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Patterns and predictors of PTSD in treatment-seeking African refugees and asylum seekers: a latent class analysis

Alberto Barbieri [1*], Federica Visco-Comandini [1], Danilo Alunni Fegatelli [2], Anna Dessì [3], Giuseppe Cannella [3], Antonella Stellacci [4], Sabine Pirchio[5]

[1] MEDU Psychè Center for Transcultural Mental Health (Rome, Italy); [2] Department of public health and infectious diseases, Sapienza University of Rome; [3] MEDU Clinical Center (Ragusa, Italy); [4] Auxilium – Reception Center for Asylum Seekers (Bari Palese, Italy); [5] Department of Dynamic and Clinical Psychology, Sapienza University of Rome.

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Author contributions

AB, together with FVC, designed the research. AB, FVC, GC, AD and AS performed data collection. AB, FVC and DA analysed the data. AB, FVC, DA, SP prepared the manuscript. All authors have read and approved the final version of the article. AB is the final guarantor of the manuscript.

Conflict of interest

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Supplementary materials

The data that support the findings of this study are available from the corresponding author upon reasonable request

Abstract

Background: Despite the empirical and clinical relevance of understanding posttraumatic stress disorder (PTSD) heterogeneity in refugees and asylum-seekers, very few studies have examined the manner in which PTSD symptoms manifest in such populations.

Aims: This study sought to investigate patterns and predictors of DSM-5 PTSD in a treatment-seeking sample of African refugees.

Methods: Participants were 122 African refugees and asylum-seekers living in Italy who completed measures of trauma exposure and PTSD symptoms. Latent Class Analysis (LCA) was used to identify PTSD symptom profiles, and predictors of class membership were identified via multinomial logistic regression.

Results: Among participants, 79.5% had a probable diagnosis of PTSD. Three PTSD classes were identified by LCA: Pervasive (32.0%) with high probabilities of all symptoms, high-Threat (45.9%) with higher probabilities of intrusions and avoidance symptoms, moderate-Avoidance (22.1%) with high probability of thoughts/feelings avoidance. None of the examined variables (legal status, gender, age, education, months spent in Italy, number of traumatic events, employment) significantly predicted class membership with the relevant exception of reception conditions. Specifically, living in large reception centres (over 1,000 people) significantly predicted Pervasive PTSD class membership compared to high/Threat PTSD class and to moderate/Avoidance class.

Conclusions: This study provides evidence for distinct patterns of PTSD symptomatology in refugees and asylum seekers. We identified three classes which present both qualitative and quantitative differences in symptoms: Pervasive class, high-Threat class and a new moderate class, characterized by avoidance symptoms. Reception conditions contributed to the emergence of the Pervasive PTSD profile characterized by the symptoms highest severity. These findings highlight that stressors in the post-migration environment, as inadequate reception conditions in large facilities, may have detrimental effect on refugees' mental health. We emphasize the importance for host countries to implement reception models that provide effective protection and integration to this vulnerable population.

Introduction

In the last years, a large number of asylum seekers and refugees arrived in Italy and in Europe from Sub-Saharan Africa (according to United Nations High Commissioner for Refugees [UNHCR] data [2020] more than 600,000 migrants and refugees have landed in Italy crossing the Mediterranean Sea in the period 2013-2019), most of them having suffered detention, serious violence and abuse in countries of origin or along the migratory route and particularly in Libya (Medici per i Diritti Umani [MEDU], 2020). More generally, over the past decade, the global population of forcibly displaced people grew substantially from 43.3 million in 2009 to 79.5 million in 2019, reaching a record high (UNHCR, 2020). Indeed, refugees and asylum-seekers are not only disproportionately exposed to cumulative trauma in their countries of origin or along migratory routes, but also experience a multiplicity of stressors in the post-migratory environment (Li, Liddell & Nickerson, 2016). Accordingly, posttraumatic stress disorder (PTSD) is particularly prominent in such groups (Bogic, Njoku & Priebe, 2015; Fazel, Wheeler & Danesh, 2005; Steel et al., 2009). Although prevalence rates of PTSD vary substantially between studies, systematic reviews have suggested that between 9% and 30% of refugees are afflicted with posttraumatic psychopathology (Fazel et al., 2005; Steel et al., 2009). Although diagnostic categorization is imperative to our understanding of the pervasiveness of PTSD in refugees, this approach fails to recognize the substantial heterogeneity in post-trauma outcomes. Indeed, recent researches have suggested that survivors of traumatic experiences typically manifest diverse responses characterized by distinct patterns of symptomatology (Bonanno & Mancini, 2012; Galatzer-Levy, Nickerson, Litz & Marmar, 2013; Steenkamp et al., 2012).

