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A Latent Class Analysis of Post Traumatic Stress Disorder in Patients with Severe Mental Illness

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Abstract

Prevalence of post traumatic stress disorder in patient with severe mental illness (SMI) is reported to be higher than in the general population and is associated with several adverse mental health consequences. Despite this, co-morbid PTSD is currently neglected in clinical settings and under researched. Therefore, the first aim of this study is to determine the prevalence of PTSD in SMI patients. The second is to determine how PTSD symptoms manifest in SMI patients using Latent Class Analysis (LCA). This statistical analysis has not previously been conducted in an SMI sample, only in the general population. There, LCA reported a 3-class system of symptom severity, providing evidence for partial-PTSD. This study hopes to uncover whether PTSD symptoms manifest similarly in SMI patients. Finally, there is significant research into PTSD risk factors but limited amounts in SMI. Being female, childhood sexual assault and violent assault are consistently reported as being PTSD risk factors. Therefore the final aim will test whether gender, childhood trauma, recent violent assault and their interaction effects are predictors of PTSD class membership; through a multinomial logistic regression.945 out- patients with chronic mental health illnesses completed the Zelfinventarisatielijst ZIL self-report PTSD questionnaire, the Childhood Trauma Questionnaire & Dutch Crime and Victimisation Survey to determine recent assaultive violence. Analysis determined 19% of participants meet the criteria for PTSD. The LCA produced a 3-class system of symptom severity, 50% of the sample were in the Low class, 34% in the Medium & 16% in the High; supporting the idea of partial PTSD. The regression analysis found that childhood sexual and physical assault predicted class membership with victims reporting higher PTSD symptom severity. Furthermore, the interaction effect of recent assault and gender was found to be significant. Therefore, women who had suffered recent assault were suffering from more severe PTSD symptoms. This data suggests that being female is not an innate PTSD risk factor regardless of trauma, instead that different trauma carry different levels of risk for women and men. Although childhood trauma was found to be a potent risk factor in both genders. This paper would call for increased acknowledgement, assessment and treatment of PTSD in SMI patients, a reigniting of the concept of partial PTSD, an increased focus on childhood trauma in PTSD theory, diagnosis, and treatment as well as a more proactive approach in reducing the female diagnosis bias.

A Latent Class Analysis of Post Traumatic Stress Disorder in Severe Mental Illness

Introduction

"My Philosophy Is Worrying Means You Suffer Twice"

Post Traumatic Stress Disorder (PTSD) is defined by the DSM-V as persons with a history of exposure to a traumatic event with symptoms from all four symptom subgroups: re-experiencing, avoidance, over-arousal and negative variations in cognitions and mood (American Psychiatric Association, 2005).

Although PTSD research has its roots in military veteran and disaster populations it is now widely recognised that a variety of life events can be considered 'traumatic events' and be the catalyst for the development of PTSD. This has been reflected in the review of the DSM definition, with an expansion of what classifies as a traumatic event as well as a plethora of studies exploring PTSD levels in the general population. With current rates of PTSD in the general population ranging between 1–5% (Breslau et al., 1998; Kessler, Chiu, Demler, Merikangas, & Walters, 2005; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995; Resnick, Kilpatrick, Dansky, Saunders, & Best, 1993) and lifetime PTSD prevalence ranging from between 8- 12% (Breslau et al., 1991; Kessler et al., 1995; Resnick et al., 1993).

Despite this influx of research on PTSD in the general population, there is markedly less research into PTSD in those suffering from existing mental health issues. Research has consistently produced higher rates of both trauma and PTSD in those suffering from severe mental illness (SMI) (such as schizophrenia, bi-polar & major depressive disorder) than that of the general population. In these groups research reports current PTSD rates range between 13% and 53% (Calhoun et al., 2007; Ford & Fournier, 2007; Gearon, Kaltman, Brown, & Bellack, 2003; Craine, Henson, Colliver, & MacLean, 1988; Howgego et al., 2005; Kilcommons & Morrison, 2005; Mueser, et al., 2004; Resnick, Bond, & Mueser, 2003; Switzer et al., 1999). However it must be noted that some prior research suffers from limitations, including small sample sizes, which may explain the vast variation in reported prevalence. Additionally, the majority of research comes from the US and there is evidence that PTSD prevalence rate varies depending on the sample country; notably findings from European studies are on average lower than US (Darves-Bornoz et al., 2008; Davidson et al., 1991; Kessler et al., 1995). There is a significant need for more research into PTSD prevalence in SMI populations that are outside the US and are methodically valid.

Despite this development in theoretical understanding of PTSD and traumatic events, diagnosis in clinical settings is markedly lower than diagnosis in research settings. This suggests that, trauma and PTSD are significantly overlooked in mental health systems. The over-looking of PTSD in SMI patients has several undesirable consequences. Firstly, PTSD can be very distressing and

debilitating and requires treatment and interventions; and obviously if patients aren't being diagnosed with PTSD they are unlikely to be receiving treatment. Secondly, the impact of comorbid PTSD seems to be more complex than simply a patient suffering from two disorders side by side. Research indicates that experiencing trauma is associated with several adverse mental health consequences including: increased symptom severity, substance abuse, reduced involvement in subsequent mental health services and homelessness (Frueh et al., 2005; Goodman, Rosenberg, Mueser, & Drake, 1997; Mueser et al., 1998). This suggesting PTSD may interact with primary mental health conditions and exacerbates them. Finally, it is well established that PTSD can diminish working memory (mental manipulation and information acquisition), executive functioning and sustained attention skills and neuropsychological test scores (Koso & Hansen, 2006; Stein, Kennedy & Twamley, 2002; Uddo, Vasterling, Brailey, Constans & Sutker, 1998). Therefore, undiagnosed PTSD could be unknowingly altering assessments and treatments of patients primary mental health conditions, rendering them less effective. Treatment of SMI patients with PTSD would benefit from reflecting these neurocognitive limitations; making sessions and task shorter and simpler. Clearly there is a need to understand the interplay between PTSD and primary mental health conditions, in order to produce a specialised treatment that involves the acknowledgement and treatment of both conditions, to avert these negative consequences. This paper hopes to further unpick this interplay.

Posttraumatic Stress Disorder Symptomatology

The four symptoms cited in DSM- V that are required for a diagnosis of PTSD are the result of several factor analysis studies where several models of PTSD symptomatology were tested. This model of four inter-correlated factors: re-experiencing, avoidance, numbing, and hyperarousal, received the strongest evidential support (McWilliams, Cox & Asmundson, 2004). Research into the symptom structure of posttraumatic stress disorder has mainly been examined by factor analysis both in general populations and SMI samples. Factor analysis examines whether observed variables can be explained by a small number of specified dimensions. An alternative approach is Latent Class Analysis (LCA) that identifies homogeneous classes within data, grouping individuals with similar profiles. There are benefits of LCA over factor analysis: notably that it is an individual- centred approach rather than variable driven, it makes no prior assumptions of data patterns and does not overlook co-occurrence of factors in an individual.

Latent Class Analysis has been performed on PTSD samples in the general population (Breslau et al., 2005; 2008; Forbes et al., 2010; Wolf et al. 2012) but to date no LCA has been performed for PTSD symptom grouping within a SMI population. Breslau et al. (2005) conducted a LCA on a sample from the general population to examine the structure underlying PTSD criteria symptoms and identify discrete classes with similar symptom profiles. Their analysis produced 3 classes: no disturbance, intermediate disturbance and pervasive disturbance; suggesting that the

structure of PTSD is ordinal and configurationally. While the DSM divides persons who experienced trauma events into 2 classes, PTSD and no PTSD, Breslau et al. (2005) LCA sorts them into a 3-class scheme, with the addition of an intermediate PTSD group. Furthermore, the results found that the symptom of emotional numbing was highest in class 3 pervasive disturbance, suggesting that emotional numbing is a defining feature of severe PTSD.

The Breslau et al. (2005) sample was of the general population. What this paper wishes to uncover is whether these symptom classes and heightened levels of emotional numbing in pervasive disturbance class will be replicated in an SMI sample. Or will the analysis instead yield different symptom classes in SMI patients? The results of this paper will help to further unpick whether the interaction between patients' PTSD and their primary SMI impacts their symptom profile. If a different PSTD symptoms profile manifests in those suffering from other mental health illness, this would suggest that PTSD and a co-morbid mental health illness interact rather than simply existing in parallel in one individual. This would have significant implications for clinicians in the understanding and treatment SMI patients with PTSD. If the null hypothesis is found and a similar class system is identified in this sample to that of Breslau et al. (2005) it would suggest that PTSD manifests itself similarly in SMI patients as in individuals with no other mental health illnesses: therefore warranting a similar approach to treatment. It would also further support Breslau et al (2005) finding of a 3-class system of PTSD and suggest a need for the acknowledgement of intermediate PTSD both within the research and the clinical fields. Patients may not meet the symptoms severity level for a diagnosis of PTSD under current guidelines but this does not mean they are not experiencing PTSD symptoms warranting treatment.

