Posttraumatic Stress Disorder, Anxiety and Depression Symptoms Following Potentially Traumatic Events: Latent Classes and Cognitive Correlates

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Paper published in *The Journal of Nervous and Mental Disease* (2022): https://journals.lww.com/jonmd/Abstract/9900/Posttraumatic_Stress_Disorder,_Anxiety,_and.55.aspx

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Author Contributions Statement

JMSM and MCE contributed to conception and design of the study. JMSM organized the database and wrote the first draft of the manuscript. JMSM, JS, MPG-V and NM collected data. JMSM and MCE performed the statistical analysis. All authors interpreted the data and contributed to manuscript revision, read, and approved the submitted version.

Conflict of Interest and Sources of Funding

The authors reported no potential conflict of interest.

This work was supported by the PhD scholarship from the Spanish Ministry of Education, Culture and Sports under Grant FPU16/02976 granted to the first author and research grant from the Spanish Ministry of Science, Innovation, and Universities under Grant PGC2018-098387-B-I00 granted to the second author.

Statement of Ethical Considerations

All participants of this study provided written informed consent. Ethical approval for this study was granted by the Ethical Committee of the Faculty of Psychology of the Complutense University of Madrid.

Abstract

People exposed to potentially traumatic events (PTEs) may develop distinct symptom patterns, which may require different therapeutic approaches. We aimed to identify classes of people exposed to PTEs based on presence of posttraumatic stress disorder (PTSD) clusters, anxiety, and depression and to explore which cognitive factors (rumination, worry and negative cognitions) are associated with class membership. Latent class analyses were conducted to identify subgroups of 258 PTE-exposed Spanish adults. A three-class solution emerged: a resilient class with low odds of all symptoms (n = 188), a partial PTSD class, characterized by partial PTSD clusters, moderate anxiety, and low depression (n = 36), and a high symptom class, characterized by high PTSD, moderate anxiety, and low depression (n = 34). These classes related meaningfully to rumination, worry, and negative cognitions. Distinct symptom patterns of PTSD clusters, anxiety, and depression can be distinguished in people exposed to PTEs and relate to cognitive risk-factors of psychopathology.

Keywords. PTSD, worry, rumination, negative cognitions, latent class analyses

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A large proportion of the world's population is exposed to potentially traumatic events (PTEs) during their lifetime. It is estimated that around 60% of the general population is affected by these events worldwide (Kessler et al., 2014). Although most people adapt to such events without professional help, a considerable minority develops significant mental health issues. Posttraumatic stress disorder (PTSD) is one of the most common psychiatric disorders that develops following a PTE (Norris et al., 2002). In Spain, more than half of all adults have suffered a PTE throughout their lives (Olaya et al., 2015). Furthermore, within this population a 12-month prevalence of 0.6% and a lifetime prevalence of 2.2% of PTSD has been estimated (Olaya et al., 2015). Therefore, it appears important carry out studies that help to improve the knowledge and treatment of PTSD in this population.

PTSD often co-occurs with anxiety and depression symptoms (Spinhoven et al., 2014). This comorbidity is critical for two reasons. First, people who simultaneously suffer from PTSD and a comorbid mood or anxiety disorder report greater psychiatric symptom severity and higher levels of adjustment difficulties than people solely diagnosed with PTSD (Shalev et al., 1998; Spinhoven et al., 2014). Second, comorbidity may have direct clinical implications. For instance, psychiatric comorbidity can negatively affect therapeutic success even with the application of empirically supported treatments for PTSD (Cook et al., 2004). Therefore, charting who experiences different patterns of symptoms of PTSD and comorbid disorders may inform clinical practice. Identification of classes of PTE-exposed people who differ according to the severity and nature of PTSD and comorbid psychiatric problems may be helpful to achieve this aim.

Two useful methodological tools that are increasingly used to identify common variations in symptom presentation are latent class analysis (LCA) and latent profile analysis (LPA) (McCutcheon, 1987). LCA integrates person-centered techniques that allow for the exploration of population heterogeneity identifying subgroups within a population based on predefined indicators (e.g., cluster analysis) and variable-centered analytic techniques (e.g., regression analysis). LPA is a similar technique which uses continuous rather than categorical indicators for latent group classification and has also been applied for similar purposes (McCutcheon, 1987).

Studies applying LCA (or LPA) to symptoms of PTSD and comorbid disorders have focused on samples exposed to specific PTEs, such as sexual assault survivors (e.g., Au et al., 2013), motor vehicle accident survivors (e.g., Hruska et al., 2014) or people bereaved through violent loss (e.g., Djelantik et al. 2021; Soydas et al., 2021). In addition, studies have focused on samples exposed to multiple PTEs in the context of wars (Armour et al., 2015), forced displacement (Nickerson et al., 2014), or natural disasters (e.g., Eisma et al., 2019). These studies typically reveal the presence of three (Armour et al., 2015; Djelantik et al. 2021; Soydas et al., 2021), four (Au et al., 2013; Hruska et al., 2014; Nickerson et al., 2014) or five (Eisma et al., 2019) latent classes. Across studies using LCA on symptoms of PTSD and comorbid disorders the classes are generally distinguished in terms of presence or non-presence combination of different subsets of symptoms (qualitative differences). For example, Nickerson et al. (2014) revealed four classes of forcibly displaced persons: high odds of PTSD-prolonged grief disorder (PGD) symptom class, high odds of PTSD symptom class, high odds of PGD symptom class, and low odds of all symptoms class. Such findings are important as they suggest that assessment and intervention should focus on symptom variations of specific subgroups. Although rare, there are also LCA studies

merely demonstrating that differences exist between classes in the odds of experiencing combined symptoms of PTSD and comorbid disorders. For example, Hruska et al. (2014) showed resilient, mild, moderate, and high odds of psychopathology latent classes using PTSD and depression symptoms as indicators in a sample of motor vehicle accident survivors. Such patterns of symptomatology suggest that assessment and intervention should focus on common factors that may underlie variations in levels of manifestations of general distress.

