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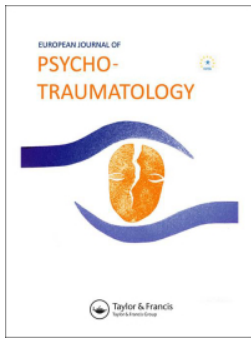
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BASIC RESEARCH ARTICLE



Trauma exposure and psychometric properties of the life events checklist among adults in South Africa

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ABSTRACT

Background: Trauma exposure is widespread and linked to chronic physical and mental health conditions including posttraumatic stress disorder. However, there are major gaps in our knowledge of trauma exposure in Africa and on the validity of instruments to assess potentially life-threatening trauma exposure.

Objective: The Life Events Checklist for the DSM-5 (LEC-5) is a free, widely used questionnaire to assess traumatic events that can be associated with psychopathology. As part of a case-control study on risk factors for psychosis spectrum disorders, we used the LEC-5 to examine the frequency of traumatic events and to assess the questionnaire's factor structure in South Africa ($N = 6,765$).

Method: The prevalence of traumatic events was measured by individual items on the LEC-5 across the study sample, by case-control status, and by sex. Cumulative trauma burden was calculated by grouping items into 0, 1, 2, 3, and ≥ 4 traumatic event types. Psychometric properties of the LEC-5 were assessed through exploratory and confirmatory factor analyses.

Results: More than 92% of the study sample reported experiencing ≥ 1 traumatic event; 38.7% reported experiencing ≥ 4 traumatic event types. The most endorsed item was physical assault (65.0%), followed by assault with a weapon (50.2%). Almost 94% of cases reported ≥ 1 traumatic event compared to 90.5% of controls ($p < .001$) and 94% of male participants reported ≥ 1 traumatic event compared to 89.5% of female participants ($p < .001$). Exploratory factor analysis revealed a 6-factor model. Confirmatory factor analyses of three models found that a 7-factor model based on the South African Stress and Health survey was the best fit (standardized root mean square residual of 0.024, root mean square error of approximation of 0.029, comparative fit index of 0.910).

Conclusion: Participants reported very high exposure to traumatic events. The LEC-5 has good psychometric properties and is adequate for capturing trauma exposure in South Africa.

Exposición al trauma y propiedades psicométricas de la Lista de chequeo de Eventos Vitales entre adultos de Sudáfrica

Antecedentes: La exposición al trauma está muy extendida y se relaciona con enfermedades físicas y mentales crónicas, incluido el trastorno de estrés postraumático. Sin embargo, existen importantes brechas en nuestro conocimiento sobre la exposición al trauma en África y sobre la validez de los instrumentos para evaluar la exposición al trauma potencialmente mortal.

Objetivo: La Lista de chequeo de Eventos Vitales del DSM-5 (LEC-5) es un cuestionario gratuito y ampliamente utilizado para evaluar acontecimientos traumáticos que pueden asociarse a psicopatología. Como parte de un estudio de casos y controles sobre factores de riesgo de trastornos del espectro de la psicosis, utilizamos la LEC-5 para examinar la frecuencia de acontecimientos traumáticos y evaluar la estructura factorial del cuestionario en Sudáfrica ($N = 6.765$).

Método: La prevalencia de eventos traumáticos se midió por ítems individuales en el LEC-5 a través de la muestra de estudio, por estatus de caso-control, y por sexo. La carga traumática acumulada se calculó agrupando los ítems en 0, 1, 2, 3 y > 4 tipos de eventos

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Propiedades psicométricas; EFA; CFA; Estresor; Trastorno por estrés postraumático (TEPT)

关键词

心理测量特性; EFA; CFA; 应激源; 创伤后应激障碍 (PTSD)

HIGHLIGHTS

- Trauma exposure was extremely prevalent in this South African sample, with less than 8% of participants reporting zero exposure to traumatic events.
- This was the first time the factor structure of the LEC-5 was assessed in South Africa.
- A confirmatory factor analysis using a 7-factor model based on a previous study of trauma exposure, the South African Stress and Health study (SASH), was the best fit for the LEC-5.

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traumáticos. Se evaluaron las propiedades psicométricas del LEC-5 mediante análisis factoriales exploratorios y confirmatorios.

Resultados: Más del 92% de la muestra del estudio informó haber experimentado ≥ 1 evento traumático; el 38,7% informó haber experimentado ≥ 4 tipos de eventos traumáticos. El ítem más refrendado fue la agresión física (65,0%), seguido de la agresión con arma (50,2%). Casi el 94% de los casos refirieron ≥ 1 evento traumático en comparación con el 90,5% de los controles ($p < 0,001$) y el 94% de los participantes masculinos refirieron ≥ 1 evento traumático en comparación con el 89,5% de las participantes femeninas ($p < 0,001$). El análisis factorial exploratorio reveló un modelo de 6 factores. Los análisis factoriales confirmatorios de tres modelos hallaron que un modelo de 7 factores basado en la encuesta sudafricana sobre estrés y salud era el que mejor se ajustaba (residuo cuadrático medio estandarizado de 0,024, error cuadrático medio de aproximación de 0,029, índice de ajuste comparativo de 0,910).

Conclusiones: Los participantes informaron una exposición muy elevada a eventos traumáticos. La LEC-5 tiene buenas prioridades psicométricas y es adecuada para captar la exposición al trauma en Sudáfrica.