Predictors of Symptom Structure

LCA can be further expanded to explore predictors of class membership, for example demographic characteristics like age and gender. Again, predictors for PTSD have mainly been examined by factor analysis testing a variety of predetermined variables such as gender, age at trauma, child abuse, trauma severity, social support, (Brewin, Andrews & Valentine, 2000 for review). Alternatively, Chung and Breslau (2008) re-tested Breslau et al. (2005) latent classes for invariance of gender and trauma type (assaultive violence and other traumas). Previous research has consistently found higher PTSD rate in females and those who experienced violent assault (Breslau et al. 1999; Kessler et al. 1995; Tolin & Foa, 2006). There is much debate over the root cause of this apparent gender bias. The first is situational-vulnerability hypothesis; the hypothesis that women are more likely than men to experience specific and more 'potent' trauma, like childhood sexual abuse and rape, as well as being more likely to experience re-victimisation. The second is the feminine- vulnerability hypothesis; this theory states that women are more vulnerable to developing PTSD regardless of trauma exposure. The third theory is a sex-related reporting bias, the idea that women are more likely

to report more severe symptoms than men. The explanation for this is that women are more likely to talk about their symptoms than men due to the differing social roles and concepts of masculinity and femininity.

Chung and Breslau (2008) found no evidence of differential symptom reporting between genders within the same disturbance classes. Yet they did report that more female than male victims of assaultive violence experienced pervasive disturbance; which they concluded reflected a gender difference in susceptibility. In terms of trauma type, Chung and Breslau (2008) found that victims of assaultive violence in the pervasive disturbance class reported more severe distress, notably in emotional numbing, than victims of non-assaultive violence in that same class. Chung and Breslau (2008) concluded that their results would suggest that the observed findings in research that proportionately more female than male victims of assaultive violence experienced pervasive PTSD is likely to reflect a gender difference in susceptibility.

In this paper, the aim is to do as Chung and Breslau (2008) did and expand the LCA to assess predictors of class membership in SMI patients. Based on previous research findings gender and trauma type will be the variables tested. The aim will be to try and unpick this web of risk factors associated with PTSD and to explain the route of the apparent gender bias in PTSD. If trauma is found to be the best predictor of class membership, this supports the situational-vulnerability hypothesis. Whereas, if gender rather than trauma proves to be the best predictor, this would support the feminine-vulnerability hypothesis but could also support the sex-related reporting bias. If this paper finds no evidence of differential symptom reporting between genders within the same disturbance classes, as Chung and Breslau (2008) did, this would undermine the sex-related reporting bias hypothesis. If a similar pattern of results is found in this sample as by Chung and Breslau (2008), this would further support the feminine- vulnerability hypothesis because if females are innately more vulnerable to PTSD this should hold true in an SMI population. Additionally, it would provide further evidence that assaultive violence is a strong risk factor for PTSD development.

The potential benefit of these findings to clinicians would be to make PTSD screening more efficient. Knowing which clients are most likely to be at risk of having PTSD would help clinicians in deciding which clients should be assessed for PTSD, therefore producing more efficient diagnosis as well as increasing financial efficiency. Furthermore, the understanding of the root cause of the apparent gender bias in PTSD is crucial for effective assessment & treatment. If indeed it were due to reporting bias in women, this would warrant a focus by clinicians on men who may be suffering in silence. In contrast if the feminine- vulnerability hypothesis is supported then clinicians' focus should be on women. Finally, if the situational-vulnerability hypothesis is supported, the focus should be those patients that have suffered 'potent' traumas, regardless of gender.

In turn, the findings regarding the gender-bias should influence treatment as well as assessment. If a gender-bias were found, interventions such as CBT & Prolonged Exposure would benefit from being gender specific. Proficiency would increase if treatment focus reflected the findings with regard to the root causes of this gender bias; to either include expressing emotions & sharing in men or to focus on internal processing of trauma and coping methods or a trauma focused approach.

Study Aims

In light of the above, the aims of this study are three fold: firstly to add to the research on PTSD prevalence in SMI patients and with that encourage a shift in the clinical perception of PTSD in SMI population to stop under-diagnosis and encourage treatment. Secondly, to explore what symptom classes are produced from a Latent Class Analysis of this SMI sample and whether the results reflect Chung and Breslau (2008) model of symptom disparity. Two Latent Class Analyses will be run, one on the sample as a whole and one on those in the sample that meet the requirements for a diagnosis for PTSD. This will explore naturally occurring symptoms profiles in the sample as a whole and those meeting ZIL criteria for PTSD. Both these aims by definition are explorative and so do not warrant a directional hypothesis (McCutcheon, 1987). Finally, the study will test whether gender (female and male) and trauma type (childhood trauma and recent assaultive violence) are predictors of class membership, to add to previous research on their risk-factor nature with the development of PTSD. This study hypothesises that in terms of gender, as in Chung and Breslau (2008), no difference in symptom reporting between genders within the same disturbance classes will be found but more female than male victims of assaultive violence will be experiencing pervasive disturbance. In terms of trauma type, it is hypothesised that more victims of assaultive violence will be in the pervasive disturbance class; specifically that of childhood sexual assault.

Method

Design

This study was approved by the Medical Ethics Committee at Erasmus Medical Centre, Rotterdam (MEC-2010-232). Informed written consent was obtained from all participants; surrogate consent was not used as ability to give consent was a mandatory inclusion criterion. This study was part of a larger study on Victimisation in Psychiatric Patients, a cross-sectional epidemiological survey of a large random community sample of patients with SMI in the Netherlands. Participants were randomly selected from six Mental Healthcare institutions, which provide outpatient care for approximately 9,250 people with chronic (2 year duration) psychotic, bipolar or major depressive disorders. Accurate figures of nationwide access to Mental Healthcare institutions and the numbers of SMI patients in the Netherlands is absent; recent estimations range between 64,000- 160,000, of which

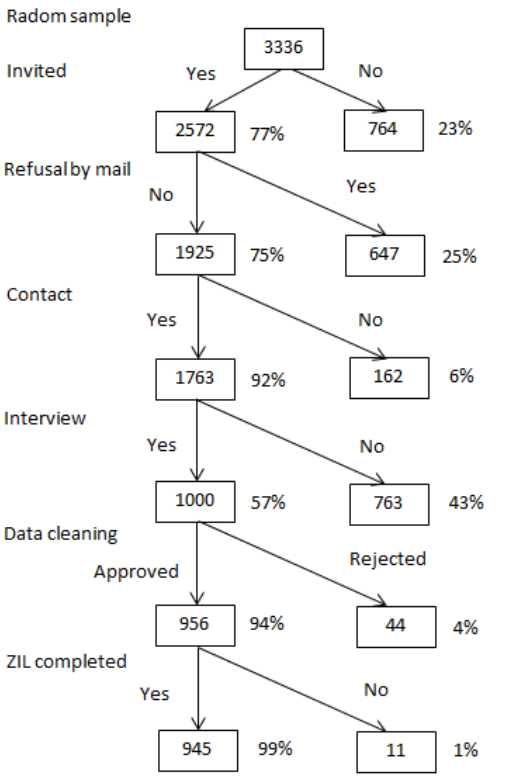
56% are out-patients (Delespaul & De Consensusgroep, 2013; Dieperink, Pijl & Driessen, 2006). Participants were enrolled in the study between December 2010- April 2012.

Participants

Participants were eligible for inclusion if they were outpatients of one of the MHC institutions, aged between 18-65 and had been diagnosed by their treating psychiatrist with chronic (a duration of 2 years) psychotic, bipolar or major- depressive disorder. Those outpatients with psycho-organic disorders, with insufficient command of the Dutch language or those with psychiatric conditions that prevented them from answering or consenting to the studies questions were excluded. 10 eligible participants refused or failed to answer the Zelfinventarisatielijst (ZIL), a Dutch language self-report questionnaire assessing for posttraumatic stress disorder (PTSD) so were removed from the analysis.

Procedure

Based on information available in the electronic patients files (EPF), a random sample of 3,336 potentially eligible outpatients were selected as eligible. The criteria for inclusion and exclusion was then checked and crosschecked with each primary MHC clinician responsible for treating each eligible patient. The result of this was that 2,572 patients were deemed eligible and received an invitation letter. This invitation letter explained the study's procedure, confidentiality issues and included a refusal form that could be returned free of charge.



Invitation letters were sent to 2,572 patients; twenty-five percent of the invitees (N = 647) returned the refusal form and no further attempts were made to contact them. Patients who had not returned the refusal form were contacted 2 weeks after the invitation letters were dispatched, to acquire a verbal confirmation of their willingness to participate in the study. An interview was then scheduled with those who were willing to participate. Patients were called three times, if they were unanswered or the telephone numbers were incorrect a reminder letter was then sent (9% of cases), their primary clinician was contacted (13% of cases) and a finally a house call was made (65% of cases). On average, three attempts at contact were made (range 1–11). Despite this 8% of the patients could not be reached. Of the remaining patients, 763(43%) refused to participate.

