Comparing the network structure of ICD-11 PTSD and complex PTSD in three African countries

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Abstract

Background: Symptom network analysis has become an essential tool for researchers and clinicians investigating the structure of mental disorders. Two methods have been used; one relies on partial correlations, and the second relies on zero order correlations with forced-directed algorithm. This combination was used to examine symptom connections for ICD-11 Posttraumatic Stress Disorder (PTSD) and Complex PTSD (CPTSD) as the symptoms for these disorders have been known to be organized in a multi-dimensional and hierarchical fashion. We aimed to examine whether networks of ICD-11 CPTSD symptoms reproduced across samples from three African countries. **Methods**: We produced network models based on data from 2,524 participants in Nigeria (n = 1018), Kenya (n = 1006), and Ghana (n = 500). PTSD and CPTSD symptoms were measured using the International Trauma Questionnaire (Cloitre et al., 2018). **Results**: The CPTSD network analysis using force-directed method alongside partial correlations based on Gaussian Graphical Models (GGM) revealed the multidimensional-hierarchal structure of CPTSD. The within-cluster symptoms of Disturbances in Self Organization (DSO) and PTSD were strongly correlated with each other in all networks, and the cross-cluster symptoms were lower. The most central symptom was 'feelings of worthlessness', a symptom of Negative Self-Concept that is part of the CPTSD cluster. The networks were very similar across the three countries. **Conclusions**: Findings support the ICD-11 model of PTSD and CPTSD in three African countries.

Keywords: Trauma; PTSD; CPTSD; Stress related Disorders; Methodology

Introduction

In 2018 the World Health Organization (WHO) published the 11th version of the ICD that uses a hierarchal approach to describe disorders following exposure to a traumatic stressor, namely Posttraumatic Stress Disorder (PTSD) and Complex PTSD (CPTSD; Cloitre, Garvert, Brewin, Bryant, & Maercker, 2013; Maercker et al., 2013). A diagnosis of PTSD requires symptoms organized in three clusters: re-experiencing of the trauma in the here and now (RE), avoidance of traumatic reminders (AV), and a persistent sense of current threat (ST). CPTSD comprises the essential PTSD symptoms plus additional Disturbances in Self Organization (DSO) symptoms which fall into three clusters: affective dysregulation (AD), negative self-concept (NSC), and disturbances in relationships (DR). A person may only be diagnosed with PTSD or CPTSD, but not both. Contrastingly, the DSM-5 conceptualizes PTSD as a single but broader diagnosis, including intrusive memories, avoidance, negative changes in cognitions and mood, and changes in physical and emotional reactions (American Psychiatric Association, 2013). In a predominately female clinical sample significantly more individuals were diagnosed with PTSD according to the DSM-5 criteria (90.4%) compared to those diagnosed with PTSD and CPTSD according to the ICD-11 guidelines (79.8%). Diagnostic associations with depression, anxiety, suicidal ideation and self-harm were higher for ICD-11 CPTSD compared to DSM-5 PTSD (Hyland et al., 2018). These essential differences that originate when using the two diagnostic systems stress the importance of exploring the symptom structure of the more novel ICD-11 CPTSD diagnosis.

The validity of the ICD-11 models of PTSD and CPTSD have been previously supported by factor analytic methods and cluster analysis studies (Brewin et al., 2017). Overall, PTSD and DSO symptoms have been found to be multidimensional (PTSD and DSO symptoms are

separate but correlated) and hierarchical. An alternative approach to assessing validity of disorders refers to psychopathology as 'systems of associations' instead of 'entities', that is, to model PTSD and DSO symptom interactions using a network approach (Borsboom et al., 2017; Knefel et al., 2020, 2019). Network analysis allows visualization of the connections, magnitude, clustering, and centrality of symptoms. This approach has been used before to examine the structure of CPTSD with findings reflecting the distinct but correlated nature of PTSD and DSO symptom clusters (Knefel et al., 2019; McElroy et al., 2019). This approach may have important clinical implications as targeting the central symptom(s) can enhance treatment response rapidity (Knefel et al., 2019).

