Psychometric Validation of Post-Traumatic Stress Disorder Checklist for DSM– 5 (PCL-5) among Rwandan Undergraduate Students

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Abstract

Introduction: The Posttraumatic Stress Disorder Checklist for DSM– 5 (PCL-5) is one of the most commonly used tools in measuring PTSD symptoms. However, little is known about its validity in post-genocide Rwanda. This research therefore, aimed at determining psychometric properties and diagnostic utility of the PCL-5 scale among university students in Rwanda.
Method: A total of 143 participants completed PCL-5, the Harvard Trauma Questionnaire-part4 (HTQ-part4), and the Hopkins Symptom Checklist-25 (Anxiety [HSCL-A] and Depression [HSCL-D] subscales). The Cronbach's alpha coefficient and the Mean Item Inter-Correlation (MIIC) were computed to assess the tool reliability and Receiver Operator Characteristics (ROC) was performed to determine a valid cutoff-score.
Results: Findings indicated excellent internal consistency for PCL-5 total score and each of the four subscales. PCL-5 scores correlated strongly with scores on HTQ-part4, HSCL-D and HSCL-A, supporting convergent validity. The diagnostic accuracy of the scale was excellent (AUC=0.934, p<.001). The optimal cutoff score of ≥23 optimized sensitivity (0.887) while maintaining adequate specificity (0.889).
Conclusion: It can be concluded that PCL-5 has high validity, internal consistency, and psychometric properties when applied to the sample of Rwandan students.

Keywords: PCL-5, Psychometric Properties, Reliability, Validity, Undergraduate Students

Introduction

Post-Traumatic Stress Disorder (PTSD) is one of the leading contributors to the global disease burden according to the global burden of disease report 2010 [1,2].PTSD can lead to a substantial functional impairment due to mental and physical dysfunctions among affected individuals and can follow a chronic course, if untreated [3–5]. Thus, PTSD should be addressed as a public health priority [6]. Being a trauma and stressor-related psychiatric disorder, PTSD may occur after experiencing or witnessing events involving physical injury, death, or other threats to physical integrity [7,8], and thus its prevalence is very high in war-affected regions and developing countries [2]. The rate of the disorder in these regions may be explained by the fact that a wider range of circumstances holds a potential life threat to this population, as seen in the burden of disease studies [9].

While the lifetime prevalence of PTSD is about 10–12% in women and 5–6% men on a global scale[2], researchers have shown that PTSD prevalence ranges from 24.8% to 74% among adults in Sub-Saharan Africa [10]. In Rwanda, an elevated rate of PTSD symptoms is linked to the 1994 Genocide against the Tutsi, which resulted in 1,074, 017 deaths of people [11],

thousands of orphans as well as untold additional disability and suffering. A recent study has shown an average PTSD rate of 43.8% for parents and 16.5% for offspring[12].

PTSD does not affect only the direct victims of trauma, but also their families, witnesses, as well as direct and indirect participants in traumatic events [13].

The present study aimed to validate PCL-5 among Rwandan undergraduate students because they are very prone to experiencing traumatic events. It was found that 40% to 85% of undergraduate students reported having experienced a traumatic event [9,14,15]. However, the prevalence of traumatic events and PTSD may be substantially elevated in a population of LMICs because a wider range of circumstances holds a potential life threat to this population, as seen in the burden of disease studies [16]. Despite tremendous evidence suggesting an alarming prevalence of PTSD, little is known about the psychometric properties of posttraumatic stress disorder checklist –5 (PCL-5) in several countries. PCL-5 is a recent update of PCL according to the new diagnostic criteria for PTSD in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), [17]. The diagnosis today consists of 20 symptoms in DSM-5 grouped in four clusters instead of the previous 17 in DSM-IV grouped in three symptom clusters. Each item of PCL-5 has the corresponding symptom of PTSD in DSM-5 grouped in four clusters: intrusion (items 1-5), avoidance (items 6-7), negative alterations in cognitions and mood (items 8-14), and alterations in arousal and reactivity (items 15-20). PCL-5 now is one of the most widely used measures for PTSD in both research and clinical settings, with adequate psychometric properties [18]. A preliminary version of the PCL-5 suggested a cutoff score of 33 for a diagnosis of PTSD, while validation studies recommended a variety of cutoff scores ranging between 23 and 37, [19–22]. Further, the best cutoff score depends on the context, the population, translation difficulties, and the gold-standard instrument applied in the validation studies. As such, the use of the non-validated tool may lead to substantial over or underestimations of prevalence rates of PTSD [23,24].