One thousand interviews were conducted. Data was collected through a computer-assisted interview by trained interviewers with social- science Master's degrees. The interview questions were

on several topics in addition to PTSD including: victimisation, self-stigmatisation, drug- and alcohol abuse, psychosocial functioning, childhood trauma and socio-demographic characteristics. This data has been published in other research papers. Each respondent received €20 cash in return for participation. On average, the interviews took 75minutes (range: 40–160 minutes), and took place at either the respondent's home or MHC institution.

44 interviews (4%) were judged by interviewers to be unreliable; due either to several inconsistencies or to unsatisfying answers because of the participants' severe psychiatric symptomatology (i.e. delusions, hallucinations, or cognitive impairments). These interviews were removed from the sample and were not included in the non-response analyses. In total, we interviewed 37% of all patients invited (956/2,572), resulting in N=956 SMI outpatients. Of those interviewed, 11 failed to complete the Zelfinventarisatielijst (ZIL) questionnaire for assessing PTSD symptoms and were therefore removed from analyses, resulting in N=945 entering analysis. Figure 1 depicts the flow chart of the data acquisition.

Measures

To test for PTSD, participants completed the Zelfinventarisatielijst (ZIL) as part of a battery of tests (Hovens, Bramsen, & van der Ploeg, 2000). The ZIL is a short Dutch language self-report questionnaire of 22 questions designed to assess symptoms of PTSD as defined by the DSM-IV. The questions do not specifically mention and are not designed around any particular trauma. Each statement examines to what extent a person has experienced a particular complaint in the past four weeks. Participants are then asked to rate each statement on a four point likert scale: 1. Not at all 2. A little 3. Quite a lot and 4. Very much. The ZIL provides a total score, with a score of 52 required for a PTSD diagnosis. The ZIL also provides four sub scales: re-experiencing, avoidance, hyperarousal & numbing. The questionnaire has been proven to have good internal consistency, test–retest reliability & validity (Hovens, Bramsen, & Van der Ploeg, 2002).

To assess historical trauma, the Childhood Trauma Questionnaire (CTQ) & Dutch Crime and Victimisation Survey were collected from participants (Bernstein & Fink, 1998; Centraal Bureau voor de Statistiek, 2009). The Childhood Trauma questionnaire is a self-report 28-item test that measures 5 types of maltreatment – emotional, physical, and sexual abuse, and emotional and physical neglect. For this study, only physical abuse, sexual abuse & neglect were included; as only these were deemed to meet the DSM V criterion for a traumatic event. Participants respond to statements using a 5-point likert scale. The scale focused on the extent to which each statement reflected their childhood, the scale ranges from Never True to Very Often True. Reliability for the CTQ is good with high internal consistency scores; reported coefficients for sexual abuse .93-.95, emotional neglect .88-92 and physical abuse .81-.86.

To establish recent trauma, participants completed the Dutch Crime and Victimisation Survey (in Dutch: Integrale Veiligheidsmonitor). This strongly resembles the International Crime

Victimization Survey (Mayhew & Van Dijk, 2014) which consists of 14 screening questions on being a victim (in the last 12 months) of one or more of the following: burglary, attempted burglary, bicycle theft, car theft, theft from car, car vandalism, pick-pocketing, robbery, theft (other than previously categorised), vandalism (other than previously categorised), sexual harassment or assault, threats of violence, physical assault, or crime (other than previously categorised). This gave us data on two forms of trauma: assaultive (sexual harassment or assault, threats of violence, physical assault) and non-assaultive (burglary, attempted burglary, bicycle theft, car theft, theft from car, car vandalism, pick-pocketing, robbery, theft and vandalism). To minimise the effect of telescoping, respondents were asked to recall incidents over the past five years before they are asked to recall incidents over the past 12 months. There are no traditional reliability and validity scores for the IVM crime-victimisation scale (Centraal Bureau voor de Statistiek, 2009).

Statistical Analysis

The PTSD prevalence rate in this SMI sample was calculated by determining the percentage of participants scoring 52 and above on the ZIL, this is the generally accepted cut off point for a diagnosis of PTSD.

A Latent Class Analysis was conducted on the whole dataset of 945 participants, on the 22 data points from the ZIL Questionnaire, using Mplus version 7 software. The aim of LCA is to identify the smallest number of latent classes that explain the associations among the symptoms. First, a 1-class model is fitted (null model) and then successive models with increasing numbers of classes are fitted. Goodness-of-fit statistics are used to select the optimal model for the data. Adjusted Bayesian information criterion (BIC), Bootstrapped parametric LR Test, Lo, Mendell, Rubin and Entopy were used for evaluation. For adjBIC models with lower adjBIC values are better fitted models. Studies suggest that the adjBIC is superior to other goodness-of-fit statistics (Sclove, 1987; Yang, 2006). A Bootstrapped Parametric p-value was used to compare goodness-of-fit; a $p < .05$ is expected to accept the new model as a model of better fit. For Lo, Mendell, Rubin again a p-value of $p<.05$ is required. For Entropy higher probability values represent greater accuracy of classification. To date, there is not common acceptance of the best criteria for determining the number of classes in mixture modelling, despite various suggestions (Nylund, Asparouhov, Muthen, 2007). Second, a LCA was conducted on those participants that scored 52 and above on the ZIL, the minimum required score for a PTSD diagnosis; the same method as above was applied.

Finally, regression modelling was then applied to the latent classes produced, to test whether gender (male & female) and trauma type (childhood sexual assault, childhood physical assault, childhood neglect & recent assaultive violence) and the interactions predicted class membership. Therefore a Multinomial Logistic Regression Analysis was conducted using SPSS. The significant fit statistics of the model as well as both Pearson & Deviance will be reported to determine the models goodness-of-fit. The Nagelkerke's R statistic will be reported to determine the percentage of variance

explained by the model. Furthermore, the statistical significance of the predictors on the model will be reported and the predictors odds ratios for membership of the latent classes. Additionally, the data is split by gender and the multinomial logistic regression run again, to further explore gender differences.

Results

Sample

The sample consisted of 945 SMI patients: 603 Male (63.8%) & 342 Female (36.2%), the mean age was 44.7 (SD=10.5; range 19-66) and 680 (72.1%) were of Dutch ethnicity. In terms of primary diagnosis: 729 had Schizophrenia (77.2%), 160 Mood Disorder (16.9%), 21 Alcohol or Drug Addiction (2.2%), 8 Anxiety Disorder (0.8%), 2 Organic Psychosis (0.2%) & 22 with other or unknown disorder (2.3%). In terms of educations: 215 had no or primary level education (20.4%), 321 basic vocational education (33.9%), 265 intermediate vocational or preparatory academic education (28.1%) and 144 high vocational or University education (15.2%). 138 patients were employed (14.6%), the majority 805, were not in paid employed or on less than 12 hours a week (85.3%). 170 participants had been hospitalised in the last 12 months (18.0%).

Prevalence Rates

Within this sample 184 (19.5%) participants scored 52 or above of the ZIL and therefore met the criteria for a diagnosis of PTSD. In regards to gender, 100 of 603 (16.6%) male participants met the criteria for a PTSD diagnosis. Whereas, 84 of 341 (24.6%) female participants meet the criteria for a PTSD diagnosis. The gender ratio for those with PTSD was therefore 25:21.

67 of 944 participants did not fully complete CTQ; of those that did 704 (74.6%) of participants report some form of childhood trauma. The CTQ consists of sub-categories of trauma: sexual assault, physical assault and neglect. In terms of prevalence of sexual assault 286 of 897 (30.3%) participants experienced childhood sexual assault. In terms of childhood physical assault 416 of 894 (44.1%) respondents experienced childhood physical assault. Additionally, 637 of 919 (67.5%) respondents experienced childhood neglect. 151 of 173 (82.1%) of participants that meet the criteria for PTSD and completed the CTQ, reported Childhood Trauma. 90 of 176 (48.9%) reported childhood sexual assault, 111 of 174 (60.3%) reported physical assault and 138 of 180 (75.0%) reported neglect. In terms of recent assault, 179 (19%) of participants reported experiencing at least one violent crime in the last 12 months. Of those participants that meet the criteria for a PTSD diagnosis 44 of 184 (23.9%) reported violent crime in the past 12 months.

Latent Class Analysis

LCA classifies similarly responding subjects into discrete groups. In this cases based on subjects ZIL answers, discrete classes of subjects with similar PTSD symptom profiles were created. M-plus produces several models, each model has one more class than the previous model. Goodness-of-fit data as specified in the method is then used to evaluate which model best explains the data. Table 1 presents the goodness-of-fit indexes for 2 to 5-class models. Goodness-of-fit data indicated that a 3-class model was superior to a 2-class model due to a lower adjBIC value, which represents a better fitting model. This is despite a somewhat reduced Entrophy score for the 3-class model; studies suggest that the adjBIC is superior to other goodness-of-fit statistics (Sclove, 1987; Yang, 2006) and therefore the 2-class model was rejected. The goodness-of-fit statistics for the 4-class model produced a modestly lower adjBIC value which would suggest a better fitting model but a lower Entrophy, an increased Lo, Mendell, Rubin and a increased Bootstrapped parametric LR which would suggest a less well fitting model. Furthermore, upon inspection of the data distribution of the 4 class and 3 class models, a significant amount of data cross over was seen in the 4-class model. Therefore based on all these variables clinical judgement determined the 3-class model as the best fit.