In previous studies, the network structure of ICD-11 PTSD and DSO symptom clusters has been examined using the well-acknowledged Gaussian Graphical Models (GGM) as the prime methodology, controlling for false positive and spurious connections by using the graphical lasso for network estimation (Friedman et al., 2008; Knefel et al., 2019). This method utilizes partial correlations in conducting the symptoms network analysis (Knefel et al., 2019). While this approach for visualization has been commonly used, it refers to symptoms and nodes between them as a reflection of the unidimensional system of a single disorder. Moreover, it refers to all nodes as equal in space and allows them to exploratorily organize to a data-driven network. This may produce graphs with strongly associated nodes that overlap, and mask the edges between two nodes, and clusters that arise from it. The use of partial correlations, along with this algorithm, may obscure the detailed symptom to symptom information in a psychopathology network (Forbes et al., 2017).

We pursued a more theory driven visualization that relies on the hypothesized ICD-11 definitions of CPTSD. For this purpose we used the Fruchterman-Reingold (FR) force-directed

algorithm with zero order correlation (Fruchterman and Reingold, 1991) which reveals more global structural features, among clusters of interrelated nodes (Forbes et al., 2017). The FR is gaining more attention in psychopathology research as it is conceptually intuitive and suitable for multidimensional networks (Fruchterman and Reingold, 1991; Holten and Van Wijk, 2009).

This study inspected the clustering of PTSD symptoms, DSO symptoms, and the overall picture of CPTSD, using zero order FR, alongside GGM network analysis that is based on partial correlations. Moreover, cross cultural network analysis is essential to confirm the structural validity of a condition across cultures. Only two recent studies conducted cross cultural network analysis of CPTSD (Knefel et al., 2020; 2019), and both confirmed the structure across Western countries. There is clearly a need to replicate this work in different non-western countries (Sharan et al., 2009) and increase the confidence in the use of ICD-11 amongst clinicians in Africa. A thorough examination of CPTSD structure is required in large samples and various trauma-exposed populations across different cultures (Karatzias et al., 2017).

This study was aimed to 1) explore the network of ICD-11 CPTSD symptomology as a multidimensional system of associations, comprised of PTSD and DSO symptoms, in three African samples; and 2) using symptom network analysis measures such as centrality and cluster coefficients in order to reveal the complexity of the network.

Methods

Participants and Procedure

The study sampled included 2,524 participants from Nigeria (n = 1,006), Kenya (n = 1,018), and Ghana (n = 500). For more information regarding the sample has been provided previously (Ben-Ezra et al., 2020). Each sample was drawn from internet panels using stratified and random probability sampling methods to ensure a close approximation of representativeness in terms of

census data on age and sex in each country. The study complied with the Helsinki declaration regarding human experimentation. All procedures involving human subjects were approved by Ariel University's IRB [AU-MBE-2018-1029].

Each participant signed an electronic informed consent prior to participation. Inclusion criteria included citizenship of one of the following countries (Nigerian. Ghana, and Nigeria), age over 18 and having English proficiency to complete the surveys. In all three countries regions with local dialects exist, but the official language is English, besides Kenya which has two official languages, English and Swahili. For each sample, demographic information is presented in table SM1 (see suplememtray materials).

Measurements

Lifetime Traumatic Exposure was measured using the Life Events Checklist for DSM-5 (LEC-5; Weathers et al., 2013), a 16-item self-report measure designed to screen for potentially traumatic life events (e.g., natural disaster, physical assault, life threatening illness/injury). For each item, respondents indicate whether they were directly exposed to the event (1 = Yes) or not (0 = No). A summed total can be calculated to represent the number of different traumatic life events ranging from 0 to 16.

