MODELING MULTIPLE RISK FACTORS FOR
BORDERLINE PERSONALITY DISORDER:
A COMPARISON OF VARIABLE-CENTERED AND
PERSON-CENTERED APPROACHES

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Christina M. Temes

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The dissertation of Christina M. Temes was reviewed and approved* by the following:

Kenneth N. Levy  
Associate Professor of Psychology  
Dissertation Adviser  
Chair of Committee

Michelle G. Newman  
Professor of Psychology

Koraly Perez-Edgar  
Professor of Psychology

Bethany C. Bray  
Associate Director of The Methodology Center  
Research Associate Professor, College of Health and Human Development

Melvin M. Mark  
Professor of Psychology  
Head of the Department of Psychology

*Signatures are on file in the Graduate School.
ABSTRACT
Borderline personality disorder (BPD) is a chronic, severe, prevalent disorder that is associated with a host of negative outcomes, including suicidal behavior. Due in part to the severity of this disorder and features of it, a growing body of research has focused on identifying factors that confer risk for BPD symptomatology, including early presence of externalizing and internalizing pathology, maladaptive experiences with caregivers, early abusive experiences, and family history of certain kinds of psychopathology. The present study is an attempt to further elucidate the nature of risk for BPD by comparing variable-centered and person-centered approaches to examining the effects of 16 risk factors from multiple ecological levels. In variable-centered, logistic regression analyses, the vast majority of identified risk factors were associated with an increased likelihood of BPD symptoms. Person-centered latent class analyses yielded five latent classes, representing distinct profiles characterized by different levels of types of risk exposure that co-occurred within individuals. Prevalence of classes differed as a function of level of BPD symptomatology, with a class characterized by early internalizing and externalizing psychopathology the most prevalent among those with full-criteria BPD. Exposure to early risk (as represented by the latent risk exposure classes) and exposure to adult risk factors were independently associated with suicide attempt in adulthood. In members of the class characterized by early psychopathology, likelihood of suicide attempt was increased when individuals experienced depression in adulthood.
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Chapter 1

INTRODUCTION

Borderline personality disorder (BPD) is chronic, severe, and potentially deadly psychiatric problem affecting approximately 1-2% of the general population, 10% of psychiatric outpatients, and 20% of psychiatric inpatients (Lenzenweger, Loranger, Korfine, & Neff, 1997; Skodol, Gunderson, Pfohl, Widiger, Livesley, & Siever, 2002). The disorder is characterized by a constellation of features, including emotion dysregulation (i.e., affective instability, chronic emptiness, angry outbursts), potential for self-destructive behavior (i.e., suicidality and self-injury, impulsivity), interpersonal difficulties (i.e., stormy relationships, abandonment concerns), identity disturbance, and transient paranoia/dissociation (American Psychiatric Association, 2013; Skodol et al., 2002).

In addition to the aforementioned symptoms, BPD has associated with a host of negative outcomes. The rate of suicidal behavior among individuals with BPD is very high, with upwards of 84% of patients with BPD reporting some history of suicidal behavior, averaging 3.4 lifetime suicide attempts (Black, Blum, Pfohl, & Hale, 2004; Soloff, Lis, Kelly, Cornelius, & Ulrich, 1994; Soloff, Lynch, & Kelly, 2002), and up to 10% of patients with BPD eventually completing suicide (Black et al., 2004; Paris & Zweig-Frank, 2001; Soloff et al., 1994). Additionally, BPD has been associated with higher rates of physical and mental disability, significant functional impairment across multiple domains, increased use of treatment services, and a more complicated clinical course for comorbid conditions and their treatment (e.g., Bender et al., 2001, Grant et al.,
2008; Gunderson et al., 2004; Shea et al., 1990; Skodol et al., 2002; Skodol, Grilo, Keyes, Geier, Grant, & Hasin, 2011).

Although a full diagnosis of BPD requires an individual to exhibit five of the nine aforementioned features (APA, 2013), the presence of fewer features has also been associated with considerable distress and impairment, and there is increasing interest in focusing on the clinical significance of dimensions of BPD pathology rather than categorical diagnosis alone (Morey et al., 2007; Skodol et al., 2005). A study of over 3,000 psychiatric outpatients (Zimmerman, Chelminski, Young, Darlrymple, & Martinez, 2012) found that presence of only one criterion of BPD was associated with poor outcomes. In particular, participants with one criterion of BPD had significantly more DSM-IV Axis I conditions, suicide attempts, suicidal ideation, hospitalizations, and time missed from work due to psychiatric illness—as well as significantly lower global assessment of functioning (GAF) scores—when compared to participants who met zero criteria. Another study using the same dataset (Ellison, Rosenstein, Chelminski, Dalrymple, & Zimmerman, 2016) found that the criterion of emptiness was the only criterion that was a marker of all forms of psychiatric morbidity, including suicidal behavior, psychiatric comorbidity, and functional deficits. Similarly, a prospective study of 351 young adults from a nonclinical sample (Bagge, Nickell, Stepp, Durrett, Jackson, & Trull, 2004) found that presence of BPD features—over and above the effects of gender and other Axis I and Axis II pathology—predicted a variety of negative outcomes (e.g., poorer academic/occupational achievement, interpersonal difficulties, etc.) over two years of follow-up. The features of impulsivity and affective instability were especially predictive of these outcomes.
Other studies have found comparable associations between a wide range of negative outcomes and presence of BPD features within nonclinical samples (e.g., Trull, 1995; Trull, Useda, Conforti, & Doan, 1997). Taken together, these findings indicate that even a low number of BPD features can be associated with significant functional impairment and morbidity, and the influence of subclinical levels of BPD features is more strongly related to these outcomes than presence of other comorbid psychiatric conditions.

**Risk factors for BPD symptoms**

Given the robust negative effects associated with elevated BPD symptoms, an increasing amount of research has focused on the early risk factors that may contribute to developing these symptoms (Cohen, 2008). The leading etiological models of BPD posit that the disorder results from an interplay between individual, constitutional vulnerabilities and aversive early experiences, particularly in the child-caregiver relationship (Bateman & Fonagy, 2001; Kernberg, 1984; Linehan, 1993). A number of longitudinal and cross-sectional studies have attempted to elucidate the developmental pathways that lead to adult BPD symptoms, with foci on multiple levels of risk both endogenous and exogenous to the individual (i.e., biological and genetic factors, maladaptive family experiences, and exposure to traumatic or stressful life events). A bulk of the findings from prospective studies of risk for BPD come from the Children in the Community Study (CIC; see Cohen, Crawford, Johnson, & Kasen, 2005 for an overview)—a large-scale, longitudinal study of the course of psychiatric disorders in approximately 800 youth from Upstate New York—although a few other studies have examined antecedents of BPD in a similar manner (e.g., Carlson, Egeland, & Sroufe,
2009; Stepp, Pilkonis, Hipwell, Loeber, & Stouthamer-Loeber, 2010). Findings from these studies of BPD risk suggest that certain factors consistently predict later BPD symptoms, although the precise nature of the interactions between these factors is complex and in need of further study.

With regard to individual-level factors, multiple studies have indicated that a range of externalizing and internalizing symptoms in childhood and adolescence act as precursors to BPD symptoms in adulthood. In the externalizing domain specifically, there exists a strong link between disruptive behavior disorders (attention-deficit hyperactivity disorder [ADHD], oppositional defiant disorder [ODD], and conduct disorder [CD]) in childhood/adolescence and adult BPD symptoms or symptoms of other Cluster B personality disorders (Bernstein, Cohen, Skodol, Bezirganian, & Brook, 1996; Burke & Stepp, 2012; Carlson et al., 2009; Cohen et al., 2005; Fischer, Barkley, Smallish, & Fletcher, 2002; Rey, Singh, Andrews, & Stewart, 1995; Helgeland, Kjelsberg, & Torgersen, 2005; Lewinsohn, Rohde, Seeley, & Klein, 1997; Zoccolillo, Pickles, Quinton, & Rutter, 1992).

There is some evidence to suggest that the effect of these disorders influences the trajectory of BPD symptoms over and above other early-onset symptoms. Using data from a longitudinal community study of girls (The Pittsburgh Girls Study), Stepp and colleagues (2012) found that childhood ADHD and ODD symptoms predicted late-adolescent BPD symptoms, even after accounting for the effects of early negative emotionality, depression, and conduct disorder. Similarly, a Norwegian community study (Helgeland et al., 2005) found that individuals with disruptive behavior problems in adolescence were more likely to have a Cluster B personality disorder in adulthood.
compared to individuals who had other types of emotional problems in adolescence. Additionally, substance use disorders with an onset in adolescence or earlier are strongly related to adult BPD (Rohde, Lewinsohn, Kahler, Seeley, & Brown, 2001; Stepp, Olino, Klein, Seeley, & Lewinsohn, 2013). Furthermore, dimensions believed to underlie BPD pathology—including impulsivity, interpersonal aggression, and negative emotionality—appear to be fairly stable throughout childhood and adolescence, and early manifestations of these features strongly predict later BPD (Chanen, Jovev, McCutcheon, Jackson, & McGorry, 2008; Stepp et al., 2010). It is important to note, however, that rates of these features tend to decrease by early adulthood (although the rank order of severity remains), suggesting that not all individuals who exhibit these traits in youth go on to develop BPD, although many adults with BPD exhibited these traits at an earlier age and/or are still characterized by elevated (relative to peers) levels of these features (Bornovalova, Hicks, Iacono, & McGue, 2009; Crawford et al., 2005).

Consistent with the pattern of “complex comorbidity” (Zanarini, Frankenburg, Dubo, Sickel, Trikha, Levin, & Reynolds, 1998) observed in the adult BPD literature, there is evidence across multiple samples that more often a combination of internalizing and externalizing disorders in childhood and adolescence (as opposed to one type of disorder alone) predicts later BPD symptomatology. For example, childhood conduct problems, anxiety, and depression predicted later Cluster B PDs in the CIC study (Bernstein et al., 1996; Kasen, Cohen, Skodol, Johnson, & Brook, 1999). In a longitudinal community study of youth in Oregon, adolescent substance abuse, suicidality, and depression predicted adult BPD even after other risk factors were controlled (Stepp et al., 2013). In an analysis of a subsample from this same study,
participants with an onset before age 19 of MDD, anxiety disorder, ADHD, CD, ODD, and/or SUDs had an increased risk of elevated BPD symptoms in adulthood (Lewinsohn et al., 1997; Rohde et al., 2001). Similarly, Thatcher and colleagues (2005) found that adolescent-onset alcohol use disorder, ADHD, CD, PTSD, and MDD predicted BPD symptom severity in adulthood in a community sample of adolescents.

