Testing the Biosocial Theory of Borderline Personality Disorder:

The Association of Temperament, Early Environment,

Emotional Experience, Self-Regulation and Decision-Making

by

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AUTHOR'S DECLARATION

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Abstract

Borderline Personality Disorder (BPD), as defined by the DSM-IV-TR (APA, 2000), is a multifaceted mental illness characterized by pervasive instability of interpersonal relationships, self-image, affect and behavior. Despite a growing consensus that the etiological basis of BPD stems from a combination of biological vulnerability and an early developmental history characterized by invalidation, abuse and/or neglect (e.g., Clarkin, Marziali, & Munroe-Blum, 1991; Linehan, 1993), the reasons for the diversity of troubling symptoms (e.g., self-injury, suicidality, mood reactivity, relationship difficulties) remain unclear. Psychopathology theorists differ in their conceptualization of the fundamental problems (e.g., impulsivity vs. identity disturbance vs. emotion dysregulation) underlying BPD and further research is needed to clarify which features are central to the maintenance of the difficulties associated with the disorder.

In the current research, the some of the tenets of Linehan's (1993) biosocial theory of BPD and the core constructs implicated in her conceptualization of the disorder were explored empirically in several samples of undergraduate university students. According to the biosocial theory, difficulties regulating emotions represent the core pathology in the disorder and contribute causally to the development and expression of all other BPD features. The emotional dysregulation is proposed to emerge from transactional interactions between individuals with biological vulnerabilities (i.e., a highly arousable temperament, sensitive to both positive and negative emotional stimuli) and specific environmental influences (i.e., a childhood environment that invalidates their emotional experience). The theory asserts that the dysregulation affects all aspects of emotional responding, resulting in (i) heightened emotional sensitivity, (ii) intense and more frequent responses to emotional stimuli, and (iii) slow return to emotional baseline. Furthermore, Linehan proposed that individuals with BPD lack clarity with respect to their emotions, have difficulties tolerating intense affect, and engage in maladaptive and inadequate emotion modulation strategies. As a result of their dysfunctional response patterns during emotionally challenging events , individuals with BPD fail to learn how to solve the problems contributing to these emotional reactions.

In accordance with this theory, a number of hypotheses were tested. First, it was hypothesized that the interaction between temperamental sensitivity and an adverse childhood environment would predict BPD features over and above that predicted by either construct independently. Second, it was hypothesized that BPD traits would be predicted by high levels of emotional dysregulation (affect lability), problems across different aspects of emotional experience (e.g., intensity, awareness, clarity), and deficits in emotion regulation skills (e.g., poor distress tolerance, self-soothing). Based on the initial findings of the research, a series of competing hypotheses were tested that addressed the nature of the emotional, cognitive and motivational mechanisms that may underlie maladaptive behavior in BPD more directly.

Prior to testing these hypotheses, it was important to select a set of measures that would best represent these constructs within an undergraduate population. The purpose of Studies 1a and 1b (N = 147 and N = 56, respectively) was to determine the reliability and validity of a series of self-report measures that assess BPD features and to select one questionnaire with high sensitivity (percentage of cases correctly identified) and high specificity (percentage of noncases correctly identified) as a screener for BPD

within undergraduate students by comparing the results of the questionnaires against a "gold standard" criterion diagnosis of BPD (as assessed by two semi-structured interviews: DIB-R and IPDE-I). The second goal of these studies was to conduct a preliminary exploratory analysis of the association of scores on the BPD measures and constructs that have been hypothesized to be relevant to the development and maintenance of BPD symptoms (e.g., "Big Five" personality factors, emotional experience, impulsivity).

Overall, the findings of Studies 1a and 1b indicated that screening for BPD in an undergraduate population is feasible and there are several questionnaires that may help in the identification of participants for future studies. Specifically, the McLean Screening Instrument for Borderline Personality Disorder (MSI-BPD; Zanarini et al., 2003), International Personality Disorder Examination DSM-IV Screening Questionnaire (IPDE-S; Loranger, 1999) and Borderline Personality Questionnaire (BPQ; Poreh et al., 2006) were all found to be internally consistent and valid screening measures. Furthermore, the results of correlation and regression analyses between dimensions of the "Big Five" and scores on the BPD measures were consistent with previous findings in the literature that BPD is associated with higher scores on neuroticism, lower scores on agreeableness, and to a lesser degree, lower scores on conscientiousness and extraversion. The similarity in results between the current and past studies suggested that individuals in the present samples showed characteristics consistent with that seen in both clinical and nonclinical populations with BPD traits. The results also provided support for the notion that individuals with BPD have a lower threshold (i.e., greater sensitivity) for both sensory and affective stimuli, as well as higher amplitude of emotional response (i.e., greater reactivity) to such stimuli. Furthermore, the findings suggested that those with BPD traits may lack understanding of their emotional state, may be unable to effectively regulate their emotional state, and that their impulsive behavior may be driven by negative affect.

The purpose of Study 2 (N = 225) was to test some of the specific tenets of Linehan's (1993) biosocial theory. The results suggested that BPD traits are associated with numerous dimensions of temperament [e.g., higher levels of negative affect; lower levels of positive affect; lower levels of effortful control; low sensory threshold (i.e., greater sensitivity) for both sensory and affective stimuli; ease of excitation (i.e., greater reactivity to sensory and affective stimuli)] and childhood environment (e.g., authoritarian parenting style, invalidating parenting, neglect, abuse). An examination of the interactions between dimensions of temperament and childhood environment suggested that interactions between (i) ease of excitation (greater reactivity to sensory and affective stimuli) and environment and (ii) trait negative affect and environment, predicted BPD symptoms over and above the temperament and environment variables alone. The results also suggested that a number of other factors are associated with BPD symptoms, including: increased attention to (or absorption in) emotional states, poor emotional clarity, affect lability (particularly anger), poor distress tolerance, and negative urgency (impulsive behavior in the context of negative affect). The association between BPD symptoms and difficulties identifying feelings seemed to be mediated by affect lability and negative urgency. Self-soothing and self-attacking did not predict BPD traits over and above the other variables.

Wagner and Linehan (1999) also proposed that the intense emotions (and emotional dysregulation) experienced by those with BPD interferes with cognitive functioning and effective problem solving, resulting in poor decisions and the observed harmful behaviors. Other researchers have suggested that

the repetitive, self-damaging behavior occurring in the context of BPD may reflect impairments in planning and failure to consider future consequences (e.g., van Reekum et al., 1994). Proponents of this view suggest that individuals with BPD show greater intensity and lability in their emotional response to their environment because they are unable to inhibit or moderate their emotional urges (i.e., impulsivity is at the core of the disorder). The purpose of Study 3 (N = 220) was to characterize decision making in an undergraduate sample of individuals with BPD traits and to ascertain the relative contribution of individual differences in the following areas to any deficits identified in decision making: emotional experience (e.g., increased affective reactivity or lability); reinforcement sensitivity (e.g., sensitivity to reward and/or punishment); impulsivity; executive functioning (measured by an analogue version of the Wisconsin Card Sorting Test); and reversal learning. Decision making was assessed using modified versions of two Iowa Gambling Tasks (IGT-ABCD and IGT-EFGH; Bechara, Damasio, Damasio, & Anderson, 1994; Bechara, Tranel, & Damasio, 2000) that included reversal learning components (i.e., Turnbull et al., 2006).

The results of Study 3 showed that participants in the BPD group demonstrated deficits in decision-making as measured by the IGT-ABCD but not on the IGT-EFGH. The results [interpreted in the context of reinforcement sensitivity models, the somatic marker hypothesis (Damasio, 1994) and the "frequency of gain" model e.g., Chiu et al. 2008)] suggested that decision making under uncertainty may be guided by gain-loss frequency rather than long-term outcome for individuals with BPD traits. The results failed to show consistent associations between BPD symptoms and performance on either version of the IGT. Individual differences in emotional experience, executive functioning or reversal learning did not account for the decision-making problems of the BPD group on the IGT-ABCD.

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Chapter 1

Introduction

Borderline personality disorder (BPD) is characterized by pervasive instability of interpersonal relationships, self-image, affect and behavior. Current theory and research suggest that BPD results from the combination of a biological vulnerability and an early developmental history characterized by invalidation, abuse and/or neglect (e.g., Clarkin, Marziali, & Munroe-Blum, 1991; Linehan, 1993). Despite a growing consensus that the etiological basis of the disorder lies in the interaction between a biological diathesis and environmental stressors (Goodman & Yehuda, 2002; Gunderson & Lyons-Ruth, 2008; Skodol, Siever, Livesley, Gunderson, Pfohl, & Widiger, 2002), the reasons for the diversity of troubling symptoms (e.g., self-injury, suicidality, mood reactivity, interpersonal difficulties) remain unclear. Psychopathology theorists differ in their conceptualization of the fundamental problems (e.g., impulsivity vs. identity disturbance vs. emotion dysregulation) underlying BPD and further research is needed to clarify which features are central to the maintenance of the difficulties associated with the disorder.

In this dissertation, I tested some of the basic tenets of Linehan's (1993) biosocial theory of BPD and explored empirically the core constructs implicated in her conceptualization of the disorder. This theory has its roots in clinical experience; comprehensive empirical studies of its fundamental assumptions are scarce. According to the biosocial theory of BPD, difficulties regulating emotions represent the core pathology in the disorder and contribute causally to the development and expression of all other BPD features. The emotional dysregulation is proposed to stem from the reciprocal interaction between a temperamental vulnerability (i.e., a highly arousable temperament, sensitive to both positive and negative emotional stimuli) and a childhood environment that invalidates the child's emotional experience. The theory asserts that individuals with BPD lack clarity with respect to their emotions (i.e. the person with BPD is often uncertain about what they are feeling), have difficulties tolerating intense affect, and engage in maladaptive and inadequate emotion modulation strategies.

In accordance with this theory, I tested the hypothesis that the interaction between temperamental sensitivity (i.e., low threshold for stimulation combined with an intense physiological response to negative or positive, emotionally-salient stimuli) and an adverse childhood environment (e.g., parental style, neglect, abuse, lack of emotional validation) predicts BPD features over and above that predicted by either construct independently. Second, I tested the hypothesis that BPD is positively associated with problems across different aspects of emotional experience (e.g., intensity, awareness, clarity) and deficits in emotion regulation skills (e.g., distress tolerance, self-soothing). Based on the initial findings of my research, I tested a series of competing hypotheses that address the nature of the emotional, cognitive and motivational mechanisms associated with the maladaptive behavior in BPD.

1.1 Borderline Personality Disorder

Borderline Personality Disorder (BPD), as defined by the DSM-IV-TR (American Psychiatric Association [APA], 2000), is a multifaceted mental illness characterized by a pervasive pattern of instability in emotional regulation, interpersonal relationships, self-image, and behavior. In general, BPD has been estimated to occur in 1 – 2% of the general population (Torgersen, Kringlen, & Cramer, 2001); however, a recent, large-scale epidemiologic study conducted in the USA found a lifetime prevalence of 5.9% (Grant et al., 2008). In clinical settings, BPD has been cited as the most common personality disorder, affecting an estimated 9 to 23% of psychiatric outpatients (Korzekwa, Dell, Links, Thabane, & Webb, 2008; Zimmerman, Rothschild, & Chelminski, 2005). Clinic interview studies with psychiatric inpatients conducted before 1990 estimated rates of BPD at around 15% (e.g., Widiger & Weissman, 1991). More recent inpatient interview studies have cited rates of BPD between 40 to 44% (Grilo, McGlashen, Quinlan, Walker, Greenfeld & Edell, 1998; Marinangeli et al., 2000).

Clinical and research literature on BPD portrays these clients as emotionally labile, interpersonally reactive, with a propensity toward impulsive, self-sabotaging behavior (e.g., substance abuse, binge eating, impulsive and later-regretted sexual promiscuity). Among the self-destructive tendencies observed in BPD are deliberate self-injury and chronic suicidality. The results of cross-sectional research in patients with BPD suggest that rates of self-mutilation and suicide attempts range

from 17% to 80% (median = 53%) and 46% to 92% (median = 76%), respectively (Zanarini et al., 2008). Mortality rates by suicide are close to 10% in this patient group, similar to that reported in patients diagnosed with Major Depressive Disorder or Schizophrenia (Paris, 2002).

1.1.1 Diagnostic Issues

In the DSM-IV-TR (APA, 2000), the diagnosis of BPD operates on a polythetic set of criteria and the presence of any five of nine symptoms can result in a positive diagnosis. As such, the clinical presentation of individuals diagnosed with BPD is heterogeneous. One important diagnostic issue that has been at the centre of much debate is the extent to which BPD is best conceptualized as a categorical or dimensional construct. The former perspective suggests a latent class of individuals who differ from each other qualitatively while the latter proposes that these individuals differ from each other in degree rather than in kind. Although earlier conceptualizations of BPD favored a discrete categorical model (e.g., Gunderson et al., 2000; Zanarini, Gunderson, Frankenburg, & Chauncey, 1989) which influenced the current classification of BPD in the DSM-IV-TR, recent theory on BPD seems to favour a dimensional perspective (e.g., Morey et al., 2003; Pukrop, 2002; Trull, Widiger, Lynam, & Costa, 2003; Widiger & Frances, 2002).

In the last decade, empirical studies examining the DSM-IV-TR nosology and latent structure of BPD have produced mixed results. For example, Clifton and Pilkonis (2007) identified a single latent class of BPD pathology in a mixed clinical and nonclinical sample, whereas Rothschild, Cleland, Haslam and Zimmerman (2003) found support for the classification of BPD as a non-discrete entity, falling on a dimensional continuum with normal personality. Other researchers have suggested that BPD is best conceptualized as a hybrid construct, consisting of both discrete and dimensional aspects. For example, Shevlin, Dorahy, Adamson and Murphy (2007) identified four discrete classes along the BPD continuum, ranging from an asymptomatic class to a BPD-like class. Similarly, Bradley, Conklin and Westen (2005, 2007) found support for two- and three-cluster models (labeled internalizing-dysregulated, externalizing-dysregulated, histrionic-impulsive) in their research on personality profiles

in adolescents and adults diagnosed with BPD using the Shedler–Westen Assessment Procedure (SWAP).

Other groups of researchers have also found evidence of distinct symptom groups in those diagnosed with BPD. In a 10-year longitudinal study, Zanarini et al. (2007) identified two types of symptoms among patients diagnosed with BPD; one group of symptoms seemed to represent manifestations of acute illness and resolved more quickly (e.g., impulsivity; active efforts to manage interpersonal difficulties), while those in the other group were more chronic in nature (e.g., chronic dysphoria; interpersonal symptoms reflecting abandonment and dependency issues). More recently, a group of researchers (Lenzenweger, Clarkin, Yeomans, Kernberg, & Levy, 2008) identified three phenotypically distinct groups within the BPD category using theory-guided finite mixture modeling analysis; the first was characterized by low levels of antisocial, paranoid, and aggressive features, the second was characterized by elevated paranoid features, and the third was characterized by elevated antisocial and aggressive features.

Overall, several methodological differences between the aforementioned studies make it difficult to determine whether BPD should be viewed as categorical or continuous in its phenomenology. Specifically, the studies varied in type and size of samples (e.g., patients only; participants selected from the community; use of comparison groups), criteria used (e.g., DSM-III-R, DSM-IV), mode of assessment (e.g., structured interviews; self-assessment) and statistical techniques employed. For the purpose of this dissertation, I used an analog sample and adopted a dimensional approach in the initial selection of participants for the first two studies. This approach was preferred because it identified the same participants as a categorical method, with the exception of clusters (or subtypes) of individuals with specific BPD traits. Identifying empirically-derived subtypes may have been difficult because they are likely more present in significant numbers in clinical settings. The dimensional approach also allowed for greater flexibility at the data analysis stage as I had the option of characterizing the sample from a categorical perspective if it was deemed necessary.

1.2 Theoretical Perspectives on the Etiology of BPD

1.2.1 Kernberg and Borderline Personality Organization

The concept of "borderline" personality originated in the psychodynamic literature and was used to describe patients who were "on the border" between the two prevailing diagnostic classifications at the time, psychotic and neurotic (e.g., Knight, 1953; Stern, 1938). The construct was later refined by Kernberg (1975, 1976) in his writings on borderline personality organization (BPO), a broad term referring to a level of pathology resulting from the failed or weakened formation of one's character, or identity. According to Kernberg (1971) individuals with a high level of personality organization demonstrate ego strength (i.e., self-control over impulses, ability to tolerate anxiety) and are able to integrate both positive and negative representations of the self and others. In contrast, BPO is characterized by "primitive" defenses, or immature ways of coping with threats to self-concept, impulses and emotions. Although individuals with BPO do not experience episodes of psychosis per se, they are prone to cognitive disturbance in times of stress, particularly when the stressor is interpersonal in nature.

In his early work, Kernberg (1975) described the interaction between innate drives (e.g., instinctual conflicts between libidinal and aggressive drives) and the quality of self-object relationships (e.g., the child's experiences with parents) as integral to the formation of healthy personality structure. Although Kernberg attributed the core feature of BPD (i.e., splitting, emotional lability) to excessive early aggression toward oneself and the caregiver, object-relations theorists (e.g., Adler & Bute, 1979; Mahler, 1971; Masterson, 1976) placed a greater emphasis on failures in early mothering (e.g., lack of empathy, inconsistency). For example, Masterson (1976) proposed that a basic fear of abandonment, stemming from the primary caregiver's emotional unavailability or overprotection of the child during development, triggers the episodes of emotional instability that are characteristic of patients with BPD in adulthood.

The influence of early childhood experiences on the development of self-concept, self-regulation skills and future interpersonal functioning has been suggested by numerous other theorists

and researchers (e.g., Ainsworth, 1989; Ainsworth, Blehar, Waters, & Wall, 1978; Bartholomew, 1990; Bowlby, 1969, 1973; Collins, 1996; Collins & Read, 1990; Kohut, 1971; Schore, 1994). However, most researchers agree that individual differences in the child's temperament also influence the quality of the bond that develops between the child and the primary caregiver (Boyce et al., 2001; Calkins & Hill, 2007; Newman & Wallace, 1993; Strelau, 1983; Thomas & Chess, 1985). Furthermore, research suggests that a child's temperament may affect his or her ability to cope with stressors in the early environment (Strelau, 2008). In line with research findings, more recent models of the etiology of BPD (e.g., Linehan, 1993; Zanarini & Frankenburg, 1997, 2007) have adopted a diathesis-stress or transactional framework.

1.2.2 Linehan's (1993) Biosocial Theory of BPD

Linehan's (1993) biosocial theory of BPD is based on a transactional model of development which proposes a bidirectional relationship between the person and environment. From this perspective, an individual's behavior is influenced by ongoing interactions between personal factors (e.g., temperament) and the social environment - the environment and the individual adapt to and influence each other. Linehan suggests that the fundamental problem underlying BPD is a pervasive difficulty regulating one's emotions. These difficulties with emotion regulation in turn stem from a biological predisposition toward emotional hypersensitivity (or high arousability) in combination with an invalidating childhood environment. Linehan suggests that those at risk for BPD are born with a temperament characterized by: 1) a low threshold for arousal; 2) a rapid, intense affective response; 3) a slow return to emotional baseline following exposure to salient events. Although the actual emotional response may be brief, the associated arousal, or mood, persists and has the potential to influence cognitive (e.g., attentional) processes. As a result, the individual is susceptible to the activation and reactivation of similar emotional states.

Linehan (1993) suggests that the temperamental sensitivity is not a risk factor in and of itself. Rather, she proposes that emotional dysregulation occurs when the primary caregivers fail to support the adaptive expression of emotion in the vulnerable child, impeding the acquisition of skills required

for successful emotional modulation. In an invalidating environment, the child's experiences are devalued and the communication of these experiences is met with erratic or extreme inappropriate responses (Fruzzetti, Shenk, & Hoffman, 2005; Linehan, 1993). For example, the child's display of emotion may be punished at times, which discourages expression of feelings. In this situation, the individual receives the message that their response to the environment is inaccurate or invalid and may start to doubt the veracity of their own thoughts and feelings. Consequently, labeling internal experiences becomes difficult (McMain, Korman, & Dimeff, 2001) and the individual begins to base their emotional reactions in response to cues in their social environment. At other times, extreme displays of emotion may be reinforced, thereby strengthening emotional reactivity. Consequently, an invalidating environment may contribute to affective lability; the individual switches between strong inhibition of emotion and extreme displays of emotion.

According to Linehan (1993), these difficulties with the experience and management of emotion (e.g., intensity of affect activation and the lack of affect control) underlie the instability in identity, relationships, and behavior that define BPD. Specifically, the potentially harmful behaviors observed in patients with BPD are viewed as attempts to self-regulate intense emotional experience (e.g., Gratz, Rosenthal, Tull, Lejuez, & Gunderson, 2006; Linehan, Bohus, & Lynch, 2007). From this perspective, the behavior of the individual is considered to be a reflection of the interference of intense emotion with cognitive functioning and effective problem solving (e.g., Wagner & Linehan, 1999).

1.3 Elaboration of Linehan's (1993) Theory and Empirical Support

Evidence regarding Linehan's (1993) biosocial theory can be gleaned by reviewing research in the following domains: studies of temperamental sensitivity in BPD; studies examining the prevalence of adverse events or degree of invalidation in childhood among individuals with BPD; studies examining emotional correlates (e.g., emotional lability, levels of negative affect) of temperamental sensitivity and exposure to adverse events during development; studies examining different aspects of emotion regulation and their association with other symptoms (e.g., impulsivity) that characterize BPD.

In the following section, I provide a summary of key theoretical perspectives and empirical findings in each of these domains.

1.3.1 Biological (Temperamental) Sensitivity

Individual differences in reactivity to external stimuli (e.g., sensory, emotional) have been implicated in the development of behavioral style and personality (e.g., Fox & Polak, 2004). Although there is no specific model of temperament that is considered to be the "gold standard," there is a general consensus within the literature that temperament refers to innate, potentially heritable, individual differences in reactivity and self-regulation associated with arousal, emotion, motivation, and attention (Derryberry & Rothbart, 1988; 1997).

Within the developmental literature, three- to nine-factor models of temperament have been suggested. Among the dimensions commonly identified as central to the construct are patterns of emotional reactions, including sensitivity and intensity of reaction (Thomas & Chess, 1977), emotional self-regulation (Rothbart, 1989), activity and sociability (Buss & Plomin, 1984). A substantial amount of research on temperament variability has been conducted with infants and children using either direct observation in the laboratory and/or parent reports on scales assessing temperament dimensions. Among these studies is the work of Thomas and colleagues that explored temperament over time in the New York Longitudinal Study (NYLS) (Thomas & Chess, 1977; Thomas, Chess, & Birch, 1968).

