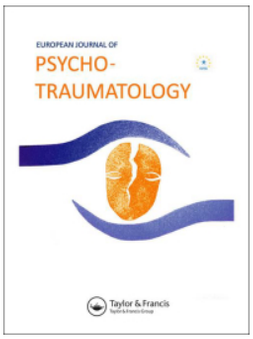

European Journal of Psychotraumatology

ISSN: 2000-8066 (Online) Journal homepage: www.tandfonline.com/journals/zept20

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To cite this article: Julia Schneider, Lena Krämer, Anja Rukundo-Zeller, Manassé Bambonyé, Jean-Arnaud Muhoza, Thierry Ndayikengurukiye, Lydia Nitanga, Amini Ahmed Rushoza & Anselm Crombach (2025) Trauma and physical pain: an urban-rural comparison of sexually abused girls in Burundi, European Journal of Psychotraumatology, 16:1, 2588113, DOI: 10.1080/20008066.2025.2588113

To link to this article: https://doi.org/10.1080/20008066.2025.2588113

Published online: 27 Nov 2025.

EUROPEAN JOURNAL OF PSYCHOTRAUMATOLOGY
2025, VOL. 16, NO. 1, 2588113
https://doi.org/10.1080/20008066.2025.2588113

SHORT COMMUNICATION

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Trauma and physical pain: an urban-rural comparison of sexually abused girls in Burundi

Julia Schneider [a], Lena Krämer[a], Anja Rukundo-Zeller[b,c,d], Manassé Bambonyé[c,e], Jean-Arnaud Muhoza[c], Thierry Ndayikengurukiye[c], Lydia Nitanga[c], Amini Ahmed Rushoza[c] and Anselm Crombach[a,b,c,d]

[a]Psychology, Clinical Psychology and Psychotherapy for Children and Adolescents, Saarland University, Saarbrücken, Germany; [b]Psychology, Clinical Psychology and Clinical Neuropsychology, University of Konstanz, Konstanz, Germany; [c]Non-Governmental Organization Psychologues sans Frontières Burundi, Bujumbura, Burundi; [d]Non-Governmental Organization vivo international e.V., Konstanz, Germany; [e]Clinical Psychology, Université Lumière de Bujumbura, Bujumbura, Burundi

ABSTRACT

Background: Childhood sexual abuse (CSA) is a significant risk factor for physical and psychological difficulties, especially in (post-)war- and conflict affected regions. Survivors often suffer from both post-traumatic stress disorder (PTSD) and physical pain. Avoidance may contribute to symptom chronification. Yet, in rural areas daily physical obligations may render physical activities unavoidable for survivors. Living conditions post-CSA may play a decisive role in symptom development and chronification.
Objective: The aim of this study was to compare PTSD symptom severity and physical pain intensities post-CSA in rural and urban children/adolescents in Burundi. Additionally, the relationship between PTSD symptom severity and physical pain intensity was analysed.
Method: The sample comprised 138 sexually abused female children/adolescents ($M = 15.9$, $SD = 1.7$), of whom 65 lived in urban and 73 lived in rural areas. Local psychologists assessed PTSD symptom severity and pain intensities using standardized questionnaires.
Results: A Fisher's Exact Test revealed significantly lower pain intensities in rural compared to urban children/adolescents. No significant group differences in PTSD symptom severity were found using a T-Test. PTSD symptom severity correlated positively with pain intensity in the total sample ($\tau_{Overall} = .16$) and in the urban subgroup ($\tau_{Urban} = .16$).
Conclusion: The results indicate a relationship between physical pain intensity and living conditions, potentially through physical activity levels post-CSA. The findings also support a link between PTSD and physical pain, highlighting the importance of avoidance for the development and maintainance of both in young female CSA survivors.