南非成年人生活事件清单的创伤暴露和心理测量特性

背景: 创伤暴露很普遍, 与包括创伤后应激障碍在内的慢性身心健康状况有关。然而, 对于非洲创伤暴露的了解以及评估潜在危及生命的创伤暴露工具的有效性方面存在重大缺口。

目的: DSM-5 生活事件清单 (LEC-5) 是一种广泛使用的免费问卷, 用于评估可能与心理病理学相关的创伤事件。作为精神病谱系障碍风险因素病例对照研究的一部分, 我们使用 LEC-5 来考查创伤事件的频率并评估南非调查问卷的因素结构 ($N = 6,765$)。

方法: 通过研究样本中 LEC-5 的个别条目、病例对照状态和性别来衡量创伤事件的发生率。通过将条目分为 0、1、2、3 和 4 次以上创伤事件类型来计算累积创伤负担。通过探索性和验证性因素分析评估了 LEC-5 的心理测量特性。

结果: 超过 92% 的研究样本报告经历了 1 次以上创伤事件; 38.7% 的人报告经历过 4 种以上的创伤事件类型。最频发的条目是人身攻击 (65.0%), 其次是使用武器进行攻击 (50.2%)。几乎 94% 的病例报告超过 1 次创伤事件, 而对照组为 90.5% ($p < .001$), 94% 的男性参与者报告超过 1 次创伤事件, 而女性参与者为 89.5% ($p < .001$)。探索性因素分析揭示了一个六因素模型。三个模型的验证性因素分析发现, 基于南非压力和健康调查的七因素模型拟合最好 (标准化均方根残差为 0.024, 近似均方根误差为 0.029, 比较拟合指数为 0.910)。

结论: 参与者报告了非常高的创伤事件暴露程度。LEC-5 具有良好的心理测量优势, 足以捕捉南非的创伤暴露情况。

Introduction

Trauma exposure is widespread globally and is a known risk factor for a range of mental and physical health conditions, including posttraumatic stress disorder (PTSD), depression, anxiety, psychosis, substance use disorders, and other chronic physical conditions (Kessler et al., 2017; Merrick et al., 2019; Scott et al., 2013; Varese et al., 2012). This is also true in South Africa, where population-representative studies show that more than 70% of adults have been exposed to at least one traumatic event in their lifetime, with these exposures associated with high rates of PTSD, anxiety, and mood disorders (Atwoli et al., 2013; Atwoli et al., 2015; Benjet et al., 2016). In addition, a recent meta-analysis found an overall pooled prevalence of 22% of probable PTSD in Africa (Ng et al. 2020).

The Life Events Checklist (LEC) is a widely used scale to assess distressing events that can result in PTSD (Weathers et al., 2013), with the most recent version based on the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 2013). The LEC is free and has been selected by experts as a recommended tool for measuring trauma and adversity exposure in studies with human participants (www.phenxtoolkit.org/protocols/view/630101).

As a stand-alone measure of trauma exposure, the LEC has been shown to capture traumatic events that happened directly to a person (i.e. being the direct victim of physical or sexual assault) (Gray et al., 2004). The LEC was developed in the United States and has been adapted in other countries, including South Korea and Poland (Bae et al., 2008; Gray et al., 2004; Rzeszutek et al., 2018).

In the United States, the LEC was found to have good test-retest reliability, moderate to almost perfect agreement across the items, and very good convergent validity (Gray et al., 2004; Kubany et al., 2000). In a sample of psychiatric outpatients in South Korea, Bae et al. found the temporal stability of the LEC was good, and the LEC-5 had excellent convergent validity with another trauma exposure scale (Bae et al., 2008; Beck et al., 2008). The Polish version of the LEC-5 found the temporal stability of the scale ranged from substantial to perfect agreement for all items (Rzeszutek et al., 2018).

The LEC has been used in several studies in Africa, and its psychometric properties were assessed in Kenya and Ethiopia in 2022 as part of the same parent study as this dataset, the Neuropsychiatric Genetics of

African Populations-Psychosis (NeuroGAP-Psychosis) study (Girma et al., 2022; Gray et al., 2015; Kwobah et al., 2022; Levin et al., 2021; Stevenson et al., 2019). In the Kenya sample from the NeuroGAP-Psychosis study, Kwobah et al. found an EFA revealed a 7-factor model, but a 7-factor model based on the South African Stress and Health study, was the best fit. In the Ethiopia sample from the NeuroGAP-Psychosis study, Girma et al. showed that an EFA of the LEC-5 led to a 4-factor model, but a 7-factor model was also the best fit.

Although lifetime exposure to traumatic events is an independent and significant risk factor for developing psychotic disorders, exposure to traumatic events may group together (Breslau et al., 1995); for example, underlying constructs such as impulsivity may increase the risk of multiple traumas such as accidents or injuries and may be associated with increased risk for future trauma exposure (Benjet et al., 2016). Understanding how events group together may inform the connection of these clusters to psychopathology (Borsboom & Cramer, 2013). There are two major approaches to conceptualizing, measuring, and modelling trauma exposure (Layne et al., 2010). The first is the common latent factor model, which assumes an underlying latent variable exists for the co-occurring traumatic events. The second one is the composite variable model, which emphasizes aggregating two or more highly related traumatic events.

While the LEC has been used previously in South Africa (Fjeldheim et al., 2014; Mhlongo et al., 2018; Nöthling et al., 2013), to the best of our knowledge, no study has examined its psychometric properties here before. The objectives of this study were to examine trauma exposure by type and by cumulative burden in a sample of 6,765 adults in South Africa from the NeuroGAP-Psychosis study across the whole study population by case-control status, and by sex. In addition, under the common latent factor model framework, we sought to determine the factor structure of the LEC-5 in this setting.

Methods

Participants

Data for the LEC-5 were collected as part of NeuroGAP-Psychosis, a case-control study examining the genetic and environmental risk factors for psychosis spectrum disorders in Ethiopia, Kenya, South Africa, and Uganda (Stevenson et al., 2019). This paper focuses solely on South Africa and data collected from the launch of the study in April 2018 to December 2021. Cases were adults with a diagnosis of schizophrenia, schizoaffective disorder, bipolar disorder, or psychosis 'not otherwise specified' and were inpatients at psychiatric hospitals or patients returning to community health clinics for outpatient mental health

care, such as a medication refill. Controls were adults without a history of psychotic disorders seeking outpatient care for general medical conditions, were the caretakers of people seeking care, or were staff or students at the medical facilities. Cases and controls were recruited from 32 hospitals and community health centres in the Western Cape, Eastern Cape, and Northern Cape. They were recruited from the same medical facilities or nearby facilities in the same catchment area. To be included in the study, participants were required to be 18 years or older, demonstrate they had the decision-making capacity to consent to the research and be fluent in one of the three South African languages NeuroGAP-Psychosis was conducted in Afrikaans, English, or isi-Xhosa. Participants were excluded if they were under the acute influence of alcohol or drugs or were inpatients for a substance use disorder.

