# ORGANIZING BORDERLINE PERSONALITY DISORDER SYMPTOMS, CHILDHOOD MALTREATMENT EXPERIENCES, AND POSTTRAUMATIC STRESS DISORDER SYMPTOMS: DO UNIQUE SUBGROUPS EXIST AND INFLUENCE DIALECTICAL BEHAVIOUR THERAPY OUTCOMES?

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## Abstract

BPD is characterized by dysregulation in emotions, behaviours, relationships, identity, and thoughts, as well as frequent engagement in self-injury. Childhood maltreatment experiences (including childhood trauma) and Posttraumatic Stress Disorder (PTSD) symptoms are highly associated with BPD, and predict worse BPD-treatment responses. However, it remains unclear whether distinct childhood maltreatment-related experiences and PTSD symptoms uniquely covary with BPD symptoms, or whether such covariation differentially predicts BPD-relevant treatment outcomes. The present study thus examined whether in trauma-exposed individuals with BPD receiving standard Dialectical Behaviour Therapy (DBT): 1) unique subgroups of distinct BPD symptoms, childhood maltreatment experiences, and PTSD symptoms exist; and 2) whether identified subgroups differentially predict BPD-relevant treatment outcomes. Latent Profile Analysis revealed three distinct classes: Low, Moderate, and High Maltreatment. Classes stratified on the bases of severity of childhood maltreatment experiences and PTSD symptoms, though BPD symptoms did not differentiate classes. Within each class, childhood emotional abuse and neglect, and some PTSD symptoms (e.g., intense negative emotion, emotional reactivity) were elevated in severity compared to other forms of childhood maltreatment and PTSD symptoms. Generalized estimating equation models also revealed that the High Maltreatment class exhibited a slower decline in frequency of self-injury and PTSD symptom severity compared to the Moderate and Low Maltreatment Classes. This study suggests that individuals with more severe childhood emotional abuse and neglect, and higher severity PTSD symptoms, may require additional or alternative (e.g., trauma-focused) interventions to standard DBT for self-injury and PTSD symptom severity to improve.

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# Introduction

Borderline Personality Disorder (BPD) is a serious mental health disorder, characterized by dysregulation in emotions, actions, relationships, identity, and thoughts (American Psychiatric Association; APA, 2013). BPD affects approximately 1-6% of the population (Grant et al., 2008; Torgersen et al., 2001). Most (i.e., up to 84%) individuals with BPD self-injure (Gunderson, 2008; Soloff et al., 2002), up to 75% attempt suicide at least once in their lifetime (Goodman et al., 2017), and 10% of Canadians with BPD die by suicide (Paris & Zweig-Frank, 2001). BPD is thus both prevalent and life-threatening in nature.

Childhood maltreatment experiences (including childhood trauma) and Posttraumatic Stress Disorder (PTSD) symptoms are highly associated with BPD (e.g., Porter et al., 2019; van Dijke et al., 2013; Frías & Palma, 2015; Scheiderer et al., 2015). Some research demonstrates that such childhood maltreatment experiences and PTSD symptoms predict worse BPD-relevant treatment responses (e.g., Links et al., 2013; Barnicot & Crawford, 2018). However, no work to date has examined whether these maltreatment-related experiences and PTSD symptoms uniquely covary with BPD symptoms, or how such distinct covariation influences BPD-treatment outcomes. Thus, the present work aims to examine whether unique subgroups of individuals with distinct childhood maltreatment experiences, PTSD symptoms, and BPD symptoms exist, and whether subgroup membership differentially predicts responses to Dialectical Behaviour Therapy (DBT; Linehan 1993, 2015) in trauma-exposed individuals with BPD.

## BPD Heterogeneity

Despite agreement among clinicians and researchers that BPD is a life-threatening illness that requires intervention, it is also known as a particularly difficult disorder to treat (Chapman,

2010). Although DBT is regarded as the gold-standard evidence-based treatment for BPD and chronically suicidal behaviour (DeCou et al., 2019), it is not effective for *all* individuals with BPD (Rizvi, 2011). For example, one study found that 35% of individuals with BPD still engaged in self-injury in the final six-months of a twelve-month course of DBT (Verheul et al., 2003), while another posits that maintenance of treatment gains following DBT is inconsistent for individuals with BPD (van den Bosch, 2005).

One reason that treating BPD may be so difficult is that it has many highly variable phenotypes. According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5, APA, 2013), a BPD diagnosis requires endorsement of at least five of nine diagnostic criteria. According to Linehan (1993), these diagnostic criteria span five domains of functioning: emotion dysregulation (i.e., disrupted emotional experiences, which can involve heightened emotional responses following provocation, as well as difficulties regulating emotion), interpersonal dysregulation (i.e., intense and unstable interpersonal relationships, as well as frantic efforts to avoid abandonment), behavioral dysregulation (i.e., suicidal or non-suicidal self-injurious behaviour; impulsive engagement of other self-destructive behaviours such as drug use, binge eating, overspending or gambling, or reckless driving), cognitive dysregulation (i.e., stress-induced dissociation, paranoid ideation), and self-dysregulation (i.e., identity disturbance, chronic emptiness). The symptoms that comprise these domains yield 256 distinct symptom combinations (Biskin & Paris, 2012) that, although different, constitute a diagnosis of BPD. Additionally, psychiatric comorbidity in this population is the rule, not the exception (Tadic et al., 2009), further increasing phenotypic heterogeneity in this group. BPD presentations are thus highly variable, making it challenging for clinicians to identify which symptom profiles of BPD their clients may have and, consequently, whether different individuals require distinct treatment

approaches. Organizing the heterogeneity of this disorder may enable clinicians to identify and customize optimally effective therapeutic strategies or interventions for each client based on their profile.

**Childhood Maltreatment Experiences: Adding to BPD Heterogeneity**

The heterogeneity of BPD symptoms is further exacerbated by the high rates (up to 71%) and varied forms of childhood maltreatment in BPD (Cicchetti & Valentino, 2006; Widom et al., 2009). Childhood maltreatment broadly involves the abuse or neglect of a child under the age of 18, and is an umbrella term that encapsulates many distinct and varied forms (e.g., sexual or physical abuse, emotional abuse or neglect). Trauma is one such specific type of maltreatment. The DSM-5 offers a specific definition of trauma which does not necessarily encapsulate emotional maltreatment experiences. According to the DSM-5, trauma is defined as exposure to actual or threatened death, serious injury, or sexual violence in one or more of the following ways: 1) directly experiencing the traumatic event; 2) witnessing the event as it occurred to others; 3) learning the event happened violently or accidentally to a close other; or 4) repeated or extreme exposure to aversive details of traumatic events (APA, 2013). It is notable that the appropriateness of this definition is controversial and has been heavily debated in the literature (e.g., Pai et al., 2017; Kilpatrick et al., 1998; Green, 1993). Those who have reviewed this issue (e.g., Weathers & Keane, 2007; Friedman et al., 2010) highlight that some theorists argue to expand this definition to include other stressors and forms of exposures. Brewin et al. (2009) suggest abolishing the requirement of Criterion A for a subsequent diagnosis of PTSD altogether, given emerging evidence that suggests that indicates non-traumatic stressors (e.g., breaking up with a best friend; marital affair or divorce) elicit PTSD symptoms (i.e., re-experiencing,

avoidance, arousal). Therefore, traumatic events may *also* involve emotional maltreatment experiences.

Although a few studies have not found linkages between BPD and childhood, adolescent, or adulthood maltreatment (e.g., Laporte et al., 2011; Cierpialkowska & Pasikowski, 2013), most research supports a strong association between BPD and childhood maltreatment (Carvalho Fernando et al., 2014; Herman et al., 1989; Bandelow et al., 2005; de Aquino et al., 2018; Merza et al., 2015). Indeed, a recent meta-analysis found that, compared to healthy controls and those with other psychiatric disorders, individuals with BPD are 13.91 and 3.15 times, respectively, more likely to have experienced childhood maltreatment (Porter et al., 2019). Additionally, research in BPD generally shows that childhood maltreatment exacerbates the negative expression of emotion (e.g., van Dijke et al., 2013; Wingenfeld et al., 2011), social and occupational dysfunction (Cotter et al., 2015), and BPD symptom severity (Perepletchikova et al., 2012), and is associated with more lifetime suicide attempts in BPD (Brodsky et al., 1997).

In addition to being common in BPD and exacerbating BPD severity, etiological theories and corroborating evidence suggest that distinct childhood maltreatment experiences likely contribute to the development of specific components of BPD pathology (e.g., Bateman & Fonagy, 2010; Ball & Links, 2009). Linehan's Biosocial Model (1993) posits that BPD develops as the result of a transaction between an individual's biological vulnerabilities to experiencing disrupted emotion and emotion regulation processes (i.e., emotion dysregulation) and an early invalidating environment. Although not exclusively referring to maltreatment, such invalidating environments are postulated to involve oversimplifying the ease of problem solving (e.g., expecting a child to independently and immediately reduce intense anxiety), intermittently reinforcing emotional escalations (e.g., a parent expressing care towards their child only in

response to extreme anger outbursts), and punishing external expressions of emotion (e.g., telling a child who is sad and tearful to "stop crying" or "get over it"). The invalidating environment can also involve childhood maltreatment experiences explicitly (e.g., emotional, sexual, and physical abuse; Lindenboim et al., 2007), as well as invalidating responses to such maltreatment (e.g., a child's sexual assault being ignored or not discussed).

A key implication of the Biosocial Model is that specific *forms* of childhood maltreatment may lead to specific *components* of BPD pathology. For instance, the Biosocial Model ultimately posits that a key component of the invalidating environment is that it inherently communicates that a child's emotions are invalid (e.g., verbally scolding a child for expressing sadness). Such invalidating experiences are theorized to particularly exacerbate *emotion dysregulation components* of BPD pathology by interfering with the development of emotion regulation processes and children's ability to identify, understand, and trust their emotional reactions (Linehan, 1993). *Thus, emotional forms of childhood maltreatment (e.g., emotional abuse and neglect) may particularly associate with emotion dysregulation components of BPD (e.g., affective instability, anger).*

There is evidence that emotional maltreatment experiences are associated with emotion dysregulation components of BPD. Some research suggests childhood emotional abuse (and not sexual or physical abuse) specifically predicts general BPD symptom severity, mediated by difficulties with emotion regulation (Kuo et al., 2015). Similarly, another study found that while childhood maltreatment as a composite (including physical neglect, emotional neglect, and emotional abuse, as well as Criterion A events involving sexual and physical abuse) was not predictive of emotional lability (i.e., intense fluctuations in emotion experiences) in BPD, childhood emotional abuse specifically was (Goodman et al., 2003). Similarly, another study

found that childhood emotional neglect only, and not general childhood maltreatment or its other composite parts (including physical neglect, emotional abuse, and Criterion A traumatic events involving sexual and physical abuse), predicted dissociation severity in BPD (Simeon et al., 2003). Thus, emotional maltreatment may also affect automatic processes that modulate emotion, such as dissociation. These studies suggest that childhood emotional abuse and neglect, compared to general or other distinct forms of maltreatment, are particularly associated with emotional lability and dissociation in BPD. However, in one study, childhood emotional maltreatment compared to other forms of maltreatment (e.g., sexual or physical) was positively associated with emotion regulation deficits *and* impulsivity in self-injuring women with BPD (Krause-Utz et al., 2019). This study indicates that emotional maltreatment may also affect behavioural domains of BPD pathology. However, these studies did not examine which specific types of maltreatment covary with specific BPD symptoms. Therefore, more research examining the relationships between these experiences and symptoms is needed.

Although childhood emotional maltreatment experiences may be associated with emotion dysregulation components of BPD, other forms of childhood maltreatment, particularly *childhood traumatic experiences, may be uniquely associated with its behavioural dysregulation components.* Despite controversy regarding the classification of some experiences as "traumatic" or "not", these distinctions imply that specific childhood maltreatment experiences may be classified as traumatic. In the Interpersonal-psychological Theory for Suicide, Joiner (2005) posits that exposure to violence (e.g., directly experiencing or witnessing physical or sexual abuse) both increases one's tolerance to physical pain and reduces one's fear of death. Such exposures theoretically contribute to an acquired capability to enact violence against oneself over time, possibly leading to self-injurious or suicidal behaviour. Traumatic events in childhood, as

defined by DSM-5 (APA, 2013), may therefore be associated with behavioural BPD symptoms. Childhood sexual abuse, for example, is associated with increased frequency of suicide attempts, severe non-suicidal self-injury (NSSI) events, cigarette smoking, alcohol use, and sexual impulsivity in BPD (Soloff et al., 2002; Turniansky et al., 2019). However, no studies have examined the way multiple maltreatment experiences, including but not limited to traumatic ones, covary with multiple BPD symptoms.

In summary, research supports that childhood emotional maltreatment may be specifically associated with the emotion dysregulation components of BPD (e.g., affect instability, anger) while childhood trauma– perhaps particularly childhood sexual abuse– may specifically be linked to its behavioural dysregulation components (e.g., impulsivity, NSSI and suicidal behaviours). Specific forms of childhood maltreatment and BPD symptoms may thus coalesce into meaningful emotional and behavioural subgroups that require distinct treatment approaches (e.g., focused on emotion processes versus behavioural interventions). However, research examining such patterns of co-occurrence is limited.

**Posttraumatic Stress Disorder: Further Complicating BPD Heterogeneity**

Although heterogeneous BPD symptom presentations are likely uniquely influenced by distinct forms of childhood maltreatment, these relationships are further complicated due to sequelae that can result from traumatic forms of maltreatment. One such common sequelae is PTSD, which involves distressing responses that persist at least once month following traumatic event exposure (defined by DSM-5; APA, 2013). PTSD is highly prevalent among individuals with BPD, wherein the majority (i.e., up to 79%) meet full diagnostic criteria (e.g., Frías & Palma, 2015; Pagura et al., 2010). On its own, PTSD is a highly heterogeneous disorder, with 636,120 different symptom combinations that can comprise its diagnosis (Galatzer-Levy &

Bryant, 2013). Individuals who are exposed to trauma may also experience subthreshold PTSD (e.g., endorsement of symptoms in some, though not all, clusters), which is also highly impairing and associated with increased depression, suicidal behaviour, alcohol use problems, and functional impairment (Kim et al., 2020). Comorbid PTSD with BPD also exacerbates BPD symptomatology, wherein individuals with both disorders experience poorer overall functioning, exacerbated interpersonal dysfunction, and more suicidal behaviour and NSSI compared to individuals with BPD alone (Frías & Palma, 2015; Pagura et al., 2010; Scheiderer et al., 2015). PTSD symptoms therefore interrelate with, exacerbate, and may contribute to the development of BPD symptoms.

The PTSD diagnosis involves four distinct symptom clusters (i.e., re-experiencing, avoidance, negative alterations in cognition and mood, and arousal) that follow traumatic event exposure. These symptom clusters reflect two broad types of PTSD symptoms, which will be referred to as "hallmark" and "non-specific" PTSD symptoms throughout this manuscript. Hallmark PTSD symptoms involve the first two symptom clusters, re-experiencing and avoidance, which directly involve and reference the traumatic event in the form of memories, dreams, flashbacks, and avoidance of the trauma itself or reminders of it. Indeed, it has been argued that a memory of a traumatic event itself is the "heart of the [PTSD] diagnosis" and the central feature around which all other PTSD related symptoms can be understood (Friedman et al., 2010). It is also suggested that flashbacks and traumatic nightmares are the two re-experiencing symptoms most characteristic of PTSD (Freidman et al., 2010). The additional two symptom clusters, negative alterations in cognition and mood and arousal, reflect non-specific PTSD symptoms because they refer to experiences that do not specifically reference a trauma per se (e.g., generally negative mood, general sleep disturbances). To be endorsed as a PTSD

symptom, the DSM-5 stipulates that these non-specific symptoms must begin, or must be exacerbated, at the time the traumatic event occurred.

Although empirical support examining this distinction between PTSD symptom clusters remains limited, some writing supports that hallmark PTSD symptoms (i.e., re-experiencing, avoiding, hypervigilance) are distinctly characteristic of PTSD (Maercker et al., 2013), while non-specific PTSD symptoms maybe reflect other overlapping pathologies, including BPD as well as other mood and anxiety disorders. McNally (2004) suggests that a focus on *past* threat (e.g., distress related to re-experiencing PTSD symptoms such as flashbacks or distressing memories of the trauma) is what differentiates PTSD from other anxiety related disorders that center around future related anxiety (e.g., generalized anxiety disorder, panic disorder). Pai et al. (2017) also specifically suggests that non-specific PTSD symptoms such as reckless or self-destructive behaviours may characterize individuals who endorse high symptom severity in general, as opposed to reflecting a distinctive PTSD feature. Indeed, several nonspecific PTSD symptoms overlap with BPD symptoms, including emotional lability, anger outbursts, impulsivity, and negative beliefs about oneself and others. Furthermore, the International Classification of Diseases, 11$^{th}$ Edition (ICD-11; World Health Organization, 2018) further supports this concept given that it recognises Complex PTSD (cPTSD) as a distinct diagnostic category. cPTSD is a condition theorized to emerge following a history of repeated, ongoing trauma. It involves several PTSD symptoms (e.g., re-experiencing, hypervigilance), as well as several additional symptoms that have greater overlap in many symptoms of BPD (e.g., emotion dysregulation, interpersonal problems; Landy et al., 2015). Therefore, while hallmark PTSD symptoms may reflect a posttraumatic stress response to trauma exposure specifically,

nonspecific symptoms may overlap highly with other forms of psychopathology including BPD (e.g., Larsen & Pacella, 2016).

Given that Criterion A events specifically may be more distinctly associated with hallmark PTSD symptoms (e.g., Solomon & Canino, 1990), whereas childhood *emotional* maltreatment experiences may associate with non-specific PTSD symptoms and the aforementioned emotion dysregulation components of BPD, childhood *traumatic* experiences may associate with *all* PTSD symptoms (including hallmark symptoms) and the behavioural dysregulation components of BPD. However, little research has examined the covariation between specific maltreatment experiences and PTSD symptoms. Further, research examining the relationships between specific PTSD symptom clusters and BPD symptoms is limited and mixed. For example, one study demonstrated that a PTSD diagnosis exacerbated intense negative emotion in BPD (Scheiderer et al., 2015), and another found that the presence of PTSD exacerbated general dysfunction, interpersonal problems, impulsivity, self-injury, and emotion dysregulation in BPD, but not overall BPD symptomatology (Zlotnick et al., 2003). Shearer (1994) also found mixed results, wherein PTSD symptoms generally were associated with greater dissociative experiences in BPD but were not associated with increases in frequency of NSSI. However, these studies are limited given that they examined PTSD diagnoses or symptoms in aggregate form, rather than examining distinct symptoms and their relation to BPD pathology. Additional work demonstrated that BPD features are associated with total PTSD symptoms, however failed to find differential associations between specific clusters of PTSD symptoms (e.g., avoidance, re-experiencing) and BPD (Beck et al., 2019). They also found that childhood abuse did not mediate the relationship between BPD and PTSD symptom clusters (i.e., re-experiencing, avoidance, arousal). However, this study was limited given it examined sexual

and physical abuse only, and did not consider whether other forms of childhood maltreatment mediate these relationships. Inclusion of such experiences and specific PTSD symptoms are critical to parse the unique ways that BPD symptoms, childhood maltreatment experiences, and PTSD symptoms may covary with each other.