The risk literature has also focused on numerous environmental and familial risk factors for BPD. Within the family context, certain maladaptive parenting behaviors and parent-child dynamics have been especially predictive of BPD. A study based on retrospective reports of childhood experiences (Zanarini et al., 1997) found that patients with BPD were more likely than Axis II comparison subjects to report a range of maladaptive experiences with caretakers, including inconsistent treatment, emotional withdrawal, role reversal, denial of feelings, and lack of necessary protection. Additional studies, including the CIC and other prospective studies, have also highlighted the risk associated with parental inconsistency, role reversal, and emotional withdrawal (e.g., Berziganian, Cohen, & Brook, 1993; Carlson et al., 2009). This risk is compounded further when aversive parenting behaviors are coupled with low affection, nurturing, or warmth (Johnson, Cohen, Chen, Kasen, & Brook, 2006) or with hostility and/or harsh punishment (Bandelow, Krause, Wedekind, Broocks, Hajak, & Ruther, 2005; Carlson et al., 2009; Johnson et al., 2006; Stepp et al., 2013). Early (prior to age 5) maternal separations are also predictive of BPD symptoms beginning in adolescence and into adulthood, and lower rates of decline in BPD symptoms with age (Crawford, Cohen, Chen, Anglin, & Ehrensaft, 2009).
In addition to the stress incurred through these events, maladaptive parenting experiences such as these likely contribute to disruption in early attachment relationships, which in turn influence later personality pathology by leading to a series of disturbed mental representations about the self and relationships that are elaborated and consolidated over the lifespan (Fonagy & Luyten, 2009; Levy, 2005; Levy, Beeney & Temes, 2010). Furthermore, a pattern often observed in the histories of individuals with BPD at higher rates than in people with other psychiatric conditions is one of “biparental failure,” or an impaired capacity of both parents to carry out the functions of parenting (Frank and Paris, 1981; Links, 1992; Zanarini, 2000).

There is also an established relationship between abusive experiences—including sexual abuse, physical abuse, and neglect—in childhood and BPD symptoms in adulthood (e.g., Herman et al., 1989; Ogata et al., 1990, Zanarini et al., 1997; Laporte & Guttman, 1996; Helgeland & Torgersen, 2004; Goldman, D’Angelo, DeMaso, & Mezzacappa, 1992). In the CIC, documented childhood abuse and neglect was related to a four-fold increase in the likelihood of having a PD in adulthood when other factors (including age, parental education, and parental psychiatric history) were controlled (Cohen et al., 2005; Cohen, 2008). In the same sample, experiences of maltreatment seemed to confer a specific risk for BPD; specifically, childhood physical abuse, sexual abuse, and neglect were strongly predictive of BPD even when other PDs were taken into account (Johnson et al., 1999). In this study, a history of these abusive experiences increased the risk of later BPD greater than seven-fold. A study using clinician report on the experiences of adult patients with BPD (Bradley, Jenei, & Westen, 2005) found that although family environment, parental psychopathology, and abuse history all
independently predicted BPD, the effect of sexual abuse was stronger than that of the other environmental risks (Bradley, Jenei, & Westen, 2005). It should be noted that although the link between abuse and BPD is consistently found, the strength of this relationship varies considerably by study (Golier et al., 2003; Westen, Ludolph, Misle, Ruffins, & Block, 1990), with a meta-analysis finding only a moderate effect size for the relationship between childhood sexual abuse and adult BPD (Fossati, Madeddu, & Maffei, 1999). These inconsistencies have led some to argue that the association between early abuse and BPD symptomatology is likely dependent on other biosocial factors, and thus a multifactorial (as opposed to simple association) approach is needed to fully explain these effects (Fossati et al., 1999, Paris & Zweig-Frank, 1992).

Other environmental risks have also been examined, including sociodemographic factors and other common aversive childhood experiences reported by individuals with BPD. In the CIC, low family socioeconomic status, family welfare support, being raised in a single-parent family, parental illness, and parental death were all independently associated with later PD symptoms (Cohen, 1996; Cohen, Chen, Gordon, Johnson, Brook, & Kasen, 2008). Low SES conferred a specific risk for borderline and schizotypal PD symptoms, independent of problematic parenting, intelligence, or abuse history (Cohen et al., 2008).

A final widely studied domain of risk has been history of psychopathology in families of individuals with BPD. Family history represents a complex risk factor in that it may reflect genetic risk, environmental risk (i.e., secondary being raised/in close contact with someone with psychological difficulties), or a combination of the two. Most investigations of family history of psychopathology for BPD have focused on history of
psychopathology in any close family members, as opposed to a specific focus on the parents of target individuals. Overall, these studies have suggested that rates of psychiatric disorders are higher among the family members of individuals with BPD when compared to rates seen in families of people with other psychiatric disorders (White, Gunderson, Zanarini, & Hudson, 2003). In particular, BPD families commonly exhibit higher rates of depressive disorders, antisocial PD, and substance use (Goldman, D’Angelo, & DeMaso, 1993). Additionally, BPD and its core features tend to aggregate in families, with first-degree relatives of those with BPD at a substantially higher risk of also having the disorder or features of it (e.g., impulsivity, interpersonal problems, affective instability, and cognitive impairments) than members of the general population (Gunderson et al., 2011; Silverman et al., 1991; Barnow et al., 2006; White et al., 2003). Studies that have examined the effects of parental history of mental illness specifically as a risk factor similarly have found that a variety of conditions, particularly those involving mood and inhibitory difficulties, is associated with a BPD in offspring. These conditions include major depressive disorder, sociopathy/antisocial PD, BPD, and substance use disorders (SUDs), as well as suicidal behavior in one or both parents (Bandelow et al., 2005; Cohen, 1996; Riso, Klein, Anderson, & Ouimette, 2000; Shachnow, Clarkin, DiPalma, & Thurston, 1997; Stepp et al., 2013; Trull, 2001).

Overall, the existing literature suggests that a number of risk factors contribute to the development of BPD symptoms; however, less is known about how these factors interact with one another to confer risk. As some authors have noted, these risk factors are often not studied together, or—when they are—it is generally not done with an effort to disentangle the effects of the variables, many of which are highly correlated (Bradley,
Jenei, & Westen, 2005; Chanen & Kaess, 2011). Knowing about the effects of one factor (or one level of risk) in the absence of others provides an incomplete or oversimplified picture of the disorder’s etiology. A more fruitful approach would involve examining a given risk factor in conjunction with a broad range of others, encompassing multiple levels—including genetic risk, family context, and other experiences—to capture the full range of potential diatheses, stressors, and the interplay between them (Paris, 1997; Fruzetti, Shank, and Perry, 2005). Doing so would allow for a richer understanding of risk and the ability to detect subtle interactions between risk factors, as some studies have demonstrated. For example, there is evidence that the context of abuse (e.g., a family context characterized by lack of support or neglect) or the combination of abuse types matters more than merely the presence of a given type of abuse in predicting BPD (Zanarini et al., 1999, Nash, Hulssey, Sexton, Harralson, & Lambert, 1993). These particular findings demonstrate how it is imperative to study configurations of risk factors, as opposed to single indices of risk.

In addition to more traditional, variable-centered methods (e.g., multivariate regression), one potentially fruitful approach for examining risk is through the use of latent class analysis (LCA; see Collins & Lanza, 2010 and Lanza, Bray, & Collins, 2013 for reviews). LCA is a person-centered technique that can be used to identify underlying subgroups of individuals that share particular characteristics within a given population. To do so, a set of observed variables (indicators) are included in latent class models, and models of different numbers of classes (e.g., 3 vs. 4) are compared using fit indices to determine how many latent classes likely exist in a given population. The characteristics of the subgroups can then be described by examining the probability of endorsing certain
variables given membership in a certain class. Although it is a somewhat newer application of this technique, LCA recently has been used as a way of modeling multiple risks and examining their effects on outcomes of interest (e.g., Lanza, Rhoades, Greenberg, Cox, & The Family Life Project Key Investigators, 2011; Lanza, Rhoades, Nix, Greenberg, & The Conduct Problems Prevention Research Group, 2010; Parra, DuBois, & Sher, 2006). Doing so provides both a descriptive lens into which risks are commonly present and/or tend to co-occur in the profiles of individuals of a given group and an examination of particular combinations of risk factors and their effects (i.e., as opposed to separately examined risk factors). Accordingly, this technique could uniquely address some of the critiques of the existing literature on BPD risk, in that it allows for both a nuanced description of common risk profiles and a way of looking at the interaction of various risk factors and unpacking the complicated relationships among common risk factors (Bradley, Jenei, & Westen, 2005; Chanen & Kaess, 2012; Disrel et al., 2011).

**A risk within BPD: Suicidal behavior**

One extension of the aforementioned method is to examine how particular configurations of risk factors relate to outcomes of interest within symptomatic groups—or, what types of individuals with BPD (as characterized by risk profiles) are most likely to exhibit a particular outcome. As noted earlier, a particularly relevant outcome within BPD is suicidal behavior, which is both dangerous and common in this population. A growing body of research has focused on the characteristics of individuals with BPD who also exhibit suicidal behavior. In general, these studies have approached this question by looking at both early risk (similar to the etiological studies of BPD), as well as more
proximal risks for suicide, including comorbid disorders and PD features in adulthood, social functioning, negative life events, and sociodemographic characteristics.

With regard to early risk, experiences of physical and sexual abuse have been found to predict both the presence and severity of suicidal behavior in individuals with BPD (Brodsky et al., 1997; Ferraz et al., 2013; Sansone, Songer, & Miller, 2005; Yen et al., 2014) even after other risk factors are controlled. In one study (Soloff, Lynch, & Kelly, 2002), 96% of BPD patients who had a history of childhood sexual abuse went on to attempt suicide. Other family environment factors, including parental loss or separation and exposure to maladaptive parenting behaviors, are likewise associated with suicidality among patients with BPD (e.g., Ferraz et al., 2013; Kjelsberg, Eikeseth, & Dahl, 1991; Rich & Runeson, 1992). Although not fully confirmed by the existing research, Paris (2005) argues that early risk factors that contribute to both later impulsivity and intense dysphoria (i.e., the features he believes strongly contribute to suicidal behavior among those with BPD), likely contribute to later suicidality. Accordingly, he posits that an interaction of internalizing and externalizing symptoms, beginning in childhood, is an important etiological factor in his developmental model of adult impulsivity and suicidality.

In terms of more proximal risks, much attention has been paid to comorbid Axis I and Axis II disorders in adulthood as they relate to suicide risk. Mood disorders are probably the most commonly studied comorbid conditions, and several studies—including notable longitudinal studies such as McGlashan’s Chestnut Lodge Study (1986) and Stone’s New York State Psychiatric Institute Study (1989)—found higher rates of suicide among BPD patients with comorbid depression (Brown et al., 2000; Black et al.,
Strong associations have also been found for substance use disorders and suicide in BPD patients (Black et al., 2004; Brodsky et al., 1997; Darke, Ross, Lynskey, & Teeson, 2004; Fyer et al., 1988; Yen et al., 2003), and antisocial personality disorder is also a commonly observed predictor of suicidal behavior (see Black et al., 2004 for a review).

