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Research paper

Severity profiles of posttraumatic stress, depression, anxiety, and somatization symptoms in treatment seeking traumatized refugees

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ABSTRACT

Background: Western countries are facing many challenges hosting refugees from several regions in the world. Many of them are severely traumatized and suffer from a variety of mental health symptoms, which complicates the identification and treatment of refugees at risk. This study examined subgroups based on a broad range of psychopathology, and several predictors, including trauma characteristics and gender.

Methods: Participants were 1147 treatment-seeking, traumatized refugees. Latent profile analysis was conducted to identify different subgroups based on levels of posttraumatic stress disorder (PTSD), depression, anxiety, and somatic symptoms. Multinomial logistic regression was used to identify predictors of subgroup membership.

Results: Three distinct subgroups were identified, reflecting Moderate (10.2%), Severe (43.0%), and Highly Severe (45.9%) symptom severity levels, respectively. Symptom severity of all psychopathology dimensions was distributed equally between the subgroups. Participants in the Severe and Highly Severe Symptoms subgroups reported more types of traumatic events compared to the Moderate subgroup. In particular, traumatic events associated with human right abuses, lack of human needs and separation from others predicted subgroup membership, as did gender.

Limitations: The results are confined to treatment-seeking, traumatized refugee populations.

Conclusions: Distinguishable symptom severity profiles of PTSD, depression, anxiety and somatic complaints could be identified in this large treatment-seeking refugee population, without qualitative differences in symptom distribution. Instead of focusing on specific mental disorders, classification based on overall symptom severity is of interest in severely traumatized patients. This knowledge will help to identify individuals at risk and to enhance existing treatment programs for specific patient groups.

1. Introduction

About 15% of the nearly 25.4 million refugees worldwide found their way to Western European countries, with a peak in the asylum applications from 1989 to 2001 and after 2013 (Turner, 2015; UNHCR, 2017). Many refugees are affected not only by multiple and prolonged traumatic experiences but also by significant post-migratory distress (Bogic et al., 2012; Miller and Rasmussen, 2017). These factors often lead to heterogeneous symptom presentations and complex mental health conditions, making this population a challenge for mental health care, with lower recovery rates compared to other traumatized populations (Crumlish and O'Rourke, 2010; Nickerson et al., 2011; Palic and Elklit, 2011; Slobodin and de Jong, 2015).

The prevalence and co-occurrence of mental disorders in refugees are high. Around 55% of all refugees in European countries reported at least one, 36% reported more than one, and 20% even reported more than three current mental disorders (Bogic et al., 2012). Mental health problems frequently reported include symptoms of posttraumatic stress disorder (PTSD), depression, anxiety, and somatization. PTSD prevalence rates among refugees range between 9% and 33%, whereas anxiety and mood disorder rates go up to 55% (Bogic et al., 2012; Fazel et al., 2005; Gerritsen et al., 2006; Steel et al., 2009), and rates of somatic symptoms go up to even 63% (Rohlof et al., 2014). Despite high prevalence rates, somatic symptoms including somatization, are rarely taken into account in existing studies. Because these symptoms may cause important obstacles with diagnosing and treating refugees in mental health care (Rohlof et al., 2014), it is critical to take these into account.

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Clarifying the complexity and heterogeneity in symptom presentation is important for recognizing, diagnosing and treating traumatized patients (Crumlish and O'Rourke, 2010; Palic and Elklit, 2011). Insight into this heterogeneity can be gained by the identification of subgroups of individuals showing similar symptom patterns within specific DSM-diagnoses (Dalenberg et al., 2012). Subgroups may differ in terms of the nature of symptoms, that would suggest that assessment and treatment should focus on symptom variations of specific subgroups to enhance treatment efficacy. On the other hand, if subgroups would differ only in terms of overall symptom severity, this would suggest that assessment and treatment efforts should focus on transdiagnostic perspectives and common factors underlying different manifestations of distress (Au et al, 2013; Contractor et al., 2017; Nickerson et al., 2011).

Several prior studies identified subgroups in civilian and military populations based on PTSD symptoms and comorbid psychopathology. Some studies identified qualitatively different subgroups, e.g., regarding symptoms of dissociation (Armour et al., 2014) or symptoms in the domains of affective dysregulation, negative self-concepts, and interpersonal problems (Elklit et al., 2014). Several studies focusing on PTSD with comorbid mood and/or anxiety symptoms have identified subgroups that differed only in terms of symptom severity, with symptoms of PTSD, depression, and anxiety very closely cohered; other studies however, showed mixed results, finding both severity subgroups and qualitatively different subgroups (Table 1). Mixed results were also demonstrated in the few studies investigating subgroups of psychopathology in traumatized refugees, but they did not specifically focus on comorbidity of mood and anxiety symptoms (Table 2).

The studies that demonstrated subgroups based on overall symptom severity, underlined the possible continuum of a general posttraumatic stress response with PTSD and a wide range of coinciding symptoms of general psychopathology that are tightly connected. This is supported by findings that show common risk factors and vulnerabilities of comorbid PTSD and depression (Stander et al., 2014), and common non-specific factors underlying co-occurring depression, anxiety, as well as PTSD. Examples of these underlying risk factors are the factor 'negative affect', as postulated by Watson et al. (2011) or the 'general psychopathology' factor or p-factor, suggested by Caspi et al., (2014). Next to underlying mechanisms, several authors described that severe PTSD and subsequent stressors lead to enduring general posttraumatic stress responses, with a variety of symptoms instead of specific disorders with clear boundaries. This causes a gradual loss of adaptive abilities and overall psychosocial and occupational functioning (Armour et al., 2015; Jongedijk et al., 2019).