Although limited with respect to whether or how all of these distinct maltreatment experiences and symptoms distinctly interact, some preliminary research has examined the relationships between childhood maltreatment experiences, PTSD symptoms, and BPD symptoms. One recent systematic review demonstrated that, in individuals with BPD, childhood sexual abuse specifically influences suicidal ideation, self-injurious behaviours, PTSD, dissociation, and the chronicity of BPD (de Aquino et al., 2018). However, this study was limited given it exclusively examined sexual abuse, and not other forms of childhood maltreatment experiences. It also examined sexual abuse across the lifetime (i.e., childhood and adulthood), obfuscating whether childhood experiences of sexual abuse specifically distinctly associate with BPD or PTSD symptoms. In a sample of college students, childhood sexual abuse as well as perceived general invalidation (i.e., a composite variable that encapsulated one's perception of a lack of warmth and affection, hostility or aggression, indifference or neglect, and undifferentiated rejection) predicted PTSD and BPD symptoms, as well as anxiety and depression (Hong et al., 2016). However, this study lacked specificity with respect to which PTSD or BPD symptoms were uniquely associated with childhood sexual abuse or specific forms of other maltreatment (e.g., emotional abuse or neglect distinctly).

In sum, individuals with BPD vary with respect to the specific BPD symptoms that they experience. These distinct BPD symptoms may also be informed by a history of unique childhood maltreatment experiences including childhood trauma. PTSD symptoms are *also*

highly variable in presentation, and unique childhood maltreatment experiences may also inform their development, with traumatic experiences specifically eliciting hallmark PTSD symptoms. Finally, unique PTSD symptoms also appear to reciprocally influence and exacerbate BPD symptoms, with high overlap between nonspecific PTSD symptoms and BPD symptoms. However, a comprehensive understanding of whether, which, and how specific childhood maltreatment experiences (including childhood trauma), PTSD symptoms, *and* BPD symptoms interface and cluster together meaningfully is lacking. Elucidating the distinct ways in which these experiences and symptoms covary would allow for a parsimonious understanding of distinct subgroups of individuals with BPD and may inform how to best optimize and tailor treatments for them.

**Disentangling Heterogeneity in BPD Through Latent Profile Analysis**

Latent profile analysis (LPA) is a statistical technique that aims to organize heterogeneous continuous data into subclasses of two or more homogenous groups. Such an approach could allow for classification of meaningful relationships between BPD symptoms, childhood maltreatment experiences, and PTSD symptoms into distinct subgroups, eliciting a granular understanding of different profiles of BPD. However, to our knowledge, no LPA or similar statistical modeling technique (e.g., Cluster or Network Analyses), has been conducted to generate subgroups of individuals based on BPD, childhood maltreatment experiences, *and* PTSD symptoms in individuals with BPD to date. LPAs that organize symptoms of BPD, PTSD, and a related disorder called complex PTSD[1] have been conducted (cPTSD; e.g., Cloitre et al., 2014; Knefel et al., 2016; Jowett et al., 2020; Saraiya et al., 2021). One of these studies involved

[1] Complex PTSD (cPTSD) is a diagnostic category recognized by the International Classification of Diseases, 11th Edition (ICD-11; World Health Organization, 2018) that shares many features of BPD (Landy et al., 2015). However, it is not recognized in the DSM-5 (APA, 2013), in part due to controversy related to whether it represents a unique diagnostic category (Landy et al., 2015).

a latent class analysis of non-treatment seeking young adults that examined whether cPTSD was distinct from BPD with comorbid PTSD. Results indicated a four-class model of high PTSD+cPTSD+BPD, moderate PTSD+cPTSD+BPD, a PTSD class, and a healthy class with low symptom endorsement (Saraiya et al., 2021). While this study also included a general measure of the presence of childhood maltreatment experiences, and found that such experiences were highest among the high and moderate PTSD+cPTSD+BPD classes, it did not examine which distinct experiences associated with this class. Further, although Saraiya et al. (2021) indicated overlap between PTSD, cPTSD, and BPD symptoms, most studies posit that high BPD, PTSD, and cPTSD symptoms cluster meaningfully into distinct diagnostic categories (e.g., Cloitre et al., 2014; Knefel et al., 2016; Jowett et al., 2020). Interestingly, even for cPTSD symptoms (i.e., negative self-concept, interpersonal problems, and affect dysregulation) that appear to have synonymous BPD symptoms (i.e., identity disturbance, interpersonal instability, and emotion lability), high cPTSD and high BPD symptoms reflect distinct classes in some works (e.g., Cloitre et al., 2014). Further, Jowett and colleagues (2020) found that high cPTSD/high BPD symptoms, high cPTSD/moderate BPD symptoms, and PTSD/low BPD symptoms could be organized into three distinct subgroups. They found that cPTSD highly overlapped with BPD symptom endorsement, and that both cPTSD classes were highly related to childhood maltreatment experiences compared to the PTSD and low BPD feature group. Taken together, these works indicate that distinct covariations between BPD and PTSD symptoms exist, and generally stratify on the basis of severity to form distinct profiles of individuals. They also suggest that the highest severity profiles of individuals involving BPD/PTSD/cPTSD symptoms are associated childhood maltreatment experiences in general. However, although some studies have examined how BPD/PTSD/cPTSD symptom profiles associate with childhood

maltreatment, specific maltreatment experiences have yet to be included in LPAs, or similar statistical analyses, in BPD samples. Thus, it remains unclear whether specific forms of childhood maltreatment experiences uniquely associate with distinct BPD and PTSD symptoms to form distinct profiles of clinical presentations in BPD.

**Do BPD and Maltreatment-Related Experiences Subgroups Differentially Predict Response to DBT?**

Finally, despite the clear deleterious effects and added heterogeneity of maltreatment-related experiences and PTSD symptoms on BPD pathology, the literature remains mixed with regard to whether and how they influence BPD treatment responses. A recent study examining the effects of childhood maltreatment and its subtypes (e.g., physical abuse or neglect, emotional abuse or neglect) on BPD treatment response to Dialectical Behaviour Therapy (DBT; a frontline BPD treatment; De Cou et al, 2019; Linehan, 1993) revealed that general childhood maltreatment had no effect on changes in depressive symptoms. They also found that experiencing childhood emotional neglect specifically predicted *greater* decreases in depressive symptoms than physical neglect (Euler et al., 2020). Another study reported that childhood maltreatment did not differentially predict standard DBT treatment dropout rates in individuals with BPD with or without PTSD, or in response to DBT-skills training only for individuals with BPD alone (Farrés et al., 2018). Therefore, although one work suggests that the presence of childhood physical neglect may impede BPD treatment response more than emotional neglect, the literature remains limited and mixed with respect to how distinct forms of childhood maltreatment influence many, and distinct types of, BPD treatment responses (e.g., self-injury, BPD symptom severity, suicidal ideation).

With respect to PTSD, some studies also suggest that individuals with comorbid BPD and PTSD respond more poorly to BPD treatment (Barnicot & Priebe, 2013; Barnicot & Crawford, 2018), while others suggest that improvement occurs at same rate compared to individuals with BPD alone (Boritz et al., 2016). However, no literature to date has examined the ways in which different subgroups of individuals with BPD, maltreatment-related experiences, and PTSD symptoms predict BPD treatment responses.

**Summary of Thesis Aims**

In summary, individuals with BPD vary considerably based on which specific BPD symptoms they experience, their childhood maltreatment (and trauma) related experiences, and the presence or absence of distinct PTSD symptoms. Furthermore, given the reviewed etiological theories and research, these three variables appear to also uniquely influence distinct components of each other. Therefore, understanding whether there is meaningful variability in the interplay of BPD symptoms, childhood maltreatment experiences, *and* PTSD symptoms, and whether such unique combinations impact BPD treatment outcomes in individuals with BPD, could allow clinicians to more readily identify which subgroups of clients require added (e.g., longer duration of DBT) and/or alternative (e.g., inclusion of trauma-focused interventions) BPD treatment elements. This study therefore used LPA aimed to evaluate whether, in individuals with BPD, there are 1) meaningful subgroups of BPD symptoms, childhood maltreatment experiences (including childhood trauma), and PTSD symptoms; and 2) whether these subgroups predict distinct BPD-relevant primary and secondary treatment responses in standard DBT. This question was examined in trauma-exposed individuals with BPD exclusively because PTSD symptoms refer specifically to exposure to traumatic events (APA, 2013) and therefore such a sample will ensure that PTSD symptomatology meaningfully aligns with the PTSD diagnosis.

Given the literature reviewed above, we hypothesized that childhood emotional neglect and abuse maltreatment experiences may covary distinctly with emotion dysregulation components of BPD (e.g., affective lability, anger) and PTSD (e.g., non-specific PTSD symptoms), while Criterion A related traumatic events (i.e., sexual abuse and physical abuse) may covary explicitly with the behavioural dysregulation components of BPD (e.g., self-injury, impulsivity) and elevated hallmark PTSD symptom severity (e.g., re-experiencing, avoidance). Given the data-driven nature of this study, we considered the variability of other BPD symptoms in the LPA, and the differential effects of profile membership on DBT response exploratory in nature.

## Methods

This study involves a secondary data analysis of data collected through a multi-site randomized clinical trial: the FASTER DBT Study. For comprehensive sample characteristics and procedures, please refer to the parent study protocol (McMain et al., 2018; McMain et al., under review). The parent study was a two-site, single-blind, two-arm randomized controlled trial. 240 total participants were enrolled in the study and randomized to receive either six- or 12-months of standard DBT. All participants were enrolled to participate at one of two study locations: 1) the BPD Clinic at the Centre for Addiction and Mental Health (CAMH) in Toronto, Ontario (n=160); and 2) the Personality and Emotion Research Laboratory, in collaboration with the DBT Centre, in Vancouver, British Columbia (BC; n=80). All procedures detailed in the below sections were harmonized and thus conducted consistently across study sites.

### Participants

Participants were between 18 and 65 years old and met diagnostic criteria for BPD based on the International Personality Disorders Examination – BPD Module (IPDE-BPD; Loranger et al., 1994). The IPDE-BPD is a semi-structured interview that examines the presence of BPD

symptoms over the past five years and before age 25. Items on the IPDE-BPD correspond to specific BPD criteria (e.g., emotional lability, interpersonal instability), and use of the instrument can determine presence or absence of a BPD diagnosis. Participants also engaged in current and chronic self-injury (i.e., engaged in two or more episodes of suicidal or NSSI in the past five years, including at least one episode in the 8 weeks prior to baseline assessment). Additional inclusion criteria for the study involved being proficient in English, reporting that they had not received eight or more weeks of standard DBT in the year prior to study enrolment, providing informed consent to participate, and reporting that they had either Ontario Health Insurance Plan (OHIP) or BC Medical Services Plan (MSP) health insurance throughout the year prior to study enrolment. Finally, the Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders-IV for Axis I Disorders (SCID-I; First et al., 2002) and Structured Clinical Interview for DSM-IV Axis II Personality Disorders (SCID-II) were administered to characterize the sample with respect to presence of diagnostic comorbidities (e.g., mood or anxiety disorders; comorbid personality disorder presence). A summary of diagnostic comorbidities for the present sample are presented in Table 1.

Individuals were excluded from study participation if they met DSM-IV (APA, 2000) criteria for a psychotic disorder, bipolar I disorder, or dementia as assessed by the SCID-IV (First et al., 2002), or had a chronic or serious physical health problem requiring hospitalization within the year following study enrolment. Participants were also excluded if they had an estimated IQ of less than or equal to 70, or if they reported plans to move outside of the province in the two years following study enrolment.

Of the 240 participants involved in the parent study, those who were identified as trauma-exposed (i.e., reported exposure to a traumatic event at any point in their lifetime, prior to study

enrolment) comprised the 192-person subsample examined in the present study. Events were considered to be traumatic if they met the definition of Criterion A trauma outlined in the DSM-5 (APA, 2013). Individuals were thus identified as "trauma-exposed" if: 1) they reported a traumatic event on the PTSD Checklist for DSM-5 (PCL-5; Weathers et al., 2013), a self-report questionnaire; or 2) they were assigned a diagnosis of PTSD based on the Structured Clinical Interview for DSM-IV (SCID-IV; First et al., 2002) prior to study enrolment (which requires assessors confirming that participants experienced a Criterion A exposure).

## Measures

### *Sample Characterization*

**Demographics.** Age, gender, income, and education were elicited through administration of the *Demographic Data Schedule* (DDS; Linehan, 1982) at baseline only. The DDS is a structured interview that was administered to all participants by trained research assessors, to be described below.

**BPD Diagnosis and Symptoms.** BPD symptoms were assessed at baseline using the *IPDE-BPD* (Loranger et al., 1994). The IPDE-BPD is a semi-structured interview that examines the presence of BPD symptoms over the past five years and before age 25. Items on the IPDE-BPD correspond to specific BPD criteria (e.g., emotional lability, interpersonal instability), and use of the instrument can determine presence or absence of a BPD diagnosis. All 9 items assessing each BPD criteria at baseline were included in the LPA. A recent systematic review reported good test-retest reliability of the IPDE-BPD, as well as high interrater reliability of the dimensional assessment of BPD, showing an intraclass correlation coefficient (ICC) of 0.93 (Carcone et al., 2015). The IPDE-BPD also demonstrated strong interrater reliability and high temporal stability in previous work (Mann et al., 1999). The IPDE-BPD, and all interviews

delineated below, in the parent study was administered by undergraduate-, graduate-, and post-doctoral level trainees, who were trained to reliability against a gold standard assessor. Assessors were supervised by study principal and co-investigators who are clinical psychologists, one of which was also the gold standard assessor. Inter-rater reliability for BPD diagnosis in the parent study was also good to excellent (intraclass correlations: 0.75 - 0.92).

**Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I; First et al., 2002).** The SCID-I is a reliable and valid structured clinical interview administered to assess presence of what previously were termed "Axis I" disorders at baseline. It generally demonstrates adequate to good interrater reliability, with kappas ranging between 0.60 to 0.83 (Lobbestael et al., 2011).

**Structured Clinical Interview for DSM-IV Axis II Personality Disorders (SCID-II; First et al., 2004).** The SCID-II is a structured clinical interview used to assess the presence of what were formally identified as "Axis II" disorders at baseline. Interrater reliability coefficients of SCID-II administration in an adult sample of participants from a larger pare 0.77 to 0.94 for categorical diagnoses, and had an average ICC value for trait and sum score of all personality disorder scores of 0.82 and 0.84 respectively (Lobbestael et al., 2011).

### *Other LPA Items*

**Childhood Maltreatment Experiences.** Childhood maltreatment experiences were examined at baseline only, using the *Childhood Trauma Questionnaire-Short Form* (CTQ-SF; Bernstein & Fink, 1998; Bernstein et al., 2003). The CTQ-SF is a 28-item self-report questionnaire that assesses exposure to five types of childhood maltreatment: sexual abuse (e.g., "Someone tried to touch me in a sexual way, or tried to make me touch them"), emotional abuse (e.g., "People in my family called me things like 'stupid,' 'lazy,' or 'ugly'"), emotional neglect

(e.g., “There was someone in my family who helped me feel that I was important or special”), physical abuse (e.g., “I got hit so hard by someone in my family that I had to go see a doctor or go to the hospital”), and physical neglect (e.g., “I didn’t have enough to eat”). Some of these maltreatment types are consistent with DSM-5 definitions of trauma (e.g., physical abuse, sexual abuse). Each item begins with the phrase “When I was growing up,” and is rated by individuals on a Likert scale ranging from 1 (never true) to 5 (very often true). Some items are also reverse coded (e.g., “I am loved”), such that a lower score on that item reflects more severe maltreatment. All maltreatment variables were included in the LPA. The CTQ-SF is a reliable and valid measure of childhood maltreatment experiences. For example, in a psychometric validation study, the CTQ-SF was substantially correlated with the childhood experiences questionnaire-revised (CEQ-R; Zanarini, 1989), such that the majority of the significantly positively correlated items on these scales demonstrated large effect sizes. Each CTQ-SF subscale was also highly correlated with either a direct CEQ-R subscale, or several related items, providing further support for strong convergent validity (Kongerslev et al., 2019). Internal reliability for the present study was strong, as exemplified by Cronbach alphas of 0.902 for the overall scale, as well as 0.947, 0.924, 0.963, 0.898, and 0.736 for the emotional abuse, physical abuse, sexual abuse, emotional neglect, physical neglect subscales respectively.

**PTSD Symptoms.** PTSD symptoms were assessed at baseline and over time using the *PCL-5 with Criterion A* (Weathers et al., 2013). The PCL-5 with Criterion A is a 26-item self-report measure that assesses severity of PTSD symptoms based on the DSM-5 and asks individuals to describe the traumatic event that is currently most distressing to them. Individuals rate the experience of their symptoms (e.g., “Repeated, disturbing, and unwanted memories of the stressful experience”) with reference to the traumatic event that they described on a 5-point

Likert scale from 0 (not at all) to 4 (extremely) over the past month. All 20 questions assessing symptom severity were included in the LPA. Additionally, as aforementioned, the Criterion A description was examined to help determine whether an individual endorsed exposure to a traumatic event, as defined by the DSM-5 (APA, 2013), and thus were included in the examined subsample for the present study. The PCL-5 is also a reliable and valid measure of PTSD symptoms. In a psychometric evaluation in a veteran population, the PCL-5 demonstrated good test-retest reliability ($r = 0.84$) as well as good discriminant and convergent validity (Bovin et al., 2016). Internal reliability for the present study was strong, as exemplified by Cronbach alpha of 0.923.

### *Treatment Outcomes*

Consistent with BPD treatment research (e.g., McMain et al., 2009; 2012; Kliem et al., 2010; Linehan et al., 2015), BPD-relevant treatment outcomes that were examined are:

**BPD Severity.** The *Borderline Symptom List-23* (BSL-23; Bohus et al., 2007; 2009) was administered at baseline and over time to measure changes in BPD severity. The BSL-23 is a self-report scale that assesses the severity of BPD symptoms and related experiences in the past week. Participants are presented with 23 statements reflective of various problems common to BPD (e.g., “I thought of hurting myself”), and are asked to rate the degree to which they suffer from each on a Likert scale ranging from 0 (not at all) to 4 (very strong). The BSL-23 has previously exhibited high internal consistency (Chronbach alpha’s ranging from 0.935-0.969), and clearly discriminates individuals with BPD compared to those with another Axis I Diagnosis (Bohus et al., 2009). The Cronbach alpha of the present study was .93.