Procedures

The study visit was conducted in person by bachelor's-level or postgraduate-level research assistants, who received training in conducting research ethically, consenting participants, administering the study measures, and collecting data on a tablet before contacting participants. After consenting to be in the study, participants were asked various sociodemographic questions and questions about their mental health and potential trauma exposure. The standard self-report LEC-5 (described below) was administered and took approximately five minutes to conduct within the study visit (60-90 min). The University of Cape Town Human Research Ethics Committee (#466/2016), Walter Sisulu University Research and Ethics Committee (#051/2016), and the Harvard T.H. Chan School of Public Health's Institutional Review Board (#IRB17-0822) approved this study. A more detailed description of NeuroGAP-Psychosis is provided in the published research protocol (Stevenson et al., 2019).

A total of 6,841 participants consented to partake in the study. Twenty-four participants withdrew, and 52 were missing data (<1%) from the LEC-5, leaving a final sample of 6,765 participants in this analysis.

Measures

We collected a range of sociodemographic variables from participants, including age, sex at birth, race, the highest level of education achieved, marital status, and current living situation.

The LEC-5 is a 17-item scale assessing exposure to 16 different types of traumatic events, plus an additional open-ended question for any other very stressful event or experience. The response options for each exposure in this study were: 'happened to

me,' 'witnessed it,' and 'doesn't apply,' except for two items that cannot be directly experienced, 'witnessed sudden violent death' and 'witnessed sudden accidental death'; the response options for the latter two items were restricted to 'witnessed it' or 'doesn't apply.'

The LEC-5 was administered in Afrikaans, English, and isi-Xhosa. We translated the tool from English to Afrikaans and to isi-Xhosa through a forward and backward translation process. The team members were psychiatric nurses, psychologists, or public health professionals who had performed psychological/psychiatric research before conducting the translations. Forward translation was completed by a bilingual team member in either English and Afrikaans or English and isi-Xhosa. A separate team member who was also bilingual then back-translated the measure to English. The study team then compared the original measure in English and the back-translated version. For any discrepancies, team members discussed the differences and came to a consensus on the correct translation.

Data analysis

We calculated the frequency distributions of sociodemographic characteristics and traumatic events in the study sample and by case-control status and sex by calculating means and standard deviations (for continuous variables) and counts and percentages (for categorical variables). Student's *t*-test was used to evaluate continuous variables and the Chi-square test for categorical variables to determine bivariate differences. First, we looked at each of the 17 individual trauma types. Next, we created a sum score across the 17 trauma types. We assessed exposure as experiencing at least one traumatic event (≥ 1) and cumulative trauma burden by grouping the number of exposure types into five categories: 0, 1, 2, 3, and ≥ 4 .

The latent factor model was assessed through factor analysis. These analyses were restricted to the first 16 items. The last open-ended item was excluded since there is no defined variable, and it is impossible to group this item as a shared factor with other items. We conducted an exploratory factor analysis (EFA) on a random split-half sample of data. Before running the EFA, Pearson's correlations were run to determine the correlations between the 16 items. Bartlett's test of sphericity and Kaiser-Meyer-Olkin test were then run to determine whether the data was suitable for factor analysis. Bartlett's test of <0.05 statistical significance assumed substantial correlation in the data, and Kaiser-Meyer-Olkin values of ≥ 0.6 were considered acceptable for sampling adequacy (Hair et al., 2009). We conducted an EFA by extracting principal components and subjecting them to varimax rotation. We then used the Kaiser criterion (factors with eigenvalues >1) and those accounting for $\geq 5\%$ of the overall

variance to determine which factors to keep. Items with rotated loadings of >0.60 in absolute value were considered the 'strongest' and became the anchor item for each factor. Items with correlation coefficients of ≥ 0.3 were deemed adequate and were retained, and items of <0.3 were removed from the analysis. Rotated factor loadings of ≥ 0.3 on more than one factor were considered cross-loading; for items that loaded onto two factors, we retained the item on the factor with the higher correlation coefficient and removed the one with the lower value.

Next, confirmatory factor analysis (CFA)s were conducted to compare results among three models: (i) EFA from this study sample; (ii) A 6-factor model based on a previous EFA of the LEC, which was conducted in South Korea (Bae et al., 2008). The Korean EFA was combined with an EFA of a 27-item module from the World Health Organization Composite International Diagnostic Interview (CIDI) in the World Mental Health Survey (Benjet et al., 2016). We refer to this model as 'the prior 6-factor model' and (iii) 7-factor model of the same 27-item module from the World Health Organization CIDI was used in the South African Stress and Health Survey (SASH) Survey (Atwoli et al., 2013, p. 2016t). We refer to this model as 'the SASH 7-factor model.' The LEC-5 items were grouped into six categories that aligned with the WHO module: war events, physical violence, sexual violence, accidents, network events, and witnessing death. The LEC-5 did not include any items for 'unexpected death of loved one' but did include 'severe suffering' (listed separately in the model).

For the first model, we confirmed the EFA using the second half of the split sample. The other two CFA models were estimated on the full dataset with a maximum likelihood procedure and a sample variance-covariance matrix. Latent variables were correlated with one another for all three models based on past literature showing the association between traumatic events (Atwoli et al., 2015; Cohen et al., 2019), but measurement error was not assumed to be correlated. The marker item for each latent factor was the first item, and the reliability for single-item indicators was set at 0.8.

The following metrics of model fit were used to compare CFA models: (1) standardized root mean square residual (SRMR) of 0.08 or below; (2) root mean square error of approximation (RMSEA) of 0.06 or below; (3) comparative fit index (CFI) of 0.90 or above; (4) Tucker-Lewis index (TLI) of 0.90 or above (Hu & Bentler, 1999). A single final model was selected based on these criteria.

As a sensitivity analysis, we then ran the final chosen model separately in cases, controls, male participants, and female participants to assess goodness of fit and determine whether the model worked reasonably well in the four groups.

All analyses were conducted in Stata 17 (StataCorp 2021).

Results

A total of 6,765 participants (3,625 cases and 3,140 controls) were included in the present analysis (mean age = 37.8 years, SD = 11.9 years). More than half of the participants were men, and most participants had completed at least some secondary school. The study sample consisted of 53.6% cases and 46.4% controls. See Table 1 for selected demographic variables.

