------|---------------|------|
| | ESCI | EREF | EPOP | EREF | GSCI | GREF | GPOP | GREF |
| GRAM_LEX | 200 | 299 | 467 | 299 | 118 | 218 | 431 | 218 |
| ATTR | 427 | 313 | 616 | 313 | 261 | 165 | 390 | 165 |
| χ^2 | 37.03 | | 5.19 | | 51.38 | | 2.06 | |
| cv (1 df) | 3.84 | | | | | | | |

Table 10: Significance: GRAM_LEX VS. ATTR (intralingual)

As in the case of the distribution of Expansive versus Contractive features, the actual distribution of GRAM_LEX versus ATTR features deviates significantly from the expected distribution in the case of ESCI versus EREF, suggesting that the intralingual divergence observed between these subcorpora is due to something other than chance. This was also found to apply to the difference between EPOP and EREF, although to a much lesser extent.

The significance value calculated for the intralingual divergence between GSCI and GREF even exceeds that obtained for ESCI and EREF. Consequently, the intralingual deviation between the expected data and the data observed in the SCI subcorpora is significantly different from the respective REF subsections in both languages. The result for GPOP versus GREF, however,

does not suffice to reject H_0 . By consequence, the deviation observed between these two subsections of the German part of the corpus could be put down to chance.

It was pointed out above that GSCI and ESCI are similar in that the percentage of ATTR features is higher than the percentage of GRAM_LEX features in both SCI subcorpora, whereas EPOP and GPOP differ from each other in this regard. The fact that EPOP contains a higher percentage of ATTR than of GRAM_LEX while GPOP contains a higher proportion of GRAM_LEX may, at least in part, be due to direct or indirect reporting of speech or thought, which, as will be seen later, is an important feature of the POP subsections. The excerpt shown below illustrates the manner in which such features are used by science journalists to pass on informational content obtained from researchers:

- (329) "What we're really doing is looking to see if there is a relevant way to adapt that for sexual and blood-borne transmission," says Mitchell Warren, executive director of the AIDS Vaccine Advocacy Coalition. The ultimate HIV-prevention strategy might be a combination of tactics, suggests Warren. "We could think about it just like we do reproductive health and family planning," he says. [EPOP]

The example is illustrative of direct and indirect speech in English, which typically involves reporting clauses such as *says Mitchell Warren*, *suggests Warren* or *he says* in the above excerpt (cf. Quirk et al. 1985:1020ff, Halliday & Matthiessen 2004:441ff). As mentioned in connection with the outline of the annotation scheme in chapter 6, such features are categorised as ATTR to external animate in the present analysis. Indirect thought is introduced once by means of the mental process verb *vermuten* in the following German excerpt:

- (330) Zahlreiche Forscher vermuten, dass sich BPA negativ auf die Fruchtbarkeit auswirkt. Das Mekonium könne dabei helfen, mögliche Beeinträchtigungen der Gesundheit von Neugeborenen früh zu erkennen. Zunächst seien allerdings weitere Untersuchungen nötig. [GPOP]

Following the introduction of reported speech, the use of the subjunctive forms (*könne* and *seien*) is sufficient to mark the continuation of indirect thought or speech. The subjunctive mood links the reported content to the speech act in the preceding clause without requiring repeated introduction by means of framing structures.

As a result of these typological differences relating to the reporting of speech or thought, EPOP appears to make more mention of external animate sources, a potential corollary effect being that the researchers who talk about their work are made visible in the text. In the German corpus, by contrast, repeated mention of speech acts, and hence of sources, is not necessary, as a consequence of which the presentation of the research may be less concrete in

terms of the actors involved in it (cf. e.g. Chafe & Danielewicz 1987:108). A glimpse at the absolute figures for ATTR to external animate seems to bear out this intuition:

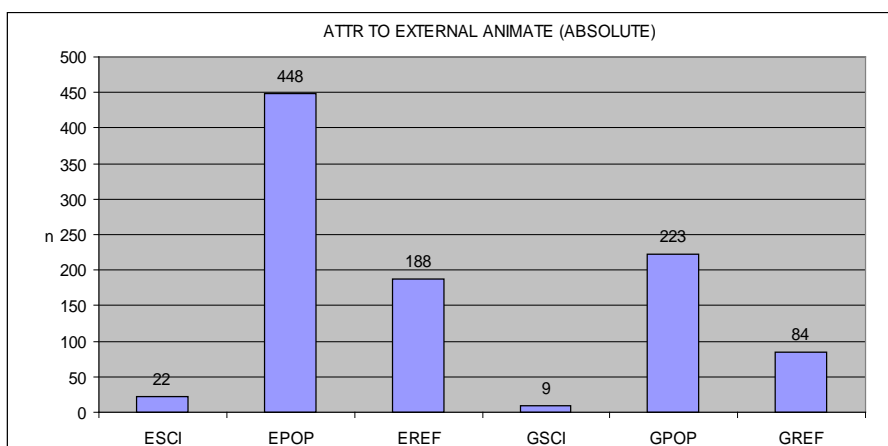


Fig. 14: ATTR to external animate (absolute)

EPOP contains over twice as many cases of ATTR to external animate as GPOP in absolute terms. It will become apparent in the next section, which takes a closer look at the linguistic expression of Engagement, that the GPOP authors ‘compensated’ for the lower use of ATTR to identified source by using GRAM_LEX resources.

While the GPOP journalists use ATTR to reference external animate sources, this type of ATTR is rare in GSCI. Nonetheless, GSCI is the only register represented in the German section to contain more instances of ATTR than GRAM_LEX features. These results imply that ATTR is used in GSCI to reference either inanimate sources, e.g.:

- (331) So zeigte eine retrospektive Analyse bei 75 Patientinnen mit Mammakarzinom (24), dass mit PET/CT ein richtiges Staging in 86% und mit der CT alleine in 77% der Fälle möglich war. [GSCI]

Or to attribute propositional content to unidentified sources as in the example shown below:

- (332) Es kann jedoch davon ausgegangen werden, dass die in letzter Zeit zunehmend verbreitete Kombination aus CT und FDG-PET im PET/CT die Spezifität erhöht bei gleich hoher Sensitivität. [GSCI]

A further similarity between the English and the German section is that the number of instances of ATTR to external animate in both POP subcorpora exceeds the frequency of occurrence of this feature in the respective REF subsections by far. Additionally, the number of cases of ATTR to external animate is far smaller in both SCI subsections than in the REF subsections. Hence, human involvement appears to be played down in the SCI subsections while it seems to be emphasised in the POP subsections.

From the overview given above, it seems that both typological and register-specific factors impact on the realisation of Engagement by means of GRAM_LEX and ATTR features. These points will be taken up again in connection with the discussion of the results relating to the different instantiations of Engagement observed in the corpus. The following section focuses on the expression of Engagement by means of GRAM_LEX features.

7.3.1 GRAM_LEX

It was pointed out in the previous section that there are fewer Engagement features in the German than in the English section of the corpus on the whole. The following chart provides a visual indication of the proportions of GRAM_LEX items in relation to the overall number of Engagement features found in the respective subcorpora (it is an abridged version of the diagram presented in fig. 13, which compared the percentages for ATTR and GRAM_LEX):

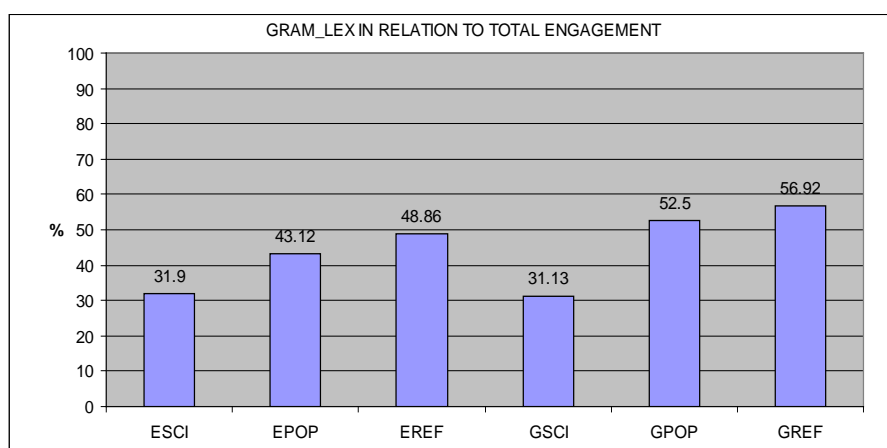


Fig. 15: GRAM_LEX in relation to total Engagement

The percentages reveal a resemblance between the use of GRAM_LEX features occurring in the English and the German section of the corpus: The SCI subsections diverge more from the corresponding REF subsections than do the POP subsections (as noted in the previous section, there is no significant difference between GOPP and GREF). The gap between GSCI and GREF is even bigger than the gap between ESCI and EREF. These observations are in line with the results of the significance tests relating to the intralingual distribution of GRAM_LEX and ATTR features discussed in the previous section.

The stronger language-internal discrepancy between GSCI and GOPP – compared with ESCI and EPOP – may, at least in part, be explained by the use of subjunctive forms in reporting structures serving to mark propositions as external to the author(s) (cf. section 7.3). This aspect will be taken up again in section 7.3.2 in the discussion of the results relating to ATTR, with special attention being paid to the role of BIBL REF as a means of marking propositions as stemming from sources external to the author without the use of linguistic indicators.

From a crosslinguistic perspective, the GPOP and the GREF writers display a stronger preference for GRAM_LEX expressions of Engagement than the corresponding English subcorpora, where the use of ATTR appears to prevail. The SCI subsections, however, differ from the other registers represented in this corpus in this regard: As mentioned in connection with the significance tests carried out for the cross-linguistic register-specific differences regarding the distribution of GRAM_LEX versus ATTR features, the divergence is not statistically significant in the case of the SCI subsections. Hence, there seems to be a stronger cross-linguistic resemblance between the SCI subsections concerning a relatively low use of GRAM_LEX expressions.

In order to elucidate the general tendencies described in this overview of the overall use of GRAM_LEX across the two languages and the different registers, the next section attends to the results relating to the use of different GRAM_LEX resources.

7.3.1.1 GRAM_LEX EXPRESSION

As mentioned previously, the overall distribution of GRAM_LEX follows a somewhat similar pattern across the two languages, GRAM_LEX being more frequent in the POP and the REF subcorpora than in the SCI subcorpora in either language. Yet, the results presented in the following chart (fig. 16) suggest that this effect is created by different resources in the two languages and in the individual registers. The frequencies of the individual features are considered in relation to the overall frequency of occurrence of GRAM_LEX items.⁶⁴

Whereas modal auxiliaries are the main contributors to GRAM_LEX in the English section of the corpus, there seems to be more variation in the German section, with subjunctive forms appearing to play a key role in GPOP and GREF.

⁶⁴ It should be noted that the few items of modal future occurring in the German part of the corpus were added to the figures for modal auxiliaries; similarly, the figures for complement uses were combined with the modal attribute projections on account of the small number of instances found in the corpus.

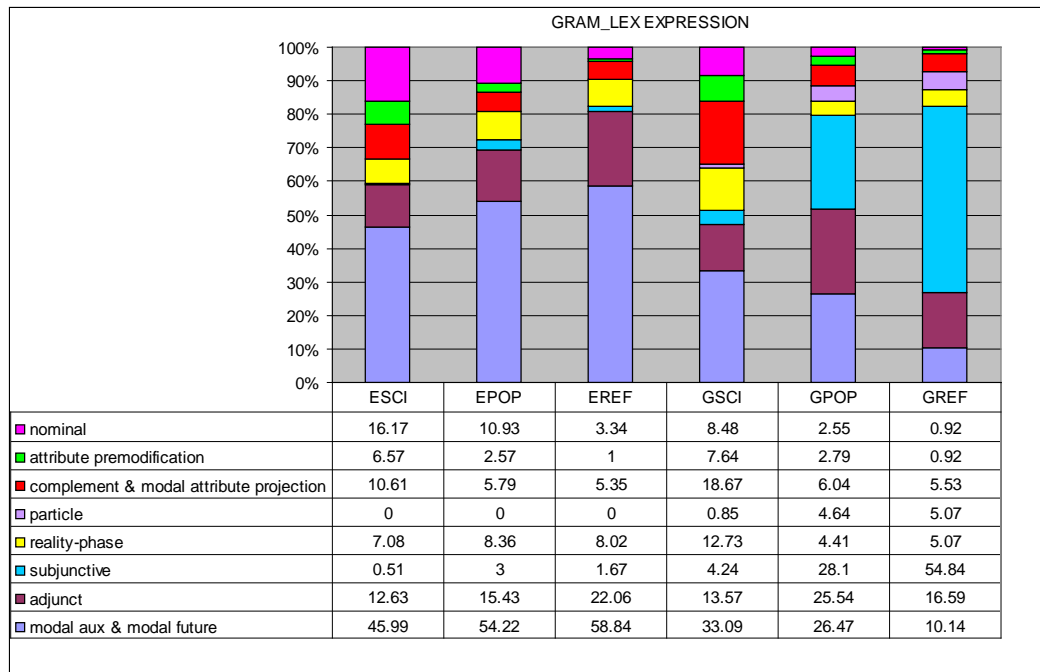


Fig. 16: GRAM_LEX EXPRESSION

Again, the interpretation of the results gathered for the expression of GRAM_LEX is preceded by significance tests, beginning with the overall distribution of these features across the two languages. It should be noted that particles were not considered since they lack in English (cf. chapter 3) and therefore the assumption of an even distribution across the whole corpus is not plausible. According to H_0 , there is no effect of language or register on the use of GRAM_LEX features.

| GRAM_LEX EXPRESSION | ESCI | EPOP | EREF | GSCI | GPOP | GREF |
|---|--------|------|------|------|------|------|
| Nominal | 32 | 51 | 10 | 10 | 11 | 2 |
| Complement & modal attribute projection | 21 | 27 | 16 | 22 | 26 | 12 |
| Reality-phase | 14 | 39 | 24 | 15 | 19 | 11 |
| Attribute premodification | 13 | 12 | 3 | 9 | 12 | 2 |
| Subjunctive | 1 | 14 | 5 | 5 | 121 | 119 |
| Adjunct | 25 | 72 | 66 | 16 | 110 | 36 |
| Modal aux. & modal future | 91 | 253 | 176 | 39 | 114 | 22 |
| χ^2 | 671.44 | | | | | |
| cv (30 df) | 43.77 | | | | | |

Table 11: Significance: GRAM_LEX EXPRESSION (global)

The critical value is exceeded by far so that H_0 is refuted. As a result, we may reasonably assume that the differences discussed above are attributable to language- and register-specific impacting factors. Zooming in on the register-specific and cross-linguistic divergences, the chi-square tests yield the following results for the data concerning the cross-linguistic comparison of the individual registers. H_0 stipulates that the use of GRAM_LEX

features is not impacted by language-specific preferences in any of the registers examined here.

| GRAM_LEX EXPRESSION | ESCI vs. GSCI | | EPOP vs. GPOP | | EREF vs. GREF | |
|---|---------------|------|---------------|------|-------------------|------|
| | ESCI | GSCI | EPOP | GPOP | EREF | GREF |
| Nominal | 32 | 10 | 51 | 11 | 10 | 2 |
| Complement & modal attribute projection | 21 | 22 | 27 | 26 | 16 | 12 |
| Reality-phase | 14 | 15 | 39 | 19 | 24 | 11 |
| Attribute premodification | 13 | 9 | 12 | 12 | (3) ⁶⁵ | (2) |
| Subjunctive | 1 | 5 | 14 | 121 | 5 | 119 |
| Adjunct | 25 | 16 | 72 | 110 | 66 | 36 |
| Modal aux. & modal future | 91 | 39 | 253 | 114 | 176 | 22 |
| χ^2 | 18.00 | | 175.36 | | 234.56 | |
| cv (6 df) | 12.59 | | | | | |

Table 12: Significance: GRAM_LEX EXPRESSION (cross-linguistic & register-specific)

All of the cross-linguistic divergences observed in the individual registers are statistically significant. However, it was pointed out above that GSCI and ESCI appear to resemble each other regarding the realisation of Engagement by means of GRAM_LEX and ATTR features. The data presented above suggest that, although there is a statistically significant cross-linguistic divergence between the research subcorpora in the two languages concerning the linguistic expression of GRAM_LEX, the two SCI subcorpora are far closer to each other in this regard than are the POP or the REF subsections. The POP subsections appear to occupy an intermediate position: While the cross-linguistic divergence is considerably more pronounced than in the case of the SCI subsections, it is less drastic than in the case of the REF subsections.

Moving on to the language-internal results, H_0 again assumes that there is no register-related bias in the use of GRAM_LEX features. To this end, each SCI and POP subsection was compared with the matching REF subsection on an intralingual basis.

⁶⁵ Bracketed values are not taken into consideration on account of the required expected values.

| GRAM_LEX EXPRESSION | ESCI vs. EREF | | EPOP vs. EREF | | GSCI vs. GREF | | GPOP vs. GREF | |
|---|---------------|------|---------------|------|---------------|------|---------------|------|
| | ESCI | EREF | EPOP | EREF | GSCI | GREF | GPOP | GREF |
| Nominal | 32 | 10 | 51 | 10 | 10 | 2 | 11 | 2 |
| Complement & modal attribute projection | 21 | 16 | 27 | 16 | 22 | 12 | 26 | 12 |
| Reality-phase | 14 | 24 | 39 | 24 | 15 | 11 | 19 | 11 |
| Attribute premodification | 13 | 3 | 12 | 3 | 9 | 2 | 12 | 2 |
| Subjunctive | 1 | 5 | 14 | 5 | 5 | 119 | 121 | 119 |
| Adjunct | 25 | 66 | 72 | 66 | 16 | 36 | 110 | 36 |
| Modal aux. & modal future | 91 | 176 | 253 | 176 | 39 | 22 | 114 | 22 |
| Particle | (0) | (0) | (0) | (0) | 1 | 11 | 20 | 11 |
| χ^2 | 50.09 | | 22.00 | | 120.49 | | 56.04 | |
| cv | 12.59 (6 df) | | 12.59 (6 df) | | 14.07 (7 df) | | 14.07 (7 df) | |

Table 13: Significance: GRAM_LEX EXPRESSION (intralingual)

As to the intralingual data, the critical value is exceeded in each case. The deviations of the SCI and the POP subcorpora from the corresponding REF subsections suggest that there is an association between the registers considered here and the type of GRAM_LEX features used to engage with readers which is triggered by factors other than chance. In both languages, the SCI subcorpora are farther apart from the REF subsections than are the POP subsections. The deviation is, however, stronger in the German subcorpora than in the case of the corresponding English subcorpora. This underpins the impression that there appears to be more language-internal variation concerning the use of GRAM_LEX features in the German section of the corpus. The level of significance is particularly marked in the case of GSCI, the deviation from the expected values being considerably higher than in the case of ESCI and EREF. The lack of subjunctives in GSCI compared with GREF appears to be a major contributor to this effect. The language-internal differences are consequently more marked than the register-specific cross-linguistic differences observed between GSCI and ESCI regarding the expression of Engagement by means of GRAM_LEX resources.

According to the data presented above, epistemic uses of modal auxiliaries are by far the main contributors to Engagement in the English section of the corpus compared with the other GRAM_LEX features considered in the present analysis. Their use in ESCI is illustrated below:

- (333) Because longer time-to-peaks may be associated with reduced vascular function [14, 26], the indirect integration of this timecourse factor into the final outcome variable may improve the sensitivity of the FMD measurement. [ESCI]

Although modal auxiliaries also appear to play a key role in GSCI and GPOP, they play a less important role in the German subcorpora than in the corresponding subsections of the English corpus.

As regards the use of adjuncts such as *evidently* in the following example, it appears that GSCI and GPOP differ more from each other than their English equivalents:

- (334) Evidently, further research is needed to determine the diagnostic accuracy and prognostic value of FMD normalization to shear stress. [ESCI]

Whereas the percentage of adjuncts is roughly similar in ESCI and GSCI, the percentage is lower in EPOP than in GPOP, which also contains more adjuncts than GSCI, e.g.:

- (335) Die Forscher denken, dass Personen beider Geschlechter, die nur eine Kopie der Variation tragen, mit ziemlicher Sicherheit einige Anzeichen der Nierenstörung zeigen werden. [GPOP]

GSCI authors seem to prefer reality-phase, that is an evidential means of conveying Engagement as exemplified below:

- (336) Jüngste Entwicklungen zeigen, dass insbesondere eine verbesserte Autoantikörperdiagnostik zentrale Bedeutung haben könnte, zumal prognostische und therapeutische Konsequenzen mit dem Nachweis von Autoantikörpern verknüpft zu sein scheinen. [GSCI]

These items are more frequent in GSCI than in the other two German subsections; they are also more frequent in GSCI than in any of the English subsections. The use of reality-phase (Halliday & Matthiessen 2014:569ff, 580f) thus differs across the English and the German sections of the corpus, the distribution being more even across the English subcorpora. As noted in connection with the Appraisal framework in chapter 4, such appearance-based features are categorised as Expansive Engagement items. However, it does seem that such features highlight the role of evidence more than, for example, epistemic uses of modals.

While the figures relating to this specific area of the scheme are indeed small due to the fine-grained level of analysis reached in this area of the annotation scheme, it is interesting to observe that qualification by means of epistemic or evidential adjectives, as illustrated by the following English and German examples, is most frequent in ESCI and GSCI:

- (337) Figure 3 illustrates the apparent overlap of individual slopes (fig. 3 b) and y-intercepts (fig. 3 c) between groups. [ESCI]
- (338) Ein weiterer entscheidender Vorteil von Angiogeneseinhibitoren gegenüber konventioneller Chemotherapie ist, dass bei einer Behandlung auch bei mehrfacher Wiederholung im Tierversuch keine Resistenzentwicklung zu beobachten war (3). Ein möglicher Grund dafür ist, dass diese Stoffe auf normale Endothelzellen wirken und nicht auf die genetisch instabilen Tumorzellen, die häufig Resistenzmechanismen gegen die angewandten Therapeutika entwickeln. [GSCI]

This result may be explained by the nominal style characteristic of academic writing (cf. e.g. Halliday 1993a, Halliday & Martin 2004:993, see chapter 2.2). Moreover, Engagement

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encoded in complement features also appears to be most common in the English and the German SCI subcorpora, e.g.:

(339) This could be true for most of the situations, because of the following aspects: [...]. [ESCI]

(340) Die signifikante Leukozyturie macht eine Harnwegsinfektion wahrscheinlich, besitzt als isolierter Befund jedoch eine geringe Spezifität. [GSCI]

In the above examples, assessments of likelihood are expressed by relational processes, which could again be interpreted in terms of a corollary of a more noun-heavy style in research writing (cf. chapter 2.2), nominal features being most frequent in the SCI subcorpora in both languages. Their use in ESCI is illustrated in the following example:

(341) In general, the results show that the rate ratio was similar or slightly increased compared to the general population. However, the absolute risk is about 100 times greater in the subgroup. This fact affects the clinical decisions regarding the risk/benefit of immunization as described below. [ESCI]

A side effect of the use of the nominal item *fact*, accompanied by the demonstrative determiner *this* in the above example, is worth a passing mention: In addition to providing a cohesive link (cf. Halliday & Matthiessen 2004:471), this Engagement feature in the form of a conceptual shell (cf. Schmid 2000) condenses the Contractive impact of the preceding Contractive ATTR feature *the results show that*, which still implies, albeit indirectly, that human agents were involved at some stage. Whereas it would be possible to mark the relationship between the results and the researchers who achieved these results by means of possessive determiners (e.g. *our results*), this is not the case with *fact* (i.e. ? *our fact*). By referring to research in this manner, it is thus presented both as given and independent of the researchers.

While, as noted earlier, modal auxiliaries also appear to be key GRAM_LEX expressions of Engagement in GSCI and GPOP, modal auxiliaries play a less prominent role in the German subcorpora than in the corresponding subsections of the English corpus. It seems that the texts included in the German section of the corpus contain a different, language-specific combination of GRAM_LEX resources. This also holds for the use of particles, which is exclusive to the German section of the corpus, e.g.:

(342) Die späte Landnahme verdankt er wohl seiner durch das Meer geschaffenen Abgeschiedenheit: Erst vor einem guten halben Jahrhundertausend [sic] überwand sie der Mensch wohl massenhaft, während einer kurzen Phase des Niedrigwassers. [GPOP]

Furthermore, it seems that this mix of ingredients varies within the German section. While a number of epistemic particles contribute to the stylistic variety of the texts contained in

GPOP and GREF, no epistemic uses of particles were observed in the German scientific subsection, bar one exception:

- (343) Allerdings bildet der EuroScore (www.euroscore.org) das Risiko für ein selektiertes Kollektiv wohl nicht in vollem Umfang ab (15). [GSCI]

The language-specific combination of GRAM_LEX resources used to create Engagement includes the use of subjunctive forms, which was highlighted previously in connection with the figures for the overall distribution of ATTR and GRAM_LEX features in the POP subsections. While ATTR prevails in EPOP, GPOP contains slightly more GRAM_LEX than ATTR. This also applies to GREF, where subjunctive forms are even more frequent than in GPOP. While a relatively high number of subjunctive features were found both in GPOP and GREF, few subjunctives occur in GSCI.

It was pointed out in connection with the design of the annotation scheme that the uses of the English and the German subjunctive mood differ (cf. chapter 3). The English section contains few instances of the subjunctive, with the highest number of subjunctive features occurring in EPOP (n=14).⁶⁶ The following example illustrates the use of the subjunctive (i.e. *were*) as a marker of hypothetical meaning in an *if*-clause:

- (344) And, if a protease inhibitor were added in the treatment mix, it could prevent some of the destruction of the host's immune response. [ESCI]

The significance of the results relating to the general use of the subjunctive were thus merely tested for the German section, assuming that there are no register-specific preferences for the use of subjunctive forms. The observed values were mapped against the expected values, i.e. the arithmetic mean:

| | GSCI | GPOP | GREF |
|-------------|--------|------|------|
| Subjunctive | 5 | 121 | 119 |
| χ^2 | 106.71 | | |
| cv (2 df) | 5.99 | | |

Table 14: Significance: subjunctive (intralingual)

Since the chi-square value exceeds the critical value drastically, it appears that the divergent distribution of subjunctive forms across the German subcorpora cannot be explained by chance alone. The higher proportion of subjunctive forms observed in GREF compared with GPOP may be explained by the structure of GREF, which contains a mix of registers, some of

⁶⁶ It should be noted that only those cases are considered which are formally distinguishable from indicative forms.

which involve the reporting of speech or thought. This is illustrated in the excerpt shown below, which appears to stem from a news article:

- (345) Zuvor hatte der Präsident der Bundesvereinigung der Deutschen Arbeitgeberverbände, Klaus Murmann, verlangt, der Bundeskanzler solle noch einmal mit Politikern der verschiedenen Parteien, mit Tarifvertragspartnern sowie mit Sachverständigen bis zum Jahresende alle möglichen Lösungsansätze und denkbaren Kombinationen durchdiskutieren. Es gebe keine Eile, weil die neuen Leistungen sowieso erst für frühestens 1996 geplant seien. (Seite 4) [GREF]

Here, the subjunctive I form marks the propositions as external, enabling the authors to dissociate themselves from the content thus presented. Similarly, the following excerpt provides an illustration of the extensive use of reported speech in a legal text, which contributes to the overall proportion of subjunctives in GREF:

- (346) Zur Begründung trägt sie im Wesentlichen vor: 1. Der Antrag sei gem. Art. 93 Abs. 1 Nr. 1 GG, § 13 Nr. 5 BVerfGG zulässig. Fraktionen des Deutschen Bundestags seien befugt, im Organstreitverfahren Rechte des Bundestags in Prozessstandschaft geltend zu machen. Um ein solches Recht handele es sich bei der Bestimmung des Art. 59 Abs. 2 Satz 1 GG. Dieses Recht des Bundestags sei dadurch verletzt, daß die Bundesregierung es unterlassen habe, das Zustimmungsverfahren für die inhaltliche Änderung des NATO-Vertrags durch die Beschlüsse zum neuen Strategischen Konzept 1999 der NATO einzuleiten. Für den Antrag bestehe auch das erforderliche Rechtsschutzbedürfnis. [GREF]

As was mentioned in connection with the design of the annotation scheme, the German scheme distinguishes between subjunctive I and subjunctive II forms. The above examples (345) and (346) contain typical instances of subjunctive I features used to mark content as originating from an external source. One of the few instances of the subjunctive mood in GSCI is shown below:

- (347) In dieser Studie führte Bevacizumab zu einem signifikanten Überlebensvorteil, obwohl es zu keiner wesentlichen Größenabnahme der Tumorknoten kam (21). In der klinischen Prüfung der Angiogeneseinhibitoren wird deshalb häufig das Überleben der Patienten als Maß des Therapieerfolges eingesetzt. Sehr viel effizienter wäre es jedoch die Hemmung der Gefäßneubildung direkt nachzuweisen. [GSCI]

The above example contains an instance of the subjunctive II, which does not serve as a signal of indirect speech, instead it marks the situation as hypothetical. A similar case including an instance of the *würde*-subjunctive form is shown below:

- (348) Die vorliegenden Ergebnisse aus der EPIC-Potsdam-Studie unterstreichen die Bedeutung der gemeinsamen Erhebung von BMI und Taillenumfang zur Abschätzung des Typ-2-Diabetes-Risikos, und zwar insbesondere auch bei Personen, die normal- oder untergewichtig sind. Beide Parameter

wirken gemeinsam auf die Höhe des Diabetes-Risikos, womit eine Beschränkung auf BMI oder Taillenumfang allein zu einer unzureichenden Risikobeurteilung führen würde. [GSCI]

Here, *würde* serves to signal non-factivity similarly to the use of the modal auxiliary *would* in the following example from ESCI:

- (349) We did not target patients with diagnosed cardiovascular disease because in this population vaso-active drugs are needed, and this would have confounded the results. [ESCI]

This functional difference needs to be taken into account in interpreting the results relating to the use of subjunctive forms. The following diagram distinguishes between instances occurring in cited material, on the one hand, and subjunctive features categorised as ‘author voice’, on the other hand. The results are considered in relation to the overall occurrence of subjunctive features:

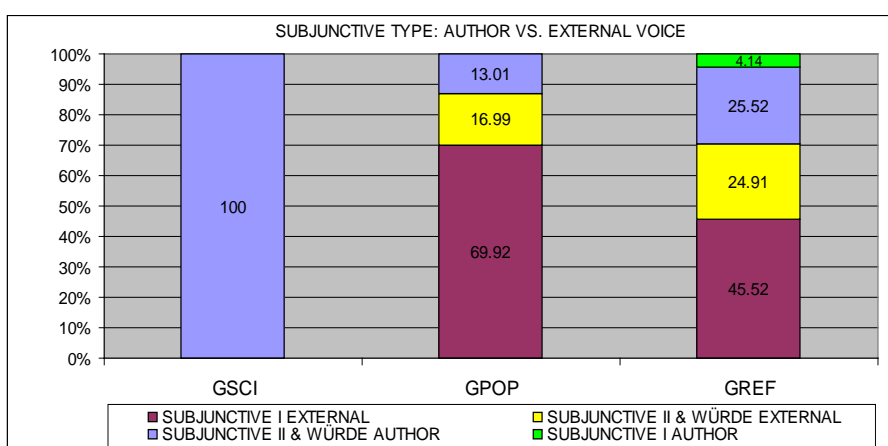


Fig. 17: SUBJUNCTIVE TYPE: author vs. external voice

It was mentioned above that GREF contains more instances of the subjunctive than GPOP in relative terms. However, the chart above suggests that most of the subjunctives occurring in GPOP are subjunctive I items functioning as markers of reported speech or thought. In fact, all of the instances of the subjunctive I found in GPOP were categorised as ‘external voice’. The corresponding proportion of subjunctive I features signalling reported speech or thought is lower in GREF. Taken together, the proportions of inserted subjunctive I and inserted subjunctive II forms and *würde*-subjunctives are higher in GPOP than in GREF. This observation seems to support the impression that subjunctives represent a key means of marking informational content as external in GPOP. Equivalent items are absent in GSCI, instead the very small number of subjunctive II forms and *würde*-subjunctives serves to signal non-factive meaning, e.g.

- (350) Bei Säuglingen unter sechs Monaten wird eine stationäre parenterale antibakterielle Therapie für 10–14 Tage empfohlen (Tab. 3) (4). In dieser Altersgruppe werden mit der Kombinationstherapie

aus Ampicillin plus Aminoglykosid (Tobramycin, Gentamycin) oder plus Ceftazidim die meisten uropathogenen Keime erfasst. Da die Resistenz von E. coli gegenüber Ampicillin 40–50 % beträgt, ist eine Monotherapie mit Ampicillin nicht sinnvoll. Ohne Ampicillin würde jedoch eine „Enterokokkenlücke“ entstehen. [GSCI]

Since it seems plausible to assume that researchers need to position themselves with regard to previous work in the field and thus to acknowledge and respond to the relevant state-of-the-art (cf. e.g. Myers 1989), some kind of interaction with external standpoints can be assumed to take place in high-brow scientific journal papers. For this reason, we may hypothesise that the authors of the GSCI articles used other Engagement resources to integrate external material into their text. As mentioned above, this issue will be addressed in connection with the results relating to the different types of ATTR. Before we move on to the expression of Engagement by means of ATTR, mention should, however, be made of the dialogic impact of the GRAM_LEX features found in the corpus.

7.3.1.2 GRAM_LEX: EXPANSIVE VS. CONTRACTIVE

The percentages expressing the proportion of Expansive and Contractive GRAM_LEX features in relation to the overall number of GRAM_LEX items are displayed in the following chart:

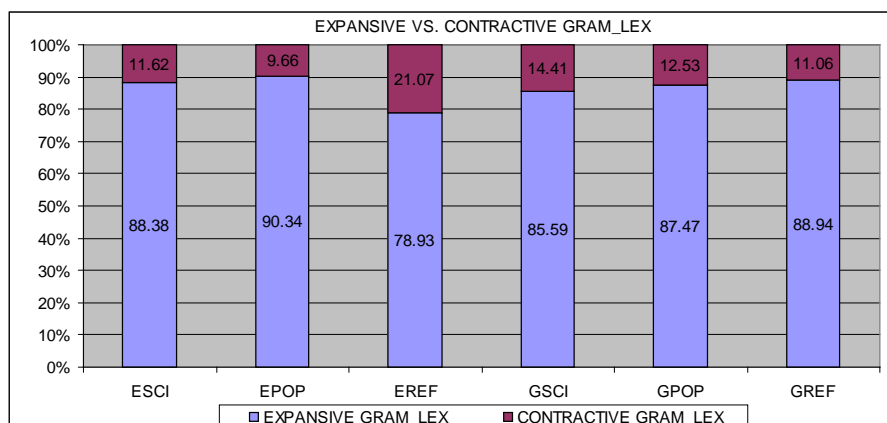


Fig. 18: Expansive vs. Contractive GRAM_LEX

The use of Expansive and Contractive GRAM_LEX features appears to vary more in the English section than in the German section, with EREF containing the highest proportion of Contractive GRAM_LEX features. The results presented above were subjected to significance testing. To this end, the data relating to the general distribution of Expansive and Contractive GRAM_LEX features across the two languages and the three registers was examined. There are no language- or register-specific influences on the use of these features according to H_0 .

| Expansive vs. Contractive GRAM_LEX | ESCI | EPOP | EREF | GSCI | GPOP | GREF |
|---------------------------------------|-------|------|------|------|------|------|
| Expansive | 175 | 421 | 236 | 101 | 377 | 193 |
| Contractive | 23 | 45 | 63 | 17 | 54 | 24 |
| χ^2 | 23.06 | | | | | |
| cv (5 df) | 11.07 | | | | | |

Table 15: Significance: Expansive vs. Contractive GRAM_LEX (global)

The chi-square value exceeds the critical value so that H_0 is rejected. Therefore, the difference observed across the languages and the registers are not likely to be due to random.

Next, a cross-linguistic register-specific assessment of the results was carried out. H_0 assumes that there is no language-specific preference for the use of Expansive or Contractive GRAM_LEX in any of the registers.

| Expansive vs. Contractive GRAM_LEX | ESCI vs. GSCI | | EPOP vs. GPOP | | EREF vs. GREF | |
|---------------------------------------|---------------|------|---------------|------|---------------|------|
| | ESCI | GSCI | EPOP | GPOP | EREF | GREF |
| Expansive | 175 | 101 | 421 | 377 | 236 | 193 |
| Contractive | 23 | 17 | 45 | 54 | 63 | 24 |
| χ^2 | 0.52 | | 1.88 | | 8.99 | |
| cv(1 df) | 3.84 | | | | | |

Table 16: Significance: Expansive vs. Contractive GRAM_LEX (cross-linguistic & register-specific)

Neither in the case of the SCI subsections nor in the case of the POP subsections is there any significant divergence from the expected values so that H_0 is retained. The results obtained from the cross-linguistic comparison suggest that H_0 is merely rejected for the cross-linguistic difference observed between the REF subsections.