**Self-Injurious Behaviours.** The *Suicide Attempt Self-Injury Interview* (SASII; Linehan et al., 2006) was administered at baseline and over time to measure changes in frequency of self-

injurious behaviours. The SASII is a gold standard structured interview that assesses the frequency, intent, medical severity and topography of suicidal and NSSI in the past three months. The frequency of suicide attempts and NSSI was a primary outcome in the present study. Consistent with previous literature, in this study we examined change in frequency of self-injurious behaviour, which encapsulated engagement in suicidal and/or non-suicidal self-injurious behaviours, given the low base rate of individual suicide and NSSI behaviours (e.g., Barnicot & Crawford, 2019; Carter et al., 2010). The SASII previously demonstrated high interrater reliability, with ICCs ranging from 0.871-0.978, and adequate validity (Linehan et al., 2006).

**Suicidal Ideation.** The *Beck Scale for Suicidal Ideation* (BSI; Beck & Steer 1991) was administered at baseline and over time to examine changes in suicidal ideation. The BSI is a 21-item self-report questionnaire that assesses the duration, frequency and severity of suicidal ideation and intent over the past week, including the day of the assessment. Each item is presented to participants with three associated options reflecting varying ranges of severity, and are associated with a score of 0, 1, or 2, with 2 reflecting the highest severity suicidal ideation and/or intent. For instance, the fourth item presents participants with the following three options, and they are instructed to select which item best describes how they've been feeling in the past week, including today: "I have no desire to kill myself," "I have a weak desire to kill myself," and "I have a moderate to strong desire to kill myself." The reliability and validity of the BSI are well established (e.g., studies consistently report a Chronbach alpha of at least 0.85; Esfahani et

al., 2015). The Cronbach alpha for the screening items of the BSI for the present study at baseline was .85.[2]

**PTSD Symptom Severity.** As aforementioned, the 20-items, excluding the Criterion A description, of the *PCL-5 with Criterion A* (Weathers et al., 2013) were used to assess changes in PTSD symptom severity over time.

***Class Characterization Measures***

The following measures were examined at baseline for all participants included in the LPA analyses to characterize the classes.

**Depression Symptom Severity.** The *Beck Depression Inventory-II* (BDI-II; Beck et al., 1996) was administered at baseline to all participants. The BDI-II is a 21 item self-report questionnaire that measures depression symptom severity. Participants are presented with 21 groups of statements that reflect varying degrees of severity for any given item, and are asked to select which statement most accurately reflects the way they have been feeling for the past two weeks, including the day of the assessment. For example, with respect to the prompt, "Sadness," participants are presented with and asked to select one of the following four options: "I do not feel sad," "I feel sad much of the time," "I am sad all the time," and "I am so sad or unhappy that I can't stand it. Higher scores reflect higher depression severity. The Cronbach alpha for the present study at baseline was .90.

**Emotion Dysregulation.** The *Difficulties with Emotion Regulation Scale* (DERS; Gratz & Roemer, 2004) was administered at baseline to all participants. The DERS is a 36-item self-

[2] The first five items of the BSI are mandatory screening items that determine whether participants will subsequently complete the remaining items. If participants endorse a score of 1 or greater on item four (described above) or 5 (which assesses passive suicidal desire), they are prompted to complete the remaining 19 items. Given that items 6 through 21 are thus inconsistently completed by participants, the Cronbach alpha for the present study at baseline was calculated based upon the first five required screening items.

report questionnaire that asks participants to indicate the extent to which various statements reflection emotion dysregulation generally apply to them (e.g., "When I'm upset, I become angry with myself for feeling that way"). Participants rate each item on a likert scale from 1 (almost never/0-10% of the time) to 5 (almost always/91-100% of the time). The Cronbach alpha for the present study at baseline was .90.

**Interpersonal Problems.** The *Inventory of Interpersonal Problems-64* (IIP-64; Horowitz et al., 1988) was administered at baseline to all participants. The IIP-64 is a 64-item self-report questionnaire that examines types and severity of interpersonal difficulties individuals may experience. Individuals are presented with an item (e.g., "Be aggressive toward other people when the situation calls for it") and asked to indicate the extent to which each statement has been problematic with any significant individual in their life by indicating how distressing each item is on a likert scale from 0 (not at all) to 4 (extremely). The Cronbach alpha for the present study at baseline was .90.

**General Psychiatric Distress.** The *Symptom-Checklist-90-Revised* (SCL-90-R; Derogatis, 1983) was administered at baseline to all participants. The SCL-90-R is a 90 item self-report questionnaire that assesses an individual's general level of psychiatric symptom distress. Participants are presented with each item (e.g., "Feelings of being trapped or caught") and asked to rate the extent to which the problem has distressed or bothered them in the past seven days on a likert scale from 0 (not at all) to 4 (extremely). The Cronbach alpha for the present study at baseline was .96.

## Treatment

The primary aims of the parent randomized control study involved examining the clinical and cost-effectiveness of an abbreviated duration of standard DBT (i.e., 6-months, the

experimental condition), compared to standard DBT (i.e., 12-months, the control condition; Linehan 1993; 2015). Standard DBT (i.e., 12-months) is an evidence-based, cognitive behavioural therapy that initially was designed for the treatment of chronically suicidal individuals with BPD (Linehan 1993; 2015). In developing DBT, Marsha Linehan drew on three primary principles: Zen Buddhism, dialectical philosophy, and behavioural science. As an intervention, DBT has five predominant functions: 1) Enhance capabilities; 2) Increase motivation; 3) Enhance generalization to individuals' natural environment; 4) Structure one's environment; and 5) Enhance therapist capabilities and motivation to intervene effectively (Linehan 1993; Lynch et al., 2007). It accomplishes these functions through the following four distinct modes of intervention delivery: 1) individual therapy; 2) group skills training; 3) phone coaching to provide skills training (available 24 hours a day); and 4) therapist consultation team meeting (2 hours per week).

In the parent study, the 6-month and 12-month treatments were identical and involved delivery of all four modes as described in standard DBT. The only difference between treatment conditions was the duration of intervention: participants who were randomly assigned to the 6-month DBT condition received 6-months of standard DBT, while those enrolled in the 12-month condition received 12-months of standard DBT. Participants were not restricted in their use of psychotropic medications. Clinicians were masters or doctoral level therapists who completed formal DBT Basics training, at minimum, and had at least two-years of supervised experience treating individuals with BPD. Additionally, adherence to the treatment manual was assessed as part of the parent study. A total of 336 individual and 62 group therapy sessions were watched by graduate-level coders masked to treatment condition and evaluated for DBT treatment adherence (Linehan & Korslund, 2003). Computed Global Scores of greater than or equal to four are

considered adherent to DBT. In the parent study for individuals in the 12-month condition, inter-rater reliability with a gold standard coder on adherence was good for individual (M = 4.15, SD = 0.21) therapy. For all groups (i.e., 6- and 12-months), group therapy adherence was also good (M = 4.13, SD = 0.17). In the present study, DBT treatment response was examined exclusively for participants in the 12-month condition. This was done in an effort to increase generalizability of results, given the 6-month condition was considered experimental and its efficacy in the literature has remained unexamined, though the 12-month arm has robust empirical support (De Cou et al, 2019).

**Procedures**

Study procedures were approved by relevant institutional review boards. In the parent study, all interested participants first completed a brief phone screening assessment with a trained research assistant. All participants suspected to be eligible based upon this screen were then invited to attend, and completed, in-person screening assessments to determine suitability for study participation. In-person screening assessments were administered by trained undergraduate-, graduate-, and post-doctoral fellowship-level assessors under the supervision of licensed clinical psychologists. All assessors in the parent study were trained to reliability against a gold-standard assessor, one of the supervising licensed clinical psychologists. Participants who were deemed eligible for study participation based on this in-person screening assessment also completed a baseline assessment which took place over two-days, and was comprised of the aforementioned measures, as well as several others (for a comprehensive list of administered assessments, see McMain et al., 2018). Individuals who completed baseline assessments were then enrolled into the study, and randomly assigned to receive 6- or 12-months of standard DBT (Linehan 1993; 2015), as described.

All participants were invited to complete research assessments containing the *Treatment Outcomes* measures detailed above, prior to beginning treatment (i.e., baseline, 0-months), in addition to throughout and following treatment at 9 additional time points: 3-, 6-, 9-, 12-, 15-, 18-, 21-, and 24-months after participants' first individual therapy session. The 15-, 18-, 21-, and 24-month timepoints reflect the one-year follow-up period after treatment completion.

**Data Analytic Strategy**

***Phase 1: Identifying Subgroups***

Phase 1 analyses applied LPA in M-Plus to identify distinct subgroups of childhood maltreatment experiences, PTSD symptoms, and BPD symptoms in trauma-exposed individuals with BPD (n=192), randomized to 6- or 12-months of standard DBT. LPA is a multivariate data analytic approach that can be applied to identify distinct subgroups within a heterogeneous population. LPA identifies subgroups of individuals within a data set based on unobserved (i.e. latent) characteristics. All item-level responses elicited from the above *LPA Items* were included in the LPA.

Consistent with the general practice of LPA analyses, a two-class model fit was first considered. We then increased the number of classes one by one for each subsequent model, until the addition of more classes was no longer warranted based upon several fit indices. A total of four models were examined and considered for optimal fit. Several fit indices were considered to determine best fit, such as the Vuong-Lo Mendell Rubin likelihood ratio test (VLMR; Lo et al., 2001; Vuong, 1989), Akaike Information Criterion (AIC; Akaike, 1987), Bayesian Information Criterion (BIC) and the parametric Bootstrapped Likelihood Ratio Test (BLRT). While each of these indices were considered, a particular emphasis was placed on the BLRT and BIC given they consistently successfully determine optimal fit (Nylund et al., 2007). However, it

is also essential to examine each model while also taking into consideration external factors such as extant theory, and the clinical utility and interpretability of results, as well as other indices that suggest a particular number of class model is a good fit (e.g., entropy).

Additionally, a maximum likelihood estimator with robust standard errors was used to examine all models in this study. Furthermore, given concerns that the model may converge on a false maximum likelihood, previous researchers recommend estimating these models by adding multiple random sets of start values (e.g., Hipp & Bauer, 2006; McLachlan & Peel, 2000). Therefore, in present analyses the number of random starts used was 1000, and 50 iterations for each random start. The analyses indicated that the best log-likelihood value was replicated in each model.

Finally, the IPDE-BPD item examining the presence of suicidal or non-suicidal self-injurious thoughts, behaviours, threats, and gestures was excluded from analysis. This item reflected one of the parent study inclusion criteria, requiring that, at the time of eligibility assessment, all participants endorsed chronic and recent self-injurious behaviours that occurred at least twice in the past five years, with at least one of those times occurring within the past eight weeks. Given this, this criterion did not show sufficient variability to offer discriminatory value in generating subgroups through the conducted LPA. Therefore, only eight of nine BPD criteria were included in the LPA.

***Phase 2: Examining whether the identified subgroups predict BPD treatment outcomes***

Generalized Estimating Equations (GEE; Hubbard et al., 2010) were conducted using SPSS version 27 to determine whether the identified subgroups from Phase 1 differentially predicted BPD-relevant outcomes, as outlined in the *Treatment Outcomes* measures section above, across multiple timepoints (e.g., 6-, 12-, 18-, and 24-months). As aforementioned, given

6-months of DBT was experimental in the parent study, whether these subgroups predicted treatment outcomes in the present study was examined exclusively for participants in the 12-month DBT condition (i.e., standard DBT; N=98), which has extensive empirical support (e.g., DeCou et al., 2019). Finally, an intent-to-treat approach was applied to retain available data from all participants, independent of treatment completion status.

GEE is a semi-parametric derivation of generalized linear modeling. It allows participants with missing data to be retained to maximize statistical power. It allows enables outcome variable measurement over time. For each GEE analysis, autoregressive, exchangeable, and unstructured covariance structures were considered. Covariance structures that evinced the lowest Quasilikelihood under the Independence Model Criterion (QIC) value were retained and interpreted. Self-injurious behaviour in this study was a count variable that was positively skewed (skew statistics of data from baseline to 24-months ranged from 2.844 to 36.933). Therefore, analyses examining self-injurious behaviour specified a negative binomial distribution in all covariance structures. Finally, some researchers postulate concerns that applying multiple test corrections may distort results in psychological research (e.g., Bonferroni corrections; e.g., O'Keefe, 2003; Armstrong, 2014). Therefore, such corrections were not used in present analyses.

Separate GEE analyses were conducted for each treatment outcome to examine whether class (i.e., identified subgroup) membership predicts the rate of change of each treatment outcome. For each analysis, the treatment outcome (i.e., BSI, BSL-23, SASII, PCL-5) measured at each time point (e.g., baseline, 3-, 6-, 9-, 12-, 15-, 18-, 21-, and 24-months from the individual therapy start date) was entered as the outcome. Class (i.e., Low-, Moderate-, or High-Maltreatment, as will be explicated in the results section below) and time (i.e., from baseline to 3-, 6-, 9-, 12-, 15-, 18-, 21-, and 24-months) were included in each analysis as predictor

variables. Two-way interactions between class and time were then added to examine whether class membership differentially predicted the rate and magnitude of change in each BPD-relevant treatment outcome over time.

## Results

The mean age of the full sample (N=192) was 28.15 (SD = 8.89), and 79.7% identified their gender as female, 14.6% identified as male, and 5.7% identified as other. With respect to socio-economic status, most participants (20.3%) reported currently earning less than $5000, 19.8% earned between $10,000 and $14,999, and the 17.2% earned between $5000 and $9999. Finally, the most highly reported education category was “having some post-secondary education” (30.2%).

With respect to relevant clinical characteristics, based upon the SCID-I, participants reported having several lifetime (M=5.37; SD = 2.349) and current (M=3.01; SD = 1.825) comorbid diagnoses, although this ranged from endorsement of one to 13 comorbid diagnoses for lifetime, and from one to 10 for current comorbidities. Additionally, 61.5% of participants endorsed symptoms consistent with PTSD at some point throughout their lifetime, and 42.2% met diagnostic criteria for current PTSD at the baseline assessment. Based upon the administration of the SCID-II, comorbid personality disorder diagnoses in the present sample were low (M=0.55; SD = 0.89). A comprehensive delineation of the sample diagnostic comorbidities is presented in Table 1. Table 2 also presents the means and standard deviations (SD) of LPA items and all measures used to characterize the classes at baseline, for all participants. Table 3 presents the means and SDs of the treatment outcome variables for only the 12-month participants included in outcome analyses at baseline and all subsequent timepoints.

## Phase 1: Identifying Subgroups of Childhood Maltreatment Experiences, PTSD and BPD Symptoms

### *LPA Class Number Selection*

Table 4 presents the fit indices for all examined class models. In the present analyses, the BLRT was the primary indicator of optimal statistical fit, with a *p* value of $\alpha = .05$. A statistical significance level (i.e., $\alpha$) of 0.05 reduces the probability of making a Type I error (i.e., rejecting the null hypothesis when it is in fact true) to 5%. This suggests that there is less than or equal to a 5% chance that results demonstrate a statistically significant difference, when in actuality there is no difference between, in this case, classes.

Although entropy does not determine the optimal model fit, it offers an indication of the model's accuracy, with values closest to 1 evincing the least number of classification errors (i.e., whether individuals are estimated to be in the correct class; Raykov et al., 2020). In the LPAs tested in the present study, the entropy for all models was high, ranging from 0.917 – 0.950, suggesting minimal classification errors. The two-, three-, and four- class models each converged and retained statistical significance given the BLRT. Additionally, the two-, three-, and four-class models had increasingly lower sample-size adjusted BIC values of 18719.958, 18400.003, and 18284.953 respectively, as presented in Table 4. The BLRT values for the two-, three-, and four-class models were all 0.000. Across all models, the VLMR did not attain statistical significance, suggesting that based on this fit index, the two-, three-, and four- class models were not meaningfully distinct. Furthermore, the AIC values for the two-, three-, and four-class models were 18711.696, 18388.688, and 18270.584 respectively, such that decreases in each subsequent model are indicative of improved fit (Tein et al., 2013). Although the four-class model had a lower BIC than the three-class model, and retained statistical significance based

upon the BLRT, the clinical interpretability and utility of the three-class model was superior to the four-class model. Specifically, the four-class model retained a group that was distinctly high in all maltreatment-related experiences and PTSD symptom severity, and divided the remaining individuals among three highly similar classes, each of which showed lower scores across all maltreatment-related experiences. Given an absence of meaningful variability within the four-class model, a three-class model was identified as the optimal fit, given it also showed lower AIC and sample-size adjusted BIC values compared the two-class model and retained a statistically significant BLRT value. Class 1 captured the smallest number of participants (n=27), while Class 2 and Class 3 each captured a similar number of participants: 80 and 85 respectively.

***LPA Class Qualitative Descriptions***

Please see Figure 1 for a graphic representation of the three classes. Classes were not differentiated on the basis of any BPD symptoms based on the IPDE-BPD, as all participants showed a similarly high number of IPDE-BPD criteria endorsement. In general, classes were distinguished on the basis of severity of maltreatment experiences and PTSD symptoms, rather than exhibiting variability in the specific symptoms that were elevated or reduced. Class 1 (n = 27; 14.06%) was the smallest class and was best characterized by low levels of PTSD symptom severity across all item responses on the PCL-5, and had the lowest levels of childhood maltreatment experiences across all subscales of the CTQ. Therefore, Class 1 was labeled the "Low Maltreatment" subgroup. Class 2 (n=80; 41.67%) was the second largest class, and was best characterized by moderate levels of PTSD symptom severity across all PTSD symptoms. Class 2 exhibited slightly higher levels of childhood maltreatment experiences across all subscales of the CTQ than did Class 1. Class 2 was labeled the "Moderate Maltreatment" subgroup. Finally, Class 3 (n = 85; 44.27%) was characterized by the highest levels of PTSD

symptom severity across all item-level responses on the PCL-5. Class 3 also demonstrated the highest levels of all subscales of childhood maltreatment experiences based upon the CTQ. Class 3 was labeled the "High Maltreatment" subgroup.

Importantly, within each class, childhood emotional abuse and emotional neglect were more severe compared to other forms of childhood maltreatment experiences (i.e., sexual abuse, physical abuse, and physical neglect) based on the CTQ. Additionally, within each class, item-level responses on the PCL-5 were highest in severity for questions related to emotional reactivity, experiencing strong negative beliefs about oneself other people or the world, and experiencing intense negative emotions (e.g., fear, horror, anger, guilt, or shame) (i.e., "non-specific" PTSD symptoms), compared to responses on other PTSD symptoms. Although these patterns (e.g., higher severity childhood emotional abuse and neglect scores relative to other childhood maltreatment items) were consistent across each group, Class 3 showed the highest scores of each of these types of experiences, compared to Class 2, which was only slightly more elevated in these childhood maltreatment experiences compared to Class 1. The same pattern held for the aforementioned heightened PTSD symptoms.