Similarly, in studies applying LPA on symptoms of PTSD and comorbid disorders classes have been distinguished that differ solely on the severity of the symptoms, both in samples exposed to specific PTEs (e.g., Au et al., 2013) and in samples exposed to multiple PTEs (e.g., Armour et al., 2015). For example, Armour et al. (2015) found low, moderate, and high levels classes of both PTSD and depression symptoms in a veterans sample. There are also studies using LPA whose classes have been differentiated both by severity and by nature of symptomatology. For example, Cao et al. (2015) reported the existence of classes of earthquake survivors demonstrating low odds of symptoms, high odds of depression symptoms, high odds of PTSD symptoms, or high odds of PTSD and depression symptoms.

To our knowledge, LCAs using PTSD, anxiety, and depression symptoms as indicators, are rare. For example, Nickerson et al. (2019) found that five classes provided the best fit in non-Western forcibly displaced people exposed to multiple PTEs (e.g., combat exposure, murder, or kidnapping): a low odds of all symptoms class, a high odds of PTSD symptoms and moderate odds of depression and anxiety symptoms class, a high odds of depression and anxiety symptoms and moderate odds of PTSD symptoms class, a moderate odds of all symptoms class and, finally, a high odds of all symptoms class. Furthermore, several studies have focused on identifying classes of

PTSD, anxiety, and depression using LPA in samples who reported at least one PTE. For example, Contractor et al. (2015) identified three classes that differed in symptom severity (mild, moderate, and high levels of symptomatology) in veterans.

In summary, studies demonstrated that there are PTE-exposed subgroups characterized by different combinations and levels of PTSD, anxiety, and depression symptoms. Most of these studies were conducted with samples exposed to multiple PTEs in the context of wars or forced displacement. In the present study, we aim to extend the current knowledge base on this topic by conducting an LCA of PTSD, anxiety, and depression symptoms in people from the general Spanish population exposed to frequently occurring PTEs within this population.

Furthermore, despite a high prevalence of PTEs in the Spanish population, to our knowledge, there are no LCA studies of PTSD and related symptoms carried out in the Spanish population. Past studies have mostly used samples from Eastern countries or American soldiers, who may have certain peculiarities such as a nonwestern cultural background or exposure to multiple, often severe PTEs due to war or disasters. Conversely, the most prevalent PTEs in Spain are being involved in an accident and experiencing the unexpected death of a loved one. Generally, such PTEs co-occur with fewer additional PTEs and do not result in great losses of resources (e.g., one's home, livelihood, or multiple family members) compared to PTEs experienced in war and disasters (Olaya et al., 2015). Nevertheless, experiencing an unexpected death contributed to the largest proportion of PTSD cases in PTE-exposed Spanish adults (Olaya et al., 2015). In addition, the prevalence and/or expression of PTSD symptoms may depend also on cultural factors, such as individualism-collectivism (Bernardi et al., 2019). Contractor et al. (2020) found that PTSD and depression classes in an Indian adult sample (collectivistic culture) differed only in severity using LPA, whereas those

in a US sample (individualistic culture) differed in both severity and type of psychopathology. Spanish culture is more collectivistic than American and Northern European cultures, but more individualistic than Eastern European cultures (Hofstede et al., 2010). Therefore, we sought extend the LCA literature on this topic by studying PTE-exposed Spanish adults from the general population.

Specifically, our first aim was to identify subgroups of PTE-exposed Spanish adults based on their endorsement of PTSD clusters, anxiety, and depression using LCA. Following the findings of the LCA based on these three comorbidities in a sample exposed to multiple PTEs (Nickerson et al., 2019), we tentatively hypothesized that different subgroups of PTE-exposed people could be identified with qualitatively distinct symptom profiles (with classes evidencing high odds on some but not all types of symptoms).

In addition, a second aim was to identify correlates of class membership. We were specifically interested in the relations between class membership and malleable cognitive transdiagnostic risk factors for PTSD and mood and anxiety disorders following PTEs, that is, depressive rumination, worry, and negative trauma-related cognitions (e.g., Kangas et al., 2013; Seligowski et al., 2015). Depressive rumination has been defined as a repetitive and passive focus on depressive symptoms and their possible causes and consequences (Nolen-Hoeksema, 2004) and worry as an attempt to engage in problem–solving on future events of which the outcome is uncertain (Borkovec et al., 1983). The application of interventions aimed at changing worry and rumination in people exposed to a PTE, has shown significant reductions in PTSD, anxiety, and depression symptoms (e.g., Wells et al., 2015; Wisco et al., 2013). In addition, negative cognitions about self, the world, and self-blame for the trauma have been highlighted as particularly detrimental to mental health following PTEs (Ehlers

and Clark, 2000; Foa et al., 1999). Their modification through cognitive therapy is associated with significant changes in PTSD and depression symptoms (e.g., Brown et al., 2019; Iverson et al., 2015). By identifying which of these transdiagnostic risk factors relate to the most severe symptom classes we can shed light on which of these may be useful targets for psychological interventions with Spanish adults exposed to PTEs. Based on previous research (e.g., Brown et al., 2019; Iverson et al., 2015; Wells et al., 2015; Wisco et al., 2013), we hypothesized that classes with more severe (comorbid) mental health problems would have higher levels of cognitive risk factors. We also hypothesized that experiencing an intentional PTE, experiencing it directly, experiencing a greater number of PTEs, and a shorter time since the event would be predictive of membership of classes showing more severe (comorbid) mental health problems (Kilpatrick et al., 2013; Neria et al., 2008; Nickerson et al., 2019; Santiago et al., 2013).