To date, there is a dearth of studies that assess the psychometric properties of PCL-5 and most of them are restricted to high-income countries. In Sub-Saharan Africa, a study conducted in Zimbabwe indicated that the PCL-5 cutoff of ≥33 achieved a sensitivity of 74.5%, the specificity of 70.6%, the area under the ROC curve of 0.78, and internal consistency of Cronbach's alpha=0.92 among the population with high HIV prevalence. For Rwanda, efforts have been made to validate the screening tool of anxiety in undergraduate students [25], but none for PTSD. Thus, this study aimed at determining the psychometric properties and diagnostic utility of the Posttraumatic Stress Disorder Checklist for *DSM– 5* (PCL-5) scale among undergraduate students in Rwanda.

Method

The participants of this study were selected using a purposive sampling method. Initially, 247 students were invited to participate in this study. The number of students that agreed to participate was 143 (56% females, MA=22.4 years, SD=2.6), giving a response rate of 58%. The participants were undergraduate students aged 18 –28 years attending the College of Medicine and Health Sciences of University of Rwanda at Remera Campus. An additional 10% refused participation (n = 25) and 32% did not respond (n = 79). We found that conflict with study time was the most common reason for subjects who didn't participate. The inclusion criteria for students were to be Rwandan, undergraduate student at the University of Rwanda, and the ability to understand and respond in Kinyarwanda.

Data were collected from June to September 2019 helped by the class representative of level 1 up to level 5 in the College of Medicine and Health Sciences. All scales in this study were rigorously adapted for use among the Rwandan undergraduate students. We applied Brislin's back-translation method for the translation of all measures into Kinyarwanda [26]. Firstly, four bilingual clinical psychologists translated the version that had been adapted from English (A) into Kinyarwanda (B). Secondly, the "consensus" version (B) was back-translated by two other bilingual individuals, who had no previous knowledge of the original. A general agreement was found for each item of the Kinyarwanda (B) version.

The tools used in this study were as follows:

Clinician administered PTSD scale (CAPS-5): This was the Clinician-administered PTSD scale CAPS-5 for DSM-5 [27], as the reference standard for evaluating DSM-5 related PTSD symptomatology and diagnostic status for both military [28] and civilian trauma survivors[7]. The CAPS-5 is a structured clinical interview which allows the clinician to make a diagnosis of PTSD according to the criteria described in the DSM-5. Furthermore, overall symptom severity as well as global, social, occupational and personal impairment is assessed. The main criterion (A), the traumatic event, was assessed using the life events checklist for DSM-5 (LEC-5) [29]. For the current study, the internal consistency was found to be 0.85.

The PTSD Checklist for DSM-5 (PCL-5): This was a self-report measure of the symptoms of PTSD in people aged at least 18 years [17]. PCL-5 contains 20 items classified into four subscales: intrusion (items 1-5), avoidance (items 6-7), negative alterations in cognitions and mood (items 8-14), and alterations in arousal and reactivity (items 15-20). These subscales correspond to the range of clusters in the DSM-5 (i.e. B-E). Items are rated on a 5-point Likert-type scale ranging from not at all (0) to extremely (4). The items refer to the past month on a specific traumatic event. Total scores range from 0 to 80 and a preliminary cutoff score of 33 is recommended as indicating PTSD cases [17].

