Heterogeneity in patterns of DSM-5 posttraumatic stress disorder and depression symptoms: Latent profile analyses

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ABSTRACT

Background: Posttraumatic stress disorder (PTSD) and depression co-occur frequently following the experience of potentially traumatizing events (PTE; Morina et al., 2013). A person-centered approach to discern heterogeneous patterns of such co-occurring symptoms is recommended (Galatzer-Levy and Bryant, 2013). We assessed heterogeneity in PTSD and depression symptomatology; and subsequently assessed relations between class membership with psychopathology constructs (alcohol use, distress tolerance, dissociative experiences).

Methods: The sample consisted of 268 university students who had experienced a PTE and subsequently endorsed clinical levels of PTSD or depression severity. Latent profile analyses (LPA) was used to identify the best-fitting class solution according to recommended fit indices (Nylund et al., 2007a); and the effects of covariates was analyzed using a 3-step approach (Vermunt, 2010).

Results: Results of the LPA indicated an optimal 3-class solutions: high severity (Class 2), lower PTSD-higher depression (Class 1), and higher PTSD-lower depression (Class 3). Covariates of distress tolerance, and different kinds of dissociative experiences differentiated the latent classes.

Limitations: Use of self-report measure could lead to response biases; and the specific nature of the sample limits generalizability of results.

Conclusion: We found evidence for a depressive subtype of PTSD differentiated from other classes in terms of lower distress tolerance and greater dissociative experiences. Thus, transdiagnostic treatment protocols may be most beneficial for these latent class members. Further, the distinctiveness of PTSD and depression at comparatively lower levels of PTSD severity was supported (mainly in terms of distress tolerance abilities); hence supporting the current classification system placement of these disorders.
(Breslau, 2009; Strander et al., 2014). Finally, the “confounding factors” explanation indicates that the associations between PTSD and depression are coincidental (Flory and Yehuda, 2015; Strander et al., 2014) attributed to secondary influences on both disorders (e.g., effect of personal expectations on the diagnostic process) (Strander et al., 2014), or shared symptoms across the disorders (e.g., sleep difficulties) (Spitzer et al., 2007; Strander et al., 2014). The empirically supported quantitative hierarchical model (Watson, 2005, 2009), proposes a higher-order factor of emotional disorders which encompasses subclasses of 1) bipolar disorders, 2) distress disorders (e.g., MDD, PTSD, generalized anxiety disorder), and 3) fear disorders. PTSD and depression are conceptualized as sharing non-specific negative affect (Watson et al., 2011), represented by PTSD’s dysphoria symptoms (Contractor et al., 2014; Elhai et al., 2015). Consequently, one debates whether PTSD and depression belong to a larger spectrum of a posttraumatic stress syndrome or whether they are distinct disorders (Strander et al., 2014). Ultimately, such questions raise concerns regarding their distinctiveness in the current classification system.

There is an on-going debate on the existence of a depressive subtype of PTSD (Flory and Yehuda, 2015). People with PTSD, high negative affectivity and lower positive affectivity are more likely to have comorbid depression; whereas people with PTSD, higher negative affectivity and lower constraint are more likely to have comorbid substance-use (Miller et al., 2004). Thus, an underlying internalizing symptomatic pattern characterized by anxiety and sadness may underlie comorbid PTSD and depression. Thus, researchers question if respondents with comorbid PTSD and depression differ from those with only PTSD or depression on biological and psychological indicators (Flory and Yehuda, 2015).

Person-centered approaches accounting for population heterogeneity are used to examine sub-types of diagnostic patterns. One such approach is Latent Class Analysis (LCA) or Latent Profile Analysis (LPA); the former assesses categorical symptom indicators while the latter assesses continuous indicators for latent group classification. Such approaches transcend the limitations imposed by use of diagnostic categories; they classify individuals into latent homogenous classes based on similar response patterns (McCutcheon, 1987). Thus, latent profiles are compared with reference to shape (qualitative differences) and symptom levels (quantitative differences) (Nugent et al., 2012). A tabulated summary of studies assessing latent classes of PTSD and depression symptoms is presented in Table 1. Most studies indicate that there is a comparable and parallel level of severity across the disorders mainly represented as a four- (Au et al., 2013; Hruska et al., 2014; Lai et al., 2015) or three-class solution (Armour et al., 2015; Contractor et al., 2015). Only one study found latent classes differing in type (predominantly depression versus predominantly PTSD latent classes (Cao et al., 2016). Thus, most evidence affirms the existence of a depressive-subtype of PTSD and the idea that PTSD and depression symptoms may be a part of a common post-traumatic response (Norman et al., 2011). In light of these findings, an improved conceptual and empirical understanding of the co-occurrence of PTSD and depression symptom patterns is critical to inform a more reliable and differentiated diagnostic and treatment framework (Rytwinski et al., 2013).