In summary, we aim to offer additional insight into the latent structure of PTSD, anxiety, and depression symptoms to help categorize subgroups of Spanish adults exposed to commonly experienced PTEs. In addition, we sought to clarify which potentially malleable cognitive risk factors (i.e., rumination, worry and negative cognitions) can distinguish latent classes of psychopathology (i.e., PTSD, anxiety, and depression symptoms) to help identify treatment targets.

Methods

Procedure and Participants

All participants were recruited in February and early March 2020 by psychology students at the Complutense University of Madrid who voluntarily participated in a seminar on PTSD. Each student was asked to recruit six participants (relatives, partners, friends, or acquaintances) exposed to at least one stressful life-event or PTE. The

participants were asked to complete a survey, which were returned by the students to the research team in the month of the seminar. The survey was administered in paper-and-pencil format. The following inclusion criteria were used: residing in Spain, being 18 years or older, and reporting exposure to at least one stressful life-event or PTE. Exclusion criteria were being a minor and not reporting a stressful life-event or a PTE. Respondents received no compensation for their participation.

In total, 523 people filled in questionnaires. Of this initial group, 258 people reported a PTE according to criterion A of the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5; American Psychiatric Association [APA], 2013) as the reference event on the PTSD symptom measure. These people were included in the present study. All participants provided written informed consent. Ethical approval for this study was granted by the Ethical Committee of the Faculty of Psychology of the Complutense University of Madrid.

Measures

Sociodemographic Characteristics

The following sociodemographic characteristics were assessed with a self-constructed questionnaire: gender (male, female), age (in years) and education level (secondary school or lower, higher secondary school [college or university]).

Potentially Traumatic Events

PTEs were assessed through a form with 24 traumatic events (e.g., natural disaster, motor vehicle accident, or assault with a weapon) based on the Life Events Checklist for DSM-5 (Weathers et al., 2013). For each event, respondents indicated if it was experienced, the date of the event, and if it directly happened to them (e.g., they had experienced a serious vehicle accident) or to others (e.g., a loved one, or a friend/acquaintance had experienced a serious vehicle accident). To corroborate the

traumatic nature of the event (i.e., exposure to actual or threatened death, serious injury, or sexual violence; APA, 2013), participants were instructed to describe a negative life-event that currently bothered them the most when completing the measure of PTSD symptoms. Participants who indicated a stressful life event that did not classify as a PTE (e.g., divorce) or who did not report any stressful event, were not included in the present study. To better understand the relationship between the nature of the PTE and class membership, we classified the type of PTE as "intentional" (those that involve the deliberate infliction of harm; e.g., assault with a weapon) or "unintentional" (those that inadvertently cause harm; e.g., bereavement due to an accident). Intentionality of a PTE has been shown to be an important factor in predicting the course of PTSD (Santiago et al., 2013).

PTSD Symptoms

PTSD symptoms were assessed using the 20-item Spanish Version of PTSD Checklist for DSM-5 (PCL-5; Blevins et al., 2015; Spanish adaptation: Sanz et al., 2016, unpublished manuscript). Participants were asked to indicate the extent to which they experienced each symptom over the past month on a 5-point scale in response to their reference event, ranging from "not at all" (0) to "extremely" (4). Consistent with prior LCA-research on depression and PTSD symptoms (e.g., Lenferink et al., 2017) a dichotomous variable for each symptom was derived. Symptoms rated as "moderately" (2), "quite a bit" (3) and "extremely" (4) were rated as "present"; lower scores were rated as "absent". Next, we divided the items over four clusters following the DSM-5 diagnostic criteria and these were dichotomized as present or absent. This decision was made because it corresponds with how PTSD is conceptualized in the DSM-5 (APA, 2013). Furthermore, our sample size was too small to conduct a LCA on all symptoms, yet distinguishing multiple indicators rather than just one (i.e., PTSD absent/present)

could lead to greater precision in detecting subgroups. The "intrusion cluster" and "avoidance cluster" were considered present when at least one B-cluster or C-cluster item was endorsed, respectively. The "negative alterations in cognition and mood cluster" and "reactivity cluster" were considered present if at least two D-cluster or E-cluster item were endorsed, respectively. Both the original and the Spanish version of the PCL-5 have shown adequate reliability and validity (e.g., Blevins et al. 2015; Sanz et al., 2016, unpublished manuscript). Cronbach's alpha of the total PCL-5 was .92 in the present sample. Cronbach's alphas of the subscales assessing posttraumatic stress B, C, D and E symptom clusters were .86, .82, .91, and .86 in the present sample, respectively.

Symptoms of Anxiety

Items to assess anxiety symptoms were taken from the 7-item Spanish Beck Anxiety Inventory-Fast Screen (BAI-FS; Beck et al., 1997; Spanish adaptation: Sanz and García-Vera, 2012, unpublished manuscript). Respondents rated the presence and severity of symptoms during the previous week. Items are scored from 0 ("not at all") to 3 ("severely"). To obtain a dichotomous indicator variable for each symptom, symptoms rated as "moderately" (2) or "severely" (3) were considered to indicate a symptom is "present" and lower scores were considered to indicate that they are "absent". Taking into account the BAI-FS cut-off of 5 established by Beck et al. (1997) for detecting a possible case of panic, generalized anxiety, or both types of disorders, anxiety was considered to be present when at least three of seven symptoms were endorsed (reflecting a minimum total score of at least six points). Both the original and the Spanish version of the BAI-FS have shown adequate reliability and validity (e.g., Beck et al., 1997; Sanz and Garcia-Vera, 2012, unpublished manuscript). The scale demonstrated good reliability in our sample (α = .81).