The Hopkins Symptom Checklist-25: This was a derivative of the 90-item Symptom Checklist (SCL-90), [30] that was used to assess symptoms of anxiety (i.e. a 10- item subscale for anxiety [α=0.87]) and depression (i.e. a 15-item subscale for depression [α=0.92]) in individual aged at least 13 years with a 6th-grade reading level. Each item is rated on a 4-point Likert-type scale ranging from 1 (not at all) to 4 (extremely). Several authors have suggested a cutoff point of 1.75 in refugee settings and cross-cultural research [1,31].

The Harvard Trauma Questionnaire: This tool is the most widely used self-report questionnaire for assessing PTSD across post-conflict societies of diverse cultural backgrounds [32,33] and has five sections. Given the purpose of the present study, we used the 4th section (HTQ-p4) composed by 40 items measuring the psychological impact [32,33]. Each item is rated on a 4-point Likert-type scale ranging from 1 (not at all) to (4) extremely. This section has 16 items relating to recurrent thoughts or memories of the most hurtful or terrifying events or feeling as though the event is happening again (PTSD subscale [α=0.87]), and the last 24 items concerning the functioning of individuals after they experienced a traumatic event (functioning subscale [α=0.94]).

The data analyses were performed using the Statistical Package for Social Science (SPSS version 24). Cronbach's alpha coefficients and Mean Inter-Item Correlation (MIIC) was used to examine internal consistency. A Cronbach's alpha of 0.70 and above is regarded as satisfactory [34], while the recommended range of MIIC is 0.15-0.50 [35]. We considered the alpha threshold of p≤0.05. Criterion-related validity was assessed by Pearson correlation between the PCL-5 and other measures: the HTQ-part4, the HSCL-A, and the HSCL-D. The Receiver Operator Characteristics (ROC) were performed to determine a valid cutoff-score. Here, the signal-detection analyses were conducted using the Clinician-administered PTSD scale CAPS-5 for DSM-5. The optimally sensitive cutoff score was identified that also had a specificity ≥ 0.80 to reduce the number of false positives [36].

Results

Of the 143 participants, 29% (n=56) had clinical levels of significant symptoms of PTSD based on cutoff score≥33 suggested by test developers. However, based on the cutoff score identified in this study (i.e. ≥23), 35% of the sample met the criteria for PTSD. There was no big difference between this prevalence and the one obtained using a clinical interview (38%). The participants were aged from 19 to 26 (mean age=23, Standard deviation=1.25).

Participants (n = 143) indicated all the events that happened to them in their lifetime. The most common report index events (five events): physical assault (n=61, 42.65%), the open category of any other very stressful event or experience (n=58, 40.55%), sudden, unexpected death of someone who was close to the participant (79 participants, 55.4%), life-threatening illness or injury (n=78, 54.24%), as well as severe human suffering (n=60, 42%).

The means, standard deviations, skewness, kurtosis, corrected item-total correlations for the PCL-5, and Cronbach's alpha, if item deleted ($N=143$) are presented in Table 1. The corrected item-to-total correlations for the 20-item PCL-5 ranged from 0.585 to 0.840 (see table 1), indicating the good relationship of items with the construct. It is worth noting that item 2 received the lowest value (0.585), and this finding requires further attention in the subsequent tests.

As shown in table 2, the coefficient alpha was α=0.88 for the intrusion, α=0.825 for the avoidance, α=0.922 for the Negative Alterations in Cognitions and Mood (NACM), α=0.903 for the Alterations in Arousal and Reactivity (AAR) subscales of PCL-5. The MIIC was 0.465 for PCL-5 total score, MIIC=0.485 for intrusion, MIIC= 0.702 for avoidance, 0.627 for NACM and MIIC= 0.49 for AAR.

The PCL-5 subscale inter-correlations ranged between 0.76 and 0.937 (Table 2).

All correlations are significant at the 0.001 level (2-tailed).