Trauma y dolor físico: una comparación urbano–rural en niñas víctimas de abuso sexual en Burundi

Antecedentes: El abuso sexual infantil (ASI) constituye un factor de riesgo significativo para el desarrollo de dificultades físicas y psicológicas, especialmente en regiones afectadas por la guerra y conflictos (post guerra). Las sobrevivientes suelen presentar trastorno de estrés postraumático (TEPT) y dolor físico. La evitación podría contribuir a la cronificación de los síntomas. Sin embargo, en zonas rurales las obligaciones físicas cotidianas pueden hacer que las actividades físicas sean inevitables para las sobrevivientes. Las condiciones de vida posteriores al ASI podrían desempeñar un rol decisivo en la aparición y cronificación de los síntomas.
Objetivo: Comparar la gravedad de los síntomas de TEPT y la intensidad del dolor físico posterior al ASI en niñas y adolescentes de zonas rurales y urbanas en Burundi. Además, se analizó la relación entre la gravedad del TEPT y la intensidad del dolor físico.
Método: La muestra incluyó a 138 niñas/adolescentes víctimas de abuso sexual ($M = 15.9$, $DE = 1.7$), 65 residentes en áreas urbanas y 73 en áreas rurales. Psicólogos locales evaluaron la gravedad del TEPT y las intensidades de dolor mediante cuestionarios estandarizados.
Resultados: La prueba exacta de Fisher mostró intensidades de dolor significativamente menores en las participantes rurales en comparación con las urbanas. No se encontraron diferencias significativas entre los grupos respecto de la gravedad del TEPT mediante prueba t. En la muestra total se observó una correlación positiva entre la gravedad del TEPT y la intensidad del dolor ($\tau_{General} = .16$), así como en el subgrupo urbano ($\tau_{Urbano} = .16$).
Conclusión: Los resultados sugieren una relación entre la intensidad del dolor físico y las condiciones de vida, posiblemente mediada por los niveles de actividad física posteriores al ASI. Los hallazgos también respaldan la asociación entre TEPT y dolor físico, destacando la importancia de su evitación y mantención en el desarrollo de ambos, tanto en niñas y adolescentes víctimas de ASI.

ARTICLE HISTORY
Received 28 July 2025
Revised 10 October 2025
Accepted 4 November 2025

KEYWORDS
Childhood sexual abuse; avoidance; physical pain; PTSD; rural-urban living conditions

PALABRAS CLAVE
Abuso sexual infantil; evitación; dolor físico; TEPT; urbano-rural condiciones de vida

HIGHLIGHTS

- Living conditions (rural vs. urban) significantly influence physical pain intensity in children and adolescents following CSA exposure.
- PTSD symptom severity is positively associated with physical pain, suggesting shared underlying mechanisms.
- Differences in physical activity levels and avoidance behaviours may contribute to variations in trauma-related physical symptoms.

CONTACT Julia Schneider julia.schneider2@uni-saarland.de Psychology, Clinical Psychology and Psychotherapy for Children and Adolescents, Saarland University, PO Box: 15 11 50 | 66041, Saarbrücken, Germany,

1. Introduction

In the aftermath of childhood sexual abuse (CSA) high levels of posttraumatic stress disorder (PTSD) are common across childhood, adolescence, and adulthood (Boumpa et al., 2024). Survivors often develop negative cognitions related to this traumatic experience, increased feelings of threat, and tend to engage in avoidant coping strategies (Ehlers & Clark, 2000). However, avoidance hinders the processing and reappraisal of traumatic experiences, and hence contributes to the development and persistence of PTSD symptoms (Dunmore et al., 2001; Ehlers & Clark, 2000; Meiser-Stedman, 2002).

Furthermore, research has established a strong link between CSA and physical pain (e.g. Hart-Johnson & Green, 2012; Irish et al., 2010). While most studies focused on chronic pain (Lampe et al., 2003; Savluk et al., 2019), immediate pain symptoms post-CSA have recevied little attention. Nevertheless, one study found that 64% of CSA suvivors reported severe pain within 48 h of the abuse, and 52% continued to experience pain one week later (McLean et al., 2012). While injuries stemming from forced penetration or other abuse-related violence (Longombe et al., 2008; Ravn et al., 2018; Sugar et al., 2004) partially explain the high prevalence of physical pain post-CSA, many survivors also report widespread pain in non-injured areas, as revealed in physical exams and nurse assessments (Tsur et al., 2022; Ulirsch et al., 2014).