Symptoms of Depression

Items to assess depression were taken from the 11-item Spanish Beck Depression Inventory-II-Short Version developed by Sanz et al. (2005) based on the Spanish BDI-II (Beck et al., 2011). All items consist of four (two items with seven) different statements, ranging from lower to higher severity levels. Participants rated the occurrence and severity of symptoms during the two preceding weeks by selecting the most relevant statement. The statements are scored from 0 to 3. To obtain a dichotomous indicator variable for each symptom, a symptom was considered to be "present" when scored "2" or "3" and "absent" when scores were lower. In line with Lenferink et al. (2017), following the DSM-5 diagnostic criteria for major depressive disorder, depression was considered to be present when at least five of nine depression symptoms were endorsed and at least one of these five symptoms was "Sadness" or "Loss of interest". The items "Pessimism" and "Loss of Satisfaction" of the BDI-II-SV were omitted in the present study following the DSM-5 diagnostic criteria for major depressive disorder. The Spanish BDI-II Short Version has shown adequate reliability and validity (e.g., Sanz et al., 2005). In this sample, the scale's Cronbach's alpha was .78.

Rumination

Depressive rumination was assessed using the 5-item brooding subscale of the Spanish Ruminative Responses Scale (RRS; Treynor et al., 2003; Spanish adaptation: Extremera and Fernández-Berrocal, 2006). It assesses the general tendency to engage in maladaptive depressive rumination. Participants indicate what they do when they feel sad, blue or depressed on a 4-point Likert scale, ranging from 0 ("never") to 3 ("always"). Both the original and the Spanish version of the RRS have shown

appropriate reliability and validity (e.g., Treynor et al., 2003; Extremera and Fernández-Berrocal, 2006). Cronbach's alpha was .80 in the present sample.

Worry

Worry was assessed using the abbreviated 11-item Spanish Penn State Worry Questionnaire (PSWQ-11; Original PSWQ: Meyer et al., 1990; Spanish adaptation: Sandín et al., 2009). This measure assesses the general tendency to engage in worry. Participants indicate to what extent statements on worry are typical to them a 5-point Likert scale, ranging from 0 ("not at all typical of me") to 4 ("very typical of me"). Both the original and the Spanish version of the PSWQ have shown acceptable reliability and validity (e.g., Meyer et al., 1990; Sandín et al., 2009). In the current sample, the scale's Cronbach's alpha was .93.

Negative Cognitions

The 36-item Spanish Post-Traumatic Cognitions Inventory (PTCI; Foa et al., 1999; Spanish adaptation: Blanco et al., 2010) was used to assess negative cognitions related to the PTE. It assesses three types of negative cognitions: negative cognitions about the self (21 items), negative cognitions about the world (7 items) and cognitions about self-blame (5 items). Participants indicate the extent to which they agree with these cognitions on a 7-point Likert scale, ranging from 0 ("totally disagree") to 6 ("totally agree"). Both the original and the Spanish version of the PTCI have shown appropriate reliability and validity (e.g., Foa et al., 1999; Blanco et al., 2010). Cronbach's alpha of the total PTCI was .96 in the present sample. Cronbach's alphas of the subscales assessing negative cognitions about self, negative cognitions about the world, and self-blame were .95, .91, and .72, respectively.

Statistical Analyses

A LCA was conducted to analyze classes of PTSD clusters, anxiety and depression symptoms in individuals who have experienced a PTE using Latent GOLD version 6.0 (Vermunt and Magidson, 2005). The LCA was performed using above-mentioned dichotomized indicators of PTSD clusters, anxiety, and depression. Specifically, the dichotomous indicators were the following: (a) four PTSD indicators (i.e., “intrusion”, “avoidance”, “negative alterations in cognition and mood”, and “reactivity”), (b) one anxiety indicator, and (c) one depression indicator.

To determine the optimal number of latent classes, we first fitted the most parsimonious (one-class) model, followed by models with increasing numbers of classes up to six classes. We used statistical and nonstatistical criteria to determine the optimal number of classes. With respect to statistical criteria, we evaluated (1) the Akaike's Information Criterion (AIC), Bayesian Information Criterion (BIC), and Sample-Size Adjusted Bayesian Information Criterion (SA-BIC) to contrast the fit of the models with different number of clusters (lower values indicate a better model fit) (Nylund et al., 2007), (2) the entropy, indicating the quality of the classification (values between 0 and 1 with higher values indicate that participants are classified with more confidence; values > .80 are considered acceptable) (van de Schoot et al., 2017), and (3) the bootstrap likelihood ratio test (BLRt) (*p*-value < .05 implies a significant improvement of fit of the current solution relative to the solution with one less class) (Nylund et al., 2007). With respect to non-statistical criteria, the interpretability and size of the latent classes were considered (i.e., models with interpretable classes and with class sizes large enough to assess correlates of subgroup membership were preferred).

To examine whether levels of PTSD clusters, anxiety and depression differed significantly between the classes, the “three-step approach” was carried out in Latent GOLD using the largest class as a reference category (Vermunt, 2010). The total scores

of the measures were added separately as covariates to the model. The following steps were used: (1) a latent class model is built according to the indicator variables, (2) participants are assigned to latent classes, and (3) theses latent classes are related to covariates taking into account the classification error to prevent bias.

Next, to examine whether the correlates differed between latent classes, the sociodemographic (gender, age, and education level), event-related variables (type of trauma, who experienced the event, and time since the event), and the cognitive variables (rumination, worry, and negative cognitions) were added separately as covariates in a univariate logistic regression model using the three-step approach in Latent GOLD and using the largest class as the reference category (Vermunt, 2010). Lastly, to test which of the variables distinguished best between classes, all variables that significantly distinguished classes in the univariate analyses were added simultaneously as covariates using the three-step approach in Latent GOLD (Vermunt, 2010). This multivariate approach takes into account the shared variance between the variables in the model.

Results

Sample Characteristics

Participants were between 18 and 89 years old (M = 41.6; SD = 16.1) and 55% were female. For sixty-eight percent, the highest education level was primary or secondary school and 32% had completed college or university. In Table 1, sociodemographic characteristics, trauma characteristics, and totals for symptom measures and cognitive variables of the full sample are shown. The types of PTEs that participants were exposed to are shown in Table 2.