Traumatic events were widely reported in the sample population, in both cases and controls, and by men and women (see Table 2). More than 92% of study participants reported experiencing ≥ 1 traumatic exposure and 38.7% reported experiencing ≥ 4 types of traumatic events. Almost 94% of cases reported experiencing ≥ 1 traumatic event compared to 90.5% of controls ($p < .001$). In addition, one-third more cases than controls were exposed to ≥ 4 traumatic events ($p < .001$). Ninety-four percent of male participants reported ≥ 1 traumatic event compared to 89.5% of female participants ($p < .001$) and males reported a higher cumulative trauma burden than females ($p < .001$).

The majority of participants experienced physical assault and assault with a weapon. Physical assault was the most reported type of trauma (65.0% of the sample), followed by assault with a weapon (50.2% of the sample). Cases reported significantly more physical assault than controls (72.1% vs. 56.9%, $p < .001$), and male participants reported significantly

more physical assault than female participants (72.7% vs. 53.1%, $p < .001$). Cases were more likely to experience assault with a weapon than controls (56.0% vs. 43.6%, $p < .001$), and male participants were almost two times more likely to experience assault with a weapon than female participants (62.0% vs. 32.0%, $p < .001$). Exposure to a war zone was the least endorsed item across the study sample, by case-control status, and by sex. Captivity was the second least endorsed item across the sample, by cases and controls, and by male participants. The second least endorsed item for female participants was exposure to a toxic substance (3.1%).

Prior to the factor analyses, we ran the bivariate correlation of the LEC-5 items (see Supplemental Table 1 for the correlation matrix). The correlation coefficients were low, ranging from 0.011–0.319, which was expected since the LEC is not unidimensional. Bartlett's test was statistically significant ($p < .001$), and the Kaiser-Meyer-Olkin test was acceptable with a result of 0.7.

An EFA of the LEC-5 in this South African sample revealed a 6-factor model, which accounted for 49.2% of the variance. Across the scale, the following items clustered together: Factor 1: physical assault, assault with a weapon, life-threatening illness/injury, caused injury/harm/death; Factor 2: sexual assault, other unwanted sexual experience, captivity; Factor 3: witnessed sudden violent death, witnessed sudden accidental death; Factor 4: transportation accident, serious accident, exposure to a toxic substance, life-threatening illness/injury, severe human suffering; Factor 5: exposure to a toxic substance, exposure to

Table 1. Study sample demographics by full sample, case-control status, and sex*.

Selected variables	Study sample		Cases		Controls		Males		Females	
	6,765	100%	3,625	53.6%	3,140	46.4%	4,097	60.8%	2,647	39.3%
	Count	%	Count	%	Count	%	Count	%	Count	%
Age (Mean, SD)	37.8	11.9	39.3	11.7	36.2	11.8	37.0	11.4	39.2	12.4
Sex (%)										
Female Participants	2,647	39.3	1,058	29.4	1,589	50.6				
Male Participants	4,097	60.8	2,546	70.6	1,551	49.4				
Age categories (%)										
18–29	1,912	28.3	847	23.4	1,065	33.9	1,236	30.2	671	25.4
30–44	2,900	42.9	1,584	43.7	1,316	41.9	1,818	44.4	1,073	40.5
45–59	1,667	24.7	1,024	28.3	643	20.5	899	22.0	762	28.8
60+	284	4.2	168	4.6	116	3.7	142	3.5	141	5.3
Marital status (%)										
Single	4,471	66.3	2,760	76.6	1,711	54.5	3,045	74.3	1,426	53.9
Married or cohabitating	1,527	22.6	436	12.1	1,091	34.7	760	18.6	767	29.0
Widowed	182	2.7	103	2.9	79	2.5	56	1.4	126	4.8
Divorced or separated	552	8.2	300	8.3	252	8.0	230	5.6	322	12.2
Level of Education (%)										
No formal education	37	0.6	27	0.8	10	0.3	24	0.6	13	0.5
Primary	862	12.8	609	16.9	253	8.1	604	14.8	258	9.8
Secondary	4,657	69.1	2,376	65.9	2,281	72.7	2,867	70.0	1,790	67.7
University	1,185	17.6	591	16.4	594	18.9	601	14.7	584	22.1
Living arrangements (%)										
Alone	1,075	15.9	367	10.2	708	22.6	592	14.5	483	18.3
With parents	2,518	37.3	1,722	47.8	796	25.4	1,675	40.9	843	31.9
With spouse or partner	1,415	21.0	334	9.3	1,081	34.4	673	16.4	742	28.0
With friends or other relatives	1,638	24.3	1,108	30.7	530	16.9	1,101	26.9	537	20.3
Other or unknown	97	1.4	73	2.0	24	0.8	56	1.4	41	1.6

*Numbers may not add up to total due to missing

Table 2. Item-level endorsements of the LEC-5 and cumulative number of trauma types in South Africa for the study sample, by case-control status, and by sex.