Apart from exploring whether subgroups could be identified based on endorsement of different symptom profiles, our study was also concerned with correlates of subgroup membership. Previous research on predictors of subgroup membership in case of traumatized refugees is scarce. Cumulative trauma exposure has been identified as an important predictor of PTSD and general levels of psychopathology (Knipscheer et al., 2015; Laban et al., 2004; Mollica et al., 1998; Wilker et al., 2015). In a sample of non-treatment-seeking refugees, greater trauma exposure predicted membership of more disturbed subgroups (Minihan et al., 2018). Not only the trauma load, but also the nature of potentially traumatic events (PTEs) has been found to affect symptom presentations (Conrad et al., 2017; Contractor et al., 2018; Momartin et al, 2004; O'Donnell et al., 2017). Some refugee studies found imprisonment, abuse and traumatic loss to be predictors of the more severe symptoms subgroups (Nickerson et al., 2014), whereas others found lack of food and water to be strongly linked with PTSD and depression (Roberts et al., 2008). Because these PTEs possibly differ per conflict, we anticipated that the region of origin might be a predictor for symptom severity in case of refugees. Furthermore, female gender has been found to be associated with more severe or chronic conditions of PTSD, depression, and anxiety (Gerritsen et al., 2006; Olff, 2017; Olff et al., 2007; Tolin and Foa, 2006). For instance, studies among victims of natural disasters found more female individuals in the more

Table 1
Non-refugee LCA/LPA studies, identifying subgroups of symptoms of PTSD with comorbid symptoms of mood and/or anxiety.

Study	Sample	Comorbidity symptoms	Number and type of classes	Description of subgroups
Armour et al. (2015)	Military	PTSD, depression	3, severity	High, Moderate, Low Symptom Severity
Au et al. (2013)	Sexual assault	PTSD, depression	4, severity	Low, Low-moderate, High-moderate, Severe Symptom Severity
Cao et al. (2015)	Earthquake survivors	PTSD, depression	4, mixed severity and nature	Low Severity, Predominantly depression, Predominantly PTSD, Combined PTSD-depression
Contractor et al. (2015)	Military	PTSD, MDD, GAD	3, severity	Mild, Moderate, Severe Symptom Severity
Contractor et al. (2017)	Students	PTSD, depression	3, mixed severity and nature	High Severity, Lower PTSD-higher depression, Higher PTSD-lower depression
Hruska et al. (2014)	Motor Vehicle Accidents	PTSD, depression, AoD	4, severity	Resilient, Mild, Moderate and Severe Symptom Severity for PTSD and depression; not for AoD
Jongedijk et al. (2019)	Military	PTSD, mood, anxiety	3, severity	Average, Severe, Highly Severe Symptom Severity

PTSD = Posttraumatic Stress Disorder; MDD = Major Depressive Disorder; GAD = Generalized Anxiety Disorder; AoD = alcohol/other drug abuse.

Table 2
Refugee LCA/LPA studies, identifying subgroups of symptoms of PTSD with and without comorbid symptoms of mood and/or anxiety.

Study	Sample	Comorbidity symptoms	Number and type of classes	Description of subgroups
Minihan et al. (2018)	Refugees	PTSD, no co-morbidity	4, mixed severity and type	No-PTSD, Moderate PTSD, High PTSD and High re-experiencing/ avoidance subgroup
Nickerson et al. (2014)	Refugees	PTSD, PGD	4, type	Combined PTSD/PGD, Predominantly PTSD, Predominantly PGD, Resilient subgroup
Tay et al. (2015)	Refugees	PTSD, depression, IED	4, type	PTSD, Depressive, IED, and Low/No Symptom subgroup

IED = Intermittent Explosive Disorder; PTSD = Posttraumatic Stress Disorder; PGD = prolonged grief disorder.

severe symptoms subgroups compared to a low severity subgroup (Cao et al., 2015; Zhen et al., 2018).

This study aimed to identify subgroups in a large treatment seeking traumatized refugee sample. To our knowledge, this is the first study in the field of refugees to examine a broad spectrum of comorbid psychopathology in order to identify symptom-based subgroups. Apart from the three DSM-IV based PTSD symptom clusters of re-experiencing, avoidance, and hyperarousal, we also took symptoms of anxiety, depression and somatization into account. Building on previous studies in various populations as well as the already mentioned assumptions of a general post-traumatic stress response, it was hypothesized that subgroups could be identified based on differences in overall symptom severity rather than qualitative differences. The second aim was to investigate whether membership of a specific subgroup could be predicted by exposure to PTEs, specifically PTE types, and gender. We hypothesized that a higher amount of PTE types and female gender, would predict membership to more severe symptoms subgroups. We also explored if class membership varied as a function of region of origin.

2. Method

2.1. Participants and procedure

Participants were trauma-exposed refugees referred for treatment at ARQ Centrum'45, a Dutch national institute for diagnostics and treatment of patients with psychotrauma-related disorders. ARQ Centrum'45 is a highly specialized psychotrauma health care institute. Patients are only admitted if they had one or more previous treatments elsewhere. Hence they always have long lasting complaints. Data were primarily collected for diagnostic purposes before the start of treatment as part of a routine diagnostic assessment procedure, and archived anonymously for scientific research purposes. Participants were informed about the storage of the anonymized assessment data and given the opportunity to have their data removed from the database. Upon consultation, the institutional review board of Leiden University stated that no review of the ethical merits of this study was needed and obtaining informed consent was not requisite, because assessments were conducted primarily for diagnostic and secondarily for research purposes. The questionnaires used in the present study are widely used with refugees and are available in many different languages (Kleijn et al., 2001). For the minority of individuals for whom no translated questionnaires were available interpreters were involved.

For the present study, data collected between 2002 and 2014 were used. Data were available for 1747 participants with a refugee background. Participants were excluded from the analyses if an assessment at the start of treatment was absent (n = 535, 30.6%), it was unclear whether the assessment took place at the start of treatment (n = 21, 1.2%), other instruments than the instruments considered in the present study had been used (n = 17, 1.0%), and when data entry was not correct (n = 27, 1.5%). The total sample included 1147 participants with a refugee background. Characteristics of the sample are described in Table 3.

Table 3
Sociodemographics.

Characteristics	N	%	Mean	Standard deviation
Gender				
Male	807	70.4		
Female	340	29.6		
Age			40.93	10.72
Region of origin				
Middle East & North Africa	652	56.8		
Former Yugoslavia	210	18.3		
Sub-Saharan Africa	171	14.9		
Other	114	9.9		

2.2. Measures

Severity of PTSD-symptoms was assessed with the Harvard Trauma Questionnaire (HTQ; Mollica et al., 1992). Participants rated how much they were bothered by PTSD symptoms during the past week, rated on a 4-point scale (*not at all, a little bit, quite a bit*, or *extremely*). Total PTSD symptom severity was calculated by averaging the responses on all items. Scores with regard to the DSM-IV PTSD symptom dimensions of re-experiencing, avoidance, and arousal were computed by averaging the responses on the corresponding items. A cut-off score of 2.5 is recommended to identify clinically significant PTSD (Mollica et al., 1996a). Internal consistencies of the items representing the three dimensions were adequate, with α's ranging from .71 to .76.