Peritraumatic pain serves a protective function by initially triggering survival behaviours, i.e. crying or shouting (Katz et al., 2021; Tsur et al., 2022), but can also induce trauma-related pain intrusions ultimately leading to central sensitization (Johnson & Greenwood-Van Meerveld, 2014; Liedl & Knaevelsrud, 2008; Woolf, 2011). Consequently, emerging catastrophic misinterpretations of somatic responses often promote avoidance and inactivity preventing potentially pain-evoking activities (Liedl & Knaevelsrud, 2008) – a mechanism called fear-avoidance (Vlaeyen & Linton, 2000). Although fear-avoidance can reduce immediate pain and distress, it also prevents individuals from correcting maladaptive fear-avoidance beliefs in the long-term, perpetuating a vicious cycle of increasing anxiety and inactivity (Liedl & Knaevelsrud, 2008; Norton & Asmundson, 2003).

Prior research has documented a high comorbidity of PTSD and physical pain (Asmundson et al., 2002; de Vries et al., 2021; Moeller-Bertram et al., 2012; Pacella et al., 2013). To explain the mechanisms linking PTSD and physical pain, Liedl and Knaevelsrud (2008) proposed the Perpetual Avoidance Model (PAM). According to the PAM, PTSD and physical pain are linked through two interrelated cycles – one for PTSD and one for physical pain. Dysfunctional cognitions and hyperarousal following a traumatic experience trigger physical and psychological stress responses and reinforce avoidant behaviours, promoting PTSD symptoms. Elevated physical stress responses also contribute to central sensitization, lowering the pain threshold resulting in heightened experiences of pain. Combined with fear-avoidance beliefs, individuals become increasingly avoidant and inactive, fuelling both PTSD and pain symptoms. Avoidance thus plays a central role in linking and perpetuating both cycles. In line with the PAM, activity avoidance in pain patients has been linked to impairments in both physical and psychological functioning (Esteve et al., 2016).

Globally, a downward trend in physical activity levels shifting from active to sedentary lifestyles has been revealed (Katzmarzyk & Mason, 2009; Park et al., 2020; World Health Organization, 2002). This trend has also been observed among schoolchildren in sub-Saharan Africa, especially in urban areas compared to rural ones. In rural communities, daily routines often include manual labour, household chores, walking to school, and other physically straining, regular activities. Urban residents, on the other hand, often have greater access to services and infrastructure, i.e. motorized transportation and television, reducing their physical exertion in their daily routines (Muthuri et al., 2014). In line with these findings, a study comparing urban and rural adolescents 15 years and older in Cameroon ($N = 2.325$) revealed significantly lower physical activity levels, and less time spent walking or cycling in urban compared to rural residents (Sobngwi et al., 2002). According to the PAM, such urban-bound inactivity may predispose children and adolescents to develop more severe PTSD symptoms and physical pain, whereas rural-bound activity may function as a buffer in rural-living CSA survivors (Esteve et al., 2016; López-Martinez et al., 2014).

Although emerging evidence suggests beneficial effects of physical activity on mental and physical well-being, research on its potential to buffer against the development and persistence of PTSD and physical pain remains limited, particularly in societies of the Global South struggling with significant disparities between urban and rural living conditions. The aim of this study was thus to compare potential differences between rural- and urban-living CSA survivors regarding PTSD symptom severity and physical pain intensity. We hypothesized that survivors living in urban areas would experience more severe PTSD symptoms and physical pain compared to those in rural areas. Additionally, we hypothesized a significant correlation between PTSD symptom severity and physical pain, regardless of living conditions.

This study was implemted in Burundi, a small country in Eastern Africa, with a long history of

ongoing violence following over a decade of civil war, and strong patriarchal norms. Elevated rates of childhood maltreatment and gender-based violence, including childhood sexual abuse, have been reported (Charak et al., 2017; Haro, 2018; Richter & Dawes, 2008; Uvin, 2009). Moreover, as Burundi is characterized by extreme societal disparities, urban and rural communities differ greatly in their daily activities. Urban life in Burundi involves more sedentary routines, i.e. motorized transportation, and television, while rural live requires a higher level of physical activity, i.e. farm work, the need to walk long distances for daily tasks like accessing markets, fetching water, and going to school.