No study to our knowledge has examined latent subgroupings in a sample with clinical levels of PTSD or depression severity. Although depression’s diagnostic criteria are unchanged from DSM-IV to DSM-5, the PTSD diagnostic criteria have undergone significant changes. In particular, the DSM-5 added several new symptoms represented under the negative alternations in cognitions and mood (NACM) sub-cluster (American Psychiatric Association, 2013), which seem to represent PTSD’s non-specific distress and may explain PTSD’s comorbidity with depression (Elhai et al., 2015). So far, only one study has examined latent subgroupings of PTSD and depression using DSM-5 PTSD criteria (Cao et al., 2016). However, this particular study by Cao et al. (2016) did not use DSM-based criteria for depression. Thus, analyzing latent classes based on DSM-5 indicators of both PTSD and depression is unprecedented. Moreover, to the extent known to us, no study has analyzed data from a student sample to assess PTSD-depression heterogeneity. Mental health among university students has been a constant focus of research. Not only are single and multiple experiences of PTEs highly prevalent among college students; there is also a high prevalence of clinical and sub-clinical PTSD (Elhai et al., 2012; Vrana and Lauterbach, 1994).

Accounting for the aforementioned, we assessed heterogeneity in PTSD and depression symptomatology using data collected from a trauma-exposed university sample with clinical levels of PTSD or depression severity. Our study aims were two-fold: (1) to examine the best-fitting latent class solution in categorizing participants based on their responses to PTSD and depression items; and (2) to examine the construct validity of the optimal latent class-solution. Individuals with PTSD only, depression only, and co-morbid PTSD and depression differ on the extent of alcohol use (Bailey et al., 2012; Hruska et al., 2014). Individuals with PTSD only have greater alcohol use than those with depression only; and those with comorbid depression and PTSD have greater alcohol use than either those with PTSD only and depression only (Bailey et al., 2012; Hruska et al., 2014). Given that the ability to tolerate distress is inversely related to PTSD severity regardless of depression (Vinci et al., 2016), one could infer a functional coping-related role of alcohol for people with clinical PTSD severity. Additionally, dissociative symptoms of depersonalization/derealization have been found to differentiate PTSD only from comorbid PTSD and depression (Armour et al., 2014b). Hence, the

Table 1
Summary of findings of latent class solutions of PTSD and depression symptoms.

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample</th>
<th>Best-fitting class solution</th>
<th>Severity/type differences</th>
<th>Nature of classes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PTSD and depression symptoms</strong></td>
<td></td>
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</tr>
<tr>
<td>Armour et al. (2015)</td>
<td>283 Canadian Veterans.</td>
<td>3-classSeverity</td>
<td>Low, moderate, and high severity classes.</td>
<td></td>
</tr>
<tr>
<td>Au et al. (2013)</td>
<td>119 female sexual assault survivors.</td>
<td>3-classSeverity</td>
<td>Low, low-moderate, high-moderate, and severe symptoms.</td>
<td></td>
</tr>
<tr>
<td>Contractor et al. (2015)*</td>
<td>1266 trauma-exposed soldiers.</td>
<td>3-classSeverity</td>
<td>Mild, moderate, and severe classes.</td>
<td></td>
</tr>
<tr>
<td>Cao et al. (2016)</td>
<td>1196 Chinese earthquake survivors.</td>
<td>4-classSeverity and type</td>
<td>Low symptoms, predominantly depression, predominantly PTSD, and combined PTSD-depression</td>
<td></td>
</tr>
<tr>
<td>Hruska et al. (2014)*</td>
<td>356 motor vehicle accident victims admitted to a Level-1 trauma center.</td>
<td>4-classSeverity</td>
<td>Resilient, mild psychopathology, moderate psychopathology, severe psychopathology.</td>
<td></td>
</tr>
<tr>
<td>Lai et al. (2015)*</td>
<td>353 children affected by Hurricane Katrina.</td>
<td>3-class solutionSeverity</td>
<td>No disturbance; posttraumatic stress only; mixed-internalizing (moderate PTSD severity, clinically significant anxiety and depression).</td>
<td></td>
</tr>
</tbody>
</table>