LEC-5 Endorsements:	Study Sample		Cases		Controls		<i>p</i> -value	Males		Females		<i>p</i> -value
	6,765	100%	3,625	53.6%	3,140	46.4%		4,097	60.8%	2,647	39.3%	
Item-level endorsements:	Count	%	Count	%	Count	%		Count	%	Count	%	
1. Natural disaster	833	12.3	492	13.6	341	10.9	.001	482	11.8	351	13.3	.068
2. Fire or explosion	935	13.8	483	13.3	452	14.4	.203	575	14.0	359	13.6	.584
3. Transport accident	1,433	21.2	795	21.9	638	20.3	.105	894	21.8	532	20.1	.091
4. Serious accident	781	11.5	481	13.3	300	9.6	<.001	563	13.7	216	8.2	<.001
5. Exposure to toxic substance	304	4.5	175	4.8	129	4.1	.154	221	5.4	81	3.1	<.001
6. Physical assault	4,399	65.0	2,614	72.1	1,785	56.9	<.001	2,980	72.7	1,406	53.1	<.001
7. Assault with a weapon	3,399	50.2	2,029	56.0	1,370	43.6	<.001	2,541	62.0	847	32.0	<.001
8. Sexual assault	930	13.7	624	17.2	306	9.8	<.001	266	6.5	660	24.9	<.001
9. Other unwanted sexual experience	1,036	15.3	525	14.5	511	16.3	.041	344	8.4	690	26.1	<.001
10. Exposure to war zone	107	1.6	61	1.7	46	1.5	.474	91	2.2	16	0.6	<.001
11. Captivity (e.g. kidnapped, held hostage, abducted)	264	3.9	158	4.4	106	3.4	.037	138	3.4	126	4.8	.004
12. Life-threatening illness/injury	1,041	15.4	600	16.6	441	14.0	.004	680	16.6	361	13.6	.001
13. Severe human suffering	1,029	15.2	667	18.4	362	11.5	<.001	615	15.0	410	15.5	.593
14. Witnessed sudden violent death (e.g. homicide, suicide)	1,367	20.2	665	18.3	702	22.4	<.001	864	21.1	498	18.8	.023
15. Witnessed sudden accidental death	1,170	17.3	609	16.8	561	17.9	.248	779	19.0	390	14.7	<.001
16. Caused injury/harm/death	734	10.9	536	14.8	198	6.3	<.001	622	15.2	108	4.1	<.001
17. Any other stressful experience	1,858	27.5	944	26.0	914	29.1	.005	869	32.8	988	24.1	<.001
Any experience of trauma												
No	525	7.8	225	6.2	300	9.6	<.001	244	6.0	279	10.5	<.001
Yes	6,240	92.2	3,400	93.8	2,840	90.5		3,853	94.0	2,368	89.5	
Cumulative number of trauma types												
None	525	7.8	225	6.2	300	9.6	<.001	244	6.0	279	10.5	<.001
One type	1,125	16.6	511	14.1	614	19.6		602	14.7	518	19.6	
Two types	1,330	19.7	664	18.3	666	21.2		817	19.9	511	19.3	
Three types	1,166	17.2	632	17.4	534	17.0		754	18.4	406	15.3	
Four + types	2,619	38.7	1,593	42.9	1,026	32.7		1,680	41.0	933	35.3	

a war zone; Factor 6: natural disaster, fire or explosion. 'Exposure to a toxic substance' loaded on Factor 4 and Factor 5, with rotated factor loadings of 0.3806 and 0.5513 respectively. 'Life-threatening illness/injury' cross-loaded on Factor 1 and Factor 4, with rotated factor loadings of 0.3459 on Factor 1 and 0.3125 on Factor 4. The item with a higher correlation coefficient on each factor was retained, dropping both 'exposure to a toxic substance' and 'life-threatening illness/injury' from Factor 4. (See Table 3.)

We then conducted CFAs to evaluate the model fit of our EFA (the 6-factor model) and two previous models, the prior 6-factor model based on the South Korean/World Mental Health Survey factor analysis and the 7-factor model based on the SASH survey. Based on the six metrics of model fit, all three models had a good fit (see Table 4). The 7-factor model based on the SASH survey had the lowest SRMR (0.024), lowest RMSEA (0.029), and the highest CFI (0.910), followed by this study's EFA 6-factor model (SRMR of 0.028, RMSEA of 0.031, CFI of 0.903). None of the models met the TLI cut point of 0.90 or above, but the SASH 7-factor model had the highest CFI (0.873). While all three models had a good fit, the SASH 7-factor model was slightly better than the other two and was selected as the final model. (See Figure 1.) The sensitivity analysis found adequate model fit between cases and controls and between male and female participants. (See Supplemental Table 2).

Discussion

This study assessed the frequency and cumulative burden of traumatic events in a clinical sample of 6,765 participants across 32 hospitals and community health clinics in the Western, Eastern, and Northern Cape in South Africa. The study also sought to evaluate the factor structure of the LEC-5 in South Africa for the first time and to see how traumatic events grouped together.

We found that the prevalence of trauma exposure amongst all participants in this study was significantly higher than in prior research, with 92.2% of participants having been exposed to ≥ 1 traumatic event and almost 38.7% of all participants being exposed to ≥ 4 events. Previous prevalence studies have found that 70.8% of people worldwide, and 73.8% of people in South Africa had experienced ≥ 1 traumatic event in their lifetime (Atwoli et al., 2013; Benjet et al., 2016). While the World Mental Health surveys (Benjet et al., 2016), which included the data from SASH, was population-representative, it excluded participants living in institutions such as prisons and mental health facilities, suggesting that the researchers might have found higher rates of trauma if they had included participants from those settings. Participants from NeuroGAP-Psychosis were recruited from state hospitals and community health clinics. They were a mixture of cases with a diagnosis of a psychotic disorder and

Table 3. Exploratory Factor Analysis of an unspecified model / Principal component analysis with orthogonal varimax rotation for the LEC-5 in South Africa.

LEC-5 Item/variable	Factor Loading					
	Factor 1: Physical violence & injury	Factor 2: Sexual & captivity	Factor 3: Witnessed Death	Factor 4: Accidents & severe suffering	Factor 5: War & toxic substance	Factor 6: Environmental
1. Natural disaster						0.7747
2. Fire or explosion						0.5412
3. Transport accident				0.4986		
4. Serious accident				0.6904		
5. Exposure to toxic substance				0.3806	0.5513	
6. Physical assault	0.7494					
7. Assault with a weapon	0.7268					
8. Sexual assault		0.7691				
9. Other unwanted sexual experience		0.7515				
10. Exposure to war zone					0.7894	
11. Captivity (e.g. kidnapped, held hostage, abducted)	0.3932					
12. Life-threatening illness/ injury	0.3459			0.3125		
13. Severe human suffering				0.4845		
14. Witnessed sudden violent death (e.g. homicide, suicide)			0.7745			
15. Witnessed sudden accidental death		0.7928				
16. Caused injury/harm/ death	0.4672					
Eigenvalue	2.19425	1.34087	1.19653	1.09278	1.03249	1.01789
% Variance	9.45%	8.90%	8.52%	8.11%	7.16%	7.08%

Note. Loadings smaller than 0.3 are not displayed.

Table 4. Fit indices for comparison of confirmatory factor analysis models for the study sample for the LEC-5 in South Africa.