***LPA Class Clinical Characterizations***

A breakdown of the one-way ANOVA and Tukey HSD Post-Hoc analyses reflecting the class characterization analyses is presented in Tables 5 and 6 respectively. With respect to clinically relevant characteristics measured at baseline (e.g., depression, general psychiatric distress), Class 3 exhibited higher depression symptom severity, emotion dysregulation than Classes 2 and 1, which did not differ from each other. Class 3 also exhibited higher levels of interpersonal problems and general psychiatric distress than Class 2, which in turn exhibited higher levels of interpersonal problems and general psychiatric distress than Class 1.

Several one-way ANOVA and subsequent Tukey HSD post hoc analyses were also conducted to examine statistically significant differences between classes on all BPD-relevant treatment outcomes at baseline (i.e., PTSD symptom severity, BPD symptom severity, frequency of self-injurious behaviours, and suicidal ideation) for participants in the 12-month condition that were included in outcome analyses. These results are briefly summarized below.

A one-way ANOVA revealed statistically significant differences between classes at baseline on PTSD symptoms ($F(2, 95) = 207.070$, $p = .000$). Specifically, a Tukey HSD post-hoc test revealed Class 3 PTSD symptom severity was significantly higher than Class 2 (19.326 +/- 1.671, $p = .000$) and Class 1 (42.603 +/- 2.151, $p = .000$). Class 2 also exhibited significantly higher PTSD symptom severity than Class 1 (23.277 +/- 2.190, $p = .000$). Classes also differed with regard to BPD symptom severity at baseline based on the BSL-23 ($F(2, 95) = 16.018$, $p = .000$), such that Class 3 exhibited significantly higher BPD symptom severity than Class 2 (.624 +/- .153, $p = .000$) and Class 1 (1.009 +/- .197, $p = .000$), although Class 2 did not differ from Class 1 (.385 +/- .200, $p = .138$). Statistically significant differences in suicidal ideation also emerged at baseline based on the BSS (($F(2, 95) = 6.743$, $p = .002$). Class 3 exhibited higher suicidal ideation than Class 2 (5.237 +/- 1.730, $p = .009$) and Class 1 (6.765 +/- 2.226, $p = .009$), while Class 2 did not differ from Class 1 (1.528 +/- 2.267, $p = .009$). Finally, there were no statistically significant differences between classes on the frequency of engagement in self-injurious behaviour at baseline (($F(2, 95) = .482$, $p = .619$).

**Phase 2: Examining Whether the Identified Subgroups Predict DBT Treatment Outcomes**

GEE analyses examining whether the identified subgroups predict BPD-relevant treatment outcomes are presented in Tables 7 (BPD symptom severity), 8 (self-injurious behaviours) 9 (suicidal ideation), and 10 (PTSD symptom severity).

A significant class×time interaction predicted frequency of all self-injurious behaviour over the course of treatment. Parameter estimates indicated that individuals in Class 1 exhibited a faster decline in the frequency of self-injurious behaviours compared to Class 2 (B=.679, *SE*=.172), $\chi^2(1)=15.610$, *p*=.000, and Class 3 (B=.670, *SE*=.188), $\chi^2(1)=12.694$, p=.000. Class 2 and Class 3 did not differ in their rate of change of frequency of self-injurious behaviours $\chi^2(1)=.009$, p=.926.

A significant class×time interaction predicted PTSD symptom severity over time. Parameter estimates indicated that individuals in Class 1 and Class 2 did not differ in their rate of change of PTSD symptom severity, $\chi^2(1)=1.989$, *p*=.158. Individuals in Class 1 exhibited a faster decline in PTSD symptom severity compared to Class 3 (B=.-2.112, *SE*=.6895), $\chi^2(1)=9.381$, p=.002. Class 2 and Class 3 also differed in their rate of change of PTSD symptom severity, such that Class 2 exhibited a faster decline in PTSD symptom severity compared to Class 3 (B=1.373, *SE*=.652), $\chi^2(1)=.4.431$, p=.035.

There were no statistically significant class×time interactions predicting changes in BPD symptom severity or suicidal ideation. However, there were statistically significant main effects of Class predicting BPD symptom severity and suicidal ideation. For BPD severity, parameter estimates revealed that Class 1 and Class 2 did not differ in BPD symptom severity (B=.316, *SE*=.261), $\chi^2(1)=1.473$, *p*=.222. Individuals in Class 3 showed higher levels of BPD symptom severity than those in Class 1 (B=.804, *SE*=.255), $\chi^2(1)=9.941$, *p*=.002, and those in Class 2 (B=.488, *SE*=.165), $\chi^2(1)=8.727$, *p*=.003. For suicidal ideation, parameter estimates indicated that Class 1 and Class 2 did not differ in levels of suicidal ideation (B=2.838, *SE*=2.349), $\chi^2(1)=1.460$, *p*=.227. Individuals in Class 3 showed higher levels of suicidal ideation than those

in Class 1 (B=5.949, *SE*=.2.395), $\chi^2(1)=6.173$, $p=.013$, but did not differ from Class 2 (B=3.112, *SE=1.684*), $\chi^2(1)=3.413$, $p = .065$.

## Discussion

Extant literature suggests that childhood maltreatment experiences and PTSD symptoms are highly correlated with, uniquely covary with, and evince deleterious effects on, BPD symptoms (e.g., Carvalho et al., 2014; Porter et al., 2019; Frías & Palma, 2015). However, a dearth of literature obfuscates whether, which, and how distinct BPD symptoms, childhood maltreatment experiences, and PTSD symptoms interact with one another. Additionally, no research to date has examined whether these distinct subgroups differentially predict BPD-relevant treatment outcomes. Identifying whether distinct profiles of individuals based on the unique covariation of such experiences and symptoms, and whether these profiles influence treatment outcomes, is essential to optimize BPD treatment outcomes by tailoring treatment approaches (e.g., longer duration of DBT, or a trauma-focused intervention) to specific individuals. The present study thus addressed these existing gaps in two phases. In Phase 1, LPA was applied to determine whether subgroups of individuals with distinct BPD symptoms, childhood maltreatment experiences, and PTSD symptoms exist in a sample of chronically self-injuring, trauma-exposed individuals with BPD. Phase 2 involved examining whether these identified subgroups differentially predict BPD-relevant DBT treatment response (i.e., BPD symptom severity, suicidal ideation, frequency of self-injurious behaviours, and PTSD symptoms). We hypothesized that childhood emotional abuse and neglect would likely covary with emotional components of BPD (e.g., affect instability) and non-specific PTSD symptoms, while sexual and physical abuse would likely associate uniquely with behavioural components of BPD (e.g., impulsivity, self-injury), as well as hallmark PTSD symptoms (e.g., re-experiencing,

avoidance). However, the associated changes of each class within treatment were exploratory given the data-driven nature of study analyses.

**Phase 1: Identified Subgroups**

With respect to Phase 1 analyses, the LPA results indicated that three classes optimally organized the indicators, such that classes were generally stratified on the bases of severity of childhood maltreatment experiences and PTSD symptoms, and each class exhibited the same relative elevations in indicators. The Low Maltreatment class showed the lowest severity of childhood maltreatment experiences and PTSD symptoms. The Moderate Maltreatment class exhibited slightly higher severity of childhood maltreatment experiences and PTSD symptoms compared to the Low Maltreatment Class. The High Maltreatment class displayed the highest severity of childhood maltreatment experiences and PTSD symptoms, such that the difference in severity between the Moderate and High classes with respect to childhood maltreatment experiences was larger than the difference observed between the Low and Moderate Maltreatment classes. The difference in PTSD symptom severity between the Low, Moderate, and High Maltreatment increased by class in similar proportions. Finally, in the present work, distinct BPD symptoms did not differentiate classes. However, ANOVAs revealed that BPD severity *did* differ across Classes, such that the High Maltreatment class was associated with the highest BPD severity compared to the Moderate and Low classes. Similarly to other examined characteristics (e.g., suicidal ideation), however, the Moderate and Low classes did not meaningfully differ in BPD severity from each other. This suggests that although classes did not differ based on the severity of *specific* BPD symptom symptoms, BPD severity did partially covary along with maltreatment and PTSD severity.

This class delineation aligns to previous LPAs examining PTSD, cPTSD, and BPD symptoms wherein class stratification generally occurs on the basis of severity (e.g., Cloitre et al., 2013; 2014; Jowett et al., 2020; Saraiya et al., 2021). It also partially aligns with previous research demonstrating that higher levels of childhood maltreatment experiences and PTSD are associated with, for instance, higher BPD severity (e.g., van Dijke et al., 2013; Cotter et al., 2015; Wingenfeld et al., 2011; Perepletchikova et al., 2012; Brodsky et al., 1997; Frías & Palma, 2015; Pagura et al., 2010; Scheiderer et al., 2015), though not distinct symptom endorsement. Overall, our findings indicate that, in a trauma-exposed BPD sample, childhood maltreatment related experiences and PTSD symptoms appear to covary based on their severity. However, these findings also suggest that there are not distinct experiences or symptoms reflective of one problem (e.g., BPD versus PTSD) that uniquely covary with other distinct experiences or symptoms of another problem.

***Stratification Based on Severity, Not Phenomena***

There are several potential explanations with respect to why classes generally stratified on the basis of severity, rather than unique covariation of various phenomena within the classes. First, it is possible that the sample reflects a particularly high severity BPD group. For instance, as an inclusion criterion for the parent study, participants engaged in chronic and recent self-injurious behaviour at baseline, which reflects a proxy for elevated BPD severity. Additionally, participants in the present study on average endorsed seven out of the nine diagnostic criteria for BPD. Thus, the presence versus absence of BPD symptoms, as captured within this study, may not have sufficiently detected meaningful variability between distinct *symptoms* to differentiate classes. Second and relatedly, the IPDE-BPD, a categorical instrument, may not have captured nuances within distinct BPD symptom *severity.* Indeed, variability in BPD symptom *severity*,

rather than symptom *presence,* may uniquely associate with childhood maltreatment related experiences and PTSD symptoms, though was not examined in the present work. This is particularly relevant given that, in this study, continuous measures of severity for childhood maltreatment-related experiences and PTSD symptoms were indicators in the LPA. Thus, although not examined, it follows that childhood maltreatment experiences and PTSD symptom *severities,* rather than presence versus absence of distinct experiences and symptoms, meaningfully covary in BPD.

Third, the components of BPD pathology that *may* account for differentiation of classes are the underlying mechanisms that characterize and underpin BPD pathology (e.g., emotion dysregulation, interpersonal problems), rather than distinct symptoms, as measured by the IPDE-BPD and included in present analyses, theorized to result from such problems (Fitzpatrick et al., 2021; Linehan, 1993). Indeed, extant literature and theory highlight robust associations between emotion dysregulation and interpersonal problems with childhood maltreatment experiences and PTSD (e.g., Linehan 1993; Dvir et al., 2014; Bateman & Fonagy, 2010; Monson et al., 2010; Ozer et al., 2003). Previous work also revealed significant positive associations between childhood physical and emotional (but not sexual) abuse and emotion dysregulation, and found that difficulties preventing engagement in impulsive behaviours while distressed accounted for additional associations between childhood physical and emotional abuse with probable PTSD (Weiss et al., 2013). Thus, it is possible that the underpinning mechanisms associated with BPD may uniquely covary with PTSD and childhood maltreatment experiences, though this requires testing in future work.

Finally, in the present work, the self-injurious behaviour BPD criterion was removed given an absence of meaningful variability in this item. Previous literature suggests that sexual

abuse is particularly associated with behavioural symptoms of BPD, and in particular the increased frequency of suicide attempts and NSSI, as well as other impulsive behaviours (Soloff et al, 2002; Turniansky et al., 2019). Thus, although our hypothesis that criterion A related traumas (i.e., sexual and physical abuse) may more explicitly lead to behavioural symptoms of BPD, one of the primary behavioural BPD symptoms was not included in the present LPA. Thus this association may have been obfuscated in the present work.

***Heightened Childhood Emotional Abuse and Neglect***

Importantly, each class also exhibited higher severity childhood emotional abuse and neglect experiences compared to other forms of maltreatment (i.e., sexual abuse, physical abuse, or physical neglect). A recent meta-analysis similarly documents significant associations between BPD and distinct forms of childhood adversity, such that the effects of emotional abuse and neglect were largest, compared to sexual abuse, physical abuse, and physical neglect (Porter et al., 2019). Additionally, in another meta-analysis examining the relationship between BPD and childhood sexual abuse specifically, the association was significant but demonstrated only moderate effect sizes (Fossati et al., 1999). Thus, these meta-analyses suggest that although childhood sexual abuse does exhibit meaningful associations with BPD, childhood *emotional* maltreatment may be even more associated with BPD, over and above other forms of childhood maltreatment. Indeed, these results also align to previous work demonstrating that childhood emotional abuse specifically, over and above sexual or physical abuse, predicts BPD symptom severity, as mediated by emotion regulation (Kuo et al., 2015), and emotional lability (Goodman et al., 2003).

Furthermore, in accordance with the Biosocial Model of BPD (Linehan, 1993), BPD is theorized to develop in the context of invalidating environments, which are centrally

characterized by punishing responses to expression of emotion. Such responses overlap most directly with emotional abuse and neglect. Thus, given the chronicity and centrality of these experiences in the development of BPD, their increased severity in the observed sample is unsurprising. Similarly, childhood physical and sexual abuse may simply be less common in BPD compared to emotional abuse and neglect. Further, physical and sexual abuse may also inherently contain emotional abuse or neglect, while the reverse is not necessarily true, which may have been captured by reports of increased emotional abuse and neglect severity, which on the CTQ specifically indicates variations in frequency of occurrence. This suggests that emotional abuse and neglect may, for example, occur daily, as opposed to sexual or physical abuse which may reflect occasionally occurring traumas.

***Heightened PTSD Symptom Severity***

Finally, each class showed higher levels of the following PTSD symptoms compared to others: emotional reactivity, intense negative emotion, and strong negative beliefs about oneself other people and the world. This aligns to previous research demonstrating deficits in emotional reactivity and experiences of intense negative emotion in BPD (e.g., Kuo et al., 2016; Elices et al., 2012; Feliu-Soler et al., 2013; Dixon-Gordon et al., 2013; Chapman et al., 2015). Previous work also suggests that those with BPD exhibit strong negative beliefs about themselves, and evince low levels of self-esteem (e.g., Winter et al., 2017). As discussed, we consider re-experiencing (e.g., intrusive memories of the traumatic event) and avoidance symptoms to be hallmark symptoms of PTSD, compared to other "non-specific" PTSD symptoms (e.g., intense negative emotion) which may characterize a range of disorders (Dalgleish & Power, 2004; Larsen & Pacella, 2016). The LPA revealed that, although participants endorsed hallmark PTSD symptoms, the non-specific PTSD symptoms that also overlap with BPD pathology (e.g.,

emotional reactivity, intense negative emotion) are more severe in this sample. Indeed, although not tested in the present study, childhood maltreatment experiences may contribute to elevated, shared pathology of PTSD and BPD (i.e., non-specific PTSD symptoms), rather than eliciting a presentation of PTSD characterized by elevated severity of hallmark PTSD symptoms. This may be particularly relevant given that the most common childhood maltreatment experiences in this study involved emotional abuse and neglect, which do not reflect Criterion A trauma required of a PTSD diagnosis, as defined by the DSM-5 (APA, 2013). Indeed, some theorists suggest that, for most individuals, PTSD symptoms (i.e., including hallmark as well as other PTSD symptoms), will not develop unless exposed to an event captured by the Criterion A definition (Friedman et al., 2010).

In summary, results suggest that there are three profiles of individuals with BPD, such that each vary in severity. Additionally, within this sample, classes are generally associated with higher severity childhood emotional abuse and neglect compared to other forms of childhood maltreatment experiences (i.e., physical abuse, physical neglect, sexual abuse), and higher levels of non-specific PTSD symptoms (e.g., emotional experiencing that involves emotional reactivity, negative beliefs about oneself, and generally intense negative emotion) compared to other hallmark PTSD symptoms. Thus, given an absence of unique symptom or experience covariations in trauma-exposed individuals with BPD, examining whether classes may be identified on the basis of exacerbated underlying mechanisms accounting for BPD pathology (e.g., emotion dysregulation, interpersonal problems) may further elucidate the unique covariations of these symptoms and experiences. However, this hypothesis was not examined in the present LPA and requires examination in future work.

**Phase 2: Predicting DBT Treatment Response**

With respect to Phase 2 analyses, classes differentially predicted the rate of change of self-injurious behaviour frequency and PTSD symptom severity, though did not predict changes in suicidal ideation or BPD symptom severity.

### *Self-injurious Behaviours*

The High Maltreatment class exhibited a slower decline in self-injurious behaviour than the Moderate Maltreatment class, which in turn demonstrated a slower rate of decline in self-injurious behaviour than the Low Maltreatment class, despite the finding that each class exhibited high frequency of engagement in self-injury at baseline, and that classes did not meaningfully differ from each other in this domain. Thus, self-injurious behaviours in the High Maltreatment class in particular appear to be less responsive to DBT, compared to other classes.

First, the direction of this relationship adds to previous literature demonstrating the deleterious impact of childhood maltreatment on suicidal ideation and suicide attempts in BPD (e.g., Aaltonen et al., 2017; Kaplan et al., 2016; Ferraz et al., 2013), and that childhood sexual abuse exacerbates maladaptive behaviours, such as self-injury, in BPD (e.g., Soloff et al., 2008; Turniansky et al., 2019). Additionally, given that the High Maltreatment class involved higher severity of PTSD symptoms, this finding also aligns with previous research that suggests that presence of PTSD predicts increased frequency of suicidal and non-suicidal behaviour in individuals with BPD (e.g., Frías & Palma, 2015; Scheiderer et al., 2015), and predicts less reductions in self-injury over time in those with BPD receiving DBT (Barnicot et al., 2013).