In the initial stages of their research, Thomas and colleagues (e.g., Thomas & Chess, 1985; Thomas et al., 1968; Thomas, Chess, & Birch, 1970) observed that approximately 10% of infants in the NYLS exhibited a "difficult" temperament, which was exemplified by irregularity in biological functions (e.g., sleep cycles), negative withdrawal responses to novel stimuli, poor adaptability to change, and intense, frequent negative displays of emotion. Over the course of the study, they found that the majority of these "difficult" infants (approximately 70%) developed behavioral problems during childhood. Based on these findings, they suggested that this temperamental style predisposed children to reactive behavior disorders.

Although data from the NYLS was initially interpreted as supporting a nine-factor model of temperament (sensory threshold, activity level, intensity, rhythmicity, adaptability, mood, approach/withdrawal, persistence, distractibility), three- to six- factor variations of this initial structure have evolved over time. These factors have included Fear (i.e., degree of distress and behavioral inhibition in response to novel and challenging stimuli), Irritability (i.e., level of distress in response to limitations or frustration), Positive Affect/Approach, Persistence, Activity Level and Rhythmicity. For example, Buss and Plomin (1984) initially distinguished between four temperament traits (Emotionality, Activity, Sociability, Impulsivity) but later revised their theory, stating that only three of these dispositions have a strong genetic component (Emotionality/Distress, Activity, Sociability) and provide the foundation for later personality. Another three-factor structure (Surgency, Negative Affectivity, Effortful Control) was identified by Ahadi and colleagues (e.g., Ahadi & Rothbart, 1994; Ahadi, Rothbart, & Ye, 1993) and is very similar to the Big Three factors identified in studies of adult personality (Extraversion, Neuroticism, Constraint).

In addition to models stemming from studies in child development, findings from animal-based psychopharmacological and biological research have influenced the study of individual differences in temperament and personality. The early work of Gray, examining biological systems associated with motivation, emotion and learning (i.e., Gray, 1967; 1981), has been particularly influential in this respect. Specifically, several prominent neurobiological models of personality (e.g., Cloninger, 1987; Zuckerman, 1979) have incorporated postulates of Gray's reinforcement-sensitivity theory (RST) in their discussion of brain mechanisms underlying trait dimensions.

The original version of RST, as summarized by Gray (1991), consisted of a reward system, a punishment system, and a threat-response system. Gray referred to these systems as the Behavioral Inhibition System (BIS), the Behavioral Approach System (BAS), and the Fight-Flight System (FFS), respectively. He proposed that the BIS mediates responses to conditioned signals of punishment (resulting in passive avoidance) and conditioned signals of frustrative nonreward (resulting in extinction of a response), and is a key biological mechanism involved in anxiety. In contrast, he suggested that the

BAS mediates responses to conditioned signals of reward (resulting in approach behavior) and conditioned signals of relieving nonpunishment (resulting in active-avoidance), and proposed that it is the biological system underlying impulsivity. The FFS was proposed to mediate responses to unconditioned aversive stimuli (e.g., innately painful stimuli), resulting in rapid escape (flight) or defensive aggression (fight).

In the original RST, the activation of the BAS and BIS was associated with positive and negative affect, respectively. Thus, individual differences in BAS and BIS reactivity were thought to correspond to stable differences in positive and negative emotionality (Gray, 1991). However, over time, it became clear that the implications of activity in the BIS and BAS for affect and emotion were more complex than was initially proposed. For example, experimental research on reward-contingent learning (e.g., Patterson & Newman, 1993; Salamone, 1994) suggested that BAS activity was associated with responses to stimuli associated with either reward or nonreward. Furthermore, the results of psychometric studies showed that self-report measures of BAS (e.g., Carver & White's (1994) BIS/BAS scales) predicted self-reported frustration in response to the omission of anticipated reward (Carver, 2004). These and other findings (e.g., Zinbarg & Revelle, 1989) were inconsistent with the original RST.

In response to research advances, revisions were made to the original RST. These revisions were documented and presented in Gray and McNaughton (2000). In the revised RST (hereafter referred to as RST-2), the BAS still functions as a reward system. However, in contrast to the original RST, Gray and McNaughton propose that the BAS mediates responses to both conditioned and unconditioned appetitive stimuli. In the RST-2, the BAS is associated with anticipatory pleasure, impulsivity, optimism and frustration in response to nonreward.

Furthermore, the role of the punishment system in RST-2 is no longer attributed to the BIS. Instead, Gray and McNaughton (2000) propose that the FFS (renamed the FFFS in RST-2, denoting a Fight-Flight-Freeze System) mediates responses to all aversive stimuli, conditioned and unconditioned. In line with this alteration, Gray and McNaughton suggest that activity in the FFFS is associated with

fear and panic. In the RST-2, the BIS system is thought to be activated in response to activity in the BAS and FFFS. It uses anxiety as an alarm signal to alert the organism that a conflict needs to be resolved and inhibits ongoing behavior (mediated by both BAS and FFFS), while directing arousal and attention toward the source of the conflict. This state of "defensive approach" is characterized by a cautious assessment of potential risk and is resolved when the BIS engages either the BAS (to continue approaching) or the FFFS (to escape).

Gray and McNaughton (2000) propose that the BIS is conservative and favors avoidance over approach in most, but not all, contexts. Research on behavioral variation within animal populations along the bold/shy continuum (e.g., Coleman & Wilson, 1998) suggest that individual differences in preference for approach and avoidance are present in several species (e.g., pumpkinseed sunfish, marmots, guppies). For example, fish that encounter different levels of predation have been shown to differ in their behavioral response to predators in ways that could be interpreted as "shy" or "bold" (e.g., predator inspection) and this interindividual variation in behavioral types has been found to be associated with the survival and success of its individual members (Dyer, Croft, Morrell, & Krause, 2009). Therefore, the inclination to either avoid or take risks appears to be an important aspect of behavioral variation with evolutionary significance.

One model that captures both developmental and neurobiological approaches to the study of temperament is that of Rothbart and colleagues (Evans & Rothbart, 2007; Rothbart, Derryberry, & Posner, 1994). The model of adult temperament proposed by Evans and Rothbart (2007) is outlined in Appendix A Figure A1, which is followed by a hierarchical listing of the main sub-components of each factor (see Figure A2). Evans and Rothbart conceptualize temperament as consisting of four higher-level factors: Extraversion/Surgency (E/S), Negative Affect (NA), Orienting Sensitivity (OS) and Effortful Control (EC). OS is defined as automatic attention to both external sensory events and internal events (e.g., awareness of slight, low intensity stimulation from multiple modalities, as well as spontaneously occurring emotions, thoughts and images) and EC reflects the capacity to control attention (e.g., while experiencing emotion).

Different neurobiological systems have been proposed to be associated with the four temperament factors put forth by Rothbart and colleagues. According to Posner and Rothbart (2006), the E/S factor is associated with systems involved in the processing of reward/pleasure and approach behaviour and involves the dopamine system and brain regions located along the medial forebrain bundle (e.g., substantia nigra, ventral tegmental area, basolateral amygdala, nucleus accumbens). The NA factor is associated with negative emotionality/distress and Posner and Rothbart suggest that amygdalar circuits involved in fear and defensive aggression play a role in its expression. They also note that negative affect systems are regulated by more general neurochemical systems including dopaminergic and serotonergic projections arising from the midbrain (e.g., serotonergic projections from the midbrain raphe nuclei). Rothbart and Posner (2001) suggest that neurobiological systems implicated in attentional orienting processes (e.g., superior parietal lobe; the midbrain eye movement structure, superior colliculus) underlie OS. Cholinergic systems arising in the basal forebrain are thought to play an important role in orienting (Posner & Fan, 2008). Rothbart and Posner (2001) and Posner and Fan (2008) propose that a network involving the medial frontal region of the brain (including the anterior cingulate gyrus) is related to the executive attention network, which is important in the resolution of conflict among stimuli. The researchers also propose that the lateral prefrontal cortex, responsible for holding in mind information that is relevant to a task, is associated with EC. Both the anterior cingulate and lateral frontal cortex are target areas of the ventral tegmental dopamine system (Posner & Fan, 2008). Applying the framework of RST-2, mechanisms associated with the BAS and FFFS may underlie individual differences in E/S and NA, respectively. The BIS, which is associated with vigilance, attentional selection and conflict resolution, may underlie the temperament factors of OS and EC.

Each of the higher-level factors in the Evans and Rothbart (2007) model can be broken down into lower-level components. With respect to the temperamental vulnerability described by Linehan (1993), certain components of the OS, NA and E/S factors could be used to represent the increased sensitivity to emotional stimuli and greater intensity in the experience and expression of emotions. For

example, perceptual (sensory) and affective variants of sensitivity (e.g., low threshold) are implicated in the OS and NA dimensions. Specifically, OS is proposed to consist of Neutral Perceptual Sensitivity (the tendency to notice small, neutral environmental stimuli), Affective Perceptual Sensitivity (the tendency to attend to subtle emotion-related details) and Associative Sensitivity (the tendency to find connections between loosely related thoughts or concepts); the NA dimension of Sensory Discomfort is associated with the unpleasant affect that could result from sensory qualities of stimulation. Increased intensity of aggressive and non-aggressive negative emotion is also represented within the NA factor and includes Sadness, Frustration, and Fear (or anticipation of distress). The E/S dimensions of Positive Affect and High Intensity Pleasure could be used to represent characteristics (e.g., intensity, duration) associated with the general experience of pleasure and positive emotions, as well as pleasure stemming from situations involving high levels of stimulus intensity or novelty.

The emotional modulation aspect of Linehan's (1993) theory is best captured by Evans and Rothbart's (2007) EC factor. This factor consists of dimensions associated with Attentional Control (capacity to focus and/or shift attention when desired), Inhibitory Control (capacity to suppress inappropriate approach behavior) and Activation Control (capacity to perform an action when there is a strong tendency to avoid it). One's ability to inhibit a habitual, automatic response in favour of a subdominant, context-appropriate response has been linked to the regulation of emotion and behavior (e.g., Botvinick, Braver, Barch, Carter, & Cohen, 2001). Rothbart and colleagues (e.g., Posner et al., 2002) also suggest that individuals with control over attention focusing and attention shifting have an advantage in regulation of emotional responses. Since Linehan suggests that emotional dysregulation is the core feature of BPD, impairments in EC may have specific implications for this group of patients.

Preliminary results from neuropsychological studies suggest that deficits in EC may be important vulnerability markers for BPD (e.g., Clarkin & Posner, 2005; Lenzenweger, Clarkin, Fertuck, & Kernberg, 2004). Among BPD patients, high scores on self-reported EC have been found to be associated with a reduced susceptibility to cognitive conflict (Posner et al., 2002) and better self-reported interpersonal and personal functioning (Hoermann, Clarkin, Hull, & Levy, 2005). In studies

using the Attention Network Task (ANT), both BPD patients (Posner et al., 2002) and children scoring high on BPD precursors (Rogosch & Cicchetti, 2005) show deficits in conflict resolution, an ability associated with EC, compared to matched controls. Individuals with BPD have also been found to exhibit deficits in the orienting response on the ANT task (Fertuck, Lenzenweger, Clarkin, Hoermann, & Stanley, 2006) and problems with behavioral response inhibition (Nigg, Silk, Stavro, & Miller, 2005).

Functional neuroimaging studies have found that, relative to healthy controls, patients with BPD demonstrate decreased activity in cortical areas associated with inhibition (Silbersweig et al., 2007) and inappropriate increases in amygdalar activity in neutral word conditions. Herpertz et al. (2001) also found elevated blood flow in the amygdala in female patients with BPD, compared to age-matched female controls. Participants in the BPD group exhibited enhanced activation in the amygdala, as well as activation of the medial and inferolateral prefrontal cortex when viewing emotionally aversive pictures. Herpertz and colleagues interpreted these results as indicative of a more intense and slowly subsiding emotional response in the BPD group in the context of stressors. Furthermore, they found that participants in the BPD group but not the control group demonstrated increased activation in the fusiform gyrus in the aversive versus neutral stimuli condition and proposed that this may be due to modulation of the perceptual cortex by the amygdala in those with BPD features. If the perceptual cortex was indeed being modulated through the amygdala, this could help explain findings in previous studies that individuals with BPD seem to be particularly sensitive to emotionally-salient aspects of their environment (Herpertz, et al., 1997).

Increased vigilance for emotionally salient stimuli in BPD patients has also been demonstrated by Sieswerda, Arntz, Mertens and Vertommen (2007). These researchers used a modified version of the emotional Stroop task to study attentional vigilance in BPD patients, two groups of patients (one with cluster C personality disorders; another with an Axis I diagnosis) and a group of normal controls. The computerized task was a series of one-by-one trials, consisting of schema-related and unrelated, negative and positive, person-related word stimuli. Ten types of words (12 words in each category)

were used in the task; six of the categories consisted of BPD schema-related negative words and their positive opposites (e.g., 'I am powerless and vulnerable' - e.g., powerless, powerful; 'I am inherently unacceptable' - e.g., unacceptable, worthy; 'Others are dangerous and malevolent' - e.g., malevolent, reliable). Sieswerda and colleagues found that BPD patients demonstrated increased attention to both negative and positive cues, with a specific bias toward schema-related negative cues.

In contrast, studies using psychophysiological indicators of emotional reactivity (e.g.,heart rate, skin conductance) have failed to find reliable differences in responses to affect-inducing pictures when comparing patients diagnosed with BPD to other psychiatric groups or healthy controls (e.g., Herpertz, Kunert, Schwenger, & Sass, 1999; Herpertz et al., 2000). For example, the results of a study assessing psychophysiological affect correlates in females diagnosed with BPD, avoidant personality disorder (APD) and normal controls, did not support the presence of affective hyper-responsivity in BPD (Herpertz et al., 2000). In fact, participants in the BPD group actually exhibited lower electrodermal reactivity than participants in both the APD and control groups. The researchers concluded that low somatic arousal in BPD may interfere with the anticipation of salient stimuli and may explain the hypersensitivity that those with BPD show in interpersonal situations.

Together, these findings suggest that those with BPD have trouble modulating affective, attentional and behavioral responses. However, it remains unclear whether these difficulties represent stable individual differences in physiological response tendencies (e.g., orienting sensitivity), context-specific vigilance (e.g., in response to interpersonal threats), deficits in top-down inhibitory processes, or a combination of these and other factors. The Evans and Rothbart (2007) model of adult temperament seems to provide a particularly useful framework for conceptualizing and testing the nature of the temperamental vulnerability that Linehan (1993) suggests underlies BPD. However, as noted previously, temperament alone does not lead to BPD; Linehan suggests that an individual's childhood environment is equally relevant, if not more so, in the development of BPD symptoms. In the following section, I review the aspects of early environment that have been implicated in the etiology of the disorder.

1.3.2 Early Environment: Disturbed Attachment, Trauma and Invalidation

Research on the role of environmental factors in the etiology of BPD has generally focused on five aspects: (1) early separations/losses and disturbances in attachment; (2) instability in parental involvement; (3) presence of verbal and emotional abuse; (4) incidents of physical and sexual abuse; and (5) occurrence of physical and emotional neglect (Zanarini & Frankenburg, 2007). Empirical studies within the first two domains were initially conducted to evaluate the postulates of psychoanalytical theories of BPD, whereas later research focusing on history of traumatic experiences stemmed from clinical observation (i.e., frequent reports of abuse by patients diagnosed with BPD) (Zanarini & Frankenburg, 2007).

Studies examining the prevalence of prolonged early separation and losses during childhood have found that patients with BPD report a higher frequency of such events than patients in other diagnostic groups (e.g., Akiskal et al., 1985; Links, Steiner, Offord, & Eppel, 1988; Paris, Zweig-Frank, & Guzder, 1994; Zanarini, Gunderson, Marino, Schwartz, & Frankenburg, 1989). In line with these findings, Gunderson (1984) proposed that BPD is best understood as a disorder of attachment and the results of several studies suggest a strong association between insecure attachment styles and BPD (Agrawal, Gunderson, Holmes, & Lyons-Ruth, 2004). In a review of 13 studies, Agrawal and colleagues (2004) found that unresolved, preoccupied and fearful attachment styles were highly characteristic of individuals with BPD. Furthermore, those with BPD demonstrated concerns about dependency and rejection simultaneously with a strong desire for intimacy. Aaronson, Bender, Skodol and Gunderson (2006) compared the attachment styles of patients with BPD to that of patients with obsessive-compulsive personality disorder. Those with BPD were more likely to report unavailability of attachment figure, fears of losing the attachment figure, and difficulty relying on the attachment figure.

Studies examining patients' retrospective perceptions of parental bonding and family conflict have produced three main findings (Zanarini & Frankenburg, 2007). First, compared to patients in other diagnostic groups, patients with BPD perceive their relationships with their mothers as more conflictual, distant, or uninvolved (Paris & Frank, 1989; Soloff & Millward, 1983). Second, those with

BPD report a lack of paternal involvement or absence, which appears to be an even more discriminating aspect of early environment than a problematic relationship with their mother (Frank & Paris, 1981; Soloff & Millward, 1983). Third, troubled relationships with both parents appear to be more specific for BPD than problems with either parent alone (Frank & Hoffman, 1986; Gunderson, Kerr, & Englund, 1980).

Studies investigating the developmental history of patients with BPD suggest that childhood abuse, in the form of emotional, physical or sexual abuse, is highly prevalent in this group (Gershuny & Thayer, 1999; Herman, Perry, & Van der Kolk, 1989; Sabo, 1997; Zanarini et al., 1989). Herman and colleagues (1989) reported that 80% of BPD patients in their study acknowledged a history of physical or sexual abuse, or being a witness to serious domestic violence. In a sample of 358 patients diagnosed with BPD, Zanarini and Frankenburg (1997) reported that 91% of participants acknowledged some form of abuse (e.g., emotional, verbal, physical, sexual) and 92% acknowledged some form of neglect. In cases where the parent was not the perpetrator of the maltreatment, he or she may have failed to protect the child or was unable to help the child process the abuse emotionally. In other words, the parental figure who the child should associate with safety and security, was either unavailable, inconsistent, or neglectful (Masterson, 1985).

Similar findings have been noted in studies comparing patients diagnosed with BPD to patients without this diagnosis. For example, Laporte and Guttman (1996) compared the history of traumatic childhood experiences in the psychiatric records of 751 female patients (16 to 45 years of age) with a discharge diagnosis of BPD with those of female patients with other Axis II disorders. They found that over 93% of patients diagnosed with BPD experienced at least one form of separation or abuse in childhood, compared with 74% of patients diagnosed with other personality disorders (Laporte & Guttman, 1996).

In another study, Weaver and Clum (1993) assessed childhood traumatic experiences (e.g., sexual abuse, physical abuse, witnessed violence, and early separation experiences) and family environment characteristics in a sample of depressed female inpatients; 17 of these patients had a

comorbid diagnosis of BPD and 19 patients did not. Weaver and Clum found that those in the BPD group reported significantly higher rates of past sexual abuse, physical abuse, and witnessed violence. Of these variables, sexual abuse emerged as a significant predictor of dimensional BPD scores, even after controlling for history of physical abuse, subjective depression, family environment and diagnostic differences between groups.

In summary, four key findings have emerged from studies on childhood abuse in criteria-defined BPD patients. First, both physical and sexual abuse are commonly reported in the childhood histories of this group. Second, sexual abuse is reported with greater frequency in the BPD group than comparison samples of depressed or other axis II patient groups (e.g., Ogata et al., 1990). Third, unlike reports of sexual abuse, BPD and comparison patient groups do not appear to differ with respect to frequency of physical abuse (Ogata et al., 1990). Fourth, among BPD patients, frequency and nature (e.g., one-time occurrence vs. ongoing) of childhood sexual abuse is positively correlated with the severity of symptoms (Ogata et al., 1990).

Studies examining reports of childhood neglect in BPD patients have generally found that emotional neglect occurs frequently and is highly discriminating for BPD (e.g., Zanarini & Frankenburg, 1997). For example, Zanarini and Frankenburg (1997) operationalized emotional neglect as a multidimensional construct and found that each component (emotional withdrawal, inconsistent treatment, denial of feelings, lack of a real relationship, parentification of patient, failure to provide needed protection) was reported with a greater frequency among BPD patients than among comparison participants. In contrast, studies examining prevelance of physical neglect in this group have found that this form of neglect is relatively rare in the childhood history of patients with BPD; however, in studies where physical neglect was reported, it was more common among BPD patients than other diagnostic groups (Westen, Ludolph, Misle, Ruffins, & Block, 1990; Zanarini & Frankenburg, 1997).

Overall, these results support the role of adverse childhood experiences in the development of BPD. However, it remains unclear which aspects of the early environment (i.e., parenting styles, early attachment, emotional neglect, sexual abuse) are the best predictors of BPD symptoms. Furthermore,

there is limited data on the association of childhood experiences and specific dimensions of dysfunction associated with BPD (e.g., poor impulse control, dissociation, emotional reactivity). Preliminary research on the association between certain types of childhood trauma and deficits in emotional processing and experience in BPD has found a significant, positive association between self-reports of emotional and physical neglect and alexithymia in this patient group (Zlotnick, Mattia, & Zimmerman, 2001). Interestingly, Zlotnick and colleagues (2001) did not find an association between self-reports of abuse and alexithymia scores. Furthermore, these researchers found that the association between BPD and alexithymia was stronger than that between alexithymia and physical neglect. This finding suggests that deficits in emotional awareness and clarity are likely associated with other BPD features, in addition to history of emotional and physical neglect.

1.3.3 Evidence for an Interaction: Temperament and Environment

Most temperament theorists and researchers agree that temperament is inherent to the individual but that its expression is subject to environmental circumstances and past experience (e.g., Goldsmith, Buss, Plomin, & Rothbart, 1987; Strelau, 2008). For example, Thomas and Chess (1977) emphasize that the parent-child relationship is a constantly evolving process of interaction in which both the parent and the child influence one another. The effect of the child's temperament on the parent depends on the caregiver's personality structure, goals and expectations for the child, and on socio-economic opportunities and constraints. The effect of the parent's attitudes and practices on the child depends on the child's style of response and adaptation (i.e., temperament). In discussing the association between temperament and environment, Chess and Thomas (1989) emphasize the notion of "goodness of fit," the match or mismatch between the temperament of the child and that of other family members. They suggest that the "fit" between parents' and children's temperaments may have a strong effect on family life, influencing the affective tone of one's early environment.