Latent Class Analysis (LCA) is a technique that allow for the examination of such heterogeneity as it aims to identify substantively meaningful groups of people (also called classes) who are similar in their responses on categorically scored variables (e.g. symptom endorsed or not endorsed). To date, despite the empirical and clinical relevance of understanding the heterogeneity of PTSD in refugees and asylum-seekers, only one study, which used LCA, has examined the manner in which DSM-5 PTSD symptoms manifest in such populations and specifically among refugees and asylum-seekers from culturally diverse backgrounds who had been resettled in Australia (Minihan, Liddell, Byrow, Bryant & Nickerson, 2018). Four main classes were identified, including a new class, characterized by high-re-experiencing and avoidance symptoms (15.3%), and classes characterized by high (21.3%), moderate (23%), and no PTSD symptomatology (40.3%). Additionally, it is particularly relevant to investigate DSM-5 PTSD heterogeneity, given the substantial differences between DSM-IV and DSM-5 diagnostic criteria (i.e. the PTSD diagnosis was expanded in the DSM-5 encompassing symptoms such as self-blame, negative beliefs about the self and feeling alienated from others [American Psychiatric Association [APA], 2013]). It may be that refugees exhibit comparable profiles of PTSD symptomatology using the DSM-5 criteria to those previously identified using the DSM-IV criteria in non-refugee samples exposed to traumatic events (Ayer et al., 2011; Breslau, Reboussin, Anthony & Storr, 2005; Elhai, Naifeh, Forbes, Ractliffe & Tamburrino, 2011); that is, these groups may present with symptom profiles characterized by quantitative differences: pervasive, moderate, and low disturbance. Alternatively, given the unique combination of traumas and stressors experienced by refugees and asylum-seekers, distinct profiles of posttraumatic symptoms may emerge as suggested by the study of Minihan and colleagues (2018). In this regard,

latent class techniques have also been used to explore the variability in the manifestation of DSM-5 PTSD symptoms following trauma exposure in non-refugee samples (Byrne, Harpaz-Rotem, Tsai, Southwick & Pietrzak, 2019; Hansen, Műllerová, Elklit & Armour, 2016; Műllerová, Hansen, Contractor & Elhai, 2016; Frewen, Brown, Steuwe & Lanius, 2015) suggesting that diverse constellations of PTSD symptoms emerge following trauma.

Determining the factors associated with variable symptom presentations is also paramount to identifying those individuals that may be at risk of psychopathology. Previous research has found that trauma exposure and post-migration living difficulties are important predictors of PTSD in refugees (Blair, 2000; Cheung, 1994; Chu, Keller & Rasmussen, 2012; Chen, Hall, Ling & Renzaho 2017; Laban, Gernaat, Komproe, Schreuders & De Jong, 2004; Porter & Haslam, 2005; Schweitzer, Melville, Steel & Lacherez 2006; Steel et al., 2009), however the role of these variables in predicting specific PTSD symptom profiles remains unclear. Understanding the association between refugee experiences and posttraumatic symptomatology would advance knowledge regarding the specific impact of persecution and displacement on refugees' mental health and functioning and it would further contribute to develop new approaches to preventing PTSD in refugee populations. In their study, Minihan and collaborators (2018) found that trauma exposure and post-migration stress significantly predicted class membership and classes differed in degree of functional disability.

In the current study, we sought to investigate patterns and predictors of PTSD in a relatively homogeneous group: i.e. a treatment-seeking sample of African refugees living in Italy. To this end, the study's aims were to: 1) identify the prevalence of DSM-5 PTSD and trauma exposure; 2) identify predominant patterns of DSM-5 PTSD symptoms, employing LCA; 3) explore whether there were any relationships between a range of socio-demographic and trauma-related variables and the observed classes. Consistent with the only previous LCA using DSM-5 measures in refugees (Minihan et al., 2018), we hypothesized that high, moderate and high-re-experiencing/avoidance symptoms classes would emerge from our analysis. We did not expect to find a low symptoms class given the treatment-seeking nature of our sample. We also predicted that both pre-migration trauma and post-migration stress would uniquely contribute to the emergence of these classes, such that those in the classes characterized by higher symptom severity would have been exposed to more potentially traumatic events and living difficulties.

Method

Participants

The data for these analyses were obtained as part of an initial routine assessment of 122 African refugees and asylum-seekers who were seeking treatment and psycho-social support for trauma-related mental health disorders at 3 outpatient units: the two clinical units for victims of torture managed by the humanitarian organization MEDU (Doctors for Human Rights, Italy) in Rome (MEDU Psyché Center) and Ragusa (Italy), and the psychological service in the reception center for asylum seekers (CARA) in Bari (Italy). To be eligible for the study participants were required to: a) be an African refugee or asylum seeker, b) be over the age of 18, c) be in the initial clinical assessment phase and d) be able to speak fluently one of the three study languages (English, French, Arabic). Exclusion criteria were the