PTSD and CPTSD symptoms were measured using the International Trauma Questionnaire (ITQ; Cloitre et al., 2018). The ITQ includes six PTSD items and six DSO items. The PTSD symptom clusters of re-experiencing (RE), avoidance (AV), and sense of threat (SoT) are measured using two items each. Three items are measuring functional impairment associated with these symptoms. The DSO symptom clusters of affective dysregulation (AD), negative self-concept (NSC), and disturbances in relationships (DiR) are measured by two items each. Each one of the conditions is also assessed by three items addressing functional impairment. The

internal consistency estimates for the PTSD items (Nigerian sample, α = 0·84; Kenyan sample, α = ·85; Ghanaian sample, α = .86; full sample, α = .85;) and the DSO items (Nigerian sample, α = .88; Kenyan sample, α = .89; Ghanaian sample, α = .88; full sample, α = .89) in this study were excellent.

All items were answered using a five-point Likert scale ranging from 'Not at all' (0) to 'Extremely' (4). Following standard practice in trauma research, scores ≥2 ('Moderately') were used to indicate the presence of a symptom (Ben-Ezra et al., 2018; Karatzias et al., 2017). Diagnosis criteria of probable PTSD and CPTSD endorsement algorithm can be found in Cloitre et al. (2018).

Statistical analysis

First, to examine which life events are more associated with PTSD and CPTSD, in the three African countriea, logistic regressions were performed. The statistical analyses were conducted in two phases. The first phase is a partial replication of Knefel's cross cultural network analysis of complex PTSD (Knefel et al., 2019), using regularized partial correlation networks across the three samples. This competitive model will provide the node centrality and edges strength. The second phase will be based on a force directed methodology for visualization. It will allow to capture the bigger hierarchical structure of the complex PTSD and its separated PTSD and DSO components.

Regularized partial correlation networks across the three samples

Network Estimation

The symptom network was estimated for all symptoms of Complex PTSD (i.e. PTSD and DSO symptoms), using the R-package qgraph (Epskamp et al., 2012). Networks were estimated using regularized partial correlation models in the R-package qgraph that present the unique,

independent relationships between symptoms (Karatzias et al., 2017). Symptoms in a network model are called nodes; associations between nodes are called edges. The network is weighted and undirected due to the cross-sectional nature of the study. Questionnaire data were answered at an ordinal scale, thus we estimated a polychoric matrix. We estimated partial pairwise correlations parameters between all nodes, through a Gaussian Graphical Model (GGM).

Visualization with the Graphical Lasso

We visualized the networks in a more conservative, data-driven manner, with no directed hypotheses (Knefel et al., 2019; Segal et al., 2020). We used the graphical least absolute shrinkage and selection operator (glasso; implemented in qgraph), which visualizes sparse networks using part correlations and considered the ordinal scale of the questionnaire. This method directly estimates the inverse of the covariance matrix (Friedman et al., 2008). It shrinks small edges and many parameters to zero by estimating a penalized maximum likelihood solution based on the Extended Bayesian Information Criterion (EBIC; Foygel & Drton, 2010). For ease of visual comparison, the networks were restricted to a consistent "average layout," presented across all samples.

Network stability

We examined the stability of the individually estimated networks, including estimating 95% confidence intervals around the edge weights and estimating a correlation-stability coefficient for strength centrality. More information regarding network analysis techniques can be found in supplementary materials and in a tutorial (Epskamp et al., 2018).

Network Comparisons

To compare differences between networks, we estimated network differences between each pair of networks using the *NetworkComparisonTest* (NCT) package in R (van Borkulo et al.,

2017). More information regarding network analysis techniques can be found in supplementary materials.

Visualization of the zero-order correlation networks across the three samples

Displays using part-correlations may obscure subgroups of similar symptoms in the network. To visually encapsulate the phenomenon of CPTSD and its separated components of PTSD and DSO symptoms, we implemented the force-embedded Fruchterman-Reingold (FR) algorithm which is included in qgraph. We used the 'groups' argument to create a list in which each element is a vector containing the numbers of nodes belonging together (Epskamp et al., 2012). This strategy allows us to inspect the clustering of the variables, that is to yield networks with a geographical separation between the group of PTSD symptom and the group of DSO symptoms (Fruchterman and Reingold, 1991; Jones et al., 2018). In psychopathology, this geographically based method is employed when fused with the graphical lasso procedure that estimates a network in which the edges are partial correlation coefficients (Fried et al., 2016). In the force-directed method, nodes with stronger connections are more central and nodes with weaker connections are more peripheral (Epskamp et al., 2012; Fruchterman and Reingold, 1991).

