The construct of posttraumatic stress disorder in post-genocide Rwanda

PhD theses outline

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1. Introduction

The Rwandan Genocide is the largest mass murder of the late 20th century. In the spring of 1994 – during the course of about 100 days – an estimated 800,000 Tutsi people were slaughtered by the extremist members of the majority ethnic group called Hutus (Prunier, 2008). The mass murder was extremely brutal and the sole purpose of it was to exterminate the Tutsis and moderate Hutus and gain their political power.

Although considerable time has passed since 1994 the country has continued to be in the limelight of interdisciplinary research. The nature of physical and psychological suffering of individuals gives a unique opportunity to study mental health, especially related to psychological traumatization of extreme circumstances in a non-Western setting. Probable posttraumatic stress disorder (PTSD) rates so far has been established to be between 4.2-59.5% (Harbertson et al., 2013; Cohen et al., 2009) depending on sample characteristics and methods of measurements. In the two representable studies the rate of PTSD is between 24.8-26.1 percent (Munyandamutsa et al., 2012; Pham et al., 2004).

Just like in other research projects from non-Western settings the objectives of most of the studies in Rwanda were to establish prevalence rates of PTSD and to diagnose the disorder for humanitarian aid purposes. These objectives are problematic because the concept of PTSD used in Rwanda is based on the *Diagnostic and Statistical Manual of Mental Disorders*' fourth, text revised version that is rooted in theoretical ideas of disease of the West, the knowledge base pertaining to it is from Western, high-income countries

(Fodor et al., 2014), and the universality of PTSD is assumed without empirical evidence or question.

For the most accurate examination and measurement of PTSD in Rwanda, the validity of the construct needs to be examined in regard of factorial and criterion validity.

2. Objectives

The current dissertation has two objectives. Firstly, to compare the following five models of PTSD factor structure with confirmatory factor analysis (CFA). All models are based on the 17 DSM-IV symptoms. The models tested in the analysis are (1) DSM-IV's three-factor model (APA, 2000), (2) four-factor Emotional Numbing model (King et al., 1998), (3) four-factor Dysphoria Model (Simms et al., 2002), (4) four-factor Aroused Intrusion model (Rasmussen et al., 2007), and finally (5) the five-factor Dysphoric Arousal model (Elhai et al., 2011). We hypothesize that based on findings in the West the five factor Dysphoric Arousal model will best fit the data (Elhai et al., 2011).

Secondly, to investigate whether a distinct subset of individuals emerge with only PTSD, only major depressive disorder (MDD) or only prolonged grief (PG) or people only differ in terms of symptom severity. Latent profile analysis (LPA) is employed to investigate whether subpopulations characterized by different symptom profiles could be identified among genocide survivors exposed both to significant trauma and bereavements. We hypothesized a priori based on previous findings that classes will differ based on symptom severity rather than symptom type (Armour et al., 2015; Au et al., 2013; Contractor et al., 2015). Second, we hypothesize that classes

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significantly differ along basic demographic factors (gender, age, education) and the level of traumatic experiences (Roberts and Browne, 2011).

3. Methods

Procedures

Data collection was conducted in 2011 in South Rwanda. Trained locals administered the survey material in an interview format. Their work was monitored by the US based research team (Fodor et al., 2015). Probability proportional to size (PPS) sampling was employed and 50 villages were selected to recruit approximately 500 subjects from the Huye district, an area heavily affected by the genocide (Pham et al., 2004). The households and individuals were randomly selected in each village with the method of "random walks" (Coghlan et al., 2009; Patel et al., 2007). My roles included planning of study materials, coordinating data collection, data cleaning, data synthesis and data analysis.

The Institutional Review Board of NYS Psychiatric Institute and the Rwandan National Ethics Committee (RNEC) approved the research protocol. At RNEC's suggestion, participants were offered $10 in Rwandan francs as compensation for their time (Fodor et al., 2015; Pozen et al., 2015).