Another approach has been to examine features of BPD (or, the personality dimensions believed to underlie these features) as predictors of suicidal behaviors. Studies that have examined all BPD criteria together in the prediction of suicidality have yielded mixed results with regard to which BPD features are most strongly associated with these outcomes. Generally, impulsivity is most consistently found to predict suicidal outcomes across studies (Brodsky et al., 1997; Mann, Waternaux, Haas, & Malone, 1999; Yen et al., 2004), although affective instability and identity disturbance have also been implicated (Links et al., 2007; Yen et al., 2004). Additionally, characteristics that are consistent with chronic suicidality in general are also predictive of continued suicidal behavior (including completed suicide) in individuals with BPD. These factors include a higher number of lifetime suicide attempts with more serious intent and/or lethality (Soloff et al., 1994) and more extensive history of hospitalization (Black et al., 2004).

Finally, a host of other sociodemographic and history variables have been found to predict suicidality in BPD samples. Generally, lower SES, employment difficulties, older age, and female gender have all be found to be associated with a history of suicide attempts in BPD samples (Black et al., 2004, Mehlum, Friis, Vaglum, & Karerud, 1994; Soloff et al., 1994). Poorer social functioning and/or lack of social connectedness or support are also associated with suicide risk (McKay, Gavigan, & Kulchycky, 2004;
Mehlum et al., 1994; Wedig, Frankenburg, Reich, Fitzmaurice, & Zanarini, 2013).

Furthermore, negative life events, particularly those concerning interpersonal stresses (e.g., relationship dissolution) or legal matters, also consistently predict suicide attempt in this population (Brodsky, Groves, Oquendo, Mann, & Stanley, 2006; Horesh, Nachshoni, Wolmer, & Toren, 2009; Yen et al., 2005).

In general, the existing research on risk for suicidality within BPD is comprised of studies which focus on a small set of variables believed to elevate risk for these behaviors. In these studies, few early risk factors are typically included—if they are included at all—despite suggestion that these factors likely influence both the development of BPD dimensions more generally, as well as the eventual emergence of suicidal behavior (e.g., Paris, 2005). Furthermore, findings about early risk for suicide have historically not been well-integrated with findings concerning more proximal risk in adulthood, and the mechanisms through which these early factors exert later influence are not well understood (see Nock, 2008 for a review). Seeing as suicidal behavior is both an important outcome related to BPD as well as a defining behavioral manifestation of the disorder, it is likely that there is some shared etiological risk for both adult BPD and adult suicidal behavior within this population. Thus, it is imperative to both unpack the nature of the influence of early risk and to disentangle the effects of early risk from more proximal factors in adulthood. Building upon the previously discussed LCA models is one way of approaching this issue.

**The Present Study**

The present study used data collected as part of a large, epidemiological study of mental health conditions in the United States (U.S.) to examine the interaction of early
risk factors for adult BPD and their relation to adverse outcomes in adulthood (e.g., suicidal behavior). The risk factors examined in this study come from multiple, research-informed domains, including individual-level precursor signs and symptoms (i.e., endogenous factors), family context and environmental influences, and family history of psychopathology.

The first aim of this study was to examine early risk for BPD using a variety of approaches. In doing so, we first used more traditional, variable-centered approaches (i.e., logistic regression) to evaluate the relative strength of risk factors in predicting level of BPD symptomatology in a representative sample of the adult U.S. population. In these analyses, we also generated a cumulative risk index to examine whether the extent of risk exposure (i.e., total number of risk factors present) predicted BPD status. We predicted that exposure to each risk factor would confer greater odds of exhibiting some BPD symptoms or full-criteria BPD, as compared to having no BPD symptoms, in analyses of the effects of individual risk factors. Further, it was expected that likelihood would be greatest for full-criteria BPD given exposure to each risk factor, followed by having some symptoms of BPD. Finally, we predicted that having a greater amount of risk exposure, represented by the cumulative risk index, would be associated with a greater likelihood of belonging to a more symptomatic group.

Next, we employed a person-centered approach—LCA—to identify and characterize profiles of risk and to evaluate the degree to which distribution of risk profiles differed by level of BPD symptomatology. The primary goal of the LCA is descriptive in nature, as its intention is to distill a large amount of data (in this case, 16 risk factors) to uncover patterns of risk exposure that could not be identified a priori.
Although the exact nature of the risk exposure classes generated from these analyses could not be predicted beforehand, it was expected that the analyses would yield a relatively small number of classes, which could parsimoniously capture the interplay of the multiple risk factors studied in this sample. We also expected that the prevalence of membership in each risk exposure class would differ as a function of the level of BPD symptomatology. Given the representative nature of the dataset, we predicted that at least one class would represent a no risk/very low risk class; accordingly, it was expected that membership in this class would be more prevalent in the no BPD symptom group and less common in symptomatic groups. We expected the other classes to represent other combinations of risk factors and anticipated that risk factors from all ecological levels would be represented in the risk exposure classes yielded from the LCA.

The **second aim** of the current study is to examine the effects of childhood and adult risk factors on adverse outcomes (in this case, suicide attempt) in individuals who met full criteria for BPD. In doing so, we extended the aforementioned LCA models of early risk to a) test the effect of risk exposure class membership on likelihood of suicide attempts in adulthood in this group, and b) examine the extent to which adult risk factors predict suicide attempt and moderate the effect of risk exposure class membership on this outcome. Although these analyses were dependent on the specific classes yielded from the LCA, we predicted that membership in “riskier” classes (relative to low/no risk classes) would be associated with a greater odds of suicide attempt in adulthood. We also expected that some of the adult risk factors would independently be associated with increased odds of suicide attempt in adulthood and would likewise compound earlier risk for this outcome, particularly in “riskier” classes.
Chapter 2

METHOD

Sample and Data Collection Procedures

This study used data from Waves 1 and 2 of the National Epidemiological Survey on Alcohol and Related Conditions (NESARC; Grant, Kaplan, & Stinson, 2005; Grant, Stinson, Dawson, Chou, Dufour, Compton et al., 2004), a large, multi-wave, epidemiological survey of comorbid mental health conditions, including substance use disorders, mood disorders, anxiety disorders, and personality disorders. The sample is representative of civilian adults (over age 18) from the U.S., including residents of Washington, D.C., Hawaii, and Alaska. Demographically, Wave 1 NESARC oversampled Black, Hispanic, and young adult (aged 18-24) participants.

In NESARC Wave 1, face-to-face interviews were conducted with 43,093 participants in 2001-2002. During follow-up, attempts were made to contact all Wave 1 participants for Wave 2 interviews, which took place in 2004-2005. All Wave 1 participants were eligible for Wave 2 unless they were deceased, deported, on active military duty, and/or otherwise physically or mentally impaired at the time of the follow-up assessment. The Wave 2 response rate was 86.7%, yielding a total Wave 2 sample size of 34,653. As in Wave 1, Wave 2 participants completed face-to-face interviews assessing mental health conditions (with a focus on mental health between Wave 1 and Wave 2), adverse childhood events, social connectedness, intimate partner violence, perceived experiences of discrimination, and other variables (see Measures section for more detail on the specific assessments used in this study). The average amount of time between Wave 1 and Wave 2 interviews was 36.6 months (s.e. = 2.62; Grant et al., 2009).
Due to the complex sampling methods used in NESARC, the data can be weighted so that sociodemographic characteristics of the sample are representative of the U.S. population (i.e., by adjusting for nonresponse, survey design characteristics, initial oversampling of particular demographic groups, and attrition between the two waves). All analyses included the recommended weights.

Measures

Psychiatric diagnoses. All diagnoses were made using the Alcohol Use Disorder and Associated Disabilities Interview Schedule for DSM-IV (AUDADIS-IV; Grant, Dawson, & Hasin, 2001), a structured interview designed to be administered by lay interviewers. DSM-IV Axis I conditions that were assessed include alcohol and drug abuse (for 10 classes of substances), major depressive disorder, bipolar I and II disorders, dysthymia, hypomania, panic disorder with and without agoraphobia, social phobia, specific phobia, and generalized anxiety disorder. Post-traumatic stress disorder (PTSD) and attention-deficit hyperactivity disorder (ADHD) were assessed only at Wave 2. Although the same series of questions was administered at Wave 1 and Wave 2, the timeframe being assessed differed somewhat between the two waves. At Wave 1, participants were asked about the 12 months preceding the assessment in addition to their entire life prior to the year preceding the interview. At Wave 2, participants were asked about the 12 months preceding the Wave 2 interview in addition to the interval between Wave 1 and Wave 2. The exceptions to this general rule were PTSD and ADHD; because these conditions were only assessed at Wave 2, the Wave 2 assessment asked about symptoms in the preceding 12 months and in any time before the year prior to assessment.
Personality disorders were also assessed using the AUDADIS-IV, on a lifetime basis. Avoidant, dependent, obsessive-compulsive, paranoid, schizoid, and antisocial PDs were assessed in NESARC Wave 1, and borderline, schizotypal, and narcissistic PDs were assessed in Wave 2. All PD items were asked with respect to how participants felt or acted most of the time throughout their lives, regardless of context. The initially published prevalence rates for PDs in the NESARC indicated very high prevalence for PDs, with rates of 21.5% for any PD and 5.9% for BPD (Grant et al., 2004; Grant et al., 2008). Because these rates are higher than those reported in other epidemiological studies of PDs in the U.S. and Great Britain (e.g., National Comorbidity Survey-Replication, reported in Lenzenweger et al., 2007; British National Survey of Psychiatric Morbidity, reported in Coid et al., 2006), there was some debate in the literature about whether the initially published NESARC prevalence rates indicated over-diagnosis of these disorders. Trull and colleagues (2010) proposed a more conservative method for diagnosing PDs in the sample and found rates that were more comparable to other studies and with more typical patterns of comorbidity (e.g., an overall prevalence rate of 9.1% for any PD and 2.7% for BPD). In the original NESARC studies (Grant et al., 2004; 2008), the investigators only required participants to indicate clinically significant distress (i.e., answering in the affirmative to the follow-up query, “Did this ever trouble you or cause problems at work or school, or with your family or other people?”) for one of the required PD symptoms in order to qualify for the full diagnosis. By contrast, Trull and colleagues (2010) required that each PD symptom be accompanied by significant levels of distress and impairment in order for the symptom to be counted toward diagnosis. The current study employed Trull’s suggested method for characterizing the presence/absence
of PD features and PD diagnosis for all relevant analyses to ensure diagnostic accuracy and the inclusion of clinically significant phenomena.

**Definition of groups based on BPD symptomatology.** To evaluate risk across a spectrum of BPD symptom severity, participants were assigned to one of three groups based on their BPD status: no BPD symptoms, some BPD symptoms (1-4 symptoms), and full-criteria BPD (5+ symptoms). This grouping variable was used in all subsequent analyses.