presence of a psychotic disorder diagnosis and the inability to complete the PTSD symptoms or the trauma exposure questionnaires due to mental disability. Of the 143 patients considered eligible for the study, 21 did not complete the PTSD symptoms or the trauma exposure questionnaires (amongst them, some were transferred to reception centers located in other cities [n=15], some others left the reception centers autonomously [n=6] before finishing the evaluation sessions) and therefore they were not included in the sample. The final sample size was 122 participants. Gender ($\chi 2$ = .78, p = .51) and age (two sample t-test; p = .19) distribution of the 21 patients not included did not show significant differences with the sample group of this study. Data was collected between March 2016 and October 2019. The sample comprised 105 men (86.1%) and 17 women (13.9%). Participants in this study had a mean age of 25.11 years (*SD* = 6.66). Participants were from 20 African Countries: Nigeria (n = 35, 28.6%); Ivory Coast (n = 19, 15.5%); Gambia (n = 14, 11.4%); Senegal (n = 9, 7.3%); Ghana (n = 9, 7.3%); Guinea Conakry and Sierra Leone (n = 6, 4.9%); Libya, Somalia, Egypt and Democratic Republic of the Congo (n = 3, 2.4%); Cameroon, Mali, Morocco (n = 2, 1.6%); Benin, Congo-Brazaville, Mauritania, Sudan, Togo, Guinea Bissau (n = 1, 0.8%). Overall, the participants came mainly from West Africa (n = 111, 91.0%) and a small number also from North Africa (n = 7, 5.7%) and East Africa (n = 4, 3.3%). As concerns the migratory routes, the vast majority of participants (91.0%, n = 111) reached Italy from Sub-Saharan Africa, crossing both the Sahara Desert to Libya and the Mediterranean Sea in routes controlled by smuggling or trafficking networks. They travelled mainly though pick up vehicles and makeshift dinghies. Participants had been residing in Italy for an average of 11.18 months (*SD* = 9.29). The majority of participants were unemployed (72.1%; n = 88) with a mean of 7.36 years of education (*SD* = 4.97; range 0-18 years) and resided within a reception center without family members (95.9%; n = 117). Regarding legal status, only 5.7% (n = 7) of the participants got a residence permit for international protection (i.e. refugee or subsidiary protection status) or humanitarian protection, while the majority were still asylum seekers. Regarding residence, participants were hosted in one of these three types of residences: 1) large reception centers with over 1,000 guests (n = 19, 15.6%); 2) medium to small reception centers with less than 1,000 guests (n = 98, 80.3%); and 3) other small reception facilities (n = 5, 4.1%).

Measures

Trauma exposure

We assessed trauma exposure using a 23-item instrument developed by Nickerson and colleagues (2016). This scale represented the compilation of trauma event lists from two standardized questionnaires, namely the Harvard Trauma Questionnaire (HTQ) (Mollica et al., 1992) and the Posttraumatic Diagnostic Scale (PDS) (Foa, 1996; Foa, Cashman, Jaycox & Perry, 1997). This scale indexed exposure to traumatic events commonly experienced by refugees, including witnessing the murder of loved ones, torture, deprivation of food, water, shelter, etc. Participants were asked to indicate whether they had experienced or witnessed any of the events personally. Overall trauma exposure was represented by a count of the number of traumatic event types each participant experienced (possible range: 0–23).

PTSD symptoms

We assessed symptoms of PTSD using the symptom scale of PTSD Checklist for DSM-5 (PCL-5; Weather et al., 2013; Cronbach's alpha= .87 [0.84 - 0.90]). The PCL-5 is a 20-item self-report measure that assesses the 20 DSM-5 symptoms of PTSD. Items are rated on a five-point scale (0 = *not at all*, 1 = *a little bit*, 2 = *moderately*, 3 = *quite a bit*, 4 = *extremely*). As a first step a probable diagnosis of PTSD according to DSM-5 criteria was made by treating each item ≥ 2 as a symptom endorsed, then following the DSM-5 diagnostic rule which requires at least: one Cluster B item (questions 1-5), one Cluster C item (questions 6-7), two Cluster D items (questions 8-14), two Cluster E items (questions 15-20) (APA, 2013).

Procedure

This study was approved by the Ethics Committee of the Department of Dynamic and Clinical Psychology at Sapienza University of Rome (Rome, Italy). Before attending the study session, participants first completed written informed consent. Measures were administered within a clinical setting as a standard clinical assessment. Participants provided sociodemographic details first, after which they completed, in the following order, the PCL-5 scale and the trauma exposure questionnaires. The translated versions of the questionnaires were read out loud for the participants to avoid possible reading disabilities. Participants listened to each item and possible responses in the three study languages (i.e. Arabic, English, French). Participants then vocalized their response. The research assessment lasted about 60 to 90 minutes. Participants were assisted by a team which included a trained interpreter/cultural mediator, a medical doctor and/or a clinical psychologist with a minimum of 3 years' experience in mental health work with refugees.