In a third step, both the SCI subcorpora and the POP subcorpora were compared with the corresponding REF subsections on an intralingual basis to ascertain if the intralingual deviations are statistically significant (H_0 : The use of Expansive and Contractive GRAM_LEX features does not vary intralingually according to register).

| Expansive vs. Contractive GRAM_LEX | ESCI vs. EREF | | EPOP vs. EREF | | GSCI vs. GREF | | GPOP vs. GREF | |
|---------------------------------------|---------------|------|---------------|------|---------------|------|---------------|------|
| | ESCI | EREF | EPOP | EREF | GSCI | GREF | GPOP | GREF |
| Expansive | 175 | 236 | 421 | 236 | 101 | 193 | 377 | 193 |
| Contractive | 23 | 63 | 45 | 63 | 17 | 24 | 54 | 24 |
| χ^2 | 7.44 | | 19.57 | | 0.80 | | 0.30 | |
| cv (df 1) | 3.84 | | | | | | | |

Table 17: Significance: Expansive vs. Contractive GRAM_LEX (intralingual)

The results obtained by the significance tests suggest that the discrepancies observed in the English section are significant. While H_0 can be rejected for ESCI versus EREF and EPOP

versus EREF, there appears to be little internal variation in the German section, with neither GSCI nor GPOP differing from GREF in a statistically significant manner.

As mentioned initially, EREF contains the highest proportion of Contractive GRAM_LEX features, which may be interpreted as reflecting the higher frequency of adjuncts compared with ESCI and EPOP. The results computed for the English REF subsection may thus be explained by a more frequent use of Contractive adjuncts such as *of course* in the example shown below:

- (351) It is, of course, plainly established that, in cases under the Refugee Convention where the well-founded fear of persecution emanates from non-state agents, the asylum seeker must establish not merely the risk of severe ill-treatment but also that his home state was unwilling or unable to provide a reasonable level of protection from it-see *Horvath v Secretary of State for the Home Department* [2001] 1 AC 489. [EREF]

From the outline of the results relating to GRAM_LEX coding, we can conclude that, on the whole, the use of GRAM_LEX appears to spread across the English and the German in a similar fashion. However, the results hint that this effect is created by means of different resources in the two languages, some of which appear to be typologically motivated while others seem to result from different usage preferences. The data presented above suggest that the GPOP (and the GREF) authors tended to exploit the range of options available for expressing Engagement more than their English counterparts. It thus seems that there is cross-linguistic variation concerning the construal of Engagement by GRAM_LEX and language-internal variation according to register-specific Engagement ‘requirements’. Following the discussion of the data relating to the GRAM_LEX features found in the corpus, the next section turns to the realisation of Engagement by means of ATTR.

7.3.2 ATTR

On the whole, the English corpus was found to contain more instances of Engagement expressed by means of ATTR than the German corpus (cf. section 7.3). While the discrepancy between the absolute number of GRAM_LEX features in the English and in the German sections amounts to 20.60%, the difference concerning ATTR appears to be more marked, with the German section containing 39.82% fewer ATTR features than the English subcorpus. The data relating to GRAM_LEX and ATTR were contrasted in fig. 13. The following chart repeats the proportion of ATTR in relation to the overall frequency of occurrence of Engagement features in each subcorpus for ease of reference:

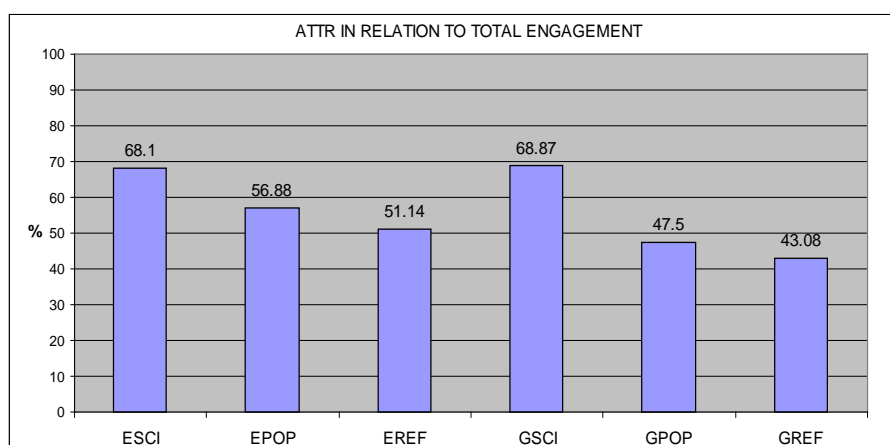


Fig. 19: ATTR in relation to total Engagement

The figures displayed above mirror the percentages of GRAM_LEX in relation to total Engagement displayed in fig. 15. The general tendency concerning the use of ATTR features appears to be fairly similar across the subcorpora in English and German, with the SCI subsection containing the highest proportion of ATTR features whereas the POP and REF subcorpora in both languages contain a lower percentage of ATTR features than the corresponding SCI subsections. This is reflective of the results obtained by the significance tests carried out in section 7.3 with regard to the distribution of GRAM_LEX versus ATTR. We may recall that both SCI subsections differ considerably from the corresponding REF subsections in this respect. The significance value for GSCI and GREF even exceeds that calculated for the intralingual divergence between ESCI and EREF.

As to the intralingual comparison of the REF with the POP subsections, statistically significant results were only obtained for the comparison of EPOP with EREF, the divergence being much less marked than in the case of ESCI and EREF.

Yet, the picture changes when we consider the data relating to the different types of ATTR, beginning with the distinction between ATTR features entailing source-mention and ATTR features involving unspecified sources. The first set of features in the section of the scheme dealing with the annotation of ATTR features discerns between ATTR to identified source and ATTR to unidentified source. By way of recapitulation, ATTR to identified source involves self-mention or the sourcing of propositions to inanimate or external animate entities as exemplified below:

- (352) Nevertheless, trying to develop new therapies based on what treatments will look like in the coming decade is a nearly impossible task, points out Michael Stratton, joint head of the Cancer Genome Project and professor of cancer genetics at the University of London's Institute of Cancer Research, who has been working on developing finely targeted cancer treatments since identifying the *BRAF* oncogene in 2002. [EPOP]

ATTR to unidentified source, by contrast, implies the involvement of a source which is however not mentioned as illustrated in the following example:

- (353) To create the individual vaccine, a receptor protein is extracted from the patient's malignant B cell lymphocytes and purified in large amounts. This idiopathic protein is added to an adjuvant growth factor, keyhole limpet hemocyanin (KLH) – a protein derived from a giant sea mollusk found off the California coast – known to provoke a strong immune response. [EPOP]

The following chart displays the relation between ATTR to identified source and ATTR to unidentified source in the respective subcorpora:

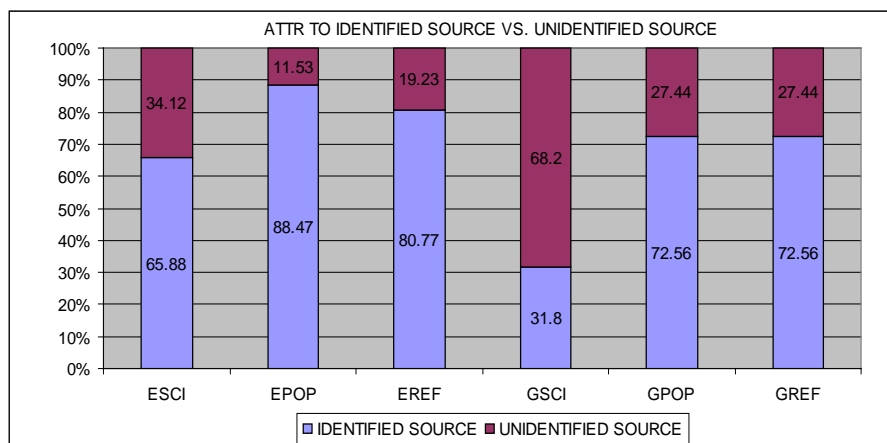


Fig. 20: ATTR to identified source vs. unidentified source

In each one of the subcorpora, ATTR to identified source is more common than ATTR to unidentified source, GSCI being the only exception. The German research authors represented in the corpus display a preference for ATTR to unidentified source. ATTR to identified source appears to be a pervasive phenomenon in the English popularisations. The relative frequency is lower in ESCI than in EPOP and in EREF. GPOP and GREF contain identical percentages, while GSCI contains the smallest percentage of ATTR to identified source.

In order to test the significance of the results presented above, the data relating to the general distribution was examined, H_0 being that there are no language- or register-specific influences on the use of ATTR to identified or to unidentified source:

| ATTR to identified vs. unidentified source | ESCI | EPOP | EREF | GSCI | GPOP | GREF |
|--|--------|------|------|------|------|------|
| Identified source | 280 | 545 | 252 | 83 | 283 | 119 |
| Unidentified source | 145 | 71 | 60 | 178 | 107 | 45 |
| χ^2 | 312.34 | | | | | |
| cv (5 df) | 11.07 | | | | | |

Table 18: Significance: ATTR to identified vs. unidentified source (global)

As can be seen from the table shown above, the chi-square value exceeds the critical value by far so that H_0 can be assumed to be false. Therefore, the differences observed across the languages and the registers are not likely to be caused by random.

Next, a cross-linguistic assessment of the results relating to ATTR to identified versus unidentified source obtained for the registers considered here was carried out. According to H_0 , there is no language-specific preference for the use of ATTR to identified source over ATTR to unidentified source in any of the given registers.

| ATTR to identified vs. unidentified source | ESCI vs. GSCI | | EPOP vs. GPOP | | EREF vs. GREF | |
|--|---------------|------|---------------|------|---------------|------|
| | ESCI | GSCI | EPOP | GPOP | EREF | GREF |
| Identified source | 280 | 83 | 545 | 283 | 252 | 119 |
| Unidentified source | 145 | 178 | 71 | 107 | 60 | 45 |
| χ^2 | 75.39 | | 41.51 | | 4.21 | |
| cv (1 df) | 3.84 | | | | | |

Table 19: Significance: ATTR to identified vs. unidentified source (cross-linguistic & register-specific)

The results obtained from the cross-linguistic comparison suggest that H_0 is rejected for each one of the registers. The cross-linguistic divergence observed in the case of the SCI subsections is, however, considerably more marked than in the case of the POP subsections. It was mentioned previously that more uses of ATTR to identified source occur in the individual subsections than do instances of ATTR to unidentified source, GSCI being the only exception. Sources are thus mentioned significantly less frequently in GSCI than in ESCI in cases where ATTR is used to engage with the readership. Although the cross-linguistic divergence between the REF subsections crosses the significance threshold, the difference is much less marked than in the case of the tests carried out for the SCI and the POP subsections.

Finally, both the SCI subcorpora and the POP subcorpora were compared with the corresponding REF subcorpora to ascertain if the intralingual deviations concerning the use of ATTR to identified source versus unidentified source observed in the subcorpora are likely to be the result of forces other than chance (H_0 : The use of ATTR to identified and to unidentified source does not vary intralingually according to register).

| ATTR to identified vs. unidentified source | ESCI vs. EREF | | EPOP vs. EREF | | GSCI vs. GREF | | GPOP vs. GREF | |
|--|---------------|------|---------------|------|---------------|------|---------------|------|
| | ESCI | EREF | EPOP | EREF | GSCI | GREF | GPOP | GREF |
| Identified source | 280 | 252 | 545 | 252 | 83 | 119 | 283 | 119 |
| Unidentified source | 145 | 60 | 71 | 60 | 178 | 45 | 107 | 45 |
| χ^2 | 19.86 | | 10.14 | | 67.10 | | 0 | |
| cv (1 df) | 3.84 | | | | | | | |

Table 20: Significance: ATTR to identified vs. unidentified source (intralingual)

The results obtained by the significance tests suggest that the discrepancies regarding the use of ATTR to identified and unidentified source are significant for all of the subsections with the exception of GPOP. The EPOP journalists use significantly more ATTR to identified source than is used in EREF, while it is the other way around in ESCI, where significantly fewer cases of ATTR to identified source occur than in EREF.

While H_0 can be rejected for EPOP and both SCI subsections, it appears that the value obtained for GSCI is far higher than the corresponding value for ESCI. While propositions tend to be attributed to identified sources in all of the other subsections, GSCI authors appear to prefer ATTR to unidentified source. The use of ATTR to unidentified source in GSCI is exemplified below:

- (354) Frustrane Atemexkursionen, die bei OSA im Rahmen der Apnoen regelhaft vorkommen, führen durch Veränderungen transmuraler Druck- und Größenverhältnisse zur Triggerung atrialer, dehnungssensibler Ionenkanäle (22). Auch für die ZSA/CSR können ähnliche Mechanismen angenommen werden. jedoch konnte gezeigt werden, dass hier Arrhythmien in den Hyperventilationsphasen der CSR auftreten (23). [GSCI]

The GSCI publications thus seem to stray considerably from the way Engagement is realised in ESCI and in the other subcorpora in that sources tend to be mentioned less frequently in cases where ATTR is used as a means of Engagement. In order to shed light on the marked result obtained for the SCI subcorpora, the next section will address the different types of entities brought into play and the manner in which these are referenced and realised before getting back to the apparent avoidance of source-mention in GSCI.

7.3.2.1 ATTR TO IDENTIFIED SOURCE

As mentioned previously, the present analysis distinguishes between different kinds of sources referenced by means of ATTR to identified source. These will be considered in more detail in the following section.

7.3.2.1.1 SOURCE TYPE

In section 7.3, the figures relating to ATTR to identified source were discussed in view of the potential impact of the subjunctive mood as a means of marking a proposition as external to the author's voice without using ATTR features to achieve this effect. In the following chart,

the results relating to the different types of sources are expressed in terms of proportions in relation to the overall use of ATTR to identified source in the individual subcorpora:

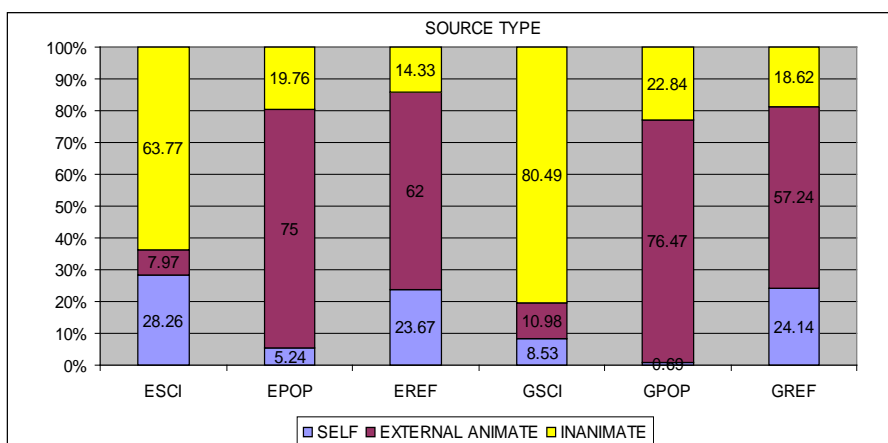


Fig. 21: SOURCE TYPE

The results indicate that the types of sources mentioned in the subcorpora differ within and across the two languages: For instance, Engagement features involving self-mention occur more often in ESCI than in GSCI. GSCI, in turn, includes less self-mention than GREF, while ESCI contains more self-mention than EREF. In both languages, ATTR to self is least frequent in the POP subsections. The REF subsections, by contrast, appear to resemble each other fairly closely in this regard.

As mentioned previously, the POP subsections contain the highest percentage of ATTR to external animate in each language, while ATTR to external animate is least frequent in the SCI subsections. In both languages, the REF subcorpora contain a lower proportion of ATTR to external animate than the POP subsections, but they are still closer to the POP subsections than to the SCI subsections as regards the use of ATTR to external animate.

ESCI and GSCI contain the highest proportions of ATTR to inanimate, while the REF subcorpora contain the lowest proportion of ATTR to inanimate in both languages. The percentages presented above hint that cross-linguistic variation is stronger in the case of the SCI and POP subsections than in the case of the mix of registers represented in the REF subsections. A more detailed discussion of the data obtained for the different types of sources occurring in ATTR features will take place in the following.

The overview of the data relating to the different source types concludes with a look at the results obtained by the significance tests carried out for these figures, beginning with the global distribution. According to H_0 , there are no language- or register-specific influences on the source types occurring in ATTR to identified source.

| SOURCE TYPE | ESCI | EPOP | EREF | GSCI | GPOP | GREF |
|------------------|--------|------|------|------|------|------|
| Self | 79 | 29 | 60 | 7 | 2 | 29 |
| External Animate | 22 | 409 | 156 | 9 | 216 | 68 |
| Inanimate | 178 | 108 | 36 | 66 | 65 | 22 |
| χ^2 | 564.90 | | | | | |
| cv (10 df) | 18.31 | | | | | |

Table 21: Significance: SOURCE TYPE (global)

The critical value is exceeded by far by the chi-value obtained for the general cross-linguistic distribution so that H_0 can be refuted. The table shown below displays the results obtained by applying the chi-square test to the cross-linguistic differences between corresponding registers. H_0 stipulates that the use of the different source types is not impacted by language-specific preferences in any of the registers examined here.

| SOURCE TYPE | ESCI vs. GSCI | | EPOP vs. GPOP | | EREF vs. GREF | |
|------------------|---------------|------|---------------|------|---------------|------|
| | ESCI | GSCI | EPOP | GPOP | EREF | GREF |
| Self | 79 | 7 | 29 | 2 | 60 | 29 |
| External animate | 22 | 9 | 409 | 216 | 156 | 68 |
| Inanimate | 178 | 66 | 108 | 65 | 36 | 22 |
| χ^2 | 13.72 | | 11.53 | | 1.23 | |
| cv (2 df) | 5.99 | | | | | |

Table 22: Significance: SOURCE TYPE (cross-linguistic & register-specific)

The critical value is exceeded in the case of the SCI and the POP subsections so that H_0 is rejected, the cross-linguistic divergences from the expected values being slightly higher in the case of the SCI than in the case of the POP subsections. The observations made above regarding the different use of ATTR to self in ESCI and ATTR to external animate in the POP subsections seem to be mirrored in these values. Once again, there is significant cross-linguistic divergence in the case of the SCI publications and the POP articles. This does not apply to EREF and GREF as no significant deviation from the expected values was computed for the REF subsections.

The H_0 applied to the intralingual comparisons of the SCI and the POP subsections with the corresponding REF subsections is that there is no register-specific bias in the occurrence of certain source types in ATTR to identified source.

| SOURCE TYPE | ESCI vs. EREF | | EPOP vs. EREF | | GSCI vs. GREF | | GPOP vs. GREF | |
|------------------|---------------|------|---------------|------|---------------|------|---------------|------|
| | ESCI | EREF | EPOP | EREF | GSCI | GREF | GPOP | GREF |
| Self | 79 | 60 | 29 | 60 | 7 | 29 | 2 | 29 |
| External animate | 22 | 156 | 409 | 156 | 9 | 68 | 216 | 68 |
| Inanimate | 178 | 36 | 108 | 36 | 66 | 22 | 65 | 22 |
| χ^2 | 196.83 | | 59.90 | | 76.43 | | 66.00 | |
| cv (2 df) | 5.99 | | | | | | | |

Table 23: Significance: SOURCE TYPE (intralingual & register-specific)

H_0 is rejected for the comparison of the SCI and the POP subsections with the corresponding REF subsections so that there do appear to be language-specific biases in each register. While the critical value is exceeded in each case, the value for ESCI is especially striking. The respective results for the individual source types will be considered more closely in the following sections, beginning with ATTR to self.

ATTR to self

As pointed out earlier, self-referential ATTR as illustrated in the following example occurs most frequently in ESCI:

- (355) We rationalized that if this approach does improve sensitivity of the FMD technique, we may be able to demonstrate impairments in endothelial function in a population where traditional FMD is unable to detect impaired function. [ESCI]

This type of source-mention was less frequent in EREF and least frequent in EPOP in the English section of the corpus. The picture is different in the German part of the corpus: It was mentioned above that ATTR to self is rarer in GSCI and in GPOP than in the corresponding English subsections of the corpus. One of the rare instances of ATTR in GSCI involving self-mention is shown below:

- (356) Wir sind der Überzeugung, dass aufgrund unserer Ergebnisse und der Erfahrungen anderer Studiengruppen (13, 16, 17) ein Umdenken im primären Staging des Mammakarzinoms erfolgen sollte. [GSCI]

The data presented in the previous section suggest that, in contrast to the ESCI authors, GSCI authors avoid reference to self in presenting informational content. It was noted above that a number of instances involving self-mention were found in EPOP, ATTR to self is, however, essentially absent in GPOP.

In the German section of the corpus, both GSCI and GPOP differ from GREF in that they use less ATTR to self in cases where ATTR to identified source is involved. Yet, in contrast to the research papers and the popularisations, the mix of registers included in EREF and GREF appears to be relatively close as regards the use of self-reference. An example taken from a political speech in GREF is shown below:

- (357) Herr Präsident! Meine Damen und Herren! Ich verstehe, daß man im Rahmen einer Geschäftsordnungsdebatte versucht einzuhalten, was zwischen dem Bundeskanzler und allen Fraktionsvorsitzenden vereinbart worden ist. Allerdings gibt es auch Geschäftsordnungsdebatten, die es dann erforderlich machen, auf einige Dinge hinzuweisen, von denen ich denke, daß sie klarbleiben sollten. [GREF]

In interpreting these results the distinction according to external voice and author voice needs to be taken into account to determine whether the instances of ATTR to self actually stem from the author(s), that is the “authorial voice” (White 2012a), or whether somebody else’s self-mention is incorporated by referencing an external voice (cf. e.g. Körner 2000:138ff, White 2012a). The latter case is illustrated in the following example from EPOP:

- (358) Soil chemistry, humidity and even when during the day a plant is harvested affect its chemical make-up, Holmes notes. “I think we have to be cautious with the way we use traditional Chinese medicines and other herbal remedies.” [EPOP]

The following chart compares the proportion of ATTR to self occurring in cited external material with the proportion of ATTR to self in author-voice settings in relation to the overall number of ATTR to self:

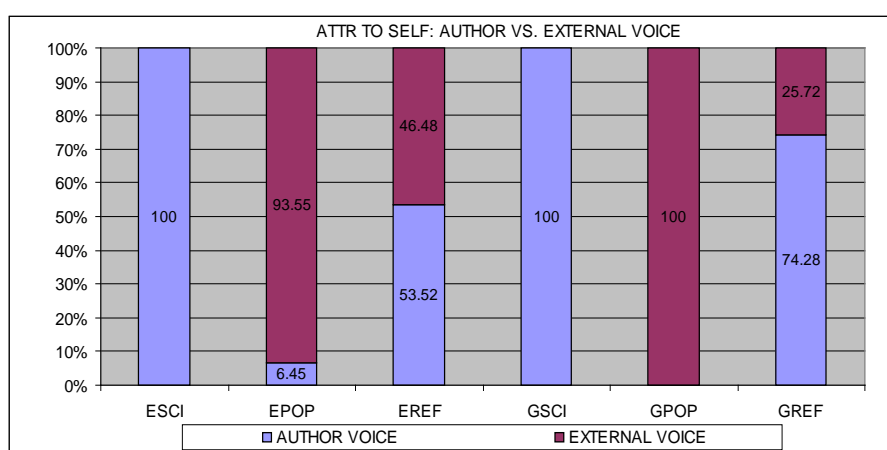


Fig. 22: ATTR to self: author vs. external voice

According to the relative data in the table shown above it appears that self-mention is exclusively linked to the author voice in both SCI subsections. As to the POP articles, EPOP and GOPP seem to share a common characteristic in that ATTR involving self-reference seems to be avoided by the author’s voice in both POP subcorpora. It appears that scientific journalists tend to remain in the background in presenting medical news.

The instances of self-mention found in the POP subcorpora thus mainly stem from external voices. It was mentioned earlier that the reporting of speech and thought appears to play a key role in the POP subsections of the corpus. In the following example, quotation marks signal that the ATTR feature *Our hypothesis is that* etc. is external to the text:

- (359) Although Splenda elicits less overall activity within the brain, the researchers were surprised to find that the artificial sweetener seems to inspire more communication between these regions. “Looking at the connection between the taste areas, Splenda is stronger,” Frank says. He suggests that when

we taste Splenda, the reward system becomes activated but not satiated. “Our hypothesis is that Splenda has less of a feedback mechanism to stop the craving, to get satisfied.” [EPOP]

In contrast to the above instance of direct speech, the next example shows a case of ATTR to self involving indirect speech:

- (360) Don't call them stem cells just yet, but researchers say they have discovered a rare and long-sought class of cell in adult mice that is responsible for patching up an injured pancreas. [EPOP]

The example does not include first-person reference to self, instead the third-person pronoun *they* is used as a consequence of the shifts resulting from the grammar of reported speech (Quirk et al. 1985:1028f). In the following example, the external voice (*Virologen*) is inserted into the text by the use of the mental verb *glauben* in the reporting clause combined with a non-finite structure in the projected clause:

- (361) Virologen glauben inzwischen auch den Ursprung der Infektion identifiziert zu haben: ein aus Indien heimgekehrter Tourist. [GPOP]

On a spectrum running from Intra-vocalise to Extra-vocalise, the items in example (360) or (361) would occupy a position slightly closer to the Intra-vocalise end of the spectrum as a result of the changes taking place in indirect speech, whereas example (359) would be located closer to the Extra-vocalise end (cf. White 2012b, Körner 2000, see chapter 4).

The figures concerning EPOP suggest that the external voices, i.e. scientists talking about their work in cited material, also attributed claims to themselves, as was found to be the case in ESCI. To a certain extent, the manner of presentation involving self-mention observed in ESCI seems to have been preserved across the English registers by the scientists quoted in the EPOP articles. GPOP, by contrast, contained a mere two comparable instances of ATTR to self, both of which are marked as inserted material, e.g.:

- (362) Berens: „Wir vermuten, dass die Nervenzellen so verdrahtet sind, dass Korrelationen kaum auftreten.“ [GPOP]

Thus, correspondingly, the avoidance of ATTR to self observed in GSCI seems to have been transported across to GPOP, resulting in a lack of inserted ATTR to self.

The discussion of the data concerning ATTR to self concludes with a look at the dialogic impact of the instances of ATTR involving self-reference. The results are considered in terms of the percentages representing the relation between Expansive and Contractive uses of ATTR to self:

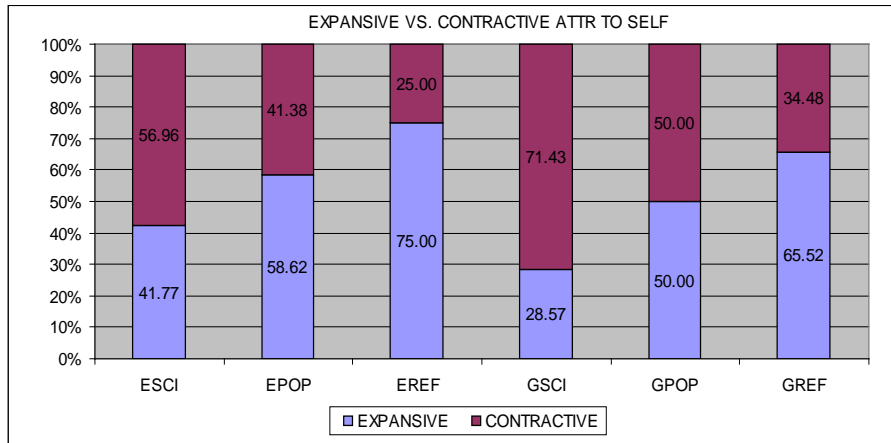


Fig. 23: Expansive vs. Contractive ATTR to self

As was mentioned above, ATTR to self is most frequent in ESCI, while the overall – absolute – number of ATTR to self is low in GSCI and GOPP in absolute terms. Keeping in mind that these data relate to a fine-grained level of analysis, it is, however, interesting to note that the percentage of Contractive uses of ATTR to self in GSCI exceeds the percentage of corresponding Contractive items observed in ESCI.

As ATTR to self is rare in GSCI, chi-square tests were not applied to the global cross-linguistic distribution of Expansive and Contractive uses of ATTR to self on account of the requirements concerning the expected frequencies not being met (Preacher 2001). The same applies to the cross-linguistic differences observed between the SCI and the POP subsections. In the case of the REF subsections the significance test yielded the following result (H_0 : There is no cross-linguistic register-specific bias in the distribution of Expansive and Contractive ATTR to self):

| Expansive vs. Contractive ATTR to self | EREF vs. GREF | |
|---|---------------|------|
| | EREF | GREF |
| Expansive | 45 | 19 |
| Contractive | 15 | 10 |
| χ^2 | 0.87 | |
| cv (1 df) | 3.84 | |

Table 24: Significance: Expansive vs. Contractive ATTR to self (cross-linguistic & register-specific)

The chi-square value falls short of the critical value so that H_0 is not refuted. By consequence, there does not appear to be any significant cross-linguistic divergence concerning the use of Contractive versus Expansive ATTR to self between EREF and GREF.

As to the intralingual differences, chi-square testing was not carried out for the results relating to the intralingual comparison of GSCI and GOPP with GREF due to the requirements concerning the expected values (Preacher 2001). Chi-squared testing was, however, suitable

for the intralingual comparisons of ESCI and EPOP with EREF (H_0 : There is no register-specific bias in the distribution of Expansive and Contractive ATTR to self).

| Expansive vs. Contractive ATTR to self | ESCI vs. EREF | | EPOP vs. EREF | |
|---|---------------|------|---------------|------|
| | ESCI | EREF | EPOP | EREF |
| Expansive | 33 | 45 | 17 | 45 |
| Contractive | 45 | 15 | 12 | 15 |
| χ^2 | 18.16 | | 2.48 | |
| cv (1 df) | 14.75 | | | |

Table 25: Significance: Expansive vs. Contractive ATTR to self (intralingual)

The result relating to the comparison of ESCI and EREF is in line with the marked preference for Contractive ATTR to self observed in ESCI. H_0 is rejected for the comparison of ESCI and EREF so that we may assume that the use of these features is affected by significant language-internal register-specific biases. By contrast, the divergence observed between EPOP and EREF is not statistically significant.

From a language-internal perspective, it appears that in cases in which the research writers represented in ESCI attribute informational content to themselves they show a strong tendency to close down dialogic space in doing so. The Contractive use of this type of ATTR is exemplified below:

- (363) In this report, by using the HuRA-SCID mouse model we were able to provide direct evidence of functionality and to present a number of novel findings regarding the production of ACPA within the rheumatoid synovial membrane. [ESCI]

Here the authors' presence is made explicit in the presentation of the knowledge claim and at the same time the claim is presented in an assertive manner which challenges potential objections (cf. e.g. Martin & White 2005:102ff). Compared with the authors represented in the other subsections of the English part of the corpus, the scientists represented in ESCI are thus less prone to source claims to themselves in a fashion that presents propositions as negotiable, as in:

- (364) Calculation of the ratio of Eqs. (8a) and (8b) leads to the following equation:

$$(t_1-t_3)/(t_1-t_2) = \ln((36+LAP)/(4+LAP))/\ln((16+LAP)/(4+LAP)) \quad (9)$$

from this equation we can draw the conclusion that LAP is determined by the ratio of $(t_1-t_3)/(t_1-t_2)$ on the descending limb of mitral regurgitation continuous wave Doppler spectrum. [ESCI]

In EPOP and in EREF the situation is different compared with ESCI: There are more Expansive than Contractive uses of ATTR to self. The tendency to present knowledge claims in a manner which involves Contractive ATTR to self in research publications appears to be scaled down in the popularisations in the English section of the corpus (we may recall that the vast

majority of cases of ATTR to self in EPOP are external-voice features and that there are hardly any corresponding instances of self-referential ATTR in GPOP). Therefore it seems that the researchers cited in EPOP as in the following example are more prone to attribute claims to themselves in a manner that presents claims as negotiable than in the case of the expert-to-expert communication represented in ESCI:

(365) "We think that viruslike particles mimic the virus much better than soluble proteins," Liang says.
[EPOP]

Since, as pointed out previously, ATTR to self is virtually absent in GPOP the results for the German journalistic subsection will not be discussed in any further detail. Finally, from a cross-linguistic perspective, the REF subsections were found to resemble each other as regards the use of Contractive versus Expansive ATTR to self.

Following the above discussion of the data relating to ATTR to self, the next section turns to the ATTR of propositions to external animate sources.

ATTR to external animate

The role of ATTR to external animate was treated briefly in section 7.2. It was pointed out that typological differences regarding the realisation of reported speech or thought seem to be reflected in the POP subsections of the corpus. The respective absolute figures were shown in fig. 14. It was mentioned that the fact that over twice the number of instances of ATTR to external animate occur in EPOP than in GPOP may be interpreted as a consequence of the repeated introduction of speech acts involving the mention of external animate sources. The chart shown below repeats the percentages for ATTR to external animate in relation to the overall use of ATTR to identified source:

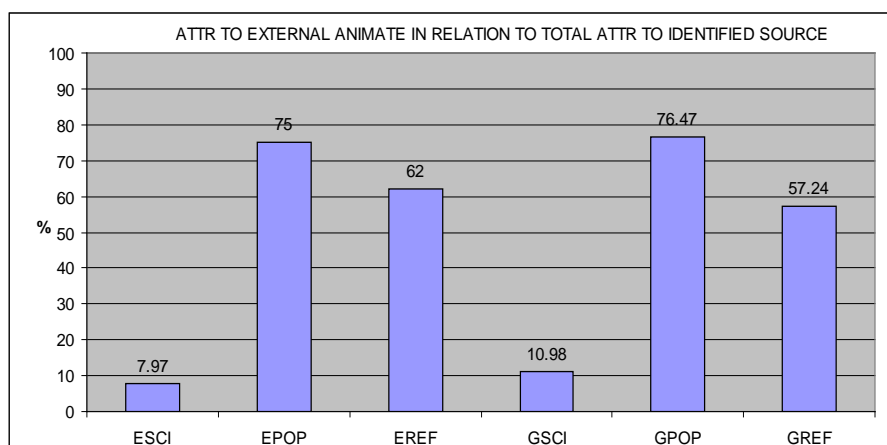


Fig. 24: ATTR to external animate in relation to total ATTR to identified source

While fewer instances of ATTR to external animate occur in the German section in absolute terms, their use appears to follow a somewhat similar pattern across the registers in the two

languages when compared to the overall frequency of occurrence of ATTR to identified source. Thus ATTR to external animate is least frequent in the SCI subsections. Their use in ESCI is illustrated in the following example:

- (366) In 1976, Weiss et al. [1] found that left ventricular pressure was able to be plotted and fit to an exponential function: [...]. [ESCI]

One of the rare instances in GSCI is shown below:

- (367) Kanagala et al. beschrieben ein Rezidiv bei 82 % der 27 unbehandelten OSA-Patienten im Vergleich zu 42 % bei 12 behandelten und 53 % in der Kontrollgruppe (n = 79). [GSCI]

The POP subsections have the highest percentages of ATTR to external animate source in both languages. In interpreting these data, it should be kept in mind that a heteroglossically diverse setting is construed by different resources in the two POP subsections: As pointed out in section 7.3, GPOP authors generally have a stronger preference for GRAM_LEX features in engaging with their readership for typological reasons, whereas EPOP authors display a preference for ATTR. Additionally, in cases which involve ATTR, there is a stronger tendency to attribute propositions to identified sources in EPOP than in GPOP. Hence, it seems that the EPOP journalists tend to give the floor to the researchers. In the German corpus, by contrast, there seems to be a stronger tendency to incorporate external material by subjunctive forms. Repeated mention of framing structures, and hence of sources, is thus made superfluous. However, the percentages displayed above suggest that ATTR to external animate source is roughly as frequent as in EPOP in the smaller number of cases in which ATTR to identified source is employed in GPOP.

The REF subsections contain a lower percentage than the respective POP subsections in both languages. ATTR to external animate thus appears to be a key characteristic of popular scientific prose.

Following the overview of the results relating to the frequencies of ATTR to external animate sources, the chart shown below looks at the dialogic impact of the uses of ATTR to external animate occurring in the individual subcorpora:

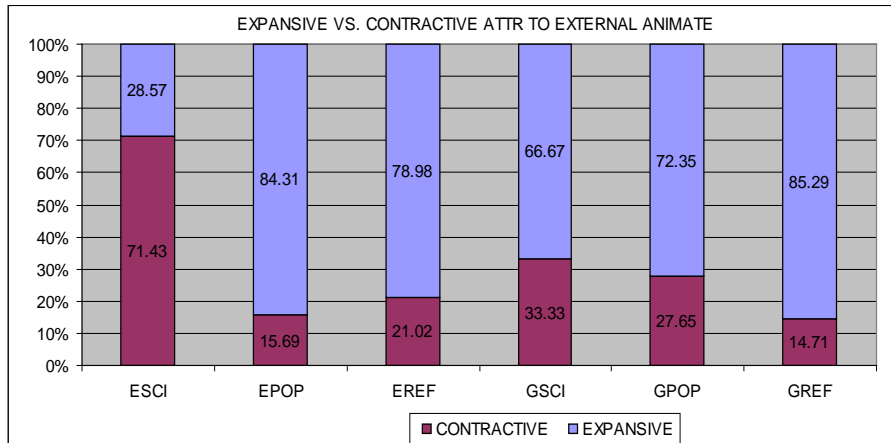


Fig. 25: Expansive vs. Contractive ATTR to external animate

While, as noted above, the use of ATTR to external animate appears to follow a somewhat similar pattern across the registers in English and German, the picture changes when the dialogic properties of these features are considered: Although the absolute frequency of occurrence of ATTR to external animate is small in the two research subsections, it is interesting to note that ESCI contains the highest percentage of Contractive items. Moving on to the POP subsections, we note that GPOP contains a higher percentage of Contractive ATTR to external animate than EPOP. Moreover, there are more Contractive instances of ATTR to external animate in GPOP than in GREF, whereas the opposite applies to the English subsection.