Note. * indicates studies that used other indicators besides PTSD and depression to inform latent class formations.
constructs of alcohol use, distress tolerance, and dissociative experiences were used to establish construct validity of the optimal class solution. We hypothesized finding an optimal three- (Armour et al., 2015; Contractor et al., 2015) or four-class solution (Au et al., 2013; Hruska et al., 2014; Lai et al., 2015) differing in severity. Additionally, we expected the latent classes to differ in type based on recent research with DSM-5 PTSD symptoms (Cao et al., 2016) and the clinical nature of our sample, which may increase the likelihood of finding a PTSD only and depression only latent class. Regarding the covariate analyses, we predicted that dissociative experiences (Blevins et al., 2014) would differentiate latent classes with predominant/higher PTSD symptom severity from other latent classes. Additionally, given that individuals with comorbid PTSD and depression have greater distress (Morina et al., 2013), we speculate that distress tolerance will distinguish a comorbid PTSD-depression class from other latent classes. Regarding alcohol use, we speculated that members in the latent class of comorbid PTSD - depression symptoms would be more likely to utilize alcohol than members of the other latent classes (Bailey et al., 2012; Hruska et al., 2014).

2. Method

2.1. Procedure and participants

Data was collected from university students who were sent a survey invitation email distributed by the university central Information and Communication Technology (ICT) services. The survey invitation was only sent to registered students (full-time and part-time) who were over 18 years of age at the time of the email distribution. The email invitation was sent on multiple instances over a six-month period, and targeted 25,000 students. All project procedures were approved by the University Ethics Committee prior to data collection.

The email invitation consisted of a brief description of the overall project, including the purpose, eligibility criteria, an estimation of the amount of time required to complete the survey (approximately 20–30 min), information about a lottery incentive (six chances to win £50 [roughly $61] Amazon vouchers), and a link to the survey which was hosted on Qualtrics online software site (Qualtrics, 2015). Clicking the link to the survey led to a participant information sheet including a description of the study and details of any potential risks (e.g., questions may elicit upset feelings), potential benefits, confidentiality, and information on voluntary participation and on-going use of data. If the participant selected to continue, this led to a consent form. The consent form contained questions designed to verify that participants understood the nature of the study and what they would be asked to do, including an example of the type of questions they may be asked during the survey. No identifying information was requested. When participants had completed the survey they were assigned a random ID code by the online survey software. Participants were then asked to email this random ID code to an email account which was set up for the lottery incentive.

2.2. Measures

Demographic Information. Information on age, gender, employment (i.e., full-time, part-time, retired, unemployed, unemployed student), and ethnicity was obtained.

Stressful Life Events Screening Questionnaire (SLESQ; Goodman et al., 1998). The SLESQ is a 13-item self-report measure that assesses exposure to PTEs (e.g., childhood sexual abuse). Three additional items were added to address changes in DSM-5 criteria for a qualifying traumatic event. These items were: clarifying whether the participant directly witnessed rather than observed the traumatic events via the media, whether there was reported exposure to details of the traumatic event, and whether those details were obtained via the person’s job or via the media (Elhai et al., 2012). Participants endorsing more than one traumatic event were asked to specify which traumatic event was most distressing (Elhai et al., 2012).

PTSD Checklist for DSM-5 (PCL-5; Weathers et al., 2013). The PCL-5 is a 20-item self-report measure that assesses severity of PTSD symptoms referencing the past month. Response options range from 0 (“Not at all”) to 4 (“Extremely”). The PCL-5 has shown excellent internal consistency reliability, good test-retest reliability, and good convergent and discriminant validity (Blevins et al., 2015). Internal consistency in the present study was .93.