Measures

Trauma history was assessed using a 7 item trauma checklist that was specifically developed to measure exposure to genocidal violence (Pham et al., 2004).

PTSD was measured by the Posttraumatic Stress Disorder Checklist-Civilian Version (PCL-C, Blanchard et al., 1996). The PCL-C is a 17-item checklist of PTSD symptoms based closely on the DSM-IV criteria. Scores can range from 17 to 85. The English version of the measure has been widely used and has sound psychometric properties (McDonald and Calhoun, 2010; Ruggiero et al., 2003). To identify probable PTSD a cutoff score of 44 points was applied (Blanchard et al., 1996). The instrument has been widely used in studies of non-Western populations with excellent psychometric properties (e.g. Thapa and Hauff, 2005; Peltzer et al., 2013; Vera-Villarroel et al., 2011; Wu et al. 2008). Cronbach's alpha of the scale is .96.

Depression symptoms were assessed with the Depression module of the M.I.N.I. (Lecrubier et al., 1997). The 9 items in the module correspond to the DSM-IV depression symptom criteria pertaining to the preceding 2 weeks. Responses are limited to "yes/no" answer options. The measure has excellent psychometric properties (Lecrubier et al., 1997; Sheehan et al., 1997). Cronbach's alpha of the scale is .88.

Prolonged grief symptoms were measured by ten items derived from the Prolonged Grief-13 (Prigerson et al., 2009). Items were each asked on a five-point Likert scale. Response options ranged from "never" (0) to "always" (4). Prior to administration of these grief items, respondents were asked: "Did you lose a loved one during 1994 or afterwards from violence, illness, or other cause?" followed by "Who was that person"? Cronbach's alpha of the scale is .92.

Previously fielded Kinyarwanda translations of the PCL-C and M.I.N.I.-D were made available by other colleagues (Munyandamutsa et al., 2012; Pham

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et al., 2004). These translations were subjected to independent review, with several items selected for repeat forward-backtranslation.

Participants

Five hundred and four people participated in the study (response rate is 96%). Mean age of the sample was 41 ($SD = 15.1$). Women comprised over 75% of those surveyed, which reflects the male to female ratio of the habitants of the area and is a result of the fact that males were overrepresented among those who were killed (Pham et al., 2004). About 70% had no education beyond primary school; 45% reported no monetary income in the preceding year; about 20% were widowed; 60% were Catholic. A third of respondents obtained their water from public wells; 20% had no access to any type of toilet facilities.

Data analysis

Confirmatory factor analysis consisted of CFA of the five alternative models of factor structure with Mplus 6.12 software (Muthén and Muthén, 1998-2011). For an overview of the competing models see Table 1. We used robust maximum likelihood estimation (MLR). The analytic subsample comprised $n = 465$ subjects who reported at least one trauma on the trauma checklist. Goodness of fit was evaluated using the comparative fit index (CFI), the Tucker-Lewis index (TLI), the standardized root-mean square residual (SRMR), and the root-mean square error of approximation (RMSEA). For comparisons of nested models we used Santorra-Bentler scaled chi-squared difference test (S-Bχ^2diff) (Santorra and Bentler, 2001). For non-nested models (the four-factor models) the Bayesian information criterion (BIC) was considered (Kass and Raftery, 1995). The testing of construct-criterion validity was performed with an external latent factor of depression added to

the models that obtained good fit with weighted least squares means and variance adjusted estimation (WLSMV). Finally, to assess gender differences across PTSD factors, we tested a MIMIC model in which gender was added as a covariate (Fodor et al., 2015).