There are several reasons regarding why the High Maltreatment group may exhibit less reduction in self-injurious behaviours, compared to the Moderate and Low classes. Although not tested in the present study, those in the High Trauma group may be more likely to endorse full diagnostic criteria for PTSD, and extensive research documents that PTSD independently is

significantly associated with engagement in self-injurious behaviours (e.g., Dyer et al., 2009; Fliege et al., 2009; Kessler et al, 1999). One of the most common functions of self-injury is to regulate distress (e.g., Klonsky et al., 2014; In-Albon et al., 2013; Neasciu et al., 2018). Furthermore, research suggests that self-injury in PTSD can function to downregulate distress associated with hallmark PTSD symptoms as well as non-specific PTSD symptoms, and alternatively can help to reduce dissociation and numbness (Smith et al., 2014; Vansteelandt et al., 2017). Although DBT teaches individuals skills to reduce general distress, it does not explicitly target trauma-specific sequelae (e.g., re-experiencing symptoms or avoidance). Further, research suggests that standard DBT does not effectively reduce comorbid PTSD in BPD (Harned et al., 2010). Therefore, individuals in the High Maltreatment class may continue to self-injure because they do so in response to PTSD-related distress, which has not been effectively addressed by the treatment. Conversely, the other forms of distress that may elicit self-injury in the Low and Moderate Maltreatment groups, may be effectively addressed by DBT.

Additionally, those in the High Maltreatment Group endorsed greater severity of childhood maltreatment experiences compared to other groups. Thus, it is possible that given this elevation, self-injury for this class may begin at an earlier age as an attempt to downregulate trauma-related distress. Thus, it may reflect a longer-standing behaviour that may be particularly resistant to change in treatment. Finally, given that the High Maltreatment Class exhibited heightened severity across multiple domains (e.g., interpersonal problems, emotion dysregulation, general psychiatric distress), individuals in this class may also have had more frequent or a greater magnitude of therapy interfering behaviours. Such behaviours may also have obstructed change in the frequency of self-injurious behaviours.

### *Suicidal Ideation*

Interestingly, and despite differences in this construct between classes at baseline, class membership did not differentially predict rate of change of suicidal ideation. This aligns to previous work that demonstrated that BPD symptoms fully mediate the relationship between childhood maltreatment and *behavioural* problems (i.e., suicide attempts), rather than cognitive ones, which BPD traits only partially mediate (i.e., suicidal ideation; Aaltonen et al., 2017). Findings from a recent meta-analysis also indicate that DBT does not influence changes in suicidal ideation in BPD (De Cou et al., 2019). Therefore, it is possible that there was not enough variability in this outcome to be able to predict change, independent of class membership. Finally, it is also possible that suicide or NSSI *behaviours* may function to downregulate distress, particularly informed by childhood maltreatment experiences, PTSD symptoms, and BPD symptoms, while suicidal *ideation* may instead be influenced by a separate, unmeasured mechanism. For instance, Joiner's Interpersonal-psychological Theory of Suicide suggests that perceived burdensomeness (i.e., believing that one's existence reflects a burden to others) and loss of belongingness (i.e., experiencing loss of connection to others and an unmet need to belong) contribute significantly to suicidal thoughts and behaviors (Joiner, 2005; Van Orden et al., 2010). Therefore, these unmeasured variables may differentially organize classes and might influence changes in suicidal ideation. However, these were not examined in the present study and thus require future testing.

### *PTSD Symptoms*

With respect to PTSD symptom response, the High Maltreatment class exhibited a slower rate of change than both the Low and Moderate Maltreatment classes, although the Low and Moderate classes did not differ. That each class did not exhibit differential rates of change in

PTSD is surprising, given that each class stratified based on PTSD symptom severity. One explanation for this is that the High Maltreatment class may involve PTSD severity that more closely resembles a PTSD diagnosis, while the other classes may have been impacted predominantly by non-specific PTSD symptoms. Thus, PTSD in the High Maltreatment class may have been less responsive to treatment, given DBT did not explicitly target PTSD and research suggests it does not effectively reduce it (Harned et al., 2010). It therefore follows that more severe PTSD which may characterize the High Maltreatment group may require PTSD intervention to elicit improvement in this domain. Overall, this study suggests that PTSD symptoms in general improve at a faster rate in BPD when they, and childhood maltreatment experiences, are less severe. However future work is needed to examine whether hallmark versus non-specific PTSD symptoms may change at differing rates in this population to clarify these explanations. Additionally, the individuals in the High Trauma class may require more, and particularly trauma-focused, intervention in addition to standard DBT to improve with respect to PTSD symptoms.

***Borderline Personality Disorder Symptom Severity***

Finally, this study demonstrated that class membership did not differentially impact the rate of change in BPD symptom severity. This diverges from prior work that suggests that individuals with BPD and PTSD respond more poorly to DBT (Barnicot et al., 2013). However, other work that demonstrates that those with BPD and PTSD do not respond differently to DBT (Boritz et al., 2016), that they may respond *better* with respect to BPD symptom severity than those with BPD alone (Gratz et al., 2020), and that presence childhood emotional neglect may *improve* related BPD outcomes (i.e., depression; Euler et al., 2020). Therefore, the literature examining the influence of childhood maltreatment and PTSD on BPD symptom severity in

response to DBT is limited, though mixed. Our findings add to this literature to suggest that maltreatment and PTSD symptoms may not influence the rate of change in BPD symptom severity in DBT. As aforementioned, this may be explained by our findings indicating that classes did not stratify on the basis of presence versus absence of distinct BPD symptoms, and thus changes in BPD symptoms over time may not be observable. However, it is also possible that, given this sample is likely particularly elevated in BPD severity, differential rates of change in BPD severity may not have been observable in this study. Alternatively, it is also possible that the sample itself represents a distinct type of BPD, given all participants engaged in self-injurious behaviours. Thus, it is possible that this may obfuscate differential BPD symptom severity response to DBT between Low, Moderate, and High Maltreatment classes among most individuals with BPD, as opposed to those who engage in chronic, recent self-injurious behaviours.

**Limitations and Future Directions**

While this study has several strengths, it must be also contextualized within its limitations. First, although the sample was sufficiently large to execute the LPA and is similar to recent work conducting similar analyses (e.g., Saraiya et al., 2021), given the high number of indicators (i.e., 34) included, the analyses may be underpowered. Furthermore, as aforementioned, this sample may reflect a particularly severe BPD subsample given the presence of chronic and recent self-injury and high rates of comorbidity, and was predominantly female, which obfuscates whether the identified classes and differential treatment responses optimally characterize the majority of individuals with BPD. Thus, replication of the present analyses with a larger, and more representative BPD sample with respect to severity and gender is warranted. Relatedly, replicating analyses with gender accounted for as a moderator is also warranted given

work that posits clinically meaningful differences in BPD pathology between men and women. For example, men engage in higher lethality suicide attempts and are more likely to have a substance use disorder compared to women with BPD (Sher et al., 2019; Sansone & Sansone, 2011). Women are also more likely to exhibit problems with eating, anxiety, and importantly, PTSD (Sansone & Sansone, 2011). Therefore, conducting such analyses may further elucidate whether men and women require distinct treatment approaches (e.g., increased emphasis on means restriction when working with men early in treatment; increased emphasis on targeting PTSD in women).

Additionally, this study was strengthened given that the restriction of the subsample to trauma-exposed individuals with BPD elicited meaningful PTSD analyses. However, examining individuals with BPD who were not exclusively trauma-exposed may increase generalizability of results, and the heterogeneity with which to delineate classes by. Although research to our knowledge has not empirically examined this to date, those with BPD may experience hallmark traumatic reactions, as well as minimum non-specific PTSD symptom reactions, to events that do not align to Criterion A trauma (e.g., interpersonal rejection; traumatic invalidation; childhood emotional abuse and neglect). Such distinctions may further alter and contribute to class delineations. Therefore, future researchers are advised to replicate study methods with a more representative sample of trauma-exposed and non-trauma exposed individuals with BPD.

An additional limitation emerged with respect to the quantity of missing data within this study. The treatment dropout rate for the overall subsample used to generate classes in the present study (N=192) was 27.1%, and the treatment dropout rate for the subsample of 12-month condition participants who were used in treatment response analyses (N=98) was 29.6%. These rates are consistent with previous DBT trials in the literature, where dropout can range from 17%

to 58% (Landes et al., 2016). Although the present study outcome analyses utilized an analytic model that maximizes statistical power by retaining participants with missing data, the study remains limited by a significant amount of missing data, which may have impacted treatment outcome findings. This may, for instance, obstruct the detection of changes in suicidal ideation or BPD symptom severity. Furthermore, this study was limited given that analytically, it did not examine or account for the influence of site (i.e., participants located in Vancouver, BC versus Toronto, ON) on LPA subgroup formation, or whether site influenced treatment responses. Thus, future work is required to replicate these analyses to examine whether differential effects exist between sites, given their potential distinctions (e.g., varied cultural and ethnic demographic representations, potential therapist characteristics and clinic differences).

Furthermore, and as aforementioned, the use of a semi-structured diagnostic interview of BPD symptoms in the LPA reflects a strength of the study given general concerns of self-report bias in BPD (e.g., Balsis et al., 2019). However, the interview used did not provide a measure of variability in BPD symptom severity as much as the presence of BPD symptoms. Variability in BPD severity may be needed to optimally organize classes. Continuous measures of BPD symptomatology, such as the Zanarini Rating Scale for BPD (ZAN-BPD; Zanarini, 2003), which can be administered by clinicians, the Borderline Evaluation of Severity Over Time self-report scale (BEST; Pfohl et al., 2009), or the BSL-23, which was utilized in the present study as an outcome (Bohus et al., 2009), should be used as LPA indicators in future replication of this work to allow for more variability in BPD symptoms, enhancing precision of class delineation.

**Clinical Implications**

The findings from the present work also offer several clinical implications. First, when working with clients who have BPD, researchers and clinicians are advised that distinct profiles

of individuals with BPD exist (i.e., Low, Moderate, and High Trauma) and vary based on their severity of childhood maltreatment experiences, PTSD symptoms, and possibly BPD symptoms. Furthermore, the profiles identified within the present work exhibited increased severity of childhood emotional abuse and neglect, and all PTSD symptoms, with the highest severity symptoms endorsed involving emotional experiencing PTSD-related symptoms that overlap with BPD pathology. Additionally, emotional abuse and neglect are common and appear to distinctly influence overall severity and profiles. Thus, this work suggests that assessing the presence of distinct childhood maltreatment experiences is important, particularly given that Criterion A events are often, and should be, assessed in initial intake assessments, although broader maltreatment experiences may not be. Furthermore, for individuals with increased elevation in these domains (i.e., reflecting High Maltreatment class individuals), additional or more intensive targeting of self-injurious behaviours may be necessary. Alternatively, it is possible that these behaviours may be more amenable to change following a trauma-focused intervention. Indeed, research shows that administering an adapted version of DBT with an integrated PTSD intervention called prolonged exposure (i.e., DBT-PE; Harned et al., 2014) to self-injuring women with BPD and PTSD results in greater reductions in self-injury and PTSD than DBT alone (Harned et al., 2014). Similarly, the efficacy of an adapted version of DBT designed to treat PTSD (i.e., DBT-PTSD; Bohus et al., 2020) was recently examined in a randomized control trial in individuals with childhood-maltreatment associated PTSD and at least three BPD criteria, including affective lability. Although DBT-PTSD and the control condition (i.e., Cognitive Processing Therapy; CPT) reduced PTSD, DBT-PTSD showed a small, though significantly superior effect compared to CPT (Bohus et al., 2020). Therefore, individuals characterized by the High Maltreatment class may require PTSD interventions to reduce PTSD, as well as frequency

of self-injury. Furthermore, when diagnosing PTSD in individuals with BPD, it is advised that clinicians aim to exert specificity with respect to identifying which hallmark PTSD symptoms clients endorse. This is particularly key given findings that clients may be elevated in other non-specific PTSD symptoms regardless of whether or not they have BPD due to its shared overlap with BPD symptom severity. Thus, clients with elevated, hallmark PTSD symptoms (e.g., re-experiencing, avoidance of trauma stimuli) may require explicit trauma-intervention more so than others with BPD and PTSD symptoms generally.

**Conclusions**

Overall, the present findings contribute novel information that enhances understanding of BPD pathology in the presence of childhood maltreatment experiences and their sequelae, and whether and how such information may influence BPD-relevant treatment responses to DBT. Results indicated that three distinct classes of individuals with childhood maltreatment experiences, PTSD symptoms, and BPD symptoms exist, and are generally stratified on the basis of severity of childhood maltreatment and PTSD symptoms. This work also shows that, within a chronically self-injuring population of individuals with BPD, childhood emotional abuse and neglect, as well as non-specific PTSD symptoms (e.g., intense negative emotion, emotional reactivity) that overlap with BPD pathology are elevated in severity compared to other forms of childhood maltreatment and more hallmark PTSD symptoms. Importantly, for the first time, this study demonstrates that individuals with higher severity PTSD symptoms and more severe childhood emotional abuse and neglect respond more slowly to DBT with respect to reducing the frequency of engagement in self-injurious behaviours and PTSD symptom severity. As well, class membership does not differentially predict suicidal ideation or BPD symptom severity response in DBT. Further work is needed to explicate whether alternative metrics of delineating

class membership optimize the organization of childhood maltreatment experiences, PTSD symptoms, and BPD pathology, and whether such metrics would further predict BPD treatment outcomes with greater precision.

## References

Aaltonen, K. I., Rosenström, T., Baryshnikov, I., Karpov, B., Melartin, T., Suominen, K., Heikkinen, M., Näätänen, P., Koivisto, M., Joffe, G., & Isometsä, E. (2017). Mediating role of borderline personality disorder traits in the effects of childhood maltreatment on suicidal behaviour among mood disorder patients. *European psychiatry : the journal of the Association of European Psychiatrists*, *44*, 53–60. https://doi.org/10.1016/j.eurpsy.2017.03.011

Akaike, H. (1987). Factor analysis and AIC. *Psychometrika, 52,* 317-33. https://doi.org/10.1007/BF02294359

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders: DSM-IV-TR.* (4th ed.). Washington, DC: Author.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). https://doi.org/10.1176/appi.books.9780890425596

Armstrong, R. A. (2014). When to use the Bonferroni correction. *Ophthalmic and Physiological Optics*, *34*(5), 502–508. https://doi.org/10.1111/opo.12131

Ball, J. S., & Links, P. S. (2009). Borderline personality disorder and childhood trauma: Evidence for a causal relationship. *Current Psychiatry Reports*, *11*, 63–68. https://doi.org/10.1007/s11920-009-0010-4

Balsis, S., Loehle-Conger, E., Busch, A. J., Ungredda, T., & Oltmanns, T. F. (2018). Self and Informant Report Across the Borderline Personality Disorder Spectrum. *Personality Disorders*, *9*(5), 429–436. https://doi.org/10.1037/per0000259

Bandelow, B., Krause, J., Wedekind, D., Broocks, A., Hajak, G., & Rüther, E. (2005). Early traumatic life events, parental attitudes, family history, and birth risk factors in patients

with borderline personality disorder and healthy controls. *Psychiatry Research*, *134*, 169–179. https://doi.org/ 10.1016/j.psychres.2003.07.008

Barnicot, K., & Crawford, M. (2018). Posttraumatic stress disorder in patients with borderline personality disorder: Treatment outcomes and mediators. *Journal of Traumatic Stress*, *31*, 899–908. https://doi.org/ 10.1002/jts.22340.

Barnicot, K., & Crawford, M. (2019). Dialectical behaviour therapy *v.* mentalisation-based therapy for borderline personality disorder. *Psychological medicine*, *49*(12), 2060–2068. https://doi.org/10.1017/S0033291718002878

Barnicot, K., & Priebe, S. (2013). Post-traumatic stress disorder and the outcome of dialectical behaviour therapy for borderline personality disorder. *Personality and Mental Health*, *7*, 181–190. https://doi.org/10.1002/pmh.1227

Bateman, A., & Fonagy, P. (2010). Mentalization based treatment for borderline personality disorder. *World Psychiatry*, *9*, 11. https://doi.org/ 10.1002/j.2051-5545.2010.tb00255.x

Beck, A. T., & Steer, R. A. (1991). *Manual for the Beck Scale for Suicide Ideation*. Psychological Corporation.

Beck, A. T., Steer, R. A., & Brown, G. (1996). *Beck depression inventory–II.* Psychological Assessment. https://doi.org/10.1037/t00742-000

Beck, J. G., Woodward, M. J., Pickover, A. M., Lipinski, A. J., Dodson, T. S., & Tran, H. N. (2019). Does a history of childhood abuse moderate the association between symptoms of posttraumatic stress disorder and borderline personality disorder in survivors of intimate partner violence? *Journal of Clinical Psychology*, *75*(6), 1114–1128. https://doi.org/10.1002/jclp.22756

Bernstein, D. P., & Fink, L. (1998). *Childhood trauma questionnaire: A retrospective self-report: Manual.* Psychological Corporation.

Bernstein, D. P., Stein, J. A., Newcomb, M. D., Walker, E., Pogge, D., Ahluvalia, T., Stokes, J., Handelsman, L., Medrano, M., Desmond, D., & Zule, W. (2003). Development and validation of a brief screening version of the Childhood Trauma Questionnaire. *Child Abuse & Neglect*, *27*, 169–190. https://doi.org/10.1016/S0145-2134(02)00541-0

Biskin, R. S., & Paris, J. (2012). Diagnosing borderline personality disorder. *CMAJ*, *184*, 1789–1794. https://doi.org/10.1503/cmaj.090618

Brewin, C. R., Lanius, R. A., Novac, A., Schnyder, U., & Galea, S. (2009). Reformulating PTSD for *DSM-V*: Life after Criterion A. *Journal of Traumatic Stress*, *22*(5), 366–373. https://doi.org/10.1002/jts.20443

Bohus, M., Kleindienst, N., Limberger, M. F., Stieglitz, R.-D., Domsalla, M., Chapman, A. L., Steil, R., Philipsen, A., & Wolf, M. (2009). The short version of the Borderline Symptom List (BSL-23): development and initial data on psychometric properties. *Psychopathology*, *42*, 32–39. https://doi.org/ 10.1159/000173701

Bohus, M., Limberger, M. F., Frank, U., Chapman, A. L., Kühler, T., & Stieglitz, R.-D. (2007). Psychometric properties of the borderline symptom list (BSL). *Psychopathology*, *40*, 126–132. https://doi.org/10.1159/000098493

Bohus, M., Kleindienst, N., Hahn, C., Müller-Engelmann, M., Ludäscher, P., Steil, R., Fydrich, T., Kuehner, C., Resick, P. A., Stiglmayr, C., Schmahl, C., & Priebe, K. (2020). Dialectical Behavior Therapy for Posttraumatic Stress Disorder (DBT-PTSD) Compared With Cognitive Processing Therapy (CPT) in Complex Presentations of PTSD in Women

Survivors of Childhood Abuse: A Randomized Clinical Trial. *JAMA psychiatry*, *77*(12), 1235–1245. https://doi.org/10.1001/jamapsychiatry.2020.2148

Boritz, T., Barnhart, R., & McMain, S. F. (2016). The influence of posttraumatic stress disorder on treatment outcomes of patients with borderline personality disorder. *Journal of Personality Disorders, 30*, 395-407. http://doi.org/10.1521/pedi_2015_29_207

Bovin, M. J., Marx, B. P., Weathers, F. W., Gallagher, M. W., Rodriguez, P., Schnurr, P. P., & Keane, T. M. (2016). Psychometric properties of the PTSD Checklist for Diagnostic and Statistical Manual of Mental Disorders-Fifth Edition (PCL-5) in veterans. *Psychological assessment*, *28*(11), 1379–1391. https://doi.org/10.1037/pas0000254

Brodsky, B. S., Malone, K. M., Ellis, S. P., Dulit, R. A., & Mann, J. J. (1997). Characteristics of borderline personality disorder associated with suicidal behavior. *American Journal of Psychiatry*, *154*, 1715–1719. https://doi.org/10.1176/ajp.154.12.1715

Carcone, D., Tokarz, V. L., & Ruocco, A. C. (2015). A systematic review on the reliability and validity of semistructured diagnostic interviews for borderline personality disorder. *Canadian Psychology/Psychologie canadienne, 56*(2), 208–226. https://doi.org/10.1037/cap0000026

Carter, G. L., Willcox, C. H., Lewin, T. J., Conrad, A. M., & Bendit, N. (2010). Hunter DBT project: randomized controlled trial of dialectical behaviour therapy in women with borderline personality disorder. *The Australian and New Zealand journal of psychiatry*, *44*(2), 162–173. https://doi.org/10.3109/00048670903393621

Carvalho Fernando, S., Beblo, T., Schlosser, N., Terfehr, K., Otte, C., Löwe, B., Wolf, O. T., Spitzer, C., Driessen, M., & Wingenfeld, K. (2014). The impact of self-reported childhood trauma on emotion regulation in borderline personality disorder and major

depression. *Journal of trauma & dissociation : the official journal of the International Society for the Study of Dissociation (ISSD)*, *15*(4), 384–401. https://doi.org/10.1080/15299732.2013.863262

Cicchetti, D., & Valentino, K. (2006). An ecological-transactional perspective on child maltreatment: Failure of the average expectable environment and its influence on child development. In D. Cicchetti & D. J. Cohen (Eds.), *Developmental psychopathology: Risk, disorder, and adaptation* (p. 129–201). John Wiley & Sons, Inc..