Data analysis

The analytical plan for the current study included three steps, where each step corresponded to one of the three study objectives. First, prevalence estimate of DSM-5 PTSD was calculated along with assessments of gender differences using a chi-square analysis. Second, latent class analysis (LCA) was used to model symptom profiles of PTSD. We conducted LCA on the basis of 20 dichotomous indicators of DSM-5 defined PTSD symptoms, derived from scores on the standard PCL-5 measure. Six latent class models were tested (1– 6 classes) using the EM and Newton-Raphson algorithms to maximize the latent class model log-likelihood function. The Akaike Information Criterion (AIC; Akaike, 1987), the Bayesian Information Criterion (BIC; Schwarz, 1978) were used to select the best latent class model. Moreover, the bootstrap likelihood ratio test (BLRT) with 1000 bootstrap samples was also used to compare models with increasing numbers of latent classes. Consistent with previous research employing LCA (Galatzer-Levy et al., 2013; Nickerson et al., 2014; Forbes et al., 2015), the following values were used to evaluate symptom probabilities of endorsement: values ≥0.60 (high probability); values ≤0.59 and ≥0.16 (moderate probability); and values ≤0.15 (low probability). Third, to elucidate predictors of LCA class membership, a number of variables were regressed on the derived classes in the conditional model. Covariates included in the multinomial logistic regression were: gender (1 = female

participants, 0 = male participants), age, years of education, number of months spent in Italy as refugees, number of traumatic event types, employment (1 = employed, 0 = unemployed), legal status (1 = visa, 0 = asylum seeker), reception condition (1 = large reception center >1,000 people, 0 = small-medium reception center <1,000 people). All the analyses were performed with the statistical software R (version 3.5.2).

Results

Exposure to trauma and diagnostic rates

Participants had been exposed to a mean of 7.65 (*SD* = 3.41) types of traumatic events with the majority of the sample having experienced lack of food and water (88.5%; n = 108), torture (82.0%; n = 100) and detention (68.0%; n = 83). All the participants were survivors of at least one repeated, prolonged, interpersonal traumatic event (complex trauma) in their country and/or in the migratory route. Frequency of exposure to specific trauma types is presented in Table 1. Results showed that 97 participants (79.5%) had a probable diagnosis of PTSD according to the DSM-5 criteria. There were no significant gender differences in the diagnostic rates for DSM-5 PTSD ($\chi 2$ = .41, df = 1, p = .524, *OR* = .47).

The mean sample score on the PCL-5 measure was 44.23 (range 0–80). This indicates relatively severe posttraumatic symptomatology in this sample, since a score of 31-33 on the PCL-5 measure has been reported as the best cut-off for a likely diagnosis of PTSD (Weathers et al., 2013).

LCA results

The LCA results (Table 2) were somewhat equivocal in that the BIC favoured a two-class solution and the BLRT favoured a three-class solution. The three-class solution was selected for two reasons. First, the simulation analysis of Nylund, Asparouhov & Muthén (2007) demonstrated that the BLRT was the best statistic by which to select the optimal class solution; and second, inspection of the profile plot for the three-class solution provided a more theoretically interpretable set of results (Figure 1). The symptom frequency for the entire sample and probabilities of PTSD symptom endorsement for each class are presented in Table 3. As shown in Figure 1, Class 1 (22.1%, n = 27) was the smallest class and was characterised by moderate/low probability of all PTSD symptoms with the exception of high probability of thoughts/feelings avoidance. This class was labelled the "moderate PTSD/Avoidance" class. The mean PCL-5 score in this group was 27.44 (*SD* = 8.15). Class 2 (45.9%, n = 56) was the largest class. Although there were high/moderate probabilities of meeting all PTSD symptoms (with the exception of low probability of risky behaviour), this class was particularly characterized by elevations of intrusions and avoidance clusters. Therefore, this class was labelled the 'high PTSD/Threat" class. The mean PCL-5 score in this group was 44.28 (*SD* = 7.49). Individuals in Class 3 (32.0%; n = 39) demonstrated high probability of all PTSD symptoms with the exception of moderate probability of risky behaviour. This class was labelled the "Pervasive PTSD" class. The mean PCL-5 score in this group was 55.79 (*SD* = 9.40).

Multinomial logistic regression analysis

Descriptive statistics on the covariates in the full sample and each LCA latent class are shown in Table 4. The full results of the multinomial logistic regression are presented in Table 5. Among the eight predictors in the model only reception condition was significantly associated with class membership. Those in the Pervasive PTSD class were more likely to live in large reception centers (i.e. over 1,000 people) compared to those in the high/Threat PTSD class (*OR* = 6.68; 95% CI = 1.81-24.61, *p* = .004) and in the moderate/Avoidance class (*OR* = 12.78; 95% CI = 1.49-109.44, *p* = .020).

Discussion

The current sample reflected, in terms of gender and age, the distribution of refugees who have reached Italy by sea during the last years. According to UNHCR (2018), in 2018 the percentages of men and women adult migrants and refugees arrived by sea in Italy were respectively 88% and 12% (in our sample 86% and 14%). The mean age of our sample (25.11) was also consistent with the mean age indicated in two recent articles investigating socio-demographic variables of refugees and asylum seekers in Italy which were respectively 30.0 (Ortensi, 2015) and 27.4 (Nante et al., 2016).

According to the DSM-5 criteria the rate of probable PTSD (79.5%) was high in the current sample but consistent with findings of other previous studies investigating samples of treatment-seeking refugees resettled in Europe which reported DSM-IV PTSD rates of 82% (Teodorescu, Heir, Hauff, Wentzel-Larsen & Lien, 2012) and 94% (Teegen & Vogt, 2002). In a slightly different sample to the one of the current study, the reported DSM-5 PTSD rate was 79.0% (Barbieri et al., 2019). Meta-analytic findings have suggested that the prevalence of PTSD in refugee groups was approximately 30% (Steel et al., 2009). As a general consideration, the high rates of PTSD in our study was likely due to the fact that the sample was composed of treatment-seeking complex trauma survivors.