Table 1. Model Fit Index for Latent Class Analysis of PTSD Symptoms in SMI Sample

	adjBIC	Entrophy	Lo, Mendell, Rubin	Bootstrapped parametric LR	N for each class *(N)*
2 Class	52691	94%	2 vs 1 5317; P<0.000	2 vs 1 P<0.000	1= 656 (69%) 2=289 (31%)
3 Class	51424	91%	3 vs 2 1343; P<0.000	3 vs 2 P<0.000	1=319 (34%) 2=477 (50%) 3=149 (16%)
4 Class	51066	90%	4 vs 3 439 P<0.032	4 vs 3 P=0.034	1=459 (48%) 2=149 (16%) 3=141 (15%) 4=196 (21%)
5 Class	50796	89%	5 vs 4 353; P=0.72	5 vs 4 P<0.000	1=425 (45%) 2=190 (20%) 3=129 (14%) 4=135 (14%) 5=66 (7%)

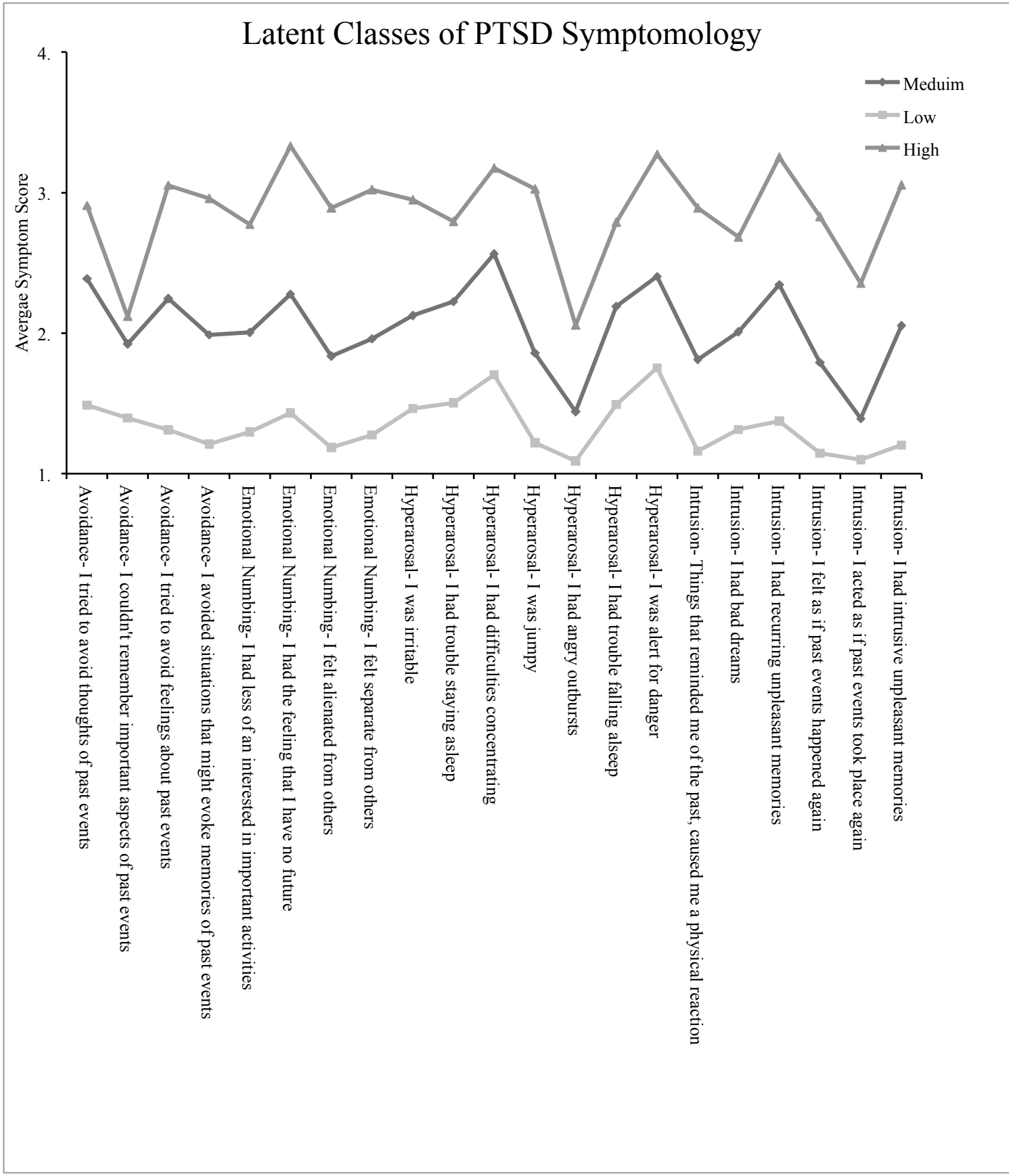


Figure 2. The Latent Classes of the SMI Sample.

Figure 2, represents the 3-class model of symptomology; it demonstrates the mean score on each ZIL item for each of the 3 latent class. The ZIL items are labelled on horizontal axis, with the phrase used for that item in the questionnaire. Additionally, the ZIL items are subdivided into avoidance, hyper-arousal & intrusion. As demonstrated in Graph 1, there is little variation in the pattern of symptoms but instead on the PTSD symptom severity. The 3-class model is best interpreted to represent a low, medium and high scoring class system and therefore these classes were labelled thusly. 50% were in the Low class, 34% of participants were in the Medium class & 16% in the High class. In regards to PTSD diagnosis's, of those diagnosed with PTSD, due to the fact they scored above 52 on the ZIL, 147 (79.9%) were in the High latent class, 37 (20.1%) were in the Medium latent class and none were in the Low latent class. In regards to those who weren't diagnosed with PTSD, participants scoring less than 52 on the ZIL, 2 (0.3%) were in the High class, 282 (37.1%) were in the Medium latent class and 476 (62.6%) were in the Low latent class.

Analysis of PTSD Subscales

To further analyse symptom profile differences between the latent classes, the class average for each ZIL question generated by the LCA were divided into their 4 subcategories of intrusion, hyper-arousal, avoidance and emotional numbing. As figure 3 demonstrates, little difference is seen in the relationship of intrusion, hyper-arousal and avoidance between the Low and Medium, the only difference is in overall severity of symptoms. For the High latent class, we can observe that emotional numbing is proportionately higher than the other subscales, than what is seen for the Low and Medium classes.

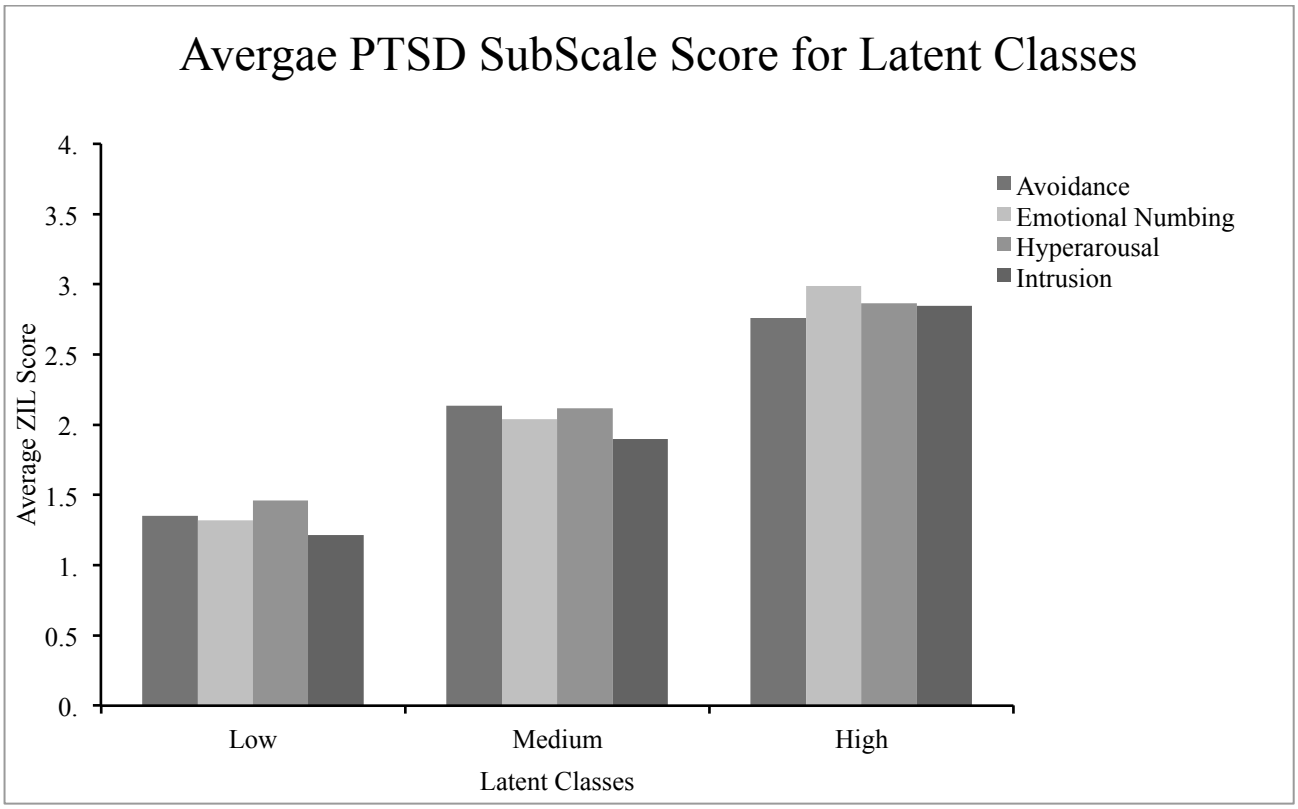


Figure 3. The average score for each latent class on the PTSD subscales of avoidance, emotional numbing, intrusion and hyper-arousal.