Results

Descriptive information

The total African sample reported the following traumatic life events. The most common traumatic event was physical assault (51.8%), followed by motor vehicle accident (42.3%), serious accident at work, home, or during recreational activity (29.8%), unwanted or uncomfortable sexual experience (28.8%), life-threatening illness or injury (26.2%) and natural disasters (25.4%), fire or explosion (24.4%), sexual assault (21.8%), assault with a weapon

(21.2%), sudden, unexpected death of someone close (21.0%), exposure to toxic substance (20.8%), severe human suffering (18.3%), sudden, violent death (12.1%), combat or exposure to a war-zone (11.5%), serious injury, harm or death you caused to someone else (8.7%), and captivity (5.3%).

Table 1 shows the mean scores on the PTSD and DSO symptoms across the three samples. All items differed across the three samples, although the effect size (η^2: small = .10, medium = 0.25, large = 0.50) were generally small. As reported previously (Ben-Ezra et al., 2020) the rates of probable PTSD (J-Ta = 1.433 p = .310) and CPTSD (J-Ta = -.526 p = .560) were similar in Ghana (PTSD = 17.6% n = 88; CPTSD = 13% n = 65), Kenya (PTSD = 17.4% n = 175; CPTSD = 19.6% n = 197), and Nigeria (PTSD = 20.3% n = 207; CPTSD = 13.7% n = 139). However, testing whether the distribution of PTSD and CPTSD is different between the countries using Chi square test showed significant results, Chi square (df = 4) = 19.31 p = .001. While PTSD was more common in Nigeria, CPTSD was more common in Kenya.

Life events and probable PTSD

Logistic regressions for set of traumatic events associated with PTSD for each country were presented in a previous study (Ben-Ezra et al., 2020). Analyses showed that in Nigeria, natural disaster (OR = 1.716 95% CI 1.156-2.547), serious accident at work, home, or during recreational activity (OR = 1.657 CI 95% 1.096-2.504), sexual assault (OR = 2.088 CI 95% 1.218-3.579), and severe human suffering (OR = 2.256 CI 95% 1.350-3.770) were significantly associated with PTSD. In Kenya, natural disaster (OR = 1.815 95% CI 1.199-2.746), assault with a weapon (OR = 1.798 95% CI 1.234-2.620), and sudden violent death (OR = 1.931 95% CI 1.048-3.558) were associated with PTSD. In Ghana, however, only severe human suffering was associated with PTSD.

Life events and probable CPTSD

Logistic regressions for set of traumatic events associated with PTSD for each country were presented in a previous study (Ben-Ezra et al., 2020). Analyses showed that in Nigeria, physical assault (OR = 2.320 95% CI 1.516-.3.551), sexual assault (OR = 1.688 95% CI 1.044-2.731), other unwanted or uncomfortable sexual experience (OR = 1.947 95% CI 1.272-2.979), life-threatening illness or injury (OR = 1.556 95% CI 1.023-2.367), and severe human suffering (OR = 2.074 95% CI 1.261-3.411) were associated with probable CPTSD. In Kenya, serious accident at work, home, or during recreational activity (OR = 2.197 95% CI 1.411-3.420), physical assault (OR = 3.467 95% CI 2.082-5.771), other unwanted or uncomfortable sexual experience (OR = 2.344 95% CI 1.467-3.747), and severe human suffering (OR = 3.147 95% CI 1.862-5.320) were associated with probable CPTSD. In Ghana, life-threatening illness or injury (OR = 2.275 95% CI 1.134-4.566) and Severe human suffering (OR = 3.015 95% CI 1.433-6.341) were associated with probable CPTSD.