Patient Health Questionnaire-9 (PHQ-9; Kroenke and Spitzer, 2002). The PHQ-9 is a 9-item self-report measure that assesses severity of depression symptoms referencing the past 2 weeks. Response options range from 0 (“Not at all”) to 3 (“Nearly every day”). Further, there is an additional item assessing the degree of functional impairment with a response scale ranging from “not difficult at all” to “extremely difficult”. The PHQ-9 has shown excellent internal consistency reliability and validity (Kroenke and Spitzer, 2002; Kroenke et al., 2001). Internal consistency in this study was .83.

Dissociative Symptoms Scale (DSS; Carlson et al., 2016). The DSS is a 20-item self-report measure assessing facets of dissociation including depersonalization (4 items, e.g., “I felt like I wasn’t myself”) and derealization (2 items, e.g., “Things around me seemed strange or unreal”); cognitive-behavioral re-experiencing (i.e., intrusion) (4 items; “I got reminded of something upsetting and then spaced out for a while”); gaps in awareness or memory (5 items, e.g., “I couldn’t remember things that had happened during the day even when I tried to”); and trauma-related re-experiencing of sensations, thoughts, and behaviors (5 items, e.g., “I smelled something that I know wasn’t really there”). The response scale ranges from 0 (“not at all”) to 4 (“more than once a day”). The DSS (overall and its subscales) has adequate to excellent internal consistency reliability, and adequate to excellent test-retest reliability and validity (Carlson et al., 2016). In the current study, internal consistency of the subscales of depersonalization/derealization, gaps in memory, sensory misperceptions, and cognitive-behavioral re-experiencing were .90, .84, .85, and .77 respectively.

Distress Tolerance Scale (DTS; Simons and Gaher, 2005). The DTS is a 15-item measure used to assess one’s perceived ability to tolerate emotional distress. It has a response scale ranging from 5 (strongly disagree) to 1 (strongly agree), where higher scores indicate higher distress tolerance ability (Simons and Gaher, 2005). The DTS has good internal consistency and test-retest reliability, as well as good to excellent validity (Simons and Gaher, 2005). Internal consistency in the present study was .90.

Alcohol Use Disorders Identification Test (AUDIT; Saunders et al., 1993). The AUDIT is a 10-item measure that assesses extent of alcohol use. Three items assess amount and frequency of alcohol use, three items assessing alcohol dependency, and four items assess problems stemming from alcohol use. The response scale ranges from 0 to 4, where higher scores indicate harmful use (Saunders et al., 1993). The AUDIT has adequate to excellent internal consistency and good validity (Allen et al., 1997). Cronbach’s alpha in the present study is .84.

2.3. Exclusions and missing data

We restricted our sample of 1416 participants to those endorsing at least one PTE on the SLESQ (n =940) and not missing 30% or more items on either the PCL-5 (>6 items) or the PHQ-9 (>3 items; n =118) resulting in a sample size of 822 participants. Finally, we restricted the sample of 822 participants to those endorsing clinical level severity on the PCL-5 (> /=31; Bovin et al., 2015) or the PHQ-9 (> /=10; Kroenke et al., 2001). Missing data for the effective sample of 268 participants was minimal and was estimated with Maximum Likelihood (ML) in Mplus version 7 for the primary analyses. The sample of 268 participants averaged 24.17 years of age (SD =7.50) and
the majority were females (n = 213, 81.30%). Detailed information on demographics is provided in Table 2.