2. Method

2.1. Participants

The final sample consisted of a total of $N = 138$ ($n_{Rural} = 73$, $n_{Urban} = 65$) Burundian female children and adolescents aged between 8 and 18 years ($M = 15.89$, $SD = 1.65$). All participants had contacted first aid centres 3–6 months earlier and were invited for a second, more in-depth screening. Twenty participants could not be contacted to deliver the invitation ($n_{Rural} = 11$, $n_{Urban} = 9$). No participant met our exclusion criteria of obvious cognitive impairment or not having been sexually abused. Three male participants were excluded from analyses because they were the only male participants, to rule out gender bias in the sample.

2.2. Study design and procedure

Recruitment took place between March and April 2021 in collaboration with the rural first aid centre Centre Nturengaho in the provinces Ngozi and Makamba, and the urban first aid centre Association Nationale de Soutien aux Séropositifs et maladies de Sida in Bujumbura, Burundi. Urban participants originated from the economic capital of Burundi, characterized by decent access to running water and electricity, high population density, and developed infrastructure. Rural participants originated from areas located 5–6 h from the economic capital in the hills of Burundi, with very limited access to running water and electricity and minimal infrastructure. All participants had contacted the centres 3–6 months earlier and had been screened for mental disorders to include them into a larger research project preventing mental health deterioration in the aftermath of childhood sexual abuse (Schneider et al., 2025). The children included in this study were part of the control group and had received no specific intervention. Data was collected through individual semi-structured clinical interviews. The assessments were conducted by experienced local psychologists from the Non-Governmental Organization Psychologues sans Frontières Burundi (PSF). The PSF psychologists participated in ongoing supervision and consultation with international trauma experts (co-authors A. C. R.-Z., M. B., and A. C.). The interviews lasted on average between 1.5 and 2 h, with breaks if needed.

The implementation of this study was supported by the Université Lumière of Bujumbura, and participant travel expenses were covered by research funds (~5€ per person). The study and all procedures were approved by the ethics committee of the University of Konstanz and adhered to the Declaration of Helsinki. Participants were informed about the study's objectives and procedures, and written consent was obtained from them and their caregivers prior to the interview. They were assured of the anonymization of data for scientific purposes and potential publications and that participation was voluntary.

2.3. Measures

In a double-blinded process, all instruments used were translated and back translated between English, French and Kirundi. Inconsistencies in the translations were discussed in detail with local experts. All relevant instruments were previously used in studies on mental health in Burundi (Crombach et al., 2014; Crombach & Elbert, 2014).

We collected *sociodemographic information*, including sex, age, birthplace, educational level, and professions of parents or other caregivers. Furthermore, we collected information about the *sexual abuse*, including the date, location, specific circumstances of the incident, and whether the abuse involved penetration. Additionally, we assessed the participant's relationship to the offender, as well as the offender's age and sex.

We measured physical pain intensities on a Likert scale using the 11-point Numeric Rating Scale (NRS-11) ranging from 0 (no pain) to 10 (worst possible pain) (Farrar et al., 2001). The NRS-11 retrospectively assesses physical pain intensities for each day of the week preceding the interview. Pain intensity scores are calculated by averaging the summed pain intensities across four daily time points and dividing it by the number of days assessed. Higher scores indicate higher pain intensities. We used those to illustrate associations graphically. Furthermore, we created a dichotomous variable of pain – present vs not present – to conduct more robust statistical tests. The NRS-11 has been effectively used in previous research (Alghadir et al., 2016; Pathak et al., 2018), and validated in non-Western developing countries, showing good to excellent psychometric properties across cultures (Sharma et al., 2017). In our study, we obtained a Cronbach's α of 0.99 for average pain intensities.

The University of California Los Angeles (UCLA)-PTSD Reaction Index (RI; Steinberg et al., 2004; Steinberg et al., 2013) for children and adolescents was used to assess the *number of* experienced *traumatic events* and *PTSD symptom severity* over the past month based on the DSM-5 criteria (Pynoos & Steinberg, 2015). Participants confirmed if they had experienced 14 traumatic event types, yielding a score between 0 and 14. The symptom checklist comprises 31 items scored on a 5-point Likert scale ranging from 0 (none of the time) to 4 (all of the time). An overall PTSD severity score ranging from 0 to 80 was obtained by summing the individual symptom scores excluding dissociative features (Pynoos & Steinberg, 2013), with higher scores indicating more severe PTSD symptoms. The DSM-5 RI has been used and validated in non-Western low-income countries (Doric et al., 2019; Kaplow et al., 2020) including Burundi (Rukundo-Zeller et al., 2022). In our sample, the symptom checklist demonstrated excellent reliability, with a Cronbach's alpha of $\alpha = .92$.