Latent Class Analysis

Based on fit-indices and interpretability of the outcomes, a three-class solution was selected as the optimal solution (Table 3). This model yielded the lowest SA-BIC and AIC indices. The non-significant BLRt *p*-value of the four-class solution showed that this model did not have a better fit compared to the three-class solution. Except for the five-class model, all models showed acceptable entropy values. The smallest class sizes of the four-, five-, and six-class models were not large enough to estimate correlates of subgroup membership (< 6 participants). Therefore, three-class model was chosen as the optimal class solution. We note that the two- and six-class solutions had a higher entropy. However, these models also yielded higher BIC (not the two-class solution), SA-BIC, and AIC indices, and the solutions were more difficult to interpret compared to the three-class solution. Thus, whereas the two-class solution showed a lower BIC value, and this is considered to be the preferred index for model selection (Nylund et al., 2007), we considered all fit indices jointly, as well as interpretability, when selecting a final model (van de Schoot et al., 2017).

Overall symptom prevalence rates and conditional probabilities of symptoms for the three-class solution are reported in Table 4, representing the percentage in each class exhibiting each PTSD cluster, anxiety, and depression. In keeping with previous research (Nickerson et al., 2014), we considered values of < .15 representing a low probability, values between .15 and .59 as representing a moderate probability, and values of > .59 as representing a high probability. Class 1, named as the “resilient class” (*n* = 188; 73%), was characterized by a low probability of presence of PTSD clusters, anxiety, and depression, with the exception of the “intrusion cluster” which yielded a moderate probability. Class 2, named as the “partial PTSD class” (*n* = 36; 14%), was characterized by high probabilities of presence of two PTSD clusters (“intrusion” and “avoidance”) and moderate probabilities of the presence of the other two PTSD clusters

("negative alterations in cognition and mood and alterations in arousal" and "reactivity") and anxiety. Class 3 was named as the "high symptom class" (*n* = 34; 13%). Participants in this class had high probabilities of the presence all PTSD clusters and a moderate probability of anxiety. Participants in class 3 approached a moderate probability of experiencing depression (probability = .144).

Symptom Severity across Classes

As shown in Table 5, average PTSD, anxiety, and depression symptom scores were significantly lower in the resilient class than in the partial PTSD class and high symptom class. The differences between high symptom class and partial PTSD class scores are shown in Supplemental Table 1.

Correlates of Class Membership

Table 5 shows the results of the tests examining differences between the classes with respect to the eleven sociodemographic, event-related, and cognitive variables when entered separately into the model. Compared to the resilient class, people in the partial PTSD class were more likely to be women and scored significantly higher on rumination, worry, negative cognitions about self, and self-blame. People in the high symptom class were younger, less likely to have a high educational level, and were more likely to have experienced an intentional PTE, and a greater number of PTEs than people in the resilient class. In addition, the people of this class scored significantly higher on rumination, worry, negative cognitions about self, the world, and self-blame than people in the resilient class. The time since the PTE and if the event directly happened to participants or to others were not significantly associated with class membership. Differences between high symptom class and partial PTSD class scores are shown in Supplemental Table 2.

As mentioned, variables distinguishing classes in the univariate analysis were also added simultaneously as covariates of the same class comparisons in the three-step approach (Table 6). People in partial PTSD class did not differ significantly from the resilient class on any correlates in these multivariate analyses. Compared to the resilient class, people in the high symptom class were more often female and scored significantly higher on negative cognitions about the world.

Discussion

To our knowledge, studies applying LCA on PTSD, anxiety, and depression symptoms are rare and have mostly used samples from Eastern countries or American soldiers exposed to multiple and often severe PTEs. In addition, there are no LCA studies using these symptom types as indicators in samples from the Spanish general population. Therefore, an LCA on PTSD clusters, anxiety, and depression symptoms was conducted to identify different classes of PTE-exposed Spanish adults. These analyses revealed three classes: a resilient class (73%; low odds of PTSD clusters, anxiety, and depression), a partial PTSD class (14%; high to moderate odds of PTSD clusters and moderate odds of anxiety) and a high symptoms class (13%; high odds of all PTSD clusters and moderate odds of anxiety).

We discovered that our PTE-exposed sample could be distinguished in terms the odds of experiencing symptomatology. We distinguished classes with low, moderate (in two out of four PTSD indicators) and high odds of PTSD clusters, with the latter two classes also showing moderate odds of anxiety. Therefore, our findings are partially in line with previous studies differentiating classes according to odds of symptoms of PTSD and related disorders (Hruska et al., 2014; Soydas et al., 2021), as well as studies distinguishing classes solely according to severity of symptoms (e.g., Contractor et al., 2015). However, our findings are also compatible with studies differentiating classes by

combination of distinct subsets of symptoms. For example, among bereaved earthquake survivors, Eisma et al. (2019) found classes with moderate or high odds of prolonged grief symptoms but low odds of PTSD symptoms, and classes that had low, moderate, or high odds of both types of symptoms. Finally, class differences in both severity and type of symptoms are compatible with findings from research comparing latent classes of psychopathology across individualistic and collectivistic cultures (Contractor et al., 2020). Our results align more with prior results from LCAs in individualistic cultures, compared to collectivist cultures. Differences in emotional experiences and in the types of PTEs commonly experienced within each culture have been proposed as possible explanations for these findings (Contractor et al., 2020).