2.4. Data analysis

We conducted a latent profile analyses (LPA) to categorize participants into latent sub-groups based on their endorsed item-level responses on the PCL-5 and the PHQ-9 (McLachlan and Peel, 2000; Muthén, 2004). LPA was conducted using Mplus 7 and the estimator was Maximum Likelihood estimation with robust standard errors (ML). One- through four-class models were analyzed based on prior research findings (e.g., Armour et al., 2015; Contractor et al., 2015). In terms of recommended fit indices, the optimal class solution had lower Akaike Information Criterion (AIC) values, Bayesian Information Criterion (BIC) values and sample-size adjusted BIC values (SSAIC); a significant Lo–Mendell–Rubin likelihood (LRT) test value; a significant Bootstrapped Likelihood Ratio Test (BLRT) p value; relatively higher entropy values; and conceptual meaning (DiStefano and Kamphaus, 2006; Nylund et al., 2007a). A model with a 10-point lower BIC value has a 150:1 likelihood to be the better fitting model (Raftery, 1995). When comparing a K-class model with a K-1 class model, a significant LRT test indicates that the model with K classes is optimal (Nylund et al., 2007a).

After identifying the best-fitting class solution, we first tested if the latent classes significantly differed in total PTSD and depression severity using a one-way ANOVA in SPSS. Further, we tested the effect of covariates (alcohol use, distress tolerance, depersonalization and derealization, gaps in memory and awareness, sensory misperception, and cognitive-behavioral re-experiencing) on latent class membership. We used the three-step approach (multinomial logistic regression) by estimating class membership in relation to auxiliary variables of interest while accounting for misspecification bias (Asparouhov and Muthén, 2014; Vermunt, 2010). For this part of the analyses, the default in dealing with missing data is list-wise deletion in Mplus, thus reducing our sample to 201 participants.

3. Results

Descriptive information on demographics and psychopathology constructs is provided in Table 2. Table 3 indicates results of the LPA. Based on established guidelines, we selected the 3-class solution as the optimal class solution (DiStefano and Kamphaus, 2006; Nylund et al., 2007a). According to LRT value guidelines, the 2-class solution would be the best-fitting model. However, we chose the 3-class model as the best-fitting class solution based on subsequently declining BIC values, a relatively smaller difference in BIC values between the 3- and 4-class models, and conceptual and interpretative meaning. Further, entropy values were quite similar for all the models tested.

See Table 4 for detailed results of the multinomial logistic regression analyses (n = 201). Results indicated that distress tolerance scores (B = .04, p = .03, OR = 1.04) were significant in predicting the lower PTSD-higher depression versus the higher PTSD-lower depression class membership. Higher distress tolerance scores by every single unit increment increased the chances of being in the lower PTSD-higher depression class compared to the higher PTSD-lower depression class by 4%.

Table 2
Descriptive information on demographics and psychopathology constructs for the entire sample and each latent class.