The results showed that the correlations between the overall PCL-5 scale, subscale, and the specific items, and the other construct-related scales were significant. As presented in Table 2, Overall PCL-5 scale was significant and strongly positive correlated with HTQ-S4 PTSD ($r= .74$, $p<.001$), HTQ-S4 Functioning score ($r = .76$, $p<.001$), HTQ-p4-Total score ($r = 0.78$, $p<.001$), HSCL-A score ($r= .64$, $p< .001$) and HSCL-D score ($r= 0.70$, $p< 0.001$). Also, the subscales of PCL-5 were significantly and strongly positively correlated with the above-listed scales (r range = 0.49-0.79, $p<0.001$). However, items 2 and 19 showed only moderate associations with the above-listed scales (Table 2). Briefly, the Kinyarwanda version of the PCL-5 showed good criterion-related validity with the other construct-related measures.

Table 1. Descriptive statistics for the PCL-5 items

Item	M	SD	Skewness	Kurtosis	Corrected item-total correlations	Cronbach's alpha, if item deleted
1. Memories	0.93	1.18	1.09	0.12	0.72	0.96
2. Dreams	0.98	1.14	1.05	0.25	0.58	0.97
3. Flashbacks	1.05	1.39	1.04	-0.28	0.78	0.96
4. Cued distress	1.16	1.29	0.93	-0.19	0.74	0.96
5. Cued physical reactions	.96	1.16	0.88	-0.56	0.71	0.96
6. Avoiding internal reminders	1.07	1.19	0.82	-0.57	0.84	0.96
7. Avoiding external reminders	0.96	1.02	0.98	0.55	0.80	0.96
8. Amnesia	1.03	1.24	0.99	-0.11	0.77	0.96
9. Negative beliefs	1.11	1.22	1.01	0.001	0.74	0.96
10. Blame	1.18	1.30	0.93	-0.28	0.76	0.96
11. Negative feelings	1.21	1.25	0.65	-0.77	0.77	0.96
12. Loss of interest	1.11	1.23	1.06	0.19	0.70	0.96
13. Detachment or estrangement	1.15	1.30	0.89	-0.35	0.83	0.96
14. Numbing	1.01	1.11	0.75	-0.59	0.77	0.96
15. Irritability or aggressive behavior	0.92	1.25	1.18	0.14	0.73	0.96
16. Reckless behavior	0.98	1.22	1.06	0.12	0.77	0.96
17. Hypervigilance	0.97	1.11	0.95	0.001	0.73	0.96
18. Startle	0.89	1.15	1.11	0.12	0.74	0.96
19. Concentration	1.23	1.12	0.39	-1.01	0.68	0.96
20. Sleep	1.14	1.43	0.97	-0.48	0.83	0.96

The ROC analyses were performed to determine the optimal cutoff score for the PCL-5 among Rwandan undergraduate students. As seen in Figure 1 and Table 3, the diagnostic accuracy of the scale was excellent (*AUC* = 0.934, *p*<.001). The most optimal cutoff score of ≥23 optimized sensitivity (0.887) while maintaining adequate specificity (0.889). A total of 35% of the sample met the criteria for PTSD based on this cutoff score.

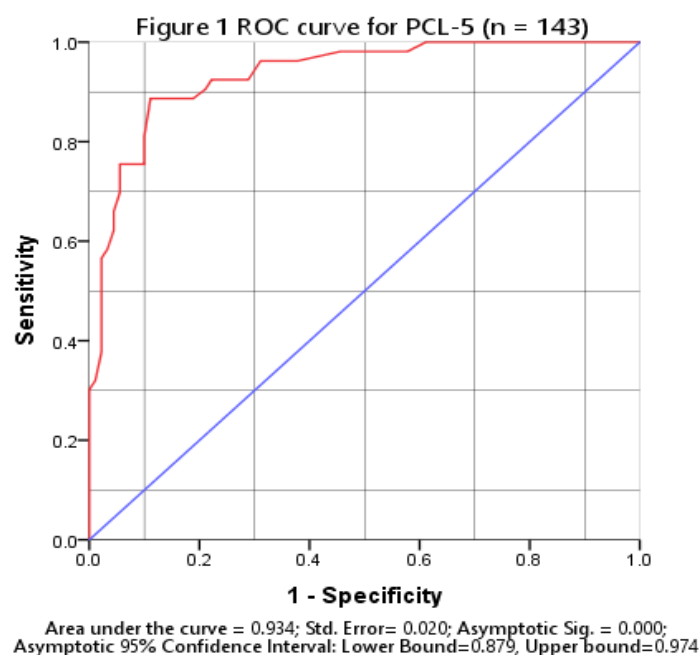**Table 2.** PCL-5 Inter-correlations and Correlations with other Construct Scales