**Risk factors.** The risk factors examined include an array of early (i.e., before age 18) risk factors and precursors to BPD that have been highlighted in the literature. These 16 risk factors roughly fit under three larger umbrella domains: 1) individual-level risk factors, or symptoms/characteristics that exist within a person, 2) family or developmental environment risk factors, including exposure to adverse experiences in the family setting or larger environmental context, and 3) family history risk factors, including history of problematic behaviors and psychological problems. All resulting risk factor variables were dichotomous, and each stage of variable creation is explained in detail below. A listing of the risk factors by domain is provided in Table 1.

**Individual-level precursors.** Five variables were created to represent precursor signs and symptoms to adult BPD. These variables capture a range of childhood externalizing and internalizing problems that have been found to be related to adult BPD symptoms. Each variable is based upon participants’ reports of childhood problems. The **mood disorder risk** factor represents a history of mood disorder prior to age 18. Each individual received a score of 1 (signifying risk) for the mood disorder risk factor if they reported a history of major depressive disorder or dysthymia prior to age 18, as assessed
by the AUDADIS-IV. Similarly, the anxiety disorder risk factor indicates presence of anxiety disorder prior to adulthood. For this variable, each individual received a score of 1 if they reported a history of generalized anxiety disorder, social phobia, or panic disorder prior to age 18, as assessed by the AUDADIS-IV. Three domains of externalizing symptoms were also examined. Participants received a score of 1 on the ADHD risk factor if the AUDADIS-IV revealed evidence of ADHD prior to age 18; they also received a score of 1 on the substance abuse risk factor if the AUDADIS-IV indicated presence of abuse or dependence for any of the assessed substances with an onset before age 18. Finally, the conduct problems risk factor represents the presence of significant problematic behaviors before age 15. As part of the AUDADIS-IV, participants were asked whether or not they engaged in 33 of these behaviors (e.g., “Did you EVER have a time when you bullied or pushed people around or tried to make them afraid of you?” or “Did you ever have a time when you often cut class, not go to class or go to school and then leave without permission?” etc.) and if they did so prior to age 15. Individuals received a score of 1 on this risk factor if they reported having engaged in at least three of these behaviors prior to age 15.

**Family/environmental risk factors.** Seven variables were created to represent environmental risks found to contribute to the development of BPD; these risk factors represent those experiences that happen to an individual as a function of their external environment, including parental maltreatment, abuse, and exposure to other stress. The low income risk refers to indicators of low SES/family financial resources. For this study, participants scored a 1 (signifying presence of risk) for this variable if they answered “yes” to the following question concerning welfare status: “Before you were 18
years old, was there ever a time when your family received money from government assistance programs like welfare, food stamps, general assistance, Aid to Families with Dependent Children, or Temporary Assistance for Needy Families.” The parental loss risk indicates a history of loss (to death) of a parent or significant caregiver prior to age 18; participants received a score of 1 on this variable if they answered yes to the question, “Did either of your (biological/adoptive) parents die before you were 18?”

Three of these variables concern problematic parenting behaviors or maltreatment in the family unit. The low affection/low nurturing risk factor represents the experience of having little or no support or warmth from the family unit when growing up. This variable was created based on participants’ responses to five items about familial support and warmth. For each item, participants rated how often each statement (e.g. “my family was a source of strength and support,” “there was someone in my family who helped me feel that I was important or special”) was true of their experiences growing up. To identify those for whom support was lacking, participants scored a 1 (indicating risk) for this variable if they responded to each of these items with the responses “never true” or “rarely true.” The parental hostility risk factor represents the experience of parental interactions that are particularly harsh or threatening. This variable was created using the responses to the following three questions about these problematic behaviors: 1) “How often did a parent or other adult living in your home swear at you, insult you or say hurtful things?”, 2) “How often did a parent or other adult living in your home threaten to hit you or throw something at you, but didn’t do it?”, and 3) “How often did a parent or other adult living in your home act in ANY other way that made you afraid that you would be physically hurt or injured?” For each item, participants rated the frequency with
which they had these experiences when growing up (from “never” to “very often”). Participants scored a 1 for this variable if they reported a frequency of “fairly often” to “very often” for at least one of these items. The parental neglect risk factor captures participants’ experiences of being neglected or ignored by their parents on a regular basis on a number of indices. This variable is based on participants’ responses to four items about neglectful parental responses (e.g., “How often did a parent or other adult living in your home ignore or fail to get you medical treatment when you were sick or hurt?”). As in the parental hostility items, participants rated the frequency of these experiences. Participants scored a 1 for this variable if they reported a frequency of “fairly often” to “very often” for at least one of these items.

The remaining two variables from this domain concern abusive experiences. The physical abuse risk factor captures experiences of physical abuse and assault that occurred in the participants’ lives prior to age 18. This variable was created based upon participants’ responses to three items. For one of these items, participants answered “yes” or “no” to the following question: “Before you were 18 years old, were you physically attacked or badly beaten up or injured by either of your parents or any other people who raised you?” For the other two items, participants rated the frequency of specific abusive experiences (e.g., “How often did a parent or other adult living in your home push, grab, shove, slap or hit you?”) using the same frequency scale discussed above. Participants scored a 1 on this risk factor if they answer “yes” to the first question OR they answer any frequency other than “never” for the other items. Similarly, the sexual abuse risk factor represents any history of sexual abuse or molestation prior to age 18. This variable was based on participants’ responses to four items for which they indicated whether they
had experiences that are consistent with sexual abuse (e.g., did anyone fondle you in a sexual way when you didn’t want them or when you were too young to know what was happening?”). Participants scored a 1 on this risk factor if they answered “yes” to any of these questions.

**Family history risk factors.** Four variables were created to capture history of psychopathology in the parents of participants, representing a potential combination of genetic and environmental risk. The scores for each of these variables was based upon items for which the participant is asked whether either of their parents had a history of a specific psychiatric problem. For the **parental depression risk** factor, participants received a score of 1 if they report that either their mother or father was depressed at any point. For the **parental substance abuse risk** factor, participants scored a 1 if they indicated that either their mother or father had a history of either drug or alcohol abuse. For the **parental antisocial behavior risk** factor, participants scored a 1 if they reported that either of their parents had a history of some of the problematic behaviors assessed during the conduct disorder/antisocial PD assessment. Finally, for the **parental suicide risk** factor, participants received a score of 1 if they indicated that one of their parents either attempted or committed suicide.

**Cumulative risk.** An index of cumulative risk was created for each individual by summing the total number of risk factors endorsed. This score had a possible range of 0-12.

**Suicidal behavior.** Participants were asked if they ever attempted suicide at any point during their lives, with follow-up queries about the time of their first and most recent attempts. To examine suicidal behavior as an outcome in adulthood, a
dichotomous variable was created for each participant to indicate if they had attempted suicide since age 18.

**Social support and connectedness.** In the Wave 2 assessment, participants were asked a set of 12 questions to indicate their degree of perceived social support from friends and relatives. In this section, participants were asked to rate the frequency of social experiences on a scale from 1 (*definitely false*) to 4 (*definitely true*). Example items include: “If I wanted to have lunch with someone, I could easily find someone to join me” and “When I need suggestions on how to deal with a personal problem, I know someone I can turn to.” An index of social connectedness was generated by summing these items. A dichotomous variable was created based on a median split of this index score; this variable was used in subsequent analyses.

**Negative life events.** Participants were asked to indicate if they had experienced particular negative and stressful life events in the 12 months preceding the Wave 2 interview. These questions included items such as, “Were you fired or laid off from a job?” and “Did you get separated or divorced or break off a steady relationship?” A sum score was created to reflect the total number of negative life events reported by each participant. A dichotomous variable was created based on a median split of this index score; this variable was used in subsequent analyses.

**Data Analysis**

**Population-level risk factors for BPD.** The effect of each risk factor on BPD symptom group was examined using logistic regression. SAS PROC SURVEYLOGISTIC was used for these analyses to adjust for sample weights and other complex survey design characteristics, thus making the results generalizable to the U.S.
population. All analyses were run first as bivariate models and then as multivariate models adjusting for the presence of other risk factors. A cumulative risk index was also created by calculating a sum score for each participant based on the number of early risk factors to which they were exposed. Separate logistic regression analyses were run to examine the prediction of group membership based on the cumulative risk index score.

**Latent class models of risk.** Latent class models were estimated using SAS PROC LCA (Lanza et al., 2007). Models of varying numbers of latent classes were tested, and a grouping variable (BPD symptom group) was included in each model. All analyses were properly weighted. Each of the 16 risk factor variables was included as an indicator of latent class membership.

**Linking risk profiles to suicidal behavior.** The inclusive (Bray, Lanza, & Tan, 2015) approach was used to properly assign individuals to latent classes for use in models predicting suicidal behavior from risk exposure class. This approach ensured that the link between risk exposure class and outcome (in this case, suicide attempts in adulthood) was not attenuated, as it is in other approaches used to assign individuals to classes. Using this approach, posterior probabilities were generated from the final LCA model with suicide attempt in adulthood, adult risk factors, and interaction between adult risk factors and suicide attempt included as covariates. Individuals were assigned to their most likely class using maximum probability, at which point class membership was treated as known and used in subsequent models. To examine the degree to which class membership predicted suicidal behavior in individuals with BPD, a series of logistic regression analyses were conducted only in the group meeting full criteria for BPD. These models included suicide attempt in adulthood as the dependent variable, with class membership
as the predictor. Adult factors potentially related to suicidal behavior (i.e., depression, substance abuse, ASPD, social support, and negative life events) were also added to these models, both as independent predictors and as interaction terms (with class membership) to examine the extent to which they moderated early risk. Predictors were retained in the final predictive model if they maintained statistical significance in the presence of other predictors.
Chapter 3

RESULTS

Prevalence of Risk

The prevalence of each early risk factor is presented in Table 2. This table highlights the prevalence of each risk factor in the full sample and in each BPD symptom group, as well as the unadjusted odds of symptom group membership based upon exposure to early risk factors. Generally, participants who met full criteria for BPD had the highest rates of exposure to each risk factor, followed by those with some (i.e., 2-4) symptoms of BPD. The one exception to this pattern was for parental loss risk, which was more prevalent in the group with no symptoms of BPD. The largest between-group differences in prevalence were observed for early mood disorder, early ADHD, sexual abuse, and parental hostility, all of which also conferred significantly higher odds of belonging to a more symptomatic group.

As noted previously, a cumulative risk index was also calculated for each individual by summing the number of risk factors each person endorsed. The average cumulative risk scores for those without BPD symptoms, with some BPD symptoms, and with full criteria BPD were 1.31 (s.e. = 0.01), 2.53 (s.e. = 0.02), and 4.38 (s.e. = 0.05), respectively. Each group was significantly different from the others with respect to cumulative risk index scores.