The LCA supported a three-class solution: a Pervasive-PTSD class, a high-PTSD/Threat class, a moderate-PTSD/Avoidance class. These classes varied both with respect to overall symptom severity and probabilities of certain symptoms. This differs from previous LCA investigations that primarily varied on symptom severity (e.g., Breslau et al., 2005) but is consistent with recent studies focused on DSM-5 PTSD (Byrne et al., 2019, Minihan et al., 2018). The pervasive-PTSD class (32.0%) was characterized by a marked elevation of all symptom clusters (intrusions, avoidance, negative cognitions and mood and alteration in arousal reactivity); accordingly, 100% of this class met probable diagnostic criteria for PTSD.

With regard to the high-PTSD/threat class, this was the largest class (45.9%) and was particularly characterized by elevations of intrusions and avoidance symptom clusters, even though also most of the other clusters' symptoms had a high/moderate probability to be met. Furthermore, 87.5% of participants in this class met diagnostic criteria for probable PTSD.

Notably, the item *Having strong negative feelings such as fear, horror, anger, guilt, or shame* was particularly high in this class as the symptom endorsement probability was slightly higher than in the Pervasive-PTSD class. With respect to this finding, we could hypothesize that in the high PTSD/Threat class, primary emotions related to threat, such as fear and horror, were more relevant than others related to a negative self-concept, such as shame and guilt.

The moderate-PTSD/avoidance class (22.1%) was first identified by this study and was predominantly characterized by the symptom *Avoiding memories, thoughts, or feelings related to the stressful experience*. In this class, only 33.3% of participants met diagnostic criteria for probable PTSD. We assumed that individuals belonging to this class adopted avoidance of internal reminders as the main coping strategy when faced with the traumatic events they experienced.

Additionally, we compared our findings with the only previous LCA study investigating DSM-5 PTSD heterogeneity among a sample of refugees and asylum seekers (Minihan et al., 2018). The presence of a large no PTSD class (40.3%) in Minihan et al. (2018)'s study was coherent with the fact that the participants were recruited among the general refugee population. As expected, the no PTSD class was absent in our sample. As initially hypothesized, this can be explained by the treatment-seeking nature of the refugee group selected for the current study. Both pervasive-PTSD class and high PTSD/Threat class detected in our investigation were consistent respectively with high-PTSD class and high-re-experiencing/avoidance class identified by Minihan and colleagues (2018). On the contrary, our moderate-PTSD/avoidance class did not correspond to the moderate-PTSD class identified by the previous LCA on refugees as the latter was not specifically characterised by the high probability of thoughts/feelings avoidance symptom.

On the other hand, the pervasive-PTSD class and the high-PTSD/threat class identified by our study were consistent (both qualitatively and in the level of severity) respectively with the high symptom class (34%) and the threat class (29.8%) detected by a previous LCA in 158 U.S. veterans who screened positive for PTSD (Byrne et al., 2019). Furthermore, the two classes together presented a similar weight in the two studies (78% in our sample and 65% in the U.S. veteran sample). Notably, both studies analysed two clinical samples characterized by patients exposed to multiple traumatic events often characterized by physical violence.

In conclusion, our investigation detected two classes already found in previous studies on refugee and veteran samples and identified a novel moderate class, specifically characterized by avoidance of internal reminders.

The results of the multinomial logistic regression analysis found that none of the examined variables (i.e. legal status, gender, age, years of education, months spent in Italy, total number of traumatic event types, employment status) significantly predicted class membership with the exception of reception conditions. Notably, this was in contrast with previous findings observing a dose-response relationship between trauma and mental health, whereby greater trauma exposure was associated with poorer mental health outcomes, including increased PTSD symptomatology (Mollica et al., 1998; Mollica et al., 1999; Steel et al., 2009; Minihan et al., 2018). Indeed, the present study suggests that in our sample of adulthood complex trauma survivors the outcome in more pervasive forms of posttraumatic disorders was not

due to the quantity of traumatic events types but rather to the specific characteristics of each single traumatic event as well as to other several risk factors. Actually, the 23-item instrument we employed to assess trauma exposure was unable to capture the severity and duration of each traumatic event. On the other hand, childhood interpersonal trauma, not specifically investigated in this study, as well as some pre-traumatic personality traits could be relevant predictors for the most pervasive PTSD clinical presentations. Some studies have showed higher predisposition to PTSD symptoms in individuals with certain personality characteristics (Bachar, Hadar & Shalev, 2005; Gunderson & Sabo, 1993; Marzillier & Steel, 2007). Notably, in our study, reception conditions emerged as the only consistent predictor of pervasive PTSD symptomatology. Specifically, living in large asylum seekers reception centers (over 1,000 people) rather than in small-medium sized centers (less than 1,000 people) was associated with an increased likelihood of Pervasive PTSD class membership.