<table>
<thead>
<tr>
<th></th>
<th>Full sample (n=268)</th>
<th>Class 1 (n=63)</th>
<th>Class 2 (n=70)</th>
<th>Class 3 (n=135)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean (SD)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>24.17 (7.50)</td>
<td>22.42 (4.36)</td>
<td>25.31 (7.91)</td>
<td>24.62 (8.31)</td>
</tr>
<tr>
<td>PTSD severity</td>
<td>37.50 (18.91)</td>
<td>12.05 (8.55)</td>
<td>59.04 (11.42)</td>
<td>38.21 (8.04)</td>
</tr>
<tr>
<td>Depression severity</td>
<td>13.11 (4.67)</td>
<td>12.98 (3.19)</td>
<td>17.67 (3.23)</td>
<td>10.81 (4.14)</td>
</tr>
<tr>
<td>Alcohol use</td>
<td>9.46 (6.72)</td>
<td>10.31 (8.11)</td>
<td>10.13 (6.97)</td>
<td>8.78 (5.85)</td>
</tr>
<tr>
<td>Distress tolerance</td>
<td>38.41 (12.80)</td>
<td>43.57 (13.58)</td>
<td>32.28 (11.92)</td>
<td>39.39 (11.68)</td>
</tr>
<tr>
<td>Depersonalization</td>
<td>3.88 (5.24)</td>
<td>1.65 (2.23)</td>
<td>8.40 (6.88)</td>
<td>2.47 (3.49)</td>
</tr>
<tr>
<td>Derealization</td>
<td>3.88 (5.24)</td>
<td>1.65 (2.23)</td>
<td>8.40 (6.88)</td>
<td>2.47 (3.49)</td>
</tr>
<tr>
<td>Gaps in memory</td>
<td>6.24 (5.06)</td>
<td>4 (3.96)</td>
<td>10.72 (5.48)</td>
<td>4.88 (3.65)</td>
</tr>
<tr>
<td>Cognition</td>
<td>2.65 (3.98)</td>
<td>1.14 (2.16)</td>
<td>5.66 (5.04)</td>
<td>1.83 (2.62)</td>
</tr>
<tr>
<td>Sensory misperception</td>
<td>4.40 (3.57)</td>
<td>2.69 (2.42)</td>
<td>7.37 (3.86)</td>
<td>3.63 (2.89)</td>
</tr>
<tr>
<td><strong>n (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>213 (81.30%)</td>
<td>51 (81.0%)</td>
<td>61 (88.49%)</td>
<td>101 (77.70%)</td>
</tr>
<tr>
<td>Employed</td>
<td>159 (59.30%)</td>
<td>35 (55.60%)</td>
<td>41 (58.60%)</td>
<td>83 (61.50%)</td>
</tr>
<tr>
<td>Ethnic status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>263 (98.10%)</td>
<td>63 (100%)</td>
<td>68 (97.10%)</td>
<td>132 (97.8%)</td>
</tr>
<tr>
<td>Asian</td>
<td>4 (1.50%)</td>
<td>0 (0%)</td>
<td>1 (1.40%)</td>
<td>3 (2.20%)</td>
</tr>
<tr>
<td>African American</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Mixed ethnicity</td>
<td>1 (4.00%)</td>
<td>0 (0%)</td>
<td>1 (1.40%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Probable PTSD (&gt; /= 31)</td>
<td>186 (69.4%)</td>
<td>0 (0%)</td>
<td>70 (100%)</td>
<td>116 (85.90%)</td>
</tr>
<tr>
<td>Probable depression (&gt; /= 10)</td>
<td>215 (80.20%)</td>
<td>63 (100%)</td>
<td>67 (95.70%)</td>
<td>85 (65.6%)</td>
</tr>
</tbody>
</table>

Note. *All reported percentages are valid percentages to account for missing data; Class 1 is lower PTSD-higher depression; Class 2 is high overall; Class 3 is higher PTSD-lower depression.
Comparing the high severity class to the higher PTSD-lower depression class, results indicated significant covariates of distress tolerance (\(B = -0.07, p = 0.05, OR = 0.93\)); and dissociative experiences of gaps in memory (\(B = 0.22, p = 0.009, OR = 1.25\)). Greater dissociative experiences of gaps in memory by every single unit increment increased the chances of being in the higher severity class compared to the higher PTSD-lower depression class by 24%. Higher distress tolerance scores by every single unit increment decreased the chances of being in the high severity class compared to the higher PTSD-lower depression class by 7%.

Comparing the higher severity class to the lower PTSD-higher depression class, results indicated significant covariates of distress tolerance skills (\(B = -0.11, p < 0.001, OR = 0.90\)); dissociative experiences of derealization and depersonalization (\(B = 0.22, p = 0.03, OR = 1.24\)); and dissociative experiences of gaps in memory (\(B = 0.23, p = 0.05, OR = 1.26\)). Greater dissociative experiences of derealization/depersonalization, and greater dissociative experiences of gaps in memory by every single unit increment increased the chances of being in the higher severity class compared to the lower PTSD-higher depression class by 24%, and 26% respectively. Further, higher distress tolerance scores by every single unit increment decreased the chances of being in the higher severity class compared to the lower PTSD-higher depression class by 10%.

### 4. Discussion

The current study examined latent subgroupings of participants based on the endorsed responses to items assessing PTSD and depression severity. The sample consisted of 268 university students who had experienced a PTE and subsequently endorsed clinical levels of PTSD or depression severity. Results of the LPA indicated an optimal 3-class solution: high severity (Class 2), lower PTSD-higher depression (Class 1), and higher PTSD-lower depression (Class 3). Thus, we found evidence for a depressive subtype of PTSD (high severity class). Additionally, several covariates such as distress tolerance abilities, and different kinds of dissociative experiences differentiated the latent classes.