Studies applying LCA exclusively on PTSD, anxiety, and depression symptoms are rare. Most notably, Nickerson et al. (2019) conducted a study applying LCA on these three types of symptoms and identified five classes of refugees. Their results are somewhat compatible with our findings as we also found a class with low odds of all symptoms, a class with high odds of PTSD clusters and moderate anxiety (depression approached a moderate odds) and a class with moderate (to high) odds of PTSD clusters and anxiety (albeit low odds of depression). However, we found no evidence for a class with high odds of anxiety/depression and moderate odds of PTSD symptoms nor a class with high odds of all symptoms. One plausible explanation may be that Nickerson et al. (2019) studied refugees which were confronted with PTEs involving serious interpersonal violence such as exposure to combat or kidnapping. This may lead to higher odds of PTSD than other PTEs (Kessler et al., 2014). Possibly, the severity and number of PTEs experienced by refugees may also lead to the identification of additional high symptom classes. However, differences could also be due to

methodological issues (e.g., the use of cluster-based LCA rather than symptom-based LCA, differences in sample sizes) or to the cultural differences between both samples.

Our finding of two PTSD classes (one with high odds of intrusion/avoidance and one with high odds of all symptom clusters) has implications for the debate about the appropriate criteria for PTSD and the differences between DSM-5 and International Classification of Diseases, 11th Revision (ICD-11) criteria (World Health Organization, 2019). The DSM-5 PTSD criteria broadly include posttraumatic anhedonic/dysphoric and cognitive clinical presentations along with fear-based anxiety presentations characterized by intrusion/re-experiencing, avoidance, and arousal/reactivity. Instead, the ICD-11 criteria narrowly focuses exclusively on fear-based anxiety presentations characterized by re-experiencing/intrusion, avoidance, and sense of current threat. Our findings seem to support both approaches. First, class 3 contained a group of PTE-exposed people who presented a heterogeneous set of PTSD symptoms (intrusion, avoidance, negative alterations in cognition and mood, alterations in arousal and reactivity). In addition, class 2 contained a group of PTE-exposed people who presented a homogeneous set of fear-based anxiety symptoms (intrusion and avoidance cluster) but not negative alterations in arousal and reactivity. Therefore, our findings suggest that DSM-5 and ICD-11 approaches for PTSD may be complementary.

The present study has some clinical implications. Our LCA results generate potentially useful information about symptomatology in Spanish adults confronted to a PTE. Within the high symptom class, high odds of PTSD symptom clusters often co-occurred with anxiety symptoms. This suggests that it is useful to assess comorbid anxiety disorders in people presenting with PTSD symptomatology. In addition, the identification of a partial (or subthreshold) PTSD class in the present study could be relevant as such symptom patterns have been associated with a wide range of negative

outcomes including more healthcare utilization and an increased risk of suicidality (Brancu et al., 2016). Potentially, providing treatment for this group, such as exposure-based writing therapy (Dawson et al., 2021), may help mitigate the negative consequences of PTSD symptomatology within this group.

In addition, we analyzed the correlates of class membership. With respect to the sociodemographic and event-related variables, key findings were that female sex differentiated the partial PTSD class from the resilient class and that those who were younger, had a lower education level, had experienced an intentional PTE, and had experienced a greater number of PTEs were more likely to be in the high symptom class compared to the resilient class. These results align with previous literature on risk factors for PTSD, anxiety, and depression following PTEs (Kessler et al., 2014; Kilpatrick et al., 2013; Nickerson et al., 2019; Santiago et al., 2013). However, time since the PTE and who experienced the event (participants or others) did not distinguish the different classes. Our findings are incompatible with finding that risks of PTSD are higher among people who have been directly rather than indirectly exposed to a PTE (Neria et al., 2008). Possibly, the number of people reporting PTEs that happened to others was too low across classes to detect significant differences on this variable. Similarly, while our findings were inconsistent with studies demonstrating that PTSD symptoms tend to decline over time (Neria et al., 2008), it should be considered that our participants experienced a PTE, on average, 15 years ago. Possibly, the decline in PTSD symptoms becomes weaker over time.

Univariate class comparisons further demonstrated that more rumination, worry, negative cognitions about self and self-blame predicted partial PTSD class membership (versus the resilient class). In addition to these correlates, more negative cognitions about the world predicted membership of high symptom class (versus the resilient

class). These findings are generally compatible with previous studies that have shown the association between these correlates and PTSD, anxiety, and depression symptoms (e.g., Kangas et al., 2013; Seligowski et al., 2015). Therefore, our results suggest that transdiagnostic factors assessed in the present study are important to understand symptomatology of PTE-exposed Spanish adults and this also provides useful information on clinical practice. Spanish PTE-exposed people with PTSD and anxiety symptoms may benefit from interventions targeting rumination, worry, and negative cognitions (e.g., Brown et al., 2019; Wisco et al., 2013; for a review: Querstret and Cropley, 2013).

Finally, multivariate class comparisons demonstrated that female sex and negative cognitions about the world predicted membership of the high symptoms class (versus the resilient class). Although power problems limit the inferences we can draw from this analysis, it suggests that these variables are the strongest correlates of severe symptomatology in PTE-exposed Spanish adults.

Limitations

This study had a number of limitations. First, although the sample size was sufficient to conduct an LCA, it was relatively small. The resulting sample sizes in the partial PTSD class and high symptoms class affected the statistical power of the analyses of correlates of class membership (particularly the multivariate analysis). Second, another consequence of our sample size is that we could only use six indicators of three types of symptoms in PTE-exposed people. This has affected precision in identifying meaningful classes or specific symptom patterns. Third, self-report measures were used to assess symptoms of PTSD, depression and anxiety which may lead to overestimations of symptom severity levels relative to other methods, such as clinical interviews. Fourth, participants retrospectively reported on exposure to traumatic events

introducing the possibility of recall bias. Fifth, depressive and anxiety symptoms could originate from other events or factors than the reported PTE (e.g., nontraumatic stressful events or genetic vulnerability). Lastly, although all the participants had experienced a PTE, most of these were experienced some time ago, so we could only shed light on the long-term consequences of exposure to PTEs.