This finding bolsters the growing literature emphasizing the importance of the post-migration environment on mental health outcomes. Our finding is also consistent with the ecological model of refugee distress proposed by Miller and Rasmussen (2017) drawing on research demonstrating that mental health among refugees and asylum seekers stems not only from prior traumatic events exposure, but also by an individual's social ecology, encapsulating both displacement-related and ongoing stressors. Indeed, our sample participants living in a large reception center all came from the asylum seeker reception center of Mineo in Sicily (CARA Mineo). At the moment of our investigation this reception center was characterized by a greater number of daily stressors than those of medium-small centers: strong overcrowding; geographic and social isolation of the facility; very long stay, waiting for the completion of the legal procedures for permanent visa (18 months on average); difficulty accessing the National Health System, difficulty accessing psycho-social and/or legal support; episodes of social degradation, violence and illegality (MEDU, 2015). At this regard, **numerous studies** emphasize the importance of several post-migration factors as predictive of PTSD symptomatology over and above pre-migration trauma in refugees. Among them, several factors characterizing "the large reception center model" of Mineo included: living difficulties (Minihan et al., 2018; Aragona, Pucci, Mazzetti & Geraci, 2012), long-term institutional accommodation (Porter & Haslam, 2005; Rangaraj, 1988), loneliness (Chen, Hall, Ling & Renzaho, 2017), poor social integration (Chen et al., 2017), difficulties accessing health care and social services (Steel, Silove, Bird, McGorry & Mohan, 1999), prolonged process of obtaining permanent visa (Nickerson et al, 2019; Chu et al., 2012; Laban et al., 2004; Steel et al., 1999).

All these factors constitute as many daily stressors generating insecurity and fear, anxieties already provoked by past trauma experiences. At this regard, the large reception centers, such as CARA Mineo, can be considered as "re-traumatizing models" of reception facilities which have detrimental effects on asylum seekers and refugees' mental health. This aspect is particularly relevant as refugees and asylum seekers are increasingly hosted in huge and overcrowded first reception centers, even in Western high-income countries (EU Agency for Fundamental Rights, 2019).

Our findings have relevant clinical implications. The Pervasive PTSD profile is the most concerning as the patients belonging to this class reported the greater severity of symptoms and they will likely require the most intensive and prolonged monitoring and treatment

compared to trauma survivors presenting with Threat and Avoidance profiles. Moreover, while mental health interventions for refugees and asylum-seekers have been largely trauma-focused (Miller and Rasmussen, 2017), our findings imply that post-migration reception conditions should also be considered in the conceptualization and implementation of PTSD treatments and prevention. Ignoring the daily stressors suffered by refugees living in inadequate reception conditions may impede treatment outcomes, as distress and psychopathology may be misattributed to trauma exposure and individuals may not have the emotional and/or cognitive capacity to effectively engage in treatment before such living conditions are addressed and changed. At this regard our study emphasizes the importance for host countries to implement models of first reception centers that provide effective protection, concrete integration, adequate housing and services. As Silove and Ekblad (2002) appropriately commented, although preventing trauma inflicted on refugees in source countries may be beyond our control, recipient countries can exert an influence on the post-migration challenges faced by incoming refugees. In our response, it is important that we extend our deliberations beyond the short-term goal of immigration control to a more global perspective on public health. If not, posttraumatic symptoms in refugees and asylum seekers may be prolonged and intensified and society in the global sense might ultimately bear the health, social and economic costs.

This study has several methodological limitations. First, our study was cross-sectional, precluding causal inferences in terms of examination of the stability of latent classes of psychopathology. Future research is required to investigate the dynamic courses of symptom presentation over time as well as to determine whether individuals that endorse sub-clinical PTSD symptoms - particularly those belonging to Avoidance class - are at risk for full PTSD later in life. Second, we were unable to address a number of individual difference factors (e.g. exposure to childhood trauma) that may influence the emergence of distinct PTSD symptom profiles. Third, our small participant sample size limited the interpretability and generalizability of the findings. While there is no general rule-of-thumb regarding the minimum sample size required to conduct a LCA, the literature have suggested that latent class models should contain distinguishable and interpretable classes (Dziak, Lanza & Tan, 2014). Despite our relatively small sample size, our LCA yielded acceptable fit statistics and an interpretable model. Moreover, the three classes identified by LCA were not only distinguished by symptom presentation, but also each included a substantial percentage of participants. Future research is required to determine whether the symptom presentations identified in the current study are generalizable across ethnicities or unique to specific ethnic and trauma survivors' groups.

Finally, a strength of the study is that it was one of the few contemporary investigations focusing on patterns of PTSD in refugees. This was the first study using LCA to investigate the manner in which DSM-5 PTSD symptoms manifest in a treatment-seeking sample of refugees and asylum seekers. It was also the first investigation of this type specifically focused on a group of African refugees.