The data relating to the general distribution of Expansive and Contractive features was examined, with H_0 assuming that there are no language- or register-specific influences on the use of Expansive or Contractive ATTR to external animate:

| Expansive vs. Contractive ATTR to external animate | ESCI | EPOP | EREF | GSCI | GPOP | GREF |
|--|-------|------|------|------|------|------|
| Expansive | 6 | 344 | 124 | 6 | 157 | 58 |
| Contractive | 15 | 63 | 33 | 3 | 60 | 10 |
| χ^2 | 48.01 | | | | | |
| cv (5 df) | 11.07 | | | | | |

Table 26: Significance: Expansive vs. Contractive ATTR to external animate (global)

The critical value is exceeded by the chi-square value obtained for the general cross-linguistic distribution. Therefore, H_0 can be rejected so that factors other than chance need to be taken into consideration in explaining the divergence observed in the general distribution of these features.

The following table displays the results obtained by testing the significance of the cross-linguistic differences observed between corresponding registers in the two languages (H_0 :

The register-specific use of Expansive or Contractive ATTR external animate source does not vary cross-linguistically):

| Expansive vs. Contractive ATTR to external animate | EPOP vs. GPOP | | EREF vs. GREF | |
|---|---------------|------|---------------|------|
| | EPOP | GPOP | EREF | GREF |
| Expansive | 344 | 157 | 124 | 58 |
| Contractive | 63 | 60 | 33 | 10 |
| χ^2 | 13.25 | | 1.22 | |
| c2 (1 df) | 3.84 | | | |

Table 27: Significance: Expansive vs. Contractive ATTR to external animate (cross-linguistic & register-specific)

The SCI subsections are not taken into account since, as mentioned above, ATTR to external animate source is relatively rare and, as a result, at least 20 percent of the expected values are < 5. Yet, the divergences observed between EPOP and GPOP are statistically significant so that H_0 is rejected, which does not apply to the REF subsections.

The next table shows the data relating to the intralingual comparisons of the SCI and the POP subsections with the corresponding REF subsections (H_0 : There are no register-specific influences on the use of Expansive or Contractive ATTR to external animate):

| Expansive vs. Contractive ATTR to external animate | ESCI vs. EREF | | EPOP vs. EREF | | GSCI vs. GREF | | GPOP vs. GREF | |
|---|---------------|------|---------------|------|---------------|------|---------------|------|
| | ESCI | EREF | EPOP | EREF | GSCI | GREF | GPOP | GREF |
| Expansive | 6 | 124 | 344 | 124 | 6 | 58 | 157 | 58 |
| Contractive | 15 | 33 | 63 | 33 | 3 | 10 | 60 | 10 |
| χ^2 | 23.90 | | 2.46 | | 1.97 | | 4.68 | |
| cv (2 df) | 5.99 | | | | | | | |

Table 28: Significance: Expansive vs. Contractive ATTR to external animate (intralingual)

According to the results obtained by the chi-square tests, H_0 is rejected for the comparison of ESCI with EREF so that there appear to be significant register-specific biases. In the other cases, there do not seem to be any noteworthy divergences as H_0 is retained.

The data presented above suggest that the EPOP authors seem to be more inclined than their German counterparts to introduce external human sources in a manner which presents knowledge claims as negotiable. It seems that the journalists represented in GPOP display a stronger tendency to close down dialogic space when using ATTR to external animate than do the EPOP authors. This effect is illustrated below by a Contractive instance of ATTR to external animate in GPOP:

- (368) In der Milch der Frauen in den Vitamin-A- und Carotin-Gruppen fanden sich signifikant mehr Viren als in der von Müttern, die das Multivitaminpräparat oder die Placebopille eingenommen hatten, entdeckten die Forscher. [GPOP]

It appears that when the GPOP journalists bring into play researchers by attributing knowledge claims to them, these claims are presented in a more ‘authoritative’ manner than

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is the case in the English popularisations. The latter seem to have a stronger tendency to attribute propositional content to external animate sources in a fashion which presents claims as open to discussion. The next example illustrates such uses of ATTR to external animate which do not provide any hint as to the journalist's stance towards the informational content thus presented:

- (369) "In general, cancers like pancreatic cancer that almost always have a *KRAS* gene mutation have been quite refractory. That would of course change overnight if there were a promising way to molecularly target *KRAS* abnormalities," says Daniel Haber, director of the MGH-East Cancer Center. For patients who respond well to these vaccines, however, cancer could become manageable, even if it's not curable, Haber says. [EPOP]

The results may be interpreted such that the EPOP authors tend to accommodate dialogic diversity more than do the German journalists represented in GPOP. In this regard, the POP subsections are different from the REF subsections, which do not differ significantly from a cross-linguistic perspective.

Moving on to the intralingual comparisons, we note that the only significant difference concerns ESCI. There is no statistically significant language-internal divergence concerning the preference of Expansive over Contractive ATTR to external animate in any of the other cases. ESCI authors tend to include external voices in an assertive manner. It may be surmised that these external sources are introduced as 'evidence' provided in support of the authors' own claims or as points of departure in the authors' own argumentation as illustrated below:

- (370) Karabulut et al. found that while NTproBNP levels increase significantly with each increasing class of disease, there is a wider range of NT-proBNP levels in NYHA classes III and IV [26]. This may account for our relative inaccuracy at estimating NT-proBNP levels in higher NYHA classes. [ESCI]

Following the discussion of ATTR features involving external animate sources, the next section is concerned with the sourcing of propositions to inanimate sources.

ATTR to inanimate

As mentioned previously, this category concerns the Attribution of propositional content to non-human entities. The excerpt shown below includes instances of Contractive ATTR to inanimate which exemplify the kind of features falling into this category:

- (371) Unpublished data from our laboratory and reports from others [10, 11] have demonstrated that manipulating the duration of forearm occlusion is an effective strategy to induce a wide range of hyperemic stimuli, thus setting the stage to comprehensively evaluate the relationship between shear stress and FMD. [ESCI]

In the example above, *unpublished data from our laboratory* and *reports from others* would be classified as inanimate sources. Similarly, *Tierexperimente* in the German example functions as the inanimate source of an ATTR feature:

- (372) Tierexperimente legen nahe, dass Antikörper gegen GP Ib/IX mit einem schlechteren Ansprechen auf Immunglobuline assoziiert sein könnten als Antikörper gegen GP IIb/ IIIa (17) [...]. [GSCI]

If we look at the proportion of inanimate sources in relation to the overall number of ATTR features as shown in the next figure, the use of ATTR to inanimate source seems to follow a similar pattern in the English and the German part of the corpus: In both languages, the proportion of ATTR to inanimate is highest in the SCI subsection, followed by the POP subsection, the proportion being lowest in the REF subsection.

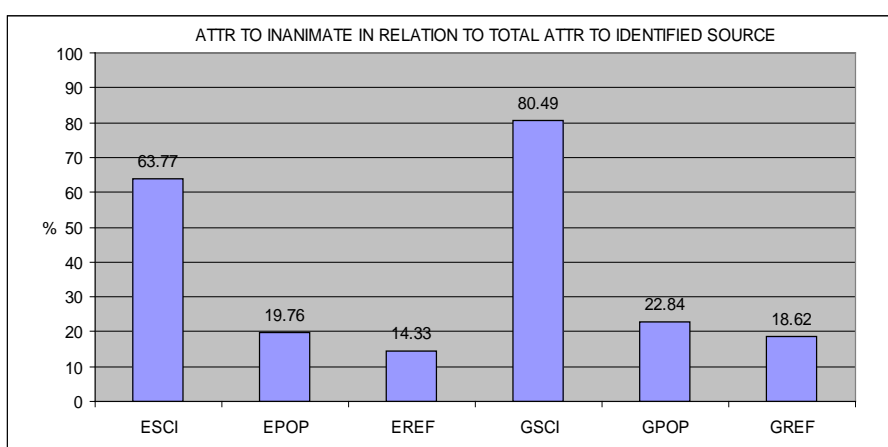


Fig. 26: ATTR to inanimate in relation to total ATTR to identified source

The data suggest that SCI authors share in common a penchant for ATTR to inanimate as a means of foregrounding research procedures and outcome (cf. chapter 2). This is illustrated by the following example:

- (373) The gross examination revealed that both prestenotic and poststenotic segments were similar in all groups. [ESCI]

ATTR to inanimate is less frequent in GSCI than in ESCI in absolute terms (cf. section 7.3.2.1.1). This observation may be interpreted as reflecting the greater semantic versatility of the subject position in English (cf. Doherty 1996, Teich 2003). This is illustrated by the following example:

- (374) Several papers have looked at the relationship between vaccines and type 1 diabetes and have not found an association [12, 13]. [ESCI]

A similar item from GSCI is shown below:

- (375) Frühere Studien beschreiben eine hohe Prävalenz insbesondere der ZSA/CSR bei systolischer Herzinsuffizienz (7, 8) [...]. [GSCI]

However, it seems that this type of combination has a stronger flavour of personification in German and might seem less habitual than in English. Yet, as can be seen from the chart shown above, the GSCI writers are even more prone than the ESCI authors to exploit this option as means of foregrounding research in those cases in which ATTR to identified source occurs in GSCI. This observation is in line with the statistical tests carried out for ESCI and GSCI in section 7.3.2.1.1. The results indicated that the cross-linguistic differences observed between the SCI papers regarding the sources referenced by means of ATTR to identified source are of statistical significance.

Moving on to the POP subsection, we note that the tendency to invoke inanimate sources in the presentation of claims is reduced compared with the SCI publications, EPOP being far closer to EREF in this regard. The use of ATTR to inanimate is illustrated in the following example:

- (376) The current trial follows a nine-month safety and efficacy trial conducted last year at the Institute Dante Pazzanese of Cardiology in São Paulo, Brazil, on 15 patients that proved VESTAsync works safely in people, Landy says. [EPOP]

GPOP seems to be even farther apart from GSCI in this regard. Therefore, the intralingual adaptations taking place in gearing the presentation of claims to the requirements of a non-specialist readership appear to be more pronounced in the German section than in the English section as regards the use of ATTR to inanimate.

It was pointed out in the previous chapter that ATTR to inanimate source represents a resource which enables authors to ‘step back’ behind their research. This effect is illustrated below:

- (377) Our additional finding of a lower risk of MI after lacunar vs nonlacunar ischemic stroke provides further epidemiological evidence to suggest that many lacunar ischemic strokes are caused by a distinct, nonatherothrombotic, small vessel arteriopathy. [ESCI]

Here the proposition *many lacunar ischemic strokes are caused by a distinct, nonatherothrombotic, small vessel arteriopathy* is attributed to *additional finding*, albeit in a slightly roundabout way involving the verb-noun group *provides further epidemiological evidence*. This relational process is then expanded further by the addition of *to suggest that*. The inanimate source *finding* is, in turn, ascribed to the authors by means of the possessive

determiner *our*. This point will be taken up in the following in connection with the results relating to ascribed inanimate sources.

As mentioned in the outline of the annotation scheme, the set of features dealing with ASCR distinguishes between inanimate sources which imply human involvement and those which do not signal human participation. The following example includes a source which does not involve ASCR (i.e. *recent findings*):

- (378) By a simple food-in/energy-out model, a run on the treadmill or swim in the pool should make you want to eat more. But recent findings have suggested that exercise can actually help to slow overeating. [EPOP]

In the following example, by contrast, human involvement is signalled by means of ASCR of the source (*related research*) via postmodification (i.e. *by Kim Cecil of Cincinnati Children's Hospital Medical Center*):

- (379) Related research by Kim Cecil of Cincinnati Children's Hospital Medical Center published with this study in PLoS Medicine found that 157 of the subjects with the highest lead levels had the smallest brain sizes compared with normal adults, providing a possible mechanism for lead's effect on behavior. [EPOP]

The following chart details the percentages of ascribed inanimate sources and non-ascribed inanimate sources:

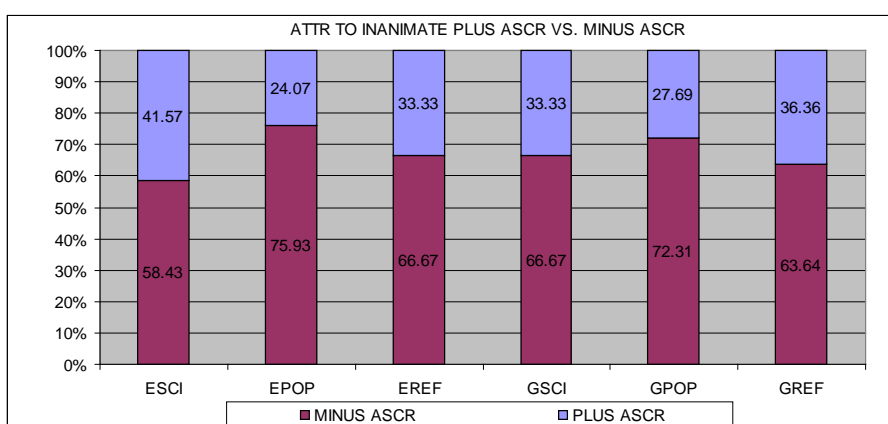


Fig. 27: ATTR to inanimate plus ASCR vs. minus ASCR

The results indicate that non-ascribed sources are more common than ascribed sources in all of the subcorpora. To verify whether language- and register-specific factors are at work or not, the results presented above were subjected to a general significance test, H_0 being that there are no language- or register-specific preferences for the use of ASCR:

| ATTR to inanimate plus ASCR vs. minus ASCR | ESCI | EPOP | EREF | GSCI | GPOP | GREF |
|---|-------|------|------|------|------|------|
| Plus ASCR | 74 | 26 | 12 | 22 | 18 | 8 |
| Minus ASCR | 104 | 82 | 24 | 44 | 47 | 14 |
| χ^2 | 10.55 | | | | | |
| cv (5 df) | 11.07 | | | | | |

Table 29: Significance: ATTR to inanimate plus ASCR vs. minus ASCR (global)

It was observed in section 7.3.2.1.1 that there is variation concerning the general use of inanimate sources. However, as regards the ASCR of these inanimate sources, the chi-square value falls short of the critical value so that H_0 cannot be rejected. Hence, the use of ascribed or non-ascribed ATTR to inanimate does not differ in a statistically significant manner at this general level.

Yet, in interpreting the results relating to ASCR, the different entities referenced by means of ASCR should also be taken into account. Therefore, the relative frequencies of the different entities invoked by ASCR are compared in the next chart. The frequencies of occurrence of ASCR to self and of ASCR to external animate source are considered in relation to the overall number of ascribed inanimate sources occurring in the respective subcorpora:

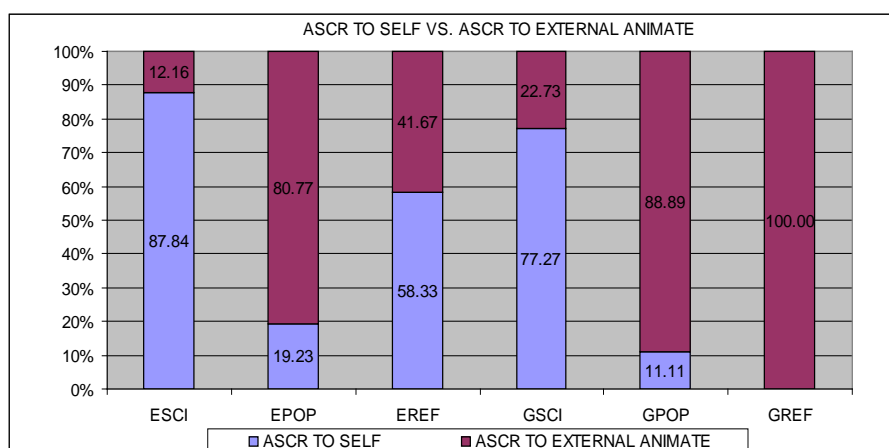


Fig. 28: ASCR to self vs. ASCR to external animate

It is interesting to note that while there do not appear to be any considerable divergences concerning the general distribution of ASCR across the languages and the registers, the situation relating to the entities referenced by means of ASCR appears to be more nuanced: ASCR to self is more frequent than ASCR to external animate in the two SCI subsections. The POP subsections, by contrast, both contain more ASCR to external animate than ASCR to self. The English and the German REF subsections appear to differ in this regard: EREF includes more ASCR to self than ASCR to external animate while the few instances of ASCR found in GREF are exclusively ASCR to external animate. Since the REF subsections contain the

smallest proportion of inanimate sources in relation to the total number of ATTR features, they will not be considered in further detail.

To verify whether language- and register-specific factors are at work, the significance of the figures presented above was assessed. According to H_0 , there are no language- or register-specific preferences for the use of ASCR to self over ASCR to external animate:

| ASCR to self vs. ASCR to external animate | ESCI | EPOP | EREF | GSCI | GPOP | GREF |
|---|-------|------|------|------|------|------|
| ASCR to self | 65 | 5 | (7) | 17 | 2 | (0) |
| ASCR to external | 9 | 21 | (5) | 5 | 16 | (8) |
| χ^2 | 64.06 | | | | | |
| cv (5 df) | 11.07 | | | | | |

Table 30: Significance: ASCR to self vs. ASCR to external animate (global)

The critical value is exceeded by a long way so that H_0 can be rejected at this general level. This time, however, the tests were not narrowed down to the cross-linguistic divergences between the individual registers since some expected frequencies are < 5 (Preacher 2001, [1]). As pointed out above, this area of the study is merely exploratory due to the small data set, but the results hint that despite the general similarity regarding the use of ASCR, there appear to be biases concerning the type of entity referenced by ASCR features.

In both languages, ASCR to self thus seems to be most frequent in the SCI subsections. From a cross-linguistic perspective, it is more frequent in ESCI than in GSCI, both in relative and in absolute terms. The example given below includes an instance of ACSR to self in ESCI. While the authors are present (*our results*), they appear to foreground the role of *results* as the source of the claim thus framed (*angiographic grades 2 and 3 do not reliably* etc.):

- (380) Our results suggest that angiographic grades 2 and 3 do not reliably differentiate groups with different hemodynamically active regurgitant volume. [ESCI]

An example of an ATTR feature involving an inanimate source ascribed to self from GSCI is provided below:

- (381) Unsere Ergebnisse weisen darauf hin, Personen mit Normal- oder Untergewicht, aber erhöhtem Taillenumfang, als Risikogruppe anzuerkennen und in entsprechende Leitlinien aufzunehmen. [GSCI]

The relative data displayed in fig. 28 shown further up suggest that ASCR to external animate is rarer in the SCI subsections than in the POP subsections. One of the few instances found in GSCI is shown below:

- (382) In der vorliegenden Studie lag die Sensitivität der Skelettszintigraphie unabhängig von der Art der Interpretation der Befunde etwas niedriger als die der FDG-PET bei gleicher Spezifität. Diese Ergebnisse werden durch die Untersuchungen von Ohta und Kollegen (21) bestätigt, [...]. [GSCI]

Here, the inanimate source (*die Untersuchungen*) of the ATTR feature is ascribed to the external animate source *Ohta und Kollegen*.

By contrast, few instances of ASCR to self were found in the POP subcorpora. Moreover, all cases of ASCR to self occurring in EPOP are reported external voice items as illustrated below:

- (383) "It is not yet clear if any illnesses are directly caused by XMRV," the researchers wrote in their study. But "our data indicates that XMRV infections might be prevented or treated with specific antiviral agents." [EPOP]

The same applies to the instances of ASCR to self observed in GPOP. The next example contains an instance of ASCR to self, which is, however, expressed by the third-person possessive pronoun *ihre* as a result of the shifts taking place in reported speech and thought (cf. section 3.3.4):

- (384) Nach Meinung der Autoren lässt ihre genetische Analyse vermuten, dass die Mutation möglicherweise bereits vor 16 Generationen (mehr als 3 Jahrhunderte zuvor) bei einem einzigen Vorfahren aufgetreten ist. [GPOP]

As in the case of ATTR to self, the POP journalists avoid overt involvement by means of ASCR in both languages. Thus the scientific journalists represented in the corpus seem to position themselves as impartial 'brokers' of knowledge.

Whereas ASCR to self may be interpreted as enabling scientific authors to step back behind their work, in the POP sections this position is assigned to them by the journalists who report on research from a news perspective as illustrated below:

- (385) However, growth may be permanently stunted in girls who suffer from anorexia for longer than about 2.5 years, according to the research conducted by Dr. Rajani Prabhakaran of Harvard Medical School in Boston and colleagues. [EPOP]

The interpretations presented above being based on a small number of occurrences as a result of the very intricate level of the scheme reached here, more data would be needed in order to corroborate these tentative observations.

The following section turns to examine the manner in which entities are referenced by means of ASCR. As mentioned in connection with the outline of the annotation scheme in the previous chapter, ASCR features are also classified according to how explicit human

involvement is made. This area of the analysis is concerned with whether human beings, that is self or external animate, are referred to indirectly or whether this person or group of people is referenced in a relatively straightforward fashion as in the following example, in which the inanimate source is ascribed to an external animate source by means of the possessive determiner *her*:

- (386) Ulrike Peters isn't happy that she had a hand in placing ketchup back in the condiment aisle. A nutrition and genetics epidemiologist at the University of Washington and the Fred Hutchinson Cancer Research Center in Seattle, she had high hopes for lycopene's cancer-fighting ability. But when her research team analyzed blood lycopene levels of participants in a large cancer study, including 692 men who had developed prostate cancer and 844 randomly selected men who had not, they found no association between the antioxidant and the malignancy. Even more troubling, her study found a link between high blood levels of lycopene's chemical cousin, beta-carotene, and an increased risk of aggressive prostate cancer – not enough to justify avoiding carrots and other food sources of beta-carotene but an ominous sign that not all food-derived compounds are necessarily benign when taken at higher doses. [EPOP]

The use of the third-person possessive determiner *her* provides a relatively clear indication that human involvement is present. It was mentioned previously that, although the source is not as directly retrievable as in the case of full nominal reference, it is still considered to be slightly more explicit than the realisation of ASCR in the following example:

- (387) RESULTS

The results (Table 1) show that in the general population there was an elevated unadjusted rate ratio associated with many different vaccines including the hemophilus, MMR, polio, whole cell pertussis, and the combined diphtheria, tetanus inactive polio vaccine. [ESCI]

Here, the anaphoric use of *the* (i.e. *the results*) requires contextual knowledge, which is aided by the headline *results*, to enable the authors to be identified as the source of the proposition thus framed. The following chart takes a closer look at the proportions of the different realisations of ASCR in relation to the overall frequency of ASCR:

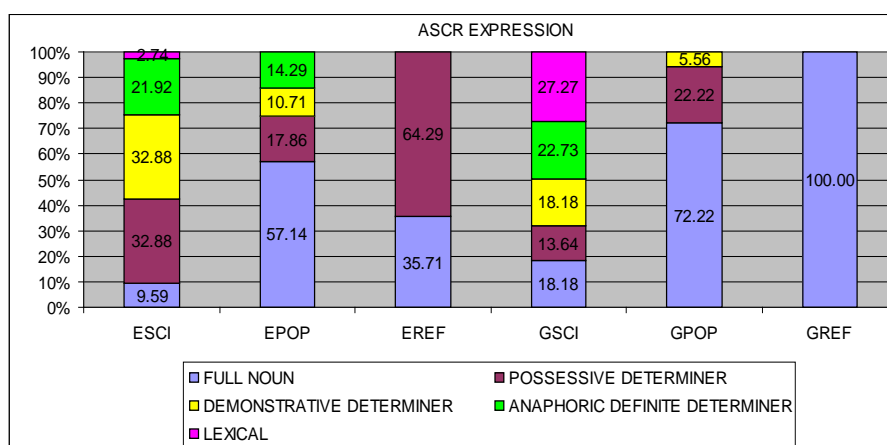


Fig. 29: ASCR EXPRESSION

Again, it should be borne in mind that this area of the scheme deals with a fine-grained level of analysis requiring corroboration by a larger data base. The results presented above are merely tentative and were not subjected to significance tests as the requirements relating to the expected frequencies are not met. Notwithstanding the limited amount of data, the results hint that ASCR appears to be realised differently across the registers and the two languages: Firstly, ASCR appears to be expressed in a different manner in ESCI than in GSCI, the latter containing fewer instances of ASCR on the whole. For example, ESCI authors appear to be more prone to ascribing inanimate sources by means of possessive determiners than the authors of the GSCI articles. This observation is probably attributable to the higher rate of ASCR to self in ESCI, which typically involves the use of first-person possessive determiners as illustrated below:

- (388) This evidence, further supported by our data demonstrating the presence of AID transcripts only in the presence of CD21L mRNA, strongly supports the conclusion that within the rheumatoid synovial membrane, AID requires the presence of FDCs for expression. [ESCI]

Demonstrative determiners are also more common in ESCI than in GSCI. An example of their use in ESCI is provided below:

- (389) Overall, these results strongly support the notion that lymphoid structures expressing AID and CD21L can directly contribute to ACPA production within the rheumatoid synovial membrane. [ESCI]

The following example is illustrative of ASCR by means of demonstrative determiners found in GSCI:

- (390) Ergebnisse
Markierung der Mauserythrozyten

Die mittlere Aktivitätskonzentration im Blut aller untersuchten Tiere (n = 39) betrug $57\% \pm 2,4\%$ ID/g. Mehr als 96% der gesamten Blutaktivität war zum Untersuchungszeitpunkt an die Erythrozyten gebunden. Die Aktivitätskonzentration in der Skelettmuskulatur war sehr niedrig $0,7\% \pm 0,06\%$ ID/g und entsprach einem relativen Blutvolumen von 1,2%. Diese Daten zeigen, dass eine stabile Markierung der Mauserythrozyten mit dem eingesetzten in-vivo/invitro Verfahren erzielt wurde. [GSCI]

As in the English example, the inanimate source is implicitly attributed to the authors by a demonstrative determiner in the German example. The indirect association created by *diese* can be established by taking into account the headline preceding this statement (*Ergebnisse*), which signals that the section introduced by the ATTR features deals with the discussion of the results obtained by the authors of the article. Such features provide a cohesive link which strengthens the chain of argumentation in that they enable the authors to progress by condensing given information and using it as a point of departure in the following argumentation (cf. e.g. Halliday 1993a).

Moreover, GSCI has a higher proportion of lexical items compared with ESCI. The pronominal adverb *hier*, for example, serves to ascribe the inanimate source *Daten* in the following example:

- (391) Die hier präsentierten Daten zeigen neben dem bekannt gehäuften Vorkommen obstruktiver, schlafbezogener Atemstörungen (42,7 % im eigenen Kollektiv) erstmals einen erhöhten Anteil von ZSA/CSR (31,3 %) bei Patienten mit Vorhofflimmern und unauffälliger globaler systolischer Pumpfunktion. [GSCI]

The GSCI authors also differ from the ESCI authors in their use of third-person reference to self, which is also included under this heading:

- (392) Der sicherste Virusnachweis ergab sich nach Erfahrung der Autoren aus tiefen Nasenabstrichen. [GSCI]

Instead of using first-person expressions, the authors' account is written in the third person, resulting in a 'dispassionate' style of presentation. In the following example, in which an institution is referenced by means of ASCR, the third-person style results in a similarly detached manner of presentation:

- (393) Die Ergebnisse des Deutschen Herzzentrums München zeigen eine bemerkenswerte klinische Verbesserung der Patienten, die bisher als inoperabel galten und eine sehr zufrieden stellende hämodynamische Funktion der neuen Prothesen nach sechs Monaten. [GSCI]

Here, contextual knowledge is required to identify *des Deutschen Herzzentrums München* as an instance of ASCR to self.

From the data shown above, it appears that compared with the researchers represented in the corresponding SCI subsections, the POP authors in both languages prefer more explicit ASCR by means of full nominal reference. This is illustrated in the example shown below, in which ASCR to external animate occurs in the form of a premodification (i.e. *Schwarz*):

- (394) Better long-term heart health for breastfeeding mothers might stem in part from blood pressure, which was “significantly higher” in mothers who had not breastfed than in those who had (120 mmHg and 115 mmHg, respectively), according to the 2010 Schwarz study. [EPOP]

The use of possessive determiners in GPOP is shown below:

- (395) Zu ähnlichen Ergebnissen kamen auch Konrad Hochedlinger vom Harvard Stem Cell Institute und sein Team, dem Jaenisch unter anderem ebenfalls angehörte [4]. Die Gruppe hatte sich insbesondere darauf konzentriert, den Prozess der Fibroblasten-Auswahl zu perfektionieren. Auch ihre Resultate legen nahe, dass sich die anfangs undifferenzierten Gewebezellen mit Hilfe der vier Transkriptionsfaktoren am Ende in pluripotente embryonale Stammzellen gleichwertige Zellen zurückverwandeln – wobei zum Beispiel das eine inaktivierte von zwei X-Chromosomen in den Zellen erwachsener Mausweibchen wieder reaktiviert wird. [GPOP]

The following example contains a comparable instance of ASCR by means of a possessive determiner in EPOP:

- (396) “In susceptible patients, this might lead to an additional risk for cardiovascular events,” Schneider and colleagues say. Their finding, they add, “suggests a biologic mechanism” for the observed seasonal variation in death from heart disease and stroke in the elderly. [EPOP]

The results may be interpreted such that in cases where inanimate sources are brought into play and human involvement is signalled at the same time in science journalism, it is implied that news are based on hard facts as in the example, but these news are given a ‘human face’.

An example of ATTR to inanimate (i.e. *several papers*) lacking ASCR is provided below:

- (397) Several papers have looked at the relationship between vaccines and type 1 diabetes and have not found an association [12, 13]. [ESCI]

The percentages relating to non-ascribed inanimate sources are repeated for ease of reference in the following chart:

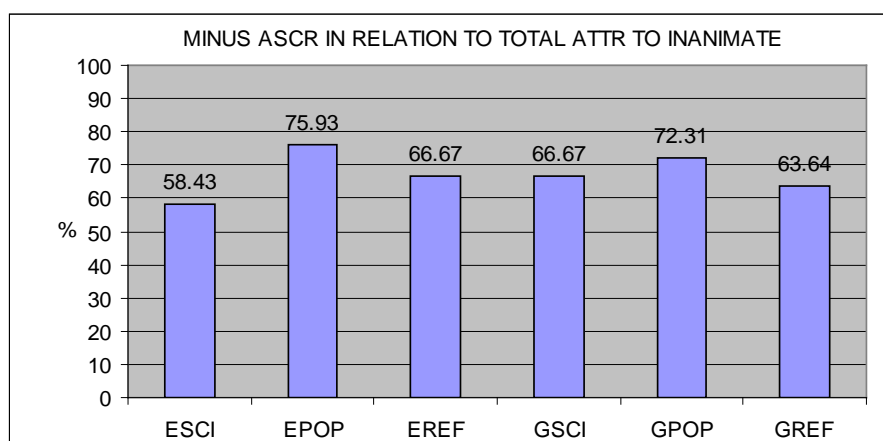


Fig. 30: Minus ASCR in relation to total ATTR to inanimate

As mentioned above, the results obtained for this granular level merely give a tentative indication that non-ascribed sources are more common than ascribed sources in each one of the subcorpora and that they seem to be less common in the SCI than in the POP subsections. Example (398) illustrates the use of this type of feature in GSCI, which includes a higher percentage of non-ascribed inanimate sources than ESCI:

- (398) Eine Untersuchung der para sternalen, mediastinalen und auch supra klavikulären Lymphknoten erfolgt hingegen nicht, obwohl Studien belegen, dass bei histologisch nachgewiesenem Befall der parasternalen Lymphknoten eine signifikant schlechtere Prognose besteht (6, 7). [GSCI]

A similar example from EPOP is shown below:

- (399) And early studies in the 1990s showed that people who ate more antioxidants had a lower risk of heart disease and stroke. But those findings didn't hold up for antioxidant supplements. [EPOP]

The use of non-ascribed ATTR to inanimate in GPOP is illustrated in the next example:

- (400) Einzelne Akupunktur-Studien hatten zwar einen schmerzlindernden Effekt offenbart, der darauf beruhen dürfte, dass durch eine Nervenreizung verschiedene schmerzhemmende Systeme aktiviert werden. [GPOP]

The features in the examples taken from the SCI subcorpora, i.e. (397) and (398), include bibliographic references, which are absent in the examples from GPOP and EPOP. The examples from the POP subsections are therefore vaguer in terms of reference in that the authors of the studies mentioned in the articles are not specified any further. In the examples taken from the SCI subsections, by contrast, the numerical indices mark the sources, i.e. *papers* and *Studien*, as stemming from external authors, enabling these to be identified without the use of linguistic markers.

The following chart compares the proportions of non-ascribed inanimate sources involving such bibliographic references and those without numerical indices to the overall number of non-ascribed inanimate sources:

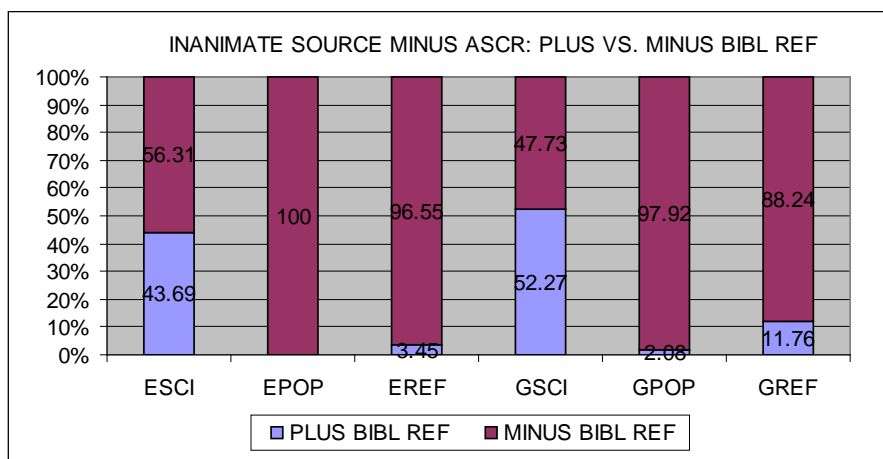


Fig. 31: INANIMATE SOURCE minus ASCR: plus vs. minus BIBL REF

From these data, it appears that the use of BIBL REF follows a roughly similar pattern across the two languages, with the SCI subsections containing the highest percentage of non-ascribed inanimate sources combined with BIBL REF, which is virtually absent in the POP subsections. Not only do the SCI subsections contain a lower proportion of non-ascribed inanimate sources without BIBL REF than the corresponding POP subsections, these features also appear to serve a different function. This is illustrated in the following example from ESCI, which contains an instance of ATTR to a non-ascribed inanimate source without BIBL REF:

- (401) The apparent overlap of individual slopes between groups suggests that the individual dose-response regression line may not be a robust outcome measure for clinical purposes. [ESCI]

Similarly, the instance of ATTR to inanimate source shown below includes neither ASCR nor BIBL REF:

- (402) Ein zusätzlicher Interaktionsterm (Modell4) zeigte bei beiden Geschlechtern eine negative Interaktion ($p < 0,0001$) zwischen Taillenumfang und BMI, was darauf hindeutet, dass die Assoziation zwischen Taillenumfang und Diabetes-Risiko von der Größe des BMI abhängig ist. [GSCI]

These examples differ from the examples involving numerical indices, i.e. examples (397) and (398), in that the inanimate source is not metonymical (as in case of formulations along the lines of *our analysis suggests that*), instead evidence is brought into play. Authors are required by scientific protocol to mark cited material as such. In addition to contextual clues,

the absence of bibliographic references, therefore, indicates that the authors are talking about their own work, signalling that the evidence was obtained by the authors themselves.