Regression

To meet the assumptions for a multinomial logistic regression, the dataset produced by the LCA was tested for multicollinearity, outliers, leverage and highly influential points. In regards to multicollinearity, all VIF statistics where below 10 and tolerance statistic above 0.2 suggesting no multicollinearity (Myers, 1990; Menard, 1995). In terms of outliers, Mahalanobis distance was calculated, and no value was greater than 25 (Barnett & Lewis, 1978). To determine leverage, a leverage average is calculated K+1/N, k being the number of predictors. Therefore for this sample, the leverage average was .0064. Stevens (2002) suggest the removal of any variable three times the leverage average be removed; in this sample no data points warranted removal. Cook's distance was calculated to determine high influential points. Cook & Weisberg (1982) suggest any Cook's value over 1 should be removed; in this sample no data points warranted removal. Therefore, all regression assumptions were meet.

Table 2. The Number and Percentage of Participants in Each Latent Class for Each Predictor

		Latent Classes					
		Low		Medium		High	
		N	%	N	%	N	%
Gender	Male	318	67	204	64	68	46
	Female	158	33	115	36	81	54
Childhood Sexual Assault	Yes	90	19	123	39	73	49
	No	362	76	181	57	68	46
Childhood Physical Assault	Yes	160	34	166	52	90	60
	No	296	62	131	41	51	34
Childhood Neglect	Yes	292	61	231	72	114	77
	No	170	36	80	25	32	22
Recent Assault	Yes	71	15	73	23	35	24
	No	405	85	246	77	114	77

Table 2, demonstrates the numbers and percentage of females and males in each of the 3 latent classes: Low, Medium and High. As well as the number of participants having experience childhood sexual assault, childhood physical assault, childhood neglect and recent assault in each latent class.

The percentage of females that make up a latent class is lowest in the Low latent class, the percentage of females is higher for the Medium class and then is higher again in the High latent class. The same pattern can be seen for the percentage of participants experiencing childhood sexual assault, childhood physical assault, childhood neglect & recent assault; the percentage is lowest in the Low latent class, is then higher in the Medium class and then higher again in High latent class. To determine the statistical significance of this a multinomial logistic regression was run.

The multinomial logistic regression model yielded a significant fit, χ^2= 106.17 (16) p<.001. Pearson & Deviance goodness-of-fit statistics produced a non-significant results, χ^2= 52.90 (44) p=.168, χ^2=58.40 (44) p=.072. With a Nagelkerke's R^2= .132, therefore these predictors explains 13% of the variance. For the multinomial logistic regression, only childhood sexual assault, χ^2= 32.41 (2) p<.001 and childhood physical assault, χ^2= 10.37 (2) p=.006, were significant predictors of class membership. Gender, χ^2= 3.12 (2) p=.211, childhood neglect, χ^2= 5.93 (2) p=.052 and recent assault, χ^2= 2.83 (2) p=.243, were not significant.

Table 3. Results of the Multinomial Logistic Regression for Latent Class Membership.

Predictors	B (SE)	Odds Ratio	*p*-value	95% Confidence Intervals	
Low vs Medium					
Gender *	-.25(0.24)	1.29	.291	.81	2.06
Childhood Sexual Assault	.94 (0.24)	2.57	<.001	1.61	4.11
Childhood Physical Assault	.56 (0.21)	1.76	.007	1.16	2.70
Childhood Neglect	.29(.071)	1.34	.086	.96	1.87
Recent Assault	.50 (0.25)	1.65	.049	1.00	2.70
Gender*Childhood Sexual Assault	-.27 (0.38)	0.76	.470	.36	1.60
Gender*Childhood Physical Assault	-.26(0.36)	0.77	.468	.38	1.55
Gender*Recent Assault	-.45 (0.44)	0.64	.302	.27	1.50
Low vs High					
Gender*	.20 (0.34)	1.22	.568	.62	2.38
Childhood Sexual Assault	1.40 (0.31)	4.06	<.001	2.21	7.44
Childhood Physical Assault	.46 (0.29)	1.59	.115	.89	2.82
Childhood Neglect	.49 (0.24)	1.64	.038	1.03	2.60
Recent Assault	-.19 (0.38)	.83	.621	.39	1.76
Gender*Childhood Sexual Assault	-.60 (0.47)	.55	.196	.22	1.36
Gender*Childhood Physical Assault	.25(0.47)	1.29	.592	.51	3.21
Gender*Recent Assault	.84 (0.54)	2.31	.119	.80	6.59
Medium vs High					
Gender *	-.06 (0.37)	.94	.876	.46	1.94
Childhood Sexual Assault	.46(0.30)	1.58	.134	.87	2.87
Childhood Physical Assault	-.10 (0.30)	.90	.737	.50	1.63

Childhood Neglect	.20(0.25)	1.22	.426	.75	1.98
Recent Assault	-.69 (0.37)	0.50	.066	.24	1.05
Gender*Childhood Sexual Assault	-.33 (0.47)	0.72	.485	.29	1.81
Gender*Childhood Physical Assault	.51(0.49)	1.66	.296	.64	4.33
Gender*Recent Assault	1.28(0.53)	3.61	.015	1.28	10.21

Note: *Male was the reference category. R^2= .132.

Table 3 displays the odds ratios for gender, childhood sexual assault, childhood physical assault, childhood neglect and recent assault on latent class membership; to determine the predictive power of these variables on class membership. When comparing the Low and Medium classes odds ratios demonstrate: those in the Medium class were 2.57 times more likely to have experienced childhood sexual assault ($p < .001$, 95% CI= 1.61, 4.11), 1.76 time more likely to have experienced childhood physical assault (p=.007, 95% CI= 1.16, 2.70) and were 1.65 times more likely to have experienced recent assault (p=.049, 95% CI= 1.00, 1.87). In terms of gender, recent assault and the interactions no statically significant effect is produced. When comparing the Low and High class odds ratios demonstrate, those in the High class were 4.06 times more likely to have experienced childhood sexual assault (p<.001, 95% CI= 2.21, 7.44) and were 1.64 times more likely to have experienced childhood neglect (p=.038, 95% CI=1.03, 2.60). In terms of gender, recent assault and the interactions no statically significant effect is produced. When comparing the Medium latent class to the High latent odds ratios demonstrate: that women who experience recent assault are 3.61% more likely to be in the High class than the Medium (p=.015, 95% CI= 1.28, 10.21). No other variable or interaction reached statistical significance.

Gender Split Regression

To further explore the gender difference in PTSD risk factors for class membership, the dataset was split by gender and the multinomial logistic regression was run again. The results of that regression are in Table 4. The multinomial logistic regression model for males yielded a significant fit, χ^2= 65.44 (8) p<.001. Deviance goodness-of-fit statistics produced a significant results χ^2= 19.87 (22) p=.591; as did Pearson χ^2= 19.98 (22) p=.584. With a Nagelkerke's R^2=.132, 13% of the variance is explained by these predictors in this model. For the multinomial logistic regression, only childhood sexual assault, χ^2= 26.77 (2) p<.001 and childhood physical assault, χ^2= 7.98 (2) p=.019, were significant predictors of class membership. Childhood neglect, χ^2= 2.56 (2) p=.279 and recent assault, χ^2= 5.60 (2) p=.061, were not significant. The multinomial logistic regression model for females yielded a significant fit, χ^2= 34.53 (8) p<.001. Deviance goodness-of-fit statistics did not produced a significant results χ^2= 32.98 (20) p=.034; as did Pearson, χ^2= 37.96 (20) p=.009. With an

Nagelkerke's R^2=.114, 11% of the variance is explained by these predictors in this model. For the multinomial logistic regression, only childhood sexual assault, χ^2= 7.59 (2) p<.023 was significant predictors of class membership. Childhood physical assault, χ^2= 3.83 (2) p=.147, childhood neglect, χ^2= 3,75 (2) p=.154 and recent assault, χ^2= 3.44 (2) p=.179, were not significant.

Table 4. Results of the Multinomial Logistic Regression for Latent Class Membership Split by Gender.