2.3.1. Data analysis

Based on the assumption that all data points represent true values and interviews were conducted by trained psychologists, we incorporated all values, including outliers, in the analysis. To compare descriptive group differences as well as differences in PTSD-symptom severity, two-sided t-tests for independent samples with Welch correction (Welch, 1947) were calculated, to account for non-normality and inequality in variances (Kubinger et al., 2009). Given that only 6 participants in the rural cohort reported having experienced pain, we decided to use binary measures for pain, to ensure robust and interpretable statistical comparisons. We calculated a Fisher's Exact Test to assess the relationship between living condition and pain. Correlations were calculated using Kendall rank correlations (Kendall, 1938) to account for outliers and non-linearity (Newson, 2002). Effect sizes were calculated using Cohens' *d* for PTSD and Odds Ratios for pain (Cohen, 1988; Field, 2013). All analyses used a two-tailed $\alpha = 0.5$. Analyses were performed using the statistics software R version 2021.9.2.

3. Results

See Table 1 for demographic details. In the rural sample, 70 (96.0%) reported having experienced a sexual abuse including penetration, in the urban sample 62 (95.4%) reported having experienced a sexual abuse including penetration ($p \leq 1.0$). More participants of the rural sample ($n = 53$ (72.6%)) than the urban sample ($n = 17$ (26.2%)) knew their offenders ($p < .001$). None of the offenders in the rural sample was related to the survivor, whilst 3 (4.6%) of the offenders in the urban sample were related to the survivors ($p = .102$).

3.1. PTSD symptom severity and pain

Rural-living individuals did not significantly differ in PTSD symptom severity ($M = 16.04$, $SD = 12.58$) compared to urban-living individuals ($M = 13.75$, $SD = 9.30$), $t(131.7) = -1.22$, $p = .224$, $d = -0.21$, 95%CI [−0.54, 0.13]; see Figure 1. A Fisher's Exact test indicated that there was a significant association between living condition and pain ($p < .001$, OR = 7.81, 95% CI [2.83, 25.26]; see Figure 2). Urban-living individuals were more likely to report pain symptoms ($n = 27$; 41.5%) than rural-living individuals ($n = 6$; 8.2%).

As illustrated in Figure 3, PTSD symptom severity correlated significantly with physical pain intensity in the total sample ($\tau = .16$, 95%CI [.07, .24], $p = .010$). Moreover, a significant correlation between PTSD symptom severity and physical pain intensity could be observed within urban-living individuals ($\tau = .16$, 95%CI [.01, .31], $p = .047$). As only six individuals of the rural sample reported pain symptoms, a reliable estimation of the correlation was not possible in this subgroup.

4. Discussion

In this cross-sectional study, we showed that post-CSA urban-living individuals reported more frequently pain symptoms than rural-living individuals. Living conditions did not have a significant impact on PTSD symptom severity. Furthermore, results indicate a modest positive correlation between PTSD symptom severity and pain intensities.

Consistent with previous findings, we found that living conditions might influence the development of physical pain symptoms (Muthuri et al., 2014; Sobngwi et al., 2002). In line with the PAM, we suggest that our findings support the association between physical inactivity and avoidance and elevated levels of chronic pain through fear-avoidance beliefs (López-Martinez et al., 2014; McGeary et al., 2020; Vlaeyen & Linton, 2000). Unlike their urban-living counterparts, rural-living individuals have to engage in more physically active daily routines limiting the possibility to engage in avoidant and inactive behaviours – further influenced by the sharing of common spaces and hence having fewer options to withdraw from others or difficult situations. Additionally, due to more physically active routines rural-living individuals may have developed a higher pain tolerance than those living in urban environments (Årnes et al., 2023; Zecchin-Oliveira & Poli-Neto, 2020). However, as we did not directly assess physical activity, other factors might contribute to explaining the rural-urban differences. E.g. noise, crowding, and traffic in urban

Table 1. Sociodemographic details of participants.