Regularized partial correlation networks across the three samples

Network estimation

Estimated networks are shown in Fig. SM1 (can be found in supplementary materials). To enhance visual comparability of edges, we estimated the average layout of the three networks and presented all networks using this layout (see Fig. 1). In the network of the PTSD and DSO symptoms, 39 of 66 possible edges were nonzero (59·1%) in the Ghana network, 46 of 66 possible edges were nonzero (69·6%) in the Kenya network, and 54 of 66 possible edges were nonzero (81·8%) in the Nigeria network. This designates that the symptoms had extensive connections with each other in all samples. The visual inspection of the three networks exhibited many consistent edges similarities across the three samples, such as strong connections between

the NSC items: 'feelings of worthlessness' and 'feelings of failure', between the DiR items: 'feeling distant or cut off from others' and 'difficulties staying close to others', between the elements of RE: 'distressing dreams' and 'intrusive recollections,' and between the AV items: 'internal' and 'external' avoidance. The associations between the pairs of SoT items and the AD items were weaker.

Network inference

To confirm the visual similarity of networks, we used Spearman correlations of edge-weights for all combinations of networks, presented in online Supplementary materials. Analysis shows that the accuracy of the edges is satisfactory. The standardised strength centrality estimates are presented in Fig. 2. 'Feelings of worthlessness' was the node with the highest strength centrality in all networks and 'Long time upset' was the node with the smallest centrality value in all networks.

Network stability

The stability analyses relied on the correlation-stability coefficient and the bootstrapped confidence intervals around the estimated edges. The results of the confidence interval showed that edge-weights were moderately large. In addition, the results showed moderate accuracy and the robustness of our networks. Small edges should be inferred cautiously (see supplementary material, Results: Network accuracy and stability and Fig. SM2-SM3 for more details).

Network comparison

Relationships patterns were similar across the countries. In addition, we used the network comparison test, which is an overall test of network similarity (van Borkulo et al., 2017). Results from the network comparison test showed that all networks did not differ significantly regarding

network structure or global strength. Networks were thus similar concerning structure and the level that nodes were connected.

Examination of overall structures: Visualization of the Zero-order association networks

The visual inspection of the two sections of the networks supported the ICD-11 separated structures of PTSD and DSO symptom clusters as two systems with internal consistency and weaker connections between them. The DSO clusters were highly intercorrelated. The edges were substantially firm. In particular, the edges between the NSC factors of feelings of failure and worthless, and between the two factors of DiR, and in between the factors of NSC and DiR. The second item of AD (numbing) was also associated with the other DSO items. The associations between the first factor of AD ('long time to relax after upset feelings') and the other elements of the DSO symptoms were weaker compared to other edges in the DSO section. This item was also weakly related to the other AD item ('I feel numb or emotionally shut down'). The PTSD factors were interrelated to a lower extent than the associations between the DSO clusters. The strongest association in the PTSD section occurred between internal and external AV. The weakest edges appeared between the PTSD items on the one hand and the DSO items on the other side.

Discussion

We investigated the symptom network structure of the ICD-11 CPTSD in three nationally representative samples from Nigeria, Kenya, and Ghana. Results suggest that the structure of CPTSD across all three countries is similar, aiming to provide further evidence for the validity of this new condition in non-Western cultures. It is also important to highlight that the two methods of visualization (i.e., Graphical LASSO based on part correlations and Force-embedded

Fruchterman-Reingold (FR) based on zero order correlations) supported the ICD-11 multidimensional structure of CPTSD. Despite that samples varied across several demographics, culture, society, traumatic experiences, and symptom severity, comparisons regarding the structure, strength, and edge weights between networks was not significant, indicating that the patterns were similar across samples. Importantly, our findings add support to the questioned replicability of psychopathology symptom network analytical studies (Borsboom, 2017; Fried et al., 2018).

Our findings showed that the majority of CPTSD edges were nonzero across all African samples, in both clusters of PTSD and DSO symptoms. Specifically, within the DSO symptom cluster, strong edges were found between the negative self-concept factors of feelings of failure and worthlessness, and between the two factors of difficulties in relationships, and in between the factors of negative self-concept and difficulties in relationships. The associations between the first factor of affect dysregulation representing hyperactivation ("long time to relax after upset feelings") and the other factors of the DSO symptoms were weaker compared to other edges in the DSO section which were very strong. The force-directed visualization gave this further support as this item was associated to a lesser degree with the other DSO symptom clusters. The detailed symptom-to-symptom information in a psychopathology network was the advantage of the force-directed zero-order methodology (Holten and Van Wijk, 2009). This is in line with other studies that examined networks of CPTSD symptoms (Knefel et al., 2019). The idea of affective dysregulation as a unitary subdomain of CPTSD has already been questioned in previous research (McElroy et al., 2019).