As in the case of ATTR to self and ATTR to external animate, the discussion of the results concludes with a glance at the data relating to the dialogic impact created by ATTR to inanimate source. The following example includes an instance of this type of Engagement feature which serves to close down dialogic space:

- (403) Die auf der diesjährigen Interscience Conference on Antimicrobial Agents and Chemotherapy (ICAAC) vorgestellten Daten (Präsentationen K-1918a und V-1269c) zeigten, dass 8 von 100 untersuchten Patienten noch eine Woche nach Krankheitsbeginn PCR- und kulturpositiv auf die Neue Influenza A (H1N1/09) waren. [GSCI]

ATTR to inanimate serves to open up dialogic space in the next example:

- (404) The role of IF large B cells is currently unknown, but their dendritic-like morphology and close association with T cells has led to speculation that they may play an important role as antigen presenting cells [22]. [ESCI]

The following bar chart details the use of ATTR to inanimate according to Expansive or Contractive dialogic impact:

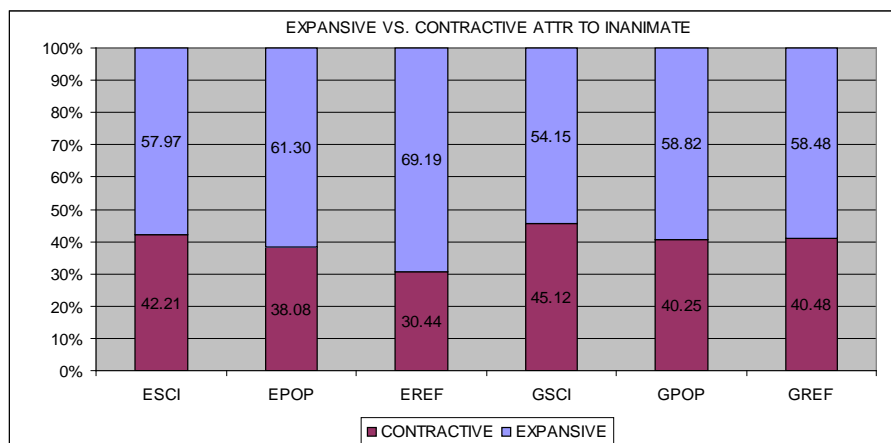


Fig. 32: Expansive vs. Contractive ATTR to inanimate

The percentages indicate that there is relatively little variation at this global level. To verify whether any language- or register- specific factors are at work or not, the significance of these figures was assessed. According to H_0 , there are no language- or register-specific preferences for the use of either Expansive or Contractive ATTR to inanimate:

| Expansive vs. Contractive ATTR to inanimate | ESCI | EPOP | EREF | GSCI | GPOP | GREF |
|--|-------|------|------|------|------|------|
| Expansive | 103 | 66 | 25 | 36 | 38 | 13 |
| Contractive | 75 | 41 | 11 | 30 | 26 | 9 |
| χ^2 | 2.56 | | | | | |
| cv (5 df) | 11.07 | | | | | |

Table 31: Significance: Expansive vs. Contractive ATTR to inanimate (global)

The critical value is not exceeded so that H_0 is not rejected at this general level. Hence, although the use of ATTR to inanimate source varies in general (cf. section 7.3.2.1.1), there do not appear to be any major preferences concerning the use of Expansive or Contractive expressions involving ATTR to inanimate.

Following the discussion of the data relating to the different types of entities serving as sources in ATTR features, the next section is concerned with the way these sources are specified.

7.3.2.1.2 SOURCE INDICATION

This set of features is concerned with whether human beings, concrete things or abstract concepts functioning as sources in Engagement features involving ATTR to identified are immediately retrievable or whether they are referenced by less explicit means. As in the case of the realisation of ASCR, this set of features distinguishes between different options available for mentioning sources, the obvious one being full nominal reference as exemplified below:

- (405) Eine große Multizenterstudie legt nahe, dass die Kombination aus Biomarkern, darunter anti-GP-IIb/IIIa-produzierende B-Lymphozyten, gebundene gegen GP IIb/IIIa gerichtete Autoantikörper, retikulierte Thrombozyten und TPO-Konzentration im Plasma bei sehr hoher Spezifität (98%) auch eine gute Sensitivität (79%) erreicht (18). [GSCI]

Sources may also be indicated by personal pronouns such as *they* in the next example:

- (406) Zaphiriou et al. performed a study on 306 patients referred to a heart failure clinic by their general practitioners with suspected heart failure. They found that NT-proBNP and BNP were good rule-out tests with high negative predictive values (0.97 and 0.87, respectively) but low positive predictive values (0.44 and 0.59, respectively) [2]. [ESCI]

Less direct means of indicating sources include items such as the demonstrative pronoun *this* in the following excerpt from ESCI:

- (407) Conversely, for FMD:shear stress ratio, a main effect of group ($F_{1, 38} = 10.17$, $p = 0.003$) but no main effect of occlusion duration ($F_{4, 152} = 0.66$, $p = 0.618$) or group by occlusion duration interaction ($F_{4, 152} = 0.30$, $p = 0.876$; fig. 1 b) was observed. This suggests that correction of FMD for shear stress is sufficient to account for the observed effect of occlusion duration on FMD

response, and the adjustment for this source of measurement variability allowed the group difference in response to be demonstrated. [ESCI]

In the diagram shown below, the results relating to the different forms of SOURCE INDICATION are considered:

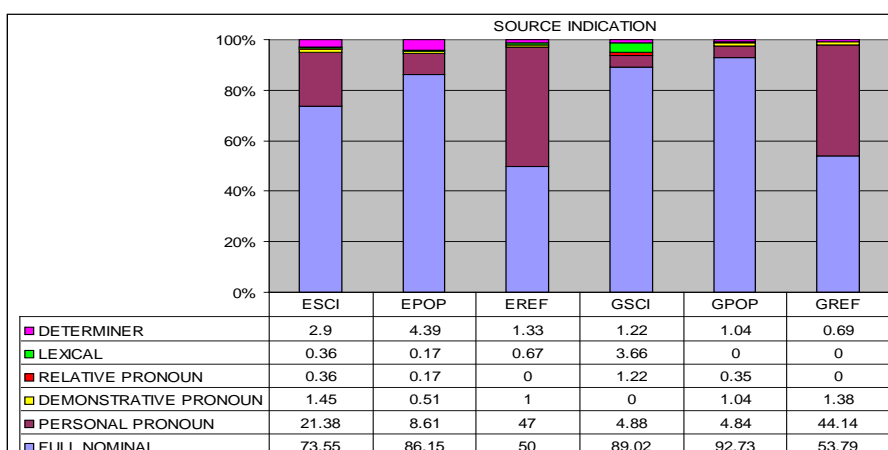


Fig. 33: SOURCE INDICATION

Full nominal reference, that is the most explicit means of source reference, is the preferred means of SOURCE INDICATION in each subcorpus. The use of full nominal reference appears to spread across the English and the German subsections in a fairly similar way, this type of reference being most frequent in the POP subcorpora and least frequent in the REF subsections. The POP subsections are closer to the SCI subsections than to the REF subsections as regards full nominal reference, the gap between EPOP and ESCI being bigger than between GPOP and GSCI.

The results concerning SOURCE INDICATION were subjected to significance testing. Again, the data relating to the general distribution were examined, with H_0 assuming that there are no language- or register-specific influences on the indication of sources in Engagement features involving ATTR to identified source. Only the data relating to full nominal reference, personal pronouns and determiners were taken into account in order to meet the test requirements relating to the minimum expected frequencies (Preacher 2001):

| SOURCE INDICATION | ESCI | EPOP | EREF | GSCI | GPOP | GREF |
|-------------------|--------|------|------|------|------|------|
| Full nominal | 205 | 469 | 126 | 74 | 262 | 64 |
| Personal | 60 | 47 | 118 | 4 | 14 | 53 |
| Determiner | 8 | 24 | 3 | 1 | 3 | 1 |
| χ^2 | 276.61 | | | | | |
| cv (10 df) | 18.31 | | | | | |

Table 32: Significance: SOURCE INDICATION (global)

The divergences observed at this global level are statistically significant, the critical value being exceeded by far. Therefore, H_0 is rejected so that factors other than chance need to be taken into consideration in explaining the differences concerning the general distribution of these features.

The following table shows the results obtained by testing the significance of the cross-linguistic differences observed between corresponding registers (H_0 : The register-specific use of SOURCE INDICATION features does not vary cross-linguistically). In the case of EREF versus GREF only full nominal and personal pronoun SOURCE INDICATION were considered since the inclusion of determiners would have resulted in $\geq 20\%$ of the expected frequencies being < 5 .

| SOURCE INDICATION | ESCI vs. GSCI | | EPOP vs. GPOP | | EREF vs. GREF | |
|-------------------|---------------|------|---------------|------|---------------|------|
| | ESCI | GSCI | EPOP | GPOP | EREF | GREF |
| Full nominal | 205 | 74 | 469 | 262 | 126 | 64 |
| Personal pronoun | 60 | 4 | 47 | 14 | 118 | 53 |
| Determiner | 8 | 1 | 24 | 3 | (3) | (1) |
| χ^2 | 12.97 | | 10.71 | | 0.30 | |
| cv | 5.99 (2 df) | | 5.99 (2 df) | | 3.84 (1 df) | |

Table 33: Significance: SOURCE INDICATION (cross-linguistic & register-specific)

The divergences observed between ESCI and GSCI as well as those between EPOP and GPOP are statistically significant so that H_0 is rejected; this does not apply to the mix of registers represented in the REF subsections. The SCI publications and the POP articles are thus considerably disparate from a cross-linguistic perspective, while the two REF subsections appear to be comparable as regards the use of full nominal reference and personal pronouns as means of SOURCE INDICATION.

The significance values for the intralingual comparisons of the SCI and the POP subsections with the corresponding REF subsections are displayed below (H_0 : There are no language-internal register-specific influences on the use of SOURCE INDICATION features). In the case of the German section of the corpus, only full nominal and personal pronoun SOURCE INDICATION were considered since the inclusion of determiners would have resulted in $\geq 20\%$ of the expected frequencies being < 5 .

| SOURCE INDICATION | ESCI vs. EREF | | EPOP vs. EREF | | GSCI vs. GREF | | GPOP vs. GREF | |
|-------------------|---------------|------|---------------|------|---------------|------|---------------|------|
| | ESCI | EREF | EPOP | EREF | GSCI | GREF | GPOP | GREF |
| Full nominal | 205 | 126 | 469 | 126 | 74 | 64 | 262 | 64 |
| Personal pronoun | 60 | 118 | 47 | 118 | 4 | 53 | 14 | 53 |
| Determiner | 8 | 3 | 24 | 3 | (1) | (1) | (3) | (1) |
| χ^2 | 38.82 | | 157.34 | | 36.51 | | 94.02 | |
| cv | 5.99(2 df) | | | | 3.84 (1df) | | | |

Table 34: Significance: SOURCE INDICATION (intralingual)

The critical value is exceeded in each case so that H_0 is rejected for the intralingual comparisons of the SCI and POP subsections with the corresponding REF subsections. The intralingual discrepancies are more marked than the cross-linguistic register-specific divergences. This specifically applies to the deviations between the POP and the REF subsections.

As mentioned initially, explicit SOURCE INDICATION by means of full nominal reference prevails in all of the subsections in percentage terms, while personal pronouns represent the second most frequent type of SOURCE INDICATION in each one of the subcorpora. As to the SCI subsections, we may recall that GSCI has a lower percentage of ATTR to identified source than ESCI. In both languages, the percentage of personal pronouns occurring in the SCI subsections is lower than in the corresponding REF subsections. Source-mention by means of personal pronouns appears to be of inferior importance in GSCI. The authors represented in GSCI seem to display a stronger preference for the most explicit type of referencing than their ESCI counterparts in relative terms. An example of full nominal ATTR is given below:

- (408) Zudem zeigen neuere Studien in Deutschland hohe Prävalenzen für Adipositas (23,9 Prozent) und erhöhten Taillenumfang (39,5 Prozent; Männer > 102 cm, Frauen > 88 cm) (16). [GSCI]

ESCI differs from GSCI in that it contains less full nominal reference and more personal pronoun reference. While the percentage of personal pronouns in ESCI is lower than the value for EREF, it is higher than the corresponding figure for EPOP. The issue of self-mention was discussed in connection with the type of source referenced in ATTR to identified source in the previous section. ESCI was found to differ from GSCI and the POP articles in that the ESCI authors employ more self-referential ATTR expressions. An example from ESCI is shown below:

- (409) We demonstrated that circulating ACPA from synovial grafts were produced at a significantly higher level in AIDpgrafts, while ACPA were negligible in the serum of animals transplanted with AID_ grafts (Figure 6C). [ESCI]

This register-specific divergence seems to be linked to the fact that self-mention generally involves the use of first-person pronouns. Whereas self-mention seems to be avoided in EPOP, GSCI and GPOT, it also plays a role in the REF subsections. This is exemplified by the following excerpt from a political speech included in GREF:

- (410) Ich verstehe, daß man im Rahmen einer Geschäftsordnungsdebatte versucht einzuhalten, was zwischen dem Bundeskanzler und allen Fraktionsvorsitzenden vereinbart worden ist. Allerdings gibt es auch Geschäftsordnungsdebatten, die es dann erforderlich machen, auf einige Dinge hinzuweisen, von denen ich denke, daß sie klarbleiben sollten. [...]. [GREF]

The selection of registers represented in the REF subsections includes fictional literature, which also seems to involve ATTR to external animate by means of pronominal reference, e.g.:

- (411) Udi liegt stocksteif im Bett, fest davon überzeugt, daß er todkrank ist. Bis er schließlich merkt, daß es in Wirklichkeit die Herrschsucht seiner Frau ist, die ihn lähmt. [GREF]

Personal pronoun reference is more frequent in the REF subsections than in the respective SCI and POP subsections, whereas full nominal reference is more frequent in the SCI and POP subsections than in the REF subsections. The use of full nominal reference and personal pronouns thus appears to be more 'balanced' in the two REF subcorpora than in the corresponding SCI and REF subcorpora. This can be seen from the next diagram, which provides information on the relative frequencies of the different types of sources referenced by means of personal pronouns. The different types of sources (i.e. self, external animate and inanimate) referenced by means of personal pronouns are considered in relation to the total frequency of SOURCE INDICATION by means of personal pronouns:

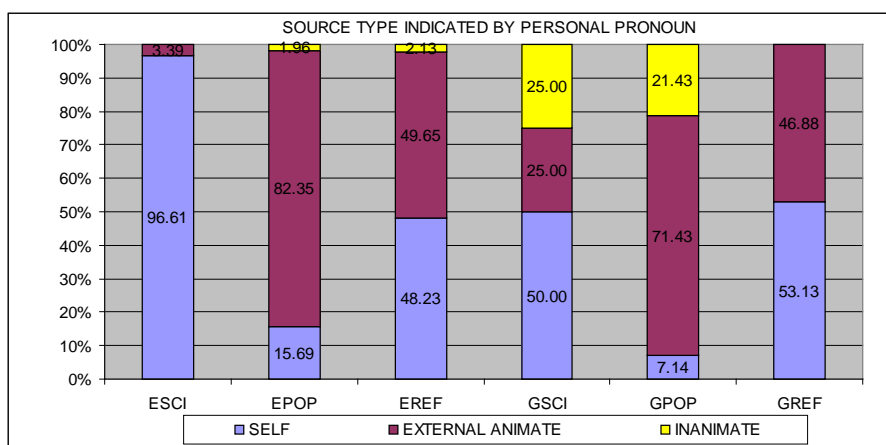


Fig. 34: SOURCE TYPE indicated by personal pronoun

The occurrence rate of self-mention in ESCI is reflected in the high percentage of personal pronoun reference to self while ATTR to self is infrequent in GSCI. In both languages, ATTR to

identified source involving personal pronoun reference to external animate is scarce in the SCI subcorpora. One of the rare instances is shown below:

- (412) Researchers screened blood at birth, nine months, two years, and five years. They found that in children who had two autoantibodies by age two, 50% developed diabetes by age five, a median onset of approximately 36 months after detection of autoantibodies [7]. [ESCI]

The least common type of SOURCE INDICATION by means of personal pronouns is ATTR to inanimate, e.g.:

- (413) Die neue Studie ist daher gleich in zweierlei Hinsicht interessant: Zum einen belegt sie, dass der Muskelabbau – zumindest im Tiermodell – tatsächlich die Überlebenschancen beeinträchtigt, und zum anderen zeigt sie einen Weg auf, wie dieser Abbau verhindert und sogar rückgängig gemacht werden kann. [GPOP]

A corresponding example from EPOP is provided below:

- (414) That vaccine test, halted in 2007, got only as far as phase II, but even so it did not leave researchers back at square one. It suggested, he notes, how some HIV strains could be blocked from infecting cells and offered data that could help in the interpretation of the Thai results. [EPOP]

The POP journalists differ from the SCI authors in that they tend to use personal pronouns to reference external animate sources in relaying informational content to their readership. An example from GPOP involving the indication of an external animate source by means of a third-person personal pronoun is shown below:

- (415) Zwar verbesserte sich die Sehfähigkeit nicht ganz so stark wie nach der Transplantation einer Spender-Hornhaut, das künstliche Material hat aber den Vorteil, keine Abstoßungsreaktionen hervorzurufen, schreiben die Wissenschaftler um Per Fagerholm von der Universität in Linköping. Sie glauben, mit dem Implantat eine echte Alternative zur Hornhauttransplantation gefunden zu haben, die allzu häufig am Spendermangel scheitert. [GPOP]

Both POP subsections include more cases of ATTR to external animate by means of personal pronoun reference than the corresponding REF subsections. From a cross-linguistic perspective, the EPOP journalists use more ATTR features involving mention of external animate sources by means of personal pronouns than the GPOP journalists, e.g.:

- (416) Cheng's team will present phase I/II clinical trial results for PHY906 in patients with pancreatic cancer at a conference in Hong Kong next week. And Cheng hopes to get phase II and III trials going in the United States and Europe soon. He adds that he would love to account for every last molecule in the medicine; it could even help his team to develop new drugs. However, at this stage, "the importance is for patients undergoing chemotherapy", he says. [EPOP]

Again the different realisation of reported speech seems to come into play in explaining the different results obtained for the English and the German POP subsections. In the example from EPOP, the external animate source *Cheng* is introduced into the text by full nominal reference. As the text proceeds to report his utterances, the personal pronoun *he* is used in the matrix structures to reintroduce and mark *Cheng* as the source of the reported material. While cohesion is outside the immediate focus of the present research, the use of pronominal reference as illustrated in example (416) also appears to form a cohesive tie (cf. e.g. Halliday & Hasan 1976). It was mentioned previously that the use of the subjunctive mood enables German authors to mark a proposition as stemming from an external source without explicit source-mention realised, for instance, by means of full nominal or personal pronoun reference.

As to SOURCE INDICATION by means of determiners, the figures shown further up suggest that this type of source reference is not very common in general. The following example illustrates the use of the demonstrative determiner *that* in a nominal ATTR feature in EPOP, which contains the highest number of uses of SOURCE INDICATION by means of determiners:

- (417) And if nothing else, the Jarvik-7 experiments demonstrated that the basic concept was not flawed: they proved that people could survive for extended periods with a heartlike thing made of plastic and metal. Back then, that demonstration in itself was a dramatic step forward, and it was very good news for the 50,000-plus Americans with heart failure who die every year, some while awaiting one of the meager 2,200 donated hearts available for transplant. [EPOP]

That creates a deictic link with *the Jarvik-7 experiments*, which are thus identified as the source of the nominal ATTR feature *that demonstration*. In a sense, *that* acts as a substitute for the actual source. Once again, the notion of conceptual shells (Schmid 2000) seems to come into play, with *demonstration* condensing and presenting as confirmed and thus as ‘given’ the propositions that *the basic concept was not flawed* and *people could survive for extended periods with a heartlike thing made of plastic and metal*. Moreover, as in the case of source indication by means of personal pronouns, the use of deictic elements such as *that* in example (417) contributes to the cohesion of the text. A similar effect is created by anaphoric uses of the definite article *the* serving to identify the source of nominal ATTR features as in the following example:

- (418) A full repair required up to six hours of bonding, the researchers report. They note that a ripped sample could be left overnight before being repaired, although it would not stretch as far, because some of the severed bonds had linked to their neighbors. Recycling a sample into a new shape is easy, Leibler adds – just heat it so the bonds break and reform. The demonstration does have “a

touch of magic about it,” biochemists Justin Mynar and Takuzo Aida wrote in an editorial accompanying the paper. [EPOP]

These items appear to serve a double purpose in EPOP, where they seem to be used to engage with readers and to ‘pull together’ the texts. The frequencies of nouns versus more verbal items will be taken up in more detail in the following section, which discusses the linguistic realisation of ATTR to identified source.

Lastly, brief mention should be made of those cases found in GSCI in which the authors write about themselves in the third person:

- (419) Neben der bekannten Häufung obstruktiver schlafbezogener Atemstörungen, die klinisch relevant sind in der Primär- und Sekundärprävention des Vorhofflimmerns (sowohl nach Kardioversion als auch nach Ablation) (17–19), konnten die Autoren erstmals auch einen hohen Anteil an ZSA/CSR im untersuchten Gesamtkollektiv nachweisen, [...]. [GSCI]

Here the authors describe the process from the viewpoint of detached onlookers. It seems that the use of the third person enables a maximum degree of removal from the concrete situation to be combined with a verbal realisation of Attribution to self (i.e. *konnten die Autoren [...] nachweisen*). These findings cannot claim to be representative since the number of features found in the corpus is small. Nonetheless, it would still be interesting to verify this tendency by using more data since no instance of this type of opaque reference to self via third-person expressions was found in ESCI, which contained merely one comparable item (i.e. *currently*).

- (420) [...] future studies should determine the repeatability of the currently demonstrated sensitivity of FMD normalization. [ESCI]

Following the discussion of the results relating to the different types of source-mention, the next section looks at the figures relating to the linguistic resources used to construe framing structures in ATTR features.

7.3.2.1.3 ATTR TO IDENTIFIED SOURCE EXPRESSION

The annotation of features categorised as ATTR to identified source mainly distinguishes between verbal, verb/noun combinations, nominal realisations, elliptic formulations and circumstantial expressions realised by prepositional phrases (cf. section 6.1.2.2.1). The proportions of the different linguistic features serving to construe ATTR to identified source are considered in the following chart and the accompanying table:

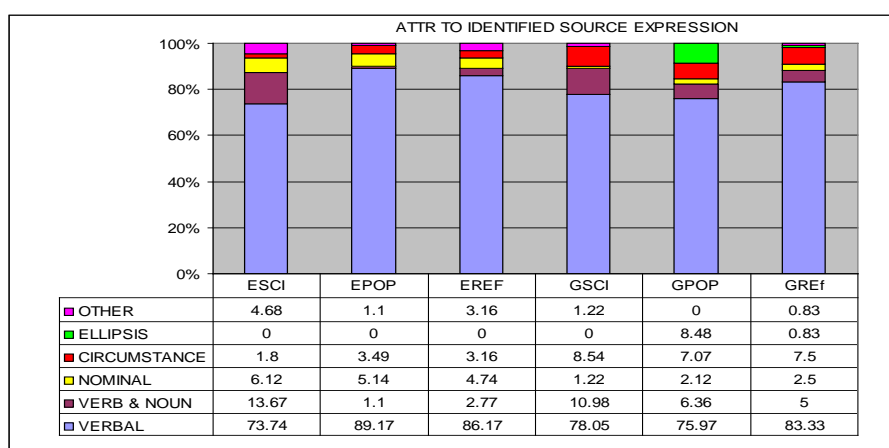


Fig. 35: ATTR TO IDENTIFIED SOURCE EXPRESSION

It appears that ATTR to identified source is mainly expressed by verbal structures across all subcorpora in the two languages. Despite this predominant tendency to employ verbal framers, there seems to be some cross-linguistic variation as regards the other expressions of ATTR to identified source.

Again, the significance of the general distribution was examined, with H_0 assuming that there are no language- or register-specific influences on the realisation of ATTR to identified source:⁶⁷

| ATTR TO IDENTIFIED SOURCE EXPRESSION | ESCI | EPOP | EREF | GSCI | GPOP | GREF |
|--------------------------------------|-------|------|------|------|------|------|
| Verbal | 205 | 486 | 218 | 64 | 215 | 100 |
| Verb & noun | 38 | 6 | 7 | 9 | 18 | 6 |
| Circumstance | 5 | 19 | 8 | 7 | 20 | 9 |
| Noun | 17 | 28 | 12 | 1 | 6 | 3 |
| χ^2 | 94.93 | | | | | |
| cv (15 df) | 25.00 | | | | | |

Table 35: Significance: ATTR TO IDENTIFIED SOURCE EXPRESSION (global)

The critical value is exceeded by far by the chi-value obtained for the general cross-linguistic distribution. Since H_0 is rejected, factors other than chance need to be taken into account in explaining the differences in the general distribution of these features.

In the following table, the focus is narrowed down to the results obtained by testing the significance of the cross-linguistic differences between corresponding registers in the two languages (H_0 : The register-specific realisation of ATTR to identified source is not subject to cross-linguistic variation):

| ATTR TO IDENTIFIED SOURCE EXPRESSION | ESCI vs. GSCI | | EPOP vs. GPOP | | EREF vs. GREF | |
|---|---------------|------|---------------|------|---------------|------|
| | ESCI | GSCI | EPOP | GPOP | EREF | GREF |
| Verbal | 205 | 64 | 486 | 215 | 218 | 100 |
| Verb & noun | 38 | 9 | 6 | 18 | 7 | 6 |
| Circumstance | 5 | 7 | 19 | 20 | 8 | 9 |
| Noun | (17) | (1) | 28 | 6 | (12) | (3) |
| χ^2 | 8.25 | | 30.54 | | 4.42 | |
| cv | 5.99 (2 df) | | 7.82 (3 df) | | 5.99 (2 df) | |

Table 36: Significance: ATTR TO IDENTIFIED SOURCE EXPRESSION (cross-linguistic & register-specific)

The divergences observed between ESCI and GSCI as well as between EPOP and GPOP are statistically significant so that H_0 is rejected in these cases, the differences observed between the POP subsections being more marked than in the case of the SCI subsections. By contrast, EREF and GREF do not differ in a statistically significant way.

The focus is narrowed down further by testing the intralingual differences between the SCI and the POP subsections and the corresponding REF subsections (H_0 : The realisation of ATTR to identified source is not affected by intralingual register-specific influences).

| ATTR TO IDENTIFIED SOURCE EXPRESSION | ESCI vs. EREF | | EPOP vs. EREF | | GSCI vs. GREF | | GPOP vs. GREF | |
|---|---------------|------|---------------|------|---------------|------|---------------|------|
| | ESCI | EREF | EPOP | EREF | GSCI | GREF | GPOP | GREF |
| Verbal | 205 | 218 | 486 | 218 | 64 | 100 | 215 | 100 |
| Verb & noun | 38 | 7 | 6 | 7 | 9 | 6 | 18 | 6 |
| Circumstance | 5 | 8 | 19 | 8 | 7 | 9 | 20 | 9 |
| Noun | 17 | 12 | 28 | 12 | (1) | (3) | 6 | 3 |
| Ellipsis | (0) | (0) | (0) | (0) | (0) | (1) | 24 | 1 |
| Other | 13 | 8 | 6 | 8 | (1) | (1) | (0) | (1) |
| χ^2 | 23.38 | | 7.41 | | 2.55 | | 8.89 | |
| cv | 9.49 (4 df) | | | | 5.99 (2 df) | | 9.49 (4 df) | |

Table 37: Significance: ATTR TO IDENTIFIED SOURCE EXPRESSION (intralingual)

The critical value is merely exceeded in the case of ESCI versus EREF so that H_0 is rejected. The other intralingual differences do not appear to be of statistical significance.

While the results presented above indicate that the differences between the English and the German REF subsection are not of statistical importance, the SCI papers and the POP articles differ significantly from a cross-linguistic perspective. In the case of the SCI subsections, this may, at least in part, be explained by the use of circumstantial items as exemplified below:

⁶⁷ Other realisations are not taken into consideration on account of the required expected values. Ellipsis is only taken into account in connection with the monolingual German data since this option lacks in English.

- (421) Je nach Studie liegt der Anteil ITP-untypischer Befunde zwischen 5 und 13%. In Abwägung von Aufwand und Aussagekraft ist die Wertigkeit der Knochenmarkuntersuchung als positiver Krankheitsnachweis zumindest fraglich. [GSCI]

Circumstantial features such as the one in the following example are rarely used in ESCI:

- (422) To our knowledge, this is the first study to compare the profiles of shear stress-FMD regression lines between 2 different populations. [ESCI]

Moreover ESCI and GSCI appear to differ with regard to the relative frequency of nominal ATTR to identified source. ESCI contains a number of instances as exemplified below:

- (423) This study has certain limitations. First, the interpretation of the results is based on the assumption that the (actual) endothelial function of the MR group is lower than that of the LR group. Although this was not confirmed by any alternative measure of endothelial function, we believe that this supposition can be reasonably accepted. [ESCI]

As mentioned previously, this type of ATTR to identified source appears to aid the linear progression of the text (cf. e.g. Schmid 2000, Halliday & Matthiessen 2004). This form of ATTR is rare in GSCI, which contains only one instance of nominal ATTR to identified source:

- (424) Die hier dargestellten klinischen Daten deuten darauf hin, dass es sich bei der Infektion mit der Neuen Influenza A (H1N1/09) bis Mitte September 2009 um ein eher mildes Krankheitsgeschehen handelte, das vorwiegend im Ausland akquiriert wurde. Diese Beobachtung gilt auch für die erkrankten Kinder. [GSCI]

A cross-linguistic similarity concerns the use of relational processes involving the combination of verbs and nouns as shown in the next example:

- (425) [...] our data support the conception that the atherosclerotic disease process indeed occurs at the level of the conduit artery. [ESCI]

A corresponding example from GSCI is provided below:

- (426) Die aktuelle Studienlage bei Erwachsenen lässt nur den Schluss zu, dass der Anteil retikulierter Thrombozyten bei ITP zwar im Mittel erhöht ist, ein Einzelwert aber keine Unterscheidung zwischen Patienten mit aktiver ITP und solchen mit ITP in partieller Remission, mit aplastischer Anämie oder mit Gesunden erlaubt. [GSCI]

In both languages, these features appear to be more frequent in the SCI subcorpora than in the other corresponding subcorpora, which is suggestive of a more noun-heavy style in the SCI subcorpora compared with the POP and REF subsections. As mentioned in the previous chapter, formulations of this type enable meaning to be encoded in noun phrases, the “active

‘doing’ part” is thus backgrounded (Brown & Levinson 1987:208). It seems that ESCI is farther apart from EREF than GSCI is apart from GREF in this respect.

As to the POP articles, it was noted earlier that there is pronounced cross-linguistic variation between EPOP and GPOP regarding the expression of ATTR to identified source according to the significance tests carried out above, the divergence being considerably more marked than in the case of the SCI subsections. Firstly, GPOP and EPOP differ in terms of the use of verbal ATTR to identified source: While verbal realisations prevail in all of the subcorpora, EPOP appears to be marked by a more verbal style than GPOP. The use of this feature in EPOP is illustrated below:

- (427) Some medications already being used to treat HIV appear to inhibit a retrovirus that has been linked to prostate cancer and chronic fatigue syndrome, reports a new study published online April 1 in PLoS ONE. [EPOP]

Corresponding verbal structures as illustrated by the next example are less frequent in GPOP:

- (428) Die Wissenschaftler merken an, dass diese Veränderung der Fettmasse größer war, als zu erwarten gewesen wäre. Das mache es schwer abzunehmen und ein neues Gewicht zu halten. „Sogar kurzzeitige Veränderungen des Essverhaltens können ausgedehnte Effekte auf die Gesundheit haben“, fasst Ernersson zusammen. [GPOP]

Moreover, nominal ATTR to identified source as exemplified below is more frequent in EPOP than in GPOP from a relative perspective:

- (429) The new work in PNAS produced similar results. Alter, study leader Shyh-Ching Lo of the Food and Drug Administration’s Tissue Microbiology Laboratory, and their colleagues tested blood samples from 37 patients with CFS and 44 healthy volunteers and found genetic traces of an MLV-like virus in more than three quarters of the CFS patients (86.5 percent) and only three of the volunteers (6.8 percent).

But the new findings will not likely be the final word in the debate. [EPOP]

As pointed out above in connection with the data relating to the SCI subsections, this type of ATTR to identified source appears to contribute to the linear development of the text (cf. e.g. Schmid 2000, Halliday & Matthiessen 2004). The GPOP journalists seem to employ other resources than the EPOP writers to express ATTR to identified source. The use of elliptical expressions, for instance, seems to impact on the results obtained for this feature. The data shown in fig. 35 suggest that GPOP makes stronger use of elliptic items than the other registers represented in the corpus. While ellipsis is not employed in a comparable function in the English section of the corpus, elliptic expressions are the second most frequent feature in GPOP, e.g.:

(430) Die beobachteten Fortschritte seien ermutigend, so die Forscher. [GPOP]

As can be seen from the following screenshot of the respective instances, these typically involve ATTR to external animate, which as mentioned previously, is rare in GSCI:

| Texts/MEDPOP_Germ_exte |
|--|
| so die Forscher - |
| so die Medizinerin |
| so Kallio [5]. |
| so de Virgilio, |
| so die Idee |
| so Coenen |
| so May Griffith von der University of Ottawa. |
| so Griffith und Kollegen. |
| so die Wissenschaftler um Griffith. |
| so die Wissenschaftler: |
| so die Forscher optimistisch – |
| so die Wissenschaftler, |
| Berens: |
| so die Forscher. |
| so die Forscher |
| so Joachim Hauber vom Heinrich-Pette-Institut |
| so die Vorstellung der Wissenschaftler |
| so Johnstone. |
| so die Forscher. |
| so die Forscher |
| so die Psychologen Peter Giancola und Michelle Corman von der Universität von Kentucky in Lexington. |
| so die Forscher |
| so Mettenleiter |
| so die Forscher |
| so die Wissenschaftler |

Fig. 36: Screenshot ATTR to external animate through ellipsis

As in the case of the SCI subcorpora, the POP subcorpora also differ in terms of the use of prepositional phrases serving as circumstantial adjuncts. The use of this feature in the GPOP is illustrated by the following example:

(431) Vielleicht am viel versprechendsten mag nach Hauber dann in der Zukunft sein, Blut-Stammzellen aus Patienten zu isolieren, sie im Labor per Tre von Viren zu befreien und dann zurück zu transplantieren: Diese Zellen könnten dann den Grundstock für eine HIV-freie Population bilden. [GPOP]

Example (432) includes a comparable instance of ATTR to identified source found in EPOP:

(432) According to a cohort analysis by Stuebe et al., the longer a woman had lactated during her reproductive years, the less likely she was to get type 2 diabetes, regardless of BMI, which can be a risk factor for the disease. [EPOP]

Similarly to the elliptic adjuncts discussed above, this realisation represents a condensed form of ATTR, enabling sources to be brought into play without the use of a verbal element. It was mentioned earlier that the EPOP and the GPOP journalists tend to use ATTR to identified source to reference external animate sources. Whereas the distinctly verbal style in EPOP suggests that emphasis seems to be on people doing or saying things, it seems that the GPOP journalists introduce more stylistic variety than the EPOP authors by exploiting a wider range of linguistic features in attributing claims to external animate sources.

The discussion of the data relating to ATTR to identified source concludes with a look at the dialogic effect created by these ATTR features.

7.3.2.1.4 ATTR TO IDENTIFIED SOURCE: EXPANSIVE VS. CONTRACTIVE

While the previous sections dealt with formal aspects relating to the linguistic expression of ATTR to identified source, the following chart gives a general overview of the dialogic impact created by ATTR to identified source, regardless of the type of source referenced:⁶⁸

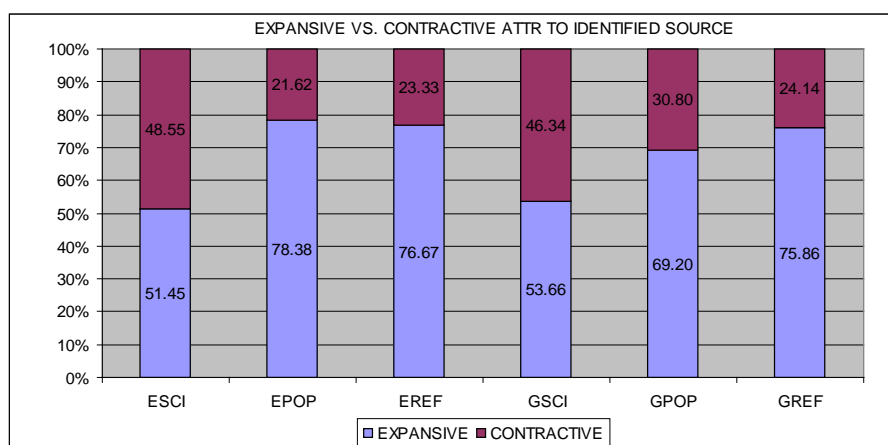


Fig. 37: Expansive vs. Contractive ATTR to identified source

The percentages indicate that there is some similarity between the English and the German section: In each one of the subcorpora, Expansive ATTR to identified source is more frequent than Contractive ATTR to identified source. However, the proportion of Contractive ATTR to identified source is highest in the two SCI subsections, hinting that the SCI writers are less prone than the journalists represented in the POP subsections and the authors in the REF subsections to present claims as open to discussion.

The examination of the results relating to the dialogic status of the instances of ATTR to identified source begins with an assessment of the significance levels. Following the usual procedure, the data relating to the overall distribution are considered first. H_0 assumes that there are no language- or register-specific influences on the use of these features:

| Expansive vs. Contractive ATTR to identified source | ESCI | EPOP | EREF | GSCI | GPOP | GREF |
|---|-------|------|------|------|------|------|
| Expansive | 143 | 427 | 193 | 44 | 196 | 91 |
| Contractive | 135 | 118 | 59 | 38 | 87 | 29 |
| χ^2 | 81.54 | | | | | |
| cv (5 df) | 11.07 | | | | | |

Table 38: Significance: Expansive vs. Contractive ATTR to identified source (global)

⁶⁸ Distancing frames will not be considered separately from other Expansive items. ESCI and GSCI contain no instances of *claim* or, similarly, *behaupten*.