Predictors	B	Odds Ratio	95% Confidence Intervals	B	Odds Ratio	95% Confidence Intervals
			Low vs Medium			
		Male			Female	
Childhood Sexual Assault	.95***	2.58	1.61-4.13	.67*	1.95	1.10-3.48
Childhood Physical Assault	.58*	1.78	1.18-2.69	.28	1.32	.75-2.34
Childhood Neglect	.20	1.22	.80-1.86	.46	1.58	.91-2.75
Recent Assault	.50*	1.64	1.00-2.70	.44	1.05	.52-2.09
			Low vs High			
		Male			Female	
Childhood Sexual Assault	1.40***	4.06	2.21-7.44	.80*	2.22	1.12-4.40
Childhood Physical Assault	.47	1.59	.90-2.83	.71	2.03	.98-4.17
Childhood Neglect	.48	1.61	.86-3.00	.53	1.70	.85-3.40
Recent Assault	-.19	0.83	.39-1.76	.64	1.90	.92-3.96
			Medium vs High			
		Male			Female	
Childhood Sexual Assault	.45	1.57	.87-2.86	.12	1.14	.57-2.29

Childhood Physical Assault	-.11	.90	.49-1.62	.43	1.53	.72-3.27
Childhood Neglect	.28	1.32	.69-2.54	.07	1.08	.52-2.24
Recent Assault	-.69	.50	.24-1.05	.60	1.82	.87-3.81

Females R^2=.114. Males R^2=.132 ****p>.001* **p>.005* *p>.05*

Table 4, displays the odds ratios for childhood sexual assault, childhood physical assault, childhood neglect and recent assault on latent class membership when the data is split by gender. This is to explore whether the predictive power of these variables on class membership vary in respect to gender. For males, when comparing the Low latent class to the Medium latent class, members of the Medium class were 2.58 times more likely to have experience childhood sexual assault (*p*>.001, 95% CI= 1.61, 2.69), 1.78 times more likely to have experienced childhood physical assault (*p*>.05, 95% CI= 0.90, 4.11) and 1.64 more likely to have experience recent assault (*p*>.05, 95% CI= 1.00, 2.70). For males, when comparing the Low latent class to the High latent class, members of the High class were 4.06 times more likely to have experience childhood sexual assault (*p*>.001, 95% CI= 2.21, 7.44), no other variable produces a statically significant effect. When comparing the Medium latent class to the High latent class, no variable produced a statistically significant effect. For females, when comparing the Low latent class to the Medium latent class, members of the medium class were 1.95 times more likely to have experienced childhood sexual assault (*p*>.05, 95% CI= 1.10, 3.48). No other variable produces a statically significant effect. For females, when comparing the Low latent class to the High latent class, members of the High class were 2.22 times more likely to have experience childhood sexual assault (*p*>.05, 95% CI= 1.12, 4.40). Again when comparing the Medium latent class to the High latent class, no variable produced a statistically significant effect.

LCA of PTSD Diagnosed

A LCA analysis was conducted on those in the sample that scored above 52 on the ZIL questionnaire; this is the cut off point for a PTSD diagnosis. Goodness-of-fit data indicated that a 2-class model was superior to a 1-class model and that a 3-class or higher model was not a superior fit. Table 5 presents the goodness-of-fit indexes for 2 to 5-class model. Goodness-of-fit data indicated that a 2-class model was superior to a 1-class, due to the p-values of Lo, Mendell, Rubin and Bootstrapped parametric LR. The 2-class model was deemed a better fitting model than the 3-class model due to the higher adjBIC and Entrophy values.

Table 5. Model Fit Index for Latent Class Analysis of PTSD Symptoms in SMI Patients Scoring >51 on ZIL

	adjBIC	Entrophy	Lo, Mendell, Rubin	Bootstrapped parametric LR	N for each class *(N)*
2 Class	11520	97%	2 vs 1 215; P<0.000	2 vs 1 P<0.000	1=76 (41%) 2=108 (59%)
3 Class	11416	90%	3 vs 2 149; P=0.435	3 vs 2 P<0.000	1=64 (35%) 2=75 (41%) 3=45 (24%)
4 Class	11394	89%	4 vs 3 69 P<0.341	4 vs 3 P<0.000	1=39 (21%) 2=35 (19%) 3=76 (41%) 4=34 (19%)
5 Class	11404	91%	5 vs 4 37; P=0.576	5 vs 4 P<0.667	1=46 (25%) 2=4 (2%) 3=75 (41%) 4=26 (14%) 5=33 (18%)

As demonstrated in Figure 4, the main difference between these 2-classes symptomology is on two ZIL-items in the Hyper-arousal sub category: 'I had trouble staying asleep' & 'I had trouble falling asleep'. Therefore these 2-classes were labelled Good Sleep & Bad Sleep to reflect this difference between the classes symptoms profile. 59% of the PTSD sample were in the Bad Sleep class and 41% were in the Good Sleep class. The Bad Sleep class scored higher on 18 out of 22 ZIL item.

An independent t-test was run with the two ZIL questions regarding sleep removed. It found that the bad sleepers symptoms were no statically significantly higher when compared to the good sleepers, $t(38) = 1.09$, $p=.282$.

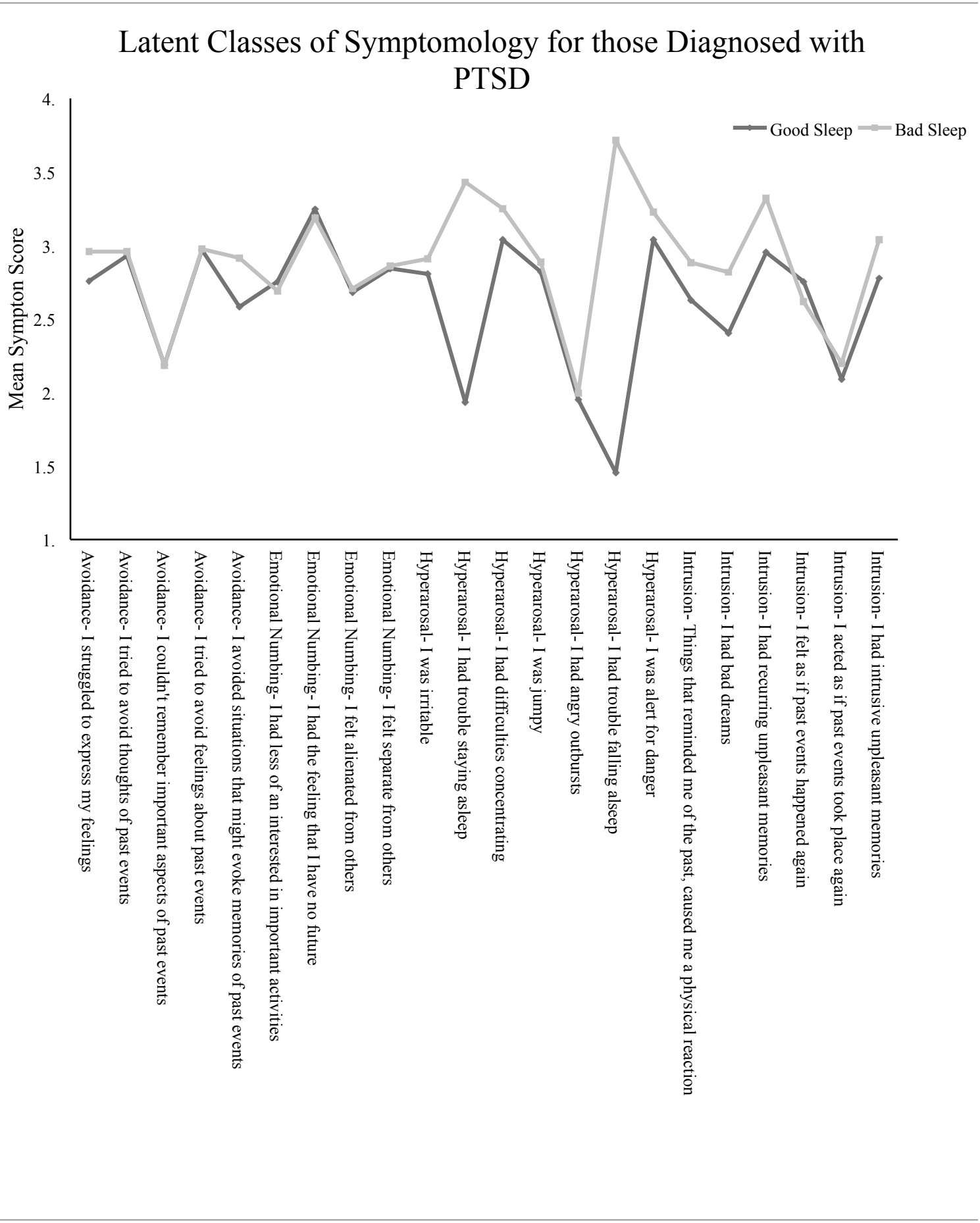


Figure 4. Latent Classes of the PTSD diagnosed sample. Note: Percentage date labels represent the percentage of the sample represented in that latent class.