Linehan (1993) compares the temperamental style of the BPD patient to that of Thomas and Chess' (1977) "Difficult Child," which is characterized by irregularity in biological functions (e.g., erratic sleep and feeding schedules), negative withdrawal responses to novel stimuli, poor adaptability

to change, and intense emotional expressions which are often negative in valence. Thomas and Chess (1977) propose that there are three types of parental responses that are elicited by the Difficult Child. First, the parents may feel anxious or threatened if they perceive their child's problems as being reflective of their own inadequacy as caregivers. Alternatively, the parents may blame and resent the child for its behavior and withdraw from it. Unfortunately, in each of these scenarios, the parents will be less likely to provide the child with the patient, gradual and repeated exposures to new situations and demands that it actually needs to adapt positively. Instead, the parents are more likely to pressure, appease or punish the child or communicate negative feelings such as hostility and impatience. These parental responses, in turn, further exacerbate the child's negative emotional expressions and difficulties in adaptation (Thomas & Chess, 1977).

Consistent with this transactional view, data from animal and human studies suggest that physiological sensitivity may amplify both the positive and negative aspects of one's environment. Within the field of health psychology, studies with children suggest that sensory sensitivity magnifies both the positive effects of nurturing parenting and the adverse effects of stressful environments on the development of respiratory illness (e.g., Boyce & Ellis, 2005; Ellis, Essex, & Boyce, 2005). Similar effects have been documented in studies with sensitive rhesus monkeys that show accelerated development and greater dominance when raised in nurturing environments and increased anxious-depressive stress reactions when exposed to early adversity (Davidson, Fox, & Kalin, 2007).

The work of Strelau and colleagues (as summarized in Strelau, 2008) provides further support for the interaction between temperament and environment. According to Strelau's Regulative Theory of Temperament (RTT; Strelau, 1983; 1996), temperamental traits play an important role in regulating the relationship between the individual and their environment. Specifically, Strelau proposes that temperamental traits codetermine the individual's style of action (or reaction), choice of situations and behaviors, as well as the psychophysiological costs inherent in performing activity under highly stimulating demands (Strelau, 1996).

Data collected by Strelau and colleagues (as summarized in Strelau, 2008) suggest that the regulative function of temperament is most obvious in response to difficult or extreme circumstances – ones that are not controlled by the individual. For example, Strelau and Zawadzki (2005) assessed the role of temperament and trauma as predictors of Posttraumatic Stress Disorder (PTSD) symptoms experienced during flood and coal mining accidents in five different samples. In all samples, certain temperamental traits were found to act as buffers, reducing the effect of trauma-inducing events, whereas others were found to act as augmenters, increasing the effect of experienced trauma. The buffers included traits such as briskness (i.e., tendency to react quickly and shift easily in response to changes in the surroundings from one behavior to another) and endurance (i.e., ability to react adequately in situations demanding long-lasting, highly stimulating activity or under intensive external stimulation). The augmenters included perseveration/persistence (i.e., tendency to continue or to repeat behavior after cessation of stimuli evoking this behavior) and emotional reactivity (i.e., the tendency to react intensively to emotion-generating stimuli; high emotional sensitivity and low emotional endurance). In all samples, emotional reactivity was the best predictor of the intensity of PTSD symptoms.

Strelau's findings (as summarized in Strelau, 2008) lend credence to certain aspects of Linehan's (1993) biosocial theory of BPD. For example, the notion that there are temperamental risk factors which augment the effects of environmental stressors (e.g., Strelau, 1995) is consistent with Linehan's hypothesis that BPD stems from a biological vulnerability in combination with childhood adversity. Strelau's finding that emotional reactivity is the best predictor of severity of posttraumatic response also supports Linehan's theory that the temperamental vulnerability for BPD includes emotional sensitivity (i.e., decreased threshold for responding) and enhanced reactivity (i.e., increased amplitude of response). Furthermore, the second risk factor, perseveration/persistence, may be related to the third, temporal aspect of vulnerability proposed by Linehan - prolonged activation or slower return to baseline physiological arousal. Specifically, Linehan suggests that problems with recovery

from peak emotional intensity make these individuals particularly vulnerable to prolonged or exacerbated emotional responding after the cessation of the original stressor.

Many theorists and researchers (e.g., Judd & McGlashan, 2003; Schore, 1994; Thomas & Chess, 1977) propose that the ongoing, reciprocal interaction between temperament and the environmental context has important implications for emotional experience and regulation. During infancy, behavioral expression of emotion should cue the parents to the child's internal state and guide the caregivers' response. Research in child development suggests that parental encouragement of emotional expression, as well as discussion of the causes and consequences of emotions, fosters higher levels of emotional understanding in children (e.g., Judd & McGlashan, 2003). Linehan (1993) proposes that the early environment of BPD patients discourages or punishes the expression of emotions, either directly or indirectly. For those who are emotionally sensitive and require increased parental assistance with self-regulation, this invalidation of emotional experience has a particularly negative impact, contributing to the maintenance of emotional distress and confusion with respect to how to best modulate that distress. To better characterize the emotional experience of individuals with BPD and make specific predictions about potential deficits and their implications, I will now review the literature on normative individual differences in emotional experience and emotional intelligence.

1.4 Individual Differences in Emotional Experience and Emotional Intelligence

In recent years, there has been a growing emphasis on the functional significance of emotions in guiding behavior (e.g., Frijda, 1988). According to Damasio (1994), emotions are biologically-determined patterns of chemical and neural responses that have a regulatory purpose; they alert the organism to salient events in the environment, so that the organism can take action. Similarly, the affect-as-information hypothesis (Gohm & Clore, 2002a) proposes that emotions are bodily experiences that convey information about the value ("goodness" or "badness") of different aspects of one's environment. Furthermore, emotions trigger a coordinated set of response tendencies in the body (e.g., approach or avoidance) that allow one to modulate the experience and expression of the emotion effectively.

Research suggests that the functionality of emotions is, at least in part, determined by an individual's ability to process the affective experience accurately. Salovey and Mayer (1990) introduced the concept of emotional intelligence (EI) to describe one's capacity to understand and express their emotions, recognize emotions in others, regulate affect, and use moods and emotions to motivate adaptive behaviors. Studies on EI suggest that it is associated with a number of positive outcomes and is advantageous for mental health, everyday coping, and social problem solving (Barrett, Gross, Christensen, & Benvenuto, 2001).

In an effort to better understand the nature of emotional experience and intelligence, Gohm and Clore (2000) examined the content and structure of 18 self-report scales related to individual differences in emotional experience. Based on their initial research, they proposed that individual differences in emotional experience can be broken down into 5 conceptual categories: absorption, attention, clarity, intensity, and expression. In a later study, Gohm and Clore (2002b) adopted factor analytic techniques to explore the latent structure of emotional experience; the results of confirmatory factor analysis suggested that a four, rather than five, factor model fit best. The four latent traits were labeled attention, clarity, intensity and expression.

In the four-factor model, attention to emotions included both absorption (defined as the tendency to get absorbed in sensory or emotional experiences and to attend to one's internal state) and attention (defined as the tendency to attend to and value feelings). The second latent trait, clarity, was defined as the ability to identify and distinguish specific emotions and the third latent trait, intensity, was defined as the magnitude with which an individual tends to experience emotions. The final latent trait, expression, was defined as the tendency to express emotions outwardly. Gohm and Clore (2002b) proposed that three of these traits – attention, clarity and intensity - moderate emotion-relevant information processing.

Several theorists have pointed out the significance of having access to one's own feelings (e.g., Bagby, Taylor, & Parker, 1994; Gohm & Clore, 2002a; Salovey, Mayer, Goldman, Turvey, & Palfai, 1995). However, the effects of mood monitoring, or focusing inward on one's emotional state, seem to

be mediated by the degree to which one is able to discriminate between feelings and understand them (Swinkels & Giuliano, 1995). In general, lacking clarity about one's feelings makes it difficult to know how to use the information conveyed by emotions adaptively. Studies have found that lower levels of emotional clarity are associated with higher levels of neuroticism and negative affect (NA) (e.g., Coffey, Berenbaum, & Kerns, 2003; Gohm & Clore, 2002b), ambivalence about emotional expression, general depression and higher levels of distress (Salovey et al., 1995). Furthermore, Gohm (2003) suggests that persons low in emotional clarity may be confused about their responses in emotional situations, find their reactions to be unpredictable and problematic, and hence be more likely to engage in emotional inhibition or attenuation. The negative consequences of inhibiting emotional experience have been documented in several areas of psychology (Lynch, Cheavens, Morse, & Rosenthal, 2004; Lynch, Robins, Morse, & MorKrause, 2001), including the development of psychopathology.

The latent trait of affect intensity in Gohm and Clore's (2002b) model is based on Larsen and Diener's (1987) conceptualization of the construct. Larsen and Diener suggest that this parameter of emotional responsiveness generalizes across specific emotion categories such that individuals who experience their positive emotions strongly will also experience their negative emotions more strongly. They differentiate affect intensity from the constructs of emotionality and emotional reactivity (e.g., Buss & Plomin, 1984; Strelau, 1983), which they argue refer mainly to the regular experience of negative emotion and the tendency to easily slip from a positive or neutral state into a negative emotional state. As such, Larsen and Diener's perspective is consistent with Linehan's (1993) conceptualization of increased intensity of affective experience in patients with BPD – both suggest that the construct encompasses positive and negative emotions.

Larsen and Diener (1987) have found that affect intensity, as measured via questionnaire and diary methods, is strongly correlated with variability in day-to-day emotional states, higher levels of activity, and extraversion. They also present evidence that suggests that persons high on the affect intensity dimension actually seek out and prefer emotional stimulation; furthermore they may feel and perform better in highly stimulating situations. They propose that individual differences in affect

intensity may serve an arousal regulation function, where certain individuals seek to maximize their emotional responses to compensate for an otherwise chronically low level of baseline arousal. In other words, they suggest that emotional responses function as a source of stimulation for use in arousal regulation. Although Linehan (1993) associates affect intensity in BPD with hyperarousal, rather than hypoarousal, of the nervous system, one can draw on Larsen and Diener's model to test alternative hypotheses regarding the nature of emotional problems in BPD.

In summary, the latent constructs identified by Gohm and Clore (2002b) – affect intensity, attention, clarity, expression – provide a useful framework for exploring the nature of both the emotional sensitivity and emotion modulation difficulties that Linehan (1993) identifies as central to BPD. Based on the biosocial theory of BPD, individuals scoring high on BPD should report higher levels of affect intensity and lower levels of clarity. Clear predictions related to the association between BPD, attention, and expression are more difficult to ascertain. Although patients with BPD have been found to engage in the suppression, or inhibition, of emotional experience, Linehan suggests that these efforts are unsuccessful and result in a dysregulated affective presentation. Therefore, a construct associated with affect lability rather than expression per se, may be more consistent with the shifts between over-control and under-control of emotional expression that are thought to characterize BPD.

With respect to attention to emotions, differentiating between automatic versus willful types of attention may be helpful in clarifying the nature of this process in BPD. The automatic reaction, or biological response tendency, would likely favour the orientation of attention toward the internal sensations experienced. For example, it is possible that affect intensity mediates the relationship between attention and BPD – the more intense the emotion, the more it pulls for attention. However, Linehan (1993) suggests that the individual with BPD tends to suppress or avoid emotional experience. In other words, the actual value that those with BPD place on attending to their emotions is hypothesized to be low. In fact, Linehan's dialectical behavior therapy (DBT) for BPD targets emotional awareness explicitly via the incorporation of mindfulness skills. To better understand the implications of conscious and unconscious attempts to control emotional experience, it is important to

consider the research on emotion regulation and understand the skill deficits that Linehan and colleagues (2007) propose underlie BPD.

1.5 Emotion Regulation

Emotion regulation refers to efforts by the individual to influence which emotions are experienced, when they are experienced, and how they are experienced. As such, emotion regulation plays an important role in the modulation of emotional expression - the fourth factor identified in Gohm and Clore's (2002b) model of emotional experience. Although several theories address the etiological basis of emotion regulation in infants and children, Gross' (1998) process model presents a useful framework for examining the progression of specific strategies in adults. Gross defined emotion regulation as the set of conscious and nonconscious strategies that individuals adopt in an effort to increase, maintain, or decrease their emotional response to salient events in the environment. He proposed that the emotional response consists of three components: the subjective feeling of the emotion, the behavioral response(s), and the physiological response(s) (e.g., changes in heart rate, respiration). Furthermore, he outlined five strategies that individuals may use to alter aspects of their emotional experience at two different time points: before and after an emotion is generated. The first four strategies, labeled antecedent-focused, included situation selection, situation modification, attentional deployment and cognitive change. The fifth strategy, response modulation, was labeled response-focused.

1.5.1 BPD as a Disorder of Pervasive Emotional Dysregulation

Linehan, Bohus and Lynch (2007) adapted Gross' model to explain the concept of pervasive emotion dysregulation and how it relates to BPD and its treatment (i.e., DBT). Individuals with BPD features have been found to score higher than healthy controls on measures of emotional dysregulation (e.g., Clarkin, Hull, Cantor, & Sanderson, 1993) and clinical work with BPD patients suggests that they tend to avoid or suppress internal negative emotional cues because of fears that they will be unable to cope with the ensuing psychological distress or punishment (e.g., Linehan, 1993). Unfortunately, research suggests that attempts to inhibit or avoid private experience (e.g., thoughts, feelings) mediate

the relationship between negative affect intensity and acute psychological distress in both clinical and nonclinical samples (e.g., Lynch et al., 2001). Furthermore, chronic inhibition of negative emotions can lead to neglect of a problem and may interfere with ability to learn from past experiences. Without allowing oneself to experience negative emotions, an individual fails to learn that he/she is capable of tolerating the emotions and that punishment will not invariably follow their expression (Linehan, 1993).

Linehan and colleagues (2007) propose that the key aspects of emotion regulation and its associated skills can be dispersed across five "arbitrary" time points or targets of change: emotional vulnerability, emotional cue, low magnitude emotional response tendencies, high magnitude emotional responses and emotional aftereffects. First, they suggest that an individual's vulnerability (i.e., sensitivity and intensity of reaction) to emotional cues varies over time; as such, it is possible to teach the individual strategies to modulate their vulnerability via biological (e.g., self-care strategies aimed at maintaining balanced biological rhythms) and contextual (e.g., increasing frequency of positive, external life events) processes. Second, Linehan and colleagues acknowledge that one can regulate emotions by avoiding or being selective with respect to emotionally-charged situations, improving one's efficacy to cope with challenging situations (e.g., learning interpersonal-effectiveness and problem-solving skills, planning ahead), redirecting attention and changing one's cognitive appraisal of a situation. Together, this set of strategies can be employed before the emotion is generated.

Linehan and colleagues (2007) also outline a set of response-focused strategies. The first set of skills, referred to as distress tolerance skills, targets the ability of the individual to endure emotional pain. The goal is to inhibit impulsive response tendencies that interfere with, or cut short, the experience of intense emotions; instead, individuals are encouraged to accept emotions that are typically experienced as aversive or "intolerable" without evaluation. Rather than trying to control one's emotions, the individual is encouraged to focus on fully accepting their emotional experience. The second set of response modulation skills, referred to as emotion regulation skills, targets the emotional distress directly in a nonjudgmental manner. The goal at this stage is to change the emotion directly without engaging higher level cognitive processes; strategies include changing body

temperature, participating in intense exercise, progressive relaxation and behaving in a manner that opposes the automatic response (e.g., approaching a feared situation, responding in a gentle rather than hostile manner).

The response modulation strategies outlined by Linehan and colleagues (2007) are similar to that described by Gottman and Katz (1989). These latter researchers proposed that successful emotional regulation consists of the ability to: (a) inhibit inappropriate behavior related to the strong affect, (b) self-soothe to reduce physiological arousal that the strong affect induced, (c) shift attention toward a positive stimulus or away from a negative stimulus, and (d) organize oneself for coordinated action in the service of an external goal. The important role of controlling attention and inhibiting behavior as a way to regulate emotional experience was pointed out earlier in the discussion of Evans and Rothbart's (2007) model of adult temperament. The relationship between emotional well-being and the capacity to self-soothe has also been implicated in research on self-compassion (e.g., Leary, Tate, Adams, Allen, & Hancock, 2007; Neff, 2003).

In the fifth and final stage of the model proposed by Linehan and colleagues (2007), the goal is to alter the aftereffects of emotions (e.g., on cognition and future emotional responses) by increasing the individual's emotional awareness and clarity. Research suggests that understanding what one is feeling minimizes rumination and lessens the length and intensity of the negative emotions (Salovey et al., 1995). Therefore, the focus is on the identification of events that prompt specific emotions, the interpretations or appraisals surrounding the triggering events, and the identification of the physical sensations, expression and action associated with each emotion.

Since Linehan and colleagues (e.g., 1993; 2007) conceptualize emotion dysregulation as the fundamental problem in BPD, it is presumed that putting the DBT skills to use will have a positive impact on other aspects of the patient's life. For example, being mindful of one's emotional state and learning to tolerate, rather than avoid intense affect, should increase the individual's awareness of their personal preferences, thereby contributing to a clearer sense of identity. In addition, paying attention to one's emotional state should be associated with earlier recognition of internal cues that signal feelings

of distress, allowing the individual to cope with them before they escalate and become overwhelming. The implementation of distress-tolerance and emotion-regulation skills should also result in increased affective stability and a decrease in the frequency of emotional outbursts that often have unfavorable interpersonal consequences. Furthermore, the increased stability in affect is assumed to have a direct impact on impulsivity, given that Linehan (1993) conceptualizes impulsive behaviors as maladaptive attempts to cope with intense, intolerable affect.

1.6 BPD as a Disorder of Impulse-Control

In contrast to Linehan and colleagues (1993; 2007), other researchers suggest that BPD is best conceptualized as an impulse-control disorder (Gunderson & Phillips, 1991; van Reekum, Links, & Fedorov, 1994). From this perspective, the pervasive negative affect and other features of the disorder, such as interpersonal problems and confusion with respect to self-identity, are viewed as secondary to the patient's impulsive response tendencies. In other words, the emotional dysregulation is hypothesized to occur in response to the consequences (e.g., interpersonal difficulties, failure of meet responsibilities) associated with the impulsive act.

Although impulsive behavior is clearly present in BPD (e.g., substance use, chronic suicidality) and research suggests a positive association between BPD features and dispositional impulsivity (e.g., Critchfield, Levy, & Clarkin, 2004), the underlying mechanisms associated with these behaviors are unclear. One reason for this lack of clarity may be the multiplicity of operational definitions associated with the construct of impulsivity across disciplines (Whiteside & Lynam, 2001). Whereas some researchers conceptualize impulsivity as synonymous with impairment in cognitive control, others view it as behavioral in nature and comparable to problems with delaying gratification or sensation-seeking.

1.6.1 Impulsivity: Defining and Operationalizing the Construct

Recent attempts to better conceptualize the construct of impulsivity have confirmed its multidimensional nature (e.g., Caci, Nadalet, Baylé, Robert, & Boyer, 2003; Flory, Harvey, Mitropoulou, New, Silverman, Siever et al., 2006). Both Miller, Joseph and Tudway (2004) and Flory et al. (2006) examined the factor structure of dispositional impulsivity by administering several self-

report measures of the construct to participants in large, normative samples. The results of both studies supported a three-factor conceptualization of impulsivity; however, the factors themselves differed. Miller et al. identified dysfunctional non-planning, functional venturesomeness and drive/reward responsiveness as the key factors, whereas Flory et al. (2006) identified thrill seeking, nonplanning and disinhibited behavior. The difference in the dimensions identified was likely due to the different set of questionnaires administered by these research groups.

Whiteside and Lynam (2001) examined the multidimensionality of impulsivity using the Five-Factor Model (FFM) of personality as a framework to generate a priori predictions with respect to the nature of potential factors. Specifically, they assessed whether the four aspects of impulsivity inherent in the FFM (Neuroticism facet of impulsiveness; Conscientiousness facets of low deliberation and self-discipline; Extraversion facet of excitement seeking) mapped empirically onto the conceptions of impulsivity present in the literature. Both the Revised NEO personality inventory (Costa & McCrae, 1992) and several self-report measures of impulsivity were administered to a large sample of college students. The results of exploratory factor analyses indicated that four distinct traits explained the variance associated with impulsive-like behavior. The traits labeled urgency, lack of premeditation, perseverance and sensation seeking mapped onto the FFM facets of impulsiveness, low deliberation, self-discipline and excitement seeking, respectively. The researchers concluded that these four traits did not represent variations of impulsivity; rather, they viewed them as four distinct personality traits that resulted in actions that overtly appeared to lack forethought. Based on their findings, Whiteside and Lynam (2001) devised a 45-item, Likert-scaled self-report measure (the UPPS Impulsive Behavior Scale) that divided impulsivity into four factors: Urgency, (Lack of) Perseverance, (Lack of) Premeditation, and Sensation Seeking.

1.6.2 Preliminary Research Findings: UPPS Impulsive Behavior Scale and BPD

Preliminary research on the validity of the UPPS Impulsive Behavior scale has been conducted in both normative and clinical samples. Using participants selected from the general population, Miller, Flory, Lynam and Leukefeld (2003) found that the four factors were differentially linked to a variety of

outcomes such as aggression (Urgency), eating problems (Urgency), antisocial behavior (Sensation Seeking, low Premeditation), substance use (low Premeditation), as well as inattention (low Perseverance) and hyperactivity/impulsivity (low Premeditation) symptoms of ADHD. Similarly, Whiteside, Lynam, Miller and Reynolds (2005) found that several of the UPPS scales differentiated individuals diagnosed with BPD, pathological gamblers (PG), anti-social alcohol abusers (AA) from individuals in the control and non-antisocial AA groups. Furthermore, they found that the four UPPS scales accounted for 64% of the overall variance in BPD features and that Urgency was a strong unique predictor of BPD.

The finding that individuals with BPD features report a strong tendency toward rash action in the context of negative affect is consistent with Linehan's (1993; Linehan et al., 2007) view of impulsivity as an emotion-regulation strategy. For example, Linehan's model of the disorder conceptualizes behaviors such as self-injury and substance abuse as attempts to cope with intolerable negative emotion. However, Whiteside and colleagues (2005) also found associations, albeit weaker, between scores on the other UPPS scales and BPD. Thus, it is conceivable that the relationship between BPD and impulsivity is more complex and could be clarified further by examining the association between the UPPS subscales and the BPD criteria as dimensions.

1.7 Studies 1 and 2: Purpose and Hypotheses

As noted previously, the primary goal of my dissertation was to test some of the specific tenets of Linehan's (1993) biosocial theory of BPD. Specifically, I tested the hypotheses that BPD is primarily a disorder of emotional dysregulation and that these problems with affect modulation are rooted in biological predispositions, exacerbated by specific environmental experiences. Second, I predicted that individuals with BPD features would not only have higher scores on measures of affect lability, but also exhibit a pattern of deficits on dimensions of emotional experience characterized by intense positive and negative affect combined with difficulties discriminating between emotions and identifying them. Third, BPD features were expected to be associated with higher levels of impulsivity (particularly

Urgency), lower levels of distress tolerance, lower levels of self-compassion and higher levels of self-criticism.