	X ²	df	SRMR	RMSEA	CFI	TLI
EFA 6 factor based on random split sample	365.981	89	0.028	0.031	0.903	0.869
Prior 6 factor (Korean/ WMH)	777.331	90	0.029	0.034	0.873	0.831
Prior 7 factor (SASH)	572.654	85	0.024	0.029	0.910	0.873

All chi-square values are significant at $p < 0.001$; EFA = Exploratory factor analysis; WMH = World Mental Health surveys; SASH = South African Stress and Health study; df = degrees of freedom; SRMR = standardized root-mean-square residual; RMSEA = root mean square error of approximation; CFI = comparative fit index; TLI = Tucker – Lewis index; AIC = Akaike information criterion; BIC = Bayesian information criterion.

controls who had no history of a psychotic disorder. Given that NeuroGAP-Psychosis is a case–control design, higher levels of trauma exposure than the general population were to be expected. In addition, even though the controls did not have a psychotic disorder, about half of them were outpatients seeking general medical care or a prescription refill, which typically trends with higher rates of trauma (Karthä et al., 2008). Despite the inclusion of a case–control sample, the scale performed adequately for all subgroups suggesting that it is informative for understanding trauma in this context.

It is expected, however, that there may be some difference in the calculated prevalence of trauma exposure between this study and the World Mental Health Surveys (and SASH) which used the 27-item CIDI since a different instrument was used for measuring traumatic events.

The differences in traumatic events that male and female participants reported in this sample aligned with prior studies on the distribution of trauma exposure by sociodemographic variables. Our findings that men reported more traumatic events (by both cumulative types of events and by ≥ 1 exposure) than women and that men reported more physical assault and women reported more sexual assault mapped onto previous research (Hatch & Dohrenwend, 2007).

Our EFA found a 6-factor model, which clustered items into factors grouped along: 1) physical violence and injury; 2) sexual violence and captivity; 3) witnessing death; 4) accidents and severe human suffering; 5) war and exposure to a toxic substance; and 6) environmental events. While we would presume some of these items to fall on the same factor, others, such as captivity, severe human suffering with war, and exposure to a toxic substance, were unexpected. Because we had such a low endorsement on some of these items (exposure to a toxic substance, war, and captivity are the three least endorsed items on the scale), it is possible that the factor analysis was ineffective at loading these events onto factors that would make sense to cluster together. In addition, ‘severe human suffering’ might have been a confusing question, and participants might have interpreted it differently from one another. Although 9.0% of the study sample endorsed severe human suffering, previous literature has suggested improvements to identifying traumatic exposures in traumatic event checklists and has recommended using an open-ended item to better

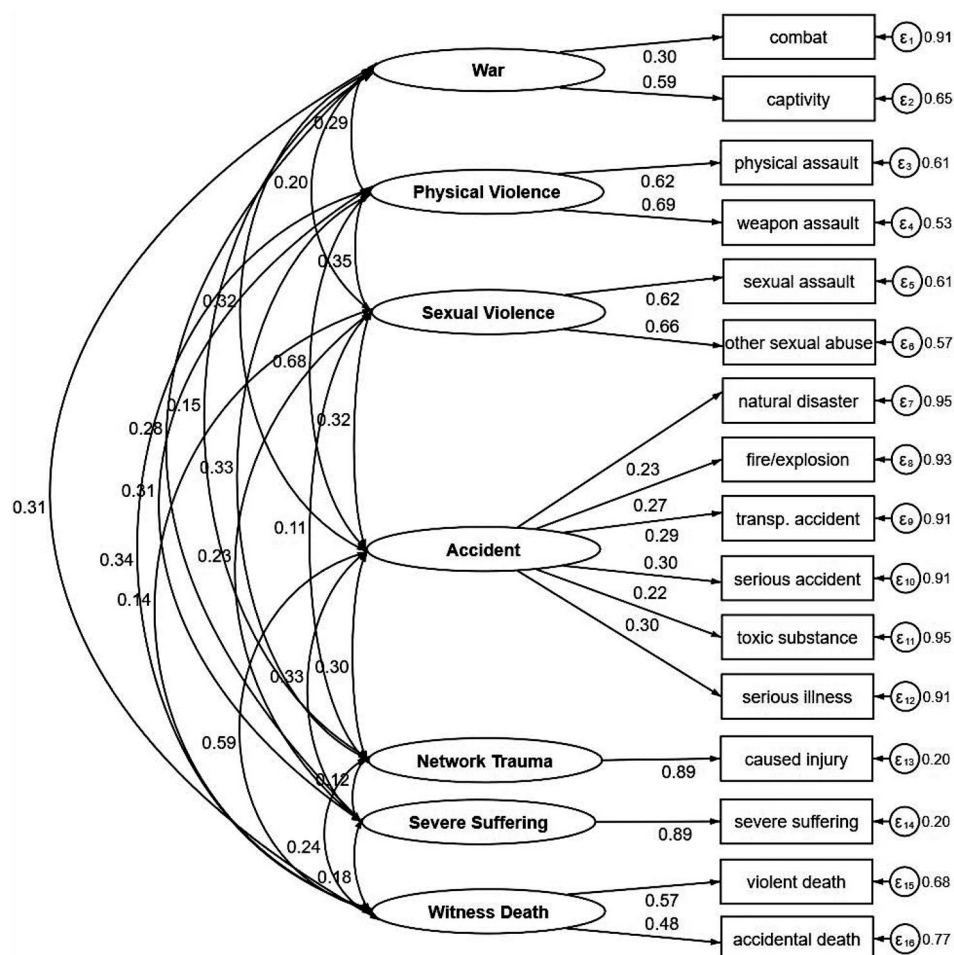


Figure 1. The Prior-7 factor model. Final model selected for Life Events Checklist for DSM-5 (LEC-5) in South Africa

understand the responses to this item (Schoenleber et al., 2018). In addition, it might be helpful to add a short descriptor in parenthesis for severe human suffering the way the LEC-5 does for captivity, sudden violent death, and other items, to make the definition of severe human suffering more explicit.