Symptoms of anxiety and depression were assessed with the Hopkins Symptom Checklist-25 (HSCL-25; Mollica et al., 1996b). Participants indicated how much they were bothered by 10 symptoms of anxiety and 15 symptoms of depression during the past week, rated on a 4-point scale (*not at all, a little bit, quite a bit*, or *extremely*). Symptom severity with regard to anxiety and depression was calculated by averaging responses on the anxiety and depression items. A cut-off score of 1.75 is recommended to indicate clinically significant anxiety or depression (Mollica et al., 1996b). Internal consistency of the scales was high (α's were .87 and .88).

Both the HTQ and the HSCL-25 were translated into the most common languages spoken by refugees referred for treatment at ARQ Centrum'45, i.e. Arabic, Farsi, Serbo-Croatian, and Russian. Both instruments have been shown to have good psychometric qualities and adequate validity in studies with refugees (Hollifield et al., 2002; Lavik et al., 1999). In addition, refugees with different language backgrounds appear to interpret the items and underlying concepts of both instruments in a similar way (Wind et al., 2017).

Somatic complaints were assessed with a shortened version of the Pennebaker Inventory of Limbic Languidness (PILL). The original questionnaire asks participants to rate the presence of 54 physical symptoms (Pennebaker, 1982). To make the PILL less time consuming, the shortened questionnaire asks participants to rate how often they were bothered by 26 somatic complaints during the past 12 months on a 5-point scale (*rarely or never, sometimes, regularly, often,* or *very often*). This revised version showed good psychometric properties (Gijsbers van Wijk and Kolk, 1996). Scores were summed to yield an index of the severity of somatic complaints, ranging between 26 and 130 (current study α = 0.87).

Exposure to PTEs was assessed with the HTQ. Participants rated their level of exposure to 19 types of PTEs on a 4-point scale (*experienced, witnessed, heard of,* or *no exposure*). The total number of PTE types was computed by counting the number of self-experienced and witnessed events, yielding a score between 0 and 19. Principal component analysis of the HTQ on a large clinical sample of refugees by Knipscheer et al. (2015) showed that PTE items cluster into four separate domains: human right abuses (physical torture, threatened to be physically tortured, threatened to watch torturing, threatened to be executed, serious injury, lost or kidnapped, imprisonment), traumatic loss (murder of family member or friend, unnatural death of family member or friend, murder of stranger(s)), lack of basic human needs (lack of shelter, lack of food or water, ill health without access to medical care), and separation from others (forced separation from family members, forced isolation from others). The number of PTE types within each domain was calculated in the same way as the total number of PTE types (potential ranges: 0-7 for human right abuses; 0-3 for traumatic loss and lack of basic human needs; 0-2 for separation from others).

2.3. Statistical analyses

Latent profile analysis (LPA) in MPlus version 8 (Muthén and Muthén, 1998-2017) was used to classify individuals into homogeneous latent subgroups based on the continuous measures of severity of psychopathology. The robust maximum likelihood estimator (MLR) was used which is robust to non-normality of observations. Full information maximum likelihood estimation was used to include participants with missing data. Complete data were available for 74.7% of the participants. Estimation of the covariances between the psychopathology scales was based on 75.8% to 92.3% of the data (mean = 82.8%). To simplify interpretation of the LPA results, scores on symptom measures were standardized into Z-scores. To avoid local likelihood maxima 1000 random sets of starting values in the first and 100 in the second step of optimization were requested and 50 initial stage iterations were used. A series of models with increasing numbers of latent subgroups were estimated until no acceptable model fit or substantive meaning was achieved (DiStefano and Kamphaus, 2006; Masyn, 2013). The model with the least number of latent subgroups with acceptable model fit and classification quality, as well as theoretical substantive meaning was selected as the most optimal solution. To compare models with different solutions the Bootstrapped Likelihood Ratio Test (BLRT), Lo-Mendell-Rubin adjusted likelihood ratio test (LMRA-LRT), and the Bayesian Information Criterion (BIC) were used. For the BLRT and LMRA-LRT, a significant p-value indicates that the estimated model fits the data better than the model with 1 subgroup less (Nylund et al., 2007). Regarding BLRT, 500 bootstrap samples were requested with 50 sets of starting values in the first and 20 in the second step of optimization to avoid local likelihood maxima in each bootstrap sample. A lower value of BIC indicates a better fit of the model to the data (Van de Schoot et al., 2012). In LPA, the BLRT commonly yields a significant p-value and the lowest value of BIC is only reached in a highly complex model (Masyn, 2013). Therefore, diminishing gains in model fit according to the log-likelihood and BIC across models with an increasing number of subgroups were explored. When increasing the number of subgroups is starting to be accompanied by a diminishing gain in model fit this indicates a marginal gain in information. For this reason, it is likely that the minimal number of subgroups with substantive meaning and acceptable model fit is reached at this point (Masyn, 2013; Nylund et al., 2007). To evaluate the classification quality the entropy statistic was used, in combination with the average assignment probabilities. Classification is considered adequate when entropy values are >0.80 (Celeux and Soromenho, 1996). Mean differences in the symptom dimensions between the subgroups resulting from the LPA were tested using bootstrapped robust ANOVAs and post-hoc tests (Wilcox, 2017). This test was performed in R (version 3.1.0) using the WRS2 package. A 20% trimmed mean was used for this analysis and 1000 bootstrap samples were requested. An explanatory measure of effect size ε as suggested by Wilcox and Tian (2011) was used, with values of $\varepsilon = 0.10$, 0.30, and 0.50 corresponding to small, medium, and large effect sizes respectively.