I decided to use an analog sample of undergraduate students for this research for several reasons. First, in order to study the temperament by environment interaction, I needed participants with a range of temperamental styles and from a variety of environmental backgrounds. Second, this sampling strategy allowed for the opportunity to collect a large quantity of data which is important for the acquisition of more stable estimates of the factor structure of the variables and the associations between the variables when conducting exploratory research. Although university students may be relatively high-functioning compared to clinical samples, empirical evidence suggests that borderline personality features, such as deliberate self-harm, problems with irritability/anger, affective instability, unstable self-esteem, and impulsivity, may occur among nonclinical samples, including the undergraduate population, to a greater extent than is commonly recognized (Bagge et al., 2004; Gratz, 2006; Gratz & Chapman, 2007; Trull, 1995; Zeigler-Hill & Abraham, 2006). Past research also suggests that young adults who report significant BPD features experience significant maladjustment in several domains of functioning and that BPD features predict dysfunction and psychopathology at follow-up (Bagge et al., 2004; Daley, Burge & Hammen, 2000; Trull, Useda, Conforti, & Doan, 1997). Furthermore, there is a growing theoretical and empirical consensus that personality disorder symptomatology may be better conceptualized dimensionally than categorically (e.g., Blais, 2010; Clark, 2007; Widiger, Livesley, & Clark, 2009; Widiger & Trull, 2007). For example, the draft proposal for the BPD diagnosis in the fifth edition of the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders* (DSM–5) is based on a dimensional model of personality and borderline features (American Psychiatric Association, 2011; Skodol & Bender, 2009). Exploring the hypotheses in a nonclinical sample allowed for a broader range of symptom severity and personality functioning to be sampled.

Prior to testing these hypotheses, it was important to select a set of measures that would best represent these constructs within an undergraduate population. The purpose of Studies 1a and 1b was to

determine the reliability and validity of a series of self-report measures that assess borderline personality features and to select one questionnaire with high sensitivity (percentage of cases correctly identified) and high specificity (percentage of noncases correctly identified) as a screener for BPD within undergraduate students. The second goal of these studies was to conduct a preliminary exploratory analysis of the association of scores on the BPD measures and constructs that have been hypothesized to be relevant to the development and maintenance of BPD symptoms (e.g., sensory sensitivity, emotional experience, impulsivity).

Chapter 2

Study 1a

The purpose of Study 1a was two-fold: (i) to assess the reliability and validity of a select number of BPD screening measures within an undergraduate sample and (ii) to explore some of the hypothesized relationships between BPD traits and associated constructs (e.g., impulsivity, deficits in emotional experience, sensory sensitivity).

2.1 Method

2.1.1 Study 1a Participants

One hundred and forty-seven undergraduate students (57 males, 90 females; mean age = 19.7 years) completed a series of online questionnaires as part of the University of Waterloo (UW) Validation Testing pool. Due to the large number of questionnaires submitted by various researchers, the Validation Testing pool had two orders. Some of the questionnaires described below were in both orders and were thus completed by all participants. The BPI Cut-20 and UPPS were only included in one order and were thus completed by only half of the sample (32 males, 41 females; mean age = 19.9 years). The remaining questionnaires (MSI-BPD-R, BPQ-R, HSPS, BFI, TMMS) were completed by all participants. All participants received partial course credit for first, second or third year psychology courses for their participation.

2.1.2 Study 1a Measures

2.1.2.1 Borderline personality traits. Three measures were used to assess borderline personality traits:

McLean Screening Instrument for Borderline Personality Disorder (MSI-BPD; Zanarini et al., 2003) – Revised. The MSI-BPD is a 10-item, dichotomous (i.e., yes-no) self-report screening measure based on the DSM-IV-TR (APA, 2000) criteria for BPD. It includes eight items for each of the first eight DSM-IV-TR criteria for BPD and two items for the ninth criterion of paranoia/dissociation. Each endorsed item is worth 1 point on a scale that ranges from 0 to 10. In a sample of adults with treatment histories (Zanarini, et al, 2003), the MSI-BPD (cut-off = or > 7) had good sensitivity (0.81; proportion

of individuals correctly identified as having BPD) and specificity (0.85; proportion of individuals correctly identified as not having BPD) against a criterion diagnosis of BPD on the Diagnostic Interview for DSM-IV Personality Disorders (DIPD-IV; Zanarini, Frankenburg, Sickel, & Yong, 1996). In post hoc analyses of participants aged 18–25 years, these figures increased to 0.90 (sensitivity) and 0.93 (specificity). Internal consistency of the MSI-BPD was found to be acceptable ($\alpha = .74$) in the Zanarini et al. study.

The version of the instrument in Validation Testing did not include the self-harm/suicide item that is part of the original MSI-BPD; hence, it is referred to as the MSI-BPD-Revised (MSI-BPD-R). All 147 participants completed the MSI-BPD-R and the co-efficient alpha was .75.

Borderline Personality Questionnaire (BPQ; Poreh et al., 2006) – Revised. The BPQ is an 80-item true/false self-report measure. The scale is comprised of nine subscales corresponding to the nine DSM-IV-TR BPD criteria: Impulsivity (9 items), Affective Instability (10 items), Abandonment (10 items), (unstable) Relationships (8 items), Self-Image (9 items), Suicide/Self-mutilation (7 items), Emptiness (10 items), Intense Anger (10 items) and Quasi-Psychotic States (7 items). Poreh and colleagues (2006) demonstrated moderate to high internal consistency (coefficients ranging from .65 to .89) for all but one of the subscales (quasi-psychotic states). The reliability estimates for the quasi-psychotic subscale ranged from .51 to .65 across the three samples. When all items were entered into the reliability analysis, the co-efficient alpha ranged from .92 to .94. Poreh and colleagues also demonstrated good convergent validity and satisfactory criterion validity of the BPQ. Specifically, the BPQ total score was found to be highly correlated with the MMPI-2 BPD scale (*KR20* = .85) [1] and

[1] KR20 refers to the Kuder-Richardson reliability index, a measure of internal consistency used with dichotomous responses. According to Cronbach (1951), the KR20 is a special case of the coefficient alpha. More recent research reports Cronbach's alpha as an index of reliability because it can be used with both dichotomous and continuous responses.

moderately correlated ($\tau = 0.51$) [2] with results from the Diagnostic Interview for Borderline Patients (Gunderson, Kolb, & Austin, 1981).

In the current sample of 147, only 8 of the 9 BPQ scales (73 items) were included. Items on the Suicide/Self-mutilation were excluded due to the sensitive nature of the item content. The 73-item version is referred to as the BPQ-R.

Borderline Personality Inventory Cut-20 (BPI Cut-20; Leichsenring, 1999). The BPI is a 53-item, true-false self-report instrument that combines dimensional and categorical models of BPD. It is based on Kernberg's (1984) concept of borderline personality organization and has been used as a screening instrument for borderline personality organization and BPD and for dimensional research of borderline features in Axis I and Axis II disorders. In a series of studies, Leichsenring (1999) demonstrated that the BPI identified patients with BPD in high agreement with Kernberg's structural criteria, Gunderson's Diagnostic Interview for Borderlines (Gunderson et al., 1981; Zanarini, Gunderson, Frankenburg, & Chauncey, 1989), and DSM-III-R criteria (APA, 1987). Internal consistency and retest reliability indexes were satisfactory (α = .68 to .91; r = .73 to.89). Results for sensitivity were 0.85–0.89, and for specificity were 0.78–0.89.

Leichsenring (1999) identified a six-factor structure in a sample of adults that consisted of both nonclinical and clinical participants. The first factor, labeled *primitive defense mechanisms,* included items related to paranoid ideation and idealization/devaluation. The second factor included content associated with dissociative experiences and identity disturbance and was called *identity diffusion*. The third factor, *fear of fusion*, consisted of items describing fear of closeness and the fourth factor was labeled *impaired reality testing* (e.g., hallucinations, derealization). The fifth factor, labeled *impulsivity*, included items depicting impulse control problems such as stealing and substance abuse. The sixth factor was labeled *self-mutilation* and consisted of items related to suicide attempts and self-harm.

[2] τ refers to Kendall's tau, a measure of correlation that is carried out on the ranks of data; it is similar to Spearman's rank correlation (r_s; Arndt, Turvey, & Andreasen, 1999).

The BPI Cut-20 is a 20-item short-form version of the BPI. It is comprised of the 20 most discriminating items on the BPI. It is not based on factors and includes items from only four of the scales described above (i.e., identity diffusion, fear of fusion, impaired reality testing, primitive defenses). Based on studies examining sensitivity and specificity of the Cut-20 across various samples, a score equal to or greater than 10 has been suggested as a cut-off (Leichsenring, 1999). Leichsenring reported good internal consistency (α = .85) and test-retest (r = .89) reliability for the Cut-20.

2.1.2.2 Sensory processing sensitivity. The Highly Sensitive Person Scale (HSPS; Aron & Aron, 1997) was used to measure sensory processing sensitivity (SPS). The HSPS consists of 27 items, each of which is rated on a scale from 1 "strongly disagree" to 7 "strongly agree." According to Aron and Aron (1997), SPS represents an individual difference characteristic in which those who are high in SPS experience increased physiological reactivity to stimuli in the environment (e.g., "Are you easily overwhelmed by strong sensory input?"), as well as more subtle reactivity (e.g., "Do you become unpleasantly aroused when a lot is going on around you?"). Since the publication of the original scale, some researchers have suggested that more than one factor underlies the items on the HSPS (e.g., Evans & Rothbart, 2008; Liss, Mailloux, & Erchull, 2008; Smolewska, McCabe, & Woody, 2006). In line with these findings, we calculated both a total scale score and three subscale scores labeled Ease of Excitation (EOE), Low Sensory Threshold (LST) and Aesthetic Sensitivity (AES).

2.1.2.3 Personality. The Big Five Inventory (BFI; John, Donahue, & Kentle, 1991; John & Srivastava, 1999) was used to measure personality traits. The BFI is a self-report questionnaire that assesses individual differences in five broad dimensions ("Big Five") of personality: Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness. It consists of 44 short-phrase items that respondents rate on a five-point Likert scale (1 = "strongly disagree" to "5" = "strongly agree"). According to John and Srivastava, the alpha reliabilities of the BFI scales typically range from .75 to .90 and average above .80 in U.S. and Canadian samples; three-month test-retest reliabilities range from .80 to .90, with a mean of .85. Validity analyses suggest substantial convergent and divergent relations with other "Big Five" instruments.

2.1.2.4 Emotional experience. The Trait Meta-Mood Scale (TMMS; Salovey, Mayer, Goldman, Turvey & Palfai, 1995) was used to assess general beliefs about attention to mood, the clarity of one's emotional experiences and efforts to repair mood states. The TMMS is a 48-item self-report measure that consists of three subscales. The first subscale, Attention to Mood, indexes the amount of attention individuals feel they allot to experienced emotions and the importance they place on attending to mood. Items such as "I pay a lot of attention to how I feel" are characteristics of this subscale. Another subscale, referred to as Clarity in the Discrimination of Feelings measures how clearly and distinctly individuals feel they experience their emotions. Items such as "I am usually very clear about my feelings," and "I can't make sense out of my feelings" are examples from this subscale. The third subscale, Mood Repair, is a measure of one's tendency to repair one's mood when one is feeling down by trying to maintain a positive outlook. Items such as "I try to have good thoughts no matter how bad I feel" characterize this scale. The items on this scales were rated on a 5-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree").

2.1.2.5 Impulsivity. The UPPS Impulsive Behavior Scale (UPPS; Whiteside & Lynam, 2001) was used to measure impulsive behavior. The questionnaire consists of 45 items that were scored on a 5-point Likert scale (1 = "strongly disagree" to 5 = "strongly agree"). Factor analytic investigations of the UPPS (e.g., Whiteside & Lynam, 2001) suggest that the questionnaire measures four areas of impulsivity that have been identified in the psychological literature: (i) urgency, (ii) (lack of) planning/premeditation, (iii) (lack of) perseverance, and (iv) sensation seeking.

The first factor, Urgency, measures the tendency to engage in impulsive behaviors when experiencing negative affect. Whiteside and Lynam (2001) suggest that those who score high on Urgency may behave in ways that have harmful long-term consequences to alleviate negative emotions in the moment. They also propose that these individuals have difficulty resisting cravings and temptations. The second factor, Premeditation, assesses one's ability to think and reflect on the consequences of an act before engaging in the behavior. Whiteside and Lynam describe lack of Premeditation as similar to the prototypical definition of impulse control issues and suggest that it may

be related to behavioral definitions of impulsivity related to problems with delaying gratification (e.g., person chooses a smaller, immediately available reward rather than a more valued, delayed reward). Perseverance, the third factor, corresponds to one's ability to stay focused on tasks that may be boring or difficult. Whiteside and Lynam suggest that individuals low in perseverance have trouble sustaining their attention when trying to complete projects under distracting conditions. The conceptualization of the fourth factor, Sensation Seeking, is similar to the type of impulsivity described in several personality models (e.g., Zuckerman, Kuhlman, Joireman, Teta, & Kraft, 1993). On the UPPS, Sensation Seeking has two aspects: (1) proclivity toward pursuing activities that are exciting, and (2) openness to try new, potentially dangerous, experiences.

2.1.3 Statistical Analyses

The relationships between sensory processing sensitivity, emotional experience, personality, impulsivity and BPD traits were examined using correlational analyses. Regression analyses were used to examine the relationship between the five personality factors (BFI) and BPD traits. All analyses were completed with Statistical Package for the Social Sciences, Version 17.0.1 (SPSS 17.0.1).

2.2 Results

2.2.1 Data Screening and Preparation

The following sections summarize the data screening and preparation measures. This includes an assessment of incomplete and missing data, departures from normality, outlier analyses and reliability of measures.

2.2.1.1 Incomplete/Missing Data

As mentioned previously, the questionnaires were included in two separate orders in the University of Waterloo Validation Pool. Due to the large number of questionnaires submitted by other researchers, the BPI Cut-20 and UPPS were only included in one order and were administered to only half of the sample (32 males, 41 females; mean age = 19.9 years). The MSI-BPD-R, BPQ-R, HSPS, BFI, and TMMS were in both orders and were administered to 147 participants. Scale and subscale

scores were calculated for each participant as long as 80 percent of the items were completed; a summary score was computed using a prorating technique.

All 73 participants who were administered the Cut-20 completed it. With regard to the UPPS, one participant did not complete a sufficient number of UPPS Premeditation (n = 72) but a sufficient number of items for the remaining subscales was completed by all participants who were administered the UPPS (n = 73). All 147 participants completed the MSI-BPD-R and the BFI. Two participants did not complete the BPQ-R in its entirety and thus, the BPQ-R Total score was only calculated for 145 participants. Some participants did not complete a sufficient number of items to calculate the remaining BPQ-R subscales and thus, the n varies between 144 and 146 for the various subscales. One participant did not complete the HSPS, so the HSPS Total, EOE, and LST scales had a n of 146; the HSPS AES subscale had more missing items and the total was calculated for fewer participants (n = 141). The TMMS was not completed by two participants and a third participant did not complete a sufficient number of items to calculate the Attention subscale total; thus, the n was 144 to 145 for the TMMS subscales.

2.2.1.2 Normality and Outlier Analyses

2.2.1.2.1 Univariate normality. Univariate normality was explored by examining absolute values of univariate skew and kurtosis and the one-sample Kolmogorov-Smirnov test of normality (i.e., as a goodness-of-fit test of the sample distribution). Guidelines provided by Kline (1998) suggest that absolute skew values greater than three and absolute kurtosis values between 10 and 20 may be indicative of deviance from normality. A summary of the skew, kurtosis, Kolmogorov-Smirnov statistics and significance values for the total scale and subscales are provided in Appendix B, Table B1. The skew and kurtosis values were within acceptable ranges for all variables; however, several of these totals were identified as non-normal by the Kolmogorov-Smirnov statistic. The variables that were identified as non-normal were measures of BPD (i.e., MSI-BPD-R, BPQ-R subscales) and it was not surprising that they were positively skewed (i.e., most participants obtained low scores on these

scales). Considering the nature of the variable and difficulties with the interpretation of transformed variables, the non-normal distributions were left untransformed.

2.2.1.2.2 Univariate outliers. Univariate outliers were examined. Each variable was examined for cases with scores more than three standard deviations away from the mean ($z > 3.29$, $p < .001$; Tabachnick & Fidell, 2007). No such cases were identified.

2.2.1.3 Reliability

The reliability analyses for each measure and subscales are presented in Appendix B, Table B2. The co-efficient alphas for the three BPD measures were comparable ($\alpha = .75$ for MSI-BPD-R; $\alpha = .85$ for BPI Cut-20; $\alpha = .90$ for BPQ-R) and the correlations between the total scores on the measures were high ($r = .73$ to .80). The reliabilities of the BPQ-R scales ranged from $\alpha = .60$ to $\alpha = .87$. Reliabilities for the remaining measures ranged from $\alpha = .64$ to $\alpha = .90$.

2.2.2 Correlational Analyses

Convergent validity was established by examining the associations between the three BPD measures. The correlation matrix for the BPD measures is presented in Appendix B, Table B3. All of the BPD total scores and BPQ-R subscales were moderately to strongly correlated ($r = .73$ to .80 for total scores; $r = .40$ to .72 for correlations between the MSI-BPD-R, Cut-20 and BPQ-R subscales). It should be noted that the inter-correlations with the BPQ-R subscales were attenuated due to low reliabilities of some of the subscales. The disattenuated estimates for the correlations between the MSI-BPD-R, Cut-20 and BPQ-R subscales are also presented in Table B3 and range from .51 to .97 for correlations. These findings suggest that the three questionnaires were all measuring a similar construct.

The correlation matrix for the BPD scales and other measures is presented in Table B4. Total scores on the MSI-BPD-R, Cut-20 and BPQ-R were positively associated with scores on the HSPS Low Sensory Threshold ($r = .23$ to .40). The BPQ-R total score showed a significant positive correlation with HSPS Ease of Excitation ($r = .23$); the associations between HSPS Ease of Excitation and the other BPD questionnaires were positive but not statistically significant. Scores on all three BPD scales were positively associated with BFI Neuroticism ($r = .37$ to .53) and negatively associated with BFI

Extraversion (r = -.25 to -.28), BFI Agreeableness (r = -.27 to -.45), and BFI Conscientiousness (r = -.40 to -.48). BFI Openness showed a small, negative association with only the BPQ-R scale (r = -.19). All three BPD scales were negatively associated with TMMS Clarity(r = -.35 to -.41), TMMS Repair (r = -.35 to -.58), and UPPS Perseverance (r = -.31 to -.40). Positive associations were found between the BPD scales and UPPS Urgency (r = .43 to .47).

With respect to the BPQ-R subscales, the associations were generally similar to that of the BPQ-R Total Score; however, there were a few exceptions. Scores on the Abandonment, Intense Anger, Impulsivity, Quasi-Psychotic States, and Relationships subscales were not associated with the HSPS Ease of Excitation or the BFI Extraversion scales. The Impulsivity and Relationships subscales were not associated with HSPS Low Sensory Threshold subscale. Also, the Quasi-Psychotic States and Relationships subscales were not associated with the UPPS Urgency or Perseverance subscales. With the exception of negative associations between BPQ-R Impulsivity and UPPS Premeditation (r = -.28) and BPQ-R Emptiness and UPPS Sensation Seeking (r = -.27), there was no evidence of a relationship between lack of premeditation/poor planning or sensation seeking and BPD.

2.2.3 Regression Analyses

Regression analyses were used to examine how well each of the BFI dimensions predicted total scores on the BPD measures. The results are presented in Appendix B Table B5. Results from the simultaneous regression analyses suggested that scores on the BFI dimensions accounted for a moderate portion of the variance in scores on the MSI-BPD (F (5, 141) = 13.77, p < .001, R^2 = .33), BPQ-R (F (5, 139) = 22.02, p < .001, R^2 = .44), and Cut-20 (F (5, 67) = 4.80, p < .001, R^2 = .26). BFI Neuroticism consistently emerged as the strongest predictor of scores on the BPD measures. BFI Agreeableness and Conscientiousness predicted lower scores on the BPD measures; the strength of the predictive value varied depending on the BPD measure. BFI Extraversion also predicted lower scores but it accounted for only a small portion of the variance once the other dimensions were considered. BFI Openness predicted BPD scores inconsistently (i.e., it predicted higher or lower scores, depending on the measure) and the predictive value was low.

2.3 Discussion

The results of Study 1a suggest that all three self-report measures have good internal consistency and show similar patterns of association with constructs thought to be related to BPD. The results of the preliminary examination of the association between BPD features and temperamental sensitivity, emotional intelligence, the "Big Five" personality factors, and impulsivity showed several associations.

First, the results from Study 1a suggested that BPD traits are associated with two dimensions of sensory sensitivity (i.e., low sensory threshold and ease of excitation); however, the association is stronger and more consistent with low sensory threshold than with ease of excitation. The results provide support for the notion that individuals with BPD have a lower threshold (i.e., greater sensitivity) for both sensory and affective stimuli and, to a lesser degree, higher amplitude of emotional response (i.e., greater reactivity) to such stimuli. This finding is consistent with the results of Meyer, Ajchenbrenner, and Bowles (2005) who found a positive association between sensory processing sensitivity (as measured by the HSPS) and BPD traits (as measured by a personality disorder screening questionnaire) in a non-clinical adult sample.

Second, the results of the correlational and regression analyses between dimensions of the BFI and scores on the BPD measures were consistent with previous findings in the literature that BPD is associated with higher scores on neuroticism, lower scores on agreeableness, and to a lesser degree, lower scores on conscientiousness and extraversion (e.g., Pukrop, 2002; Samuel & Widiger, 2008; Saulsman & Page, 2004). Pukrop (2002) examined dimensional personality profiles in patients diagnosed with BPD and found a positive association with neuroticism and a negative association with agreeableness. In their meta-analyses examining the relationship between the domains of the five-factor model of personality and the DSM personality disorders, both Saulsman and Page (2004) and Samuel and Widiger (2008) found similar results in studies using clinical (inpatient and outpatient) and nonclinical samples. Specifically, the strongest association was a positive relationship between scores on measures of BPD and neuroticism. This was followed by negative associations with agreeableness

and conscientiousness. A much smaller, negative association was identified with extraversion and no significant association with openness. Together, the results of previous studies and the current study suggest that BPD can be conceptualized using the five-factor model of normal personality. Furthermore, the similarity in results between the current and past studies suggest that the individuals in the present sample showed characteristics consistent with that seen in both clinical and nonclinical populations with BPD traits.