More than one-quarter of the sample population endorsed the open-ended item of the LEC-5, 'any other stressful experience,' suggesting that there might be additional country-specific trauma exposures that are not being captured by the scale in its current form and would be worthwhile to consider adding. For example, SASH included potentially traumatic events such as having a child with serious illness, being stalked, and saw atrocities that were not listed in the LEC-5, which were widely endorsed in that study (Atwoli et al., 2013). Given that the LEC-5 was developed in a different setting (the United States), pairing the tool with robust qualitative or semi-structured research in Western, Northern, and Eastern Cape in future research may elicit locally-relevant traumatic events that could be appended to the checklist. Although the LEC-5 is meant to be a non-exhaustive list, expanding the types of traumatic events may better detect common events in this population. Previous semi-structured research in Western Cape with people

who speak isi-Xhosa found several types of life events not captured in the LEC. For example, Hiller et al. found 'house robbery' as one participant's most upsetting trauma (Hiller et al., 2017). Another study found 66 important life events in this population ranging from having a family member with a serious mental illness to having trouble at work (Swartz et al., 1983), however, Swartz et al. used a broader concept of a life event as something with 'impact' as opposed to a traumatic event which could result in PTSD.

While the first 16 items of the LEC-5 do not capture the full range of traumatic events in this setting, there are limitations to adding population-specific items to a measure or developing a population-specific tool. By using a standardized tool, researchers are able to make comparisons across different populations and settings. Since this study is part of a larger study taking place in Ethiopia, Kenya, and Uganda (NeuroGAP-Psychosis), it was important to use uniform measures across all four countries to compare the results across sites and harmonize the data.

Our CFA of the 7-factor model, based on SASH, was the best fit of all three models. Given that the 7-factor model was based on data from South Africa, it makes sense conceptually that the factor structure assessed in the South African NeuroGAP-Psychosis sample was

the best fit. Interestingly, this same 7-factor model was also chosen as the best fitting model in two studies of the LEC-5 in Kenya and Ethiopia (Girma et al., 2022; Kwobah et al., 2022). Although sub-Saharan Africa consists of more than 45 countries, which are distinct geographically and culturally, there may be enough shared characteristics of trauma exposure in the region that trauma items trend in the same way. A cross-cultural examination of the LEC-5 in sub-Saharan Africa is worth investigating in future research.

There are different schools of thought about whether to conduct factor analysis on traumatic events checklists, particularly in an attempt to identify an underlying latent factor model. As Netland described in their 2001 and 2005 papers, trauma checklists can be seen as a composite variable with causal indicators (Netland, 2001; Netland, 2005). Our goal was not to see how the LEC-5 items were correlated with latent variables, but to use factor analysis to statistically organize traumatic events based on their co-occurrence of being endorsed together. We did not exclude any item based on the factor loading as the intention was to cluster the events, and not to identify latent variables (Netland, 2001). Our EFA result can only be interpreted as a statistical grouping of items instead of a theoretical one.

Going forward, the results from these factor analyses and how traumatic events group together may be used to investigate the relationship between these clusters and psychosis spectrum disorders. Future research aims to examine the pathways between groupings in the LEC-5 in relation to manic and psychotic symptoms, for example, in a network analysis (Isvoranu et al., 2017).

Limitations

As discussed previously, this study design is case-control and not a random sample from South Africa, so there may be limits to the generalizability of the prevalence of trauma exposure and cumulative trauma burden to the general population of the country. However, the study is strengthened by the large sample size of 6,765 participants, which is the largest study to date that we are aware of using the LEC-5. In South Africa, NeuroGAP-Psychosis took place in three different provinces, so while the study was not nationwide, it did have a good geographical representation, recruiting from one-third of South Africa's provinces and more than 30 healthcare facilities in both urban and rural settings.

Though this research was conducted in three languages, Afrikaans, English, and isi-Xhosa, we did not examine traumatic events or factor analysis by language, which may have revealed different patterns of exposure to trauma. This would be a worthwhile direction for future research.

Because the study was only administered to participants once, we did not conduct test-retest reliability of

the LEC-5. While the LEC was found to have good to perfect agreement in test-retest reliability studies in the United States, South Korea, and Poland, we did not conduct this in South Africa, which would have helped establish the temporal consistency of the LEC-5 in this sample.

Conclusion

This study is a meaningful contribution to the literature on trauma exposure and the factor model of the LEC-5 in South Africa. As a measure that is free, brief to administer, translated into three South African languages, and has good psychometric properties, the LEC-5 is a suitable screening tool for assessing trauma exposure in clinical practice and research in this setting.

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Data availability

All data will be deposited and made available through the National Institute of Mental Health Data Archive at this site: https://nda.nih.gov/edit_collection.html?id=3805.

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QUESTIONNAIRE

C18(26) Part 1 of 2

Trauma exposure and psychometric properties of the life events checklist among adults in South Africa

INSTRUCTIONS

- Read through the article and answer the multiple-choice questions provided below.
- **Some questions may have more than one correct answer;** in which case you must mark **all** the correct answers.

Introduction

Question 1: Trauma exposure is a widespread global issue that serves as a known risk factor for which of the following conditions?

- A:** Mild cognitive impairment and acute physical health problems
- B:** A range of mental and physical health conditions, including posttraumatic stress disorder (PTSD), depression, anxiety, psychosis, substance use disorders and other chronic physical conditions
- C:** Mainly acute psychotic episodes
- D:** Physical health conditions such as acute epilepsy and sometimes concomitant short-term anxiety

Question 2: When utilised as a stand-alone assessment instrument, what specific type of experiences has the Life Events Checklist been shown to capture?

- A:** Events that involve natural disasters and environmental phenomena
- B:** Childhood events that occurred before the age of twelve
- C:** Secondary trauma
- D:** Traumatic events that happened directly to a person

Question 3: What underlying construct may increase the risk of an individual experiencing multiple traumas, such as accidents or injuries?

- A:** Introversion
- B:** Impulsivity
- C:** Resilience
- D:** Hypervigilance

Question 4: When conceptualising trauma exposure, what does the common latent factor model assume regarding co-occurring traumatic experiences?

- A:** Two or more highly related traumatic events can be aggregated into a single score
- B:** All trauma is caused by environmental factors
- C:** An underlying latent variable exists for the co-occurring traumatic events
- D:** Past traumatic events have no correlational relationship with future exposures

Methods

Question 5: Which description accurately characterises the individuals who comprised the control group in the study design?