Chapman, A. L. (2010). Borderline personality disorder. In D. E. McKay, J. S. Abramowitz, & S. E. Taylor. (2010). *Cognitive-behavioral therapy for refractory cases: Turning failure into success.* (347-367). American Psychological Association.

Chapman, A. L., Dixon-Gordon, K., Butler, S. M., & Walters, K. N. (2015). Emotional reactivity to social rejection versus a frustration induction among persons with borderline personality features. *Personality Disorders: Theory, Research, and Treatment, 6*, 88-96. http://dx.doi.org/10.1037/per0000101

Cierpiałkowska, L., & Pasikowski, T. (2013). Traumatic events and personality features in borderline personality disorder. *Acta Neuropsychologica*, *11*, 127-141. https://doi.org/10.5604/17307503.1073471

Cloitre, M., Garvert, D. W., Brewin, C. R., Bryant, R. A., & Maercker, A. (2013). Evidence for proposed ICD-11 PTSD and complex PTSD: a latent profile analysis. *European journal of psychotraumatology*, *4*, 10.3402/ejpt.v4i0.20706. https://doi.org/10.3402/ejpt.v4i0.20706

Cloitre, M., Garvert, D. W., Weiss, B., Carlson, E. B., & Bryant, R. A. (2014). Distinguishing PTSD, complex PTSD, and borderline personality disorder: a latent class analysis.

*European Journal of Psychotraumatology*, *5*, 25097. https://doi.org/10.3402/ejpt.v5.25097

Cotter, J., Kaess, M., & Yung, A. R. (2015). Childhood trauma and functional disability in psychosis, bipolar disorder and borderline personality disorder: a review of the literature. *Irish Journal of Psychological Medicine*, *32*, 21–30. https://doi.org/10.1017/ipm.2014.74

Dalgleish, T., & Power, M. J. (2004). Emotion-specific and emotion-non-specific components of posttraumatic stress disorder (PTSD): Implications for a taxonomy of related psychopathology. *Behaviour Research and Therapy*, *42*(9), 1069–1088. https://doi.org/10.1016/j.brat.2004.05.001

de Aquino Ferreira, L. F., Pereira, F. H. Q., Benevides, A. M. L. N., & Melo, M. C. A. (2018). Borderline personality disorder and sexual abuse: a systematic review. *Psychiatry Research*, *262*, 70–77. https://doi.org/10.1016/j.psychres.2018.01.043

DeCou, C. R., Comtois, K. A., & Landes, S. J. (2019). Dialectical behavior therapy is effective for the treatment of suicidal behavior: a meta-analysis. *Behavior Therapy*, *50*, 60–72. https://doi.org/10.1016/j.beth.2018.03.009

Derogatis, L. R., & Cleary, P. A. (1977). Confirmation of the dimensional structure of the SCL-90: a study in construct validation. *Journal of Clinical Psychology*, *33*, 981–989. https://doi.org/10.1002/1097-4679(197710)33:4<981::AID-JCLP2270330412>3.0.CO;2-0

Dixon-Gordon, K., Gratz, K. L., & Tull, M. T. (2013). Multimodal assessment of emotional reactivity in borderline personality pathology: The moderating role of posttraumatic stress disorder symptoms. *Comprehensive Psychiatry, 54*, 639-648. http://dx.doi.org/10.1016/j.comppsych.2012.12.019

Dvir, Y., Ford, J. D., Hill, M., & Frazier, J. A. (2014). Childhood maltreatment, emotional dysregulation, and psychiatric comorbidities. *Harvard review of psychiatry*, *22*(3), 149–161. https://doi.org/10.1097/HRP.0000000000000014

Dyer, K. F., Dorahy, M. J., Hamilton, G., Corry, M., Shannon, M., MacSherry, A., McRobert, G., Elder, R., & McElhill, B. (2009). Anger, aggression, and self-harm in PTSD and complex PTSD. *Journal of clinical psychology*, *65*(10), 1099–1114. https://doi.org/10.1002/jclp.20619

Elices, M., Soler, J., Fernández, C., Martín-Blanco, A., Jesús Portella, M., Pérez, V., . . . Carlos Pascual, J. (2012). Physiological and self-assessed emotional responses to emotion-eliciting films in borderline personality disorder. *Psychiatry Research, 200*, 437-443. http://dx.doi.org/10.1016/j.psychres.2012.07.020

Esfahani, M., Hashemi, Y., & Alavi, K. (2015). Psychometric assessment of beck scale for suicidal ideation (BSSI) in general population in Tehran. *Medical journal of the Islamic Republic of Iran*, *29*, 268.

Euler, S., Stalujanis, E., Lindenmeyer, H. H., Nicastro, R., Kramer, U., Perroud, N., & Weibel, S. (2020). Impact of childhood maltreatment in borderline personality disorder on treatment response to intensive dialectical behavior therapy. *Journal of Personality Disorders, 33,* 461-479. https://doi.org/10.1521/pedi_2019_33_461

Farrés, C. C., Pascual, J. C., Elices, M., Navarro, H., Martin Blanco, A., & Soler, J. (2018). Factors predicting early dropout from dialectical behaviour therapy in individuals with borderline personality disorder. *Actas Españolas de Psiquiatria*, *46*, 226–233.

Feliu-Soler, A., Pascual, J. C., Soler, J., Pérez, V., Armario, A., Carrasco, J., . . . Borràs, X. (2013). Emotional responses to a negative emotion induction procedure in borderline

personality disorder. *International Journal of Clinical and Health Psychology, 13*, 9-17. http://dx.doi.org/10.1016/S1697-2600(13)70002-4

Ferraz, L., Portella, M. J., Vállez, M., Gutiérrez, F., Martín-Blanco, A., Martín-Santos, R., & Subirà, S. (2013). Hostility and childhood sexual abuse as predictors of suicidal behaviour in Borderline Personality Disorder. *Psychiatry research*, *210*(3), 980–985. https://doi.org/10.1016/j.psychres.2013.07.004

First, M. B., Spitzer, R. L., Gibbon, M., & Williams, J. B. (2002). *Structured clinical interview for DSM-IV-TR axis I disorders, research version, patient edition*. New York State Psychiatric Institute.

First, M. B., & Gibbon, M. (2004). The Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I) and the Structured Clinical Interview for DSM-IV Axis II Disorders (SCID-II). In M. J. Hilsenroth & D. L. Segal (Eds.), *Comprehensive handbook of psychological assessment, Vol. 2. Personality assessment* (pp. 134–143). John Wiley & Sons, Inc.

Fitzpatrick, S., Liebman, R. E., & Monson, C. M. (2021). The borderline interpersonal-affective systems (BIAS) model: Extending understanding of the interpersonal context of borderline personality disorder. *Clinical psychology review*, *84*, 101983. Advance online publication. https://doi.org/10.1016/j.cpr.2021.101983

Fliege, H., Lee, J. R., Grimm, A., & Klapp, B. F. (2009). Risk factors and correlates of deliberate self-harm behavior: a systematic review. *Journal of psychosomatic research*, *66*(6), 477–493. https://doi.org/10.1016/j.jpsychores.2008.10.013

Fossati, A., Maffei, C., Bagnato, M., Donati, D., Namia, C., & Novella, L. (1999). Latent structure analysis of DSM-IV borderline personality disorder criteria. *Comprehensive psychiatry*, *40*(1), 72–79. https://doi.org/10.1016/s0010-440x(99)90080-9

Frías, Á., & Palma, C. (2015). Comorbidity between post-traumatic stress disorder and borderline personality disorder: a review. *Psychopathology*, *48*, 1–10. https://doi.org/10.1159/000363145

Friedman, M. J., Resick, P. A., Bryant, R. A., & Brewin, C. R. (2010). Considering PTSD for DSM-5. *Depression and Anxiety*, *28*(9), 750–769. https://doi.org/10.1002/da.20767

Galatzer-Levy, I. R., & Bryant, R. A. (2013). 636,120 ways to have posttraumatic stress disorder. *Perspectives on Psychological Science*, *8*, 651–662. https://doi.org/10.1177/1745691613504115

Goodman, M., Tomas, I. A., Temes, C. M., Fitzmaurice, G. M., Aguirre, B. A., & Zanarini, M. C. (2017). Suicide attempts and self-injurious behaviours in adolescent and adult patients with borderline personality disorder. *Personality and Mental Health*, *11*, 157–163. https://doi.org/10.1002/pmh.1375

Goodman, M., Weiss, D. S., Koenigsberg, H., Kotlyarevsky, V., New, A. S., Mitropoulou, V., Silverman, J. M., O'Flynn, K., & Siever, L. J. (2003). The Role of Childhood Trauma in Differences in Affective Instability in Those With Personality Disorders. *CNS Spectrums, 8*, 763–770. https://doi.org/10.1017/S1092852900019131

Grant, B. F., Chou, S. P., Goldstein, R. B., Huang, B., Stinson, F. S., Saha, T. D., Smith, S. M., Dawson, D. A., Pulay, A. J., & Pickering, R. P. (2008). Prevalence, correlates, disability, and comorbidity of DSM-IV borderline personality disorder: results from the Wave 2

National Epidemiologic Survey on Alcohol and Related Conditions. *The Journal of Clinical Psychiatry*, *69*, 533. https://doi.org/ 10.4088/jcp.v69n0404

Gratz, K. L., & Roemer, L. (2004). Multidimensional assessment of emotion regulation and dysregulation: development, factor structure, and initial validation of the difficulties in emotion regulation scale. *Journal of Psychopathology and Behavioral Assessment*, *26*, 41–54. https://doi.org/10.1023/B:JOBA.0000007455.08539.94

Gratz, K. L., Berghoff, C. R., Richmond, J. R., Vidaña, A. G., & Dixon-Gordon, K. L. (2020). Examining posttraumatic stress disorder as a predictor of treatment response to dialectical behavior therapy. *Journal of clinical psychology*, *76*(9), 1563–1574. https://doi-org.ezproxy.library.yorku.ca/10.1002/jclp.22961

Green, B. L. (1993). Identifying survivors at risk: Trauma and stressors across events. In J. P. Wilson & B. Raphael (Eds.), *International handbook of traumatic stress syndromes* (pp. 135–144). Plenum Press. https://doi.org/10.1007/978-1-4615-2820-3_11

Gunderson, J. G. (2008). *Borderline personality disorder: A clinical guide* (2nd ed.). American Psychiatric Publishing Inc.

Harned, M. S., Jackson, S. C., Comtois, K. A., & Linehan, M. M. (2010). Dialectical behavior therapy as a precursor to PTSD treatment for suicidal and/or self-injuring women with borderline personality disorder. *Journal of Traumatic Stress*, *23*(4), 421–429. http://doi.org/10.1002/jts.20553

Harned, M. S., Korslund, K. E., & Linehan, M. M. (2014). A pilot randomized controlled trial of Dialectical Behavior Therapy with and without the Dialectical Behavior Therapy Prolonged Exposure protocol for suicidal and self-injuring women with borderline

personality disorder and PTSD. *Behaviour Research and Therapy*, *55*, 7–17. http:// doi.org /10.1016/j.brat.2014.01.008

Herman, J. L., Perry, J. C., & Van der Kolk, B. A. (1989). Childhood trauma in borderline personality disorder. *The American Journal of Psychiatry, 146*, 490- 495. https://doi.org/10.1176/ajp.146.4.490

Hipp, J. R., & Bauer, D. J. (2006). Local solutions in the estimation of growth mixture models. *Psychological Methods, 11*(1), 36–53. https://doi.org/10.1037/1082-989X.11.1.36

Hong, P. Y., & Lishner, D. A. (2016). General invalidation and trauma-specific invalidation as predictors of personality and subclinical psychopathology. *Personality and Individual Differences*, *89*, 211–216. https://doi.org/10.1016/j.paid.2015.10.016

Horowitz, L. M., Rosenberg, S. E., Baer, B. A., Ureño, G., & Villaseñor, V. S. (1988). Inventory of interpersonal problems: psychometric properties and clinical applications. *Journal of Consulting and Clinical Psychology*, *56*, 885. https://doi.org/ 10.1037//0022-006x.56.6.885

In-Albon, T., Bürli, M., Ruf, C., & Schmid, M. (2013). Non-suicidal self-injury and emotion regulation: a review on facial emotion recognition and facial mimicry. *Child and adolescent psychiatry and mental health*, *7*(1), 5. https://doi.org/10.1186/1753-2000-7-5

Joiner, T. (2005). *Why people die by suicide.* Cambridge: Harvard University Press.

Jowett, S., Karatzias, T., Shevlin, M., & Albert, I. (2020). Differentiating symptom profiles of ICD-11 PTSD, complex PTSD, and borderline personality disorder: a latent class analysis in a multiply traumatized sample. *Personality Disorders: Theory, Research and Treatment, 11*, 36-45. https://doi.org/10.1037/per0000346

Kaplan, C., Tarlow, N., Stewart, J. G., Aguirre, B., Link to external site, this link will open in a new window, Galen, G., & Auerbach, R. P. (2016). Borderline personality disorder in youth: The prospective impact of child abuse on non-suicidal self-injury and suicidality. *Comprehensive Psychiatry*, *71*, 86–94. http://dx.doi.org.ezproxy.library.yorku.ca/10.1016/j.comppsych.2016.08.016

Kessler, R. C., Borges, G., & Walters, E. E. (1999). Prevalence of and risk factors for lifetime suicide attempts in the National Comorbidity Survey. *Archives of general psychiatry*, *56*(7), 617–626. https://doi.org/10.1001/archpsyc.56.7.617

Kilpatrick, D. G., Resnick, H. S., & Acierno, R. (2009). Should PTSD Criterion A be retained? *Journal of Traumatic Stress*, *22*(5), 374–383. https://doi.org/10.1002/jts.20436

Kim, J. I., Oh, S., Park, H., Min, B., & Kim, J. (2020). The prevalence and clinical impairment of subthreshold PTSD using dsm-5 criteria in a national sample of Korean firefighters. *Depression and Anxiety,* https://doi.org/10.1002/da.22998

Kliem, S., Kröger, C., & Kosfelder, J. (2010). Dialectical behavior therapy for borderline personality disorder: A meta-analysis using mixed-effects modeling. *Journal of Consulting and Clinical Psychology*, *78*, 936. https://doi.org/ 10.1037/a0021015

Klonsky, E. D., Victor, S. E., & Saffer, B. Y. (2014). Nonsuicidal self-injury: what we know, and what we need to know. *Canadian journal of psychiatry. Revue canadienne de psychiatrie*, *59*(11), 565–568. https://doi.org/10.1177/070674371405901101

Knefel, M., Tran, U. S., & Lueger-Schuster, B. (2016). The association of posttraumatic stress disorder, complex posttraumatic stress disorder, and borderline personality disorder from a network analytical perspective. *Journal of Anxiety Disorders*, *43*, 70–78. https://doi.org/ 10.1016/j.janxdis.2016.09.002

Kongerslev, M. T., Bach, B., Rossi, G., Trauelsen, A. M., Ladegaard, N., Løkkegaard, S. S., & Bo, S. (2019). Psychometric validation of the Childhood Trauma Questionnaire- Short Form (CTQ-SF) in a Danish clinical sample. *Child Abuse & Neglect, 94,* Article 104026. https://doi.org/10.1016/j.chiabu.2019.104026

Krause-Utz, A., Erol, E., Brousianou, A. V., Cackowski, S., Paret, C., Ende, G., & Elzinga, B. (2019). Self-reported impulsivity in women with borderline personality disorder: The role of childhood maltreatment severity and emotion regulation difficulties. *Borderline Personality Disorder and Emotion Dysregulation*, *6*(1), 6. https://doi.org/10.1186/s40479-019-0101-8

Kuo, J. R., Khoury, J. E., Metcalfe, R., Fitzpatrick, S., & Goodwill, A. (2015). An examination of the relationship between childhood emotional abuse and borderline personality disorder features: the role of difficulties with emotion regulation. *Child Abuse & Neglect*, *39*, 147–155. https://doi.org/ 10.1016/j.chiabu.2014.08.008

Kuo, J.R., Fitzpatrick, S., Metcalfe, R.K., & McMain, S. (2016). A multi-method laboratory investigation of emotional reactivity and emotion regulation abilities in borderline personality disorder. *Journal of Behavior Therapy and Experimental Psychiatry, 50,* 52-60. https://doi.org/10.1016/j.jbtep.2015.05.002

Landes, S. J., Chalker, S. A., & Comtois, K. A. (2016). Predicting dropout in outpatient dialectical behavior therapy with patients with borderline personality disorder receiving psychiatric disability. *Borderline personality disorder and emotion dysregulation*, *3*(1), 9. https://doi.org/10.1186/s40479-016-0043-3

Landy, M. S. H., Wagner, A. C., Brown-Bowers, A., & Monson, C. M. (2015). Examining the evidence for complex posttraumatic stress disorder as a clinical diagnosis. *Journal of*

*Aggression Maltreatment & Trauma, 24*, 215-236. https://doi.org/10.1080/10926771.2015.1002649

Laporte, L., Paris, J., Guttman, H., & Russell, J. (2011). Psychopathology, childhood trauma, and personality traits in patients with borderline personality disorder and their sisters. *Journal of Personality Disorders*, *25*, 448–462. https://doi.org/ 10.1521/pedi.2011.25.4.448

Larsen, S. E., & Pacella, M. L. (2016). Comparing the effect of DSM-congruent traumas vs. DSM-incongruent stressors on PTSD symptoms: A meta-analytic review. *Journal of Anxiety Disorders, 38,* 37–46. https://doi.org/10.1016/j.janxdis.2016.01.001

Lindenboim N., Chapman A.L., Linehan M.M. (2007) Borderline Personality Disorder. In: Kazantzis N., LL'Abate L. (eds) *Handbook of Homework Assignments in Psychotherapy.* Springer, Boston, MA . https://doi.org/10.1007/978-0-387-29681-4_14

Linehan, M.M. (1982). Demographic Data Schedule (DDS). University of Washington, Seattle, WA, Unpublished work.