Subgroup membership was predicted by regressing the latent subgroups in the optimal solution on a set of observed predictor variables by conducting a series of multinomial logistic regression models using the three-step procedure in Mplus (Asparouhov and Muthén, 2014). The PTE domains of traumatic loss, lack of basic human needs, and separation from others were treated as categorical, because the potential range of these scores did not allow them to be treated as continuous. Using Helmert contrast coding, these were coded into two or three variables. By using Helmert contrasts each category of a categorical variable is compared to the mean of subsequent categories. The score regarding the PTE domain of human right abuses could be treated as continuous. The nominal region of origin variable was coded into two dummy variables in such a way that each category was compared to the reference category Middle East. Because data on the predictor variables were available for subsamples of different composition and MPlus handles missing values in the predictor variables with listwise deletion in this context, separate multinomial regression models were estimated for each of the predictor variables.

3. Results

3.1. Descriptive statistics

Table 4 presents descriptive statistics of the symptom dimensions and predictor variables. The large majority of participants endorsed a clinical level of symptom severity with regard to PTSD, anxiety, and depression. This indicates that participants suffered multiple co-morbid symptom dimensions. Participants also indicated to have experienced and/or witnessed multiple PTE types (M = 13.88, SD = 4.55 PTE types) indicating that they were severely traumatized.

3.2. Latent profile analysis

Seven models with one to seven subgroups were tested with regard to six symptom dimensions (PTSD re-experiencing, PTSD avoidance, PTSD hyperarousal, anxiety, depression, and somatic complaints).

Table 4
Descriptive statistics with regard to the symptom dimensions and predictor variables.

	N	Mean	Standard deviation	% in clinical range
PTSD: re-experiencing	1066	3.23	0.70	–
PTSD: avoidance	1056	2.85	0.61	–
PTSD: arousal	1064	3.20	0.63	–
PTSD: overall	1060	3.05	0.55	85.5
Anxiety symptoms	918	2.91	0.67	93.6
Depressive symptoms	912	2.92	0.62	95.2
Somatic complaints	980	68.77	17.30	–
Total number of PTE types	861	13.88	4.55	–
Number of PTE concerning human right abuses	861	4.80	2.12	–
Number of PTE concerning traumatic loss	861	2.20	1.04	–
Number of PTE concerning lack of basic human needs	861	2.09	1.08	–
Number of PTE concerning separation from others	861	1.48	0.75	–

Note. For some symptom dimensions the % of participants endorsing a clinical level of symptom severity could not be established because of the absence of a clinical cut-off value. PTSD = posttraumatic stress disorder. PTE = potentially traumatic events.

Table 5
Model fitting results and classification quality of the latent profile analysis.

Model	Entropy	BIC	Log-likelihood	BLRT		LMRA-LRT	
				-2LL difference	*P*	Value	*p*
1. One subgroup	1.000	17094.451	-8504.956	–	–	–	–
2. Two subgroups	0.843	15153.372	-7509.760	1990.393	<.001	1950.834	<.001
3. Three subgroups	**0.806**	**14423.262**	**−7120.047**	**779.425**	**<.001**	**763.934**	**<.001**
4. Four subgroups	0.786	14192.120	-6979.819	280.456	<.001	274.882	<.001
5. Five subgroups	0.800	14155.677	-6936.940	85.757	<.001	84.053	0.568
6. Six subgroups	0.720	14123.018	-6895.954	81.974	<.001	80.345	0.027
7. Seven subgroups	0.711	14107.129	-6863.352	65.203	<.001	63.907	0.1513

Note. Most meaningful model is printed in bold. BIC = Bayesian information criterion; BLRT = Parametric bootstrapped likelihood ratio test; -2LL difference = -2 times log-likelihood difference between a N class solution and N – 1 class solution; LMRA-LRT = Lo-Mendell-Rubin adjusted likelihood ratio test.

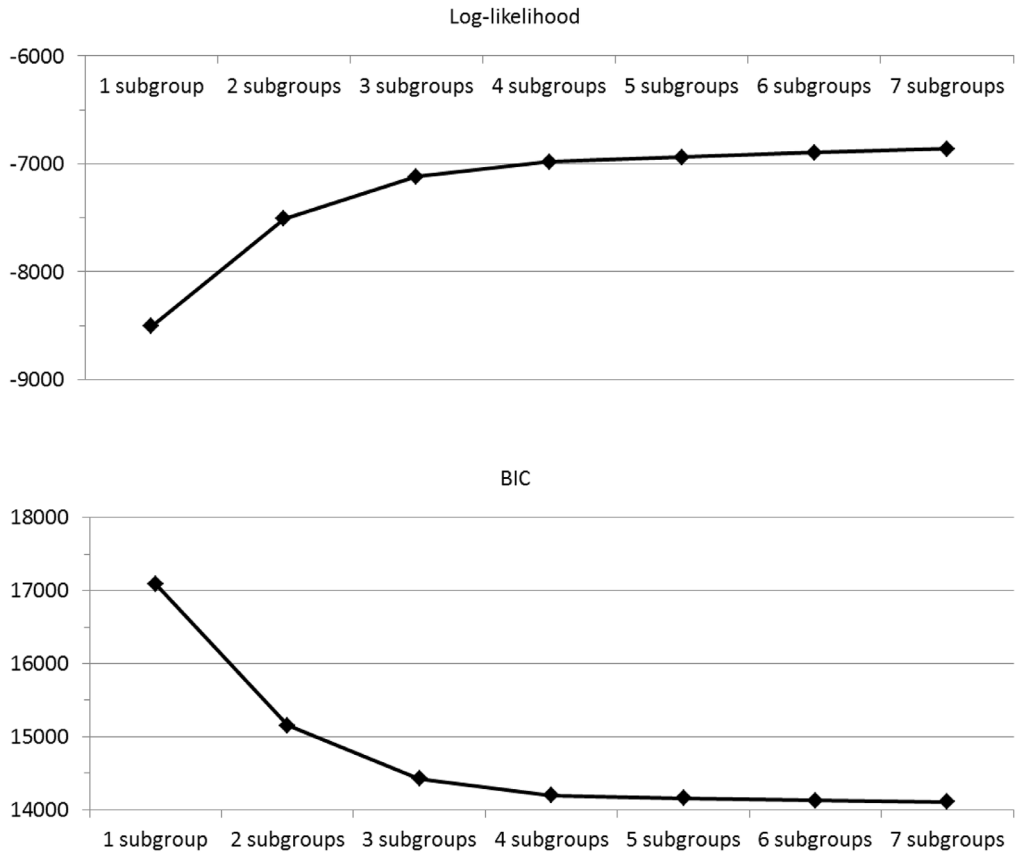

Fig. 1. Gain in log-likelihood and BIC across LPA models with increasing numbers of latent subgroups.