Discussion

PTSD in SMI Patients

The first aim of this study was to determine the PTSD prevalence in this SMI sample; the ZIL calculated 184 (19.5%) participants met the criteria for a diagnosis of PTSD. This prevalence rate is higher than the general population of The Netherlands, which is reported to be 1.9% (Darves-Bornoz et al., 2008), providing further evidence that PTSD is more common in those with a severe mental illness. In comparison to other research on PTSD in SMI populations, this prevalence is quite low; reported prevalence ranging between 13-53% (Calhoun et al., 2007; Ford & Fournier, 2007, Gearon, Kaltman, Brown, & Bellack, 2003, Henson, Colliver, & MacLean, 1988; Howgego et al., 2005; Kilcommons & Morrison, 2005; Mueser, et al., 2004; Resnick, Bond, & Mueser, 2003). Small sample sizes and methodological limitations likely explain the range in reported prevalence's. In contrast, this study is the first of its size in Europe and currently the largest sample size in the field. Additionally, this sample is nation-wide and collected through random selection, not selective sampling, and is more methodically valid. It is therefore concluded that this paper's prevalence rate is more accurate. An additional factor that likely explains the variance in reported prevalence is sample location. It is established that PTSD prevalence varies with the sample country; notably findings from European studies are on average lower than US (Darves-Bornoz et al., 2008; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). All the above mentioned studies are located in the US. Mueser et al. (2004) has a similar sample size to this study yet reports a current PTSD rate of 34.8%. In this case, it is proposed that the divergence in prevalence is due to sample location.

This paper more irrefutably than previous studies provides evidence that PTSD is present in significant numbers of patients with SMI. In clinical settings PTSD seems to be overlooked, with the presence of other mental health issues such as major depression or schizophrenia taking precedence. As discussed in the introduction, there are many undesirable consequences of untreated PTSD in SMI patients including, exacerbating primary mental health symptoms, adverse mental health outcomes, impacting neurocognitive assessment and, of course, the PTSD symptoms themselves. An increased acknowledgement and treatment of PTSD in SMI is needed.

Latent Classes of PTSD Symptoms

The second aim of this research was to explore the symptomology of PTSD through latent class analysis. The latent class analysis and goodness-of-fit analysis determined a 3-class model of PTSD in the SMI sample (for the statistical rationale for this class selection see the results section). The classes reflect a quantitative variation of symptom severity and are therefore named Low, Medium and High; 50% were in the Low class, 34% in the Medium and 16% in the High. There are several stark similarities between this study and Breslau et al. (2005). Firstly, this paper replicated the 3-class model of symptom severity. Furthermore, the distribution of the sample across these 3 classes

is similar to Breslau et al. (2005), reporting 55% of trauma exposed participants in the Low class, 34% in the Medium and 11% in the High. In addition, it is observed that the High class demonstrate a higher reported emotional numbing than the other classes. Emotional numbing is one of the four ZIL symptom subscales (intrusion, hyper-arousal, avoidance & emotional numbing). Interestingly, Breslau et al. (2005) reported similar results. Whether such higher emotional numbing is statistically significant was not tested, and this would be recommended as a next step in research.

The implications of the LCA will now be discussed in relation to the general research field. Firstly, it would suggest that the symptomology of PTSD in SMI patients bears similarity to the general population. The purpose of exploring the symptomology of PTSD was to further understand how PTSD and SMI interact; whether they simply exist parallel in an individual, or whether they feed off and exacerbate one another. These findings would give evidentiary support for the first. There was no suggestion that the pattern of PTSD symptomology manifests differently than in the general population. However, it should be noted that no direct statistical analysis was conducted in this study, somewhat limiting conclusions. This would be a suitable next step in research and has important ramifications for treatment. If symptomology were similar in patients with 'pure' PTSD and co-morbid PTSD they would likely respond to similar treatment.

Secondly, the LCA challenges the currently accepted dichotomised model of PTSD. The strength of LCA is that it finds natural trends in data rather than testing pre-determined notions, and our LCA produced a non-binary grouping of PTSD symptoms in contrast to the DSM V model. Through the use of goodness of fit statistics, a 3-tier rather than 2-tier system was found to most accurately reflect the sample. Further evidence that undermines the 2-tier system is that 2 participants in the High class had not met the criteria for PTSD by scoring more than 52 on the ZIL. Either the ZIL test is infallible and these participants must be seen as false positives or these participants question the efficacy of the ZIL cut-off score and the 2-tier system. Rather than reject the participants as false positives it is concluded that the 2-tier system does not accurately reflect the manifestation of PTSD. Breslau et al. (2005) also concluded that a 3-tier system of PTSD might be more accurate than the accepted 2-tier system. Breslau et al. (2005) suggested that this medium group "might illustrate previously proposed sub-threshold clinical entities, such as partial PTSD". This concept of partial PTSD is not new, sub-threshold symptoms of PTSD have been acknowledged before in Vietnam veterans, victims of sexual abuse, traffic accident and in community sample (Schlenger et al., 1990; Schnurr et al, 1993; Weiss et al., 1992). Even more importantly despite these sub-threshold symptoms, previous research has reported that levels of impairment were as pervasive. As Stein et al. (2004) concluded, "These persons with partial PTSD, although somewhat less impaired than persons with the full syndrome, nonetheless exhibit clinically meaningful levels of functional impairment in association with their symptoms". Sub-threshold clinical disorders are acknowledged in other mental health disorders, such as depression. These research findings suggest the same is warranted in PTSD. A

renewal of research and acknowledgement of the existence of partial PTSD is required, in both research and clinical practice, specifically in terms of treatment.

Thirdly, Breslau et al. (2005) concluded based on the heightened severity of the emotional numbing in the high latent class, that emotional numbing might be key in the manifestation of pervasive PTSD. Some researchers see emotional numbing as a cardinal feature of PTSD. Emotional numbing was found to be the best predictor of PTSD above any other of the symptoms (Foa et al. 1995). Furthermore, a study by Breslau and Davis (1992) explored the symptomology of those with chronic and non-chronic PTSD and found emotional numbing and over reactivity differentiated the two groups. Not all researchers support this view, others believe emotional numbing symptoms characterise an overlap between PTSD and depression. This sample by design has a significant number of participants with chronic depression, so conclusions made on this topic are somewhat limited. Are those in the persuasive class just those suffering from depression and co-morbid PTSD or is emotional numbing the cardinal feature of extreme PTSD? More analysis of this data set could be useful for this debate and would be a preferable next step for research.

PTSD and Sleep Disturbance

The further latent class analysis of the participants that met ZIL criteria for a PTSD diagnosis produced a 2-class model. There were two questions on the ZIL where the 2-class symptom pattern most pointedly diverged: "I had trouble staying asleep" class 1 (mean=1.9), class 2 (mean=3.4) & "I had trouble falling asleep" class 1 (mean=1.5), class 2 (mean=3.7). 59% of the 184 participants with PTSD had trouble falling or staying asleep ("bad sleep") and 41% did not ("good sleep"). It was therefore concluded that these classes reflected a difference in symptoms associated with sleep. An independent t-test, with the two ZIL questions regarding sleep removed; found that the bad sleepers did not have statistically significantly higher ZIL scores compared to the good sleepers. As the original focus of this study was not sleep levels, specific data collection and detailed analysis were not done. Additional research is needed to reach further conclusions, for example on the effects of sleep medication, and of primary mental health conditions.

Nevertheless, the results are still noteworthy as the impact of sleep levels on mental health is a significant research field. Sleep disturbance, including insomnia and nightmares, are a central feature of PTSD and there is mounting evidence that sleep disturbance in PTSD independently negatively impacts both mental and physical health outcomes (Clum, Nishith, & Resick, 2001; Krakow et al., 2000; Krakow et al., 2002; Nishith, Resick, & Mueser, 2001). Furthermore, sleep disturbance is known to deteriorate emotional and cognitive functioning as well as neurological test scores (Bonnet, 2005; Dinges, Rogers & Baynard, 2005; Kerkhof & Van Donden, 2010). Sleep focused interventions in PTSD patients have produced improvements in PTSD symptoms and reduction in sleep disturbance (Krakow et al., 2001; Raskind et al., 2003). All the above mentioned studies are in 'pure' PTSD patients, therefore perhaps sleep disturbance does not have as much of an impact in SMI patients with

co-morbid PTSD as those with 'pure' PTSD. This paper would suggest further research into the topic, to determine whether sleep disturbance does impact PTSD severity in SMI patients.

PTSD Risk Factors: Trauma Type and Gender

The third aim of this study was to determine whether gender and trauma type (childhood trauma and recent assaultive violence) are predictors of class membership, to add to previous research on their risk-factor nature with the development of PTSD. Gender, recent assault and childhood neglect were found to be non- significant predictors of class membership. However, childhood sexual assault, childhood physical assault and the interaction effect of gender and recent assault were found to be significant predictors of class membership and therefore to be potent traumas.