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Figure 1. Probabilities of PTSD Symptom Endorsement for Each Latent Class

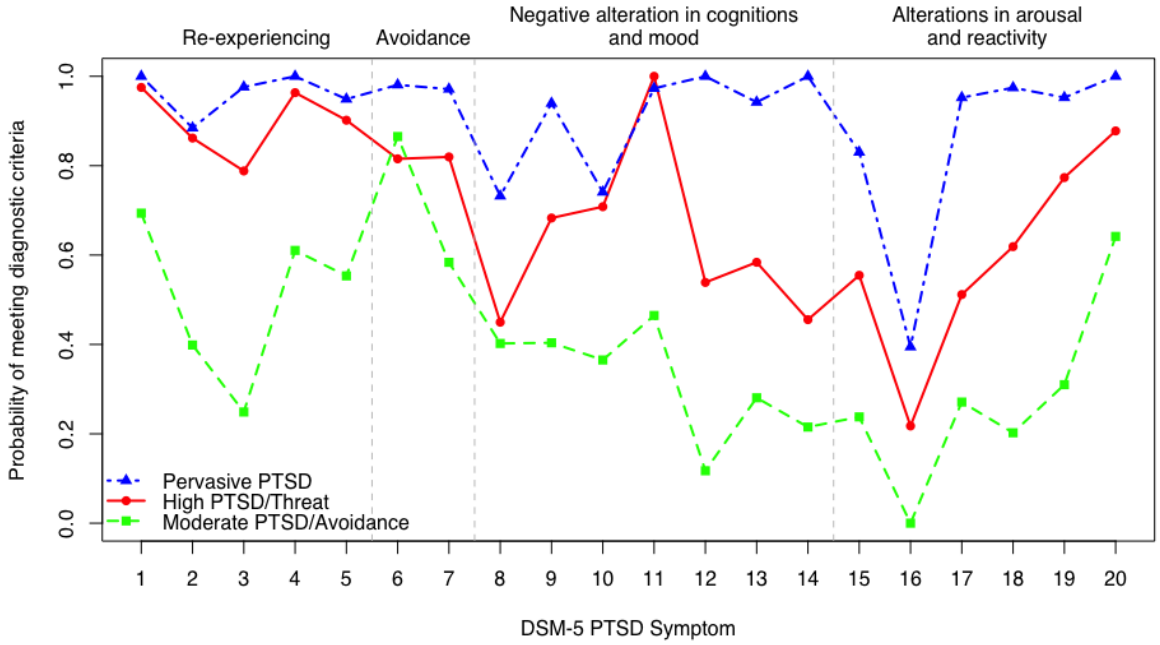

Table 1. Trauma Exposure Reported by Refugees.

Trauma Type	*n*	*%*
Lack of food or water	108	88.5
Torture	100	82.0
Imprisonment	83	68.0
Non-sexual assault	79	64.8
Lack of shelter	73	59.8
Murder of one or more strangers	62	50.8
Being close to death	57	46.7
Disappearence or kidnapping	56	45.9
Serious physical injury	46	37.7
Ill health without access to medical care	44	36.1
Murder of a family member or friend	39	32.0
Unnatural death of a family member or friend	30	24.6
Forced separation from family member	28	23.0
Non-sexual assault by a family member or someone you know	25	20.5
Sexual assault by a stranger	22	18.0
Serious accident. fire or explosion	20	16.4
Combat situation	19	15.6
Enforced isolation from others	18	14.8
Life-threating illness	17	13.9
Sexual contact when you were younger than 18 with someone who was 5 or more years older than you	9	7.4
Sexual by a family member or someone you know	8	6.6
Brainwashing	6	4.9
Natural disaster	1	0.8

Table 2. Latent Class Analysis and Latent Profile Analysis and Fit Indices

LCA					
Model	log-likelihood	AIC	BIC	Entropy	BLRT (*p*)
1 class	-1,340.08	2,720.17	2,776.25	-	-
2 class	-1,191.81	2,465.62	2,580.59	0.71	< .001
3 class	-1,152.36	2,428.71	2,602.56	0.68	< .001
4 class	-1,131.36	2,428.72	2,661.45	0.67	.522
5 class	-1,340.08	2,720.17	2,716.59	0.66	.156
6 class	-1,191.81	2,465.62	2,792.45	0.65	.920

Note. LCA = Latent Class Analysis; AIC = Akaike information criterion; BIC = Bayesian information criterion; BLRT = Bootstrap likelihood ratio test

Table 3. Overall PTSD Symptom frequency and probability of PTSD symptom endorsement for each latent class