	1	2	3	4	5	HTQ p4 PTSD	HTQ p4 Functioning	HTQ-p4 Total	HSCL-A	HSCL-D	HSCL-Total
PCL-5 total (1)	1	0.89	0.91	0.97	0.94	0.74	0.76	0.78	0.64	0.70	0.71
Intrusion (2)		1	0.80	0.81	0.76	0.64	0.64	0.67	0.62	0.72	0.71
Avoidance (3)			1	0.93	0.84	0.64	0.66	0.68	0.49	0.57	0.56
NACM(4)				1	0.90	0.68	0.73	0.74	0.58	0.64	0.64
AAR (5)					1	0.76	0.77	0.80	0.58	0.64	0.64
Item 1						0.48	0.53	0.53	0.50	0.62	0.59
Item 2						0.46	0.40	0.44	0.50	0.60	0.58
Item 3						0.60	0.63	0.65	0.61	0.64	0.66
Item 4						0.57	0.54	0.57	0.49	0.61	0.58
Item 5						0.56	0.55	0.57	0.47	0.53	0.53
Item 6						0.64	0.68	0.69	0.48	0.54	0.54
Item 7						0.54	0.54	0.56	0.43	0.50	0.49
Item 8						0.61	0.59	0.62	0.44	0.48	0.48
Item 9						0.49	0.54	0.54	0.48	0.53	0.53
Item 10						0.51	0.58	0.58	0.54	0.54	0.56
Item 11						0.56	0.63	0.63	0.45	0.46	0.47
Item 12						0.54	0.56	0.57	0.55	0.60	0.60
Item 13						0.64	0.63	0.65	0.51	0.57	0.57
Item 14						0.58	0.68	0.67	0.47	0.55	0.54
Item 15						0.69	0.69	0.71	0.64	0.59	0.63
Item 16						0.61	0.58	0.61	0.43	0.42	0.44
Item 17						0.68	0.60	0.65	0.42	0.49	0.48
Item 18						0.57	0.57	0.60	0.51	0.53	0.54
Item 19						0.52	0.63	0.62	0.40	0.50	0.48
Item 20						0.67	0.71	0.73	0.59	0.56	0.59

Note: NACM: Negative Alterations in Cognitions and Mood; AAR: Alterations in Arousal and Reactivity; HSCL-A: The Hopkins Symptom Checklist-Depression subscale; HSCL-D: The Hopkins Symptom Checklist-Anxiety subscale; HTQ-p4: Harvard Trauma Questionnaire part4.

Table 3. Classification Quality of the PCL-5 for the DSM-5 Diagnosis of PTSD

Score≥	18	19	20	21	23	25	28	29	31	32
Sensitivity	0.90	0.88	0.88	0.88	0.88	0.81	0.75	0.75	0.73	0.69
Specificity	0.78	0.81	0.83	0.86	0.88	0.90	0.90	0.94	0.94	0.94

Note. The Red and italicized column indicates the optimal cutoff score.

Figure 1 ROC curve for PCL-5 (n = 143)

Area under the curve = 0.934; Std. Error= 0.020; Asymptotic Sig. = 0.000; Asymptotic 95% Confidence Interval: Lower Bound=0.879, Upper bound=0.974

Figure 1. Receiver operator characteristics curve for PCL-5

Discussion

This study aimed to assess the psychometric properties of the posttraumatic stress disorder checklist for DSM-5 (PCL-5) by using a sample of Rwandan university students and to determine its utility and applicability in our context. We have validated other relevant tools for common mental disorders such as anxiety [25] but in all settings none for PTSD specifically. The results indicate that PCL-5 was psychometrically sound, as it demonstrated excellent internal consistency and strong convergent validity. Internal consistencies for the PCL-5's subscales were also very high. The total score of PCL-5 had excellent internal consistency (α= 0.96), indicating the unity of the concept of PTSD. The results in this study replicated those found in previous studies [9,19,22].