Logistic Regression Analysis

As previously discussed, variable-centered analyses were conducted using logistic regression to predict BPD symptom group from presence of each risk factor, controlling for presence of other risk factors. Full results of these analyses are presented in Table 3.
Presence of nearly all risk factors was significantly associated with increased odds of having some BPD symptoms compared to having no symptoms at all. The only exception to this pattern was for parental loss: in this case, having lost a parent was more associated with having no BPD symptoms than some symptoms of the disorder. These findings were largely replicated in comparisons of the group with some BPD symptoms and those with full-criteria BPD. For these two groups, nearly all risk factors were associated with a higher likelihood of full-criteria BPD with the exception of parental loss for which the odds were reversed. The risk factors that conferred the highest odds for full-criteria BPD included early ADHD (OR = 5.0), sexual abuse (OR = 3.5), and early mood disorder (OR = 3.0).

We also conducted logistic regression predicting BPD status from the cumulative risk index. Higher CRI scores were associated with greater odds of having some symptoms of BPD (OR = 1.4, \( p < 0.001 \)) and full BPD (OR = 1.7, \( p < 0.001 \)) when compared to the no BPD symptom group.

**Latent Class Analysis**

Preliminary analyses were conducted within BPD symptom groups to ascertain constellations of risk factors associated with these varying levels of psychopathology. In order to examine differences in prevalence of risk profiles between the groups, analyses were ultimately conducted using the full sample and including a three-level grouping variable (no BPD symptoms, some BPD symptoms, full-criteria BPD). During this phase, LCA models with one through eight classes were tested. Models with seven and eight classes could not be identified sufficiently well. In determining the optimal number of classes, the AIC, BIC, bootstrap-likelihood ratio test (BLRT), and entropy values were
considered. These fit indices for all models are provided in Table 4. Given that these results indicated that models with four to six classes should be considered further, the latent class structure of these candidate models was examined carefully. Specifically, attention was paid to interpretability of the classes (i.e., each class could be described with discriminable classes and models with classes at near-zero prevalence were considered for elimination), clean structure of the measurement model, and concordance of the classes with those observed in models run separately for each group. Using these criteria, the five-class model was selected as optimal.

Measurement of the five latent classes was constrained to be equal across the three BPD symptom groups for several reasons pertaining to model fit and stability. First, the BIC was lower and the entropy value higher for the model with measurement invariance, suggesting a better (and more parsimonious) model fit with more precise classification of individuals to classes. Additionally, specifying measurement invariance allowed us to interpret the risk profiles the same way across the three groups and make inferences concerning differences in prevalence of risk profiles as a function of group membership. Finally, the likelihood could not be reliably replicated for models that were tested without constraints on the measurement model.

Characterization of the latent classes. The characteristics of the five latent classes can be determined by examining the pattern of item-response probability, which are provided in Table 5. These probabilities denote the likelihood that an individual in that class reported history of a given risk factor. Item-response probabilities greater than 0.50 are bolded for easier interpretation; an item-response value >0.50 indicates that more than 50 percent of the members of a given class were exposed particular risk factor. The
overall population prevalence of each risk factor (also in Table 5) should also be considered when interpreting item-response probabilities, specifically the degree to which probability of a risk is elevated over and above the baserate. Because measurement invariance was specified, the item-response probabilities by class are consistent across symptom groups. Latent classes were given descriptive names that corresponded with the probability of presence of certain risk factors.

The **Low Risk** class was characterized by individuals who had a low probability of reporting any risk factors (all item-response probabilities < 0.13). The **Parental Psychopathology** class was comprised of individuals who had a moderate-to-high likelihood of having parents with multiple forms of psychopathology, including depression (57%) and substance use disorders (81%), and a low probability of most other risk factors (<18%). Members of the **Early Psychopathology** class were more likely to report experiences of several forms of psychopathology before age 18, including depression (66%), anxiety (60%), and substance use disorders (60%). The **Harsh Early Environment** class was made up of individuals with a higher probability of experiences related to growing up in a harsh rearing environment, including parental hostility (69%), low warmth (75%) and physical abuse (63%), and a lower probability of other risk factors (<30%). Finally, the **Multi-Level Risk** class was characterized by individuals who had a moderate-high probability of a variety risk factors from all domains, including early psychopathology (61-64%), family environment risks (54-87%), and parental psychopathology (57-72%).

**Prevalence of latent class membership by symptom group.** The proportion of individuals in each risk exposure class by symptom group is provided in Table 6. As this
table shows, there were between-group differences in prevalence for nearly all risk profiles. Notably, individuals with no symptoms of BPD were by far most likely to belong to the Low Risk class (80%), and much less likely to belong to any other class (probability of membership in all other classes <10%). By contrast, individuals with full-criteria BPD were most likely to belong to the Early Psychopathology class (42%), followed by the Multi-level risk class (28%). These individuals were less likely than members of the other groups to belong to the Low Risk class (15%); however, the rarest class for those with full-criteria BPD was the Parental Psychopathology class (4%). Generally, individuals with some symptoms of BPD were somewhere between the other two groups, with slightly less than half belonging to the Low Risk class, around a fifth belonging to the Early Psychopathology class, and probability of membership distributed more evenly among the remaining classes.

**Prediction of Suicidal Behavior within BPD**

The following variables significantly predicted suicide attempt in adulthood and were retained in the final model as main effects: risk exposure class membership, depression, substance abuse, negative life events, and social support (see Table 7). The interaction between class membership and depression in adulthood was also significant and was retained in the final model.

With respect to main effects, membership in nearly all risk exposure classes was related to significantly higher odds of suicide attempt, when compared to the Low Risk class. The greatest likelihood of this outcome was for members of the Multi-Level (OR = 3.48) and Early Psychopathology Risk (OR = 1.92) classes. The smallest effect was found for membership in the Harsh Early Environment class. Interestingly, membership
in the Parental Psychopathology class was associated to decreased likelihood of suicide attempt in adulthood (OR = 0.54). Similarly, several of the adult factors were independently associated with an increased risk of suicide attempt. In particular, having depression and/or substance abuse in adulthood, experiencing a greater number of negative life events, and having less social support were all associated with an increased likelihood of suicide attempt.

Interactions between adult factors and class membership were also examined to determine whether any adult factors moderate the relationship between class membership (i.e., early risk) and likelihood of suicide attempt in adulthood. Only one interaction term was significant, which was the interaction between depression and group membership. When contrasts were examined, this effect was driven by the Early Psychopathology class. In this case, having depression in adulthood increased the likelihood of suicide attempt among those in the Early Psychopathology class but not other classes.
Chapter 4

DISCUSSION

This study employed a variety of approaches to better understand the role of early risk exposure in the pathogenesis of BPD and other adverse outcomes within the disorder. The first portion of this study compared variable-centered and person-centered approaches to modeling risk for BPD. The goal of doing so was both 1) to better understand the factors (and combinations of factors) that confer risk for BPD, and 2) to demonstrate the relative strengths and weaknesses of these varied modeling techniques in elucidating risk for the disorder. In the second portion of this study, these analyses were extended to provide an illustration of the longitudinal interaction of risk factors (i.e., early vs. late) for adverse outcomes within BPD, in this case suicide attempts in adulthood.

The results yielded from more traditional, variable-centered approaches were largely consistent with existing literature (e.g., Carlson et al., 2005; Cohen et al., 2005; Winsper et al., 2016) and our hypotheses. Nearly all of the previously identified risk factors for BPD were associated with an elevated likelihood of having some or all symptoms of the disorder, even when controlling for the effects of other risk factors. The one exception to this general finding was for parental loss, which did not confer increased risk for BPD symptoms in this study (rather, it was more associated with having no symptoms or subthreshold symptoms of BPD). It may be the case that loss of a parent is a more general risk factor of psychopathology or one that is more strongly associated with conditions other than BPD in the general population. Analyses using the cumulative risk index (i.e., an index of how many risk factors were present within an individual) indicated that the number of risk factors was associated with the level of BPD symptomatology, also consistent with our hypotheses. Put another way, exposure to a
greater number of early risk factors was associated with having more symptoms of BPD in adulthood.

Taken together, the results from the variable-centered regression analyses provide an important replication and extension of the existing findings that initially identified each of the studied variables as risk factors for BPD. In particular, the effects of these risk factors remained robust in predicting BPD status even when the effects of all other risk factors are taken into account. Although the power granted by this study’s large sample may have helped to preserve these effects, these findings also speak to the multifactorial, multi-level nature of risk for BPD. Many of the risk factors also differentially predicted varying levels of BPD symptomatology (as opposed to just presence/absence of the disorder), as did the cumulative risk index, suggesting that there may be a linear relationship between risk exposure and dimensional BPD symptomatology. These results also provide some insight into the risk factors that had the strongest effects of predicting BPD status on a population-level. In particular, early ADHD and sexual abuse conferred the greatest odds for elevated BPD symptoms in this set of analyses. That being said, the degree to which these findings are able to capture the interplay between risk factors (i.e., the influence of one risk factor given the presence of another) is limited.

In contrast to the logistic regression results, the LCA results provided a more nuanced distillation of the heterogeneity in risk exposure within groups characterized by varying levels of BPD symptomatology. In particular, the classes yielded from these analyses illustrated how typical risk exposure profiles can be differentiated, both in terms of the amount of risk represented in the profiles (e.g., Low Risk vs. Multi-Level Risk classes) as well as the specific types of risk that tend to co-occur (e.g. Early
Psychopathology vs. Parental Psychopathology). The specific classes also highlight the diversity of risk exposure experiences, with multiple ecological levels of risk represented, as hypothesized. Importantly, the uncovered risk exposure classes demonstrate how risk factors from multiple levels tend to intersect within individuals. The capacity of this LCA model to detect and describe implicit interactions between risk factors represents a major extension of the variable-centered analyses. In particular, the capacity to model such complex interactions between variables is limited even in multivariate regression analyses of risk factors in a large sample; by contrast, LCA can parsimoniously account for the effects of specific risk factors among people who differ on exposure to other forms of risk.

Overall, five latent classes representing different levels and types of risk emerged from these analyses. Two of these classes represented two extremes with respect to risk: the Low Risk class was characterized by low probability of any risk factor, whereas the Multi-level Risk class was characterized by higher probability of several risk factors stemming from multiple ecological domains. The other three classes had risk profiles that were dominated by a single domain/level of risk factor and were labeled accordingly; these included the Early Psychopathology class, the Harsh Early Environment class, and the Parental Psychopathology class. The BPD symptom groups differed in terms of the prevalence of each of these classes, reflecting that certain risk profiles are more common and more specific to those meeting full criteria of BPD, as compared to individuals with a subthreshold level of symptoms or those who are symptom-free. In particular, individuals with BPD were more likely to belong to “riskier” classes (and, accordingly, less likely to belong to the class defined by an absence of risk). Those with BPD were also
substantially more likely than others to belong to two classes in particular: the Early Psychopathology class and Multi-Level Risk class. For the groups with no BPD symptoms and some BPD symptoms, membership in the Low Risk class was more common and its prevalence increased as BPD symptoms decreased. For both of these symptom groups, membership in other risk exposure classes was rarer and generally evenly distributed.