	Rural			Urban			
	M	*SD*	Range	*M*	*SD*	Range	*p*
Age	16.18	1.19	12–18	15.57	02.01	8–18	.035
Education	5.33	2.84	0–10	5.12	3.05	0–12	.684
Age of Offender	27.64	6.79	18–44	28.90	10.35	15–70	.411
Time since abuse at FUP	6.67	4.99	3–34	7.49	1.83	6–20	.193
Number of traumatic events	5.36	2.46	1–11	5.74	2.46	1–12	.365
Pain intensity	0.16	0.80	0–5	0.84	1.14	0–3	< .001
PTSD symptom severity	16.04	12.58	0–52	13.75	9.30	0–38	.224
PTSD Avoidance	1.73	1.65	0–7	1.74	1.45	0–4	.963

Note: $n_{rural} = 73$, $n_{urban} = 65$. Educational level measured in years in school. Time since abuse measured in months. FU*P* = Follow-Up.

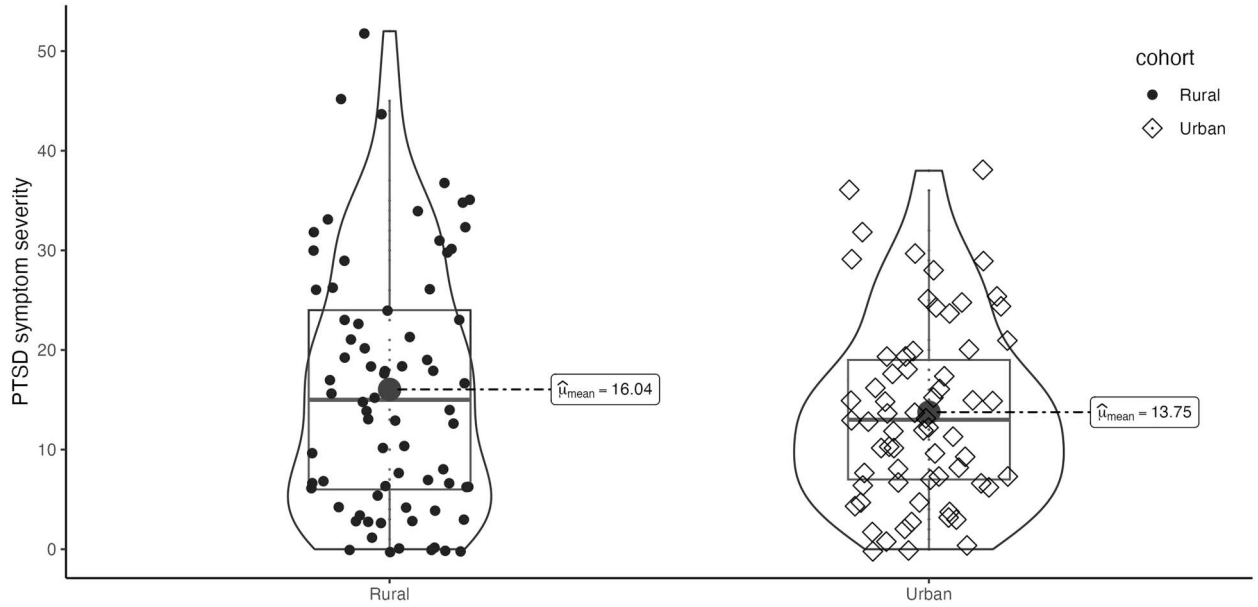

Figure 1. *PTSD symptom severity across cohorts.*

Note: n_{rural} = 73, n_{urban} = 65. (a) Box-and-whisker plot illustrating the interquartile range: mean values are indicated by grey dots.

environments might further increase stress (Sadeghpoor et al., 2024), thereby increasing pain sensitivity in urban-living individuals (Nelson et al., 2021). Furthermore, limited resources and long distances to healthcare may lead rural children and adolescents to underreport pain due to learned restraint rather than lower pain experience. Furthermore, social support has been previously linked to a reduction in physical pain (Esteve et al., 2016). Potential differences in social support, as reported in high-income countries (Card & Delgado-Ron, 2025), might contribute to reduced pain in the rural population. However, these differences of Western countries might not apply to the same extent to the Burundian context.