Third, the results suggest that BPD traits are associated with difficulties in two aspects of emotional intelligence: emotional clarity and mood repair. In contrast, BPD traits were not found to be associated with the degree of attention devoted to feelings. This pattern of results is consistent with the findings of Leible and Snell Jr. (2004) who assessed the relationship between the DSM-IV-TR personality disorder symptomatology and emotional intelligence in a large sample of university students. In another study examining global trait emotional intelligence and personality disorder features in Spanish samples of university students, Petrides, Pérez-González, and Furnham (2007) found that global trait emotional intelligence negatively predicted BPD traits after accounting for variance from dispositional mood. More recently, Gardner and Qualter (2009) and Gardner, Qualter and Tremblay (2010) identified deficits in emotional intelligence in nonclinical adult samples with BPD traits. Together, these findings suggest that those with BPD traits lack understanding of their emotional state and are unable to effectively regulate their emotional state. This is consistent with theory and research findings that disturbances in emotional experience and regulation play an important role in the BPD presentation (e.g., Linehan, 1993; Rosenthal, Gratz, Kosson, Cheavens, Lejuez, & Lynch, 2008).

Fourth, the results suggest that BPD traits are related to certain aspects of impulsivity more than others. Specifically, there was a consistent positive association between UPPS Urgency and all BPD indexes (including most BPQ-R subscales). The magnitude of the correlations was similar to that reported by Tragesser and Robinson (2009) who studied the association between impulsivity (as measured by the UPPS) and BPD features (as measured by the Personality Assessment Inventory—Borderline Features scale, Morey, 1991) in an undergraduate sample. In addition, Whiteside, Lynam,

Miller, and Reynolds (2005) found that the UPPS Urgency subscale was the only significant correlate of the four subscales in a sample of BPD patients. The finding of negative associations between UPPS Perseverance and indexes of BPD in the current study was also similar to that of Tragesser and Robinson (2009) and suggests that individuals with BPD may have trouble with sustained attention and experience distractibility when working on tasks. In the current study, the UPPS Premeditation was only associated (negatively) with the BPQ-R Impulsivity scale, which was not measured in the Tragesser and Robinson study. Both this study and that of Tragesser and Robinson failed to find consistent associations between UPPS Sensation Seeking and BPD features. In this study, sensation seeking was associated negatively with only one subscale, BPQ-R Emptiness. The lack of association between UPPS Sensation Seeking and general indexes of BPD is consistent with other studies (e.g., Lynam, Miller, Miller, Bornovalova, & Lejuez, 2011; Whiteside et al., 2005). Overall, the results from the UPPS correlational analyses suggest that impulsive behavior in those with BPD traits may be driven by negative affect and contribute to problems with emotional dysregulation. Thus, the constructs of impulsivity and aspects of emotional experience are important to consider in future research.

There were several limitations to this study. First, this was analog research in which undergraduate students completed self-report measures online. Second, I used shortened versions of two of the questionnaires (MSI-BPD-R, BPQ-R) which did not include items assessing suicide/self-harm. Third, there was no criterion validity index. Although the current data suggest that the BPD measures were associated with constructs related to the disorder (e.g., urgency, emotional experience deficits), I did not evaluate the measures against a criterion diagnosis. To address some of these limitations, I selected the full versions of the MSI-BPD and BPQ for further exploration in Study 1b. I chose these measures over the BPI Cut-20 because they are both based on DSM-IV-TR criteria. The MSI-BPD is substantially shorter than the BPQ (10 vs. 80 items), however, the latter is multidimensional and its inclusion in later studies would allow me to test multidimensional models of BPD. Another limitation was the small amount of information gathered about the sample itself, which affects the generalizability

of the findings. To better characterize the undergraduate sample, more information was gathered about the participants in Study 1b.

Chapter 3

Study 1b

The purpose of Study 1b was to further assess the reliability and validity of BPD screening measures by comparing their performance against a "gold standard" criterion diagnosis of BPD. The "gold standard" for diagnostic assessment of BPD is the semi-structured interview. However, research on the utility of these interviews (and BPD self-report questionnaires) in non-clinical populations is scarce. The goal of the study was to select one questionnaire with high sensitivity (percentage of cases correctly identified) and high specificity (percentage of non-cases correctly identified) as a screener for future studies on BPD features within undergraduate samples.

3.1 Method

3.1.1 Study 1b Participants

Fifty-seven UW students (6 males, 51 females; mean age = 20.8 years) were selected from the Mass Testing pool based on their scores on an online, 9-item MSI-BPD (MSI-BPD-R) which did not include the self-injury/suicide item. Participants were selected across the range of scores (0 to 9) with oversampling at the top and bottom fifth percentile. One participant reported marked changes in emotional and behavioral functioning following a recent traumatic brain injury and was excluded from the study. The demographic characteristics of the sample of 56 are presented in Appendix B Table B6. Half of the participants (50%) self-identified as White/Caucasian and 25% as East Asian. Almost half of the students (23, 41.07%) reported that they have experienced symptoms of depression and/or anxiety during their lifetime; three participants (5.4%) indicated that they were taking anti-depressant medication at the time of the study. Three participants (5.4%) reported a past history of eating disorders and two (3.6%) described previous substance abuse/dependence. A family history of mental health problems (e.g., unipolar or bipolar depression, anxiety, schizophrenia, and/or alcohol dependence) was reported by 26 (46.4%) students. It should be noted that neither self nor family Axis I diagnoses were confirmed in this study.

The characteristics of the sample at the bottom and top 20th percentile of the MSI-BPD-R are presented in Table B7. The participants in both groups were of similar ages and of mixed ethnic backgrounds. Histories of familial and personal mental health problems were reported by both sets of participants. Current use of psychotropic medications was not reported by either group.

3.1.2 Study 1b Measures

3.1.2.1 Questionnaires

Two questionnaires from Study 1a, the McLean Screening Instrument for Borderline Personality Disorder (MSI-BPD; Zanarini et al., 2003) and the Borderline Personality Questionnaire (BPQ; Poreh et al., 2006), were administered to participants in the lab. Unlike Study 1a, which used shortened versions of the MSI-BPD and BPQ (i.e., did not include self-harm/suicide items), the full 10-item MSI-BPD and 80-item BPQ were administered in the lab for the current study.

In addition to the MSI-BPD and BPQ, the International Personality Disorder Examination DSM-IV Screening Questionnaire (IPDE-S; Loranger, 1999) was used. The IPDE-S consists of 77 dichotomous (true/false) items that yield dimensional scores corresponding to the 10 DSM-IV-TR (APA, 2000) personality disorders: Borderline, Antisocial, Histrionic, Narcissistic, Avoidant, Dependent, Obsessive-Compulsive, Paranoid, Schizoid, and Schizotypal. For the purpose of Study 1b, only data from the IPDE-S Borderline subscale was used.

3.1.2.2 Semi-structured Interviews

The International Personality Disorder Examination DSM-IV Interview - BPD Section (IPDE-I; Loranger, 1999) and the Revised Diagnostic Interview for Borderlines (DIB-R; Gunderson & Zanarini, 2006) were administered to each participant by a Ph.D.-level graduate student (Kathy Smolewska). The DIB-R interview assesses four symptom clusters thought to be of critical importance in diagnosing BPD (affect, cognition, impulse action patterns, interpersonal relationships) and measures all of the DSM-IV-TR BPD criteria except affective instability and identity disturbance. The DIB-R contains 108 questions and 22 section summary statements. The summary statements in each of the 4 sections are converted to a "scaled score" by means of a scoring algorithm that is unique to each section. For example, the affect

section scaled score is reduced to zero if hypomania is diagnosed and the cognition scaled score is reduced by the presence of overt psychosis or mania. Scores equal to or greater than 8 (out of 10) on the DIB-R Revised Total are indicative of a BPD diagnosis.

The version of the IPDE-I used in this study was designed to produce a diagnosis of BPD consistent with DSM-IV criteria. On the IPDE-I, items assessing personality disorder criteria are presented based on common themes or domains of experience being assessed (e.g. interpersonal relationships, affect, impulse control, etc.), rather than by disorder. Each item is scored on a 3-point scale (0 = absent, 1 = subthreshold or 2 = present). The IPDE-I yields both categorical diagnoses and dimensional summary scores for each PD. For the purpose of this study, only the questions relating specifically to BPD were administered. Previous studies have found high levels of reliability for the number of BPD criteria met by each participant and acceptable levels for the BPD categorical diagnosis (Critchfield, Levy, & Clarkin, 2007).

3.1.3 Procedure

Participants who qualified for the study were invited to take part in a two-hour session that involved the completion of a series of self-report measures (i.e., MSI-BPD, BPQ, IPDE-S) and two semi-structured interviews (DIB-R and IPDE-I). Undergraduate-level research assistants administered the questionnaires. I interviewed each of the participants and scored their responses on the DIB-R and IPDE-I. Both the research assistants who administered the questionnaires and I were blind to the participants' scores on the screening measures administered during mass testing. The three components (i.e., questionnaire package, DIB-R, IPDE-I) were administered in one of four orders: (1) questionnaires, DIB-R, IPDE-I, (2) questionnaires, IPDE-I, DIB-R, (3) DIB-R, IPDE-I, questionnaires, or (3) IPDE-I, DIB-R, questionnaires. The questionnaires in the package were presented in a random order. Permission for audio-taping of the interviews was obtained from each participant. All participants received partial course credit for first, second or third year psychology courses for their participation.

3.1.4 Statistical Analyses

All data were analyzed using SPSS Statistics Version 17.0.1. The internal consistency for the self-report measures was computed using Cronbach's alpha reliability coefficient. Correlational and regression analyses were used to examine the association between the questionnaire and interview measures. The performance of each screening instrument was evaluated by computing the sensitivity (true positive rate), specificity (true negative rate), positive predictive value (PPV; probability that a positive test means the person has the condition), negative predictive value (NPV; probability that a negative test means the person does not have the condition) and accuracy for that instrument. The Cohen's Kappa statistic (κ) was also used as a measure of agreement between the criterion diagnosis and each of the screening instruments, employing Landis and Koch's (1977) guidelines (poor agreement: < 0.00, slight agreement: 0.00 – 0.20, fair agreement: 0.21–0.40, moderate agreement: 0.41-0.60, substantial agreement: 0.61-0.80, almost perfect agreement: 0.81-1.00).

3.2 Results

3.2.1 Data Screening and Preparation

The following sections summarize the data screening and preparation measures. This includes an assessment of incomplete and missing data, departures from normality, outlier analyses and reliability of measures.

3.2.1.1 Incomplete/Missing Data

All 56 participants completed the MSI-BPD, IPDE-S, DIB-R and IPDE-I. Data from 55 participants were available for the BPQ as one person did not complete the questionnaire in its entirety. Data from this one participant was included for all measures except the BPQ.

3.2.1.2 Normality and Outlier Analyses

3.2.1.2.1 Univariate normality. Univariate normality was explored by examining absolute values of univariate skew and kurtosis and the Kolmogorov-Smirnov test of normality (i.e., as a goodness-of-fit test of the sample distribution). This was the same procedure as described in Study 1a (p. 39). A summary of the skew, kurtosis, Kolmogorov-Smirnov statistics and significance values for the total scale and subscales are provided in Appendix B, Table B8. The skew and kurtosis values were within acceptable ranges for all variables; however, both the DIB-R Revised Total and IPDE-I Criteria Total were identified as non-normal by the Kolmogorov-Smirnov statistic. An examination of the normality plots indicated that both indexes were positively skewed. This finding was not unexpected given the low base rate of BPD in the general population and the non-normal distributions were left untransformed.

3.2.1.2.2 Univariate and multivariate outliers. Univariate outliers were examined. Each variable was examined for cases with scores more than three standard deviations away from the mean ($z > 3.29$, $p < .001$; Tabachnick & Fidell, 2007). No such cases were identified. One multivariate outlier was identified in the course of the regression analyses; the participant had a very high MSI-BPD score (9/10) and a very low BPQ score (3/80) and was removed from the sample. Therefore, the final sample consisted of 55 participants.

3.2.1.2 Reliability

The reliability analyses for the measures are presented in Appendix B Table B9. The co-efficient alphas for the three BPD measures were comparable ($\alpha = .80$ for MSI-BPD; $\alpha = .85$ for IPDE-S BPD; $\alpha = .95$ for BPQ). The reliability indexes for the IPDE-I Criteria Total and DIB-R Revised Total were below .70 (.58 and .65, respectively). These total scores are based on summing dichotomous items. In an effort to overcome the somewhat disappointing reliability of these two measures, two additional indexes were computed that were based on a more dimensional approach. The IPDE-I Dimensional Total was calculated based on whether each criterion was present (value = 2),

subthreshold (value = 1) or absent (value = 0); the potential sum ranged from 0 to 18. The DIB-R Section Score Total was the sum of the score on each of the 22 sections (coded 0 = absent, 1 = subthreshold, 2= present) and could range from 0 to 44. The reliabilities for IPDE-I Dimensional Total and DIB-R Section Score Total were .79 and .83, respectively.

3.2.2 Descriptive Statistics

Descriptive statistics for the BPD questionnaires and interviews are listed in Appendix B, Table B10. No participant scored above original recommended cut-offs for the IPDE-I BPD (>4) or the DIB-R (>7). Thus, for the purpose of this study, the criterion for a diagnosis of BPD was lowered by 1 for each. Only one participant obtained a score of 7 on the DIB-R and three participants obtained a score of 4 on the IPDE-I. No participants met criteria on both interviews.

3.2.3 Comparing BPD Screening Measures and Criterion Diagnoses

The self-report measures were highly correlated (r = .80 to .83) and scores on each were positively associated with global indices from the DIB-R (r = .54 to .82) and IPDE-I (r = .48 to .70) (see Appendix B, Table B11). Results from a simultaneous regression analysis (F (3, 51) = 28.20, p < .001, R^2 = .62) that examined the predictive value of all three self-report measures on an aggregate index of scores on both interviews[3] suggested that the MSI-BPD was the strongest, unique predictor of the three questionnaires. A follow-up hierarchical regression analyses suggested that scores on the MSI-BPD accounted for a significant portion of the variance in the aggregate index (F (1, 52) = 57.83, p < .001, R^2 = .53); the inclusion of the IPDE-S BPD and BPQ scores did not result in a significant improvement in the regression.

I also compared the screening measures by selecting various cut-points for each questionnaire based on previous research (e.g., Zanarini et al., 2003; Chanen et al., 2008) and evaluating their performance. The results of the "best" cut-points (i.e., ones with the highest sensitivity rates) and/or those typically used in the literature are listed in Table B12. Examination of the kappa statistics

[3] Aggregate Index = [(DIB-R Revised Total Score – Mean)/Standard Deviation) + (IPDE-I Criteria Total Score – Mean)/Standard Deviation)

suggests that the questionnaires showed fair to almost perfect agreement (κ between 0.23 and 0.85) with the IPDE-I BPD criterion diagnosis and poor to moderate agreement (κ between -0.03 to 0.49) with the DIB-R criterion diagnosis. Considering agreement on both interviews, the best cut-scores for the measures were: > 41 on the BPQ, > 7 on the MSI-BPD and > 5 on the IPDE-S. Based on these cut-scores, the sensitivity (1.00), specificity (0.83 to 0.92), and NPV (1.00) were strong for all measures. The PPV and kappas were acceptable for the IPDE-I but less so for the DIB-R. Overall, the three measures performed comparably on these indexes, with the BPQ achieving higher kappa and PPV values than the other two questionnaires.

3.3 Discussion

In this study, all three screening instruments were internally consistent and had high sensitivity, specificity, and NPVs. The PPVs were low for all measures, particularly when the criterion was the DIB-R, indicating a high false positive rate. The performance of the measures depended on the criterion diagnosis used (DIB-R or IPDE-I) and whether a dimensional or categorical approach was adopted for the analyses. When the cut-point approach was used, the BPQ was more precise and had higher agreement with the criterion diagnosis. In contrast, when the measures were compared using regression and correlational analyses, the MSI-BPD was the strongest predictor of scores on the IPDE-I, DIB-R and an aggregate of the two. Since both the MSI-BPD and the BPQ were equivalent on sensitivity and specificity, I decided to select the MSI-BPD as the screener for future studies because it is much shorter in length (i.e., 10 vs. 80 items).

For the MSI-BPD, the present study found that a higher cut point (>7 vs. >6) than that reported in the original study by Zanarini et al. (2003) gave the best balance of sensitivity and specificity. This higher cut point (>7) was also identified by Chanen et al. (2008) in their study comparing BPD screening measures against a criterion diagnosis from the Structured Clinical Interview for DSM-IV Axis II Disorders (SCID-II) BPD module in a sample of outpatient youth (aged 15 -25 years). The sensitivity and specificity values for the MSI-BPD identified in the current study were higher than that

found by Zanarini et al. (2003) and Chanen et al. (2008). The high NPV and low PPV values were consistent with that found by Chanen and colleagues but the opposite pattern was identified by Zanarini and colleagues.

One key difference between the current study and those of Zanarini et al. (2003) and Chanen et al. (2008) is the size and nature of the sample used. Zanarini and colleagues advertised for participants and selected those with treatment histories. Chanen and colleagues selected their sample from acute referrals to a frontline youth mental health service. Whereas 69.5% of participants met criteria for BPD in the Zanarini et al. study and 21.8% in the Chanen et al. study, the prevalence was much lower in the current sample. In fact, when the original criteria for the DIB-R (Revised Total Score >7) and IPDE-I (Criteria >4) were used, no participants were diagnosed with BPD. With the criteria each reduced by one (i.e., >6 for DIB-R and >3 for IPDE), one participant (1.8%) met the adapted DIB-R criterion and three participants met the adapted IPDE-I criterion (5.4%). The performance of a screening measure will vary according to the base rate of the diagnosis (Morse & Pilkonis, 2007). Specifically, for a fixed test sensitivity and specificity, the PPV will be higher if the disorder is more frequent in a population. Since the base rate was so low in the current sample, the false positive rate was high and the PPV was low. Therefore, the PPV and Kappa values attained in the present should be interpreted as very conservative, with limited generalizability to in-/out-patient samples or screening of undergraduates for research purposes.

With respect to the criterion diagnosis, the data suggest that some sections of the DIB-R may be more relevant than others in an undergraduate sample. For example, no participant obtained a score greater than zero on DIB-R section 21 and only one participant obtained a score of one on section 22. These sections query behavioral regression, countertransference and the formation of "special" relationships during the course of psychiatric hospitalization or psychotherapy and fall under the Interpersonal Relationships category on the DIB-R. For future use of the DIB-R as a criterion in non-clinical, undergraduate samples, I recommend: (i) removing sections 21 & 22, (ii) altering the possible

values for the Interpersonal Scaled Score from 0, 2, 3 to 0, 1, 2, (iii) reducing the range of the Revised Total Score from 0-10 to 0-9, and (iv) lowering the cut-off to >6.

One strength of the present study is its use of participants in a setting in which the screening measure will be used (i.e., undergraduate sample for Studies 2 and 3 of this dissertation). However, this is also a limitation of the current study as the findings may not generalize well to outpatient, inpatient or community settings. Another limitation includes the requirement that participants complete all screening measures (presented in random order) in one sitting. Therefore, the findings might not reflect the performance of each measure when administered individually.

Two other notable points pertained to the selection of the sample. I did not include age as a selection criterion for participants and as a result, the age range was quite broad. Since longitudinal studies of BPD suggest that all nine DSM-IV-TR criteria decline significantly over a 10-year period (e.g., Gunderson et al., 2011), I decided to include age as a selection criterion in the remaining studies. I also excluded individuals that have suffered a traumatic brain injury from the studies because the emotional and behavioral sequelae of head injuries can resemble BPD traits (e.g., emotional lability, impulsivity) (Gagnon, Bouchard, & Rainville, 2006).

Overall, the present findings indicate that screening for BPD in an undergraduate population is feasible and any one of the three questionnaires (MSI-BPD, IPDE-S, BPQ) may help in the identification of participants for future studies. The MSI-BPD was selected for the selection of participants in Study 2 because of its length and predictive capacity when using a dimensional approach.

Chapter 4

Study 2

The purpose of Study 2 was to test specific tenets of Linehan's (1993) biosocial theory of BPD and identify the most important aspects (i.e., with regard to temperamental sensitivity and childhood experiences) contributing to the quality of one's experience of emotions and the immediate response to that experience. The purpose of this project was three-fold. First, the nature of the biologically-based temperamental vulnerability was explored psychometrically. Second, the moderating influence of different childhood experiences on the relationship between temperament and BPD features was investigated. Third, I attempted to better characterize the emotional sensitivity and problems with emotional regulation that have been proposed to underlie BPD.

4.1 Method

4.1.1 Participants

Two hundred and twenty- five participants (68 males, 157 females; mean age = 19.52 years) were selected through the UW Mass Testing pool using two measures, the Highly Sensitive Person Scale (HSPS; Aron & Aron, 1997) and the McLean Screening Instrument for Borderline Personality Disorder (MSI-BPD; Zanarini et al., 2003) Revised. Individuals with scores across the entire range of the HSPS and MSI-BPD-R were selected for the study.

4.1.2 Measures

4.1.2.1 Part 1 (Online) Questionnaires

4.1.2.1.1 Temperament. The Adult Temperament Questionnaire – Short Form (ATQ-SF) was used to measure the Evans and Rothbart (2007) model of temperament that was outlined in the introduction. The 77-item version used in this study is a subset of scales, subscales and items from Study 1 reported in Evans and Rothbart (2007). The ATQ was adapted from the Physiological Reactions Questionnaire developed by Derryberry and Rothbart (1988) and includes four broad constructs: Effortful Control, Negative Affect, Extraversion/Surgency, and Orienting Sensitivity (refer to Appendix A Figure A1 and the hierarchical listing of the ATQ-SF scales that follows it). The items

on the ATQ-SF were rated on a 7-point Likert-type scale ("1" = "extremely untrue of me" to "7" = "extremely true of me"). The short form includes the same general constructs and sub-constructs as the long form. In a study with a sample of 258 undergraduate students, Evans and Rothbart (2007) reported reliability co-efficients for the higher-order factors that ranged from α = .75 to α = .85. Reliability co-efficients for the lower-order subscales ranged from α = .60 (Inhibitory Control) to α = .79 (Affective Perceptual Sensitivity).

4.1.2.1.2 Affect intensity. The Affect Intensity Scale - Short (AIS-S; Geuens & De Pelsmacker, 2002), a 20-item brief version of the 40-item Affect Intensity Scale (AIS; Larsen, 1984), was used as an index of general affective intensity. The AIS-S has three factors: Positive Intensity, Negative Intensity and Serenity. According to Geuens and De Pelsmacker (2002), the correlation between the original and brief scales ranged from .93 to .94 in three different samples. Geuens and De Pelsmacker also reported reliability co-efficients for the subscales in three different samples that ranged from α = .60 (Negative Intensity) to α = .85 (Serenity). In the current study, participants were asked to indicate how they typically respond to different events (e.g., "When I do something wrong, I have strong feelings of shame and guilt.") by selecting a number from 1-6, based on the following scale: 1 ("I never feel like that") to 6 ("I always feel like that").