The critical value is exceeded by the chi-square value obtained for the general cross-linguistic distribution. H_0 is thus rejected so that factors other than chance should be taken into consideration in explaining the divergences observed in the general distribution of these features.

The next table details the results obtained by testing the significance of the cross-linguistic differences between corresponding registers (H_0 : The use of Expansive and Contractive ATTR to identified source does not vary cross-linguistically in the individual registers):

| Expansive vs. Contractive ATTR to identified source | ESCI vs. GSCI | | EPOP vs. GPOP | | EREF vs. GREF | |
|--|---------------|------|---------------|------|---------------|------|
| | ESCI | GSCI | EPOP | GPOP | EREF | GREF |
| Contractive | 143 | 44 | 427 | 196 | 193 | 91 |
| Expansive | 135 | 38 | 118 | 87 | 59 | 29 |
| χ^2 | 0.13 | | 8.26 | | 0.03 | |
| cv (1 df) | 3.84 | | | | | |

Table 39: Significance: Expansive vs. Contractive ATTR to identified source (cross-linguistic & register-specific)

Merely the cross-linguistic divergences observed between EPOP and GPOP are statistically significant so that H_0 is rejected. It was mentioned above that EPOP and GPOP resembled each other in that ATTR to identified source is mainly used to attribute propositions to external animate sources, but the EPOP authors appear to be more inclined than their German counterparts to introduce external human sources in a manner that presents claims as negotiable.

Moving on to the intralingual comparison of the SCI and the POP subsections with the corresponding REF subsections, H_0 stipulates that there are no register-specific influences on the use of Expansive or Contractive ATTR to identified source.

| Expansive vs. Contractive ATTR to identified source | ESCI vs. EREF | | EPOP vs. EREF | | GSCI vs. GREF | | GPOP vs. GREF | |
|--|---------------|------|---------------|------|---------------|------|---------------|------|
| | ESCI | EREF | EPOP | EREF | GSCI | GREF | GPOP | GREF |
| Contractive | 143 | 193 | 427 | 193 | 44 | 91 | 196 | 91 |
| Expansive | 135 | 59 | 118 | 59 | 38 | 29 | 87 | 29 |
| χ^2 | 36.03 | | 0.31 | | 10.81 | | 1.78 | |
| cv (1 df) | 3.84 | | | | | | | |

Table 40: Significance: Expansive vs. Contractive ATTR to identified source (intralingual)

According to the results obtained by the chi-square tests, H_0 is rejected for the comparison of ESCI with EREF and in the case of GSCI versus GREF. The language-internal register-specific divergences between the SCI and the respective REF subsections are thus significant. ESCI and GSCI are similar in that they both reference specified sources considerably more often than the other subcorpora in either language to present claims in a Contractive manner. There does not appear to be any cross-linguistic divergence of statistical significance between

ESCI and GSCI in this regard. As described in the previous chapter, authors do not detach themselves from propositions presented by using Contractive options as illustrated below (cf. Martin & White 2005:126f):

- (433) Recent serial clinical and intravascular ultrasound trials have demonstrated concordant beneficial effects of lipid-lowering treatment on arterial remodeling, including a reduction in adverse cardiovascular events and atherosclerotic plaque stabilization [7-9]. [ESCI]

The data suggest that ESCI and GSCI show a similar tendency to make more 'assertive' knowledge claims when propositional content is attributed to identified sources.

Whereas the SCI subsections differ considerably from the corresponding REF subsections in this regard, no statistically significant intralingual divergence was observed between the POP and the REF subsections in either language. The POP subsections differ from the SCI subsections in that they generally show a stronger preference for Expansive ATTR to identified sources as exemplified below:

- (434) "There's never going to be a one-size-fits-all approach," adds Warren. "To achieve prevention for all, we are going to have to be very specific. For some people, PrEP is going to be critical to break the back of the epidemic; for others, it will be the gel." [EPOP]

Overt indication of author stance is absent in this type of ATTR to identified source (cf. e.g. Martin & White 2005:111ff). It was noted previously that the POP journalists prefer attributing propositions to external animate sources so that the people who carry out scientific research are foregrounded. ESCI authors, by contrast, tend to attribute claims to themselves or to inanimate source in cases where ATTR to identified source is involved. As pointed out before, ATTR to self is used less frequently in GSCI than in ESCI. However, like the ESCI authors, the GSCI researchers also prefer ATTR to inanimate over ATTR to external animate. The role of humans is, by consequence, backgrounded in the presentation of knowledge claims. Not only do the POP subsections differ from the SCI subsections in terms of the sources brought into play, but the dialogic impact created by the use of ATTR to identified source in the SCI subsections also differs from the dialogic effect created in the POP subsections. Yet, although each POP subsection contains more Expansive instances of ATTR to identified source than the corresponding SCI subsection, EPOP and GPOP differ in that GPOP has a higher percentage of Contractive ATTR to identified source than EPOP. Compared with the journalists represented in EPOP, the GPOP authors seem to be more likely to reference sources in an assertive manner in presenting informational content, e.g.:

- (435) Kehrten ihre Versuchspersonen nach Abschluss dieses dritten Zwischenspiels zu einer der vorigen zurück, stieg das Fehlerniveau in die Nähe des statistischen Erwartungswerts – mit anderen

Worten: Die Probanden verlegten sich aufs Raten. Nach Meinung der Wissenschaftler könnten dafür weder Mängel in der Konzentration noch im Arbeitsgedächtnis verantwortlich gemacht werden. Das offenbaren ähnlich strukturierte Vergleichstests, die kein Umschalten erforderten. [GPOP]

On a concluding note, EPOP and ESCI seem to be further apart from each other in terms of the dialogic impact created by the use of ATTR to identified source than the corresponding German sections of the corpus. Therefore, the shift taking place as a result of popularisation seems to be less pronounced in the German section than in the English section as regards the dialogic effect resulting from the use of ATTR to identified source. Following the discussion of ATTR features entailing source-mention, the next chapter turns to ATTR features without source-mention.

7.3.2.2 ATTR TO UNIDENTIFIED SOURCE

It was mentioned in the discussion of the results relating to the distinction between ATTR to identified and unidentified sources that each one of the subcorpora includes more ATTR to identified source than ATTR to unidentified source in absolute terms, except for GSCI. GSCI makes less mention of sources and uses more ATTR to unidentified source instead. The use of ATTR to unidentified source in GSCI is illustrated below:

(436) Die technische Realisierbarkeit der kathetergestützten Aortenklappenimplantation konnte an mehreren Zentren weltweit demonstriert werden. [GSCI]

The following chart looks at the proportion of ATTR to unidentified source in relation to the overall frequency of ATTR features:

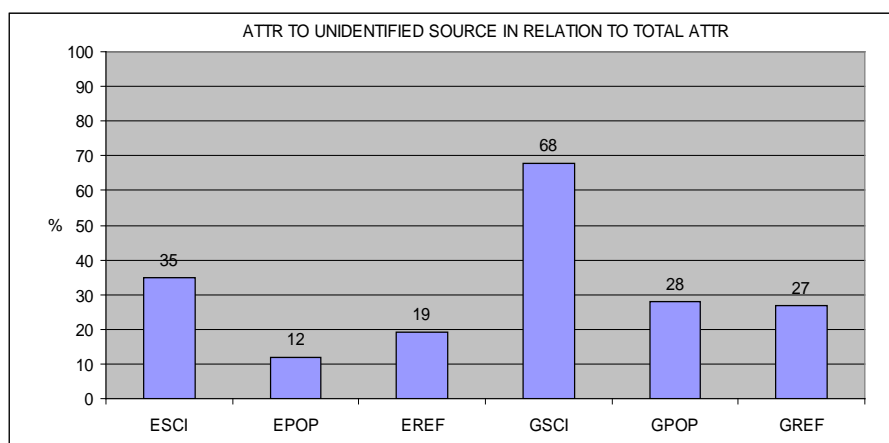


Fig. 38: ATTR to unidentified source in relation to total ATTR

The proportion of ATTR to unidentified source is higher in each German subsection than in the corresponding English subsection. The values indicate that ATTR to unidentified source is most common in the SCI subsections in each language, with GSCI containing by far the highest percentage. The values mirror the proportion of ATTR to identified source in relation to total

ATTR as discussed in section 7.3.2, where it was pointed out that the German subjunctive option appears to impact on the use of ATTR to identified source in German. GPOP contains a lower proportion of ATTR to identified source than EPOP; this, in turn, appears to be reflected in a higher relative frequency of ATTR to unidentified source in GPOP than in EPOP. This observation is in line with the significance values calculated for the results relating to the distribution of ATTR to identified source versus ATTR to unidentified source. These were discussed in section 7.3.2, where it was noted that the REF subcorpora do not differ in a statistically significant manner regarding the distribution of ATTR to identified and to unidentified source. A significant cross-linguistic divergence was, however, observed between the English and the German POP subsections in this respect.

It also seems that GSCI and GPOP differ more than the corresponding English subsections in this regard. This may, at least in part, be due to a different function of ATTR to unidentified source in the two languages and in the different registers. Below is another example of the use of ATTR to unidentified source in GSCI:

- (437) Erstmalig konnte gezeigt werden, dass auch zentrale schlafbezogene Atemstörungen gehäuft bei Patienten mit Vorhofflimmern zu finden sind. [GSCI]

While there is not enough room to provide more context to underpin this point, the authors employ ATTR to unidentified source to report on their own work in the example provided above. It was mentioned in section 7.3.2 that the use of ATTR to identified and of ATTR to unidentified source differs in a statistically significant manner in ESCI and GSCI, even more so than in the case of the POP subsections. Furthermore, the GSCI authors differ from the ESCI authors in that they tend to avoid overt self-mention. However, since it can be assumed that research writing inherently involves discussing one's own work, SCI authors require a means of referring to themselves. Therefore, it may be surmised that SCI authors also use ATTR to unidentified as a means of self-reference. This aspect will be taken up again in connection with BIBL REF.

The following section focuses on the results concerning the different resources employed in interacting with readers by means of ATTR to unidentified source.

7.3.2.2.1 ATTR TO UNIDENTIFIED SOURCE EXPRESSION

The results relating to the different linguistic resources used to express ATTR to unidentified source are considered in the next chart:

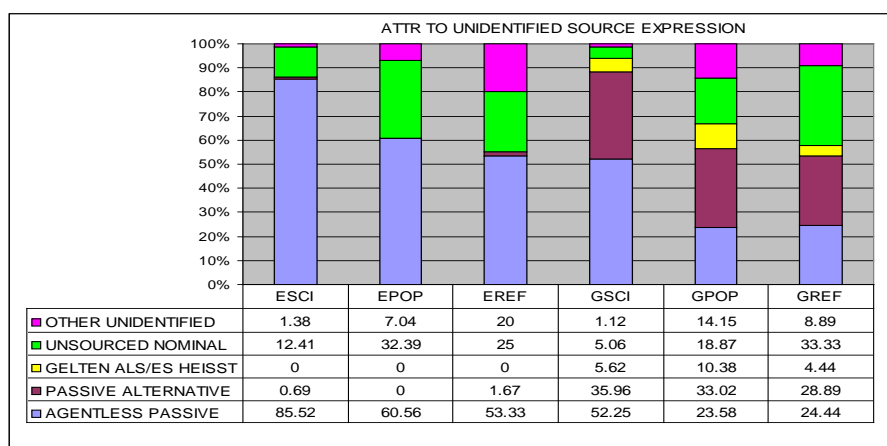


Fig. 39: ATTR TO UNIDENTIFIED SOURCE EXPRESSION

The percentages presented in the chart indicate that different resources are used to create ATTR to unidentified source in the two languages (cf. e.g. Teich 2003). Agentless passives make up the highest percentage of ATTR to unidentified source features found in each one of the English subsections, nominal features being the other main form of ATTR to unidentified source, e.g.:

- (438) This study has certain limitations. First, the interpretation of the results is based on the assumption that the (actual) endothelial function of the MR group is lower than that of the LR group. [ESCI]

As can be seen from the chart, a greater variety of resources is used in the German section of the corpus to express ATTR to unidentified source.

The results yielded by the chi-square procedure for the data presented above will be discussed in the following, beginning with the general differences regarding the resources used to express ATTR to unidentified source.⁶⁹ H_0 assumes that there are no language- or register-specific influences on the realisation of ATTR to unidentified source.

⁶⁹ *Gelten als/es heit* are not considered in the cross-linguistic assessments.

| ATTR TO UNIDENTIFIED SOURCE EXPRESSION | ESCI | EPOP | EREF | GSCI | GPOP | GREF |
|--|--------|------|------|------|------|------|
| Agentless passive | 124 | 43 | 32 | 93 | 25 | 11 |
| Passive alternative | 1 | 0 | 1 | 64 | 35 | 13 |
| Unsources nominal | 18 | 23 | 15 | 9 | 20 | 15 |
| Other unidentified | 2 | 5 | 12 | 2 | 15 | 4 |
| χ^2 | 217.78 | | | | | |
| cv (15 df) | 25.00 | | | | | |

Table 41: Significance: ATTR TO UNIDENTIFIED SOURCE EXPRESSION (global)

The critical value is exceeded considerably by the chi-square value computed for the overall distribution, which results in H_0 being refuted. Consequently, factors other than chance may plausibly be assumed to impact on the general distribution of these features.

Next, the results relating to the cross-linguistic differences between corresponding registers were subjected to significance testing (H_0 : There are no cross-linguistic differences regarding the expression of ATTR to unidentified source in the individual registers).

| ATTR TO UNIDENTIFIED SOURCE EXPRESSION | ESCI vs. GSCI | | EPOP vs. GPOP | | EREF vs. GREF | |
|--|---------------|------|---------------|------|---------------|------|
| | ESCI | GSCI | EPOP | GPOP | EREF | GREF |
| Agentless passive | 124 | 93 | 43 | 25 | 32 | 11 |
| Passive alternative | 1 | 64 | 0 | 35 | 1 | 13 |
| Unsources nominal | 18 | 9 | 23 | 20 | 15 | 15 |
| Other unidentified | (2) | (2) | 5 | 15 | 12 | 4 |
| χ^2 | 67.15 | | 42.39 | | 22.34 | |
| cv | 5.99 (2 df) | | 7.82 (3 df) | | 7.32 (3 df) | |

Table 42: Significance: ATTR TO UNIDENTIFIED SOURCE EXPRESSION (cross-linguistic & register-specific)

The cross-linguistic divergences observed in the individual registers are statistically significant so that H_0 is rejected in each case, the chi-square value being particularly high in the case of the SCI subsections.

The significance values for the intralingual comparisons of the SCI and the POP subsections with the corresponding REF subsections are displayed in the following table (H_0 stipulates that there is no register-specific intralingual preference for any specific realisation of ATTR to unidentified source):

| ATTR TO UNIDENTIFIED SOURCE EXPRESSION | ESCI vs. EREF | | EPOP vs. EREF | | GSCI vs. GREF | | GPOP vs. GREF | |
|---|---------------|------|---------------|------|---------------|------|---------------|------|
| | ESCI | EREF | EPOP | EREF | GSCI | GREF | GPOP | GREF |
| Agentless passive | 124 | 32 | 43 | 32 | 93 | 11 | 25 | 11 |
| Passive alternative | (1) | (1) | (0) | (1) | 64 | 13 | 35 | 13 |
| Unsourced nominal | 18 | 15 | 23 | 15 | 9 | 15 | 20 | 15 |
| Other unidentified | 2 | 12 | 5 | 12 | (2) | (4) | 15 | 4 |
| Gelten als/es heißt | (0) | (0) | (0) | (0) | (10) | (2) | 11 | 2 |
| χ^2 | 31.63 | | 5.12 | | 34.50 | | 5.02 | |
| cv | 5.99 (2 df) | | 5.99 (2 df) | | 5.99 (2 df) | | 9.49 (4 df) | |

Table 43: Significance: ATTR TO UNIDENTIFIED SOURCE EXPRESSION (intralingual)

The critical value for the intralingual divergences between the SCI subsections and the corresponding REF subsections is exceeded in both languages so that H_0 is rejected. The differences between the POP and the REF subsections, by contrast, are not sufficient to refute H_0 in either of the two languages. Consequently, the figures hint that the shifts induced by popularisation affect the linguistic expression of ATTR to unidentified source in both languages. From an intralingual perspective, ESCI contains a considerably higher proportion of agentless passive items than EPOP, which, in turn, is closer to EREF in this respect. The use of agentless passive expressions in ESCI is illustrated below:

- (439) Among known risk factors, hypertension and hypercholesterolemia are considered of utmost importance. [ESCI]

As in the case of ESCI, agentless passives make up the highest percentage of Engagement features categorised as ATTR to unidentified source in GSCI, e.g.:

- (440) Bei Einzelaufgaben zeigte sich erwartungsgemäß die den Zielen entsprechende Aktivierung in beiden Hirnhemisphären. Weniger erwartet war hingegen, dass die Gehirnhälften die Arbeit aufteilen, sobald parallel ein zweites Ziel verfolgt werden musste. [GSCI]

It was noted earlier that a greater variety of resources is employed to express ATTR to unidentified source in the German section than in the English section of the corpus. This seems to be reflected in the chi-square values relating to the cross-linguistic comparisons. As observed above, passive alternatives are part of the range of features employed to express ATTR to unidentified source in the German section, e.g.:

- (441) Dabei bestätigte sich, dass mit steigender BMI-Kategorie die Stärke der Assoziation zwischen Taillenumfang (in cm) und Diabetes-Risiko schwächer wird. [GSCI]

In GSCI, agentless passives are the main feature used to express ATTR to unidentified. In this regard, GSCI differs considerably from GPOP and GREF, both of which contain more passive alternative features than agentless passives. Below is an example of a passive alternative feature from GPOP:

- (442) Aus Experimenten an Ratten weiß man, dass diese Informationen im Gehirn sehr direkt und unabhängig voneinander zugänglich sind. [GPOP]

Comparable formulations, namely uses of impersonal *one* as illustrated by the following example from EREF, are virtually absent in the English part of the corpus:

- (443) She'd have been assaulted and raped, I suppose, in which case one would have expected to find her body at the site as well," Brenda suggested. [EREF]

While *gelten als/es heißt* items are not terribly frequent, they do appear to contribute to the mix of features used to create ATTR to unidentified source in the German part of the corpus. These expressions occur most often in GPOP, where there appears to be a stronger emphasis on stylistic variety than in the SCI papers. These features enable ATTR to be expressed verbally without specifying a source, which is nonetheless implied as being human as illustrated in the following examples from GPOP:

- (444) Weltweit mehr als 10 000 Kinder kamen in den vier Jahren, in denen das Medikament zu kaufen war, mit Missbildungen auf die Welt – in Deutschland allein etwa 4000. Obwohl es anfänglich hieß, dass ihre Lebenserwartung gering sei, überlebten 2800 Betroffene. [GPOP]
- (445) Mit gezielter Wärme lassen sich Tumoren wirksam zum Schrumpfen bringen – wenn die Technik ausgereift und die Behandlung gut geplant ist. Eine solche Hyperthermie unterstützt die herkömmlichen Therapieverfahren und gilt mittlerweile als vierte Säule der Krebsbehandlung. [GPOP]

As regards nominal expressions of ATTR to unidentified source, the POP and the REF subsections showed higher percentages than the respective SCI subsection in both languages. Example (446) illustrates the use of this type of expression in ESCI:

- (446) Contrary to the belief that impaired brachial artery FMD is due to structural/functional abnormalities in the microcirculation resulting in reduced upstream hyperemic shear forces [27, 28], our data support the conception that the atherosclerotic disease process indeed occurs at the level of the conduit artery. [ESCI]

Below is an example from GSCI:

- (447) Ebenso besteht mittlerweile Konsens, dass die obstruktive schlafbezogene Atemstörung ein eigenständiger Risikofaktor für die Entstehung einer arteriellen Hypertonie ist (4). [GSCI]

The English and the German SCI authors both combine ATTR to unidentified source with numerical references. This is not the case in the following example from EPOP:

- (448) The trial collaborators, however, based their decision on previous research that a combined approach can boost helper T cell response better than a single vaccine. [EPOP]

A corresponding example from GPOP is provided below:

- (449) Die traditionelle chinesische Akupunktur wird seit mehr als 4000 Jahren praktiziert und beruht ursprünglich auf der Vorstellung, dass eine Lebensenergie “Qi” auf definierten Bahnen – den “Meridianen” – unseren Körper durchfließt. [GPOP]

This nominal ATTR style appears to serve as a vague form of source reference in the examples taken from the POP subsections. It may be assumed that the origin of the claim is not felt to be of interest to the readership or simply not known. In the SCI examples, by contrast, the lack of a source marked by linguistic resources is compensated by numerical references. This aspect will be taken up in the following section, which aims to explore different register-specific functions of ATTR to unidentified source by factoring in the figures relating to the occurrence of BIBL REF.

7.3.2.2.2 ATTR TO UNIDENTIFIED SOURCE: BIBL REF

The annotation scheme includes a set of features for distinguishing between uses of ATTR to unidentified source which include bibliographic references as exemplified below:

- (450) The presence of such antibodies, particularly ACPA, has been shown to be a poor prognostic factor linked with a higher erosive burden [9,10], while ACPA titres have been reported to fall in line with clinical response to biological therapies [11]. [ESCI]

And instances which do not include numerical referencing, e.g.:

- (451) In addition to the expression of AID, further evidence of functional activation of B cells within synovial grafts was determined by performing double staining for the B cell marker CD20 and Ki67, a marker of cell proliferation. [ESCI]

The following chart details the data obtained for ATTR to unidentified source according to the presence or absence of BIBL REF. The results are considered in relation to the overall number of ATTR to unidentified source occurring in the individual subsections:

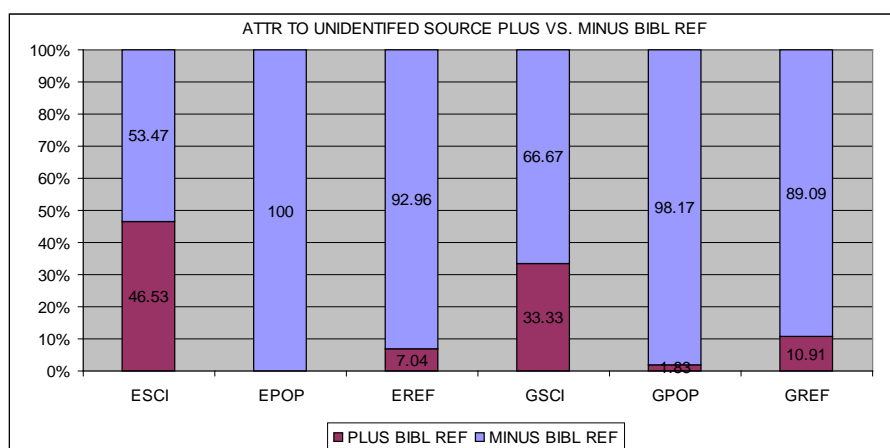


Fig. 40: ATTR to unidentified source plus vs. minus BIBL REF

In interpreting these data, it should be kept in mind that ATTR to unidentified source is more common in ESCI and GSCI than in the other subcorpora, both in absolute and in relative terms, i.e. in relation to the overall frequency of ATTR. The relative figures show that the English and German subcorpora follow a somewhat similar pattern in that numerical citation is frequently used in ESCI and GSCI, while it is virtually absent in the POP subsections and only plays a minor role in the REF subsections. The percentage of ATTR to unidentified source without BIBL REF occurring in GSCI even exceeds the percentage of corresponding items in ESCI.

The counts for the SCI subsections were subjected to significance testing, H_0 being that there are no cross-linguistic differences regarding the use of ATTR to unidentified source with or without BIBL REF in the two SCI subcorpora.

| ATTR to unidentified source plus vs. minus BIBL REF | ESCI vs. GSCI | |
|--|---------------|------|
| | ESCI | GSCI |
| Plus BIBL REF | 68 | 59 |
| Minus BIBL REF | 78 | 119 |
| χ^2 | 6.07 | |
| cv (1 df) | 3.84 | |

Table 44: Significance: plus vs. minus BIBL REF (cross-linguistic & register-specific)

The chi-square value indicates that the frequencies of occurrence observed in ESCI and GSCI are significantly different from the hypothetical values so that H_0 is not retained.

The frequency of ATTR to self observed in ESCI may contribute to this difference since the observed avoidance of self-reference in GSCI may be compensated by the GSCI authors by employing ATTR to unidentified source as a means of referring to their own work, e.g.:

- (452) Der systolische pulmonalarterielle Spitzendruck (PAP) lag bei Patienten mit ZSA/CSR bei $31,3 \pm 2,6$ mm Hg (+ zentraler Innendruck [ZVD]), bei Patienten mit OSA bei $27,8 \pm 1,7$ mm Hg (+ ZVD) und bei

Patienten ohne SA bei $25,2 \pm 2,4$ mm Hg (+ ZVD). Es zeigte sich ein relevanter Unterschied zwischen der Gruppe ZSA/CSR im Vergleich zu OSA ($p = 0,04$) und ohne SA ($p = 0,01$). Zudem konnte eine schwache Korrelation zwischen dem PAP und dem AHI im Gesamtkollektiv ($r = 0,20$, $p = 0,04$) – insbesondere in Bezug auf Patienten mit zentraler schlafbezogener Atemregulationsstörung ($r = 0,29$, $p = 0,001$) – gefunden werden. [GSCI]

It was mentioned in connection with the discussion of the results relating to the ASCR of inanimate sources that authors are required to mark cited material as stemming from an external source via proper referencing to avoid a breach of scientific protocol and accusations of plagiarism. For this reason, we may surmise that propositions are internal to the authors if no external source is mentioned and if the propositions are not marked as external to the authorship by bibliographic citation techniques.

The minor presence of ATTR to unidentified in combination with BIBL REF observed in GREF may be explained by the fact that the REF corpora also include samples representing scientific and legal discourse and other instances of specialised language use. This is illustrated in the following excerpt from EREF:⁷⁰

(453) In general it can be said that women suffer more from psychological distress and minor somatic disorders, whereas men seem to be especially vulnerable to life-threatening diseases, e.g. myocardial infarction and cancer (e.g. Rice et al., 1984; Bush and Barrett-Conner, 1985). [EREF]

Summarising the points made above, it appears that ATTR to unidentified source serves different functions according to the different registers in which it occurs and depending on the presence or absence of BIBL REF. Following the above discussion concerning the expression and the function of ATTR to unidentified source, the next section sets out to examine 'indirect' ways of referencing sources.

7.3.2.2.3 ATTR TO UNIDENTIFIED SOURCE: INDIRECT SOURCE REFERENCE

The results for features which enable sources to be brought into play in a manner such that the relationship between the proposition and the sources is not as proximate as in the case of ATTR to identified source will be discussed in the following. As outlined in the description of the annotation scheme, INDIRECT SOURCE REFERENCE concerns the combination of ATTR to unidentified source with prepositional or pronominal adjuncts (cf. Doherty 1996). This is illustrated in the following example:

⁷⁰ It should be noted that this type of referencing was not found in the SCI section. Instead, as mentioned previously, numerical indexes are used.

- (454) Ein erhöhter NT-proBNP bei Patienten mit ZSA/CSR – einer vermehrten atrialen Volumenbelastung entsprechend – konnte ebenfalls in großen Herzinsuffizienz-Studien belegt werden (7, 13). Für die hier untersuchten 150 Patienten mit Vorhofflimmern zeigte sich in der ZSA/CSR-Gruppe eine Tendenz zu höherem NT-proBNP. [GSCI]

Here, indirect reference is made to an inanimate entity by means of a prepositional adjunct (*in großen Herzinsuffizienz-Studien*) and, even more circuitously, by the pronominal adverbial *hier*. The sources are thus located ‘outside’ the ATTR features, i.e. *konnte belegt werden* and *zeigte sich*. The following chart shows the proportion of ATTR to unidentified source combined with INDIRECT SOURCE REFERENCE and the proportion of ATTR to unidentified source without INDIRECT SOURCE REFERENCE:

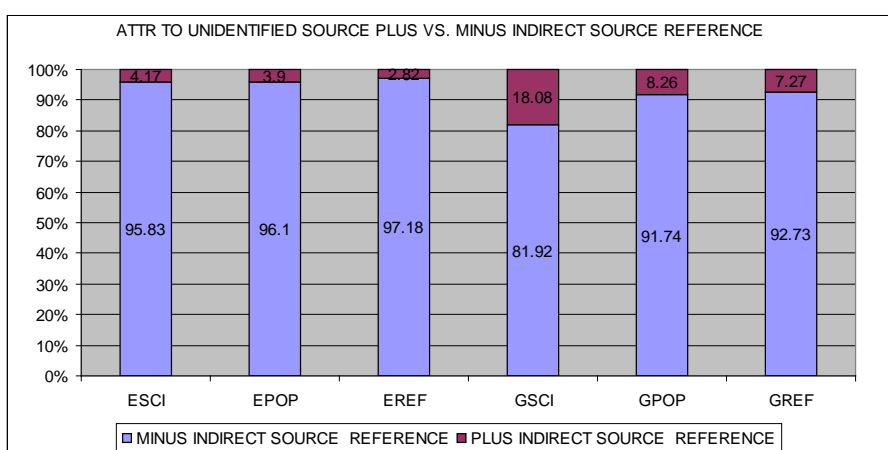


Fig. 41: ATTR to unidentified source plus vs. minus INDIRECT SOURCE REFERENCE

Clearly, these results require corroboration on the basis of a larger data set, but it is still interesting to note that the value for GSCI is higher than the values for the other subcorpora.

The significance of the results obtained for the general distribution of INDIRECT SOURCE REFERENCE was assessed, H_0 being that there is no language- or register-specific bias concerning the frequency of occurrence of INDIRECT SOURCE REFERENCE:

| INDIRECT SOURCE REFERENCE | ESCI | EPOP | EREF | GSCI | GPOP | GREF |
|---------------------------|-------|------|------|------|------|------|
| Minus indirect reference | 139 | 68 | 58 | 146 | 98 | 42 |
| Plus indirect reference | 6 | 3 | 2 | 32 | 9 | 3 |
| χ^2 | 25.35 | | | | | |
| cv (5 df) | 11.07 | | | | | |

Table 45: Significance: plus vs. minus INDIRECT SOURCE REFERENCE (global)

The critical value is exceeded, indicating that the overall distribution is not due to chance. Focussing on the observations relating to the register-specific cross-linguistic divergences, the significance test yielded the results shown in the next table (the REF subsections were not

taken into account since this would have involved expected frequencies < 5 (Preacher 2001). According to H_0 there are no language-specific preferences at work in any of the registers considered here.

| INDIRECT SOURCE REFERENCE | ESCI vs. GSCI | | EPOP vs. GPOP | |
|------------------------------|---------------|------|---------------|------|
| | ESCI | GSCI | EPOP | GPOP |
| Minus indirect reference | 139 | 146 | 68 | 98 |
| Plus in direct reference | 6 | 32 | 3 | 9 |
| χ^2 | 14.74 | | 1.19 | |
| cv (1 df) | 3.84 | | | |

Table 46: Significance: plus vs. minus INDIRECT SOURCE REFERENCE (cross-linguistic & register-specific)

The critical value for the divergence between ESCI and GSCI is exceeded, suggesting that there is indeed a statistically significant cross-linguistic difference as regards INDIRECT SOURCE REFERENCE in the SCI subsections. H_0 can thus be rejected, which supports the previous observation that this feature is considerably more frequent in GSCI than in ESCI. By contrast, the cross-linguistic differences between the POP subsections are insignificant so that the register-specific use of this feature in the POP subcorpora does not seem to be subject to language-specific influences.

Finally, the significance of the intralingual differences between GSCI and GREF was assessed. The other subcorpora were not considered as this would have involved expected frequencies below 5 (Preacher 2001). According to H_0 there is no language-internal register-specific bias in the use of INDIRECT SOURCE REFERENCE.

| INDIRECT SOURCE REFERENCE | GSCI vs. GREF | |
|------------------------------|---------------|------|
| | GSCI | GREF |
| Minus indirect reference | 146 | 42 |
| Plus indirect reference | 32 | 3 |
| χ^2 | 3.47 | |
| cv(1 df) | 3.84 | |

Table 47: Significance: plus vs. minus INDIRECT SOURCE REFERENCE (intralingual)

The value computed for GSCI versus GREF falls slightly short of the critical value so that H_0 is not refuted.

It was mentioned in connection with the design of the annotation scheme that the involvement of humans may be signalled in such features. In the following excerpt, for instance, the scientists involved in the research are delegated to the sidelines by removing them from the process expressed in the verbal element and ‘inserting’ them in the noun phrase via premodification:

(455) Dabei waren lobuläre Karzinome – unabhängig von ihrer Größe – häufiger falsch negativ als duktale Karzinome. Dieses Phänomen zeigte sich auch in der vorliegenden Studie. [GSCI]

In the example, the link to the authors is established by means of the lexical item *vorliegende*. Not only is the part of the authors involved in the research presented in a way that evokes a passive spectator role, but the expression of involvement by means of first-person reference is also avoided. As a consequence, the authors appear to ‘stand apart’ even further from their research in the example. The chart shown below zooms in to examine the type of entities invoked in relation to the total number of instances of INDIRECT SOURCE REFERENCE:

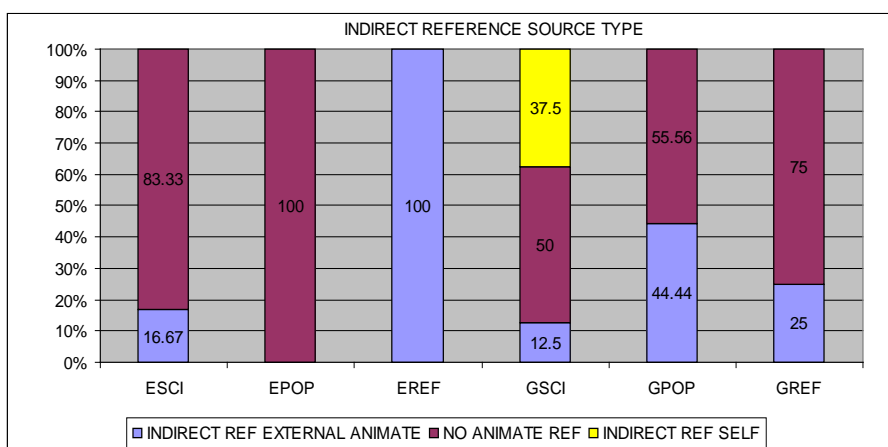


Fig. 42: INDIRECT REFERENCE SOURCE TYPE

The interpretation of the results is, of course, limited by the small data set.⁷¹ Nonetheless, it can be seen that the use of this type of indirect reference to self is exclusive to GSCI. The significance of the data obtained for the distribution of indirect sources referencing was not assessed since the requirements concerning the expected frequencies were not met (Preacher 2001). Nonetheless the results presented above may hint that INDIRECT SOURCE REFERENCE is used by GSCI authors to talk about their own work, serving as an alternative to ATTR to self, which, as mentioned before, is more popular with the ESCI authors than with their GSCI colleagues. An example of this type of usage involving reference by means of a first-person possessive determiner is given below:

(456) Die auf der diesjährigen Interscience Conference on Antimicrobial Agents and Chemotherapy (ICAAC) vorgestellten Daten (Präsentationen K-1918a und V-1269c) zeigten, dass 8 von 100 untersuchten Patienten noch eine Woche nach Krankheitsbeginn PCR- und kulturpositiv auf die

⁷¹ It is also for this reason that the results for the POP and the REF subsections will not be examined in greater detail.

Neue Influenza A (H1N1/09) waren. In unserm Kollektiv ergab sich bislang kein Nachweis einer Oseltamivir-Resistenz. [GSCI]

INDIRECT SOURCE REFERENCE was used less often by the GSCI authors to refer to other humans, as in:

(457) Im Gegensatz dazu fanden Porthan et al. eine Prävalenz von SA bei Patienten mit „lone atrial fibrillation“ bei nur 32 %, die sich zudem nicht von einer in Bezug auf Alter, Geschlecht sowie kardiovaskulärer Morbidität angepassten Kontrollgruppe unterschied (12). Die im Kollektiv dieser Autoren nachgewiesenen deutlich höheren Prävalenzen mögen neben vorhandenen kardialen Grunderkrankungen und einem niedrigeren AHI als Grenzwert (5/h in der eigenen, 10/h in der hier vorgestellten Studie auch an dem höheren Patientenalter sowie dem höheren Body-Mass-Index der Patienten liegen. [GSCI]

However, in half the cases, INDIRECT SOURCE REFERENCE does not involve self-mention or the mention of other persons in GSCI. In the following example, for instance, an inanimate source (*Fallberichte*) occurs in the adjunct, without human involvement being made explicit:

(458) Die technische Durchführbarkeit der Katheterklappenimplantation wurde in ersten Fallberichten für beide inzwischen zugelassenen Prothesentypen gezeigt (4–7). [GSCI]

Here, merely a metonymical link is established with the authors who conducted the research. The discussion of the results concerning the use of ATTR to unidentified source concludes with a glance at the dialogic potential of these features.