Model fitting results and classification quality are summarized in Table 5. All models yielded significant *p*-values of the BLRT and decreasing BIC values, indicating a highly complex model with more than 7 subgroups as the optimal solution. LMRA-LRT yielded a non-significant *p*-value for model 5 and 7, indicating a model with 4 or 6 subgroups as the optimal solution. Since model fit indices did not clearly point to a single model as the most optimal solution and BLRT and BIC indicated a highly complex model as the optimal solution, gain in model fit according to the log-likelihood and BIC across models with increasing numbers of latent subgroups was explored and depicted in Fig. 1. The log-likelihood increased and BIC decreased substantially when moving from a model with one to two latent subgroups and from two to three latent subgroups. When moving from a model with three to four latent subgroups and across subsequent models with an increasing number of subgroups, there was a diminishing gain in log-likelihood and BIC. This indicates that the model with three latent subgroups (model 3) is the most parsimonious model – i.e. the model with the minimal number of latent subgroups with substantive meaning. The entropy value indicated adequate classification quality of this model. Entropy values of models with more than 3 latent subgroups were lower, indicating worse classification quality (Table 5). Adequate classification quality of model 3 was also supported by the average assignment probabilities for each individual latent subgroup: 0.882, 0.946, and 0.922 for the first, second, and third latent subgroup respectively. Fig. 2 presents the standardized mean symptom severity on the symptom dimensions in each of the subgroups with regard to model 3, 4, 5, and 6. From a conceptual perspective model 3 was preferred over model 4 because the second and third subgroup in model 4 were very similar to the second subgroup in model 3. The division of the second subgroup in model 3 into two separate subgroups in model 4 was therefore deemed redundant. Although the third subgroup model 5 showed an interesting profile that deviates from the profiles of the other subgroups, model 3 was also preferred over model 5 because the size of the third subgroup in model 5 was negligible (i.e. N = 34, 3.0%).

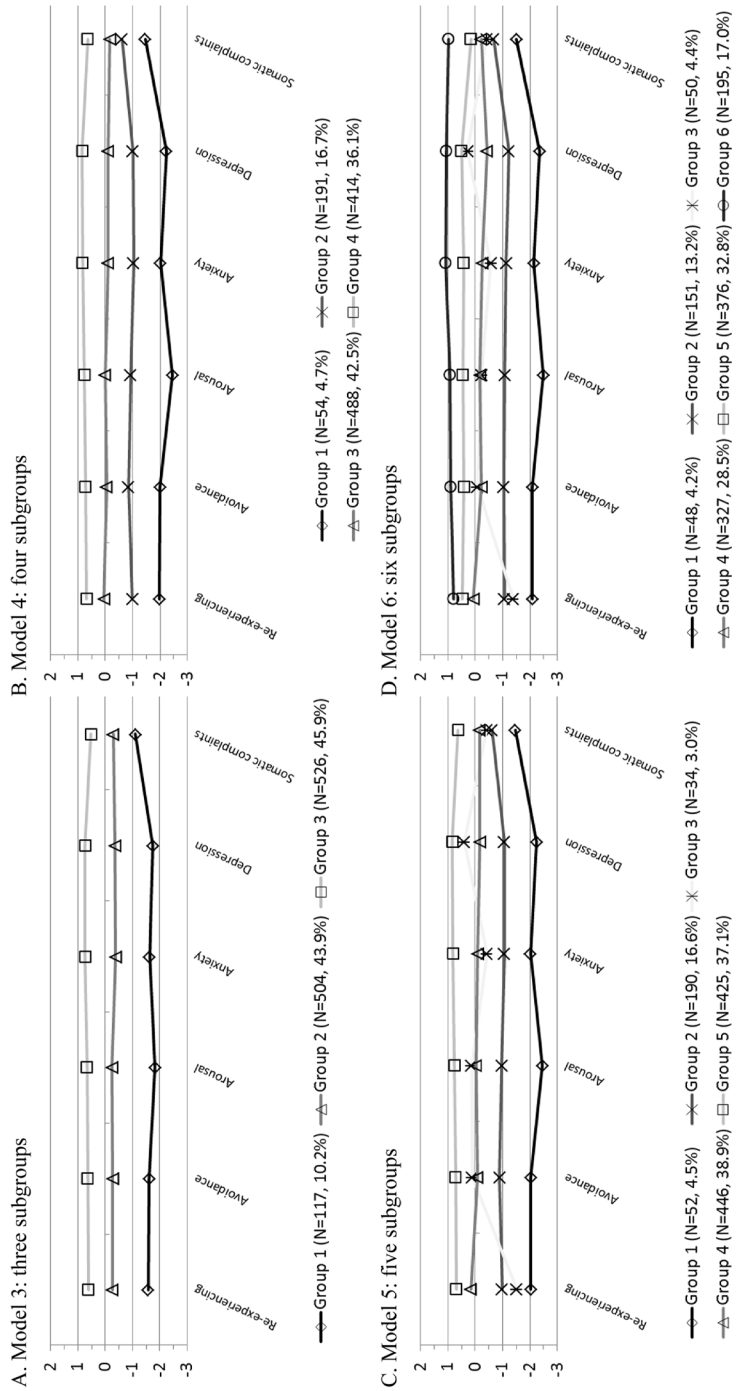

Fig. 2. Standardized mean scores on the symptom dimensions in each of the subgroups with regard to the models with 3, 4, 5, and 6 latent subgroups.

Finally, model 3 was preferred over model 6 because the fifth and sixth subgroup in model 6 were very similar to the third subgroup in model 3. The division of the third subgroup in model 3 into two separate subgroups in model 6 was therefore deemed redundant. Based on the criteria with regard to model fit, parsimony, classification quality, and theoretical meaning the model with three latent subgroups was retained.