The most common risk exposure class among those with full-criteria BPD (42% probability of membership) was the Early Psychopathology class, which was characterized by elevated probability of early disorders of mood, anxiety, and substance use as well as ADHD. The co-existence of both early internalizing (i.e., mood and anxiety) and externalizing (i.e., ADHD and substance use) disorders in this class is consistent with research suggesting that both types of psychopathology are predictive of BPD and integral to its underlying structure. This specific pattern of comorbidity was first described as “complex comorbidity” by Zanarini and colleagues (1998) and found to be a specific marker of BPD in adults, with later studies finding similar results in adolescents with emerging BPD (e.g., Ha et al., 2014). Similarly, Crawford and colleagues (2001a; 2001b) found that early co-occurring symptoms of internalizing and externalizing psychopathology were especially predictive of later BPD symptoms, noting that symptoms of BPD and other comorbid conditions may develop in tandem and influence each other over time. Considering previous investigations of complex comorbidity have focused on smaller clinically recruited samples (Ha et al., 2014; Zanarini et al., 1998) and smaller epidemiological samples from a limited geographic area (i.e., Upstate New York, as in Crawford et al., 2001a; 2001b), it is important that the
effect of this pattern of comorbidity was further confirmed in a large, representative sample of the general population. The current findings similarly dovetail on research regarding dimensions underlying BPD psychopathology more generally. One such examination of the underlying structure of BPD revealed that although BPD itself is unidimensional, both distress (an aspect of the internalizing dimension) and the externalizing dimension of psychopathology more generally contribute to liability for the disorder over time (Eaton et al., 2011). Thus, as our findings suggest, it is likely that early manifestations of these interacting dimensions of psychopathology are precursor signs and symptoms for BPD, which carry some specificity for the disorder and are related to its longitudinal course.

The second most common class among those with BPD was the Multi-Level Risk class, indicating that a sizeable portion of those with BPD (28%) are likely to have experienced early forms of psychopathology in addition to harsh parenting experiences, physical abuse, and familial psychopathology. In some ways, this class represents the more chaotic picture that one might conjure when envisioning risk for BPD. It also aligns with leading theoretical models of the disorder, which implicate transactions between individual constitutional vulnerabilities and maladaptive interactions with caregivers/the environment in the pathogenesis of BPD (Bateman & Fonagy, 2001; Kernberg, 1984; Linehan, 1993). Additionally, it is supported by empirical studies, which have found that a variety of qualitatively distinct early risk factors from multiple ecological domains have unique effects on later BPD symptomatology when modeled simultaneously (e.g., Stepp, Olino, Klein, Seeley, & Lewisohn, 2013; Trull, 2001). Although membership in this class was much more likely for those with BPD than other participants—suggesting some
specificity to the disorder—it should be noted, perhaps surprisingly so, that most people with BPD belonged to other classes. Thus, a profile where multiple risks are dominant does not describe the experience of a majority of patients with BPD.

Less common classes among those with BPD included the Harsh Early Environment class (11% probability of membership) and the Low Risk class (15%). In terms of the former, these results suggest that it is not common for those with BPD to report having experienced only those risks associated with harsh parenting and abusive experiences. Given that this domain is represented in other classes, this finding suggests that harsh rearing experiences confer more risk when coupled with risks from other domains, such as early symptomatology or parental psychopathology, as opposed to in isolation. This is consistent with research suggesting that there is a bidirectional, reciprocal relationship between psychiatric symptoms and harsh parenting responses, such that more symptomatic young people receive harsher treatment from parents and vice versa (Stepp, Whalen, Scott, Zalewski, Loeber, & Hipwell, 2014). Further, the prevalence for this class was relatively similar for each of the symptom groups, suggesting that this risk profile is not specific to BPD. With regard to the Low Risk class, it is intuitive that this class would be relatively uncommon among those with BPD and more common in the less symptomatic groups. Although this class was among the less prevalent for those with BPD, it is nonetheless important to recognize that this subpopulation of individuals with BPD is not well-characterized by the existing risk factors that stem from the literature. This may suggest that for these individuals, other constitutional vulnerabilities (e.g., genes) or unaccounted-for environmental stresses may contribute to development of the disorder.
Finally, the least common class among those with BPD was the Parental Psychopathology class (4% probability of membership). This finding indicates that having a risk profile characterized solely by parental psychopathology is uncommon for those with BPD; further, it suggests that parental psychiatric illness in isolation does not sufficiently explain most risk for the disorder. This result is consistent with other studies that have found that relationships between parental psychopathology and BPD symptoms in offspring are mediated by other factors (e.g., household stress, parent-child interactions, offspring personality traits; Infurna et al., 2016; Reinelt et al., 2014; Trull, 2001). One such study examined a structural model that included interrelationships between dimensions of BPD symptoms and putative etiological factors (including parental psychopathology and other environmental factors; Trull, 2001). Although parental psychopathology was significantly related to BPD symptoms of offspring in this study, this association was the weakest for any etiological variable measured. Taken together, the results of the current study coupled with these earlier findings highlight the importance of examining a broader ecological context when assessing risk for BPD.

Interestingly, there were a number of risk factors that were significant in multivariate logistic analyses yet largely absent from the classes uncovered by the LCAs. These included variables related to parental suicide and loss, conduct disorder, and sexual abuse. It may be the case that although these experiences affect individuals in specific ways, they may not appropriately characterize a meaningful subpopulation. It may also be the case that other risk factors exert a larger effect on the development of BPD than these risk factors. This is in some ways consistent with literature that suggests, for one, that other forms of early environmental adversity (particularly neglect) may matter more in
the subsequent development of BPD than sexual abuse and that the individual risk factor of sexual abuse may be symptomatic of a larger ecological problem, such as a chaotic home environment (e.g., Zanarini et al., 1997). Finally, it may be the case that some of these risk factors (e.g., parental loss) are risk factors for psychopathology in general, as opposed to BPD specifically.

Overall, the distribution of prevalence of risk profiles in BPD illustrates both the diversity in risk pathways that are associated with the disorder as well as the profiles that are most common among those with the disorder (as compared to those without BPD or with fewer symptoms of BPD). Additionally, they highlight the importance of early intervention for those with early internalizing and externalizing symptoms, regardless of the degree of family chaos. These findings also highlight some groups of individuals with BPD—specifically those in the Low Risk group—who are not well characterized by current models of risk for the disorder. Thus, more research is needed to better understand the mechanisms behind the pathogenesis of the disorder in these individuals. It is possible that other biological/constitutional factors not well-captured by these risk factors or other types of environmental risk factors may need to be identified.

The present study also demonstrated that suicide attempts in adults with BPD could be predicted by early risk exposure class membership, as well as multiple experiences in adulthood. In particular, belonging to the Multi-Level Risk and Early Psychopathology classes conferred the highest odds for suicide attempt in adulthood. The former may merely reflect that diverse cumulative risk from multiple ecological domains in childhood also complicates the course of BPD in adulthood, contributing to adverse outcomes. The latter may again reflect the problematic course associated with complex
patterns of comorbidity (e.g., Crawford et al., 2001a; 2001b), and is consistent with models implicating early psychopathology as integral in the etiology of suicidal behavior in this population (Paris, 2005). Additionally, several adult experiences, including substance abuse, negative life events, and level of social support independently predicted suicide attempt in adulthood. These adult risk factors are consistent with the literature regarding risk factors for suicide attempts within BPD (e.g., Black et al., 2004; McGlashan, 1986; Stone, 1989). In these analyses, we also found that the effect of depression in adulthood on suicide attempts was elevated by membership in the Early Psychopathology class. This moderation effect may reflect that BPD is likely complicated by mood disorders that are chronic in nature, which may in and of themselves be complicated by their co-occurrence with BPD (e.g., Grilo et al., 2005).

Taken together, these findings suggest that both early risk exposure and later risk exposure independently contribute to the odds of suicide attempt in adulthood. Additionally, the risk associated with early psychopathology exacerbates the risk depression in adulthood. Thus, both early risk exposure and presence of known adult risk factors should be assessed when considering risk for suicide among those with BPD.

The present study had a number of strengths, many of which stemmed from the quality of the NESARC data itself. In particular, the sample was large and nationally representative, and a wide variety of risk factors from multiple domains were surveyed. In addition to providing ample power for analyses, this sample allowed us to examine of a spectrum of BPD symptomatology (i.e., all BPD symptom groups were adequately sized). Additionally, participants were reliably assessed for all criteria of BPD—a rarity in epidemiological studies—in addition to being rigorously diagnosed with lifetime
diagnoses of co-occurring disorders. Further, the use of a latent variable to characterize constellations of risk for BPD was an important extension of previous research. In particular, using this method provided a more nuanced representation of the interaction of risk within individuals of varying symptom levels of BPD and allowed for the interaction of several risk factors to be modeled simultaneously. To our knowledge, no existing studies have used a person-centered approach in examining risk for this disorder.

A number of limitations should also be considered when interpreting the findings of this study. First, data on early experiences was assessed retrospectively, which may have impacted the validity of these reports, although reviews of the validity of retrospective reporting of childhood adversity indicate that “false positives” (i.e., reporting an event that did not happen) are rare (Hardt & Rutter, 2004). Additionally, participants were not studied longitudinally, and thus assessment of risk factors and outcomes occurred simultaneously. Although this is not uncommon for epidemiological research, directionality can only be inferred from these data. Another limitation is that the present study does not address whether or not the observed risk profiles are specific to BPD or if they describe psychopathology more generally. Future investigations are needed to determine if similar risk profiles are observed for other forms of psychopathology (e.g., major depression) and/or if prevalence of risk profiles differs between disorders. Furthermore, participants in this study were recruited as part of a general population study. Additional research is needed to determine if the characterization of early risk exposure classes would be different in a clinical sample. Finally, risk factor variables were created as composite variables from existing variables in this dataset. Although decisions about how to define variables was informed by the
literature, some subjectivity was involved in making these decisions that could impact results.

**Conclusion and Implications**

In conclusion, these findings suggest that early risk for BPD is heterogeneous. In variable-centered, logistic regression analyses, the vast majority of identified risk factors were associated with an increased likelihood of greater BPD symptoms. Similarly, analyses using a cumulative risk index found that exposure to a greater number of risk factors (regardless of type) was associated with increased odds of BPD symptoms. Person-centered latent class analyses yielded five latent classes, representing distinct profiles characterized by different levels of types of risk exposure that co-occurred within individuals. Prevalence of classes differed as a function of level of BPD symptomatology, with a class characterized by early internalizing and externalizing psychopathology the most prevalent among those with full-criteria BPD. Membership in this risk exposure class was also significantly associated with suicide attempts in adulthood among those with BPD, and this likelihood was increased when individuals experienced depression in adulthood.