Latent profile analysis was conducted on a subsample of $n = 403$ subjects, those who reported at least one traumatic loss from the 1994 period. LPA was also conducted using Mplus 6.2 full-information maximum likelihood estimation with robust standard errors (Muthén and Muthén, 1998-2011). To determine the optimal number of latent classes fitting the data, 1 to 5 class solutions were evaluated. Model fit were determined by the Akaike Information Criterion (AIC; Akaike, 1987), the Bayesian Information Criterion (BIC; Schwartz, 1978), the sample size adjusted Bayesian Information Criterion (ssaBIC; Sclove, 1987), the Lo-Mendell-Rubins adjusted likelihood ratio test (LRT; Lo et al., 2001), and entropy values (Ramaswamy et al., 1993). Once the optimal number of classes fitting the data was determined, participants were assigned to classes based on latent conditional probabilities and ANOVAs and χ^2 tests were used to evaluate between-class differences.

Table 1. Competing models of DSM-IV based PTSD factor structure

Models	DSM-IV	Emotional Numbing	Dysphoria	Aroused Intrusion	Dysphoric Arousal
Number of factors	3	4	4	4	5
DSM-IV PTSD symptoms	APA (2000)	King (1998)	Simms (2002)	Rasmussen (2007)	Elhai (2011)
B1. intrusive thoughts	R	R	R	AI	R
B2. nightmares	R	R	R	AI	R
B3. reliving trauma/flashbacks	R	R	R	AI	R
B4. emotional cue reactivity	R	R	R	AI	R
B5. physiological cue reactivity	R	R	R	AI	R
C1. avoidance of thoughts	A/N	A	A	A	A
C2. avoidance of reminders	A/N	A	A	A	A
C3. trauma-related amnesia	A/N	N	D	N	N
C4. loss of interest	A/N	N	D	N	N
C5. feeling detached	A/N	N	D	N	N
C6. feeling numb	A/N	N	D	N	N
C7. hopelessness	A/N	N	D	N	N
D1. trouble sleeping	H	H	D	AI	DA
D2. irritability/anger	H	H	D	H	DA
D3. difficulty concentrating	H	H	D	AI	DA
D4. overly alert	H	H	H	H	AA
D5. exaggerated startle response	H	H	H	H	AA

Notes. A: avoidance; AA: anxious arousal; AI: aroused intrusion; D: dysphoria; DA: dysphoric arousal; H: hyperarousal; N: numbing; R: re-experiencing.

4. Results

Ninety-two percent (n = 466) of the subjects reported traumas related to the genocide on the trauma checklist. Most common genocide related traumas were the death of a family member due to illness as a result of the genocide (66.1%), hearing people getting injured or killed (64.5%), property being destroyed (44.7%). Eighty percent of the sample lost at least one close family member or friend during or in the aftermath of the genocide. Almost half of the sample lost one (30%) or both parents (12%). Twenty percent lost at least one sibling and 14 % lost at least one child. Probable rate of PTSD and MDD in the whole sample is 20.9% and 27% respectively. The means PCL-C score is 30.7 (SD = 15.7), while the mean number of depression symptoms is 2.8 (SD = 2.9).

The four-factor Emotional numbing and Dysphoria models and the five-factor Dysphoric Arousal model achieved almost identical, good fit indices. On the other hand, the Aroused Intrusion model had worse indices and the DSM-IV model did not fit the data at all. For the fit indices see Table 2. Comparing nested models, the DSM-IV model differed significantly from the Emotional Numbing and the Dysphoria models ($S-B\chi^2_{diff}$ (3, N = 465) = 196.57, p < 0.01 and $S-B\chi^2_{diff}$ (3, N = 465) = 244.04, p < 0.01, respectively). The Emotional Numbing and Dysphoria models did not differ significantly from the Dysphoric Arousal model ($S-B\chi^2_{diff}$ (4, N = 465) = 3.65, p = .46 and $S-B\chi^2_{diff}$ (4, N = 465) = 5.02, p = .29, respectively). Among the non-nested four factor models, both the Emotional Numbing and the Dysphoria models significantly fit better than the Aroused Intrusion model based on BIC values (BIC_{diff} = -58.01 and -54.83, respectively).