Fig. 1A shows that the first subgroup consists of 117 (10.2%) participants reporting the lowest symptom severity on all six symptom dimensions compared to participants in the second and third subgroup. The second subgroup includes 504 (43.9%) participants reporting intermediate levels of symptom severity compared to the first and third subgroup. The third subgroup consists of 526 (45.9%) participants showing the most severe symptoms compared to the other subgroups. Results of the robust ANOVAs showed significant differences in symptom severity on all six symptom dimensions between the subgroups (F ranged between 230.40 and 704.06, all p-values < 0.001). The effect size on all symptom dimensions was large, with effect sizes ε ranging between 0.762 and 0.962. Results of post-hoc tests showed that participants in the first subgroup reported significantly lower symptom severity on all symptom dimensions compared to participants in the second and third subgroup (all p-values < 0.001). Participants in the second subgroup reported significantly lower symptom severity on all symptom dimension compared to participants in the third subgroup (all p-values $< .001$). In the first subgroup, a minority of the participants (4.5%) endorsed a clinical level of PTSD and 54.5% and 58.8% of the participants endorsed a clinical level of anxiety and depression. In the second subgroup, a large majority of the participants endorsed clinical levels of PTSD (89.6%), anxiety (96.4%), and depression (99.0%). In the third subgroup, all participants endorsed clinical levels of PTSD, anxiety, and depression. Based on these results, the subgroups were labelled the Moderate, Severe, and Highly Severe Symptoms subgroup respectively.

3.3. Predictors of subgroups

Descriptive statistics of the total number of PTE types, the number of PTE types within each trauma domain, region of origin, and gender within each of the subgroups are presented in Table 6. Results of the multinomial logistic regression analyses are presented in Table 7. The B coefficients (log odds) indicate how much more or less likely it becomes to be in one of the subgroups relative to the other subgroups, with every unit increase in the predictor variable. In the first and second model, the latent subgroups were regressed on the overall number of PTE types and the number of PTE types within the trauma domains respectively. In the third and fourth model, the latent subgroups were regressed on gender and region of origin.

The total number of PTE types differentiated significantly between all subgroups. Participants were respectively 2.59 and 1.58 times more likely to be in the Highly Severe Symptoms subgroup compared to the Moderate and Severe Symptoms subgroups with every additional PTE type. Likewise, they were 1.65 more likely to be in the Severe Symptoms subgroup compared to the Moderate Symptoms subgroup. PTE types within the human rights abuses domain differentiated significantly between the Moderate and Highly Severe Symptoms subgroups, as well as between the Severe and Highly Severe Symptoms subgroups. Participants were respectively 1.80 and 1.38 times more likely to be in the Highly Severe Symptoms subgroup compared to the Moderate and Severe Symptoms subgroups with every additional PTE type within the human right abuses domain. Subgroups did not differ in terms of the PTE type traumatic loss. PTE types within the domain of basic human needs differentiated significantly between subgroups. Participants were respectively 1.19 and 1.20 times more likely to be in the Severe and Highly Severe Symptoms subgroups compared to the Moderate Symptoms subgroup if they experienced one or multiple PTE types within the domain of lack of basic human needs. In addition, Participants were 1.26 times more likely to be in the Severe Symptoms subgroup compared to the Moderate Symptoms subgroup if they experienced more than one PTE type within the domain of lack of basic human needs. Within the domain of separation from others, the number of PTEs differentiated significantly between the Moderate and Highly Severe Symptoms subgroups. Participants were 1.26 times more likely to be in the Highly Severe Symptoms subgroup if they experienced any event within this domain. Gender differentiated significantly between

Table 6
Descriptive statistics of the predictor variables within subgroups.

	Moderate symptoms subgroup			Severe symptoms subgroup			Highly Severe symptoms subgroup		
	N	M	SD	N	M	SD	N	M	SD
Traumatic event types									
Total number	96	10.98	5.49	376	13.42	4.47	389	15.04	3.94
Human right abuses	96	3.67	2.50	376	4.60	2.15	389	5.27	1.84
	N	%		N	%		N	%	
Traumatic loss									
0 event types	19	19.8		52	13.8		26	6.7	
1 event type	15	15.6		47	12.5		45	11.6	
2 event types	21	21.9		85	22.6		82	21.1	
3 event types	41	42.7		192	51.1		236	60.7	
Lack of basic human needs									
0 event types	26	27.1		51	13.6		39	10.0	
1 event type	21	21.9		53	14.1		47	12.1	
2 event types	19	19.8		94	25.0		81	20.8	
3 event types	30	31.3		178	47.3		222	57.1	
Separation from others									
0 event types	30	31.3		65	17.3		42	10.8	
1 event type	18	18.8		79	21.0		80	20.6	
2 event types	48	50.0		232	61.7		267	68.6	
Gender									
Male	82	70.1		370	73.4		355	67.5	
Region of origin									
Middle East	68	63.6		290	62.9		294	63.2	
Sub-Saharan Africa	18	16.8		76	16.5		77	16.6	
Balkan Europe	21	19.6		95	20.6		94	20.2	

Table 7
Results of the multinomial regression analysis of symptom severity subgroups on the number of potential traumatic event types, gender, and region of origin.