4.1.2.1.3 Attention to emotions. Two questionnaires were used to measure individual differences in attention to emotional states, the Private Self-Consciousness subscale (PSCS) from the Self-Consciousness Scale (SCS; Fenigstein, Scheier, & Buss, 1975) and the Monitoring subscale of the Mood Awareness Scale (MAS-M; Swinkels & Giuliano, 1995). The PSCS is a 10-item scale that measures an individual's tendency to attend to their own thoughts and feelings and the degree to which they become absorbed by their internal state. The PSCS is a reliable and valid measure of the tendency to be internally self-focused and is associated with increased responsiveness to one's transient affective state (Fenigstein et al., 1975). Fenigstein and colleagues (1975) reported a test-retest reliability of .84 for the PSCS. The MAS-M is a five-item subscale of the MAS. The MAS is a measure of individual

differences in the tendency to focus on and evaluate of one's mood states. It consists of two 5-item subscales, Labeling (MAS-L) and Monitoring (MAS-M); for the purpose of the present study, only the Monitoring subscale was used. Across a series of four studies, Swinkels and Giuliano found reliability co-efficients ranging from α = .85 to α = .88 for the MAS-M. In the current study, items from the two subscales (PSCS and MAS-M) were combined into one page in the online questionnaire. The respondents rated each item on a 5-point scale ranging from 1 ("extremely uncharacteristic of me") to 5 ("extremely characteristic of me").

4.1.2.1.4 Discrimination and identification of feelings. The Difficulty Identifying Feelings subscale of the Toronto Alexithymia Scale-20 (TAS-20; Bagby, Parker, & Taylor, 1994) and the Clarity subscale of the Trait Meta-Mood Scale (TMMS; Salovey, Mayer, Goldman, Turvey, & Palfai, 1995) were used to assess emotional clarity. The TAS-20 is a 20-item measure of alexithymia that consists of three different facets, one of which is the Difficulty Identifying Feelings (DIF; 7 items) subscale. Bagby and colleagues (1994) reported alphas ranging from .78 to .81 for the DIF subscale across different samples. The TMMS is a 30-item questionnaire assessing meta-mood skills and consists of three subscales, one of which is Clarity of Feelings (Clarity; 11 items). Salovey and colleagues (1995) reported alpha co-efficients for the TMMS-Clarity subscale that were greater than .80 across different samples.

In the current study, the items on both scales were rated on a 5-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree").

4.1.2.1.5 Emotional expression. The Emotional Expressivity Scale (EES; Kring, Smith, & Neale, 1994) was used to measure one's tendency to display emotions outwardly. According to Kring and colleagues (1994), the EES assesses emotional expressivity as a unidimensional construct. It is a 17-item questionnaire that consists of items rated on a 6-point Likert scale (1 = "never true" to 6 = "always true"). Kring and colleagues found the questionnaire to be highly reliable with an average alpha of .91 across seven different administrations. They also reported a four-week test-retest correlation of .90.

4.1.2.1.6 Emotional dysregulation. The Affective Lability Scales – Short Form (ALS-SF; Oliver & Simons, 2004), an 18-item version of the 54–item Affective Lability Scales (Harvey, Greenberg, & Serper, 1989) questionnaire, was used to measure overall dysregulated affective functioning. The ALS-SF consists of three different subscales: Anxiety/Depression, Depression/Elation, and Anger. Oliver and Simons reported internal reliability co-efficients greater than $\alpha = .70$ for each subscale and test-retest reliabilities ranging from .67 to .70. In the current study, respondents rated each item on a 5-point scale ranging from 1 ("extremely uncharacteristic of me") to 5 ("extremely characteristic of me").

4.1.2.1.7 Response to distress. Two measures were used to measure distress tolerance: the Distress Tolerance Scale (Corstorphine, Mountford, Tomlinson, Waller, & Meyer, 2007) and the Distress Tolerance Scale (Simons & Gaher, 2005). Since both questionnaires have the same name, I differentiated between them using the initial of the first author's last name. The Corstorphine et al. (2007) scale was labeled C-DTS and the Simons and Gaher (2005) scale was labeled S-DTS.

The C-DTS consists of 20 items that assess means of coping with present and anticipated emotional states (anger, happiness, loneliness, anxiety, and depression). Corstorphine and colleagues (2007) found that 14 of the items loaded onto three correlated factors. The first factor, labeled 'Accept and Manage,' reflected an adaptive style of coping with emotions. The second factor, 'Avoidance of Affect,' reflected a maladaptive style centered on avoiding emotions. The third factor, 'Anticipate and Distract,' involved elements of the other two factors in that it enabled the regulation of emotion in the short term but prevented emotional problem-solving. Corstorphine and colleagues examined the psychometric properties of the scale in two different samples and found reliability co-efficients ranging from $\alpha = .55$ (Accept and Manage) to $\alpha = .77$ (Avoidance of Affect). In the current study, each item on the C-DTS was rated on a Likert-type scale ranging from 1 ("never") to 5 ("all the time") to indicate the frequency with which each coping strategy is used in the person's everyday life.

The S-DTS is a 15-item measure that was developed to assess four domains: perceived ability to tolerate emotional distress; subjective appraisal of distress; attention absorbed by negative emotions; and efforts to alleviate distress. Items on the S-DTS are rated on a five-point scale ranging from 1 ("strongly disagree") to 5 ("strongly agree") with high scores representing poor tolerance of distress. In their analyses of the scale, Simons and Gaher (2005) found that the data could be represented by either a single higher-order factor of distress tolerance or four first-order factors labeled: (Lack of) Tolerance, Appraisal, Absorption, and Regulation. Simons and Gaher reported alpha coefficients for the four factors that ranged from .72 ((Lack of) Tolerance) to .84 (Appraisal).

The 12-item Urgency subscale from the UPPS Impulsive Behavior Scale (UPPS; Whiteside & Lynam, 2001) was used to measure the tendency to act in a rash manner when experiencing feelings of distress. Whiteside and Lynam reported an internal consistency co-efficient of α = .90 for this subscale. In the current study, participants indicated their level of agreement with each statement using a Likert-type scale that ranged from 1 ("strongly disagree") to 5 ("strongly agree"). Higher scores were indicative of higher levels of urgency.

4.1.2.1.8 Self-soothing and self-attacking. The ability to self-soothe and tendency to self-attack was assessed using two questionnaires: The Forms of Self-Criticizing/Attacking and Self-Reassuring Scale (FSCRS; Gilbert, Clarke, Hempel, Miles, & Irons, 2004) and the Self-Compassion Scale (SCS; Neff, 2003).

The FSCRS measures self-criticism and the ability to self-reassure. It is a 22-item scale, which measures different ways people think and feel about themselves when things go wrong for them. The items make up three components. There are two forms of self-criticizing: inadequate self, which focuses on a sense of personal inadequacy ('I am easily disappointed with myself'); and hated self, which measures the desire to hurt or persecute the self ('I have become so angry with myself that I want to hurt or injure myself'). The third component is the ability to reassure the self ('I am able to remind myself of positive things about myself'). Responses are given on a 5-point Likert scale (1 = "not at all

like me" to 5 = "extremely like me"). Gilbert and colleagues (2004) reported reliability coefficients ranging from α = .86 to α = .90 for the subscales.

The SCS is a 26-item self-report inventory that consists of six subscales: Self-Kindness, Self-Judgment, (awareness of) Common Humanity, Isolation, Mindfulness, and Over-Identification. Self-kindness reflects the degree to which one has a kind and nonjudgmental attitude toward oneself when suffering. Awareness of common humanity refers to the recognition that one's experiences are part of the larger, more universal human experience. The other subscales measure the tendency to hold painful thoughts and feelings in balanced awareness, in which they are observed and accepted without judgment, rumination, or self-pity. Participants indicate how often they acted in the manner described in each item by rating it from 1 ("almost never") to 5 ("almost always"). Neff (2003) reported internal consistency co-efficients that ranged from α = .75 (Mindfulness) to α = .81 (Over-Identification).

4.1.2.2 Part 2 (In-Lab) Questionnaires

4.1.2.2.1 Borderline personality traits. The full, 10-item MSI-BPD (Zanarini et al., 2003) was administered in the lab.

4.1.2.2.2 Parenting style. Retrospective appraisals of parenting style were assessed using the Parental Authority Questionnaire (PAQ; Buri, 1991). The PAQ consists of 30 statements that reflect Baumrind's (1971) permissive, authoritarian, and authoritative parental authority prototypes.

According to Baumrind (1971), parents with a permissive style do not enforce clear rules on acceptable or unacceptable behavior for their children. They often accept or ignore bad behavior and make few demands on their children for mature independent behavior. Their relationship with their children is warm, accepting and non-controlling.

In contrast, the authoritarian parenting style is quite strict and the consequences for misbehavior are harsh and punitive. Baumrind (1971) suggests that these parents enforce rules rigidly and do not listen to their children's wishes or opinions. They are highly directive and more detached and less warm than other parents.

The authoritative style of parenting falls in the middle of the two extremes. Authoritative parents are warm, flexible and provide clear standards of behavior for their children. They are sensitive to their children's needs and views but are firm in setting limits and sticking to them.

Each statement on the PAQ is rated independently for the mother and father for a total of 60 responses. Buri (1991) reported Cronbach's coefficient alpha values that ranged from .74 (Permissive Father) to .87 (Authoritarian Father). In the current study, participants were asked to rate each item on a five-point scale (1 = "strongly disagree" to 5 = "strongly agree") based on how well it applied to their relationship with their parental figure during the years that they were living at home.

4.1.2.2.3 Childhood neglect and abuse. The presence of neglect and/or abuse in childhood was assessed using the Multidimensional Neglectful Behavior Scale – Adult Recall Short Form (MNBS-SF; Straus, Kinard, & Williams, 1995) and a two-item screener for sexual and physical abuse in childhood (Thombs, Bernstein, Ziegelstein, Bennett, & Walker, 2006; Thombs, Bernstein, Ziegelstein, Bennett, & Walker, 2007). The MNBS-SF is an eight-item measure of childhood neglect in four domains: emotional needs (e.g., affection, support), cognitive needs (e.g., reading, assisting with school work), supervision needs (e.g., limit setting, knowing child's whereabouts) and physical needs (e.g., food, shelter). Using a 4-point scale (1 = "strongly disagree," 2 = "disagree," 3 = "agree," 4 = "strongly agree"), participants indicated whether or not they experienced the eight different behaviors while living with caregivers (i.e., mother, father). Only one rating was made for each item; thus, separate ratings were not made for each parent. In a large-scale study of over 7000 undergraduate students at 33 universities in 17 countries, the internal consistency of the eight-item scale ranged from α = .55 to α = .72 (Straus, 2006).

History of childhood physical and sexual abuse was assessed with a two-item screener developed from the Childhood Trauma Questionnaire – Short Form (Bernstein, Stein, & Newcomb, 2003): (a) When I was growing up, people in my family hit me so hard that it left me with bruises or marks, and (b) When I was growing up, someone tried to touch me in a sexual way or tried to make me

touch them. These two items have been found to effectively identify individuals with histories of physical or sexual abuse in childhood, as determined by a semi-structured interview, with a sensitivity of 84.8% and specificity of 88.1% (Thombs et al., 2007). Participants responded to the items with "yes" or "no."

4.1.2.2.4 Invalidating environment. The Invalidating Childhood Environment Scale (ICES; Mountford, Corstorphine, Tomlinson, & Waller, 2007) was used to measure specific parental behaviors believed to represent the overall construct of invalidation. The 14 items describe parental behaviors that reflect the eight themes used to define an invalidating environment — ignoring thoughts and judgments; ignoring emotions; negating thoughts and judgments; negating emotions; over-reacting to emotions; overestimating problem solving; over-reacting to thoughts and judgments; and oversimplifying problems (Linehan, 1993). Mountford and colleagues (2007) reported levels of internal consistency for the ICES that ranged from α = .59 to α = .80 in non-clinical and clinical (Eating Disorder diagnosis) samples, respectively.

In the current study, participants were asked to rate their experience of each parental behavior twice – once for each primary caregiver - using a 5-point Likert scale (1 = "never"; 5 = "all the time"). They were asked to refer to behaviors experienced during the time they lived with their parents, or up to the age of 17 years.

4.1.3 Procedure

Participants were selected for the study based on their scores on the MSI-BPD-R and HSPS administered during online Mass Testing. Eligible participants were able to sign up for the two-part study (entitled Temperament, Familial Environment and Emotional Experience) for course credit using the Sona Experiment Management System. Part 1 of the study consisted of a series of online questionnaires that measured different aspects of temperament (ATQ-SF), experience of emotions (AIS-S, PSCS, MAS-MM, TMMS – Clarity, TAS – DIF, ALS-SF), self-compassion (FSCRS, SCS), distress tolerance (S-DTS, C-DTS), and urgency (UPPS-Urgency). Part 2 of the study required the participant to come into the lab and complete a package of questionnaires which included questions

regarding family background, three measures that explored different aspects of their childhood (PAQ, ICES, MNBS-SF, CTQ-SF), and the MSI-BPD.

All participants were informed of the limits to confidentiality related to child abuse that pertained to the study. Specifically, participants were told that the researcher would have to break confidentiality if the participant reported that he/she was a victim of sexual abuse and there was evidence that the perpetrator (i) was a health-care professional or (ii) still had contact with children and may be a threat to them. Since all participants in the study were over the age of 16 years, we were not required to break confidentiality if the perpetrator did not fall under one of these two categories. In addition, because the participants were over 16 years of age, we did not follow-up on reports of physical abuse or neglect that occurred in their childhood. In the case that the perpetrator did meet criteria (i) or (ii), information collected in Part 1 remained anonymous and confidential. However, the participants were informed that the confidentiality of the information presented during Part 2 could not be guaranteed.

In the current study, none of the participants who reported being abused identified the perpetrator as someone who met criteria (i) or (ii). Therefore, all information remained confidential.

4.1.4 Statistical Analyses

All analyses were completed with SPSS version 17.0.1 and IBM SPSS Amos version 19 (Arbuckle, 2010). The factor structure of the scales was examined using confirmatory factor analysis (CFA) and model fit was evaluated using Amos version 19 (Arbuckle, 2010). Since the computation of modification indexes in Amos requires a complete data set, missing data were replaced using the whole sample mean for each specific questionnaire item.[4] The raw data was inputted into AMOS and maximum likelihood estimation was used. The latent variables were scaled using unit loading identification (i.e., fixing one loading on each factor to 1).

[4] The missing data were also replaced using multiple imputation in AMOS to determine whether the method of replacement would produce different model results. The item loadings, correlations between latent variables, and goodness-of-fit indexes were very similar across both missing data replacement methods.

Many statistics are available for the evaluation of model fit. The chi-square (χ^2) goodness-of-fit statistic assesses the magnitude of discrepancy between the sample and fitted covariance matrices (i.e., evaluates the difference of the observed data from the data implied by the specified model); however, the χ^2 statistic is affected by many factors (e.g., sample size, model size, distribution of variables), making it a less than ideal indicator of model fit. Additional fit indexes are typically reported such as the relative chi-square; the relative chi-square is the ratio of chi-square to its degrees of freedom (χ^2/df) and values below 3 are considered to indicate adequate fit (Mueller, 1996). The Bentler's Comparative Fit Index (CFI) and the Root Mean Squared Error of Approximation (RMSEA) are also frequently reported. Hu and Bentler (1999) suggest that CFI values greater than .95 represent acceptable fit and that RMSEA values below .05 indicate close fit, values between .05 and .08 indicate reasonable fit and values greater than .10 indicate poor fit. In the current study, I examined the following statistics for each model: chi-square, relative chi-square, CFI and RMSEA.

The relations between temperament, childhood environment, emotional experience, distress tolerance, self-soothing and BPD traits were compared using correlations and moderated multiple regressions. All correlations and regressions were completed with SPSS Version 17.0.1.

4.2 Results

4.2.1 Data Screening and Preparation

The following sections summarize the data screening and preparation measures. This includes an assessment of incomplete and missing data, departures from normality, outlier analyses and reliability of measures. I also examined the factor structure of the predictor variables in an attempt to reduce the number of variables and describe the structure of these measures succinctly.

4.2.1.1 Incomplete/Missing Data

Two-hundred and twenty-five participants completed the entire study. For the most part, the data from both online and lab measures was complete for the sample. Three of the participants did not identify a significant male caregiver in their lives and did not complete the father-specific items on the

ICES and PAQ. Unfortunately, 10 participants completed only the Father column of responses on the ICES and did not provide any data for mother-specific items. One participant declined to respond to the questions related to physical and sexual abuse, one participant did not complete the MNBS-SF. HSPS data for one participant was incomplete. One participant did not complete all of the emotional experience questionnaires online and data were missing for various questionnaires. Four participants did not complete the S-DTS online and one participant left many items on the SCS unanswered. In the latter part of the study, research assistants were asked to check over the questionnaires for completeness and asked participants to complete missed questionnaires when possible during Part 2 of the study.

For multi-item measures, I developed summary composite scores for scales using a prorating technique as long as 80% of the items were completed.

4.2.1.2 Factor Analysis

Prior to examining the core hypotheses of the study, I conducted a closer inspection of the factor structure of the measures to determine their structure in the present sample and to potentially reduce the number of variables used. Data screening was not run prior to the confirmatory factor analysis (CFA) because the CFA was being done at the item rather than scale level. CFA was used as the measures adopted had been used in previous studies and each one had a proposed factor structure, either unidimensional or multidimensional. The results from the CFAs are presented in Appendix C. The factor loadings presented on each figure are standardized. Correlated error terms were added post-hoc to most models to improve fit.

4.2.1.2.1 Temperament

4.2.1.2.1.1 Highly Sensitive Person Scale (HSPS). In previous research, the HSPS has been used as a unidimensional (e.g., Aron & Aron, 1997), two-factor (e.g., Evans & Rothbart, 2008) and three factor (e.g., Liss, Mailloux, & Erchull, 2008; Smolewska, McCabe, & Woody, 2006) scale. The fit of the three-factor model was acceptable (χ^2 = 526.74, *df* = 269, $p < .001$; χ^2/df = 1.958; CFI = .763, RMSEA = .065) and better than both the two-factor (χ^2 = 568.41, *df* = 270, $p < .001$; χ^2/df = 2.105; CFI

= .726, RMSEA = .070; $\Delta\chi^2 = 41.67$, $df = 1$, $p < .001$, $\chi^2/df = 41.670$) and unidimensional ($\chi^2 = 691.14$, $df = 272$, $p < .001$; $\chi^2/df = 2.541$; CFI = .615, RMSEA = .083; $\Delta\chi^2 = 164.40$, $df = 3$, $p < .001$, $\chi^2/df = 54.800$) models. Therefore, the three-factor model (presented in Appendix C Figure C1) was used. Inter-correlations among the factors of the HSPS were .41 for Ease of Excitation (EOE) and Aesthetic Sensitivity (AES), .39 for Low Sensory Threshold (LST) and AES, and .81 for EOE and LST.

4.2.1.2.1.2 Adult Temperament Questionnaire – Short Form (ATQ-SF). Evans and Rothbart (2007) presented the ATQ-SF as a questionnaire consisting of four, higher-order factors: Effortful Control (EC), Extraversion/Surgency (E/S), Negative Affect (NA), and Orienting Sensitivity (OS). Each of these factors has three to four subcomponents. EC is made up of Activation Control (ACT), Attentional Control (ATT), and Inhibitory Control (INH). E/S consists of High Intensity Pleasure (HIP), Positive Affect (PA), and Sociability (SOC). The NA dimensions are Fear (FEAR), Frustration (FRST), Sadness (SAD), and Sensory Discomfort (SD). OS is comprised of Affective Perceptual Sensitivity (APS), Associative Sensitivity (AS), and Neutral Perceptual Sensitivity (NPS).

The fit of the three-factor EC model was acceptable ($\chi^2 = 297.97$, $df = 147$, $p < .001$; $\chi^2/df = 2.027$; CFI = .711, RMSEA = .068) and better than the one-factor model ($\chi^2 = 322.60$, $df = 150$, $p < .001$; $\chi^2/df = 2.151$; CFI = .669, RMSEA = .072; $\Delta\chi^2 = 24.63$, $df = 3$, $p < .001$, $\chi^2/df = 8.210$). Therefore, the three-factor model (presented in Appendix C Figure C2) was used. Inter-correlations among the EC factors were .44 for ACT and ATT, .54 for ACT and INH, and .73 for ATT and INH.

The fit of the three-factor E/S model was acceptable ($\chi^2 = 206.38$, $df = 114$, $p < .001$; $\chi^2/df = 1.810$; CFI = .851, RMSEA = .060) and better than the one-factor model ($\chi^2 = 244.82$, $df = 117$, $p < .001$; $\chi^2/df = 2.092$; CFI = .794, RMSEA = .070; $\Delta\chi^2 = 38.44$, $df = 3$, $p < .001$, $\chi^2/df = 12.813$). Therefore, the three-factor model (presented in Appendix C Figure C3) was used. Inter-correlations among the E/S factors were .36 for HIP and PA, .43 for HIP and SOC, and .52 for PA and SOC.

The fit of the four-factor NA model was acceptable ($\chi^2 = 581.10$, $df = 286$, $p < .001$; $\chi^2/df = 2.032$; CFI = .764, RMSEA = .068) and better than the one-factor model ($\chi^2 = 670.93$, $df = 292$, $p <$

.001; $\chi^2/df = 2.298$; CFI = .697, RMSEA = .076; $\Delta\chi^2 = 89.83$, $df = 6$, $p < .001$, $\chi^2/df = 14.972$). Therefore, the four-factor model (presented in Appendix C Figure C4) was used. Inter-correlations among the NA factors were .41 for FEAR and FRST, .36 for FEAR and SAD, .35 for FEAR and SD, .14 for FRST and SAD, .23 for FRST and SD, and -.14 for SAD and SD.

The fit of the three-factor OS model was acceptable ($\chi^2 = 123.21$, $df = 85$, $p = .004$; $\chi^2/df = 1.449$; CFI = .912, RMSEA = .045) and better than the one-factor model ($\chi^2 = 211.37$, $df = 88$, $p < .001$; $\chi^2/df = 2.402$; CFI = .714, RMSEA = .079; $\Delta\chi^2 = 88.16$, $df = 3$, $p < .001$, $\chi^2/df = 29.387$). Therefore, the three-factor model (presented in Appendix C Figure C5) was used. Inter-correlations among the OS factors were .53 for APS and AS, .72 for APS and NPS, and .49 for AS and NPS.