7.3.2.2.4 ATTR TO UNIDENTIFIED SOURCE: EXPANSIVE VS. CONTRACTIVE

The following chart presents the values obtained for Contractive and Expansive ATTR to unidentified source in the individual subsections:

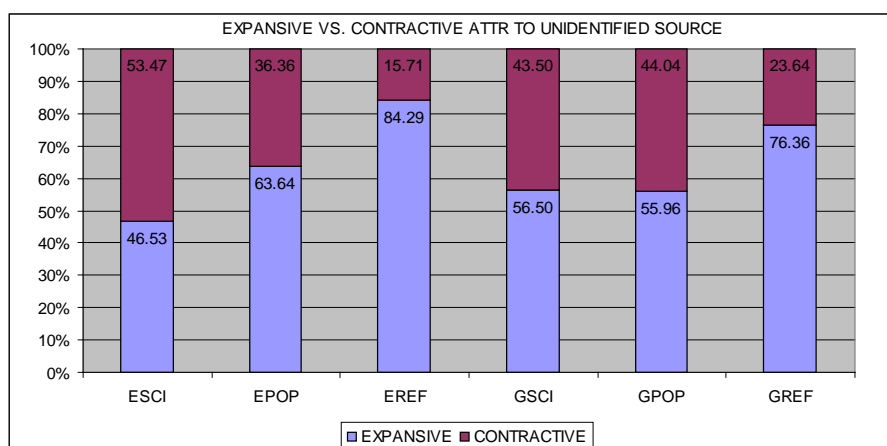


Fig. 43: Expansive vs. Contractive ATTR to unidentified source

The relative frequency of Expansive uses exceeds the frequency of Contractive features categorised as ATTR to unidentified source in each one of the subsections, bar the exception

of ESCI, which contains more Contractive than Expansive cases of ATTR to unidentified source. EPOP appears to occupy an intermediate position between ESCI and EREF, whereas GSCI and GPOP seem to resemble each other closely. The REF subcorpora have the lowest percentages of Contractive ATTR to unidentified source in both languages.

Again, the significance of the general distribution was examined, with H_0 assuming that there are no language- or register-specific preferences regarding the use of Expansive or Contractive ATTR to unidentified source:

| Expansive vs. Contractive ATTR to unidentified source | ESCI | EPOP | EREF | GSCI | GPOP | GREF |
|--|-------|------|------|------|------|------|
| Expansive | 68 | 45 | 50 | 101 | 60 | 35 |
| Contractive | 78 | 26 | 9 | 78 | 47 | 11 |
| χ^2 | 32.48 | | | | | |
| cv (5 df) | 11.07 | | | | | |

Table 48: Significance: Expansive vs. Contractive ATTR to unidentified source (global)

The critical value is exceeded by the chi-square value obtained for the overall cross-linguistic distribution. Since H_0 is rejected, factors other than chance need to be taken into consideration in explaining the differences observed in the general distribution of these features.

In the following table, the focus is narrowed down by testing the significance of the cross-linguistic differences between corresponding registers in the two languages (H_0 : The register-specific use of Expansive and Contractive ATTR to unidentified source is not subject to cross-linguistic variation):

| Expansive vs. Contractive ATTR to unidentified source | ESCI vs. GSCI | | EPOP vs. GPOP | | EREF vs. GREF | |
|--|---------------|------|---------------|------|---------------|------|
| | ESCI | GSCI | EPOP | GPOP | EREF | GREF |
| Expansive | 68 | 101 | 45 | 60 | 50 | 35 |
| Contractive | 78 | 78 | 26 | 47 | 9 | 11 |
| χ^2 | 3.13 | | 0.94 | | 1.26 | |
| cv (1 df) | 3.84 | | | | | |

Table 49: Significance: Expansive vs. Contractive ATTR to unidentified source (cross-linguistic & register-specific)

The chi-square value is not exceeded in any of the cases considered here so that H_0 is not rejected for any of the comparisons. Therefore, there does not seem to be any statistically significant cross-linguistic divergence specific to the registers considered here.

In a final step, the focus is narrowed down further by testing the intralingual differences between the SCI and the POP subsections and the corresponding REF subsections (H_0 : The use of Expansive or Contractive ATTR to unidentified is not affected by intralingual register-specific influences):

| Expansive vs. Contractive ATTR to unidentified source | ESCI vs. EREF | | EPOP vs. EREF | | GSCI vs. GREF | | GPOP vs. GREF | |
|--|---------------|------|---------------|------|---------------|------|---------------|------|
| | ESCI | EREF | EPOP | EREF | GSCI | GREF | GPOP | GREF |
| Expansive | 68 | 50 | 45 | 50 | 101 | 35 | 60 | 35 |
| Contractive | 78 | 9 | 26 | 9 | 78 | 11 | 47 | 11 |
| χ^2 | 25.06 | | 7.48 | | 5.92 | | 5.74 | |
| cv (1 df) | 3.84 | | | | | | | |

Table 50: Significance: Expansive vs. Contractive ATTR to unidentified source (intralingual)

While the authors represented in the individual subcorpora appear to ‘behave’ similarly from a cross-linguistic perspective, the critical value for the language-internal results is exceeded in all cases so that H_0 is rejected. Therefore, factors other than chance need to be taken into consideration in explaining the intralingual differences observed in the two languages, the divergence being particularly marked in the case of ESCI versus EREF.

As was pointed out in section 7.3.2.1.4, ESCI and GSCI seem to use Expansive and Contractive ATTR to identified source in a similar fashion, this also appears to hold for the use of Expansive and Contractive ATTR to unidentified source. The two SCI subsections do not differ in a significant manner as regards the dialogic effect of ATTR to unidentified source. A Contractive instance of ATTR to unidentified source from ESCI is shown below:

- (459) A statistically significant dosing effect was seen with the polio vaccine and a non significant trend was seen with the whole cell pertussis vaccine, the hemophilus vaccine, and the combined diphtheria, tetanus, and inactive polio vaccine. [ESCI]

A corresponding example from GSCI is provided below:

- (460) Es zeigte sich ein relevanter Unterschied zwischen der Gruppe ZSA/CSR im Vergleich zu OSA ($p = 0,04$) und ohne SA ($p = 0,01$). Zudem konnte eine schwache Korrelation zwischen dem PAP und dem AHI im Gesamtkollektiv ($r = 0,20$, $p = 0,04$) – insbesondere in Bezug auf Patienten mit zentraler schlafbezogener Atemregulationsstörung ($r = 0,29$, $p = 0,001$) – gefunden werden. [GSCI]

Similarly, EPOP and GPOP resemble each other fairly closely, with the same applying to the EREF and GREF. The divergences observed above thus appear to be limited to language-internal shifts, which are more pronounced in the English section than in the German section of the corpus, the difference between ESCI and EREF being more marked by far than the difference observed between EPOP and EREF. In EPOP, there seems to be a stronger tendency to open up dialogic space in cases in which the source is not specified than in ESCI. An example of Expansive ATTR to unidentified source from EPOP is provided below:

- (461) Other recent research has shown that the number of antibodies needed to provide protection is lower than previously believed, possibly making a vaccine easier to create. [EPOP]

GPOP is closer to GSCI in this regard, both subsections differing from GREF to a similar extent. An example of Expansive ATTR to unidentified source from GPOP is provided below:

- (462) Entwarnung im zweiten Kritikfeld – der Gesundheit ehemals eingefrorener Eizellen – geben dafür dänische Forscher. Lange herrschte Unsicherheit, ob ein Embryo eine Vorgeschichte aus Tiefkühlen und Auftauen wirklich ohne nachteilige Folgen übersteht. [GPOP]

The following diagram takes into account the presence of BIBL REF in Expansive and Contractive ATTR to unidentified source. Since BIBL REF only plays a very limited role in the other subsections, merely the results for the SCI subsections are considered here:

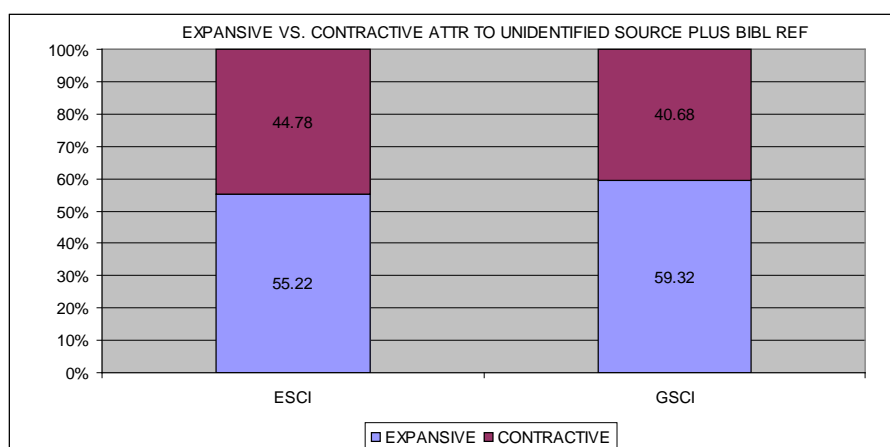


Fig. 44: Expansive vs. Contractive ATTR to unidentified source plus BIBL REF

The percentages presented above are similar for the two subcorpora. The results were subjected to significance testing, H_0 assuming that there is no cross-linguistic bias concerning the use of Expansive or Contractive ATTR to unidentified source combined with BIBL REF:

| Expansive vs. Contractive ATTR to unidentified source plus BIBL REF | ESCI vs. GSCI | |
|---|---------------|------|
| | ESCI | GSCI |
| Expansive | 37 | 35 |
| Contractive | 30 | 24 |
| χ^2 | 0.22 | |
| cv (1 df) | 3.84 | |

Table 51: Significance: Expansive vs. Contractive ATTR to unidentified source plus BIBL REF (cross-linguistic)

The chi-square value is lower than the threshold value. Therefore, there does not appear to be any statistically significant divergence between the two SCI subsections as regards Expansive or Contractive ATTR to unidentified source in combination with BIBL REF. The data suggest that this resource is used slightly more often to express meanings in a manner that presents content as negotiable. In such cases the authors do not provide any hint as to their own position towards the claim thus framed (cf. e.g. Martin & White 2005:102ff, White

2012a). The origin of the proposition is merely marked by numerical indices as exemplified by the following excerpt from ESCI:

(463) It has been suggested that NO production in large amounts by iNOS is a toxic-damaging agent [26], whereas eNOS is a protective enzyme [27]. [ESCI]

The following chart presents the results for Expansive and Contractive instances of ATTR to unidentified source which do not involve BIBL REF:

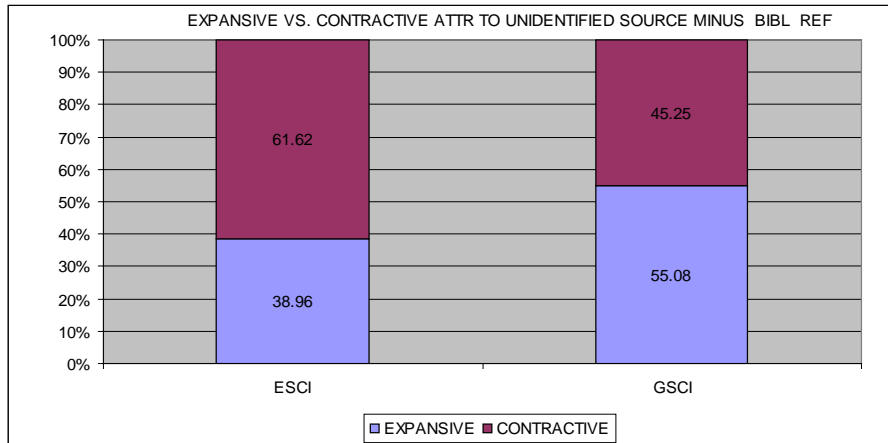


Fig. 45: Expansive vs. Contractive ATTR to unidentified source minus BIBL REF

The proportion of Contractive ATTR to unidentified source exceeds that of Expansive ATTR to unidentified source in ESCI, the opposite applying to GSCI. The results of the significance tests for the data are presented in the following table. H_0 assumes that there is no cross-linguistic bias concerning the use of Expansive or Contractive ATTR to unidentified source without BIBL REF:

| Expansive vs. Contractive ATTR to unidentified source minus BIBL REF | ESCI vs. GSCI | |
|--|---------------|------|
| | ESCI | GSCI |
| Expansive | 30 | 65 |
| Contractive | 47 | 53 |
| χ^2 | 4.85 | |
| cv (1 df) | 3.84 | |

Table 52: Significance: Expansive vs. Contractive ATTR to unidentified source minus BIBL REF (cross-linguistic)

The chi-square value being exceeded, H_0 is refuted so that the discrepancies between ESCI and GSCI appear to be due to other influencing factors than chance. As mentioned before, ATTR to unidentified source without BIBL REF seems to represent a means of self-referencing in SCI publications since the origin of external knowledge claims needs to be marked, unless content is considered to belong to the stock of knowledge commonly accepted in a discipline (cf. Myers 1989). The latter seems to be the case in the following example:

- (464) The presence of ectopic GC-like structures, characterized by T/B cell aggregates and CD21⁺ FDC networks, in the synovium of a subset of patients with RA has long been known. [GSCI]

Example (465) contains a further instance of ATTR to unidentified source without BIBL REF from GSCI:

- (465) Zusammenfassend ist die Neue Influenza A (H1N1/09) bis Mitte September 2009 durch ein mildes Krankheitsbild charakterisiert. Die vorliegende Arbeit beschreibt den Beginn der Pandemie. Es ist zu erwarten, dass die Zahlen der autochthon erworbenen Infektionen und die der Todesfälle im weiteren Verlauf deutlich ansteigen werden. [GSCI]

The preceding context enables the authors to be identified as the sources of the epistemic assessment, i.e. *es ist zu erwarten, dass*. It appears that the dialogic impact of ATTR to unidentified source without BIBL REF differs in the English and in the German SCI subcorpora. The following example illustrates the Contractive use of ATTR involving neither source-mention nor BIBL REF:

- (466) A final and highly relevant observation obtained in the HuRA-SCID chimera is that the RA synovium, in the presence of follicular structures expressing AID and CD21L, behaves as a self-sustained microanatomical unit of ectopic lymphoid tissue. [ESCI]

It thus seems that ESCI authors display a stronger tendency than the GSCI authors to use ATTR to unidentified source without BIBL REF to close down dialogic room while potentially talking about their own work.

7.4 Summary

In a nutshell, each English subsection was found to contain more instances of Engagement than the corresponding German subsection in absolute terms. On the whole, the German authors represented in each of the three subcorpora appear to ‘interact’ less with their audiences by means of the type of Engagement resources considered here than their English counterparts. Despite the generally lower use of epistemic and evidential formulations in the German part of the corpus, several similarities exist between the English and the German sections at a general level. Some resemblance was observed regarding the distribution of Engagement features across the subsections in the two languages, the journalistic articles containing the highest frequency of Engagement items in both languages. Hence, the POP journalists appear to be more inclined to acknowledge the presence of a potentially diverse communicative background than the authors of the corresponding SCI subsections. The SCI publications, by contrast, do not differ from the registers represented in the REF subcorpus in a significant manner in either of the two languages as regards the overall quantity of Engagement features.

Moreover, not only does the use of Engagement in the SCI and the POP subsections differ in general quantitative terms, the Engagement features employed in construing a heteroglossically diverse setting also differ in terms of their dialogic effect: The SCI writers in both languages were found to be more prone than the POP journalists to use Engagement resources to ‘impose’ knowledge claims on their audience by presenting propositional content in a manner which reduces the disputability of claims. The POP journalists, by contrast, are more inclined than the authors of the SCI papers to use these features to present informational content in a manner that opens up dialogic space, thereby presenting propositions as negotiable (cf. e.g. Martin & White 2005:102ff, White 2012 a, b).

While no major quantitative difference in the use of Engagement features was observed between the SCI and the corresponding REF subsections in either language, a functional difference was observed in that both SCI subsections contain more Contractive features than the respective REF subsections. GSCI and ESCI contain a similar percentage of Contractive items, whereas the GPOP subsection includes more Contractive Engagement features than EPOP. Therefore, the register shift resulting from popularisation appears to be less marked in the German than in the English section of the corpus in this regard.

Though similar tendencies were observed on a global level as regards the general use of Engagement features, on closer inspection, it was found that different resources were involved in the formal construction of Engagement in the two languages. The following chart provides a synopsis of the findings discussed in this chapter by considering the broad categories in relation to the overall frequency of Engagement features observed in each subcorpus:

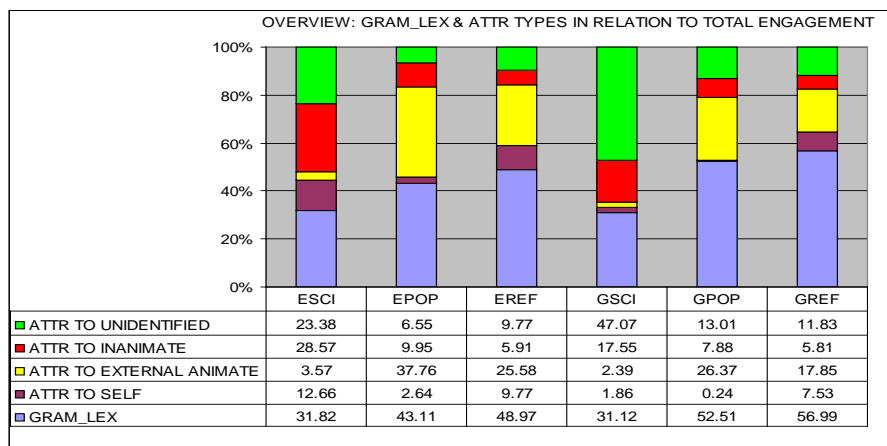


Fig. 46: Overview: GRAM_LEX & ATTR types in relation to total ENGAGEMENT

The overview reflects the language-typological and register-specific factors discussed throughout this chapter. For instance, as regards the general distinction made between

GRAM_LEX features, on the one hand, and ATTR items, on the other, the subjunctive mood and the semantic versatility of the subject position (cf. Doherty 1996, Teich 2003) were found to be major influencing factors. The subjunctive mood was found to be particularly impacting on the POP subsections. In the journalistic articles, cross-linguistic differences concerning the linguistic realisation of reported speech resulted in diverging uses of GRAM_LEX and ATTR features: GPOP is characterised by a stronger emphasis on GRAM_LEX compared with EPOP, where ATTR features were prevalent. However, in cases where Engagement was expressed by means of ATTR features in the POP subsections, these were mostly used to refer to external animate sources in both journalistic subsections. Self-referential ATTR was found to be rare in the two POP subsections (cf. Gotti 2011), hinting that the POP journalists preferred to stay in the background in presenting medical news.

It was noted that, at a general level, ESCI and GSCI have in common a generally lower use of Engagement resources than the corresponding POP subsections and a marked preference for Contractive Engagement compared with the corresponding POP and REF subsections. In addition to this, ESCI and GSCI resemble each other as regards the linguistic expression of Engagement in terms of a distinct preference for ATTR features. In contrast to the POP subsections, the use of the subjunctive mood did not impact in the case of the SCI subsections from a cross-linguistic perspective. As can be seen from the summary in the chart above, both SCI subsections contain roughly the same – low – proportion of GRAM_LEX compared with the other corresponding subcorpora.

Despite these similarities, the findings relating to ATTR suggest that the English and the German researchers use different Engagement resources to refer to themselves. Whereas ESCI authors are more prone than the GSCI authors to use ATTR features as means of self-reference, the GSCI authors were found to be more inclined to engage with their readership by using ATTR features which do not involve source-mention, resulting in a considerably higher proportion of ATTR to unidentified source in GSCI than in ESCI. This observation appears to be connected with a register-specific use of bibliographic referencing; it was observed that, under certain circumstances, the absence of source-mention combined with bibliographic indices seems to serve as a means of self-reference in scientific writing. Thus, register-specific functional variation was observed concerning the use of ATTR to unidentified source, which appears to serve as a vague form of source reference in the POP articles. Furthermore, typological differences appear to be at work in the linguistic expression of ATTR to unidentified source, with a wider range of resources serving to create this effect in the German part of the corpus.

Moreover, differences between the German and the English research subsection concern INDIRECT SOURCE REFERENCE, which deals with the combination of ATTR to unidentified source with prepositional or pronominal adjuncts which reference inanimate entities (cf. Doherty 1996). This type of feature is considerably more frequent in GSCI than in ESCI. Moreover, the inanimate entities referred to in this way may, in turn, be linked to human beings. The human sources referred to are thus located 'outside' the ATTR features in such cases. In comparison to ATTR to identified source involving human sources, this type of feature enables the part of the scientists involved in the research to be presented in a way which evokes an uninvolved spectator role. The results presented in this chapter hint that INDIRECT SOURCE REFERENCE is also used by German research writers to talk about their own work, serving as an alternative to ATTR to self.

Finally, it was observed that GSCI contains a higher proportion of ATTR to inanimate than ESCI in relation to the overall use of ATTR to identified source. Yet, the overview provided in the table shown above suggests that GSCI contains a lower percentage of ATTR to inanimate in relation to the global use of Engagement features than ESCI. This may be interpreted as a corollary of the lower semantic versatility of the subject position in German compared with English (cf. Teich 2003).

8. CONCLUSIONS AND OUTLOOK

The aim of the present study was to explore how research authors and journalists interact with their readers in presenting medical knowledge claims in English and in German. The analysis was specifically interested in the use of expressions which are not openly attitudinal (cf. e.g. Hunston 1993a), focus being on features treated in connection with the domains of modality and evidentiality (cf. e.g. Chafe 1986, see chapter 3). Traditional accounts of modality (e.g. Lyons 1977) are mainly concerned with “individualistic” approaches to the concept of modality (cf. White 2012b, White 1998:14ff, Martin & White 2005:104f). In the literature on hedging, these phenomena are frequently considered as a means of signalling that the author is not fully committed to a proposition or that the author does not wish to state his commitment in categorical terms (cf. e.g. Hyland 1998a:1, see chapter 2.4). In the present research, however, particular attention was paid to the potential interpersonal impact of the use of different types of reporting structures on different audiences. The study examined the use of ‘tentative’ features such as *We/person X believe(s) that* etc. and more ‘vigorous’ expressions such as *we have shown that/person X has shown that* etc. in presenting knowledge claims to peer and lay audiences (cf. Hunston 1993a, Martin & White 2005:102ff). In order to account for this effect, the theoretical approach proposed by Appraisal was examined (cf. chapter 4). More specifically, the Engagement system of the Appraisal framework (e.g. Martin & White 2005) was adopted and remodelled to explore how these resources are used by authors in presenting research findings in medical research publications and popularisations. In the Engagement network, a distinction is made between expressions which serve to open up dialogic space so as to invite heteroglossic diversity, on the one hand, and options which reduce dialogic space, on the other hand (e.g. Martin & White 2005:102ff). Emphasis is thus placed on dialogic impact rather than on “truth-functional semantics” in Appraisal (Martin & White 2005:105). However, in order to enable a systematic quantitative comparison of intralingual and cross-linguistic shifts, clear-cut criteria were required for a categorisation of the features examined in the present research. To this end, the tests formulated by Vendler (1980) were adopted to distinguish between features which present knowledge claims as ‘negotiable’ and expressions which ‘impose’ knowledge claims on the readership (cf. chapter 5).

Additionally, this thesis was concerned with the linguistic choices made in expressing these meanings. A large cluster of heterogeneous linguistic categories is grouped under the

relevant categories in Appraisal. Therefore, the analytical framework was adapted so as to enable a methodical classification according to fine-grained, non-overlapping categories in English and German, allowing for the annotation of ‘non-prototypical’ and intricate expressions of Engagement located at different linguistic levels. This also entailed tailoring the framework to enable the categorisation of instances in which propositions are attributed to sources located outside the immediate ‘vicinity’ of the Engagement feature and encoded through deictic reference. Engagement features were thus categorised along two axes in the present analysis, namely according to their potential dialogic effect and according to the way they are phrased.

A nuanced picture emerged from the application of the remodelled framework to the corpus: In brief, instances of the features examined here are less numerous in the German section than in the English section on the whole. At least as far as the features considered in the present analysis are concerned, this observation may, therefore, be interpreted such that there is a stronger tendency in the German part of the corpus to construe meanings in a relatively more monoglossic style in the sense that alternative positions are ignored (cf. e.g. Martin & White 2005:93ff, White 2012a, b). Yet, the two sections share similarities concerning the distribution of Engagement features across the registers, which were detailed in chapter 7.4. To summarise, in both languages, the researchers were more inclined than the journalists to present knowledge claims as ‘non-debatable’ by using Contractive Engagement features. The English and the German SCI subsections also share a distinct preference for Engagement by means of ATTR, which was not the case in the other German subcorpora. As pointed out previously, German medical researchers are under pressure to publish in English (cf. e.g. Baethge 2008). It thus seems that the research articles written in German match the English research papers in these key aspects. As mentioned earlier, English plays a pivotal role in medical publications (Baethge 2008). The similarities described above may, at least in part, be interpreted as a stylistic influence of English in the field. Given the important status of the English language in medical writing, it may be assumed that German researchers will often read about novel research findings in English-language publications. As a result of this, texts produced in German by these researchers may reflect some characteristics of English medical writing.

As to the popularisations, cross-linguistic similarities concern an avoidance of self-reference in the presentation of knowledge claims in the two POP subsections (cf. Gotti 2011:182). Hence, the scientific journalists represented in the corpus seem to position themselves as uninvolved ‘passers-on’ of information in both languages.

Despite these similarities, differences were observed which concern the way Engagement is encoded in the two languages. Pronounced cross-linguistic differences regarding the expression of reported speech result in diverging uses of GRAM_LEX and ATTR features in the English and the German popularisations. GPOP is characterised by a frequent occurrence of GRAM_LEX owing to the recurrent use of the subjunctive form for reporting speech. As a result, the style of German popularisations may be described as less ‘involved’ (cf. e.g. Chafe 1982, Chafe & Danielewicz 1987, White 2012a) than the English popularisations, where ATTR features entailing reference to the scientists are more prevalent than in the German popularisations when considered in relation to the overall use of Engagement features. Typological factors thus seem to impact such that human involvement in research is foregrounded more in the English than in the German popularisations. As a result, the style of English popularisations is marked by a stronger focus on the role of researchers as ‘narrators’. Whereas the verbal style characteristic of EPOP suggests that emphasis is on people doing or saying things, it appears that the GPOP journalists introduced more stylistic variety than the EPOP writers by exploiting a wider range of linguistic features in attributing claims to identified sources. Stylistic variety is also achieved in GPOP by the linguistic expression of ATTR to unidentified source: Typological differences result in a wider range of resources serving to create this effect in the German part of the corpus. The mix of features used to express ATTR to unidentified source is even more varied in the German popularisations than in the German research papers. This also applies to the range of GRAM_LEX features occurring in the German popularisations, which includes particles.

Furthermore, the English and the German researchers represented in the corpus seem to use different Engagement resources to refer to themselves. The English researchers were more prone than the German research authors to use ATTR to self as means of self-reference. The German researches, by contrast, were more inclined to engage with their readership by using ATTR features which do not involve source-mention, resulting in a considerably higher proportion of ATTR to unidentified source in the German research articles than in the English research papers. This observation appears to be connected with a register-specific use of bibliographic referencing. Referencing by means of numerical indices appears to represent a key means of introducing external positions into a text and referring to existing work in the field without invoking a heteroglossic communicative backdrop by means of linguistic ATTR features. The absence of source-mention combined with a lack of bibliographic indices seems to be employed as a means of self-reference in scientific writing under certain circumstances. Moreover, the German research corpus also contains cases of third-person reference to self.

The German research authors used less ATTR to inanimate in relation to the global use of Engagement features than did the English scientists. This was interpreted as a consequence of the lower semantic versatility of the subject position in German (cf. Teich 2003). However, the combination of ATTR to unidentified source with prepositional or pronominal adjuncts (cf. Doherty 1996) by means of which human involvement can be signalled appears to play a role in the German research articles. This type of expression also enables the role of the researchers involved in the research to be backgrounded compared with ATTR to self. Moreover, it was noted that, additionally to their dialogic role, ATTR features entailing deictic reference appear to contribute to text cohesion (cf. Halliday & Hasan 1976).

As to the limitations of the study, the size of the corpus was constrained so that the representativeness of the results is limited since the annotation of some of the features required co- and contextual factors to be taken into account. As mentioned before, the results relating to granular levels of the analysis were often too small to permit generalising conclusions and need to be corroborated by larger data sets. It should also be noted that the POP subcorpora are made up of a relatively large number of short journalistic articles. The research subcorpora are made up of fewer, albeit longer papers. Therefore any linguistic 'idiosyncrasies' may be assumed to impact more in the analysis of the research section of the corpus than in the case of the popularisations. It is conceivable that further expressions of Engagement would be found in larger corpora. In a similar vein, the "leading role" of English "as the international language of medicine" may come into play in this connection since it can be assumed that researchers aim to reach a wide audience by writing in English (cf. Baethge 2008:37, cf. chapter 2.1). Therefore we may presume that non-native English played an important role in the English research section of the corpus. It would be interesting to compare the use of Engagement features by non-native authors with the way writers engage with their readership in their mother tongue. It was noted earlier that ESCI and GSCI contain a comparable proportion of Contractive items, whereas the German POP subsection contained more Contractive features than the English journalistic subsection. Therefore, the register shift resulting from popularisation was more marked in the English than in the German section of the corpus in this respect. The use of Contractive and Expansive items may differ if merely native English is taken into account (cf. also Markkanen & Schröder 1997). This, in turn, would have implications for the divergence between English research articles and popularisations. The impact of translation on the use of Engagement features in texts belonging to the medical registers considered in the present analysis is another avenue of exploration (cf. Munday 2012 on evaluation in translation).

While the present focus was on the way authors engage with their readership without using openly attitudinal language, it would be interesting to explore the potential interplay of meanings considered within the context of Attitude in Appraisal (Martin & White 2005:42ff, cf. chapter 4.2.1). The same holds for the area of Graduation, which concerns the way meanings are scaled (Martin & White 2005:135ff, cf. chapter 4.2.3).

Furthermore, it was mentioned earlier that popularisations in the field of medicine appear to differ from other popularisations according to hedging-oriented research into popularisation (Varttala 2001, cf. chapter 2). The framework used in the present study could also be used to address shifts resulting from popularisations in domains other than medicine.

The results from this thesis offer insights into the language-specific use of epistemic and evidential features as ‘interactive’ resources in the presentation of medical research findings in different author/reader constellations. The study contributes to the understanding of the role of dialogic resources in the construction of the relationship between authors and their readership in research publications and of the language-specific adaptations taking place in the gearing of the presentation of medical knowledge towards the readers of popularisations.

References

- Aikhenvald, A. 2004. *Evidentiality*. Oxford: Oxford University Press.
- Arney, W.R. & Bergen, B.B. 1984. *Medicine and the management of living: Taming the last great beast*. Chicago: University of Chicago Press.
- Atkinson, P. 1999. Medical discourse, evidentiality, and the construction of professional responsibility. In: Sarangi, S. & Roberts, C. (eds.) *Talk, work and institutional order: Discourse in medical, mediation and management settings*. Berlin: Mouton de Gruyter. 75–108.
- Baethge, C. 2008. Die Sprachen der Medizin. The Languages of Medicine. *Deutsches Ärzteblatt* 105 (3). 37–40.
- Bakhtin, M.M. 1981. *The dialogic imagination: Four essays*. Michael Holquist (ed.), trans. Emerson, C. & Holquist, M. Austin: University of Texas Press.
- Barton, E. 2006. Trajectories of alignment and the situated ethics of end-of life discussions in American medicine. In: Gotti, M. & Salager-Meyer, F. (eds.) *Advances in medical discourse analysis: Oral and written context*. Bern: Lang 23–42.
- Becher, T. & Trowler, P. 2001. *Academic tribes and territories*. 2nd ed. Buckingham: The Society for Research into Higher Education and Open University Press.
- Becker, A. 2011. Modality and engagement in British and German TV interviews. In: Aijmer, K. (ed.) *Contrastive pragmatics*. Benjamins Current Topics. Amsterdam: Benjamins. 5–22.
- Bednarek, M. 2006. *Evaluation in media discourse*. London & New York: Continuum.
- Beier, R. 1977. *Untersuchungen an amerikanischen und britischen Fachtexten der Chemie: Analyse finiter Verbformen unter besonderer Berücksichtigung der Konstruktionen des Typs „be“ + Perfektpartizip*. Frankfurt am Main, Bern, Las Vegas: Lang.
- Beier, R. 1980. *Englische Fachsprache*. Stuttgart, Berlin, Köln, Mainz: Kohlhammer.
- Beneš, E. 1971. Fachtext, Fachstil und Fachsprache. In: Moser, H. (ed.) *Sprache der Gegenwart. Schriften des Instituts für deutsche Sprache* 13. Düsseldorf: Schwann. 118–132.
- Beneš, E. 1981. Die formale Struktur der wissenschaftlichen Fachsprachen in syntaktischer Hinsicht. In: Bungarten, T. (ed.) *Wissenschaftssprache. Beiträge zur Methodologie, theoretischen Fundierung und Deskription*. München: Wilhelm Fink. 185–212.
- Benwell, B. & Stokoe, E. 2006. *Discourse and identity*. Edinburgh: Edinburgh University Press.
- Bernstein, B. 1970. *Class, codes, and control. Volume 1: Theoretical studies towards a sociology of language*. London: Routledge & Kegan Paul.
- Biber, D. 1988. *Variation across speech and writing*. Cambridge: Cambridge University Press.
- Biber, D. 1995. *Dimensions of register variation. A cross-linguistic comparison*. Cambridge: Cambridge University Press.
- Biber, D. & Finegan, E. 1986. An initial typology of English text types. In: Aarts, J. & Meijs, W. (eds.) *Corpus linguistics II: New studies in the analysis and exploitation of computer corpora*. Amsterdam: Rodopi. 19–46.
- Biber, D. & Finegan, E. 1988. Adverbial stance types in English. *Discourse Processes* 11. 1–34.
- Biber, D. & Finegan, E. 1989. Styles of stance in English: lexical and grammatical marking of evidentiality and affect. *Text* 9. 93–124.
- Biber, D., Johansson, S., Leech, G., Conrad, S. & Finegan, E. 1999. *Longman grammar of spoken and written English*. London: Longman.
- Biezunski, M. 1985. Popularization and scientific controversy: the case of the theory of relativity in France. In: Shinn, T. & Whitley, R. (eds.) *Expository science. Forms and functions of popularisation*. Dordrecht: Reidel. 183–194.

- Boland, A. 2006. *Aspect, tense and modality: Theory, typology, acquisition*. Utrecht: LOT.
- Bourdieu, P. 1986. *Distinction: A social critique of the judgement of taste*. Cambridge: Polity.
- Bowern, C. 1998. Towards a typology of irrealis marking in modality. *Proceedings of the ALS conference*. Brisbane, Queensland.
<http://www.als.asn.au/proceedings/als1998/bower371.html>. (Last accessed 30-06-14.)
- Brown, P. & Levinson, S.C. 1987. *Politeness: Some universals in language usage*. Cambridge: Cambridge University Press.
- Browner, W.S. 2006. *Publishing and presenting clinical research*. 2nd ed. Philadelphia: Lippincott Williams and Wilkins.
- Buhl, S. 1999. Gestaltungsprinzipien wissenschaftlicher Texte Deutsch – Englisch. In: Gerzymisch-Arbogast, H., Gile, D., House, J., Rothkegel, A. (eds.) *Wege der Übersetzungs- und Dolmetschforschung*. Tübingen: Gunter Narr. 117-141.
- Bußmann, H. 1990. *Lexikon der Sprachwissenschaft*. 2nd ed. Stuttgart: Kröner.
- Butler, C. 2003. *Structure and function – A guide to three major structural-functional theories. Part 1: Approaches to the simplex clause*. Amsterdam: Benjamins.
- Bybee, J. & Fleischman, S. (eds.) 1995. *Modality in grammar and discourse*. Amsterdam & Philadelphia: Benjamins.
- Bybee, J., Perkins, R. & Pagliuca, W. 1994. *The evolution of grammar. Tense, aspect and modality in the languages of the world*. Chicago: The University of Chicago Press.
- Caldas-Coulthard, C.R. 1994. On reporting reporting: The representation of speech in factual and fictional narratives. In: Coulthard, M. (ed.) *Advances in written text analysis*. London: Routledge. 295-309.
- Calsamiglia, H. & López Ferrero, C. 2003. Role and position of scientific voices: Reported speech in the media. *Discourse Studies* 5 (2). 147-173.
- Celle, A. 2006. *Temps et modalité: L'anglais, le français et l'allemand en contraste*. Bern: Lang.
- Chafe, W. 1982. Integration and involvement in speaking, writing, and oral literature. In: Tannen, D. (ed.) *Spoken and written language: Exploring orality and literacy*. Norwood: Ablex. 35-53.
- Chafe, W. 1986. Evidentiality in English conversation and academic writing. In: Chafe, W. & Nichols, J. (eds.) *Evidentiality: The linguistic coding of epistemology*. Norwood, NJ: Ablex. 261-272.
- Chafe, W. & Nichols, J. (eds.) 1986. *Evidentiality: The linguistic coding of epistemology*. Norwood, NJ: Ablex.
- Chafe, W. & Danielewicz, J. 1987. Properties of Spoken and Written Language. In: Horowitz, R. & Samuels, S.J. (eds.) *Comprehending oral and written language*. San Diego: Academic Press. 83-113.
- Chandler, D. 2004. *Semiotics The basics*. London & New York: Routledge.
- Charles, M. 2006. The construction of stance in reporting clauses: A cross-disciplinary study of theses. *Applied Linguistics* 27 (3). 492-518.
- Chrzanowska, E. 1986. Factivity revisited. *Studia Anglica Posnaniensia* XIX. 129-141.
- Clemen, G. 1997. The concept of hedging. In: Markkanen, R. & Schröder, H. (eds.) *Hedging and discourse: Approaches to the analysis of a pragmatic phenomenon in academic texts*. Berlin & New York: de Gruyter. 235-248.
- Clemen, G. 1998. *Hecken in deutschen und englischen Texten der Wirtschaftskommunikation: eine kontrastive Analyse*. PhD thesis, Universität Siegen. dokumentix.ub.uni-siegen.de/opus/volltexte/2006/121/pdf/clemen.pdf. (Last accessed 14-07-2014.)