	Moderate symptoms subgroup Vs. Severe symptoms subgroup			Vs. Highly Severe symptoms subgroup			Severe symptoms subgroup Vs. Highly Severe symptoms subgroup		
	B	SE	CI	B	SE	CI	B	SE	CI
Traumatic event types									
Total number	0.50*	0.13	0.25 to 0.75	0.95*	0.13	0.70 to 1.20	0.46*	0.10	0.26 to 0.66
Human right abuses	0.27	0.15	−0.02 to 0.56	0.59*	0.14	0.32 to 0.86	0.32*	0.11	0.10 to 0.54
Traumatic loss									
0 versus 1,2 & 3 event types	−0.04	0.09	−0.22 to 0.14	0.12	0.10	−0.08 to 0.32	0.16	0.09	−0.02 to 0.34
1 versus 2 & 3 event types	0.06	0.13	−0.19 to 0.31	0.06	0.13	−0.19 to 0.31	0.00	0.09	−0.18 to 0.18
2 versus 3 event types	−0.03	0.17	−0.36 to 0.30	0.04	0.16	−0.27 to 0.35	0.07	0.12	−0.17 to 0.31
Lack of basic human needs									
0 versus 1,2 & 3 event types	0.17*	0.08	0.01 to 0.33	0.18*	0.08	0.02 to 0.34	0.01	0.08	−0.15 to 0.17
1 versus 2 & 3 event types	0.23*	0.12	−0.01 to 0.47	0.20	0.11	−0.02 to 0.42	−0.03	0.09	−0.21 to 0.15
2 versus 3 event types	0.18	0.18	−0.17 to 0.53	0.18	0.18	−0.17 to 0.53	0.13	0.12	−0.11 to 0.37
Separation from others									
0 versus 1 & 2 event types	0.15	0.11	−0.07 to 0.37	0.23*	0.11	0.01 to 0.45	0.08	0.10	−0.12 to 0.28
1 versus 2 event types	−0.18	0.19	−0.55 to 0.19	−0.27	0.18	−0.62 to 0.08	−0.10	0.13	−0.35 to 0.15
Gender									
Female vs. male	−0.21	0.25	−0.70 to 0.28	0.14	0.24	−0.33 to 0.61	0.35*	0.17	0.02 to 0.68
Region of origin									
Middle East vs. Sub-Saharan Africa	−0.01	0.33	−0.66 to 0.64	−0.01	0.31	−0.62 to 0.60	0.00	0.22	−0.43 to 0.43
Middle East vs. Balkan Europe	0.07	0.31	−0.54 to 0.68	0.04	0.29	−0.53 to 0.61	−0.03	0.20	−0.42 to 0.36

* $p < .05$; CI = 95% confidence interval of regression coefficient B.

the Severe and Highly Severe symptoms subgroups, with females being 1.42 more likely to be in the Highly Severe Symptoms subgroup. Region of origin did not differentiate significantly between any of the subgroups.

4. Discussion

To our knowledge, this is the first LPA-study investigating subgroups based on a broad range of symptoms of psychopathology in a large sample of treatment-seeking, severely traumatized refugees. Using LPA, three distinct subgroups were identified reflecting moderate, severe, and highly severe levels of co-occurring symptoms of psychopathology. These findings extend previous studies documenting subgroups based on symptom severity in civilian, military, and refugee populations across PTSD symptoms and sometimes co-morbid symptoms (see e.g., Armour et al., 2015; Au et al., 2013; Contractor et al., 2015; Jongedijk et al., 2019; Minihan et al., 2018).

Differences between the subgroups could completely be characterized by differences in symptom severity with regard to the PTSD symptom clusters re-experiencing, avoidance, and arousal, as well as anxiety, depression and somatization symptoms. The absence of qualitative differences between the subgroups (e.g., severe symptoms on a specific symptom domain and less severe symptoms on other domains) supports the proposition that severely traumatized individuals exhibit a broad and general posttraumatic stress response with a variety of mental health symptoms of which PTSD-symptoms represent only one element.

Prior studies examining psychopathology profiles among refugees yielded mixed results, with both quantitative and qualitative differences between subgroups (see Table 2). However, all these studies were conducted using community samples with non-patient participants, and not a treatment-seeking sample as in our study. Treatment seeking individuals show important differences in characteristics compared to non-patients. Particularly at lower levels of PTSD severity, classes with predominant PTSD severity and predominant depression severity were found to be distinct (Contractor et al., 2017). Furthermore, a prior study showed that PTSD and depression are separate entities in the earlier phases post-trauma whereas the distinction between the two becomes less clear as symptomatology becomes more chronic (O'Donnell et al., 2004).

More specifically, patients exhibiting severe and long-lasting psychopathology suffer from subsequent distress that is not only caused by the experienced PTEs, but also the disabling long-lasting mental health problems and resulting psychosocial dysfunctions. In particular refugees face significant post-migration, displacement-related stressors that have a significant negative influence on mental health problems (Carswell et al., 2011; Miller and Rasmussen, 2017; Minihan et al., 2018). Because exposure to past PTEs brings about increased and enhanced sensitivity to post-trauma stressors (Smid et al., 2013), enduring trauma-related mental health problems combined with lasting displacement-related stressors will cause a gradual decline of adaptive psychosocial and health related functioning and will lead to a broad mix of general psychiatric symptoms and disorders instead of clearly distinguishable diagnostic classifications (Au et al., 2013; Armour et al., 2015; Jongedijk et al., 2019).

Although we measured a broad spectrum of comorbid psychopathology next to PTSD, some potentially important symptom dimensions were not taken into account, including affective dysregulation, dissociation, prolonged grief, and personality dimensions. As stated by some authors, PTSD, anxiety and depression may have common underlying factors (e.g., Watson et al., 2011). This may be the reason why symptoms of PTSD, anxiety and depression cohere together tightly. The inclusion of other symptom dimensions might have led to the identification of subgroups differing in a more qualitative manner.

This study also aimed to identify whether exposure to PTE types predicts subgroup membership taking into account research evidence that a higher level of exposure to PTEs is associated with long-term psychiatric morbidity in refugees (Bogic et al., 2012; Knipscheer et al., 2015; Minihan et al., 2018). PTSD shows a 'building block' effect: exposure to PTEs is cumulative, contributing to the risk of developing PTSD and to the severity of PTSD over time in a 'dose-dependent' manner (Mollica et al., 1998; Schauer et al., 2003; Wilker et al., 2015). Refugees in our study experienced high numbers of PTE types. Results were as expected: participants in the Severe and in the Highly Severe Symptoms subgroup reported a larger number of PTE types compared to participants in the Moderate Symptoms subgroup. Moreover, our results indicated that symptom profiles were associated with specific domains of PTEs. This is in line with previous studies in non-refugee (Contractor et al., 2018; O'Donnell et al., 2017) and refugee populations (Nickerson et al., 2011). Participants reporting more PTEs regarding human right abuses were more likely to be in the Highly Severe Symptoms subgroup than those who reported less PTEs within this

domain. Traumatic loss did not differentiate between the subgroups. It is possible that experiences with loss precipitate other symptoms instead of those related to PTSD, anxiety, depression or somatization, such as symptoms of prolonged grief disorder (Djelantik et al., 2019; Nickerson et al., 2014). Participants reporting PTEs regarding lack of human needs were more often in the Severe and Highly Severe Symptoms subgroups. This domain is defined by a lack of material kind of needs, which, together with social support during and after traumatic situations, is an important factor influencing the course of mental health symptoms in refugees (Schweitzer et al., 2006).