4.2.1.2.2 Environment

4.2.1.2.2.1 Neglect. Since the MNBS-SF consists of only eight items, I tested the fit of a unidimensional model. The fit of the model (presented in Appendix C Figure C6) was very poor ($\chi^2 = 120.78$, $df = 17$, $p < .001$; $\chi^2/df = 7.105$; CFI = .875, RMSEA = .165). A closer examination of the items and their inter-correlations showed a wide range of correlations from $r = -.30$ to $r = .77$. The pattern of associations suggested two potential factors, one measuring physical neglect and one measuring emotional neglect/indifference. I attempted to fit a two-factor model but it was inadmissible due to a negative variance on item 7 ("My parents did not keep me clean."). Furthermore, in examining the normality plot for item 7, it was evident that this item was very positively skewed (i.e., just over 80% of participants responded "strongly disagree") and it was not possible to correct for this. Thus, it was determined that it would not be possible to obtain good fit for this model using conventional methods of modeling. The results suggest that there may be different avenues of neglect and that they do not necessarily occur together. Nevertheless, for the purpose of this study, I used the scale as a unidimensional indicator of neglect as this is how it has been used in previous research.

4.2.1.2.2.2 Invalidating childhood environment. The ICES consists of two factors: Invalidating Father (IF) and Invalidating Mother (IM). The fit of the two-factor model was poor ($\chi^2 =$

1981.46, df = 342, p < .001; χ^2/df = 5.794; CFI = .565, RMSEA = .146) but better than the one-factor model (χ^2 = 2044.22, df = 343, p < .001; χ^2/df = 5.960; CFI = .548, RMSEA = .149; $\Delta\chi^2$ = 62.76, df = 1, p < .001, χ^2/df = 62.760). Therefore, I maintained IF and IM as two separate factors (presented in Appendix C Figure C7) in the current study. The correlation between the two factors was .72.

4.2.1.2.2.3 Parenting style. The PAQ consists of six factors: Authoritarian Father (F.A-rian), Authoritarian Mother (M.A-rian), Authoritative Father (F.A-tive), Authoritative Mother (M.A-tive), Permissive Father (F.Perm), and Permissive Mother (M.Perm). I tested three two-factor models.

The fit of the two-factor Authoritarian model was adequate (χ^2 = 368.41, df = 133, p < .001; χ^2/df = 2.770; CFI = .878, RMSEA = .089) and better than the one-factor model (χ^2 = 414.97, df = 134, p < .001; χ^2/df = 3.097; CFI = .854, RMSEA = .097; $\Delta\chi^2$ = 46.56, df = 1, p < .001, χ^2/df = 46.560). Therefore, I maintained F.A-rian and M.A-rian as two separate factors (presented in Appendix C Figure C8) in the current study. The correlation between the two factors was .46. The fit of the two-factor Authoritative model was also good (χ^2 = 380.99, df = 169, p < .001; χ^2/df = 2.254; CFI = .912, RMSEA = .075) and better than the one-factor model (χ^2 = 412.39, df = 170, p < .001; χ^2/df = 2.426; CFI = .899, RMSEA = .080; $\Delta\chi^2$ = 31.40, df = 1, p < .001, χ^2/df = 31.40). Therefore, I maintained F.A-tive and M.A-tive as two separate factors (presented in Appendix C Figure C9) in the current study. The correlation between the two factors was .58. The fit of the two-factor Permissive model was poor (χ^2 = 662.57, df = 203, p < .001; χ^2/df = 3.264; CFI = .702, RMSEA = .101) but better than the one-factor model (χ^2 = 697.61, df = 204, p < .001; χ^2/df = 3.420; CFI = .680, RMSEA = .104; $\Delta\chi^2$ = 35.04, df = 1, p < .001, χ^2/df = 35.040). Therefore, I maintained F.Perm and M.Perm as two separate factors (presented in Appendix C Figure C10) in the current study. The correlation between the two factors was .59.

4.2.1.2.3 Emotional Experience

4.2.1.2.3.1 Affect intensity. The fit of the three-factor Affect Intensity Scale - Short (AIS-S) was very good (χ^2 = 241.07, df = 164, p < .001; χ^2/df = 1.470; CFI = .949, RMSEA = .046) and much

better than the one-factor model (χ^2 = 433.19, *df* = 167, *p* < .001; χ^2/df = 2.594; CFI = .825, RMSEA = .084; $\Delta\chi^2$ = 192.12, *df* = 3, *p* < .001, χ^2/df = 64.040). The correlation between Positive Intensity and Negative Intensity was .33, the correlation between Positive Intensity and Serenity was -.39, and the correlation between Negative Intensity and Serenity was .13. Therefore, I used three separate factors (presented in Appendix C Figure C11) to measure emotional intensity in this study.

4.2.1.2.3.2 Emotional awareness. A two-factor emotional awareness model was tested. It consisted of two latent variables: PSCS Private Self-Consciousness (PSC) and MAS Mood Monitoring (MM). Five PSC items (2r, 4, 5r, 8, 10) and two PSC testlets (PSC Reflection (R) and Attention (A)) were used as observed indicators for the PSC variable. PSC Reflection was the average of three highly correlated items (1, 3, 7) and PSC Attention was the average of two items (6, 9). The observed indicators for the MM variable were all five items of the MAS MM scale. The fit of the two-factor model was adequate (χ^2 = 130.47, *df* = 49, *p* < .001; χ^2/df = 2.663; CFI = .908, RMSEA = .086) and better than the one-factor model (χ^2 = 188.11, *df* = 50, *p* < .001; χ^2/df = 3.762; CFI = .844, RMSEA = .111; $\Delta\chi^2$ = 57.64, *df* = 1, *p* < .001, χ^2/df = 57.640). Although the two-factor model had a better fit, the correlation between the two latent variables was high (*r* = .80) (presented in Appendix C Figure C12). Therefore, for the purpose of this study, I decided to combine the two factors into one Emotional Awareness Index.

4.2.1.2.3.3 Emotional clarity. A two-factor emotional clarity model was tested. It consisted of two latent variables: TMMS Clarity (TMMS-C) and TAS Difficulty Identifying Feelings (TAS-DIF). Two TMMS-C items (4r, 7) and two TMMS-C testlets (TMMS Confusion (C) and TMMS Opinion (O)) were used as observed indicators for the TMMS-C variable. TMMS-C C was the average of seven items (1r, 2, 3r, 6r, 8r, 9, 11) and TMMS-C O was the average of two items (5, 10). Two TAS-DIF items (6, 7) and two TAS-DIF testlets (TAS-DIF Confusion (C) and TAS-DIF Physical (P)) were used as observed indicators for the TAS-DIF variable. TAS-DIF C was the average of three items (1, 3, 5) and TAS-DIF P was the average of two items (2, 4). The fit of the two-factor model was very good (χ^2

= 33.08, df = 17, p = .011; χ^2/df = 1.946; CFI = .971, RMSEA = .065) and better than the one-factor model (χ^2 = 66.44, df = 18, p < .001; χ^2/df = 3.691; CFI = .912, RMSEA = .110; $\Delta\chi^2$ = 33.36, df = 1, p < .001, χ^2/df = 33.360). Although the two-factor model (presented in Appendix C Figure C13) had a better fit, the correlation between the two latent variables was high (r = -.83). Therefore, for the purpose of this study, I decided to combine the two factors (with TAS-DIF reversed) into one Emotional Clarity Index. Specifically, I scored the items on the TAS-DIF in the opposite direction so that those which were reverse-scored previously were no longer reverse-scored and vice versa. I then summed all of the items from the TAS-DIF and TMMS-C to form the Emotional Clarity Index.

4.2.1.2.3.4 Emotional expressivity. A one-factor emotional expressivity model was tested. Four EES testlets were used as observed indicators: Emotional (E), Express (Ex), Cannot Hide (H), and Cannot Inhibit (I). EES-E was the average of five items (4r, 6r, 10r, 13, 15); EES-Ex was the average of four items (1r, 2r, 5, 11); EES-H was the average of four items (8, 9, 16r, 17r); EES-I was the average of four items (3r, 7r, 12r, 14r). The fit of the model (presented in Appendix C Figure C14) was good (χ^2 = 5.98, df = 2, p = .050; χ^2/df = 2.990; CFI = .991, RMSEA = .094) and it was used to compute the Emotional Expressivity index in the current study.

4.2.1.2.3.5 Emotional lability. A three-factor emotional lability model was tested. It consisted of three latent variables based on the three factors from the Affect Lability Scale (ALS): Anger, Anxiety/Depression (A/D), and Depression/Elation (D/E). The fit of the three-factor model was good (χ^2 = 236.07, df = 129, p < .001; χ^2/df = 1.830; CFI = .946, RMSEA = .061) and better than the one-factor model (χ^2 = 282.61, df = 132, p < .001; χ^2/df = 2.141; CFI = .924, RMSEA = .071; $\Delta\chi^2$ = 46.54, df = 3, p < .001, χ^2/df = 15.513). The correlations between the three factors (presented in Appendix C Figure C15) were: .63 for Anger and D/E; .77 for Anger and A/D; .74 for D/E and A/D. Emotional lability was measured using these three separate factors in this study.

4.2.1.2.4 Responses to Distress

4.2.1.2.4.1 Urgency. A one-factor urgency model was tested. It consisted of one latent variable (Urgency) and twelve observed indicators that were the Urgency scale items from the UPPS. The fit of the model (presented in Appendix C Figure C16) was adequate (χ^2 = 107.19, *df* = 50, *p* < .001; χ^2/df = 2.144; CFI = .942, RMSEA = .071) and the twelve items were used to compute the Urgency index for the study.

4.2.1.2.4.2 Distress tolerance. Two separate models were tested for distress tolerance. One was based on the S-DTS and the other was based on the C-DTS. I compared three S-DTS models: four factor, three factor and one factor. The four-factor model (refer to Appendix C Figure C17) fit better (χ^2 = 160.97, *df* = 83, *p* < .001; χ^2/df = 1.939; CFI = .948, RMSEA = .065) than the one-factor model (χ^2 = 222.79, *df* = 89, *p* < .001; χ^2/df = 2.503; CFI = .910, RMSEA = .082; $\Delta\chi^2$ = 61.82, *df* = 6, *p* < .001, χ^2/df = 10.303); however, the latent variables Tolerance and Absorption were highly correlated (*r* = .99). Therefore, I decided to test a three-factor model by setting the correlation between Tolerance and Absorption to 1. Although this model did not fit better than the four-factor model, it fit relatively well (χ^2 = 173.02, *df* = 84, *p* < .001; χ^2/df = 2.060; CFI = .940, RMSEA = .065; $\Delta\chi^2$ = 12.05, *df* = 1, *p* < .001, χ^2/df = 12.050) and was used to compute the indexes for the S-DTS.

For the C-DTS, I compared a three and one-factor model. The three-factor model (refer to Appendix C Figure C18) fit much better (χ^2 = 156.18, *df* = 73, *p* < .001; χ^2/df = 2.139; CFI = .804, RMSEA = .071) than the one-factor model (χ^2 = 315.46, *df* = 76, *p* < .001; χ^2/df = 4.151; CFI = .437, RMSEA = .119; $\Delta\chi^2$ = 159.28, *df* = 3, *p* < .001, χ^2/df = 53.093). The correlations between the three factors were: .44 for Anticipate & Distract and Avoidance of Affect; .75 for Anticipate & Distract and Accept & Manage; .43 for Avoidance of Affect and Accept & Manage. All three factors were used in the current study.

4.2.1.2.5 Self-Soothing and Self-Attacking

4.2.1.2.5.1 Self-compassion. A four-factor model of self-compassion was tested. The latent variables were based on three factors from the SCS (i.e., Self-Kindness, Common Humanity, Mindfulness) and one factor from the FSCRS (i.e., Self-Reassuring). The observed indicators were the items that belonged to each of those subscales. The fit of the model (presented in Appendix C Figure C19) was adequate (χ^2 = 415.63, *df* = 178, $p < .001$; χ^2/df = 2.335; CFI = .890, RMSEA = .077). I did not test other models because the correlations between the factors were modest and did not suggest a simpler model. The correlations were as follows: .73 between Self-Kindness and Self-Reassuring; .68 between Self-Kindness and Mindfulness; .56 between Self-Kindness and Common Humanity; .48 between Self-Reassuring and Common Humanity; .49 between Self-Reassuring and Mindfulness; .58 between Common Humanity and Mindfulness.

4.2.1.2.5.2 Self-criticism. I tested a five-factor and two-factor model of self-criticism. The latent variables were based on three factors from the SCS (i.e., Self-Judgment, Overidentification, Isolation) and two factors from the FSCRS (i.e., Inadequate Self, Hated Self). The observed indicators were the items that belonged to each of those subscales. The fit of the five-factor model (presented in Appendix C Figure C20) was adequate (χ^2 = 603.66, *df* = 308, $p < .001$; χ^2/df = 1.960; CFI = .915, RMSEA = .065); however, correlations between four of the factors were moderate to high (r = .70 to r = .89). Therefore, I decided to test the fit of a two-factor model by setting correlations between four of the factors to 1 (i.e., Self-Judgment, Overidentification, Isolation, Inadequate Self). Since the fit of the two-factor model was also adequate (χ^2 = 652.09, *df* = 314, $p < .001$; χ^2/df = 2.077; CFI = .902, RMSEA = .069; $\Delta\chi^2$ = 48.43, *df* = 6, $p < .001$, χ^2/df = 8.072), I decided to measure self-criticism using two indexes in this study: Self-Criticism and Self-Hate.

4.2.1.3 Normality and Outlier Analyses

4.2.1.3.1 Univariate normality. Univariate normality was explored by examining absolute values of univariate skew and kurtosis and the Kolmogorov-Smirnov test of normality (i.e., as a

goodness-of-fit test of the sample distribution). This was the same procedure used in Study 1a. A summary of the skew, kurtosis, Kolmogorov-Smirnov statistics and significance values for the total scale and subscales are provided in Appendix D Table D1.

Considering the nature of the variables studied (e.g., neglect and invalidation in childhood), there were a number of scales for which I did not expect a normal distribution. In line with this expectation, several of these totals were identified as non-normal by the Kolmogorov-Smirnov statistic. For example, for scales with low endorsement rates of items, such as the childhood neglect (MNBS-SF) and invalidation (ICES) questionnaires, I expected to find a positively skewed distribution.

To determine if additional measures (e.g., transformations) were required to address departures from univariate normality, I informally examined distribution plots of the total scores against the normal curve. I decided to leave scales with non-normal distributions untransformed given the difficulties with the interpretation of transformed variables.

4.2.1.3.2 Univariate and multivariate outliers. Univariate and multivariate outliers were examined for the entire sample. Cases with scores more than three standard deviations away from the mean were identified for each variable ($z > 3.29$, $p < .001$; Tabachnick & Fidell, 2007). Only one extreme outlier was identified on the Neglect scale. This outlier was flagged for potential removal at later stages of analyses.

Given the high number of combinations of multivariate variables, additional analyses were conducted for multivariate outliers using IBM SPSS Amos version 19 (Arbuckle, 2010). All variables were entered simultaneously to examine the Mahalanobis distance (*d*-squared) for each observation, along with Mardia's coefficient of multivariate kurtosis. This analysis requires complete data for all variables; therefore missing values were imputed using mean substitution (less than 2% of the data was estimated).

Using a chi-squared distribution with $p < .001$ and degrees of freedom based on the number of variables in the sample, we identified a critical value (χ^2 critical) for each analysis. Participants scoring above this criterion were identified as multivariate outliers. Three participants were identified as

multivariate outliers (χ^2 critical = 84.03, *df* = 48) in the analysis (one of which was also identified as the univariate outlier). Values of Mardia's coefficient of multivariate kurtosis above 1.96 suggest significant non-normality (Arbuckle, 2006). I found a high value for this indicator on the multivariate normality analyses (133.94 [*c.r.* = 14.50]. When the multivariate normality analysis was re-run with the identified outliers excluded, Mardia's coefficient remained elevated (111.43 [*c.r.* = 11.98]).

Although three outliers were identified in the univariate and multivariate analyses, I chose not to exclude the cases arbitrarily because outliers are not always influential cases. Instead, the cases were flagged and I completed influence analyses[5] for the regressions described later in the Results section. The regressions were completed with and without the inclusion of identified influential cases and both results are reported only when a discrepancy was found.

4.2.1.4 Reliability Analysis, Descriptive Statistics and Correlational Analyses

The means, standard deviations and internal consistency reliabilities (Cronbach's alphas) for the psychometric variables are provided in Appendix D Tables D2 to D5 (range α = .46 to α = .94). The co-efficient alpha for the MSI-BPD was .80. The various constructs, their subcomponents and their reliabilities are presented in Figures 1 to 5 below. Correlations between conceptually-related variables are presented in Appendix D Tables D6 to D10.

[5] To examine for the presence of influential cases, standardized DFBETAS were produced from the regression analyses, and cases that had a value of greater than 1.0 (Tabachnick & Fidell, 2007) were identified. These cases were dropped from the analysis and the regressions were re-done. I only report results of each analysis if a discrepancy in significance level was found.

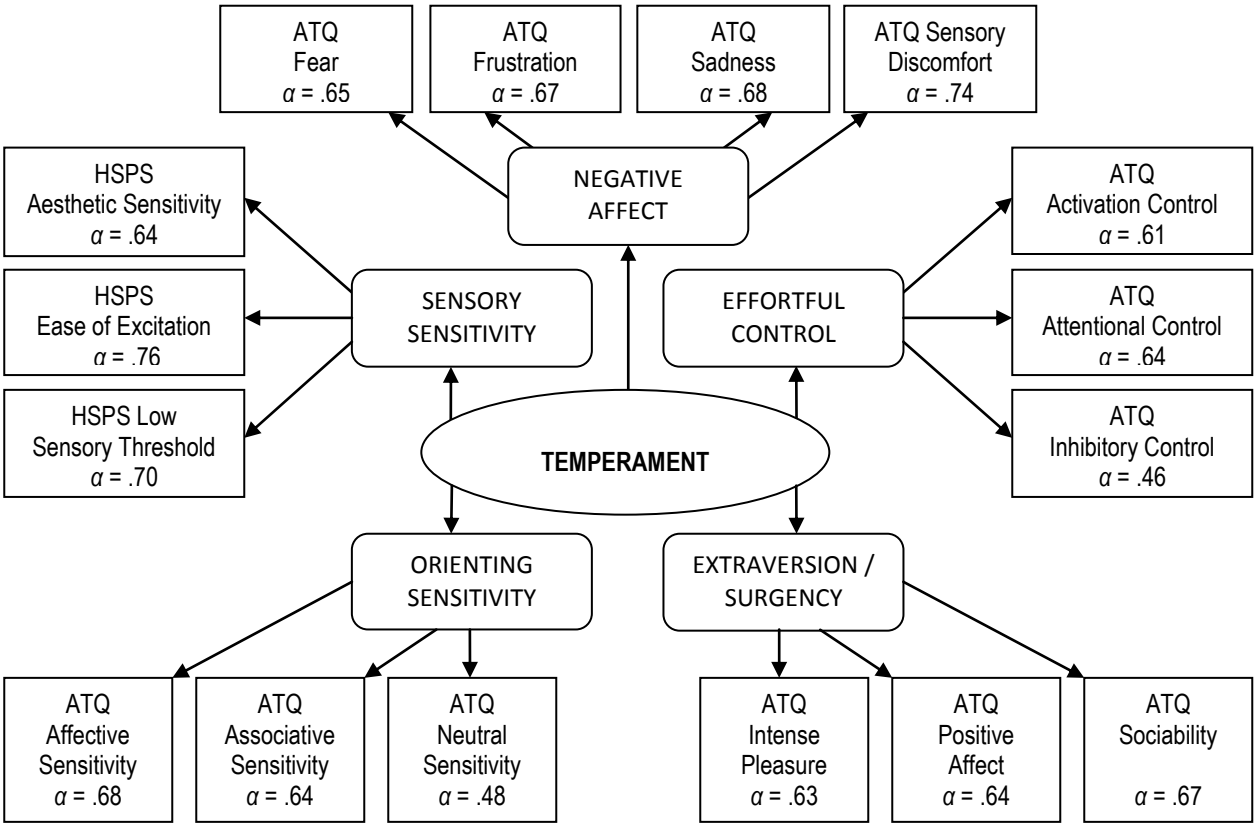

Figure 1.

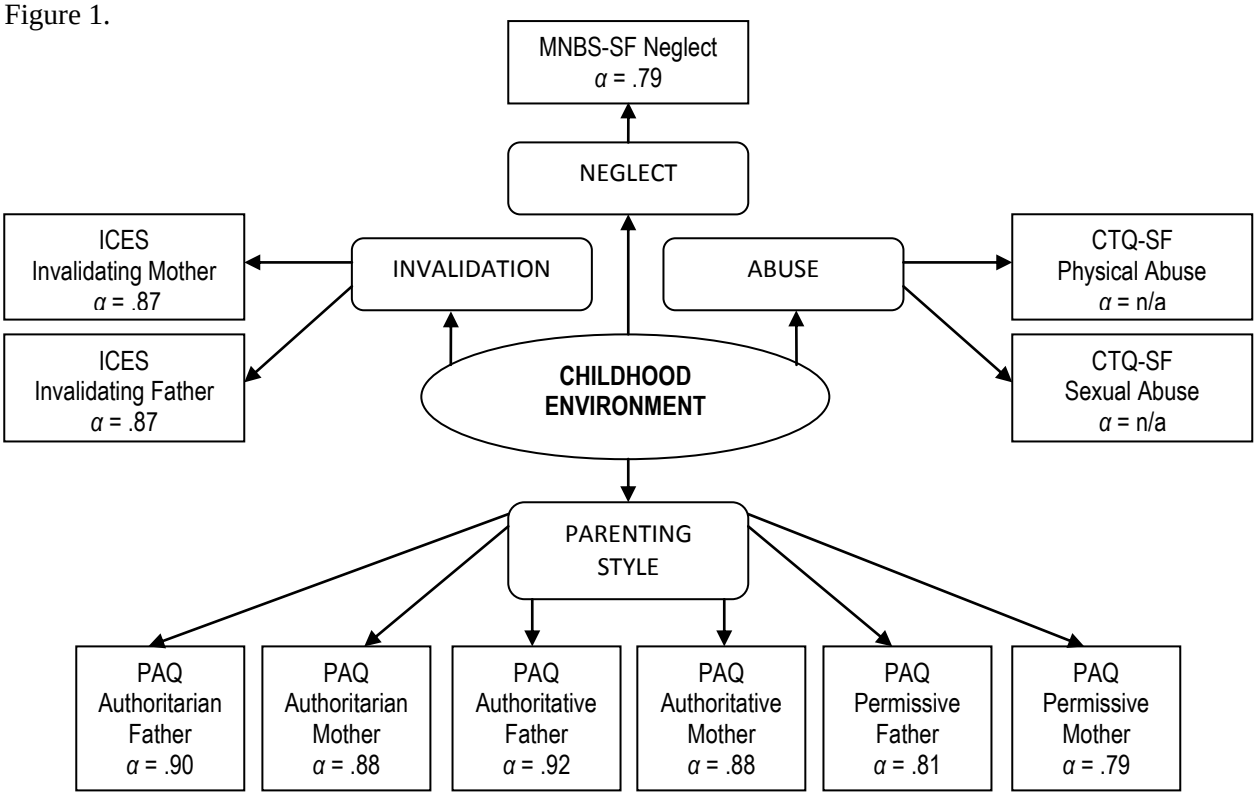

Figure 2.