PTSD Symptom	Overall symptom frequency		Moderate PTSD/Avoidance		High PTSD/Threat		Pervasive PTSD	
	n	%	Probability	*SE*	Probability	*SE*	Probability	*SE*
Intrusive thoughts	112	91.8	0.69	.12	0.97	0.03	1.00	0.00
Nightmares	93	76.2	0.40	0.16	0.86	0.07	0.88	0.06
Flashbacks	88	72.1	0.25	0.14	0.79	0.07	0.98	0.03
Emotional distress to reminders	109	89.3	0.61	0.20	0.96	0.03	1.00	0.00
Physical reactivity to reminders	102	83.6	0.55	0.21	0.90	0.06	0.95	0.04
Avoidance of thoughts/feeling	107	87.7	0.86	0.14	0.81	0.07	0.98	0.03
Avoidance of reminders	99	81.1	0.58	0.14	0.82	0.06	0.97	0.03
Inability to recall trauma	64	52.4	0.40	0.18	0.45	0.08	0.73	0.10
Negative thoughts/ assumptions	85	69.7	0.40	0.14	0.68	0.08	0.94	0.05
Self/other blame	78	63.9	0.36	0.15	0.71	0.09	0.74	0.10
Negative affect	106	86.9	0.46	0.18	1.00	0.00	0.97	0.03
Loss of interest in activities	71	58.1	0.12	0.08	0.54	0.09	1.00	0.00
Feeling isolated	76	62.3	0.28	0.14	0.58	0.09	0.94	0.05
Lack of positive affect	69	56.5	0.21	0.13	0.46	0.08	1.00	0.00
Irritability/ aggression	69	56.5	0.24	0.16	0.55	0.08	0.95	0.10
Risky behaviour	27	22.1	0.00	0.00	0.22	0.07	0.39	0.11
Hypervigilance	72	59.0	0.27	0.14	0.51	0.09	0.95	0.04
Easily startled	77	63.1	0.20	0.13	0.62	0.09	0.97	0.03
Difficulty concentrating	88	72.1	0.31	0.15	0.77	0.08	0.95	0.05

Difficulty sleeping	105	86.1	0.64	0.15	0.88	0.05	1.00	0.00

Table 4. Descriptive Statistics for the Covariates and PTSD Symptoms in the Full Sample and Each Latent Class (LCA)

	Full sample N = 122		*Moderate PTSD/Avoidance n =27*		*High PTSD/Threat n = 56*		*Pervasive PTSD n = 39*	
Covariate	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Years of education	7.36	4.97	8.60	4.81	6.76	4.79	7.42	5.36
Age	25.11	6.66	24.64	5.91	25.62	7.25	25.15	6.84
Time spent in Italy	11.18	9.29	11.22	8.50	12.66	10.31	9.02	7.95
Gender	M = 105 (86.1%)		M = 26 (96.3%)		M = 45 (80.3%)		M = 34 (87.2%)	
	F = 17 (13.9%)		F = 1 (3.7%)		F = 11 (19.7%)		F = 5 (12.8%)	
Employment	No = 88 (72.1%)		No = 19 (70.4%)		No = 45 (80.4%)		No = 24 (61,5%)	
	Yes = 34 (27.9%)		Yes = 8 (29.6%)		Yes = 11 (19.6%)		Yes = 15 (38,5%)	
Reception center	Small = 103 (84.4%)		Small = 26 (96.3%)		Small = 52 (92.9%)		Small = 25 (64.1%)	
	Large = 19 (15.6%)		Large = 1 (3.7%)		Large = 4 (7.1%)		Large = 14 (35.9%)	
Number of trauma types	7.65	3.41	6.77	2.42	7.80	3.93	8.02	3.06
PTSD symptoms								
PTSD Diagnosis	Yes = 97 (79.5%)		Yes = 9 (33.3%)		Yes = 49 (87.5%)		Yes = 39 (100%)	
	No = 25 (20.5%)		No = 18 (66.7%)		No = 7 (12.5%)		N0 = 0 (0%)	
Mean PCL-5 score	44.23	13.17	27.44	8.15	44.28	7.49	55.79	9.40

Note. PCL-5 = PTSD Checklist for DSM-5

Table 5. Predictors of Class Membership

Class comparison	OR	95% CI		*p*
		Lower	Upper	
Pervasive PTSD vs. Avoidance PTSD				
Years of education	0.97	0.86	1.10	.621
Legal status (Visa)	1.24	0.12	13.02	.857
Age	1.02	0.93	1.12	.696
Time spent in Italy	0.97	0.91	1.04	.448
Gender (F)	4.61	0.45	46.80	.196
Employment	1.59	0.48	5.21	.444
Reception condition (Large Center)	12.77	1.49	109.44	.020
Number of trauma types	1.08	0.90	1.23	.418
Pervasive PTSD vs. Threat PTSD				
Years of education	1.04	0.94	1.16	.399
Legal status (Visa)	9.44	0.66	134.93	.098
Age	0.97	0.90	1.04	.419
Time spent in Italy	0.95	0.90	1.00	.075
Gender (F)	0.94	0.24	3.64	.924
Employment	2.19	0.77	6.24	.144
Reception condition (Large Center)	6.68	1.81	24.61	.004
Number of trauma types	1.04	0.90	1.21	.580
Threat PTSD vs. Avoidance PTSD				
Years of education	0.93	0.83	1.03	.177
Legal status (Visa)	0.13	0.01	2.16	.155
Age	1.05	0.97	1.14	.214
Time spent in Italy	1.03	0.97	1.08	.324
Gender (F)	4.92	0.56	43.50	.152
Employment	0.73	0.23	2.26	.581

Reception condition (Large Center)	1.91	0.19	18.81	.578
Number of trauma types	1.03	0.88	1.22	.675