A number of improvements for future research on this topic in the Spanish population follow from these limitations. First, larger samples may allow for more precise class identification based on individual symptoms and identification of more robust associations between classes and correlates. In addition, future studies could rely on a Spanish adult sample that has experienced a specific PTE (e.g., traumatic loss) to examine whether our results generalize to such populations. In addition, because the present sample included a large group of people who had experienced violent loss, it may be prudent to include measures of prolonged grief symptoms in future similar research. Finally, a sample with a shorter time elapsed since the experience of the PTE could help to obtain more insight into the short-term psychological impact of such events.

Conclusions

In conclusion, our LCA revealed three subgroups of PTE-exposed Spanish adults based on presence of PTSD clusters, anxiety, and depression: a resilient, partial PTSD, and high symptom class. Despite the limitations of this study, our findings provide indications that this population shows distinct symptom patterns that relate meaningfully to personal characteristics and transdiagnostic risk-factors of psychopathology. Our study informs clinical practice and future, more advanced and larger-scale LCA research in Spanish PTE-exposed samples.

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Table Titles

Table 1.

Sociodemographic and event-related characteristics and symptoms and cognitive measure scores.

	Total sample (*N* = 258)
Demographic variables	
Female (N (%))	143 (55)
Age (M (SD))	41.6 (16.1)
Education level (N (%))	
Secondary school or lower	176 (68)
Higher secondary school	82 (32)
Event-related variables	
Type of PTE (N (%))	
Intentional	51 (20)
Unintentional	207 (80)
Who experienced the event (N (%))	
Me	188 (75)
Others	63 (25)
Time since event (in years) (M (SD))	15 (14)
Number of PTEs (M (SD))	1.9 (1.3)
Symptom levels (M (SD))	
PTSD	10.9 (13.4)
Anxiety	3.8 (3.5)
Depression	4.6 (4.3)
Cognitive variables (M (SD))	
Rumination	5.2 (3.4)
Worry	15.4 (10.1)
Negative cognitions about the world	0.7 (1.0)
Negative cognitions about the self	1.9 (1.6)
Self-Blame	1.0 (1.1)

Note. PTEs, potentially traumatic events; PTSD, posttraumatic stress disorder; Event-related variables information are based on PTEs indicated as “the most traumatic event” in the PCL-5; Item means are reported for each type of negative cognitions.

Table 2.

Potentially traumatic events experienced by the participants assessed through the ad hoc form.

Potentially traumatic event	***N* (%)**	**Potentially traumatic event**	***N* (%)**
Sudden death of a loved one	129 (50)	Terrorist attack	8 (3)
Serious vehicle accident	59 (23)	Being hit by your partner	8 (3)
Being threatened or assaulted with a weapon	53 (21)	Sexual assault / battery	7 (3)
Life-threatening illness of a child	34 (13)	Rape	7 (3)
Another type of accident (train, plane, work accident…)	25 (10)	Another manmade disaster	6 (2)
Being hit by someone other than your partner	18 (7)	Witness death / atrocities in war zone	4 (1)
Watching physical fights at home as a child	15 (6)	Being in a war zone as a civilian	3 (1)
Private event that you don't want to tell	14 (5)	Having been kidnapped	2 (1)
Sexual harassment	12 (5)	Being a refugee from a country	1 (0)
Natural disaster (e.g., hurricane, tornado, earthquake)	12 (5)	Another type of traumatic experience that has happened to you	27 (11)
Suffering physical abuse in childhood	11 (4)	Another type of traumatic experience that has happened to a loved one	29 (11)

Note. Potentially traumatic events experienced by the participants are shown from most to least common (another type of potentially traumatic experience was placed at the end); Accidentally or deliberately causing death in a war zone were events not experienced by any participant.

Table 3.

Goodness-of-fit statistics for 1–6 class solutions.

Model	LL	SA-BIC	BIC	AIC	BLRt *p*	Entropy R^2	Smallest class size
1 Class	-667.42	1352.85	1368.16	1346.85			
2 Class	-535.98	1110.96	**1144.15**	1097.96	<.001	**.85**	64
3 Class	-521.73	**1103.47**	1154.53	**1083.47**	**<.001**	.80	34
4 Class	-515.69	1112.37	1181.30	1085.37	.064	.80	4
5 Class	-513.58	1129.16	1215.96	1095.16	.360	.66	5
6 Class	-510.37	1143.73	1248.40	1102.73	.170	.83	3

Note. LL, log-likelihood; SA-BIC, sample-size adjusted Bayesian information criterion; BIC, Bayesian information criterion; AIC, Akaike information criterion; BLRt, bootstrap likelihood ratio test. The best fit values for each statistical index are displayed in bold.

Table 4.

Probability of item endorsement for PTSD, anxiety, and depression symptom clusters for three-class solution.

	Overall symptom frequency		**Resilient class (1) (*n* = 188)**		**Partial PTSD class (2) (*n* = 36)**		**High symptom class (3) (*n* = 34)**	
	N	%	Prob.	SE	Prob.	SE	Prob.	SE
PTSD Intrusion cluster	92	36	.153	.038	**.943**	.097	**.872**	.063
PTSD Avoidance cluster	52	21	.016	.016	**.768**	.186	**.670**	.091
PTSD Negative alterations in cognition and mood cluster	41	16	.019	.012	.221	.105	**.854**	.115
PTSD Alterations in arousal and reactivity cluster	51	20	.050	.017	.229	.139	**.967**	.059
Anxiety	35	14	.063	.018	.155	.081	.513	.099
Depression	5	2	.000	.000	.000	.002	.144	.065

Note. PTSD, posttraumatic stress disorder; Prob., probability estimate; SE, standard error. Values representing a high probability (values > .59) are displayed in bold.

Table 5.

Parameter estimates for the latent class model with sociodemographic and event-related characteristics and symptoms and cognitive levels as covariates.