- Clyne, M. 1991. The sociocultural dimension: The dilemma of the German speaking scholar. In: Schröder, H. (ed.) *Subject-oriented texts*. Berlin: de Gruyter. 49-67.
- Clyne, M. 1994. *Intercultural communication at work: Cultural values in discourse*. Cambridge: Cambridge University Press.
- Coates, J. 1983. *The semantics of modal auxiliaries*. London & Canberra: Groom Helm.
- Collins, P. 2009. *Modals and quasi-modals in English*. Amsterdam & New York: Rodopi.
- Comrie, B. 1976. *Aspect*. Cambridge: Cambridge University Press.
- Conrad, S. & Biber, D. 2000. Adverbial marking of stance in speech and writing. In: Hunston, S. & Thompson, G. (eds.) *Evaluation in text: Authorial stance and the construction of discourse*. Oxford: Oxford University Press. 56-73.
- Coulthard, M. (ed.) 1994. *Advances in written text analysis*. London: Routledge.
- Crompton, P. 1997. Hedging in academic writing: Some theoretical problems. *English for Specific Purposes* 16 (4). 271-287.
- Cutrone, P. 2011. Politeness and face theory: A consideration of the backchannel style of Japanese L1/L2 speakers. *University of Reading Language Studies Working Papers* 3 (1). 51-57.
- De Haan, F. 1999. Evidentiality and epistemic modality: Setting boundaries. *Southwest Journal of Linguistics* 18. 83-101.
- De Haan, F. 2001. The relation between modality and evidentiality. In: Müller, R. & Reis, M. (eds.) *Modalität und Modalverben im Deutschen*. Hamburg: Buske. 201-216.
- De Haan, F. 2006. Typological approaches to modality. In: Frawley, W. (ed.) *The Expression of modality*. Berlin: Mouton de Gruyter. 27-70.
- Dendale, P. & Tasmowski, L. 2001. Introduction. Evidentiality and related notions. *Journal of Pragmatics* 33 (3). 339-348.
- Depraetere, I. & Reed, S. 2006. Mood and modality in English. In: Aarts, B. & McMahon, A. (eds.) *The handbook of English linguistics*. Malden, MA: Blackwell Publishers. 269-290.
- Di Marco, C. & Mercer R. E. 2004. Hedging in scientific articles as a means of classifying citations. *Proc. AAAI Spring Symposium, AAAI*. Stanford: University Press. 50-54.
- Diewald, G. & Smirnova, E. 2010. *Evidentiality in German. Linguistic realization and regularities in grammaticalization*. Berlin & New York: Mouton.
- Diewald, G. 1999. *Die Modalverben im Deutschen: Grammatikalisierung und Polyfunktionalität*. Tübingen: Niemeyer.
- Diewald, G. 2004. Faktizität und Evidentialität: Semantische Differenzierungen bei den Modal- und Modalitätsverben im Deutschen. In: Leirbukt, O. (ed.) *Tempus/Temporalität und Modus/Modalität im Sprachenvergleich*. Tübingen: Stauffenburg. 231-258.
- Doherty, M. 1996. Passive perspectives; different preferences in English and German: a result of parametrized processing. *Linguistics* 34 (3). 591-644.
- Dollinger, S. 2008. *New-dialect formation in Canada. Evidence from the English modal auxiliaries*. Amsterdam & Philadelphia: Benjamins.
- Droessiger, G. 2010. Zur epistemischen Lesart der Modalverben im Sprachgebrauch des Deutschen. *Man and the Word (Žmogus ir žodis)* 12 (3). 12-18.
- Du Bois, J.W. 1986. Self-evidence and ritual speech. In: Chafe, W. & Nichols, J. (eds.) *Evidentiality: The linguistic coding of epistemology*. Norwood, NJ: Ablex. 313-336.
- Dury, R. s.a. *A Brief Glossary of Modality*.
<http://dinamico2.unibg.it/anglistica/slin/modgloss.htm>. (Last accessed 01-06-2014.)

- Eco, U. 1984. *The role of the reader. Explorations in the semiotics of texts*. Bloomington: Indiana University Press.
- Egger, M., Zellwäger-Zähner, T., Schneider, M., Junker C., Lengeler, C. & Antes, G. 1997. Language bias in randomised controlled trials published in English and German. *Lancet* 350. 326-9.
- Englebretson, R. 2007. Introduction. In: Englebretson, R. (ed.) *Stancetaking in discourse: Subjectivity, evaluation, interaction*. Amsterdam & Philadelphia: Benjamins. 1-26.
- Facchinetti, R. 2002. *Can* and *could* in contemporary British English: A study of the ICE-GB corpus. In: Peters, P., Collins, P. & Smith, A. (eds.) *New frontiers of corpus research*. Amsterdam: Rodopi. 229-246.
- Facchinetti, R. 2009. Subjectivity, (non-)subjectivity and intersubjectivity in English Modality. In: Tsangalidis, A., & Facchinetti, R. (eds.) *Studies on English modality*. Bern: Lang. 53-68.
- Faes, G. 2013. χ^2 -Test, Chi2-Test, Chiquadrat-Test. <http://www.faes.de/Basis/Basis-Statistik/Basis-Statistik-Chi-Quad-Test/basis-statistik-chi-quad-test.html>. (Last accessed 17-07-13.)
- Fairdough, N. 1992. *Discourse and social change*. Cambridge: Polity Press.
- Falahati, R. 2007. The use of hedging across disciplines and rhetorical sections of research articles. In: Carter, N., Hadic-Zabala, L., Rimrott, A. & Storoshenko, D.R. (eds.) *Proceedings of the 22nd Northwest Linguistics Conference*. Burnaby: Simon Fraser University. 99-112.
- Farr, F. & O'Keeffe, A. 2002. Would as a hedging device in an Irish context: An intra-varietal comparison of institutionalised spoken interaction. In: Reppen, R., Fitzmaurice, S.M. & Biber, D. (eds.) *Using corpora to explore linguistic variation*. Amsterdam & Philadelphia: Benjamins. 25-48.
- Field, M. 1997. The role of factive predicates in the indexicalization of stance: A discourse perspective. *Journal of Pragmatics* 27. 799-814.
- Fillmore, C.J. 1971. Verbs of judging: an exercise in semantic description. In: Fillmore, C.J. & Langendoen, T. (eds.) *Studies in linguistic semantics*. New York: Holt, Rinehart & Winston. 272-289.
- Fløttum, K. 2006. Medical research articles in the comparative perspectives of discipline and language. In: Gotti, M. & Salager-Meyer, F. (eds.) *Advances in medical discourse analysis: Oral and written context*. Bern: Lang. 251-269.
- Fløttum, K., Dahl, T. & Kinn, T. 2006. *Academic voices*. Amsterdam & Philadelphia: Benjamins.
- Fluck, H.-R. 1996. *Fachsprachen. Einführung und Bibliographie*. 5th ed. Tübingen & Basel: Francke.
- Foucault, M. 1963. *The birth of the clinic: An archaeology of medical perception*. London: Routledge.
- Foucault, M. 1980. *Power/knowledge: Selected interviews and other writings 1972-1977*. New York: Pantheon.
- Fraser, B. 1975. Hedged performatives. In: Cole, P. & Morgan, J.L. (eds.) *Syntax and semantics* 3. New York: Academic Press. 187-210.
- Fraser, B. 2010. Pragmatic competence: The case of hedging. In: Kaltenböck, G., Mihatsch, W. & Schneider, S. (eds.) *New approaches to hedging*. Bingley: Emerald. 15-34.
- Frawley, W. 1992. *Linguistic semantics*. Hillsdale, NJ, Hove & London: Lawrence Erlbaum.
- Fryer, D.L. 2013. Exploring the dialogism of academic discourse: Heteroglossic Engagement in medical research articles. In: Andersen, G. & Bech, C. (eds.) *English corpus linguistics: Variation in time, space and genre*. Amsterdam: Rodopi.

- Fuller, G. 1998. Cultivating science: Negotiating discourse in the popular texts of Stephen Jay Gould. In: Martin, J.R. & Veel, R. (eds.) *Reading science: Critical and functional perspectives on discourses of science*. London: Routledge. 35-62.
- Galtung, J. 1985. Struktur, Kultur und intellektueller Stil. Ein vergleichender Essay über saxonische, teutonische, gallische und nipponische Wissenschaft. In: Wierlacher, A. (ed.) *Das Fremde und das Eigene*. München: Iudicium. 151-193.
- Gazo, E.W. 1974. *Analytical ethics and ethos: an inquiry into moral language and norms*. PhD thesis, Rheinische Friedrich-Wilhelms-Universität, Bonn.
- Gerr, S. 1942. Language and science. *Philosophy of Science* 9. 147-161.
- Gilbert, G.N. & Mulkey M. 1984. *Opening Pandora's Box*. Cambridge: Cambridge University Press.
- Gläser, R. 1990. *Fachtextsorten im Englischen*. Tübingen: Narr.
- Goffman, E. 1963. *Stigma: Notes on the management of spoiled identity*. Englewood Cliffs: Prentice-Hall.
- Goffman, E. 1967. *Interaction ritual: Essays on face-to-face behaviour*. New York: Doubleday Anchor Books.
- Goffman, E. 1974. *Frame analysis: An essay on the organization of experience*. New York et al.: Harper & Row.
- Goffman, E. 1979. Footing. *Semiotica* 25. 1-29.
- Gotti, M. & Salager-Meyer, F. (eds.) 2006. *Advances in medical discourse analysis: Oral and written context*. Bern: Lang.
- Gotti, M. 2003. *Specialized discourse: Linguistic features and changing conventions*. Bern: Lang.
- Gotti, M. 2011. *Investigating specialized discourse*. Revised 3rd ed. Bern: Lang.
- Gray, B. & Biber, D. 2012. Current conceptions of stance and voice. In: Hyland, K. & Sancho Guinda, C. (eds.) *Stance and voice in written academic genres*. Basingstoke & New York: Palgrave Macmillan. 15-33
- Guido, M.G. 2006. The discourse of post-traumatic stress disorder: Specialized-genre conventions vs. West African refugees' narrative representations. In: Gotti, M. & Salager-Meyer, F. (eds.) *Advances in medical discourse analysis: Oral and written context*. Bern: Lang. 183-207.
- Habermas, J. 1979. *Communication and the evolution of society*. Trans. by McCarthy, T. Boston: Beacon Press.
- Halliday, M.A.K. 1966. Some notes on 'deep' grammar. *Journal of Linguistics* 2 (1). 110-118.
- Halliday, M.A.K. 1978. *Language as social semiotic: The social interpretation of language and meaning*. London: Arnold.
- Halliday, M.A.K. 1991. Corpus studies and probabilistic grammar. In: Aijmer, K. & Altenberg, B. (eds.) *English corpus linguistics: studies in honour of Jan Svartvik*. London: Longman. 30-43.
- Halliday, M.A.K. 1993a. On the language of physical science. In: Halliday, M.A.K. & Martin, J.R. (eds.) *Writing science. Literacy and discursive power*. London & Washington: The Falmer Press. 54-68.
- Halliday, M.A.K. 1993b. Some grammatical problems in scientific English. In: Halliday, M.A.K. & Martin, J.R. (eds.) *Writing science. Literacy and discursive power*. London & Washington: The Falmer Press. 69-85.
- Halliday, M.A.K. 1994. *An introduction to functional grammar*. 2nd ed. London: Edward Arnold.
- Halliday, M.A.K. & Hasan, R. 1976. *Cohesion in English*. London: Longman.

- Halliday, M.A.K. & Hasan, R. 1989. *Language, context, and text: aspects of language in a social-semiotic perspective*. Oxford: Oxford University Press.
- Halliday, M.A.K. & Martin, J.R. (eds.) 1993. *Writing science. Literacy and discursive power*. London & Washington: The Falmer Press.
- Halliday, M.A.K. & Matthiessen, C.M.I.M. 1999. *Construing experience through meaning: A language-based approach to cognition*. London: Continuum.
- Halliday, M.A.K. & Matthiessen, C.M.I.M. 2004. *An introduction to functional grammar*. Revised 3rd ed. London: Arnold.
- Halliday, M.A.K. & Matthiessen, C.M.I.M. 2014. *Halliday's introduction to functional grammar*. Revised 4th ed. of Halliday, M.A.K. & Matthiessen, C.M.I.M. 2004. Abingdon & New York: Routledge.
- Halliday, M.A.K., McIntosh, A. & Stevens, P. 1964. *The linguistic sciences and language teaching*. London: Longman.
- Hansen-Schirra S., 2011. Empirical profiling of LSP grammar. In: *Tagungsband der 3. Internationalen Konferenz „Grammatik und Korpora – Grammar and Corpora“*. Mannheim: Institut für Deutsche Sprache. 557-566.
- Hansen-Schirra, S., Neumann, S. & Steiner, E. 2012. *Cross-linguistic corpora for the study of translations. Insights from the language pair English-German*. Berlin & New York: de Gruyter Mouton.
- Hawkins, J.A. 1986. *A comparative typology of English and German – unifying the contrasts*. London & Sydney: Croom Helm.
- Heath, C. 1986. *Body movement and speech in medical interaction*. Cambridge: Cambridge University Press.
- Heath, C. 2002. Demonstrative suffering: The gestural (re)embodiment of symptoms. *Journal of Communication* 52. 597-616.
- Heath, C. 2006. Body work: The collaborative production of the clinical object. In: Heritage, J., & Maynard, D. (eds.) *Practising medicine: Talk and action in primary health care encounters*. Cambridge: Cambridge University Press. 185-213.
- Herrando-Rodrigo, I. 2010. "If you suffer from... check the Internet": the role of engagement and self-mention devices in medical research articles and electronic popularizations. In: Lorés-Sanz, R.P., Mur-Dueñas, P. & Lafuente-Millán, E. (eds.) *Constructing interpersonality: Multiple perspectives on written academic genres*. Newcastle upon Tyne: Cambridge Scholars Publishing. 255-274.
- Hill, J.H. & Irvine, J.T. (eds.) 1993. *Responsibility and evidence in oral discourse*. Cambridge: Cambridge University Press.
- Hindmarsh, J. & Pilnick, A. 2002. The tacit order of teamwork: Collaboration and embodied conduct in anesthesia. *Sociological Quarterly* 43 (2). 139-164.
- Hoffmann, L. 1985. *Kommunikationsmittel Fachsprache. Eine Einführung*. Revised 2nd ed. Tübingen: Narr.
- Hofmann, T. 1976. Past tense replacement and the modal system. In: McCawley, J. (ed.) *Syntax and semantics* 7. New York: Academic Press. 85-100.
- Holmes, J. 1983. Speaking English with the appropriate degree of conviction. In: Brumfit, C. (ed.) *Learning and teaching languages for communication: Applied linguistics perspectives*. London: British Association of Applied Linguistics. 100-113.
- Hömborg, W. 1990. *Das verspätete Ressort. Die Situation des Wissenschaftsjournalismus*. Konstanz: Universitätsverlag.

- Hood, S. 2004. *Appraising research: Taking a stance in academic writing*. PhD thesis, University of Technology, Sydney.
<http://www.grammatics.com/appraisal/hoodS-phd-links.htm>. (Last accessed 14-07-2014.)
- Hood, S. 2010. *Appraising research: evaluation in academic writing*. Basingstoke: Palgrave Macmillan.
- Hooper, J. & Thompson, S. 1973. On the applicability of root transformations. *Linguistic Inquiry* 4 (4). 465-491.
- Hooper, J.B. 1975. On assertive predicates. In: Kimball, J.P. (ed.) *Syntax and semantics IV*. New York: Academic Press. 91-124
- House, J. & Kasper, G. 1981. *Politeness markers in English and German*. In: Coulmas, F. (ed.) *Conventional routine*. The Hague: Mouton. 157-186.
- House, J. 1996. Contrastive discourse analysis and misunderstanding: The case of German and English. In: Hellinger, M. & Ammon, U. (eds.) *Contrastive sociolinguistics*. Berlin, New York: de Gruyter. 345-361.
- House, J. 2002. Maintenance and convergence in covert translation English – German. In: Hasselgård, H., Johansson, S., Behrens, B. & Fabricius-Hansen, C. (eds.) *Information structure in a cross-linguistic perspective*. Amsterdam: Rodopi.
- Huddleston, R. & Pullum, G.K. 2002. *The Cambridge grammar of the English language*. Cambridge: Cambridge University Press.
- Huddleston, R.D. 1971. *The sentence in written English: A syntactic study based on an analysis of scientific texts*. Cambridge: Cambridge University Press.
- Hübler, A. 1983. *Understatements and hedges in English*. Amsterdam: Benjamins.
- Hundt, M. 2003. Zum Verhältnis von epistemischer und nicht-epistemischer Modalität im Deutschen. *Zeitschrift für Germanistische Linguistik* 31 (3). 343-381.
- Hunston, S. 1993a. Evaluation and ideology in scientific discourse. In: Ghadessy, M. (ed.) *Register analysis: Theory and practice*. London: Pinter. 57-73.
- Hunston, S. 1993b. Projecting a sub-culture: The construction of shared worlds by projecting clauses in two registers. In: D. Graddol, Thompson, L. & Byram, M. (eds.) *Language and culture*. Clevedon: BAAL & Multilingual matters. 98-112.
- Hunston, S. 1994. Evaluation and organization in a sample of written academic discourse. In: Coulthard, M. (ed.) *Advances in written text analysis*. London: Routledge. 191-218.
- Hunston, S. 2000. Evaluation and the planes of discourse: Status and value in persuasive texts. In: Hunston, S. & Thompson, G. (eds.) *Evaluation in text: Authorial stance and the construction of discourse*. Oxford: Oxford University Press. 176-206
- Hunston, S. & Sinclair, J. 2000. A local grammar of evaluation. In: Hunston, S. & Thompson, G. (eds.) *Evaluation in text: Authorial stance and the construction of discourse*. Oxford: Oxford University Press. 75-100.
- Hunston, S. & Thompson, G. (eds.) 2000. *Evaluation in text: Authorial stance and the construction of discourse*. Oxford: Oxford University Press.
- Hyland, K. 1995. The author in the text: Hedging scientific writing. *Hong Kong Papers in Linguistics and Language Teaching* 18. 33-42.
- Hyland, K. 1996a. Talking to the academy. Forms of hedging in science research articles. *Written Communication* 13 (2). 251-281.
- Hyland, K. 1996b. Writing without conviction? Hedging in science research articles. *Applied Linguistics* 17 (4). 433-454.
- Hyland, K. 1998a. *Hedging in scientific research articles*. Amsterdam & Philadelphia: Benjamins.

- Hyland, K. 1998b. Boosting, hedging, and the negotiation of academic knowledge. *Text. An interdisciplinary journal for the study of discourse* 18 (3). 349-382.
- Hyland, K. 1999a. Academic attribution: Citation and the construction of disciplinary knowledge. *Applied Linguistics* 20 (3). 341-367.
- Hyland, K. 1999b. Disciplinary discourses: Writer stance in research articles. In: Candlin, C.N. & Hyland, K. (eds.) *Writing: Texts, processes and practices*. Harlow: Longman. 99-121.
- Hyland, K. 2000. Hedges, boosters and lexical invisibility: Noticing modifiers in academic texts. *Language Awareness* 9 (4). 179-197.
- Hyland, K. 2001. Bringing in the reader: Addressee features in academic writing. *Written Communication* 18 (4). 549-574.
- Hyland, K. 2003. Patterns of engagement: Dialogic features and L2 student writing. In: Ravelli, L. & Ellis, R. (eds.) *Academic writing in context: Social-functional perspectives on theory and practice*. London: Continuum. 5-23.
- Hyland, K. 2005. Stance and engagement: a model of interaction in academic discourse. *Discourse Studies* 7. 173-191.
- Hyland, K. 2008. Persuasion, interaction and the construction of knowledge: Representing self and others in research writing. *International Journal of English Studies* 8 (2). 1-23.
- Hyland, K. & Milton, J. 1997. Qualification and certainty in L1 and L2 students' writing. *Journal of Second Language Writing* 6 (2). 185-205.
- Iedema, R., Feez, S. & White, P.R.R. 1994. *Media literacy*. Sydney: Disadvantaged Schools Program, NSW Department of School Education.
- Jespersen, O. 1924. *The philosophy of grammar*. London: Allen and Unwin.
- Joseph, S. 2004. *Political theory and power*. New Delhi: Foundation Books.
- Kalverkämper, H. (ed.) 1988. *Fachsprachen in der Romania*. Tübingen: Narr.
- Kärkkäinen, E. 2003. *Epistemic stance in English conversation. A description of interactional functions, with a focus on 'I think'*. Amsterdam: Benjamins.
- Karttunen, L. 1970. On the semantics of complement sentences. *CLS* 6. 328-339.
- Karttunen, L. 1971a. Implicative verbs. *Language* 47. 340-358.
- Karttunen, L. 1971b. Some observations on factivity. *Papers in Linguistics* 5. 55-69.
- Kempson, R. 1975. *Presupposition and the delimitation of semantics*. Cambridge: Cambridge University Press.
- Key, J.P. 1997. *Research design in occupational education; Module S7 - Chi Square*, Oklahoma State University. <http://www.okstate.edu/ag/agedcm4h/academic/aged5980a/5980/newpage28.htm>. (Last accessed 17-07-13.)
- Kiefer, F. 2009. Modality. In: Brisard, F., Östman, J.-O. & Verschueren, J. (eds.) *Grammar, meaning and pragmatics*. Amsterdam: Benjamins. 179-207.
- Kiparsky, P. & Kiparsky, C. 1970. Fact. In: Bierwisch, M. & Heidolph (eds.) *Progress in linguistics*. The Hague: Mouton. 143-173. Reprinted in: Steinberg, D.D. & Jakobovits, L.A. (eds.) 1971. *Semantics: An interdisciplinary reader in philosophy, linguistics and psychology*. Cambridge: Cambridge University Press. 345-369.
- Kissine, M. 2008. Why *will* is not a modal. *Natural Language Semantics* 16. 129-155.
- König, E. & Gast, V. 2012. *Understanding English-German contrasts*. 3rd ed. Berlin: Erich Schmidt.
- Körner, H. 2000. *Negotiating authority: The logogenesis of dialogue in common law judgements*. PhD thesis, University of Sydney, Sydney. <http://www.grammatics.com/appraisal/Korner-phd-links.htm>. (Last accessed 12-07-2014.)

- Kranich, S. 2009. Epistemic modality in English popular scientific texts and their German translations. *trans-kom* 2 (1). 26-41.
- Kranich, S. 2011. To hedge or not to hedge. The use of epistemic modal expressions in popular science in English texts, English-German translations and German original texts. *Text & Talk* 31 (1). 77-99.
- Kratzer, A. 1981. The notional category of modality. In: Eikmeyer, H. J. & Rieser, H. (eds.) *Words, worlds, and contexts. New approaches in word semantics*. Berlin: de Gruyter. 38-74.
- Krause, M. 2007. *Epistemische Modalität. Zur Interaktion lexikalischer und prosodischer Marker*. Wiesbaden: Harrassowitz.
- Kreutz, H. & Harres, A. 1997. Some observations on the distribution and function of hedging in German and English academic writing. In: Duszak, A. (ed.) *Culture and styles of academic discourse*. Berlin: de Gruyter. 181-202.
- Kryk, B. 1982. The relation between predicates and their sentential complements. A pragmatic approach to English and Polish. *SAP* 14. 103-120.
- Kürschner, W. 1997. *Grammatisches Kompendium*. Revised 3rd ed. Tübingen & Basel: Francke.
- Lakoff, G. 1972. Hedges: A study in meaning criteria and the logic of fuzzy concepts. *Papers from the Eighth Regional Meeting of the Chicago Linguistic Society*. 183-228. Reprinted in: *JPL* 1973 2 (4). 458-508.
- Latour, B. 1987. *Science in action: How to follow scientists and engineers through society*. Milton Keynes: Open University Press.
- Leech, G.N. 1983. *Principles of pragmatics*. London: Longman.
- Lemke, J. 1995. *Textual politics: Discourse and social dynamics*. London: Taylor & Francis.
- Lemke, J. 1992. Interpersonal meaning in discourse: Value orientations. In: Davies, M. & Ravelli, L. (eds.) *Advances in systemic linguistics. Recent theory and practice*. London: Pinter. 82-104.
- Levinson, S.C. 1988. Putting linguistics on a proper footing: Explorations in Goffman's participation framework. In: Drew, P., & Wootton, A. (eds.) *Goffman: Exploring the interaction order*. Oxford: Polity Press. 161-227.
- Lupton, D. 2012. *Medicine as culture: Illness, disease and the body*. Revised 3rd ed. London: Sage.
- Luukka, M.-R. & Markkanen, R. 1997. Impersonalization as a form of hedging. In: Markkanen, R. & Schröder, H. (eds.) *Hedging and discourse: Approaches to the analysis of a pragmatic phenomenon in academic texts*. Berlin & New York: de Gruyter. 168-188.
- Luukka, M.R. 2001. Social and interpersonal perspectives on scientific discourse. In: Barron, C., Bruce, N. & Nunan, D. (eds.) *Knowledge and discourse: Towards an ecology of language*. Harlow: Longman. 221-237.
- Lyons, J. 1977. *Semantics*. Vols. 1 and 2. Cambridge: Cambridge University Press.
- MacDonald, M.N. 1994. *The social construction of medical discourse*. PhD thesis, University of Warwick. <http://wrap.warwick.ac.uk/3980/>. (Last accessed 07-05-2014.)
- MacDonald, M.N. 2002. Pedagogy, pathology and ideology: the production, transmission and reproduction of medical discourse. *Discourse & Society* 13 (4). 447-467.
- Maher, J. 1986. The development of English as an international language of medicine. *Applied linguistics* 7. 206-220.
- Malmström, H. 2008. Knowledge-stating verbs and contexts of accountability in linguistic and literary academic discourse. *Nordic Journal of English Studies* 7 (3). 35-60.

- Marín-Arrese, J.I. 2009. Commitment and subjectivity in the discourse of a judicial inquiry. In: Busuttil, P. & van der Auwera, J. (eds.): *Modality in English: Theory and description*. Berlin & New York: Mouton de Gruyter. 237-268.
- Markkanen, R. & Schröder, H. (eds.) 1997. *Hedging and discourse: Approaches to the analysis of a pragmatic phenomenon in academic texts*. Berlin & New York: de Gruyter.
- Martin, J.R. & Rose, D. 2007. *Working with discourse: Meaning beyond the Clause*. 2nd ed. London: Continuum.
- Martin, J.R. & White, P.R.R. 2005. *The language of evaluation, Appraisal in English*. London & New York: Palgrave Macmillan.
- Masri-Eberhard, J. 2012. An annotated bibliography of literature on the rhetoric of health and medicine. *Present Tense* 2 (2). <http://www.presenttensejournal.org/volume-2/annotated-bibliography-of-literature-on-the-rhetoric-of-health-and-medicine/>. (Last accessed 14-07-2014.)
- Mauranen, A. (1997). Hedging in language revisers' hands. In: Markkanen, R. & Schröder, H. (eds.) *Hedging and discourse: Approaches to the analysis of a pragmatic phenomenon in academic texts*. Berlin & New York: de Gruyter. 115-133.
- McEnery, T. & Hardie, A. 2012. *Corpus linguistics: Method, theory and practice*. Cambridge: Cambridge University Press.
- Menz, F. & Lalouschek, J. 2006. In: Gotti, M. & Salager-Meyer, F. (eds.) 2006. *Advances in medical discourse analysis: Oral and written context*. Bern: Lang. 133-154.
- Meyer, B. 2004. *Dolmetschen im medizinischen Aufklärungsgespräch. Eine diskursanalytische Untersuchung zur Arzt-Patienten-Kommunikation im mehrsprachigen Krankenhaus*. Münster: Waxmann.
- Miller, L. 2008. Foucauldian constructionism. In: Holstein, J. & Gubrium, J. (eds.) *Handbook of constructionist research*. New York: Guilford. 251-275.
- Mortelmans, T. 2002. "Wieso sollte ich dich küssen, du hässlicher Mensch!" A study of the German modals *sollen* and *müssen* as "grounding predications" in interrogatives. In: Brisard, F. (ed.) *Grounding. The epistemic footing of deixis and reference*. Berlin & New York: Mouton de Gruyter. 391-432.
- Müller, R. & Reis, M. (eds.) 2001. *Modalität und Modalverben im Deutschen*. Hamburg: Buske.
- Munday, J. 2012. *Evaluation in translation: A study of critical points in translator decision-making*. Abingdon & New York: Routledge.
- Mushin, I. 2001. *Evidentiality and epistemological stance: Narrative retelling*. Amsterdam & Philadelphia: Benjamins.
- Myers, G. 1989. The pragmatics of politeness in scientific articles. *Applied Linguistics* 10. 1-35.
- Narrog, H. 2012. *Modality, subjectivity, and semantic change: A cross-linguistic perspective*. Oxford: Oxford University Press.
- Neumann, S. 2014. *Contrastive register variation. A quantitative approach to the comparison of English and German*. Berlin & Boston: de Gruyter.
- Nicholas, N. 1998. *The story of pu: The grammaticalisation in space and time of a Modern Greek complementiser*. PhD thesis, The University of Melbourne. <http://www.tlg.uci.edu/~opoudjis/Work/thesis.html>. (Last accessed 28-05-2014.)
- Niederhäuser, J. 1999. *Wissenschaftssprache und populärwissenschaftliche Vermittlung*. Tübingen: Narr.
- Nikula, T. 1997. *Interlanguage view on hedging*. In: Markkanen, R. & Schröder, H. (eds.) *Hedging and discourse: Approaches to the analysis of a pragmatic phenomenon in academic texts*. Berlin & New York: de Gruyter. 188-207.
- Nørgaard, N., Busse, B. & Montoro, R. 2010. *Key terms in stylistics*. London: Continuum.

- Nuyts, J. 2001. *Epistemic modality, language and conceptualization: A cognitive-pragmatic perspective*. Amsterdam & Philadelphia: Benjamins.
- Nuyts, J. 2005. The modal confusion: on terminology and the concepts behind it. In: Klinge, A. & Müller, H.H. (eds.) *Modality. Studies in form and function*. London: Equinox. 5-38.
- Nuyts, J. 2006. Modality: Overview and linguistic issues. In: Frawley, W. (ed.) *The expression of modality*. Berlin: Mouton de Gruyter. 1-26.
- O'Donnell, M. 2008. The UAM CorpusTool: Software for corpus annotation and exploration. In: *Proceedings of the XXVI Congreso de AESLA*, Almeria, Spain, 3-5 April 2008.
- O'Donnell, M. 2012. *UAM CorpusTool Version 2.8 user manual*. <http://www.wagsoft.com/CorpusTool/Documentation/UAMCorpusToolManualv28.pdf>. (Last accessed 14-07-2014.)
- Ochs, E. (ed.) 1989. The pragmatics of affect. Special issue. *Text* 9 (1).
- Ochs, E. 1990. Indexicality and socialization. In: Stigler, J., Shweder, R. & Herdt, G. (eds.) *Cultural psychology: Essays on comparative human development*. Cambridge: Cambridge University Press. 287-308.
- Ochs, E. & Schieffelin, B. 1989. Language has a heart. *Text* 9 (1). 7-25.
- Pahta, P. 2006. This is very important: A corpus study of amplifiers in medical writing. In: Gotti, M. & Salager-Meyer, F. (eds.) *Advances in medical discourse analysis: Oral and written context*. Bern: Lang. 357-381.
- Palmer, F.R. 1979. *Modality and the English modals*. London: Longman.
- Palmer, F.R. 1990. *Modality and the English modals*. 2nd revised ed. London: Longman.
- Palmer, F.R. 1986. *Mood and modality*. Cambridge: Cambridge University Press.
- Palmer, F.R. 2001. *Mood and modality*. 2nd revised ed. Cambridge: Cambridge University Press.
- Pascale, C. 2011. *Cartographies of knowledge: Exploring qualitative epistemologies*. Thousand Oaks, CA: Sage.
- Pérez-Llantada, A.C. 2011. Heteroglossic (dis)engagement and the construal of the ideal readership: Dialogic spaces in academic texts. In: Bhatia, V., Hernández, P. S. & Pérez-Paredes, P. (eds.) *Researching specialized languages*. Amsterdam: Benjamins. 25-45.
- Perkins, M.R. 1983. *Modal expressions in English*. London: Pinter.
- Polkinghorne, D.E. 1997. Reporting qualitative research as practice. In: Tierney, W.G. & Lincoln, Y.S. (eds.) *Representation and the text: Re-framing the narrative voice*. Albany, NY: State University of New York Press. 3-21.
- Poudat, C. & Loiseau, S. 2005. Authorial presence in academic genres. In: Tognini-Bonelli E. & del Lungo Camiciotti, G. (eds.) *Strategies in academic discourse*. Amsterdam: Benjamins. 51-68.
- Preacher, K.J. 2001. *Calculation for the chi-square test: An interactive calculation tool for chi-square tests of goodness of fit and independence [Computer software]*. <http://quantpsy.org>. (Last accessed 24-07-2013)
- Prince, E., Frader, J. & Bosk, C. 1982. On hedging in physician-physician discourse. In: di Pietro, R.J. (ed.) *Linguistics and the professions*. Norwood: Ablex. 83-97.
- Quirk, R., Greenbaum, S., Leech, G. & Svartvik, J. 1985. *A comprehensive grammar of the English language*. London: Longman.
- Raskin, J.D. 2002. Constructivism in psychology: Personal construct psychology, radical constructivism, and social constructivism. In: Raskin, J.D. & Bridges, S.K. (eds.) *Studies in meaning: Exploring constructivist psychology*. New York: Pace University Press. 1-25.
- Rescher, N. 1968. *Topics in philosophical logic*. Dordrecht: Reidel.