Overall, this study presents both an important replication of existing research using variable-centered approaches to BPD risk and an important extension to this research via more novel, person-centered methods. Specifically, by identifying subpopulations that share specific risk profiles, these results highlighted both the number and type of risks that commonly co-occur within individuals of varying levels of BPD symptomatology. This method also provided a feasible way of measuring multiple interactions between these risk factors, thus providing a parsimonious distillation of
common profiles of early risk exposure. These findings also suggested that type of early risk exposure is related to an adverse outcome in adulthood (i.e., suicide attempt) and is thus important in identifying individuals with BPD most at risk for these behaviors.
REFERENCES


the National Epidemiologic Survey on Alcohol and Related Conditions. *Archives of General Psychiatry, 61*(8), 807-816


Childhood sexual and physical abuse in adult patients with borderline personality


*Journal of Personality Disorders, 11*(1), 34–49.


abuse in the etiology of borderline personality disorder. *Canadian Journal of
Psychiatry, 37*, 125-128.

for adolescent psychopathology: A person-centered approach. *Journal of Clinical

psychiatric disorders in adolescents and personality disorders in young adults.


Scandinavica, 86*(5), 335-339.

outpatients with borderline personality disorder and no history of mood disorder.

*Journal of Personality Disorders, 14*, 208 –217


Zimmerman, M., Chelminski, I., Young, D., Dalrymple, K., & Martinez, J. (2012). Does the presence of one feature of borderline personality disorder have clinical
significance? Implications for dimensional ratings of personality disorders.

*Journal of Clinical Psychiatry, 73*(1), 8-12.

### APPENDIX A

#### Tables and Figures

Table 1. Risk factors for BPD by domain

<table>
<thead>
<tr>
<th>Individual-level Risks</th>
<th>Family/Environmental Risks</th>
<th>Family History Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mood disorder&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Low income</td>
<td>Parental depression</td>
</tr>
<tr>
<td>Anxiety disorder&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Parental loss</td>
<td>Parental substance abuse</td>
</tr>
<tr>
<td>ADHD&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Low affection/warmth</td>
<td>Parental antisocial PD</td>
</tr>
<tr>
<td>Substance abuse&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Parental hostility</td>
<td>Parental suicide</td>
</tr>
<tr>
<td>Conduct problems&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Parental neglect</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physical abuse</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sexual abuse</td>
<td></td>
</tr>
</tbody>
</table>

*Note. ADHD = attention deficit hyperactivity disorder. PD = personality disorder.*

<sup>1</sup>before age 18.  <sup>2</sup>before age 15.
Table 2
Prevalence and Odds-Ratios of Borderline Personality Disorder Symptoms and Presence of Early Risk Factors

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Full Sample (n = 34,653)</th>
<th>No BPD (n = 26,835)</th>
<th>Some BPD (n = 6,762)</th>
<th>Full BPD (n = 1,056)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% (SE)</td>
<td>% (SE)</td>
<td>OR (95% CI)</td>
<td>% (SE)</td>
</tr>
<tr>
<td><strong>Individual-level risks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early mood disorder</td>
<td>4.5% (2.7%)</td>
<td>ref</td>
<td>8.5% (3.4 (3.1-3.6)***</td>
<td>24.5% (11.7 (10.6-12.9)***</td>
</tr>
<tr>
<td>Early anxiety</td>
<td>10.5% (8.2%)</td>
<td>ref</td>
<td>16.7% (2.2 (2.1-2.4)***</td>
<td>31.9% (5.2 (4.9-5.7)***</td>
</tr>
<tr>
<td>Early ADHD</td>
<td>5.0% (2.9%)</td>
<td>ref</td>
<td>10.6% (4.0 (3.7-4.3)***</td>
<td>24.6% (11.0 (9.8-12.3)***</td>
</tr>
<tr>
<td>Early substance abuse</td>
<td>8.6% (6.6%)</td>
<td>ref</td>
<td>14.1% (2.3 (2.2-2.4)***</td>
<td>25.2% (4.7 (4.3-5.2)***</td>
</tr>
<tr>
<td>Early conduct problems</td>
<td>4.0% (2.8%)</td>
<td>ref</td>
<td>7.3% (2.8 (2.6-3.0)***</td>
<td>14.8% (6.1 (5.4-6.9)***</td>
</tr>
<tr>
<td><strong>Environment-level risks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low income</td>
<td>13.0% (11.3%)</td>
<td>ref</td>
<td>18.0% (1.7 (1.6-1.8)***</td>
<td>26.9% (2.9 (2.6-3.2)***</td>
</tr>
<tr>
<td>Parental loss</td>
<td>9.3% (9.5%)</td>
<td>ref</td>
<td>8.9% (0.9 (0.89-0.9)*)</td>
<td>7.2% (0.7 (0.7-0.8)***</td>
</tr>
<tr>
<td>Parental hostility</td>
<td>8.7% (5.9%)</td>
<td>ref</td>
<td>16.4% (3.1 (3.0-3.3)***</td>
<td>33.5% (8.1 (7.3-8.9)***</td>
</tr>
<tr>
<td>Childhood neglect</td>
<td>6.0% (4.3%)</td>
<td>ref</td>
<td>10.8% (2.7 (2.6-2.9)***</td>
<td>20.1% (5.6 (5.2-6.1)***</td>
</tr>
<tr>
<td>Sexual abuse</td>
<td>10.5% (7.2%)</td>
<td>ref</td>
<td>19.3% (3.1 (2.9-3.2)***</td>
<td>38.9% (8.2 (7.4-9.1)***</td>
</tr>
<tr>
<td>Low affection/warmth</td>
<td>15.7% (13.7%)</td>
<td>ref</td>
<td>21.4% (1.7 (1.6-1.8)***</td>
<td>32.2% (3.0 (2.7-3.6)***</td>
</tr>
<tr>
<td>Physical abuse</td>
<td>8.3% (5.7%)</td>
<td>ref</td>
<td>15.6% (3.0 (2.9-3.2)***</td>
<td>28.8% (6.7 (6.2-7.2)***</td>
</tr>
<tr>
<td>Family history risks</td>
<td>Full Sample (n = 34,653)</td>
<td>No BPD (n = 26,835)</td>
<td>Some BPD (n = 6,762)</td>
<td>Full BPD (n = 1,056)</td>
</tr>
<tr>
<td>------------------------------</td>
<td>--------------------------</td>
<td>---------------------</td>
<td>----------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td></td>
<td>% (SE)</td>
<td>% (SE)</td>
<td>OR (95% CI)</td>
<td>% (SE)</td>
</tr>
<tr>
<td>Parental depression</td>
<td>23.3%</td>
<td>19.9%</td>
<td>ref</td>
<td>33.1%</td>
</tr>
<tr>
<td>Parental substance abuse</td>
<td>23.3%</td>
<td>20.4%</td>
<td>ref</td>
<td>31.6%</td>
</tr>
<tr>
<td>Parental ASPD traits</td>
<td>8.5%</td>
<td>6.4%</td>
<td>ref</td>
<td>14.5%</td>
</tr>
<tr>
<td>Parental suicidal behavior</td>
<td>4.0%</td>
<td>3.3%</td>
<td>ref</td>
<td>5.9%</td>
</tr>
</tbody>
</table>

*Note.***p < .001, *p < .05. SE = Standard Error, OR = Odds-ratio, CI = Confidence Interval, BPD = Borderline Personality Disorder, ADHD = Attention Deficit Hyperactivity Disorder, ASPD = Antisocial Personality Disorder, ref = reference group.*
Table 3

Odds-Ratios of Borderline Personality Disorder Symptoms and Presence of Early Risk Factors Adjusted for Presence of Other Risk Factors

<table>
<thead>
<tr>
<th></th>
<th>No BPD (n = 26,835)</th>
<th>Some BPD (n = 6,762)</th>
<th>Full BPD (n = 1,056)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Individual-level risks</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early mood disorder</td>
<td>ref</td>
<td>1.6 (1.5-1.8)***</td>
<td>3.0 (2.7-3.5)***</td>
</tr>
<tr>
<td>Early anxiety</td>
<td>ref</td>
<td>1.6 (1.5-1.7)***</td>
<td>2.4 (2.2-2.7)***</td>
</tr>
<tr>
<td>Early ADHD</td>
<td>ref</td>
<td>2.7 (2.4-2.9)***</td>
<td>5.0 (4.3-5.8)***</td>
</tr>
<tr>
<td>Early substance abuse</td>
<td>ref</td>
<td>1.6 (1.5-1.7)***</td>
<td>2.2 (2.0-2.4)***</td>
</tr>
<tr>
<td>Early conduct problems</td>
<td>ref</td>
<td>1.3 (1.2-1.4)***</td>
<td>1.4(1.2-1.6)***</td>
</tr>
<tr>
<td><strong>Environment-level risks</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low income</td>
<td>ref</td>
<td>1.3 (1.2-1.3)***</td>
<td>1.5 (1.3-1.6)***</td>
</tr>
<tr>
<td>Parental loss</td>
<td>ref</td>
<td>0.9 (0.8-0.9)***</td>
<td>0.6 (0.6-0.7)***</td>
</tr>
<tr>
<td>Parental hostility</td>
<td>ref</td>
<td>1.5 (1.4-1.6)***</td>
<td>2.2 (1.9-2.7)***</td>
</tr>
<tr>
<td>Childhood neglect</td>
<td>ref</td>
<td>1.2 (1.2-1.3)***</td>
<td>1.2 (1.1-1.4)***</td>
</tr>
<tr>
<td>Sexual abuse</td>
<td>ref</td>
<td>2.0 (1.9-2.1)***</td>
<td>3.5 (3.1-4.0)***</td>
</tr>
<tr>
<td>Low affection/warmth</td>
<td>ref</td>
<td>1.1 (1.0-1.2)***</td>
<td>1.1 (0.9-1.2)</td>
</tr>
<tr>
<td>Physical abuse</td>
<td>ref</td>
<td>1.4 (1.4-1.6)***</td>
<td>1.5 (1.4-1.7)***</td>
</tr>
<tr>
<td><strong>Family history risks</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parental depression</td>
<td>ref</td>
<td>1.4 (1.3-1.4)***</td>
<td>1.6 (1.5-1.8)***</td>
</tr>
<tr>
<td>Parental substance abuse</td>
<td>ref</td>
<td>1.2 (1.1-1.2)***</td>
<td>1.3 (1.2-1.5)***</td>
</tr>
<tr>
<td>Parental ASPD traits</td>
<td>ref</td>
<td>1.1 (1.1-1.4)***</td>
<td>1.1 (1.0-1.3)</td>
</tr>
<tr>
<td>Parental suicidal behavior</td>
<td>ref</td>
<td>1.2 (1.1-1.3)***</td>
<td>1.2 (1.1-1.4)***</td>
</tr>
</tbody>
</table>

*Note. ***p < .001, *p < .05. OR = Odds-ratio, CI = Confidence Interval, BPD = Borderline Personality Disorder, ADHD = Attention Deficit Hyperactivity Disorder, ASPD = Antisocial Personality Disorder, ref = reference group.*
Table 4.