	Partial PTSD class vs. Resilient class			**High symptom class vs. Resilient class**			
	B	*SE*	95% (CI)	*B*	*SE*	95% (CI)	*p*
PTSD symptoms	0.33	0.03	0.26, 0.40	0.54	0.06	0.44, 0.65	<.001
Anxiety symptoms	0.25	0.08	0.10, 0.39	0.45	0.09	0.28, 0.63	<.001
Depression symptoms	0.14	0.05	0.04, 0.23	0.37	0.06	0.25, 0.48	<.001
Age	0.01	0.02	-0.03, 0.05	-0.05	0.02	-0.09, -0.02	.013
Gender (0 = male)	1.12	0.53	0.08, 2.16	0.83	0.43	-0.01, 1.67	.015
Education level (0 = secondary school o lower)	0.76	0.45	-0.12, 1.64	-1.71	0.73	-3.13, -0.28	.017
Who experienced the event (0 = me)	-0.91	0.61	-2.11, 0.29	-0.69	0.54	-1.75, 0.36	.130
Type of PTE (0 = intentional)	-0.17	0.60	-1.35, 1.01	1.03	0.43	0.19, 1.87	.049
Years since event	-0.02	0.10	-0.22, 0.19	-0.05	0.05	-0.14, 0.05	.160
Number of PTEs	0.16	0.17	-0.17, 0.48	0.49	0.13	0.24, 0.75	<.001
Rumination	0.17	0.06	0.04, 0.29	0.44	0.07	0.30, 0.59	<.001
Worry	0.06	0.02	0.02, 0.10	0.14	0.02	0.10, 0.18	<.001
Negative cognitions about the world	0.93	0.49	-0.03, 1.89	1.66	0.47	0.73, 2.58	<.001
Negative cognitions about the self	0.26	0.13	0.01, 0.50	0.68	0.12	0.45, 0.92	<.001
Self-Blame	0.45	0.17	0.12, 3.71	0.85	0.15	0.55, 2.97	<.001

Note. When the covariate “years since the event” was included to the model, the resilient class, partial PTSD class and high symptom class sizes going from 73%, 14%, and 13% to 75%, 13% and 12% of the total sample, respectively. Similarly, when the covariate “who experienced the event” was included to the model, class sizes changed to 74%, 13% and 13% of the total sample, respectively; PTSD, posttraumatic stress disorder; PTEs, potentially traumatic events.

Table 6.

Parameter estimates for the latent class model with covariates.

	Partial PTSD class vs. Resilient class			**High symptom class vs. Resilient class**			
Covariates	*B*	*SE*	95% (CI)	*B*	*SE*	95% (CI)	*p*
Age	0.01	0.02	-0.03, 0.05	-0.03	0.02	-0.08, 0.02	.360
Gender (0 = male)	0.76	0.51	-0.23, 1.75	1.37	0.64	0.12, 2.62	.034
Education level (0 = secondary school o lower)	0.63	0.51	-0.36, 1.63	-1.31	0.77	-2.81, 0.20	.082
Type of PTE (0 = intentional)	-0.52	0.65	-1.80, 0.75	0.49	0.79	-1.05, 2.04	.630
Number of PTEs	0.12	0.18	-0.23, 0.48	0.16	0.27	-0.37, 0.69	.700
Rumination	0.09	0.10	-0.09, 0.28	0.26	0.12	0.01, 0.50	.061
Worry	0.03	0.03	-0.04, 0.09	0.06	0.04	-0.01, 0.13	.220
Negative cognitions about the world	0.19	0.40	-0.60, 0.97	1.27	0.51	0.28, 2.26	.038
Negative cognitions about the self	-0.02	0.22	-0.44, 0.40	-0.01	0.26	-0.52, 0.51	.990
Self-Blame	0.33	0.27	-0.21, 0.86	-0.04	0.27	-0.56, 0.48	.400

Note. PTSD, posttraumatic stress disorder; PTEs, potentially traumatic events.

Supplemental Table 1.

Parameter estimates for the latent class model with sociodemographic and event-related characteristics and symptoms and cognitive levels as covariates.

	Partial PTSD class vs. High symptoms class			
	B	*SE*	95% (CI)	*p*
PTSD symptoms	-0.21	0.05	-0.31, -0.12	<.001
Anxiety symptoms	-0.21	0.08	-0.06, -0.36	.006
Depression symptoms	-0.23	0.05	-0.33, -0.13	<.001
Age	0.06	0.03	0.01, 0.15	.030
Gender (0 = male)	-0.29	0.69	-1.64, 1.07	.680
Education level (0 = secondary school o lower)	-2.47	0.86	-4.16, -0.77	.004
Who experienced the event (0 = me)	0.22	0.83	-1.40, 1.84	.790
Type of PTE (0 = intentional)	1.20	0.72	-0.20, 2.60	.094
Years since event	0.03	0.14	-0.26, 0.31	.860
Number of PTEs	-0.33	0.18	-0.68, 0.01	.059
Rumination	-0.28	0.08	-0.42, -0.13	<.001
Worry	-0.08	0.03	-0.13, -0.03	.002
Negative cognitions about the world	-0.73	0.23	-1.18, -0.29	.001
Negative cognitions about the self	-0.43	0.15	-0.71, -0.14	.004
Self-Blame	-0.41	0.18	-0.75, -0.06	.022

Note. PTSD, posttraumatic stress disorder; PTEs, potentially traumatic events.

Supplemental Table 2.

Parameter estimates for the latent class model with covariates.

	Partial PTSD class vs. High symptoms class			
	B	*SE*	95% (CI)	*p*
Age	0.05	0.03	-0.01, 0.10	.026
Education level (0 = secondary school o lower)	-1.82	0.85	-3.49, -0.15	.092
Rumination	-0.12	0.14	-0.40, 0.16	.097
Worry	-0.04	0.04	-0.12, 0.05	.095
Negative cognitions about the world	-0.95	0.40	-1.74, -0.17	.008
Negative cognitions about the self	-0.07	0.25	-0.55, 0.41	.900
Self-Blame	0.40	0.33	-0.24, 1.04	.320

Note. PTSD, posttraumatic stress disorder.