- Roberts, C. 2006. Continuities and discontinuities in doctor-patient consultations in a multilingual society. In: Gotti, M. & Salager-Meyer, F. (eds.) *Advances in medical discourse analysis: Oral and written context*. Bern: Lang. 177-196.
- Rosch, E. 1973. Natural categories. *Cognitive Psychology* 4. 328-350.
- Ruiz de Mendoza Ibáñez, F.J. & Díez Velasco, O. 2003. High-level metonymy and linguistic structure. In: Inchaurrealde, C. & Florén, C. (eds.) *Interaction and cognition in linguistics*. Frankfurt & New York: Lang. 189-210.
- Ruß-Mohl, S. 1985. Wissenschaftsjournalismus im gelobten Land. In: *Wissenschaftsjournalismus in den USA. Infrastrukturen, Ausbildungsangebote, Erfolgsgeheimnisse*. Stuttgart: Robert-Bosch-Stiftung. 13-24.
- Ruusuvuori J. 2001. Looking means listening: Coordinating displays of engagement in doctor-patient interaction. In: *Social Science & Medicine* 52. 1093-1108.
- Sager, J.C., Dungworth, D. & McDonald, P.F. 1980. *English special languages. Principles and practice in science and technology*. Wiesbaden: Brandstetter.
- Salager-Meyer, F. 1992. A text-type and move analysis study of verb tense and modality distribution in medical English abstracts. *English for Specific Purposes* 11. 93-113.
- Salager-Meyer, F. 1994. Hedges and textual communicative function in medical English written discourse. *English for Specific Purposes* 13. 149-170.
- Salager-Meyer, F. 1999. Referential behaviour in scientific writing: A diachronic study (1810-1995). *English for Scientific Purposes* 18 (3). 279-305.
- Schmid, H.-J. 2000. *English abstract nouns as conceptual shells. From corpus to cognition*. Berlin & New York: Mouton de Gruyter.
- Schröder, H. & Zimmer, D. 1997. Hedging research in pragmatics: A bibliographical research guide to hedging. In: Markkanen, R. & Schröder, H. (eds.) *Hedging and discourse: Approaches to the analysis of a pragmatic phenomenon in academic texts*. Berlin & New York: de Gruyter. 249-272.
- Schröder, H. 1998. 'Ich sage das einmal ganz ungeschützt' – Hedging und wissenschaftlicher Diskurs. In: Danneberg, L. & Niederhauser, J. (eds.) *Darstellungsformen der Wissenschaften im Kontrast*. Tübingen: Narr. 263-276.
- Schulz, P. 2003. *Factivity: Its nature and acquisition*. Tübingen: de Gruyter.
- Searle, J.R. 1969. *Speech acts: An essay in the philosophy of language*. Cambridge: Cambridge University Press.
- Shankland, M.E. 1981. Factivity from a discourse perspective. *Linguistic Notes from La Jolla* 10. 20-32.
- Simon-Vandenberg, A.M., & Aijmer, K. 2007. *The semantic field of modal certainty: A corpus-based study of English adverbs*. Berlin: Mouton de Gruyter.
- Sinclair, J.M. 1986. Fictional worlds. In: Coulthard, M. (ed.) *Talking about text*. Birmingham: University of Birmingham ELR. 43-60.
- Sinclair, J.M. 1988. Mirror for a text. In: *Journal of English and Foreign Languages* 1. 15-44.
- Šipova, I.A. 2010. Epistemische Modalität im Deutschen und Russischen in kontrastiver Sicht. In: Katny, A. & Socka, A. (eds.) *Modalität/Temporalität in kontrastiver und typologischer Sicht*. Frankfurt: Lang. 211-221.
- Skelton, J. 1988. The care and maintenance of hedges. *ELT Journal* 42 (1). 37-43.
- Skelton, J. 1997. How to tell the truth in the British medical journal. Patterns of judgement in the 19th and 20th centuries. In: Markkanen, R. & Schröder, H. (eds.) *Hedging and discourse: Approaches to the analysis of a pragmatic phenomenon in academic texts*. Berlin & New York: de Gruyter. 42-63.

- Smirnova, E. 2006. *Die Entwicklung der Konstruktion würde + Infinitiv im Deutschen. Eine funktional-semantische Analyse unter besonderer Berücksichtigung sprachhistorischer Aspekte*. Berlin: de Gruyter.
- Smirnova, E. 2011. The organization of the German clausal grounding system. In: Patard, A. & Brisard, F. (eds.) *Cognitive approaches to tense, aspect, and epistemic modality*. Amsterdam & Philadelphia: Benjamins. 87-108.
- Smirnova, E. & Diwald, G. 2013. Kategorien der Redewiedergabe im Deutschen: Konjunktiv I versus *sollen*. *ZGL* 41 (3). 443-471.
- Stålhammar, M. 2006. Grammatical metaphor/metonymy in the treaty establishing a constitution for Europe: A comparison between the English and Swedish versions. *Nordic Journal of English Studies* 5 (1). 99-117.
- Stalnaker, R. 1974. Pragmatic presuppositions. In: Munitz, M.K. & Unger, P. (eds.) *Semantics and philosophy*. New York: New York University Press. 197-214.
- Steiner, E. 2004. *Translated Texts: Properties, Variants, Evaluations*. Frankfurt/M.: Peter Lang.
- Steiner, E. & Teich, E. 2004. Metafunctional profile of the grammar of German. In: Caffarel, A., Martin, J.R. & Matthiessen, C. (eds.) *Language typology: A Functional Perspective*. Amsterdam: Benjamins. 139-184.
- Strawson, P.F. 1950. On referring. In: *Mind* 59. 320-344. Reprinted in: Flew, A. (ed.) 1956. *Essays in conceptual analysis*. London: Macmillan. 21-52.
- Strawson, P.F. 1952. *Introduction to logical theory*. London. Methuen.
- Strawson, P.F. 1954. A reply to Mr. Sellars. *The Philosophical Review* 63 (2). 216-231.
- Stubbs, M. 1983. *Discourse analysis: The sociolinguistic analysis of natural language*. Chicago: University of Chicago Press.
- Stubbs, M. 1996. Towards a modal grammar of English: A matter of prolonged fieldwork. In: Stubbs, M. (ed.) *Text and corpus analysis. Computer-assisted studies of language and culture*. Cambridge, MA: Basil Blackwell. 196-229.
- Swales, J. 1990. *Genre analysis: English in academic and research settings*. Cambridge: Cambridge University Press.
- Sweetser, E. 1990. *From etymology to pragmatics: Metaphorical and cultural aspects of semantic structure*. Cambridge: Cambridge University Press.
- Szymańska, J. 2013. Gendered use of the hedge in academic discourse. In: Piechurska-Kuciel, E. & Szymańska-Czaplak, E. (eds.) *Language in cognition and affect*. Berlin & Heidelberg: Springer. 3-16.
- Tadros, A. 1993. The pragmatics of text averral and attribution in academic texts. In: Hoey, M. (ed.) *Data, description, discourse*. London: Harper Collins. 98-114.
- Teich, E. 2003. *Cross-linguistic variation in system and text*. Berlin & New York: Mouton de Gruyter.
- ten Cate, A.P. 1996. Modality of verb forms in German reported speech. In: Janssen, T.A.J.M. & van der Wurff, W. (eds.) *Reported speech: Forms and functions of the verb*. Amsterdam: Benjamins. 189-211.
- Thibault, P. 1997. Mood and eco-social dynamics. In: Hasan, R. & Fries, P. (eds.) *On subject and theme: A discourse functional perspective*. The Hague: Benjamins. 51-90.
- Thompson, P. 2005. Aspects of identification and position in intertextual reference in PhD theses. In: Tognini-Bonelli, E. & del Lungo Camiciotti, G. (eds.) *Strategies in academic discourse*. Amsterdam: Benjamins. 31-50.
- Thomas, S. & Hawes, T.P. 1994. Reporting verbs in medical journal articles. *English for Specific Purposes* 13 (2). 129-148.

- Thompson, S.A., & Mulac, A.J. 1991. The discourse conditions for the use of complementizer *that* in conversational English. *Journal of Pragmatics* 15. 237-251.
- Thompson, G. & Ye, Y. 1991. Evaluation in the reporting verbs used in academic papers. *Applied Linguistics* 12 (4). 365-382.
- Traugott, E. 1989. On the rise of epistemic meanings in English: An example of subjectification in semantic change. *Language* 57. 33-65.
- Urmson, J. 1952. Parenthetical verbs. *Mind* 61. 480-496.
- van der Auwera, J. & Plungian, V.A. 1998. Modality's semantic map. *Linguistic Typology* 2. 79-124.
- van der Auwera, J. & Zamorano Aguilar, A. (forthcoming). The history of mood and modality. In: Nuyts, J. & van der Auwera, J. (eds.) *The Oxford handbook of mood and modality*. Oxford: Oxford University Press. <http://webh01.ua.ac.be/vdauwera/MMHIST.pdf>. (Last accessed 20-09-2013.)
- van Leeuwen, T. 1996. The representation of social actors in discourse. In: Caldas-Coulthard, C.R. & Coulthard, M. (eds.) *Texts and practices: Readings in critical discourse analysis*. London: Routledge. 32-70.
- van Linden, A. 2012. *Modal adjectives. English deontic and evaluative constructions in diachrony and synchrony*. Berlin & Boston: de Gruyter.
- Varttala, T. 2001. *Hedging in scientifically oriented discourse. Exploring variation according to discipline and intended audience*. PhD thesis, University of Tampere. <http://acta.uta.fi/pdf/951-44-5195-3.pdf>. (Last accessed 14-07-2014.)
- Vazquez, I. & Giner, D. 2008. Beyond mood and modality: Epistemic modality markers as hedges in research articles. *Revista Alicantina de Estudios Ingleses* 21. 171-190.
- Vendler, Z. 1980. Telling the facts. In: Searle, J., Keifer, F. & Bierwisch, M. (eds.) *Speech act theory and pragmatics*. Dordrecht: Reidel. 273-290.
- Vihla, M. 1999. *Medical writing. Modality in focus*. Amsterdam & Atlanta: Rodopi.
- Vold, E.T. 2006. Epistemic modality markers in research articles: A cross-linguistic and cross-disciplinary study. *International Journal of Applied Linguistics* 16 (1). 61-87.
- Vološinov, V.N. 1986. *Marxism and the philosophy of language*. Transl. by Matjika, L. and Titunik, I. R. Harvard: Seminar Press.
- von Fintel, K. 2006. Modality and language. In: Borchert, D. M. (ed.) *Encyclopedia of philosophy*. 2nd ed. Detroit: MacMillan. mit.edu/fintel/modality.pdf. (Last accessed 26-06-2014.)
- von Wright, G.H. 1951. *An essay in modal logic*. Amsterdam: North-Holland.
- Watts, R.J. 2003. *Politeness*. Cambridge: Cambridge University Press.
- Weinreich, C. 2010. *Das Textsortenspektrum im fachinternen Wissenstransfer: Untersuchung anhand von Fachzeitschriften der Medizin*. Berlin & New York: de Gruyter.
- Weinreich, U. 1966: On the semantic structure of English. In: Greenberg, J.H. (ed.) *Universals of language*. 2nd ed. Cambridge, MA: MIT. 142-217.
- White, P.R.R. 1998. *Telling media tales: The news story as rhetoric*. PhD thesis, University of Sydney. http://www.grammatics.com/appraisal/whitepr_phd.html. (Last accessed 14-07-2014.)
- White, P.R.R. 2003. Beyond modality and hedging. A dialogic view of the language of intersubjective stance. *Text* 23 (2). 259-284.
- White, P.R.R. 2006. Evaluative semantics and ideological positioning in journalistic discourse. A new framework for analysis. In: Lassen, I. & Strunck, J. & Vestergaard, T. (eds.) *Mediating ideology in text and image: Ten critical studies*. Amsterdam & Philadelphia: Benjamins. 37-68.

- White, P.R.R. 2012. *The appraisal website*. <http://www.grammatics.com/appraisal/index.html>. (Last accessed 27-05-2014.)
- White, P.R.R. 2012a. *An introductory course in appraisal analysis*. <http://grammatics.com/appraisal/AppraisalGuide/Framed/Frame.htm>. (Last accessed 27-05-2014)
- White, P.R.R. 2012b. *An outline of appraisal*. <http://grammatics.com/appraisal/AppraisalOutline/Framed/Frame.htm>. (Last accessed 27-05-2014.)
- Whitley, R. 1985. Knowledge producers and knowledge acquirers: Popularisation as a relation between scientific fields and their publics. In: Shinn, T. & Whitley, R. (eds.) *Expository science: Forms and functions of popularization. Yearbook sociology of the sciences IX*. Dordrecht: Reidel. 3-28.
- Whorf, B.L. 1940. Science and linguistics. *Technology Review* 42 (6). 229-31, 247-8.
- Wiese, I. 2006. Zur Situation des Deutschen als Wissenschaftssprache in der Medizin. In: Ehlich, K. & Heller, D. (eds.) *Die Wissenschaft und ihre Sprachen*. Frankfurt/M.: Peter Lang. 275-295.
- Wilce, J.M. 2009. Medical discourse. *Annual Review of Anthropology* 38 (1). 199-215.
- Willet, T.L. 1988. A cross-linguistic survey of the grammaticalization of evidentiality. *Studies in Language* 12. 51-97.
- Williams, H. 2004. Lexical frames and reported speech. *ELT Journal* 58 (3). 247-257.
- Wratil, M. 2005: *Die Syntax des Imperativs: Eine strukturelle Analyse zum Westgermanischen und Romanischen*. Berlin: Akademie Verlag.
- Wunderlich, D. 1972. Redeerwähnung. In: Maas, U. & Wunderlich, D. (eds.) *Pragmatik und sprachliches Handeln*. Frankfurt/M.: Athenäum. 161-188.
- Yang, L. 2013. Evaluative functions of reporting evidentials in English research articles of applied linguistics. *Open Journal of Modern Linguistics* 3 (2). 119-126.
- Zadeh, L.A. 1965. Fuzzy Sets. *Information and Control* 8. 338-353.
- Zifonun, G. 2000. Textkonstitutive Funktionen von Tempus, Modus und Genus Verbi. In: Brinker, K., Antos, G., Heinemann, W. & Sager, S.F. (eds.) *Text- und Gesprächslinguistik HSK 16.1*. Berlin: de Gruyter. 315-330.
- Zifonun, G., Hoffmann, L., Strecker, B. et al. 1997. *Grammatik der deutschen Sprache*. Berlin: de Gruyter.

Online References

- [1] *Chi-Square Test*. <http://www2.lv.psu.edu/jxm57/irp/chisquar.html>. (Last accessed 01-06-2014.)
- [2] *Table of Chi-square statistics*. <http://home.comcast.net/~sharov/PopEcol/tables/chisq.html>. (Last accessed 01-06-2014.)

Primary References

ESCI

- Ahmad, I., Davis, K.F., Emil, S., Uy, C. & Sills, J. 2008. Risk factors for spontaneous intestinal perforation in extremely low birth weight infants. *The Open Pediatric Medicine Journal* 2. 11-15.
- Bai, X. 2008. Calculation of left ventricular relaxation time constant-tau in humans by continuous-wave Doppler. *Open Cardiovascular Medical Journal* 2. 9-11.
- Classen, J.B. 2008. Risk of vaccine induced diabetes in children with a family history of type 1 diabetes. *The Open Pediatric Medicine Journal* 2. 7-10.
- Humby, F., Bombardieri, M., Manzo, A., Kelly, S., Blades, M.C., Kirkham, B., Spencer, J. & Pitzalis, C. 2009. Ectopic lymphoid structures support ongoing production of class-switched autoantibodies in rheumatoid synovium. *PLoS Medicine* 6 (1). 59-75.
- Jackson, C.A., Hutchison, A., Dennis, M.S., Wardlaw, J.M., Lewis, S.C., & Sudlow, C.L. 2009. Differences between ischemic stroke subtypes in vascular outcomes support a distinct lacunar ischemic stroke arteriopathy: A prospective, hospital-based study. *Stroke* 40. 3679-3684.
- Padilla, J., Johnson, B.D., Newcomer, S.C., Wilhite, D.P., Mickleborough, T.D., Fly, A.D., Mather, K.J. & Wallace, J.P. 2009. Adjusting flow-mediated dilation for shear stress stimulus allows demonstration of endothelial dysfunction in a population with moderate cardiovascular risk. *Journal of Vascular Research* 46. 592-600.
- Prado, C.M. & Rossi, M.A. 2008. Aorta remodeling responses to distinct atherogenic stimuli: Hypertension, hypercholesterolemia and turbulent flow/low wall shear stress. *Open Cardiovascular Medical Journal* 2. 41-48.
- Schoenhagen, P., Drude, L. Klein, H.H. & Garcia, M.J. 2008. Quantitative Doppler-echocardiographic determination of regurgitant volume in patients with aortic insufficiency. *Open Cardiovascular Medical Journal* 2. 12-19.
- Sedlak, T.L., Chandavimol, M., Calleja, A., Clark, C., Edmonds, M., Pu, A., Humphries, K.H. & Ignaszewski, A. 2008. The ability of heart failure specialists to accurately predict NT-proBNP levels based on clinical assessment and a previous NT-proBNP. *Open Cardiovascular Medical Journal* 2. 36-40.
- Weinstein, J.S., Nacionales, D.C., Lee, P.Y., Kelly-Scumpia, K.M., Yan, X.J., Scumpia, P.O., Vale-Cruz, D.S., Sobel, E., Satoh, M., Chiorazzi, N. & Reeves, W.H. 2008. Colocalization of antigen-specific B and T cells within ectopic lymphoid tissue following immunization with exogenous antigen. *The Journal of Immunology* 181 (5). 3259-3267.

GSCI

- Benz, M.R. & Weber, L.T. 2008. Harnwegsinfektionen im Kindesalter. *Kinder- und Jugendmedizin* 8 (4). 223-231.
- Bitter, T., Langer, C., Vogt, J., Horstkotte, D. & Oldenburg, O. 2009. Schlafbezogene Atemstörungen: Charakteristika bei Vorhofflimmern und erhaltener linksventrikulärer Pumpfunktion. *Deutsches Ärzteblatt* 106 (10). 164-170.

- Bleiziffer, S., Ruge, H., Mazzitelli, D., Schreiber, C., Hutter, A., Krane, M., Bauernschmitt, R. & Lange, R. 2009. Klappenimplantation am schlagenden Herzen. Kathetergestützte Operation der Aortenklappenstenose. *Deutsches Ärzteblatt* 106 (14). 235-241.
- Dose-Schwarz, J., Mahner, S. Schirrmacher, S., Jenicke, L., Müller, V., Habermann, C.R. & Brenner, W. 2008. Nachweis von Metastasen bei Patientinnen mit Mammakarzinom. Vergleich von FDG-PET mit Röntgen-Thorax, Oberbauchsonographie und Skelettszintigraphie. *Nuklearmedizin* 47 (3). 97-103.
- Feller, S., Boeing, H. & Pischon, T. 2010. Body-Mass-Index, Taillenumfang und Risiko für Diabetes mellitus Typ 2. Konsequenzen für den medizinischen Alltag. *Deutsches Ärzteblatt* 107 (26). 470-476.
- Kahle, B., Denk, K., Schliephake, D. & Recke, A. 2010. Effektivität der Sklerosierungstherapie in Abhängigkeit vom Alter der Patienten. *Phlebologie* 39 (4). 202-207.
- Reichenbach, J. & von Bernuth, H. 2008. Genetisch bedingte Defekte der angeborenen Immunität. Erhöhte Anfälligkeit für mykobakterielle Infektionen, für invasive bakterielle Infektionen und für Herpes-simplex-Enzephalitis. *Kinder- und Jugendmedizin* 8 (4). 171-178.
- Sachs, U.J.H. 2008. Diagnostik der Autoimmunthrombozytopenie. *Hämostaseologie* 28. 72-76.
- Winzer, R., Kanig, N., Schneitler, S., Reuter, S., Jensen, B., Müller-Stöver, I., Oh, J., Adams, O., Mayatepek, E., Hengel, H., Schneitler, H., & Häussinger, D. 2009. Erste klinische Erfahrungen mit der Neuen Influenza A (H1N1/09). *Deutsches Ärzteblatt* 106 (47). 770-776.
- Zengel, P., Bodenstein, C., Senekowitsch-Schmidtke, R. & Weber, W.A. 2008. Darstellung der Angiogenese und der Effekte einer anti-angiogenetischen Therapie mit ^{99m}Tc-markierten Erythrozyten. *Nuklearmedizin* 47 (3). 104-109.

EPOP

- Ballantyne, C. 2007. Confirmed: A link between breast cancer and hormone therapy. <http://www.scientificamerican.com/article/confirmed-link-breast-cancer-hormone-therapy/>. (Last accessed 22-07-2014.)
- Biello, D. 2008. China tries to halt spread of hand, foot and mouth disease. <http://www.scientificamerican.com/article/china-tries-to-halt-hand-food-mouth-disease/>. (Last accessed 22-07-2014.)
- Conti, L. 2008. Artificial sweeteners confound the brain; May lead to diet disaster. <http://www.scientificamerican.com/article/artificial-sweeteners-confound-the-brain/>. (Last accessed 22-07-2014.)
- Greenemeier, L. 2008. Human Genome Project head to step down <http://www.scientificamerican.com/article/human-genome-project-head/>. (Last accessed 22-07-2014.)
- Greenemeier, L. 2008. Next-gen heart stents may feature toothlike coating. <http://www.scientificamerican.com/article/next-gen-heart-stents/>. (Last accessed 22-07-2014.)
- Greenemeier, L. 2010. Cancer-zapping precision radiation beams could soon target other diseases. <http://www.scientificamerican.com/article.cfm?id=stereotactic-cancer-fighting-improvements&print=true>. (Last accessed 22-07-2014.)
- Greenemeier, Larry, Biello, D., Swaminathan, N. & Minkel, J.R. 2008. News bytes of the week: Flying dinosaur preferred to hoof it while hunting; New spray-on explosives detector; Next-gen insect repellents; Salty water on Mars; and more...

- <http://www.scientificamerican.com/article/news-bytes-may-30/>. (Last accessed 22-07-2014.)
- Harmon Courage, K. 2010. New research linking chronic fatigue syndrome to retrovirus is released after being held by a journal.
<http://blogs.scientificamerican.com/observations/2010/08/23/new-research-linking-chronic-fatigue-syndrome-to-retrovirus-is-released-after-being-held-by-a-journal/>. (Last accessed 22-07-2014.)
- Harmon, K. 2009. Renewed hope for an AIDS vaccine.
<http://www.scientificamerican.com/article.cfm?id=renewed-hope-aids-vaccine&print=true>. (Last accessed 22-07-2014.)
- Harmon, K. 2010. Can exercise make you feel more full?
<http://www.scientificamerican.com/article.cfm?id=exercise-decreases-hunger&print=true>. (Last accessed 22-07-2014.)
- Harmon, K. 2010. How breastfeeding benefits mothers' health.
<http://www.scientificamerican.com/article/breastfeeding-benefits-mothers/>. (Last accessed 22-07-2014.)
- Harmon, K. 2010. Three distinct routes detailed for how HIV arises in male genital tract.
<http://www.scientificamerican.com/article/hiv-in-sperm/>. (Last accessed 22-07-2014.)
- Hayden, T. 2007. Getting to know nutraceuticals.
<http://www.scientificamerican.com/article/getting-to-know-nutraceut/>. (Last accessed 22-07-2014.)
- Hendry, J. 2008. Men and women may metabolize fructose differently.
<http://www.reuters.com/article/2008/06/02/us-metabolize-fructose-idUSCOL26917620080602>. (Last accessed 22-07-2014.)
- Herbert, W. 2007. The artificial heart: Not just a pump.
<http://www.scientificamerican.com/article/not-just-a-pump/>. (Last accessed 22-07-2014.)
- Minkel, J.R. 2007. Where is the AIDS vaccine?
<http://www.scientificamerican.com/article/where-is-the-aids-vaccine/>. (Last accessed 22-07-2014.)
- Minkel, J.R. 2008. Elusive pancreas-healing cells discovered.
<http://www.scientificamerican.com/article/elusive-pancreas-healing/>. (Last accessed 22-07-2014.)
- Minkel, J.R. 2008. Self-healing rubber keeps on stretching, rip after rip.
<http://www.scientificamerican.com/article/self-healing-rubber-keeps-stretching-after-rip/>. (Last accessed 22-07-2014.)
- n.n. 2008. Anorexia nervosa may not stunt growth, short term.
<http://www.reuters.com/article/2008/06/06/us-anorexia-nervosa-idUSCOL66234120080606>. (Last accessed 22-07-2014.)
- n.n. 2008. Research may explain winter spike in heart deaths
<http://uk.reuters.com/article/2008/06/06/health-winter-heart-dc-idUKCOL66217120080606>. (Last accessed 22-07-2014.)
- n.n. 2008. Study details heart problems after childhood cancer.
<http://mobile.reuters.com/article/healthNews/idUSCOL66252120080606?ca=nok>. (Last accessed 22-07-2014.)
- Norton, A. 2008. Gout tied to higher risk of heart disease mortality.
<http://www.reuters.com/article/2008/06/04/us-gout-heart-disease-idUSTON40259620080604>. (Last accessed 22-07-2014.)

- Peeples, L. 2010. Staying negative: How an unexpected antiretroviral result is reshaping the battle against AIDS. <http://www.scientificamerican.com/article.cfm?id=staying-negative>. (Last accessed 22-07-2014).
- Rex, E. 2010. Vaccines derived from patients' tumor cells are individualizing cancer treatment. <http://www.scientificamerican.com/article.cfm?id=individualizing-cancer-treatment&print=true>. (Last accessed 22-07-2014.)
- Schattner, E. 2009. A chip against cancer: Microfluidics spots circulating tumor cells. <http://www.scientificamerican.com/article.cfm?id=a-chip-against-cancer&print=true>. (Last accessed 22-07-2014.)
- Scheff, J. 2008. Fact or fiction: Antioxidant supplements will help you live longer. <http://www.scientificamerican.com/article/antioxidant-supplements-will-help-you-live-longer/>. (Last accessed 22-07-2014.)
- Svoboda, E. 2010. Good riddance to polio: A conquered disease still clings to life. <http://www.scientificamerican.com/article.cfm?id=good-riddance-to-polio-a&print=true>. (Last accessed 22-07-2014.)
- Swaminathan, N. 2008. Stem cells stop mouse shivers cold, could thwart rare, neurological disorders. <http://www.scientificamerican.com/article/stem-cells-stop-mouse-shi/>. (Last accessed 22-07-2014.)
- Swaminathan, N. 2008. The skinny on fat: You're not always what you eat. <http://www.scientificamerican.com/article/the-skinny-on-fat-youre-n/>. (Last accessed 22-07-2014.)
- Webster, M. 2008. Can you catch up on lost sleep? <http://www.scientificamerican.com/article/fact-or-fiction-can-you-catch-up-on-sleep/>. (Last accessed 22-07-2014.)
- Zeliadt, N. 2010. Arresting development: Blood biomarker patterns may aid early diagnosis of ovarian cancer. <http://www.scientificamerican.com/article.cfm?id=ovarian-cancer-test&print=true>. (Last accessed 22-07-2014.)

GPOP

- Borchard-Tuch, C. 2008. Mit Hitze gegen Krebs. <http://www.spektrum.de/news/mit-hitze-gegen-krebs/951024>. (Last accessed 21-07-2014.)
- Dewald, U. 2010. Erreger macht schlapp. http://www.wissenschaft.de/home/-/journal_content/56/12054/990866/. (Last accessed 21-07-2014.)
- Dönges, J. 2010. Kaum Rauschen in der Nervenleitung. <http://www.spektrum.de/news/kaum-rauschen-in-der-nervenleitung/1020821>. (Last accessed 21-07-2014.)
- Dönges, J. 2010. Zwei Hälften - zwei Gedanken. <http://www.spektrum.de/news/zwei-haelften-zwei-gedanken/1029222>. (Last accessed 21-07-2014.)
- Findekle, A. 2007. Hauptsache Pieks. <http://www.spektrum.de/news/hauptsache-pieks/905961>. (Last accessed 21-07-2014.)
- Findekle, A. 2007. Wunsch Kind. <http://www.spektrum.de/news/wunsch-kind/893807>. (Last accessed 21-07-2014.)
- Findekle, A. 2008. Alles im grünen Bereich. <http://www.spektrum.de/news/alles-im-gruenen-bereich/961311>. (Last accessed 21-07-2014.)
- Findekle, A. 2008. Mapping Malaria. Detaillierte Karte zeigt Ansteckungsrisiko mit Plasmodien. <http://www.spektrum.de/news/mapping-malaria/944283>. (Last accessed 21-07-2014.)

- Fischer, L. 2010. Auf neuen Wegen zum HIV-Impfstoff. <http://www.spektrum.de/news/auf-neuen-wegen-zum-hiv-impfstoff/1024746>. (Last accessed 21-07-2014.)
- Jacobs, A. 2008. Kampf den Zecken. <http://www.spektrum.de/news/kampf-den-zecken/951421>. (Last accessed 21-07-2014.)
- Klüber, T. 2010. Hüftgold bleibt erhalten. Vier Wochen Schlemmen haben Langzeiteffekt. http://www.wissenschaft.de/leben-umwelt/gesundheit/-/journal_content/56/12054/990803/H%C3%BCftgold-bleibt-erhalten/. (Last accessed 21-07-2014.)
- Köndgen, D. 2010. Verrauchter Start ins Leben. http://www.wissenschaft.de/leben-umwelt/gesundheit/-/journal_content/56/12054/990749/Verrauchter-Start-ins-Leben/. (Last accessed 21-07-2014.)
- Lehnen-Beyel, I. 2010. Gewebeimplantat fürs Auge. http://www.wissenschaft.de/home/-/journal_content/56/12054/990785/. (Last accessed 21-07-2014.)
- Lehnen-Beyel, I. 2010. Vielversprechender Ansatz. http://www.wissenschaft.de/leben-umwelt/medizin/-/journal_content/56/12054/990929/Vielversprechender-Ansatz/. (Last accessed 21-07-2014.)
- Lehnen-Beyel, I. 2010. Virus in der Muttermilch. http://www.wissenschaft.de/home/-/journal_content/56/12054/990722/. (Last accessed 21-07-2014.)
- n.n. 2007. ComputermodeLL simuliert Orientierungssinn. <http://www.spektrum.de/news/computermodeLL-simuliert-orientierungssinn/903762>. (Last accessed 21-07-2014.)
- n.n. 2007. Dank Hirnschrittmacher: Komapatient spricht wieder. <http://www.spektrum.de/news/dank-hirnschrittmacher-komapatient-spricht-wieder/896347>. (Last accessed 21-07-2014.)
- n.n. 2007. Fettsucht grassiert unter Pferden. <http://www.spektrum.de/news/fettsucht-grassiert-unter-pferden/894220>. (Last accessed 21-07-2014.)
- n.n. 2007. Fußball macht schlanker als Joggen. <http://www.spektrum.de/news/fussball-macht-schlanker-als-joggen/902991>. (Last accessed 21-07-2014.)
- n.n. 2007. Laufen am Arbeitsplatz hilft gegen Übergewicht. <http://www.spektrum.de/news/laufen-am-arbeitsplatz-hilft-gegen-uebergewicht/874025>. (Last accessed 21-07-2014.)
- n.n. 2007. Meditation wirksamer als progressive Muskelentspannung. <http://www.spektrum.de/news/meditation-wirksamer-als-progressive-muskelentspannung/907319>. (Last accessed 21-07-2014.)
- n.n. 2007. Molekularer Schalter für Prostatakrebs entdeckt. <http://www.spektrum.de/news/molekularer-schalter-fuer-prostatakrebs-entdeckt/896349>. (Last accessed 21-07-2014.)
- n.n. 2007. Motorprotein mit Schaltgetriebe. <http://www.spektrum.de/news/motorprotein-mit-schaltgetriebe/892262>. (Last accessed 21-07-2014.)
- n.n. 2007. Mundgeruch-Detektor entwickelt. <http://www.spektrum.de/news/mundgeruch-detektor-entwickelt/893793>. (Last accessed 21-07-2014.)
- n.n. 2007. Neue H5N1-Fälle in Nürnberg. <http://www.spektrum.de/news/neue-h5n1-faelle-in-nuernberg/892208>. (Last accessed 21-07-2014.)
- n.n. 2007. Neuronale Grundlagen von Depressionen weiter entschlüsselt. <http://www.spektrum.de/news/neuronale-grundlagen-von-depressionen-weiter-entschluesselt/897730>. (Last accessed 21-07-2014.)
- n.n. 2007. Viele Schwimmer, viele Erreger. <http://www.spektrum.de/news/viele-schwimmer-viele-erreger/893753>. (Last accessed 21-07-2014.)

- n.n. 2007. Wann macht Alkohol aggressiv? <http://www.spektrum.de/news/wann-macht-alkohol-aggressiv/895055>. (Last accessed 21-07-2014.)
- n.n. 2007. Zwei neue MS-Gene gefunden. <http://www.gehirn-und-geist.de/news/zwei-neue-ms-gene-gefunden/896210>. (Last accessed 21-07-2014.)
- n.n. 2008. Heavy Metal gefährdet die Gesundheit. <http://www.spektrum.de/news/heavy-metal-gefaehrdet-die-gesundheit/977301>. (Last accessed 21-07-2014.)
- n.n. 2008. Hund im Haus schützt vor Allergien. <http://www.spektrum.de/news/hund-im-haus-schuetzt-vor-allergien/951581>. (Last accessed 21-07-2014.)
- n.n. 2008. Katzenparasit infiziert Meeressäuger per Kleinfisch. <http://www.spektrum.de/news/katzenparasit-infiziert-meeressaeger-per-kleinfisch/958131>. (Last accessed 21-07-2014.)
- n.n. 2008. Mangel an Glückshormon macht aggressiver. <http://www.spektrum.de/news/mangel-an-glueckshormon-macht-aggressiver/958457>. (Last accessed 21-07-2014.)
- n.n. 2008. Wiedererleben traumatischer Erlebnisse kann deren Verarbeitung fördern. <http://www.spektrum.de/news/wiedererleben-traumatischer-erlebnisse-kann-deren-verarbeitung-foerdern/958157>. (Last accessed 21-07-2014.)
- n.n. 2009. Alkohol im Blut hilfreich bei schwersten Verletzungen. <http://www.spektrum.de/news/alkohol-im-blut-hilfreich-bei-schwersten-verletzungen/1009493>. (Last accessed 21-07-2014.)
- n.n. 2010. Akupunktur aktiviert natürlichen Schmerzblocker. <http://www.spektrum.de/news/akupunktur-aktiviert-natuerlichen-schmerzblocker/1034718>. (Last accessed 21-07-2014.)
- n.n. 2010. Antivirales Gel kann HIV-Infektion verhindern. <http://www.spektrum.de/news/antivirales-gel-kann-hiv-infektion-verhindern/1040119>. (Last accessed 21-07-2014.)
- n.n. 2010. Haare protokollieren Stressbelastung vor Herzinfarkt. <http://www.spektrum.de/news/haare-protokollieren-stressbelastung-vor-herzinfarkt/1044603>. (Last accessed 21-07-2014.)
- n.n. 2010. Joints schädlicher als Zigaretten. <http://www.sueddeutsche.de/leben/gefaehrlicher-qualm-joints-schaedlicher-als-zigaretten-1.732709>. (Last accessed 21-07-2014.)
- n.n. 2010. Künstliche Hornhaut besteht Transplantationstest am Menschen. <http://www.spektrum.de/news/kuenstliche-hornhaut-besteht-transplantationstest-am-menschen/1043458>. (Last accessed 21-07-2014.)
- n.n. 2010. Mutation führt zur chronischen Nierenerkrankung bei zyprischen Familien. <http://www.wissenschaft-online.de/artikel/1043847>. (Last accessed 21-07-2014.)
- n.n. 2010. Viel versprechende Ziele für Tiefenhirnstimulation geortet. <http://www.spektrum.de/news/viel-versprechende-ziele-fuer-tiefenhirnstimulation-geortet/1044060>. (Last accessed 21-07-2014.)
- Osterkamp, J. 2007. Männliche Fortpflanzung und die Lebensspanne des Menschen. <http://www.spektrum.de/news/altmaennerstatistiken/903529>. (Last accessed 21-07-2014.)
- Osterkamp, J. 2007. Der Ursprung des Fünften Stammes. <http://www.spektrum.de/news/der-ursprung-des-fuenften-stammes/873180>. (Last accessed 21-07-2014.)
- Osterkamp, J. 2007. Die Waffe des Virus, umgekehrt. <http://www.spektrum.de/news/die-waffe-des-virus-umgekehrt/893480>. (Last accessed 21-07-2014.)

- Osterkamp, J. 2007. Woher nehmen und nicht Leben stehlen? <http://www.spektrum.de/news/woher-nehmen-und-nicht-leben-stehlen/876202>. (Last accessed 21-07-2014.)
- Osterkamp, J. 2008. Überrollte Nachschubbasis. <http://www.spektrum.de/news/ueberrollte-nachschubbasis/977135>. (Last accessed 21-07-2014.)
- Osterkamp, J. 2009. Die Transmitterchemie stimmt nicht. <http://www.spektrum.de/news/die-transmitterchemie-stimmt-nicht/1007330>. (Last accessed 21-07-2014.)
- Osterkamp, J. 2010. Neubau oder Total-Sanierung. <http://www.spektrum.de/news/neubau-oder-total-sanierung/1037312>. (Last accessed 21-07-2014.)
- Osterkamp, J. 2010. Neurodegeneration: Gezielte Blockadebrecher. <http://www.spektrum.de/news/gezielte-blockadebrecher/1045336>. (Last accessed 21-07-2014.)
- Osterkamp, J. 2010. Zuckerschirm schützt Bakterien. <http://www.spektrum.de/news/zuckerschirm-schuetzt-bakterien/1029972>. (Last accessed 21-07-2014.)
- Pyritz, L. 2007. Chikungunya-Fieber. <http://www.spektrum.de/news/chikungunya-fieber/904347>. (Last accessed 21-07-2014.)
- Reinberger, S. 2007. Sommer, Sonne, Schweißgeruch? <http://www.spektrum.de/news/sommer-sonne-schweissgeruch/894554>. (Last accessed 21-07-2014.)
- Römer, S. 2008. Hühnersuppe als Blutdrucksenker. http://www.wissenschaft.de/archiv/-/journal_content/56/12054/1004585/Mit-H%C3%BChnersuppe-gegen-Hochdruck/. (Last accessed 21-07-2014.)
- Siever, A. 2007. Contergan. <http://www.spektrum.de/news/contergan/906616>. (Last accessed 21-07-2014.)

EREF and **GREF** CroCo-Corpus cf. Hansen-Schirra, S., Neumann, S. & Steiner, E. 2012. *Cross-linguistic corpora for the study of translations. Insights from the language pair English-German*. Berlin & New York: de Gruyter Mouton.