Internal consistencies for the PCL-5's subscales were very good for the intrusion for the avoidance, for the negative alterations in cognitions and mood (NACM), and for the alterations in arousal and reactivity (AAR) subscales. This set of findings was aligned with the results of other validation studies [19,22]. Cronbach's Alpha of greater than 0.80 should be considered to be an excellent coefficient [37]. The MIICs for avoidance and NACM subscales was above the recommended cutoff. These findings mean that there is a substantial overlap between the items of each subscale and the overall PCL-5. Similarly, Sveen et al. found that MIIC ranged from 0.22 to 0.73 for the four PCL-5 subscales and the PCL-5 total in parents of children with burns [21].

Our findings also highlight that PCL-5 have strong convergent validity. PCL-5 inter-correlations were moderate to high, which suggests that the items tap into a similar construct but are not interchangeable. The PCL-5 total, subscales, and item scores were highly correlated with the HTQ-p4 as well as with HSCL-A, HSCL-D, and HSCL-total scores which were in agreement with the hypotheses of this study. There are several overlapping symptoms between depression and PTSD, and these two conditions are commonly comorbid [21,38]. This study demonstrates that aspects of discriminant validity of the PCL-5 is low, for example, PCL-5 correlation with HTQ-S4 total score was not significantly stronger than its association with HSCL-A, HSCL-D, or HSCL-total. This might be explained by the low symptom level in the sample, perhaps the discriminant validity might be better in a more symptomatic sample [21]. Therefore, future studies with larger samples and preferably with participants who have a larger variation in symptom levels are warranted.

Our results indicate that the optimal cutoff score for the PCL-5 was 23. This score was selected because it maintained high sensitivity (0.887) and specificity (0.889), which decreases false positives [39,40]. The results of this study replicated those found in a previous study [22]. However, the cutoff score found in the present study is 8–10 points lesser than in prior studies with military and other populations. The cutoff score difference could be explained by several possible reasons. First, the higher cutoff scores shown in prior studies were based on the population of American Veteran samples exposed to trauma, so there may be differences in how they report their symptoms relative to Rwandan undergraduate students. Second, there may be cultural or language differences in how distress is expressed. Despite the efforts made to conserve the equivalence between Kinyarwanda and English versions, there can be linguistic differences that affected symptom reports. Finally, the epigenetic transmission of PTSD may be taken into account in our sample. Perroud et al. found that Rwandan women survivors of the 1994 genocide perpetrated against Tutsi could transmit PTSD symptoms to their offspring [41].

The study had some limitations. First, the test-retest reliability and factor analysis were not computed. Second, the sample size of this study was small. Therefore, future studies with large clinical samples are recommended to perform test-retest reliability and factor analysis.

Conclusion

To the best of our knowledge, this is the first study to be conducted in post-genocide countries globally. We conclude that PCL-5 has high validity, internal consistency, and psychometric properties when applied to the sample of Rwandan students in which the traumatic events are relatively common phenomena. Researchers have shown that 40% to 85% of undergraduate students have reported having experienced a traumatic event [9,14,15]. Therefore, given that the sample represents one in which the risk of PTSD is high, the psychometric findings presented here will likely be generalized well to clinical samples. People in LMIC are often exposed to multiple traumas [42] and have therefore a pronounced need for adequate, accessible, and evidence-based care.

Conflict of Interest

The authors declare that they have no competing interests.

Ethical Approval

All the research procedures involving humans were consistent with the National Research Committee's ethical standards, the Helsinki Declaration of 1964, subsequent revisions, or equivalent ethical norms. All participants in the study got informed consent. In addition, the ethical code of this study was 2019/21.

Acknowledgement

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