Linehan, M. M. (1993). *Cognitive-behavioral treatment of borderline personality disorder.* The Guilford Press.

Linehan, M. M. (2015). *DBT® skills training manual* (2nd ed.). Guilford Press.

Linehan, M. M., Comtois, K. A., Brown, M. Z., Heard, H. L., & Wagner, A. (2006). Suicide attempt self-injury interview (SASII): Development, reliability, and validity of a scale to assess suicide attempts and intentional self-injury. *Psychological Assessment, 18*, 303-312.

Linehan, M. M., & Korslund, K. E. (2003). *Dialectical Behavior Therapy Adherence Manual.* Seattle: University of Washington.

Linehan, M. M., Korslund, K. E., Harned, M. S., Gallop, R. J., Lungu, A., Neacsiu, A. D., McDavid, J., Comtois, K. A., & Murray-Gregory, A. M. (2015). Dialectical behavior

therapy for high suicide risk in individuals with borderline personality disorder: A randomized clinical trial and component analysis. *JAMA Psychiatry*, *72*, 475–482.

Links, P. S., Kolla, N. J., Guimond, T., & McMain, S. (2013). Prospective risk factors for suicide attempts in a treated sample of patients with borderline personality disorder. *The Canadian Journal of Psychiatry / La Revue Canadienne de Psychiatrie*, *58*(2), 99–106. https://doi.org/10.1177/070674371305800207

Lo, Y., Mendell, N. R., & Rubin, D. B. (2001). Testing the number of components in a normal mixture. *Biometrika*, *88*, 767–778. https://doi.org/10.1093/biomet/88.3.767

Lobbestael, J., Leurgans, M., & Arntz, A. (2011). Inter- rater reliability of the structured clinical interview for DSM- IV axis I disorders (SCID I) and axis II disorders (SCID II). *Clinical Psychology & Psychotherapy, 18*, 75-79. doi:10.1002/cpp.693

Loranger, A. W., Sartorius, N., Andreoli, A., Berger, P., Buchheim, P., Channabasavanna, S. M., Coid, B., Dahl, A., Diekstra, R. F., & Ferguson, B. (1994). The international personality disorder examination: The World Health Organization/Alcohol, Drug Abuse, and Mental Health Administration international pilot study of personality disorders. *Archives of General Psychiatry*, *51*, 215–224. https://doi.org/10.1001/archpsyc.1994.03950030051005

Lynch, T. R., Trost, W. T., Salsman, N., & Linehan, M. M. (2007). Dialectical behavior therapy for borderline personality disorder. *Annual review of clinical psychology*, *3*, 181–205. https://doi.org/10.1146/annurev.clinpsy.2.022305.095229

Maercker, A., Brewin, C. R., Bryant, R. A., Cloitre, M., van Ommeren, M., Jones, L. M., Humayan, A., Kagee, A., Llosa, A. E., Rousseau, C., Somasundaram, D. J., Souza, R., Suzuki, Y., Weissbecker, I., Wessely, S. C., First, M. B., & Reed, G. M. (2013).

Diagnosis and classification of disorders specifically associated with stress: proposals for ICD-11. *World psychiatry : official journal of the World Psychiatric Association (WPA)*, *12*(3), 198–206. https://doi-org.ezproxy.library.yorku.ca/10.1002/wps.20057

Mann, A. H., Raven, P., Pilgrim, J., Khanna, S., Velayudham, A., Suresh, K. P., Channabasavanna, S. M., Janca, A., & Sartorius, N. (1999). An assessment of the Standardized Assessment of Personality as a screening instrument for the International Personality Disorder Examination: A comparison of informant and patient assessment for personality disorder. *Psychological Medicine, 29*(4), 985–989. https://doi.org/10.1017/S0033291798007545

McLachlan, G. J., & Peel, D. (2000). *Finite Mixture Models.* John Wiley & Sons.

McMain, S. F., Chapman, A. L., Kuo, J. R., Guimond, T., Streiner, D. L., Dixon-Gordon, K. L., Isaranuwatchai, W., Hoch, J. S. (2018). The effectiveness of 6 versus 12-months of dialectical behaviour therapy for borderline personality disorder: the feasibility of a shorter treatment and evaluating responses (FASTER) trial protocol. *BMC Psychiatry, 18,* 230. https://doi.org/10.1186/s12888-018-1802-z

McMain, S. F., Guimond, T., Streiner, D. L., Cardish, R. J., & Links, P. S. (2012). Dialectical behavior therapy compared with general psychiatric management for borderline personality disorder: Clinical outcomes and functioning over a 2-year follow-up. *American Journal of Psychiatry*, *169*, 650–661. https://doi.org/10.1176/appi.ajp.2012.11091416.

McMain, S. F., Links, P. S., Gnam, W. H., Guimond, T., Cardish, R. J., Korman, L., & Streiner, D. L. (2009). A randomized trial of dialectical behavior therapy versus general

psychiatric management for borderline personality disorder. *American Journal of Psychiatry*, *166*, 1365–1374. https://doi.org/ 10.1176/appi.ajp.2009.09010039

McNally, R. J. (2004). Conceptual Problems with the DSM-IV Criteria for Posttraumatic Stress Disorder. In G. M. Rosen (Ed.), *Posttraumatic Stress Disorder* (pp. 1–14). John Wiley & Sons Ltd. https://doi.org/10.1002/9780470713570.ch1

Merza, K., Papp, G., & Kuritárné Szabó, I. (2015). The role of childhood traumatization in the development of borderline personality disorder in Hungary. *The European Journal of Psychiatry*, *29*, 105–118. http://dx.doi.org/10.4321/S0213-61632015000200002

Monson, C. M., Fredman, S. J., & Dekel, R. (2010). Posttraumatic stress disorder in an interpersonal context. In J. G. Beck (Ed.), *Interpersonal processes in the anxiety disorders: Implications for understanding psychopathology and treatment* (pp. 179–208). American Psychological Association. https://doi.org/10.1037/12084-007

Neacsiu, A. D., Fang, C. M., Rodriguez, M., & Rosenthal, M. Z. (2018). Suicidal Behavior and Problems with Emotion Regulation. *Suicide & life-threatening behavior*, *48*(1), 52–74. https://doi.org/10.1111/sltb.12335

Nylund, K. L., Asparouhov, T., & Muthén, B. O. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: a Monte Carlo simulation study. *Structural Equation Modeling: A Multidisciplinary Journal*, *14*, 535–569. https://doi.org/10.1080/10705510701575396

O'Keefe, D. J. (2003). Colloquy: Should familywise alpha be adjusted? Against familywise alpha adjustment. *Human Communication Research, 29*(3), 431-447. https://doi.org/10.1093/hcr/29.3.431

Ozer, E. J., Best, S. R., Lipsey, T. L., & Weiss, D. S. (2003). Predictors of posttraumatic stress disorder and symptoms in adults: a meta-analysis. *Psychological bulletin*, *129*(1), 52–73. https://doi.org/10.1037/0033-2909.129.1.52

Pagura, J., Stein, M. B., Bolton, J. M., Cox, B. J., Grant, B., & Sareen, J. (2010). Comorbidity of borderline personality disorder and posttraumatic stress disorder in the US population. *Journal of Psychiatric Research*, *44*, 1190–1198. https://doi.org/10.1016/j.jpsychires.2010.04.016

Pai, A., Suris, A. M., & North, C. S. (2017). Posttraumatic Stress Disorder in the DSM-5: Controversy, Change, and Conceptual Considerations. *Behavioral Sciences*, *7*(1). https://doi.org/10.3390/bs7010007

Paris, J., & Zweig-Frank, H. (2001). The 27-year follow-up of patients with borderline personality disorder. *Comprehensive Psychiatry, 42*, 482-487. https://doi.org/10.1053/comp.2001.26271

Perepletchikova, F., Ansell, E., & Axelrod, S. (2012). Borderline personality disorder features and history of childhood maltreatment in mothers involved with child protective services. *Child Maltreatment*, *17*, 182–190. https://doi.org/10.1177/1077559512448471

Pfohl, B., Blum, N., St John, D., McCormick, B., Allen, J., & Black, D. W. (2009). Reliability and validity of the Borderline Evaluation of Severity Over Time (BEST): a self-rated scale to measure severity and change in persons with borderline personality disorder. *Journal of personality disorders*, *23*(3), 281–293. https://doi.org/10.1521/pedi.2009.23.3.281

Porter, C., Palmier-Claus, J., Branitsky, A., Mansell, W., Warwick, H., & Varese, F. (2020). Childhood adversity and borderline personality disorder: a meta-analysis. *Acta Psychiatrica Scandinavica*, *141*, 6–20. https://doi.org/10.1111/acps.13118

Raykov, T., Harrison, M., & Marcoulides, G. A. (2020). Examining Class Separation Contribution by Observed Indicators in Latent Class Models: A Multiple Testing Procedure. *Structural Equation Modeling: A Multidisciplinary Journal*, *27*(1), 88–96. https://doi.org/10.1080/10705511.2018.1554446

Rizvi, S. L. (2011). Treatment failure in dialectical behavior therapy. *Cognitive and Behavioral Practice, 18*, 403-412. https://doi.org/10.1016/j.cbpra.2010.05.003

Sansone, R. A., & Sansone, L. A. (2011). Gender patterns in borderline personality disorder. *Innovations in clinical neuroscience*, *8*(5), 16–20.

Saraiya, T. C., Fitzpatrick, S., Zumberg-Smith, K., López-Castro, T., E. Back, S., & A. Hien, D. (2021). Social–Emotional Profiles of PTSD, Complex PTSD, and Borderline Personality Disorder Among Racially and Ethnically Diverse Young Adults: A Latent Class Analysis. *Journal of Traumatic Stress*, *34*(1), 56-68. https://doi.org/10.1002/jts.22590

Scheiderer, E. M., Wood, P. K., & Trull, T. J. (2015). The comorbidity of borderline personality disorder and posttraumatic stress disorder: revisiting the prevalence and associations in a general population sample. *Borderline personality disorder and emotion dysregulation*, *2*, 11. https://doi.org/10.1186/s40479-015-0032-y

Shearer, S. L. (1994). Dissociative phenomena in women with borderline personality disorder. *The American Journal of Psychiatry*, *151*, 1324-1328. https:doi.org/ 10.1176/ajp.151.9.1324

Sher, L., Rutter, S. B., New, A. S., Siever, L. J., & Hazlett, E. A. (2019). Gender differences and similarities in aggression, suicidal behaviour, and psychiatric comorbidity in borderline personality disorder. *Acta psychiatrica Scandinavica*, *139*(2), 145–153. https://doi.org/10.1111/acps.12981

Simeon, D., Nelson, D., Elias, R., Greenberg, J., & Hollander, E. (2003). Relationship of Personality to Dissociation and Childhood Trauma in Borderline Personality Disorder. *CNS Spectrums*, *8*(10), 755–762. https://doi.org/10.1017/S109285290001912X

Smith, N. B., Kouros, C. D., & Meuret, A. E. (2014). The role of trauma symptoms in nonsuicidal self-injury. *Trauma, violence & abuse*, *15*(1), 41–56. https://doi.org/10.1177/1524838013496332

Soloff, P. H., Feske, U., & Fabio, A. (2008). Mediators of the relationship between childhood sexual abuse and suicidal behavior in borderline personality disorder. *Journal of Personality Disorders, 22*, 221–232. https://doi.org/10.1521/pedi.2008.22.3.221

Soloff, P. H., Lynch, K. G., & Kelly, T. M. (2002). Childhood abuse as a risk factor for suicidal behavior in borderline personality disorder. *Journal of Personality Disorders, 16*, 201-214. https://doi.org/10.1521/pedi.16.3.201.22542

Solomon, S. D., & Canino, G. J. (1990). Appropriateness of DSM-III—R criteria for posttraumatic stress disorder. *Comprehensive Psychiatry, 31*(3), 227–237. https://doi.org/10.1016/0010-440X(90)90006-E

Tadić, A., Wagner, S., Hoch, J., Başkaya, Ö., Von Cube, R., Skaletz, C., Lieb, K., & Dahmen, N. (2009). Gender differences in axis I and axis II comorbidity in patients with borderline personality disorder. *Psychopathology*, *42*, 257–263. https://doi.org/ 10.1159/000224149

Tein, J. Y., Coxe, S., & Cham, H. (2013). Statistical Power to Detect the Correct Number of Classes in Latent Profile Analysis. *Structural equation modeling : a multidisciplinary journal*, *20*(4), 640–657. https://doi.org/10.1080/10705511.2013.824781

Torgersen, S., Kringlen, E., & Cramer, V. (2001). The prevalence of personality disorders in a community sample. *Archives of General Psychiatry*, *58*, 590–596. https://doi.org/10.1001/archpsyc.58.6.590

Turniansky, H., Ben-Dor, D., Krivoy, A., Weizman, A., & Shoval, G. (2019). A history of prolonged childhood sexual abuse is associated with more severe clinical presentation of borderline personality disorder in adolescent female inpatients: a naturalistic study. *Child Abuse & Neglect*, *98*, 104222. https://doi.org/10.1016/j.chiabu.2019.104222

van den Bosch, L. M. C., Koeter, M. W. J., Stijnen, T., Verheul, R., & van den Brink, W. (2005). Sustained efficacy of dialectical behaviour therapy for borderline personality disorder. *Behaviour Research and Therapy, 43,* 1231-1241. https://doi.org/10.1016/j.brat.2004.09.008

van Dijke, A., Ford, J. D., van Son, M., Frank, L., & van der Hart, O. (2013). Association of childhood-trauma-by-primary caregiver and affect dysregulation with borderline personality disorder symptoms in adulthood. *Psychological Trauma: Theory, Research, Practice, and Policy*, *5*, 217. https://doi.org/10.1037/a0027256

Van Orden, K. A., Witte, T. K., Cukrowicz, K. C., Braithwaite, S. R., Selby, E. A., & Joiner, T. E., Jr (2010). The interpersonal theory of suicide. *Psychological review*, *117*(2), 575–600. https://doi.org/10.1037/a0018697

Vansteelandt, K., Houben, M., Claes, L., Berens, A., Sleuwaegen, E., Sienaert, P., & Kuppens, P. (2017). The affect stabilization function of nonsuicidal self injury in Borderline

Personality Disorder: An Ecological Momentary Assessment study. *Behaviour research and therapy*, *92*, 41–50. https://doi.org/10.1016/j.brat.2017.02.003

Verheul, R., van, d. B., Koeter, M. W. J., de Ridder, Maria A. J., Stijnen, T., & van, d. B. (2003). Dialectical behaviour therapy for women with borderline personality disorder: 12-month, randomised clinical trial in the Netherlands. *The British Journal of Psychiatry, 182*, 135-140. https://doi.org/10.1192/bjp.182.2.135

Vuong, Q. H. (1989). Likelihood ratio tests for model selection and non-nested hypotheses. *Econometrica: Journal of the Econometric Society*, 307–333. https://doi.org/10.2307/1912557

Weathers, F. W., & Keane, T. M. (2007). The criterion a problem revisited: Controversies and challenges in defining and measuring psychological trauma. *Journal of Traumatic Stress*, *20*(2), 107–121. https://doi.org/10.1002/jts.20210

Weathers, F. W., Litz, B. T., Keane, T. M., Palmieri, P. A., Marx, B. P., & Schnurr, P. P. (2013). The PTSD checklist for DSM-5 (PCL-5). *Scale Available from the National Center for PTSD at www.ptsd.va.gov*.

Weiss, N. H., Tull, M. T., Viana, A. G., Anestis, M. D., & Gratz, K. L. (2012). Impulsive behaviors as an emotion regulation strategy: examining associations between PTSD, emotion dysregulation, and impulsive behaviors among substance dependent inpatients. *Journal of anxiety disorders*, *26*(3), 453–458. https://doi.org/10.1016/j.janxdis.2012.01.007

Widom, C. S., Czaja, S. J., & Paris, J. (2009). A prospective investigation of borderline personality disorder in abused and neglected children followed up into adulthood.

*Journal of Personality Disorders, 23,* 433–446. https://doi.org/10.1521/pedi.2009.23.5.433

Wingenfeld, K., Schaffrath, C., Rullkoetter, N., Mensebach, C., Schlosser, N., Beblo, T., Driessen, M., & Meyer, B. (2011). Associations of childhood trauma, trauma in adulthood and previous-year stress with psychopathology in patients with major depression and borderline personality disorder. *Child Abuse & Neglect: The International Journal*, *35*, 647–654. https://doi.org/ 10.1016/j.chiabu.2011.04.003

Winter, D., Bohus, M., & Lis, S. (2017). Understanding Negative Self-Evaluations in Borderline Personality Disorder-a Review of Self-Related Cognitions, Emotions, and Motives. *Current psychiatry reports*, *19*(3), 17. https://doi.org/10.1007/s11920-017-0771-0

Zanarini, M. C., Vujanovic, A. A., Parachini, E. A., Boulanger, J. L., Frankenburg, F. R., & Hennen, J. (2003). Zanarini Rating Scale for Borderline Personality Disorder (ZAN-BPD): a continuous measure of DSM-IV borderline psychopathology. *Journal of personality disorders*, *17*(3), 233–242. https://doi.org/10.1521/pedi.17.3.233.22147

Zanarini, M. C., Gunderson, J. G., Frankenburg, F. R., & Chauncey, D. L. (1989). The revised borderline symptoms reported by adolescent inpatients with BPD, psychiatrically healthy adolescents and adult inpatients with BPD. *Personal Mental Health, 11*(3), 150-156.