Table 2. Results of the confirmatory factor analysis: goodness of fit indices and model comparisons for tested models ($N = 465$) (Fodor et al., 2015)

Models	χ^2	df	CFI	TLI	SRMR	RMSEA (90% CI)	BIC
DSM-IV	502.34	116	.897	.879	.050	.085 (.077-.092)	19389.97
Emotional Numbing	313.89	113	.946	.935	.042	.062 (.054-.070)	19080.50
Dysphoria	314.27	113	.946	.935	.041	.062 (.054-.070)	19083.68
Aroused Intrusion	346.50	113	.938	.925	.045	.067 (.059-.075)	19138.51
Dysphoric Arousal	310.42	109	.946	.933	.041	.063 (.055-.071)	19099.99

Notes. χ^2: robust chi square; df: degrees of freedom; CFI: comparative fit index; TLI: Tucker-Lewis index; SRMR: standardized root mean square residual; RMSEA: root mean square error of approximation; CI: confidence interval; BIC: Bayesian information criterion. All chi-square tests were significant ($p < 0.01$).

Analysis showed that the extended models with the depression factor added have acceptable fit indices. The numbing and dysphoric arousal factors have high correlations with the depression factor (.71 and .73, respectively, $p < 0.01$), thus supporting the Emotional numbing and the Dysphoric Arousal model's convergent validity. On the other hand, the Dysphoria model's dysphoria factor has a slightly weaker association with depression (.63, $p < 0.01$) affording less evidence of convergent validity. The avoidance factors – which is an anxiety related factor – on all models have lower correlation with depression supporting their discriminant validity.

The CFA with gender as a covariate was performed on the Dysphoric Arousal model. All factors were associated with gender with females having higher scores than males. This association is the strongest in the case of re-

experiencing and dysphoric arousal factors; the weakest regarding the avoidance and anxious arousal factors.

Table 3 depicts the fit indices of the latent class analysis of the one to five class models. Based on fit indices and interpretability of class solutions, a three-class solution was judged to be optimal. For the three-class solution strong discrimination between classes was evidenced by high mean probabilities for class membership (0.97–0.99). This solution comprises three classes that show symptoms of PTSD, depression and prolonged grief in each class but with different severity. These are Class 1: no/minimal symptoms (47.9%), Class 2: a moderate symptoms (32.5%) and a Class 3 severe symptoms (19.6%). None of the three classes reflected a high PTSD/low depression-grief profile, or vice versa

Table 3. Fit indices for different latent class solutions (Fodor et al., 2016)

Model (N = 403)	Log likelihood	AIC	BIC	ssaBIC	Entropy	LMR	LMR p value
One class	-14043.638	28165.267	28321.235	28197.484			
Two classes	-12297.113	24722.226	24978.158	24775.079	.969	3457.033	.00*
Three classes	**-11803.374**	**23784.748**	**24140.653**	**23858.247**	**.955**	**977.296**	**.02***
Four classes	-11601.937	23431.874	23887.753	23526.019	.952	398.720	.10
Five classes	-11396.944	23071.889	23627.741	23186.680	.953	405.758	.16

Notes. AIC: Akaike Information Criterion; BIC: Bayesian Information Criterion; ssaBIC: sample size adjusted BIC; LMR: Lo-Mendell-Rubins adjusted likelihood ratio test. *p < 0.05

The ANOVA and χ^2 tests were employed to determine if the classes were significantly different in terms of demographic characteristics and mean scores on symptom measures. All pairwise comparisons were significant (p < 0.01), therefore the three classes were significantly different from each other along all examined variables. The severe class comprised mostly women (92.4% female), the mean age was comparatively higher than in the other classes (45.5 years), fewer people had achieved secondary level of education or higher (16.5%), more than half of the class was single or widowed, from the seven traumas a mean of 5 was experienced in that class. On average, people in this most severe class lost 3 close relatives. The PTSD mean score was 56.8, almost all of them were above the 44 point cutoff score, thereby meeting criteria for probable PTSD.