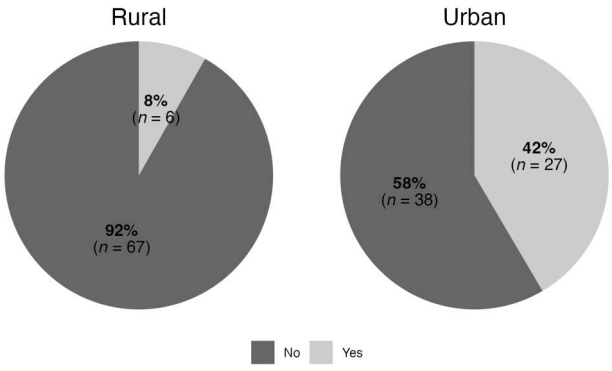

Figure 2. Distribution of participants reporting pain across cohorts.

Note: n_{rural} = 73, n_{urban} = 65.

According to the PAM, we assumed that avoidance behaviours influence not only the pain cycle, but also the PTSD cycle. Moreover, previous studies have shown significant reductions in PTSD symptoms following regular physical activity, e.g. walking (Björkman & Ekblom, 2021; Jadhakhan et al., 2022). However, contrary to our expectations, we did not find significant differences between rural-living and urban-living survivors regarding PTSD symptom severity. Possibly, survivors, regardless of their physically active or avoidant behaviours, might still avoid environmental cues, social situations or other reminders associated with the traumatic experience, e.g. by employing cognitive strategies (Ehlers & Clark, 2000). Our finding of no significant group differences in the PTSD subcluster avoidance, despite

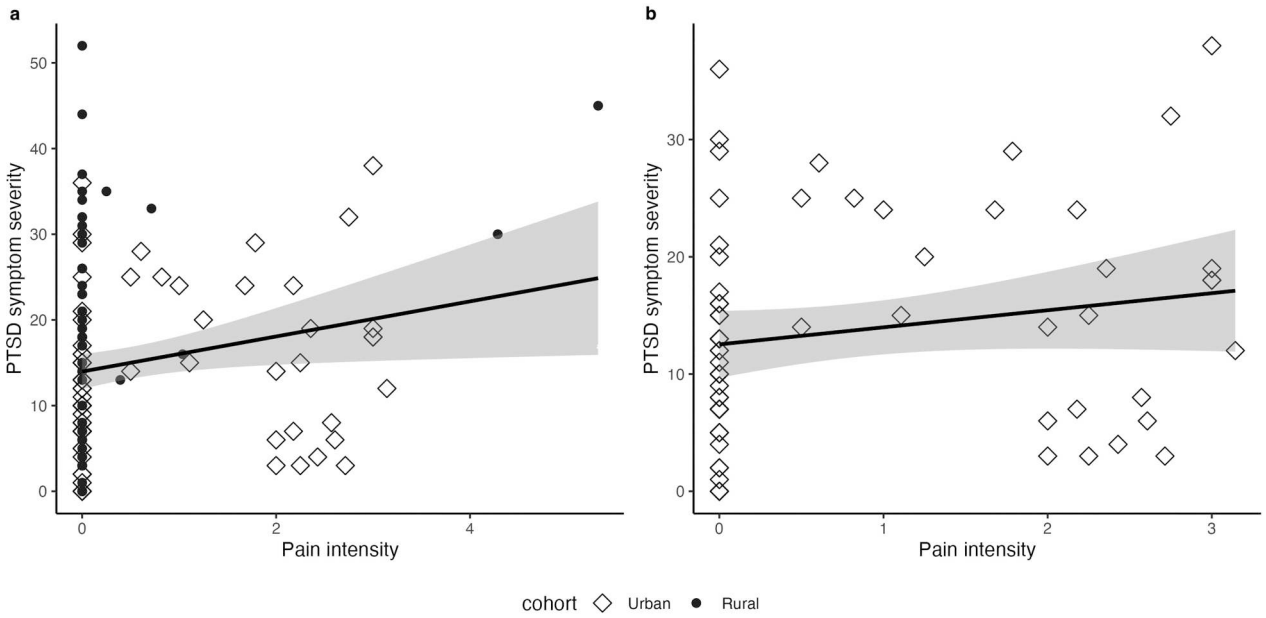

Figure 3. Scatterplots assessing the correlations between physical pain intensities and PTSD symptom severity for (a) the total sample, (b) the urban sample.