- A:** Adults without a history of psychotic disorders seeking outpatient care for general medical conditions
- B:** Individuals specifically diagnosed with anxiety and mood disorders who were hospitalised
- C:** Healthy volunteers recruited exclusively from local university campuses
- D:** Patients returning to community health clinics for mental health medication refills

Question 6: Aside from age and language fluency, what cognitive requirement was necessary for individuals to be included as participants in the study?

- A:** Proof of a formal education background at least at the secondary level
- B:** Documented evidence of previous psychological evaluations
- C:** Decision-making capacity to consent to the research
- D:** An understanding of genetic risk factors for psychiatric conditions

Question 7: During the forward and backward translation of the questionnaire, how did the research team resolve any discrepancies found between the original English measure and the back-translated version?

- A:** The primary investigator selected the most appropriate phrasing
- B:** Automated translation software was used to generate a definitive compromise
- C:** The problematic question was discarded from the final survey
- D:** Differences were discussed, and a consensus was reached on the correct translation

Results

Question 8: During the exploratory factor analysis, how did the researchers interpret items that demonstrated rotated factor loadings of greater than 0.60 in absolute value?

- A:** They were deemed to be overlapping variables and were thus eliminated from the final model
- B:** They were categorised as secondary items that required further qualitative investigation
- C:** They were considered the 'strongest' and became the anchor item for each factor
- D:** They were manually redistributed to ensure each factor had an equal number of items

Question 9: Which specific traumatic event was the most frequently reported among the participants in the study?

- A:** Held at gunpoint
- B:** Witnessing a death due to a gunshot
- C:** Physical assault
- D:** Abduction

Question 10: Regarding the endorsement of specific traumatic events, which experience was the least commonly reported across the entire study sample, by case-control status and by sex?

- A:** Natural disaster
- B:** Captivity
- C:** Exposure to a toxic substance
- D:** Exposure to a war zone

THE END

QUESTIONNAIRE C18(26) Part 2 of 2

Trauma exposure and psychometric properties of the life events checklist among adults in South Africa

INSTRUCTIONS

- Read through the article and answer the multiple-choice questions provided below.
- **Some questions may have more than one correct answer;** in which case, you must mark **all** the correct answers.

Results

Question 1: In comparing the confirmatory factor analysis models, which specific model was ultimately selected as the final model due to its marginally superior fit?

- A:** The SASH 7-factor model (the 7-factor model based on the South African Stress and Health Survey)
- B:** The EFA (the 6-factor model) derived from the exploratory factor analysis of the current study sample
- C:** The 4-factor model originally conceptualised in the Ethiopian NeuroGAP-Psychosis study
- D:** The prior 6-factor model based on the South Korean and World Mental Health Survey

Discussion

Question 2: TRUE or FALSE: The study observed that the prevalence of trauma exposure amongst all participants was lower than what had been established in prior population-representative research.

- A:** TRUE
- B:** FALSE

Question 3: What specific methodological constraint might explain why previous population-representative surveys potentially underestimated trauma rates compared to the current study?

- A:** They relied exclusively on self-administered questionnaires
- B:** They focused primarily on mild life stressors rather than life-threatening events
- C:** They surveyed populations exclusively in rural areas with lower overall crime rates
- D:** They excluded participants living in institutions such as prisons and mental health facilities

Question 4: How did the reported traumatic experiences of male and female participants in this study align with the findings of prior research regarding the distribution of trauma exposure?

- A:** Both sexes reported equal exposure to environmental disasters and severe human suffering
- B:** Women consistently reported a higher cumulative trauma burden across all categories than men
- C:** Men reported more physical assault, and women reported more sexual assault
- D:** Men and women reported equal exposure to traumatic events

Question 5: Why did the researchers suspect that the item concerning "severe human suffering" might have clustered unexpectedly during the exploratory factor analysis?

- A:** It might have been a confusing question, and participants might have interpreted it differently from one another
- B:** It was the only item that was incorrectly translated during the forward-translation phase
- C:** It overlapped with the definitions of natural disaster and sudden accidental death
- D:** It was intentionally skipped by the majority of participants due to its sensitive nature

Question 6: What did the frequent endorsement of the open-ended "any other stressful experience" item suggest to the authors regarding the comprehensiveness of the scale?

- A:** The current phrasing of the standardised items was too complex
- B:** There might be additional country-specific trauma exposures that were not being captured by the scale in its current form
- C:** Participants were likely combining multiple minor stressors into a single severe event
- D:** The participants did not really want to address the traumatic event

Question 7: What methodological approach do the authors suggest for identifying locally-relevant traumatic events that could be appended to the checklist in future studies?

- A:** Distributing the checklist across a wider array of purely medical outpatient clinics
- B:** Translating the current tool into every official language spoken within the country
- C:** Pairing the tool with robust qualitative or semi-structured research
- D:** Relying more on retrospective hospital intake records

Question 8: The study acknowledges the limitations of adding population-specific items to a measure or developing a population-specific tool for a different setting. About this, what is highlighted as a primary advantage of using a standardised assessment tool?

- A:** Researchers are able to make comparisons across different populations and settings
- B:** It eliminates the need for any ethical oversight during the data collection process
- C:** It guarantees a flawless diagnostic outcome for posttraumatic stress disorder
- D:** It is the only methodology accepted by major academic funding institutions

Question 9: TRUE/FALSE: The authors concluded that the results of their exploratory factor analysis should be interpreted as a definitive theoretical grouping of traumatic events rather than a statistical one.

- A:** TRUE
- B:** FALSE

Limitations and Conclusion

Question 10: Test-retest reliability was not conducted because?

- A:** The ethical review board prohibited multiple contacts with the patient group
- B:** The diagnostic criteria for psychotic spectrum disorders shifted during the study period
- C:** The geographical spread of the clinical sites made a second phase of data collection too costly
- D:** The study was only administered to participants once

THE END



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C18(26)

Trauma exposure and psychometric properties of the life events checklist among adults in South Africa

*Time spent on activity												hour min											
PART 1												PART 2											
	A	B	C	D	E		A	B	C	D	E		A	B	C	D	E		A	B	C	D	E
1						6						1						6					
2						7						2						7					
3						8						3						8					
4						9						4						9					
5						10						5						10					

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Not at all	Somewhat	Mostly	Extremely

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