Dual forms of dysregulation of emotions are wrapped in the affect dysregulation cluster: "long time to relax after upset feelings" and "I will numb or emotionally shut down", reflecting

overregulation and downregulation of emotions, respectively. It is likely that individuals express one of them, but not both, as shown in our study by a smaller association between the two items of affect dysregulation, compared to all other couples of items of which DSO consists. Specifically, in the current sample, the hypoactivation affect regulation strategy was associated more with the other DSO symptom clusters. Perhaps in Africa, responding to trauma using a hyperactivation style is less frequent, and therefore it is less associated with other DSO symptoms compared to the hypoactivation style. This may give support to previous findings from trauma research in Africa which suggested more internalizing methods of emotion regulation and suppression (Bozicevic et al., 2016; Knefel et al., 2019). The association of the symptoms mirroring on other clusters can be understood in light of the theoretical similarity of the symptoms, revalidating the DSO construct, or by a direct causal interaction of these symptoms. In line with previous work in the field (Knefel et al., 2019), the edges in the PTSD items were weaker than the edges in the DSO cluster, indicating higher validity in the DSO construct.

The most central symptom in all three networks was 'feelings of worthlessness'. These results replicate previous research in Western societies (Knefel et al., 2020, 2019). Since the study design is cross-sectional, high centrality indicates strong bidirectional associations with adjacent symptoms. Central symptoms can be useful targets for intervention and prioritizing symptoms of "feelings of worthlessness" for treatment can have a positive impact on all other symptoms. A sense of worthlessness typically develops after exposure to traumatic experiences which alter basic assumptions about self and others (Janoff-Bulmann, 1992). The current results mark this symptom as an important target for clinical interventions in the treatment of severely

traumatized individuals and accentuate the merit of the ICD-11 approach to distinguish PTSD and CPTSD diagnoses.

This study opens a new avenue in the visual representation of CPTSD and provided three levels of observation: first, a strong symptom connectivity across the network, as seen in the zero order FR methodology; second, patterns delineating PTSD symptoms from DSO symptoms; third, along with the ICD-11 hierarchical concept of PTSD and CPTSD, the whole network is a visual representation of CPTSD. This multi-dimensional approach is novel and may give researchers and clinicians alike a better view of symptoms of two distinct disorders. Our results confirm that the DSO symptom clusters and PTSD symptom clusters are separate entities, with strong inner associations with each of them and that DSO symptoms represent durable constructs with internal consistency. The results raise the question of whether DSO symptoms can be an independent entity of disorder as the inner edges between DSO symptoms were substantial even compared to the edges within PTSD symptoms. Subtantial evidence (Brewin et al., 2017) suggests that is an essential part of CPTSD, which adds support to the validity of the basic concept of Complex PTSD and its hierarchy. This study supports the generalisability and construct validity of ICD-11 PTSD and CPTSD in non-western countries.

Originally CPTSD was conceptualised as the prototypical response to multiple, prolonged developmental traumatic events with an early life onset (Herman, 1992). However, in the current study, even though the symptoms network analysis supports the symptomatic structure that reflects CPTSD according to ICD-11, the life events that were associated with CPTSD only partially corresponded to this description. While CPTSD indeed was associated with events such as sexual assault and unwanted sexual experiences, which are considered typical to CPTSD, most of the traumatic life events that were significantly correlated with

CPTSD were not prolonged and interpersonal, and included physical assault, which previously was found to be associated with CPTSD (Hyland et al., 2017), life-threatening illness or injury, severe human suffering, and serious accidents at work, home, or during recreational activity. These findings are in line with other research stating that CPTSD could stem from non-interpersonal trauma, such as sole catastrophic life events that could take place early in childhood or during adulthood (Courtois, 2004; Hyland et al., 2019). There is a need for furher work on the role of traumatic events as risk factors for PTSD and CPTSD.