Zlotnick, C., Johnson, D. M., Yen, S., Battle, C. L., Sanislow, C. A., Skodol, A. E., Grilo, C. M., McGlashan, T. H., Gunderson, J. G., & Bender, D. S. (2003). Clinical features and impairment in women with borderline personality disorder (BPD) with posttraumatic stress disorder (PTSD), BPD without PTSD, and other personality disorders with PTSD.

*The Journal of Nervous and Mental Disease*, *191*, 706–713. https://doi.org/10.1097/01.nmd.0000095122.29476.ff

**Table 1.**

***Current and Lifetime Common Diagnostic Comorbidities in the Full LPA Sample***

| Diagnosis | Lifetime % (n) | Current % (n) |
|---|---|---|
| Mean (SD) Comorbid Axis I Disorders | | |
| PTSD | 61.5 (191) | 42.2 (191) |
| Major Depressive Disorder | 80.2 (192) | 39.1 (192) |
| Panic Disorder | 34.9 (192) | 29.2 (192) |
| Obsessive Compulsive Disorder | 17.7 (192) | 12.0 (192) |
| Generalized Anxiety Disorder | | 32.8 (192) |
| Any Eating Disorder | 50.5 (191) | 21.9 (191) |
| Any Substance Use Disorder | 84.4 (192) | 42.7 (192) |
| Bipolar II Disorder | 12.0 (192) | 7.8 (192) |
| Mean (SD) Comorbid Axis II Disorders | | |
| Cluster A | | 9.9 (192) |
| Cluster B | | 9.9 (192) |

| | |
|---|---|
| Cluster C | 28.1 (192) |

*Note.* PTSD = Posttraumatic Stress Disorder; SD = Standard Deviation; LPA = Latent Profile Analysis. Values reported are % (n) unless otherwise indicated. Any eating disorder encapsulates Anorexia Nervosa, Bulimia Nervosa, Binge Eating Disorder, Eating Disorder Not Otherwise Specified. Any substance use disorder encapsulates alcohol abuse disorder, alcohol dependence disorder, drug abuse disorder, and drug dependence disorder.

**Table 2**

***Means (Standard Deviations) For LPA Items and Class Characterization Variables For All Participants Within and Across Classes at Baseline***

| Variable | Total<br>Mean (SD) | Class 1<br>Mean (SD) | Class 2<br>Mean (SD) | Class 3<br>Mean (SD) |
|---|---|---|---|---|
| **LPA Items** | | | | |
| Number of BPD Criteria | 7.03 (1.15) | 6.85 (1.20) | 7.00 (1.17) | 7.11 (1.11) |
| PTSD Total Score | 45.73 (16.41) | 17.44 (8.55) | 39.90 (6.27) | 60.21 (7.16) |
| Childhood Maltreatment Total | 67.89 (11.15) | 52.24 (13.66) | 57.64 (16.19) | 69.64 (21.14) |
| Emotional Abuse | 17.23 (5.48) | 15.24 (5.78) | 15.95 (4.96) | 19.12 (5.33) |
| Emotional Neglect | 16.19 (4.98) | 13.4.76 (4.53) | 15.14 (4.81) | 17.97 (4.69) |
| Physical Abuse | 9.03 (4.78) | 7.44 (3.02) | 8.16 (4.35) | 10.36 (5.31) |
| Physical Neglect | 9.79 (3.72) | 8.28 (3.02) | 9.21 (3.07) | 10.83 (4.20) |
| Sexual Abuse | 9.93 (6.42) | 7.52 (4.52) | 9.19 (5.87) | 11.40 (7.12) |
| **Class Characterization** | | | | |
| Depression | 36.39 (11.06) | 29.11 (13.41) | 33.46 (10.31) | 41.45 (8.45) |

| | | | | |
|---|---|---|---|---|
| Emotion Dysregulation | 130.29 (18.96) | 120.07 (18.47) | 127.71 (18.80) | 135.96 (17.52) |
| Interpersonal Problems | 122.63 (30.04) | 98.85 (27.28) | 119.95 (28.23) | 132.71 (27.93) |
| General Psychiatric Distress | 1.81 (0.59) | 1.33 (.64) | 1.61 (.50) | 2.14 (.46) |
| BPD Symptom Severity | 53.42 (17.31) | 41.15 (20.47) | 47.50 (15.94) | 62.88 (11.84) |
| Suicidal Ideation | 11.53 (8.76) | 7.30 (7.7) | 9.82 (8.29) | 14.47 (8.62) |
| Self-injurious Behaviours | 16.41 (38.62) | 9.41 (17.84) | 18.09 (47.03) | 17.08 (34.69) |

*Note.* PTSD = Posttraumatic Stress Disorder; SD = Standard Deviation; LPA = Latent Profile Analysis; BPD = Borderline Personality Disorder.

**Table 3**

***Means (Standard Deviations) For All Treatment Outcome Variables For 12-Month Participants Only***

| Variable | Baseline | 3-Months | 6-Months | 9-Months | 12-Months | 15-Months | 18-Months | 21-Months | 24-Months |
|---|---|---|---|---|---|---|---|---|---|
| BPD Symptom Severity | 2.35 (.79) | 2.03 (.84) | 1.97 (.91) | 1.74 (.90) | 1.64 (.99) | 1.56 (.95) | 1.50 (.92) | 1.53 (.91) | 1.56 (1.01) |
| Self-Injurious Behaviours | 14.37 (36.93) | 4.99 (10.50) | 2.55 (7.88) | 1.25 (2.84) | 1.96 (10.49) | 1.39 (5.96) | 1.08 (4.72) | 1.41 (4.66) | 1.86 (5.45) |
| Suicidal Ideation | 10.80 (8.22) | 8.63 (7.98) | 7.58 (7.62) | 5.87 (7.72) | 5.83 (8.00) | 5.42 (7.68) | 4.92 (7.68) | 5.46 (8.16) | 5.26 (8.18) |
| PTSD Symptom Severity | 44.84 (17.20) | 43.26 (16.14) | 38.30 (18.77) | 36.03 (20.72) | 36.96 (20.01) | 35.55 (20.16) | 33.35 (18.99) | 34.52 (19.08) | 32.57 (18.82) |

*Note.* BPD = Borderline Personality Disorder; PTSD = Posttraumatic Stress Disorder.

**Table 4**

***Fit Indices of All Examined Classes***

| *k* | AIC | BIC | BLRT *p* | VLMR *p* | Entropy |
|---|---|---|---|---|---|
| 2 | 18711.696 | 18719.958 | 0.000 | 0.131 | 0.917 |
| 3 | 18388.688 | 18400.003 | 0.000 | 0.165 | 0.950 |
| 4 | 1827.584 | 18284.950 | 0.000 | 0.807 | 0.944 |

*Note. k* = number of classes; VLMR = Vuong-Lo Mendell Rubin likelihood ratio test; AIC = Akaike Information Criterion; Bayesian Information Criterion (BIC); BLRT = Bootstrapped Likelihood Ratio Test. In the present study, the BLRT was the primary indicator of optimal fit, with a statistical significant level of 0.05.

**Table 5**

***ANOVA Results Comparing Classes Across Class Characterization Measures at Baseline***

| Variable | | Sum of Squares | df | Mean Square | *F* | *p* |
|---|---|---|---|---|---|---|
| Depression | Between Groups | 4289.91 | 2 | 2144.96 | 21.26 | .000 |
| | Total | 23355.48 | 191 | | | |
| Emotion Dysregulation | Between Groups | 6086.53 | 2 | 3043.27 | 9.19 | .000 |
| | Total | 68657.67 | 191 | | | |
| Interpersonal Problems | Between Groups | 24469.13 | 2 | 12234.56 | 15.64 | .000 |
| | Total | 172310.59 | 191 | | | |
| General Psychiatric Distress | Between Groups | 18.94 | 2 | 9.47 | 37.25 | .000 |
| | Total | 67.00 | 191 | | | |
| BPD Symptom Severity | Between Groups | 14480.44 | 2 | 7240.22 | 32.02 | .000 |
| | Total | 57218.67 | 191 | | | |
| Suicidal Ideation | Between Groups | 1451.51 | 2 | 725.76 | 10.38 | .000 |
| | Total | 14661.87 | 191 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Self-Injurious Behaviour | Between Groups | 1585.00 | 2 | 792.50 | .53 | .590 |
| | Total | 28340.33 | 190 | | | |
| PTSD Symptom Severity | Between Groups | 42147.40 | 2 | 21073.70 | 427.99 | .000 |
| | Total | 51453.45 | 191 | | | |

*Note.* BPD = Borderline Personality Disorder; PTSD = Posttraumatic Stress Disorder

**Table 6**

***Tukey HSD Post-Hoc Analyses For All Class Characterization Variables at Baseline***

| Variable | Reference Class (R) | Class Comparison (C) | Mean Difference (R-C) | SE | *p* | 95% Confidence Interval for Difference | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower | Upper |
| Depression | L | M | -4.35 | 2.24 | .129 | -9.63 | .93 |
| | | H | -12.34 | 2.22 | .000 | -17.58 | -7.09 |
| | M | L | 4.35 | 2.24 | .129 | -.93 | 9.63 |
| | | H | -7.99 | 1.57 | .000 | -11.68 | -4.29 |
| | H | L | 12.34 | 2.22 | .000 | 7.09 | 17.58 |
| | | M | 7.99 | 1.57 | .000 | 4.29 | 11.68 |
| Emotion Dysregulation | L | M | -7.64 | 4.05 | .145 | -17.21 | 1.93 |
| | | H | -15.89 | 4.02 | .000 | -25.39 | -6.40 |
| | M | L | 7.64 | 4.05 | .145 | -1.93 | 17.21 |
| | | H | -8.25 | 2.83 | .011 | -14.95 | -1.56 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | H | L | -21.10 | 4.02 | .000 | 6.40 | 25.39 |
| | | M | -33.85 | 2.83 | .011 | 1.56 | 14.95 |
| Interpersonal Problems | L | M | -21.10 | 6.22 | .002 | -35.81 | -6.39 |
| | | H | -33.85 | 6.17 | .000 | -48.45 | -19.26 |
| | M | L | 21.10 | 6.22 | .002 | 6.39 | 35.81 |
| | | H | -12.75 | 4.35 | .011 | -23.05 | -2.46 |
| | H | L | 33.85 | 6.17 | .000 | 19.26 | 48.45 |
| | | M | 12.75 | 4.35 | .011 | 2.46 | 23.05 |
| General Psychiatric Distress | L | M | -.27 | .11 | .041 | -.54 | -.01 |
| | | H | -.81 | .11 | .000 | -1.07 | -.55 |
| | M | L | .27 | .11 | .041 | .01 | .54 |
| | | H | -.54 | .08 | .000 | -.72 | -.35 |
| | H | L | .81 | .11 | .000 | .55 | 1.07 |
| | | M | .54 | .08 | .000 | .35 | .72 |
| BPD Symptom Severity | L | M | -6.35 | 3.35 | .142 | -14.26 | 1.55 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | H | -21.73 | 3.32 | .000 | -29.58 | -13.89 |
| | M | L | 6.35 | 3.35 | .142 | -1.55 | 14.26 |
| | | H | -15.38 | 2.34 | .000 | -20.92 | -9.85 |
| | H | L | 21.73 | 3.32 | .000 | 13.89 | 29.58 |
| | | M | 15.38 | 2.34 | .000 | 9.85 | 20.92 |
| Suicidal Ideation | L | M | -2.53 | 1.86 | .365 | -6.92 | 1.87 |
| | | H | -7.17 | 1.85 | .000 | -11.54 | -2.81 |
| | M | L | 2.53 | 1.86 | .365 | -1.87 | 6.92 |
| | | H | -4.65 | 1.30 | .001 | -7.72 | -1.57 |
| | H | L | 7.17 | 1.85 | .000 | 2.89 | 11.54 |
| | | M | 4.65 | 1.30 | .001 | 1.57 | 7.72 |
| Self-Injurious Behaviour | L | M | -8.68 | 8.63 | .57 | -29.07 | 11.71 |
| | | H | -7.68 | 8.55 | .64 | -27.88 | 12.53 |
| | M | L | 8.68 | 8.63 | .57 | -11.71 | 29.07 |
| | | H | 1.01 | 6.05 | .99 | -13.71 | 15.30 |
| | H | L | 7.68 | 8.55 | .64 | -12.53 | 27.88 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | M | -1.01 | 6.05 | .99 | -15.30 | 13.29 |
| PTSD Symptom Severity | L | M | -22.46 | 1.56 | .000 | -26.14 | -18.77 |
| | | H | -42.77 | 1.55 | .000 | -46.43 | 39.11 |
| | M | L | 22.46 | 1.56 | .000 | 18.77 | 26.14 |
| | | H | -20.31 | 1.09 | .000 | -22.89 | -17.73 |
| | H | L | 42.77 | 1.55 | .000 | 39.11 | 46.43 |
| | | M | 20.31 | 1.09 | .000 | 17.73 | 22.89 |

*Note.* L = Low Maltreatment Class; M = Moderate Maltreatment Class; H = High Maltreatment Class**;** BPD = Borderline Personality Disorder; PTSD = Posttraumatic Stress Disorder.

**Table 7**

***Generalized estimating equations model predicting changes in BPD symptom severity***

| | B | SE | $\chi^2$ | df | *p*-value |
|---|---|---|---|---|---|
| Intercept | 1.80 | .23 | 532.08 | 1 | .000 |
| Class | | | 14.49 | 2 | .001 |
| time | -.11 | .04 | 38.59 | 1 | .000 |
| Class×time | | | 2.10 | 2 | .350 |

*Note.* Parameter estimates for the variables involving Class are not provided, given it involves multiple classes and parameter estimates.

**Table 8**

***Generalized estimating equations model predicting changes in self-injurious behaviours***

| | B | SE | $\chi^2$ | df | *p*-value |
|---|---|---|---|---|---|
| Intercept | 2.65 | .37 | 121.00 | 1 | .000 |
| Class | | | .003 | 2 | .998 |
| time | -.95 | .17 | 61.43 | 1 | .000 |
| Class×time | | | 15.68 | 2 | .000 |

*Note.* Parameter estimates for the variables involving Class are not provided, given it involves multiple classes and parameter estimates.

**Table 9**

***Generalized estimating equations model predicting changes in suicidal ideation***

| | B | SE | $\chi^2$ | df | *p*-value |
|---|---|---|---|---|---|
| Intercept | 6.47 | 2.05 | 112.82 | 1 | .000 |
| Class | | | 7.13 | 2 | .028 |
| time | -.63 | .34 | 21.22 | 1 | .000 |
| Class×time | | | 0.09 | 2 | .958 |

*Note*. Parameter estimates for the variables involving Class are not provided, given it involves multiple classes and parameter estimates.

**Table 10**

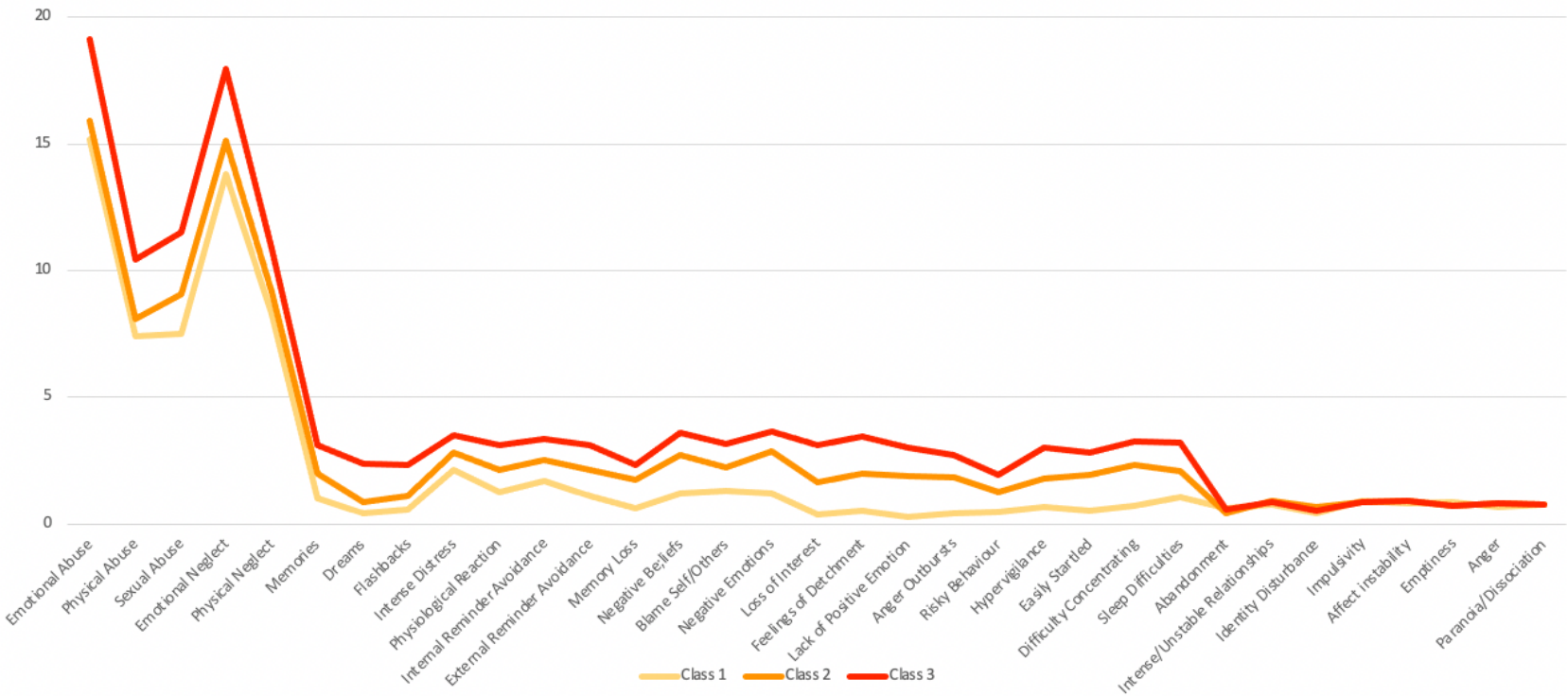
***Generalized estimating equations model predicting changes in PTSD symptom severity***

| | B | SE | $\chi^2$ | df | *p*-value |
|---|---|---|---|---|---|
| Intercept | 22.99 | 3.05 | 863.99 | 1 | .000 |
| Class | | | 92.44 | 2 | .000 |
| time | -.18 | .403 | 19.44 | 1 | .000 |
| Class×time | | | 9.38 | 2 | .009 |

*Note.* The table does not include parameter estimates for Class given it involves multiple classes, and multiple estimates.

**Figure 1**

***Graphic representation of Classes 1, 2, and 3 across LPA items***




Note. Class 1 = Low Maltreatment Class, Class 2 = Moderate Maltreatment Class; Class 3 = High Maltreatment Class.