*Latent Class Analysis Fit Indices*

<table>
<thead>
<tr>
<th>Solution</th>
<th>Loglikelihood</th>
<th>AIC</th>
<th>BIC</th>
<th>BLRT</th>
<th>Entropy</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-class</td>
<td>-159278.70</td>
<td>31177.30</td>
<td>31473.16</td>
<td>.01</td>
<td>0.82</td>
</tr>
<tr>
<td>3-class</td>
<td>-156858.15</td>
<td>26374.21</td>
<td>26830.68</td>
<td>.01</td>
<td>0.79</td>
</tr>
<tr>
<td>4-class</td>
<td>-155944.04</td>
<td>24583.99</td>
<td>25201.07</td>
<td>.01</td>
<td>0.79</td>
</tr>
<tr>
<td>5-class</td>
<td>-155443.32</td>
<td>23620.55</td>
<td>24398.24</td>
<td>.01</td>
<td>0.79</td>
</tr>
<tr>
<td>6-class</td>
<td>-155103.24</td>
<td>22978.39</td>
<td>23916.69</td>
<td>.06</td>
<td>0.69</td>
</tr>
<tr>
<td>7-class</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Not well identified</td>
</tr>
<tr>
<td>8-class</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Not well identified</td>
</tr>
</tbody>
</table>

*Note.* All models run with three-level grouping variable (No BPD symptoms, some BPD symptoms, full-criteria BPD) and with measurement invariance specified. AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; BLRT = Bootstrap Likelihood Ratio Test.
Table 5.

*Item Response Probabilities Representing Endorsement of Each Indicator by Class*

<table>
<thead>
<tr>
<th>Indicator</th>
<th>% Endorsing</th>
<th>Class 1: Low Risk</th>
<th>Class 2: Parental Psychopathology</th>
<th>Class 3: Early Psychopathology</th>
<th>Class 4: Harsh Early Environment</th>
<th>Class 5: Multi-Level Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Individual-level risks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early mood disorder</td>
<td>4.5%</td>
<td>0.01</td>
<td>0.04</td>
<td><strong>0.66</strong></td>
<td>0.04</td>
<td><strong>0.61</strong></td>
</tr>
<tr>
<td>Early anxiety</td>
<td>10.5%</td>
<td>0.06</td>
<td>0.12</td>
<td><strong>0.60</strong></td>
<td>0.12</td>
<td><strong>0.64</strong></td>
</tr>
<tr>
<td>Early ADHD</td>
<td>5.0%</td>
<td>0.02</td>
<td>0.01</td>
<td>0.41</td>
<td>0.10</td>
<td>0.25</td>
</tr>
<tr>
<td>Early substance abuse</td>
<td>8.6%</td>
<td>0.04</td>
<td>0.17</td>
<td><strong>0.60</strong></td>
<td>0.05</td>
<td>0.31</td>
</tr>
<tr>
<td>Early conduct problems</td>
<td>4.0%</td>
<td>0.01</td>
<td>0.06</td>
<td>0.19</td>
<td>0.03</td>
<td>0.24</td>
</tr>
<tr>
<td><strong>Environment-level risks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low income</td>
<td>13.0%</td>
<td>0.08</td>
<td>0.28</td>
<td>0.20</td>
<td>0.19</td>
<td>0.40</td>
</tr>
<tr>
<td>Parental loss</td>
<td>9.3%</td>
<td>0.09</td>
<td>0.09</td>
<td>0.09</td>
<td>0.14</td>
<td>0.10</td>
</tr>
<tr>
<td>Parental hostility</td>
<td>8.7%</td>
<td>0.01</td>
<td>0.05</td>
<td>0.04</td>
<td><strong>0.69</strong></td>
<td><strong>0.87</strong></td>
</tr>
<tr>
<td>Childhood neglect</td>
<td>6.0%</td>
<td>0.01</td>
<td>0.05</td>
<td>0.05</td>
<td>0.29</td>
<td><strong>0.54</strong></td>
</tr>
<tr>
<td>Sexual abuse</td>
<td>10.5%</td>
<td>0.04</td>
<td>0.14</td>
<td>0.26</td>
<td>0.26</td>
<td><strong>0.56</strong></td>
</tr>
<tr>
<td>Low affection/warmth</td>
<td>15.7%</td>
<td>0.09</td>
<td>0.14</td>
<td>0.15</td>
<td><strong>0.75</strong></td>
<td><strong>0.68</strong></td>
</tr>
<tr>
<td>Physical abuse</td>
<td>8.3%</td>
<td>0.01</td>
<td>0.05</td>
<td>0.05</td>
<td><strong>0.63</strong></td>
<td><strong>0.75</strong></td>
</tr>
<tr>
<td>Indicator</td>
<td>% Endorsing</td>
<td>Class 1: Low Risk</td>
<td>Class 2: Parental Psychopathology</td>
<td>Class 3: Early Psychopathology</td>
<td>Class 4: Harsh Early Environment</td>
<td>Class 5: Multi-Level Risk</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------------</td>
<td>-------------------</td>
<td>----------------------------------</td>
<td>-------------------------------</td>
<td>----------------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Parental depression</td>
<td>23.3%</td>
<td>0.12</td>
<td>0.57</td>
<td>0.39</td>
<td>0.17</td>
<td>0.68</td>
</tr>
<tr>
<td>Parental substance abuse</td>
<td>23.3%</td>
<td>0.11</td>
<td>0.81</td>
<td>0.38</td>
<td>0.28</td>
<td>0.72</td>
</tr>
<tr>
<td>Parental ASPD traits</td>
<td>8.5%</td>
<td>0.01</td>
<td>0.38</td>
<td>0.22</td>
<td>0.07</td>
<td>0.57</td>
</tr>
<tr>
<td>Parental suicidal behavior</td>
<td>4.0%</td>
<td>0.02</td>
<td>0.06</td>
<td>0.08</td>
<td>0.06</td>
<td>0.19</td>
</tr>
</tbody>
</table>

**Family history risks**
Table 6.

Proportion of Sample in Each Latent Class by Symptom Group

<table>
<thead>
<tr>
<th>Class Description</th>
<th>No BPD symptoms</th>
<th>Some BPD symptoms</th>
<th>Full-criteria BPD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1: Low Risk</td>
<td>0.80</td>
<td>0.47</td>
<td>0.15</td>
</tr>
<tr>
<td>Class 2: Parental Psychopathology</td>
<td>0.09</td>
<td>0.11</td>
<td>0.04</td>
</tr>
<tr>
<td>Class 3: Early Psychopathology</td>
<td>0.04</td>
<td>0.21</td>
<td>0.42</td>
</tr>
<tr>
<td>Class 4: Harsh Early Environment</td>
<td>0.06</td>
<td>0.13</td>
<td>0.11</td>
</tr>
<tr>
<td>Class 5: Multi-level risk</td>
<td>0.01</td>
<td>0.08</td>
<td>0.28</td>
</tr>
</tbody>
</table>
Table 7.

*Logistic Regression Predicting Suicide Attempt in Adulthood from Risk Exposure Class Membership and Risk Factors in Adulthood*

<table>
<thead>
<tr>
<th>Main Effects</th>
<th>Odds-Ratio Estimate</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Risk Class Membership</strong>&lt;sup&gt;1&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Risk</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Parental Psychopathology&lt;sup&gt;1&lt;/sup&gt;</td>
<td>0.57</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Early Psychopathology&lt;sup&gt;1&lt;/sup&gt;</td>
<td>1.92</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Harsh Early Environment&lt;sup&gt;1&lt;/sup&gt;</td>
<td>1.51</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Multi-Level Risk&lt;sup&gt;1&lt;/sup&gt;</td>
<td>3.48</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>Adult Factors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression&lt;sup&gt;1&lt;/sup&gt;</td>
<td>1.68</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Substance Abuse&lt;sup&gt;2&lt;/sup&gt;</td>
<td>1.22</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Negative Life Events&lt;sup&gt;3&lt;/sup&gt;</td>
<td>1.27</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Social Support&lt;sup&gt;4&lt;/sup&gt;</td>
<td>0.95</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>Interaction Effects</strong>&lt;sup&gt;5&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression&lt;sup&gt;1&lt;/sup&gt; x Parental Psychopathology Class&lt;sup&gt;5&lt;/sup&gt;</td>
<td>0.92</td>
<td>0.4093</td>
</tr>
<tr>
<td>Depression&lt;sup&gt;1&lt;/sup&gt; x Early Psychopathology Class&lt;sup&gt;5&lt;/sup&gt;</td>
<td>1.18</td>
<td>0.0231</td>
</tr>
<tr>
<td>Depression&lt;sup&gt;1&lt;/sup&gt; x Harsh Early Environment Class&lt;sup&gt;5&lt;/sup&gt;</td>
<td>1.05</td>
<td>0.4915</td>
</tr>
<tr>
<td>Depression&lt;sup&gt;1&lt;/sup&gt; x Multi-Level Risk Class&lt;sup&gt;5&lt;/sup&gt;</td>
<td>1.05</td>
<td>0.5427</td>
</tr>
</tbody>
</table>

*Note.*<sup>1</sup> Reference group = No depression; <sup>2</sup> Reference group = No substance abuse; <sup>3</sup> Reference group = Below-median negative life events; <sup>4</sup> Reference group = Above-median social support; <sup>5</sup> Reference group = Low risk class.

<sup>1</sup> Overall effect significant at p<0.05
VITA
Christina M. Temes

Education
The Pennsylvania State University, University Park, PA
Doctor of Philosophy in Psychology (in progress)
Dissertation Title: Modeling Multiple Risks for Borderline Personality Disorder: A Comparison of Person-Centered and Variable-Centered Approaches
Faculty Adviser: Kenneth N. Levy, Ph.D.

The Pennsylvania State University, University Park, PA
Masters of Science in Psychology, May 2013
Masters Thesis Title: Understanding Heterogeneity in Non-Suicidal Self-Injury: A Latent Class Analysis Approach
Faculty Adviser: Kenneth N. Levy, Ph.D.

Swarthmore College, Swarthmore, PA
Bachelor of Arts in Psychology, May 2007
Thesis Title: The Development of Coping in Adolescence: Conceptualization, Characteristics, and Change
Faculty Adviser: Jane E. Gillham, Ph.D.

Honors and Awards
2015 Superior Teaching and Research Award
2014 RGSO Dissertation Support Award
2014 Departmental Research Grant
2013 Hans Strupp Memorial Award (NASPR)
2009 Graduate Scholar Award
2007 Sigma Xi

Publications