Based on country of origin, three separate geographic regions of origin were defined. However, they did not differentiate with regard to the severity subgroups. Maybe region of origin is not an appropriate way to categorize character and severity of conflict. Within each region, different countries may have different kinds of conflicts and wars and, hence, a substantial difference in PTE types. For example, a previous study demonstrated that within one region, in our study defined as 'Middle East and North Africa', respondents from Iran had a higher risk for PTSD and depression/anxiety compared to respondents from Afghanistan and Somalia (Gerritsen et al., 2006). Cultural differences within and between the geographic regions possibly also play a role in the presentation of mental health complaints. Furthermore, patients from different cultures can be faced with different acculturation problems and confusion of cultural identity, which are risk factors for mental health problems (Groen et al., 2019). This means that several other factors related to region of origin might play a role in developing psychopathology and that region of origin as such is insufficiently specific.

Previous studies in different populations, including refugees, showed that women had higher risks for developing PTSD and comorbid disorders (Cao et al., 2015; Gerritsen et al., 2006; Olff et al., 2007; Tolin and Foa, 2006; Zhen et al., 2018). In our study, we demonstrated that female refugee participants were significantly more often included in the Highly Severe Symptoms subgroup than in the Severe Symptoms subgroup. This suggests that women not only have more chance to develop PTSD and comorbid symptomatology, but also suffer more severe symptoms.

4.1. Strengths, limitations, and future research

This is the first LPA-study to identify subgroups in a sample of refugees based on their scores on indices of PTSD and other forms of psychopathology. Strengths of this study are that it relied on a large sample of refugees from a wide range of countries, increasing the generalization of the findings. Moreover, a broad range of psychopathology was taken into account, which allowed us to examine overall symptom severity, rather than examining specific categorical diagnoses. However, as the participants were referred to a highly specialized trauma treatment center, the findings are confined to individuals experiencing clinically significant distress and having long-lasting symptoms. Furthermore, we did not investigate the specific influence of potentially traumatic events that were not related to the refugee status, like for instance early childhood trauma. Another limitation is that we measured PTSD-symptoms in keeping with DSM-IV criteria instead of DSM-5 criteria. Therefore the findings lack some of the symptoms related to the DSM-5 criterion 'negative alterations in cognitions and mood' that are not represented in DSM-IV (APA, 1994; 2013). Because these particular symptoms overlap with symptoms captured by depression and negative affect, which is an underlying factor of PTSD, anxiety, and depression (Contractor et al., 2017), we do not expect that different subgroups would be identified when PTSD-symptoms would be assessed in accord with DSM-5. However, future research is needed to examine that.

This study is a cross-sectional study. In a longitudinal study more information can be obtained about temporal relations between PTEs, subsequent psychopathology, and factors of post-migration distress. More specific, investigating the interactive degree to which participants were exposed to ongoing stressors in daily life, including psychological symptoms and post-migration distress is recommended for future studies.

4.2. Clinical Implications

The findings that there are symptom severity subgroups and that they are based on a general and broad range of psychopathology underscores the value of re-conceptualizing psychopathology in severely traumatized patients into a broadened framework of a posttraumatic stress response continuum. Clinicians should not only focus on PTSD-symptoms but also address comorbid mental disorders and symptoms. In addition, the description of PTSD subgroups along the continuum of severity may play an important role in classifying traumatized patients, as is the case for depressive disorders in the DSM-5 (APA, 2013).

Focusing on a broadened concept of the posttraumatic stress symptoms as a continuum with severity subgroups is of importance in identifying individuals at risk. Merely screening for PTSD or any other specific diagnostic disorder will lead to underreporting mental health care problems and difficulties in detecting individuals that are at risk for developing mental health problems, or maybe need treatment. Considering our and prior findings (Contractor et al., 2018; Gerritsen et al., 2006; O'Donnell et al., 2017), this seems especially important in individuals with a high PTE load in their history and individuals with higher symptom severity profiles. They are at risk of poorer general health outcomes and higher health related functional impairment (Armour et al., 2015; Au et al., 2013; Minihan et al., 2018).

High symptom severity is associated with poorer treatment outcome in comparison with less symptom severity in refugee patients with trauma-related mental disorders and high levels of comorbid depression (Haagen et al., 2017). For these refugees with often a broad range of mental health problems, treatment modifications may be needed to enhance treatment effectiveness. Patients with more severe symptoms in particular may need a more intensified treatment including broader cognitive and behavioral interventions in addition to interventions focused on trauma processing. This may reduce severity of comorbid symptoms and enhance overall psychosocial functioning. Some authors recommend looking beyond diagnostic criteria and to treat the common underlying mechanisms like 'negative affect' by using transdiagnostic treatment interventions (Contractor et al., 2017; Minihan et al., 2018). As avoidant coping is supposed to be associated with high symptom severity (Badour et al., 2012; Jongedijk et al., 2019), intensifying trauma focused therapy with treatment sessions even twice a day during one or two weeks may help to overcome avoidance and foster recovery (Zepeda Méndez et al., 2018).

The finding that symptom severity levels were represented by a broad variety of co-morbid symptoms could mean that targeting only distinct disorders will not be appropriate and more integrated treatment programs will be needed. It is recommended to offer in addition to the usual evidence-based therapies a more personalized and integrated treatment program based on symptom severity, comorbidity, functional impairments, resources and needs, and specific distress related predictors for general health problems (Haagen et al., 2017; Minihan et al., 2018; Sonne et al., 2016). In displaced populations, psychological distress is related to both ongoing daily stressors and living difficulties and to prior war experiences (Miller and Rasmussen, 2017). Indeed, several studies have shown that post-migration stressors in the recipient country are associated with long-term psychiatric morbidity (Bogic et al., 2012; Laban et al., 2004; Minihan et al, 2018; Schweizer et al., 2006). These findings clearly indicate that post-trauma and post-migration stressors are of major importance to health related functioning and hence need to be addressed in a comprehensive treatment program for traumatized refugees.

Declarations of Competing Interest

None.

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