Prior studies have indicated an optimal fitting 3-class solution (Armour et al., 2015; Contractor et al., 2015) which offers support for our study results. However, most prior study results differ from the current study in terms of the nature of classes. Specifically, classes have been found to be different mainly in terms of severity rather than type (Armour et al., 2015; Au et al., 2013; Contractor et al., 2015; Hruska et al., 2014). One exception is the study by Cao et al. (2016) which found classes differing in severity and type; these results are consistent with our study findings. Methodological differences can explain most of the discrepant findings, mainly that our sample was restricted to those reporting clinically significant levels of PTSD and/or depression symptoms. Such sample characteristics would eliminate a low PTSD and depression severity group as found in most studies (e.g., Armour et al., 2015; Contractor et al., 2015). Further, differing data collection procedures, and differing measures may also explain some of the discrepant results.

Extensive changes from DSM-IV to DSM-5 in PTSD’s diagnostic criteria (American Psychiatric Association, 2013) may influence the co-occurrence patterns of PTSD and depression symptoms. At relatively higher levels of PTSD severity, we find comparable levels of higher PTSD and depression severity (depressive subtype of PTSD). Such results may support the idea of a common latent factor of negative affect underlying PTSD and depression symptoms (Watson et al., 2011) especially when participants endorse a higher level of PTSD severity. The negative affect may be captured by the greater number of dysphoria-laden DSM-5 NACM symptoms (Elhai et al., 2015). We could additionally infer that at relatively lower levels of PTSD severity, a class with prominent depression symptoms may be expected.

Our current study findings of a predominant PTSD severity class and a predominant depression severity class extends support for the distinctiveness of PTSD and depression as independent sequelae of post-traumatic experiences (Strander et al., 2014). Although there is a probable PTSD subtype characterized by prominent depression and negative-affect based symptoms; it is possible that following the experience of PTE, participants could have prominent PTSD or depression symptoms only. Such PTSD and depression symptom heterogeneity well demonstrated by the current study findings is important to acknowledge in clinical work.

We see a parallel trend in severity for most of the individual PTSD

**Fig. 1.** Latent profiles of participants based on responses to PTSD and depression indicators.
and depression symptoms. Noteworthy is that severity of the PCL-5 item assessing traumatic amnesia is lower relative to other PCL-5 items for the high severity and the higher PTSD-lower depression latent classes. These results are consistent with prior research indicating low base rates for the traumatic amnesia endorsement (Baschagel et al., 2005; Boal et al., 2016; Palmieri et al., 2007) and may be linked to studies demonstrating that this item often produces the lowest factor scores. Prior research has shown that people with higher depression severity have lower memory specificity for stressful experiences (Klein and Ehlers, 2008; Williams et al., 2007).

Results confirmed the construct validity of the latent classes. The depressive subtype of PTSD comprising of co-occurring PTSD and depression symptoms at an equivalent and high level of severity was distinct from other latent classes on certain aspects. Specifically, individuals with comorbid depression and PTSD were more likely to endorse greater dissociative experiences of gaps in memory and lower distress tolerance skills compared to individuals with prominent PTSD symptoms. Further, individuals with the depressive subtype of PTSD were more likely to endorse greater derealization/derealization, greater dissociative experiences of gaps in memory, and lower distress tolerance compared to individuals with prominent depression symptoms. Thus, dissociative experiences of gaps in memory and depressive subtype of PTSD are more associated with co-occurring PTSD and depression severity. There is significant correlation between dissociation and depression severity (Lipsanen et al., 2004); and between dissociation and PTSD severity (Briere et al., 2005). Thus experiences of derealization, depersonalization, and difficulties in memory could be conceptualized as common vulnerability or covariate to co-occurring PTSD and depression. Further, ineffective distress tolerance skills may explain the detrimental functional impairment seen among people with comorbid PTSD and depression severity (Post et al., 2012).

The latent class with prominent depression severity was distinct in distress tolerance skills from the latent class with prominent PTSD symptom severity. Specifically, individuals with prominent depression symptoms were more likely to have better distress tolerance abilities compared to individuals with prominent PTSD severity. There is considerable research indicating that people with increased PTSD severity struggle with effective emotion regulation and distress tolerance skills; which in turn, could lead to engagement in risky and impulsive behaviors as coping strategies (Weiss et al., 2013). Dissociative experiences was not distinguishing of latent classes with prominent PTSD and prominent depression symptoms. Dissociative experiences may be an indicator of increased severity of both PTSD and depression symptoms; rather than just one symptomatology.