5. Conclusions

The first objective was to test alternative models of DSM-IV PTSD symptoms in a population that is markedly different from those in which such factor structure has been examined previously. Five competing models were specified and estimated using confirmatory factor analysis. We found that, as is the case in Euro-American samples, the Emotional Numbing, Dysphoria and Dysphoric Arousal models all fit the data well, whereas the DSM-IV three-factor and Aroused Intrusion models did not. The Emotional Numbing and Dysphoric Arousal models also possess good criterion validity as the numbing and dysphoric arousal factors had strong associations with the depression factor. These two models therefore may be preferable to the dysphoria model. The prominence of the numbing factor in the current sample may be due to the possible over-representation of chronic and late onset PTSD symptoms as compared with samples drawn in the first year or two of trauma occurrence. The comparatively poor fit of the DSM-IV three-

factor model is consistent with previous research (e.g. Elhai & Palmieri, 2011; Yufik & Simms; 2010). Moreover, the Emotional Numbing model contains four dimensions that closely resemble the DSM-5 PTSD criteria (APA, 2013) therefore our findings grant additional support of the revised DSM symptom clusters (Fodor et al., 2015).

We found that the latent structure of PTSD is similar to that found in Euro-American samples and the weight of the evidence supports the Emotional Numbing and Dysphoric Arousal models. These results suggest that the internal structure of PTSD symptoms is similar in Rwanda to that found in other parts of the world. However, we emphasize that a complete understanding of PTSD in Rwanda would require ethnographic and qualitative studies conducted in combination with the types of approaches employed here. Nonetheless, our findings provide further evidence for the generalizability of the Emotional Numbing and Dysphoric Arousal models and add to our more general understanding of PTSD symptomatology in extraordinarily traumatized populations (Fodor et al., 2015).

For our second objective, we employed LPA to establish symptom patterns of PTSD, depression and prolonged grief, the results provide evidence for three classes that differ by symptom severity but not by symptom type. Compared to simply calculating comorbidity rates based on cut-off scores a higher percent of the participants were identified to be affected by the disorders. This emphasizes the importance of latent variable modelling, the consideration of subsyndromal symptoms and the unusefulness of diagnostic algorithms. Half of the sample showed no or minimal symptoms at the time of data collection. This fact indicates that either they did not develop any symptoms after the genocide, or possibly their symptoms naturally decreased

with time. In 2002 the probable PTSD rate of Rwandan women from the same region was almost 40% (Pham et al., 2004) while in our sample it was considerably lower indicating a tendency of decreasing symptoms. Both pathways can be interpreted as evidence of resilience or a natural decrease in symptoms over time (Bonanno, 2011). The high rate of PTSD almost 20 years after the events indicates that this natural decline can take decades for those without therapeutic interventions. Because our study was cross-sectional we can only assume that the no/minimal symptom class contained both resilient and recovered individuals. On the other hand, 19.6% of the sample had extremely elevated symptoms. This group significantly differed from the remainder of the sample. The group had characteristics that have been proven to be risk factors for PTSD, such as being female, lower education and income, and more trauma exposure (Brewin et al, 2000; Roberts and Browne, 2011). These people could either have delayed onset symptoms or chronic symptoms (Maercker et al., 2013; Pietrzak et al., 2014).

Since PTSD is recognized and endorsed globally in epidemiological projects, its symptoms as defined by Western nosology arguably correspond to a universal human experience. While local idioms of distress might be useful in a clinical setting, the construct of PTSD serves as a common framework of human suffering that permits, facilitates and promotes global discussion (Breslau, 2004; Hinton and Lewis-Fernández, 2011). Conflict-affected populations are at heightened risk for developing disabling mental disorders like PTSD and PG as a result of exposure to trauma and loss. Our results underscore the importance of identifying specific symptom profiles in individuals exposed to both trauma and loss. This may facilitate the development of intervention strategies that target specific types of distress in survivors of persecution and conflict.

6. Bibliography of the candidate's publications

Publications related to the dissertation

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