Regarding childhood trauma, this study suggests that those who have experienced childhood sexual and physical assault are more likely to be experiencing more severe PTSD symptoms. Those who have experienced sexual assault were 4.06 times more likely to be in the High than the Low PTSD symptoms class and 2.57 times more likely to be in the Medium than the Low class. Similarly those who have experienced physical assault were 1.76 times more likely to be in the Medium than the Low class. There is also substantial evidence from other research that those who experience childhood trauma, specifically sexual abuse and physical neglect, are more likely to demonstrate PTSD symptoms (Bremner et al., 1993; Elliott & Briere, 1995; Epstein, Saunders & Kilpatrick, 1997; Widom, 1999; Zlotnick, et al., 1996). Furthermore, many psychological difficulties are reportedly higher in those that have suffered childhood trauma including: depression, personality disorders, anxiety & substance abuse, to name just a few. Childhood trauma is a key risk factor for later mental illness and this is further demonstrated in this study of PTSD in SMI patients. With this in mind, when treating PTSD in SMI patients an inclusion and acknowledgement of childhood trauma could be highly beneficial. Yet to date no well-tested treatments for PTSD related to childhood abuse exists; research into the treatment for child abuse is far behind that of abuse in adulthood.

With regard to more recent trauma, despite a higher percentage of participants with recent violent assault in the high latent class, the regression found this not to be a statistically significant predictor of latent class membership. Therefore suggesting those who had experienced recent assaultive violence were not likely to have more severe PTSD symptoms. This finding is to some extent unexpected, as sexual and physical assault is consistently reported in research as causes of PTSD (Brewin, Andrews & Valentine, 2000). Two methodological weaknesses in the measurement tool for recent assault could account for this. Firstly, recent trauma was only measured in the last 12 months and only included sexual and physical assault. This variable therefore excludes trauma that took place more than 12 months ago and that could have caused PTSD. Secondly the measurement excluded other traumas that are known to cause PTSD such as car accidents, fire & natural disasters.

Another possible explanation is that the finding may not be a methodical error but a substantial conclusion. There is previous research to support this; Brewin, Andrews & Valentine's (2000) meta-analysis demonstrated weaker effect sizes for recent trauma in epidemiological studies that included PTSD arising from events in childhood. If this finding, that childhood historical traumas rather than recent trauma are more likely to elicit PTSD, is indeed substantial then the way we currently perceive PTSD may be mistaken. It would suggest that PTSD is much more to do with our chronic stress response and coping mechanisms that are formed in our early years, than an inappropriate response triggered by a traumatic life event. This is further supported by evidence that structural and neurological brain changes to do with fear responses occur as a result of childhood trauma and that this underlies the risk of later developing PTSD. There is evidence for smaller hippocampus size, memory deficits and higher level of noradrenaline both in those with PTSD and in those who have experienced childhood trauma (Bremner et al., 2003; Bremner et al., 1995; Bremner et al., 1997; Bonne et al., 2001) but this research is still in its foundation stages. Although there is growing evidence to demonstrate the strength of childhood trauma as a risk factor for PTSD the neurological or cognitive explanation for this is not yet clear. As this paper's opening statement explained, PTSD research began in military veteran populations' responses to war; this may explain why we have this (possibly limited) theoretical view that PTSD is an event-based disorder. Like for those with PTSD, maybe this research fields past is coming back to inappropriately influence the present.

In term of gender as a risk factor, females were not found to be experiencing increased PTSD symptoms. Despite the percentage of females being higher in the High latent class, the regression found gender not to be a statically significant predictor of latent class membership. Previous research has consistently found higher PTSD rate in females (Breslau et al. 1999; Kessler et al. 1995; Tolin & Foa, 2006). One possible explanation for this difference is that with the removal of a binary diagnosis system of PTSD, gender differences are removed. Chung and Breslau (2008) the only other study in this research field to use a latent class approach of PTSD symptoms rather than a binary diagnosis approach, also found no suggestion of a different in PTSD symptoms between genders. Brewin, Andrews & Valentine's (2000) meta-analysis reported that studies using continuous measures of PTSD were associated with weaker effect sizes of gender than diagnostic measures of PTSD. They noted that all other risk factors remained significant except for gender. In continuous scoring, you would expect larger effect sizes not smaller ones due to the absence of attenuating effects of data grouping. Therefore, the use of diagnostic measures of PTSD in research may be producing the reported gender bias. Additionally, Brewin, Andrews & Valentine (2000) acknowledged that the gender bias in PTSD was greater when participants were interviewed then when given self-report questionnaires, as in this study. Possible explanations for this fact could be that interviewers are biased to diagnosis women, or men are less willing to express symptoms to interviewers. In conclusion, it seems that indeed more women than men are diagnosed with PTSD but the disparity of PTSD symptoms is not different. It

seems that researchers and clinicians are biased, not PTSD. This leaves the research field with two questions: Why are we biased to diagnose more women than men? How can we prevent this?

Since gender was found not to be a predictor of class membership and to further understand gender difference in PTSD symptoms, the data was split. This analysis did produce differences in PTSD risk factors between the genders: for the females, only childhood sexual assault reached significance; whereas for the males, both childhood sexual assault and physical assault were significant. These variations between genders continued when comparing the 3 latent classes with one another; different traumas are more likely to elicit more severe PTSD symptoms. This provides evidence for differences between genders in the potency of different traumas and their risk factor nature, and suggests that men and women respond differently to trauma vary in their likelihood of developing PTSD consequently.

This pattern continues, despite neither gender nor recent assault reaching statistical significance the interaction effect is statistically significant. This interaction is the only predictor in this study to explain membership of the High latent class over the Medium class. In other words, females recently assaulted were more likely to be experiencing pervasive PTSD symptoms than men. The percentage of men and women having experienced assaultive violent crime in the last year were similar, slightly higher percentage for women. Chung & Breslau (2008), found strikingly similar findings; the latent structure of PTSD was equal in males and females, although more female than male victims of assaultive violence experienced pervasive disturbance. Chung & Breslau (2008) therefore concluded the gender bias reported in PTSD was likely to reflect a gender difference in susceptibility, adding further support for the feminine- vulnerability hypothesis. This theory states that women are more vulnerable to developing PTSD regardless of trauma exposure. This study's finding that childhood sexual assault and physical assault are statistically significant risk factors regardless of gender does somewhat limit this conclusion, as women were not more likely to develop serve PTSD symptoms from this type of trauma.

These results do match what was hypothesised: no difference in symptom reporting between genders; more female than male victims of assaultive violence experiencing pervasive disturbance and more victims of assaultive violence and childhood sexual assault in the pervasive disturbance class. This data does not provide evidence for any one particular hypothesis for the gender-bias, instead it is suggested that male and females do respond differently to traumas and with that vary with how likely that trauma is to result in PTSD. The relationship between trauma, gender & PTSD is a complicated one; but one where the importance of gender has been inflated and trauma, specifically childhood trauma, in comparison neglected. PTSD research and clinical focus would benefit from somewhat of a re-focus and rebalance.

Evaluation and Conclusion

There are weaknesses and limitations in this study that must be taken into account. The study focused on SMI patients, and those with major depression, schizophrenia and bi-polar were analysed together. There is a potential that these illnesses interact differently with PTSD, and if this is the case our conclusions may be limited in their validity. In addition, the conclusions in regard to influence of sleep and emotional numbing on PTSD symptomatology were not part of the original aims of this study and therefore the methodology controls are limited. This being said they are thought- provoking and credible findings. More specific research into these variables is required to determine the validity of these findings; they have substantial consequences for this research field and for clinicians if they indeed hold true.

This paper produces several striking findings. Firstly, PTSD is much more prevalent in SMI patients than currently acknowledged in clinical settings and higher than in that of the general population. In light of this, an increase in assessments of PTSD in SMI patients is warranted. Secondly, the latent class analysis produced a pattern of PTSD symptomology in this SMI sample that is strikingly similar to that of the general population, suggesting that PTSD manifests itself similarly in both populations and could be treated similarly. Thirdly, the LCA provided further evidence for a 3-tier system of PTSD symptom severity rather than the current 2-tier system laid out in the DSM. This warrants recognition of intermediate PTSD in both research and in treatment settings; especially when impact on daily life is reported to be pervasive. Finally, in terms of PTSD risk factors, childhood sexual and physical assault was found to be the most predictive of symptom severity. This is a seminal finding in this field. If childhood trauma were indeed a stronger predictive factor than recent assaultive trauma, it would suggest that how we currently view PTSD is mistaken. Namely that PTSD is more likely to be a chronic stress response than an event related illness. Current research into the treatment of PTSD related to childhood trauma is limited and further research is required. Furthermore, gender was found not to be predictive of PTSD symptoms severity, suggesting that the gender bias reported in PTSD research is not a substantial bias. Differences in how genders process traumas and their likelihood to increased severity of PTSD symptoms are present; but a statistically significant bias toward females having higher PTSD symptoms was not produced in this SMI sample.

In relation to the above findings, this paper's recommendations for clinicians are four-fold. Firstly, to increase PTSD assessment and treatment in SMI patients. Secondly, an acknowledgement and treatment of those with intermediate PTSD. Thirdly, an increased focus on childhood trauma in PTSD theory, diagnosis and treatment. Finally, an increased awareness and a more proactive approach in order to reduce the female diagnosis bias in PTSD.

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