The construct of alcohol use was not significant in distinguishing the latent classes. Alcohol use is highly comorbid with both PTSD and depression (Erbes et al., 2007; Morina et al., 2013), both of which share underlying negative affectivity (Watson, 2009). It could be speculated that alcohol use may serve a similar functional coping role in dealing with the commonly shared negative affect associated with PTSD and depressive symptoms (Martens et al., 2008). Thus, the construct of alcohol use would not distinguish the three latent classes.

4.1. Implications

Our study results have several conceptual and clinical implications. The existence of a distinct depression subtype of PTSD indicates the clinical importance of assessing for co-occurring depression following the experience of a PTE. Theoretically, one could speculate that non-specific negative affect underlies co-occurring PTSD and depression symptoms (Contractor et al., 2015; Watson, 2009) especially when people endorse higher levels of PTSD severity. Clinicians may benefit from using a transdiagnostic treatment protocol targeting negative affect for participants with the co-occurring symptom patterns. Such treatment protocols would additionally benefit from targeting disso- ciative experiences of gaps in memory, and distress tolerance skills. Further, considering the level of PTSD severity may be critical to identifying latent subgroups. At lower levels of PTSD severity, classes with predominant PTSD severity and predominant depression severity were distinct. Thus, current study results suggest differing underlying mechanisms for both disorders and confirm the continued separation of the disorders in diagnostic manuals (i.e., DSM/ICD). It may be beneficial to use specific treatment protocols to match the distinct symptom patterns.

The psychopathology construct of dissociation is most distinguishing of the latent classes. It is thus important for clinicians to assess for dissociative symptoms, and in particular, the type of dissociation a given client is experiencing (Armour et al., 2014a). With co-occurring depression and PTSD, experience of derealization, depersonalization, and memory difficulties may be critical to assess and target in treatment. Additionally, results support literature on the importance of assessing distress tolerance skills among people with higher PTSD severity irrespective of the level of co-occurring depression severity. Targeting effective distress tolerance and emotion regulation skills as emphasized in certain trauma treatment protocols (Cloitre et al., 2002) may be particularly effective.

4.2. Limitations and future research

Results of the current study need to be interpreted in the light of several limitations. The specific nature of our sample restricts its generalizability to other types of samples. Further, we did not assess...
for other possible factors that may be critical in distinguishing the latent classes such as rumination; this is an avenue for future research. Additionally, the use of self-report measures entails the possibility of response bias. Hence, a multimethod assessment is recommended in subsequent studies. Lack of a longitudinal study precludes any causal interpretations between PTSD and depression severity. Latent transition analyses could capitalize on the temporal nature of the data to answer questions on causality as well as trends in class membership across time; this is an avenue for future research. Lastly, research indicates that specific types of traumatic experiences (e.g., interpersonal traumas) and the cumulative impact of multiple trauma types are associated with a greater risk of PTSD and depression (Davies et al., 2015; Golder et al., 2012). Thus, it would be important to address the interacting patterns of the PTSD-depression latent classes with the number, type, frequency, and age of onset for endorsed traumatic events.

In conclusion, we see that PTSD and depression represent distinct constructs; however seem to co-occur at higher levels of PTSD severity. Thus, identifying and addressing the distinctive nature of the depressive subtype of PTSD is critical. There is extensive discussion on the dissociative and childhood subtypes of PTSD (Dalenberg et al., 2012); however, less on the depressive (internalizing) versus externalizing subtypes of PTSD (Miller et al., 2004). Sufficient research on PTSD subtypes may inform the formulation of a check-box approach which will allow clinicians to identify the subtypes of PTSD. This would be an alternative to more additions to the diagnostic criteria for PTSD, which risks adding more negative-afﬁ act based non-speciﬁ c symptoms and creating fuzzy diagnostic boundaries across distress-based disorders. Additional research on the nature and prevalence of the depressive subtype of PTSD is needed given the extensive comorbidity across these two disorders.

References