Several limitations should be acknowledged in the present study. The unique cultural and political context of the African countries prohibit generalizations to other countries. Furthermore, internet sampling may lead to lower response rates in comparison to phone surveys or face to face interviews. Nevertheless, internet sampling is considered a viable method that provides adequate population based samples (Bodas et al., 2017). Another potential bias in the present study is the use of self-report questionnaires. It is important to note that even though each national sample was approximately representative of the population with regard to age and gender, the current study's sample consisted predominantly of well-educated participants who reside in urban and suburban areas, with better internet access, higher economic status, and most likely with higher proficiency in English. Even though the official language in the three countries is English and thus English is spoken by the majority of the population, there are multiple additional local dialects which we were unable to consider and which may have "westernized" the results to some degree. Finally, the cross sectional nature of networks in this study cannot infer causality (Bodas et al., 2017) and future longitudinal (within-person) network research is essential to provide information of the stability of symptoms over time.

In conclusion, the current study confirms the validity of the ICD-11 conceptualization of CPTSD and the ITQ as an assessment tool among non-Western individuals. Research is already taking place using the ITQ to assess PTSD and CPTSD among clearly a need diverse non-Western samples, such as among former female Yazidi captives residing in post-ISIS (the Islamic State of Iraq and Syria) camps (Hoffman et al., 2018) or Arabic-speaking refugees in the Middle East (Vallières et al., 2018). Even though additional validation among non-Western populations from regions outside Africa are indicated, the current study contributes to the growing evidence for the cross-cultural replicability of ICD-11 PTSD and CPTSD concepts and thus strengthens the empirical evidence obtained in past and future studies conducted among non-Western samples.

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Table 1. Mean (SD) of the PTSD and DSO items among the study samples

	Nigeria[a] *(n = 1006)*	*Kenya*[b] *(n = 1018)*	*Ghana*[c] *(n = 500)*	ANOVA Pairwise comparisons F (2, 2521)	Effect size (η^2)
Distressing dreams (RE1)	1.25 (1.26)	1.35 (1.28)	1.13 (1.24)	5.31, p = .00 c < b	.004
Intrusive recollections/flashbacks (RE2)	1.64 (1.36)	1.62 (1.39)	1.46 (1.38)	3.19, p = .04 c < a b	.002
Internal avoidance (AV1)	1.92 (1.37)	2.03 (1.37)	1.72 (1.37)	8.71, p < .001 c < a, b	.01
External avoidance (AV2)	1.99 (1.43)	2.02 (1.42)	1.74 (1.40)	7.29, p = .001 c < a, b	.01
Hypervigilance (SoT1)	2.80 (1.34)	2.66 (1.42)	2.66 (1.43)	3.25, p = .05	.002
Exaggerated startle response (SoT2)	1.60 (1.33)	1.60 (1.29)	1.41 (1.33)	4.38, p = .01 c < a, b	.003
Long-time upset (AD1)	1.50 (1.17)	1.70 (1.21)	1.51 (1.17)	8.68 p < .001 b > a, c	.01
Emotional numbing (AD2)	1.40 (1.29)	1.62 (1.35)	1.44 (1.31)	7.33 p < .001 b > a, c	.01
Feelings of failure (NSC1)	1.01 (1.29)	1.44 (1.44)	1.12 (1.34)	26.01 p < .001 b > a, c	.02
Feelings of worthlessness (NSC2)	0.74 (1.17)	1.17 (1.41)	0.86 (1.26)	29.81 p < .001 b > a, c	.02
Feeling distant or cut off from others (DiR1)	1.41 (1.36)	1.67 (1.45)	1.38 (1.33)	11.66 p < .001 b > a, c	.01
Difficulties feeling close to others (DiR2)	1.39 (1.34)	1.74 (1.43)	1.44 (1.34)	35.36 p < .001 b > a, c	.01