significant differences in pain symptoms, supports the idea that avoidance in PTSD may reflect a construct distinct from avoidance of physical activity. The latter would explain why aerobic exercise yields greater improvements in PTSD symptoms if combined with trauma-focused treatments (Bryant et al., 2023), and not if offered as a stand-alone intervention. Whilst previous literature found effect sizes ranging from small to large regarding the effect of exercise on both, PTSD (Jadhakhan et al., 2022) and physical pain (Geneen et al., 2017), potential differences in physical activity due to living circumstances might not be sufficient to reduce PTSD symptoms. Alternatively, the very low number of rural-living survivors reporting physical pain symptoms might also reflect a higher pain tolerance due to an overall increased physical activity and thus an increased physical fitness (Årnes et al., 2023; Jones et al., 2014). Most likely both explanations contribute to the low pain intensities reported in the rural survivors despite the fact that physically demanding activities, e.g. carrying water, walking long distances, have been shown to increase musculoskeletal pain (Delele et al., 2018; Mukiese et al., 2024).

Our results align with previous research evidencing high co-morbidities of PTSD and physical pain (de Vries et al., 2021; Moeller-Bertram et al., 2012). Following the PAM, we assume that avoidance behaviours might play a central role in explaining the association between PTSD and pain in our sample (Liedl & Knaevelsrud, 2008). However, since we have not assessed specific mechanisms linking PTSD and physical pain, the role of avoidance remains speculative. Alternatively, shared neurobiological mechanisms, e.g. hyperarousal, dysregulated stress responses, cognitive-emotional factors, such as heightened negative affect, catastrophizing and attentional bias, as well as social and environmental factors like social withdrawal along with reduced social support might account for the association of PTSD and pain (Asmundson et al., 2002; de Vries et al., 2021; Esteve et al., 2016; López-Martinez et al., 2014).

4.1. Limitations

Several limitations affect the interpretation of the results. The study's cross-sectional design restricts causal conclusions. The lack of a control group without CSA experiences limits the generalizability of the results. Furthermore, generalizability is limited to female survivors of CSA. Retrospective self-reporting, although generally found to be reliable assessments for both pain and PTSD symptoms (Brauer et al., 2003; Greene et al., 2022), may have introduced memory or perception biases. Finally, avoidance behaviours and physical activity were not explicitly measured. Differences in pain development between groups can thus not be definitively attributed to these factors. Future studies should thus specifically assess physical activity, e.g. school commutes or recreational activities, to analyse the relationship between pain and avoidance of physical activity.

5. Conclusion

Our findings suggest that physical pain intensity post-CSA is associated with geographic living conditions, potentially through physical activity levels of daily

routines following the abuse. Physical activity might mitigate the development of physical pain symptoms through limiting avoidance behaviours in rural low-income regrions. The results also supported a link between PTSD symptom severity and physical pain intensity, highlighting the importance of avoidance for the development and maintainance of both in female adolescent CSA survivors.

Acknowledgements

We are grateful to the first aid centres Centre Nturengaho and Association Nationale de Soutien aux Séropositifs et maladies de Sida for their collaboration and assistance in recruiting clients for this study. Furthermore, we would like to thank all the participants who contributed their time and stories to this research. The NGOs Psychologues sans Frontières Burundi and vivo international provided the necessary infrastructure for this research project. Justin Preston proofread our manuscript.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by the W. P. Schmitz Stiftung (VWN 81-5-1 to A. Crombach); Stiftung für Entwicklungszusammenarbeit Baden-Württemberg (SEZ; bw-Burundi_2020-116 to A. Crombach & A. C. Rukundo-Zeller); University of Konstanz (Young Scholar Fund to A. Crombach). The Hector Fellow Academy awarded a PhD scholarship to A. C. Rukundo-Zeller.

Data availability

Due to the highly sensitive nature of this research, we did not make their data available in a data repository. However, participants gave their informed consent that excerpts of the data that guarantee anonymity may be shared with other researchers upon reasonable request. Please address requests to the corresponding author.

ORCID

Julia Schneider http://orcid.org/0009-0003-6658-6171

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