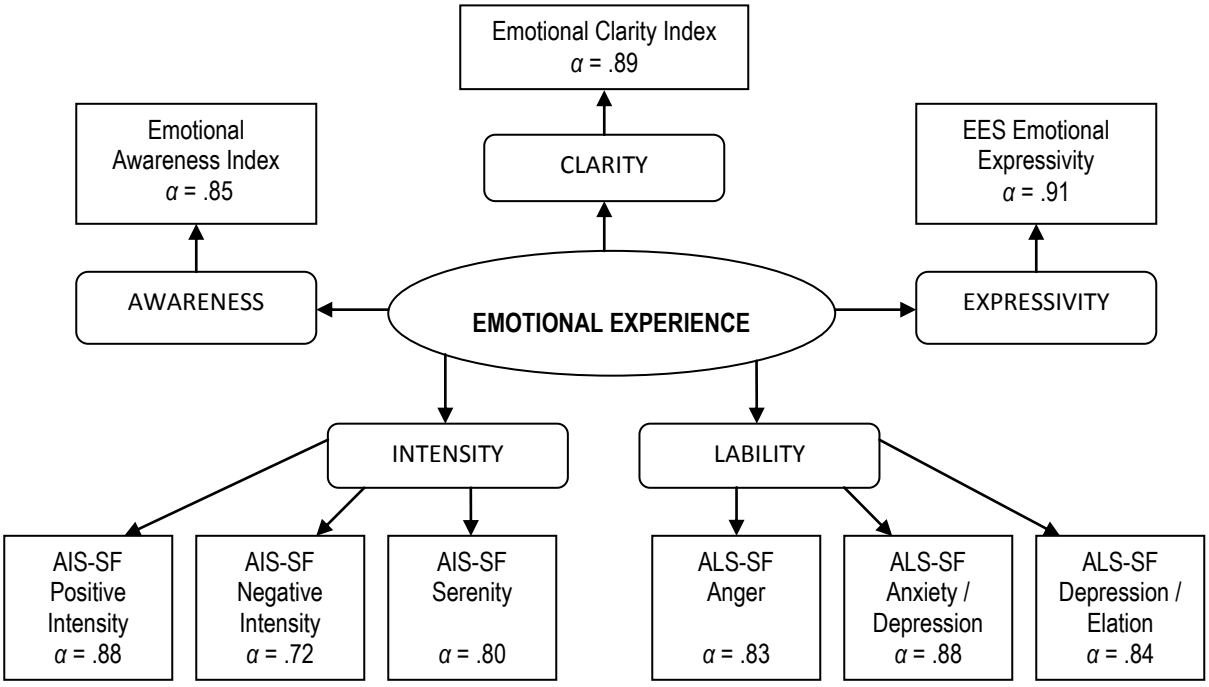

Figure 3.

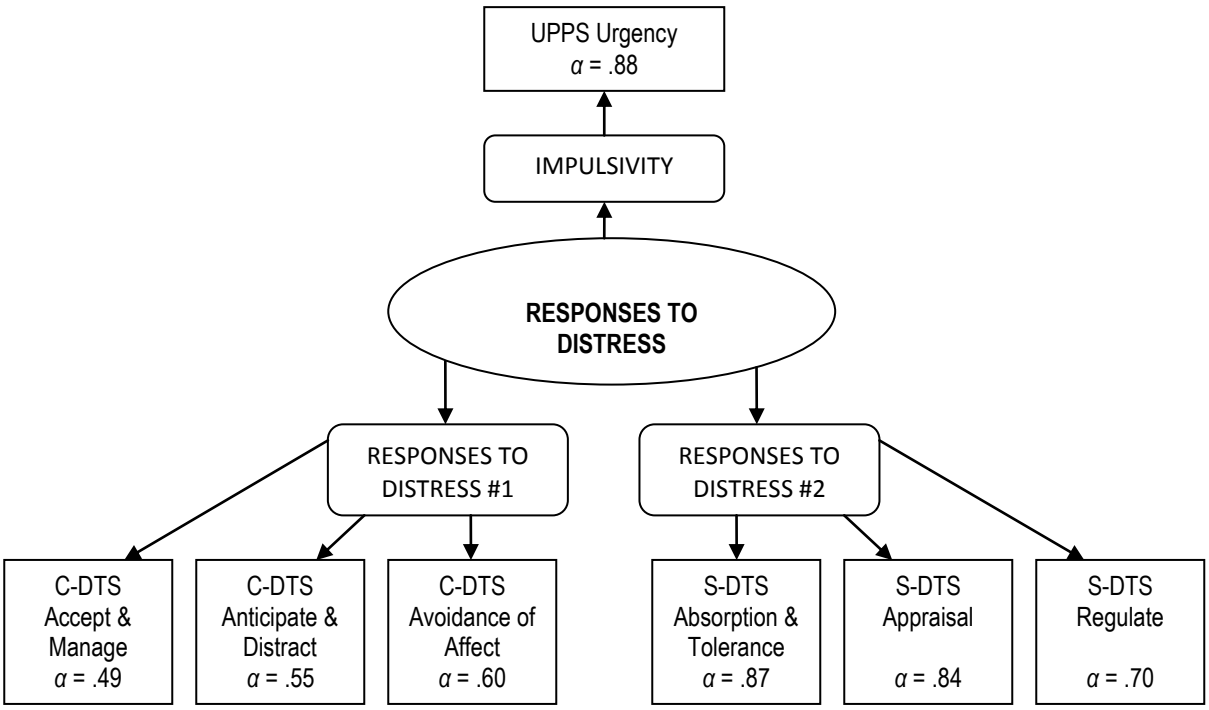

Figure 4.

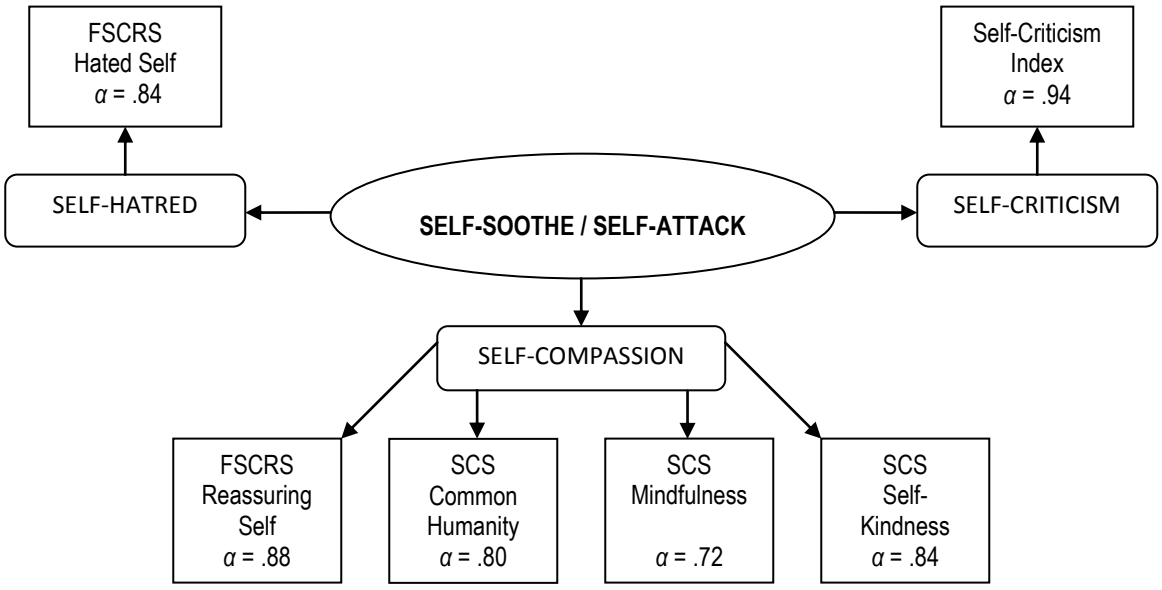

Figure 5.

4.2.2 Results from Regression Analyses

The following set of analyses examined the relation between the predictor variables (temperament, environment, emotional experience, distress tolerance, self-soothing) and scores on the MSI-BPD. I centered the predictor variable scores using the means from the whole sample. Centering shifted the scale of each variable, making the new means equal to zero. This allowed for easier interpretation of parameter estimates (regression coefficients, or betas) and interaction terms.

4.2.2.1 Temperament, Environment, and BPD

The independent variable in this set of analyses was temperament, as measured by the Adult Temperament Questionnaire (ATQ; Evans & Rothbart, 2007) and HSPS. The moderating variables reflected different aspects of one's childhood environment (i.e., presence/absence of abuse and/or neglect; parenting style; degree of invalidation). The dependent variable was the score on the MSI-BPD.

Prior to examining interactions between temperament and environment, I ran two separate simultaneous regressions – one to determine which aspects of temperament best predict BPD features and another to determine which aspects of the environment best predict BPD features. The results for

the separate analyses, presented in Appendix E (Tables E1 and E2, respectively), suggested several relevant associations between adult temperament and BPD, as well as early environment and BPD. As a group, the temperament variables accounted for 31.0 percent of the variance in scores on the MSI-BPD [F (16, 206) = 5.77, $p < .001$] and the environment variables accounted for 29.6 percent of the variance [F (11, 200) = 7.763, $p < .001$] when considered separately from the temperament variables. Among the temperament variables, scores on ATQ-sadness and ATQ-associative sensitivity uniquely predicted higher scores on the MSI-BPD, whereas scores on ATQ-positive affect uniquely contributed to scores on the MSI-BPD in the opposite direction. Among the environment variables entered into the regression, childhood sexual abuse predicted variance in scores on the MSI-BPD.[6]

To examine predicted interactions between temperament and environment, a series of hierarchical multiple regression analyses were run with a common structure: measures of a single temperament construct entered in Block 1, all 11 environment variables in Block 2, and the interactions between the two in Block 3. Model summaries for the seven regressions are presented in Tables E3/E3a, E5, E7, E9, E11, E13/E13a, and E15. A table of the regression coefficients corresponding to the seven final regression models appear in Tables E4, E6, E8, E10, E12, E14 and E16.

Unique contributions for interaction terms explaining variance in scores on the MSI-BPD were found in two of the seven analyses. In particular, the following linear interactions showed the predicted pattern: HSPS Ease of Excitation and Environment (R^2 *change* = .07, p = .028; refer to Tables E3a and E4); ATQ Negative Affect and Environment (R^2 *change* = .19, p = .030; refer to Tables E13a and E14).

4.2.2.2 Individual Differences in Emotional Experience and BPD

In addition to the association between temperament, environment and BPD, I also examined the predictive value of individual differences in emotional experience on MSI-BPD scores. The summary

[6] Eleven participants reported a history of childhood sexual abuse (CSA). Some of these participants also reported childhood physical abuse (CPA). I decided not to divide this group into subgroups (i.e., CSA with CPA and CSA without CPA) because the sample sizes would have been very small. I also ran a between-subject ANOVA using three groups: childhood sexual abuse and physical abuse (CSA; n = 11), childhood physical abuse only (CPA; n = 28), and no abuse (n = 184). The model was significant F (2, 220) = 9.86, $p < .001$, with lower scores on the MSI-BPD in those who were never abused; the CSA and CPA groups did not differ from each other.

of the standard regression analysis is presented in Table E17. Among the emotional experience variables, Emotional Awareness and Affect Lability - Anger were strong, unique predictors of higher scores on the MSI-BPD. In contrast, scores on Emotional Clarity were associated with lower scores on the MSI-BPD. Individual differences in affect intensity and emotional expression were not significant predictors of scores on the MSI-BPD. The combination of scores on all nine indexes explained 31.9 % of the total variance in scores on the MSI-BPD [F (9, 210) = 10.91, $p < .001$].

4.2.2.3 Distress Tolerance and BPD

A separate standard regression was run to explore the predictive value of distress tolerance on scores on the MSI-BPD. The combined set of seven predictors accounted for approximately 29.5% of the variance in scores on the MSI-BPD [F (7, 212) = 12.66, $p < .001$]. S-DTS Appraise and UPPS Urgency emerged as unique predictors of higher scores on the MSI-BPD (refer to Table E18). C-DTS Anticipate & Distract was a strong predictor of lower scores on the MSI-BPD. These results suggest that the tendency to act in a rash manner when experiencing high levels of negative affect, as well as the tendency to respond to distress by judging oneself, is positively associated with BPD features. The ability to anticipate distress and distract oneself from these feelings is negatively associated with BPD features.

4.2.2.4 Self-Soothing, Self-Attacking and BPD

A standard regression was run to explore the predictive value of self-soothing and self-attacking on scores on the MSI-BPD. The combined set of six predictors accounted for approximately 27.0% of the variance in scores on the MSI-BPD [F (6, 215) = 13.26, $p < .001$]; however, only FSCRS Hated Self emerged as a strong unique predictor of higher scores on the MSI-BPD (refer to Table E19). These results suggest that the tendency to respond to perceived failure with intense self-criticism (e.g., verbal attacks on the self, shame/disgust with self) is positively associated with BPD features.

4.2.2.5 Temperament, Environment, Temperament x Environment, Emotional Experience, Responses to Distress, Self-Soothing/Self-Attacking and BPD

To examine the relative contribution of the various predictors to scores on the MSI-BPD, I ran a final hierarchical multiple regression using only the strongest predictors from the previous analyses. The following structure was used: seven temperament variables were entered in Block 1; seven environment variables were entered in Block 2; eight temperament and environment interaction variables were entered into Block 3; three emotional experience variables were entered into Block 4; three distress tolerance variables were entered into Block 5; one self-soothing variable was entered into Block 6. The model summary for the regression is presented in Table E20 and the regression coefficients corresponding to Block 5 appear in Table E21. I also ran a second analysis switching the order of the temperament and environment variables (i.e., the seven environment variables were entered into Block 1, the seven temperament variables were entered in Block 2); the results were very similar and the model summary for this regression is presented in Table E20a.

Each Block, with the exception of Block 6, contributed to explaining the variance in scores on the MSI-BPD (R^2 *change* = .04 to .24). As seen in Table E20, the combined set of predictors in Block 5 accounted for approximately 59.1% of the variance in scores on the MSI-BPD [F (3, 181) = 5.61, p = .001]. The following emerged as unique predictors of higher scores on the MSI-BPD (refer to Table E21): Neglect; HSPS Ease of Excitation x Physical Abuse Only; ATQ Fear x Neglect; ATQ Sadness x Invalidating Father; Emotional Awareness Index; and UPPS Urgency. In contrast, the following emerged as unique predictors of lower scores on the MSI-BPD: ATQ Sensory Discomfort and ATQ Sadness x Neglect.

The results of recent research by Fink, Anestis, Selby, and Joiner (2010) suggested that urgency may mediate the relationship between alexithymia and dysregulated behaviors. Although the Emotional Clarity Index only includes one aspect of alexithymia (i.e., difficulty identifying feelings), I decided to examine the relationship between the emotional experience variables, urgency, and scores on the MSI-BPD using partial correlations. The zero-order and partial correlations between Emotional Awareness

Index, Emotional Clarity Index, Affect Lability – Anger, Urgency and MSI-BPD scores are presented in Table E22.

The zero-order correlations ranged from *r* = -.04 (between the Emotional Awareness Emotional Clarity Indexes) to *r* = .56 (between Affect Lability – Anger and Urgency). Controlling for Emotional Awareness or Emotional Clarity did not result in marked changes in the associations between the variables. In contrast, controlling for Affect Lability- Anger resulted in weaker associations between the Emotional Clarity Index and BPD symptoms (*r* = -.31 decreased to *r* = -.14) and between Urgency and BPD symptoms (*r* = .47 decreased to *r* = .27). Similarly, controlling for Urgency resulted in weaker associations between the Emotional Clarity Index and BPD symptoms (*r* = -.31 decreased to *r* = -.14) and between Affect Lability- Anger and BPD symptoms (*r* = .46 decreased to *r* = .28). These results suggest that there is a strong relationship between affect lability (with respect to anger) and urgency and that both may partially mediate the relationship between poor emotional clarity and BPD symptoms. In contrast, controlling for these variables had less of an impact on the relationship between emotional awareness and BPD symptoms; the association remained significant (*r* = .27) even when both variables were controlled.

4.3 Discussion

The present investigation evaluated the contribution of aspects of temperament, childhood environment and the interaction of the two to BPD traits. Findings were consistent with hypotheses. First, aspects of both temperament and childhood environment were significant predictors of BPD traits, each explaining approximately 30% of the variance in scores on the MSI-BPD when considered separately. Although numerous dimensions of temperament were associated with BPD (e.g., factors of ATQ Negative Affect, ATQ Effortful Control, ATQ Orienting Sensitivity, and HSPS) only a few emerged as unique predictors in the simultaneous regression analysis. Specifically, ATQ Sadness and Associative Sensitivity predicted higher scores on the MSI-BPD; ATQ Positive Affect predicted lower scores on the MSI-BPD.

ATQ Sadness is a subscale of the Negative Affect factor that reflects lower mood and energy following exposure to suffering, disappointment, or object loss. Several studies have documented the centrality of negative affect to BPD (Bradley et al., 2005; Skodol et al., 2002; Trull, 2001; Zanarini, Frankenburg, DeLuca et al., 1998). In fact, the presence of "chronic low-grade depression" or "one or more major depressive episodes" in the past two years is among the items on the Affect Section of the Diagnostic Interview for Borderlines – Revised (DIB-R; Gunderson & Zanarini, 2006). The finding is also in line with findings from a longitudinal study conducted by Johnson, Cohen, and Kasen (2009) that showed an association between depressive symptoms during adolescence and BPD during adulthood.

The ATQ Associative Sensitivity is a subscale of the ATQ Orienting Sensitivity factor, which is thought to reflect a broad attentional construct. According to the scoring instructions that accompany the ATQ-SF, ATQ Associative Sensitivity assesses the frequency and remoteness of automatic, or spontaneous, cognitive activity that is not directly related to associations with the environment (Evans & Rothbart, 2007). Based on the item content (e.g., "Sometimes my mind is full of a diverse array of loosely connected thoughts and images," and "I sometimes dream of vivid, detailed settings that are unlike anything that I have experienced when awake."), it is possible that this scale reflects one's tendency to become absorbed by internal experiences or openness to experiences. Indeed, the ATQ Orienting Sensitivity factor has been found to be positively associated with the "Big Five" personality factor Intellect/Openness to Experience (Evans & Rothbart, 2007; Laverdière, Diguer, Gamache, & Evans, 2010; Rothbart, Ahadi, & Evans, 2000).

The role of Openness to Experience with regard to BPD is unclear. Trull (1992) found a modest and positive correlation between Openness to Experience and BPD when using the Revised Personality Diagnostic Questionnaire (PDQ-R) in a clinical sample. Avia, Sanz, Sánchez-Bernardos, and Martínez-Arias (1995) also identified a significant relationship between BPD and Openness to Experience. Carrillo, Rojo, Sánchez-Bernardos, and Avia (1998) reported that the Openness facet Fantasy predicted certain personality disorders, including BPD. In contrast, the results of Study 1a and findings from

studies by other researchers (e.g., Samuel & Widiger, 2008; Saulsman & Page, 2004; Widiger & Costa, 2002) do not support an association between BPD traits and Openness to Experience.

Since many of these studies, including Study 1a, considered the higher-level Openness factor and not its subfacets (i.e., Fantasy, Aesthetics, Feelings, Actions, Ideas, Values), it is possible that certain associations with BPD features may have been missed. For example, Widiger and Costa (1994) have suggested that high Openness scores are associated with fantasy proneness and dissociative tendencies, both of which have been linked to BPD (e.g., Merckelbach, à Campo, Hardy & Giesbrecht, 2005; Zanarini, Ruser, Frankenburg & Hennen, 2000). Zanarini and colleagues (2000) found that 75% of the BPD patients in their study endorsed experiencing most types of absorption (as measured by the Dissociative Experiences Scale) which suggests that they can turn their attention away from external events. The researchers hypothesized that this may develop as a coping strategy that allows for the individual to turn away from stressors that produce dysphoric affects that are difficult for them to manage. Unfortunately, it can quickly become maladaptive in that the person can become absorbed in their emotional pain.

The negative association identified in the current study between BPD traits and ATQ-Positive Affect is consistent with previous research (including Study 1a) that suggests an inverse relationship between extraversion/positive emotionality and BPD (e.g., Conklin, Bradley, & Westen, 2006; Samuel & Widiger, 2008). However, it should be noted that some researchers (e.g., Conklin et al., 2006) have found that different BPD subtypes may vary in the degree to which they experience positive affect. For example, Conklin and colleagues reported that histrionic-impulsive BPD patients have high levels of positive affect not characteristic of the other subtypes (i.e., internalizing-dysregulated and externalizing-dysregulated).

Consistent with previous research examining reports of neglect and different forms of abuse among those with BPD features (e.g., Zanarini, 2000), the current study found that many aspects of childhood environment (e.g., authoritarian parenting style, invalidating parenting, neglect, abuse) were associated with higher scores on the MSI-BPD. However, only one of these variables emerged as a

unique predictor in the simultaneous regression: childhood sexual abuse (CSA). Although many researchers have found an association between CSA and BPD, it should be noted that CSA is not necessary for the development of BPD. In fact, prior research has indicated only a modest relationship between CSA and BPD symptoms/diagnoses (e.g., meta-analysis conducted by Fossati, Madeddu, & Maffei, 1999; Goodman & Yehuda, 2002). Other researchers have failed to find a relationship between CSA and BPD. For example, in a study of individuals diagnosed with personality disorders, Bierer et al. (2003) found that that childhood experiences of emotional abuse were predictive of BPD, whereas physical and sexual abuse were not. One reason for the inconsistent findings in previous research could be the lack of consideration of temperament in the relationship between CSA and BPD. Specifically, Linehan (1993) suggests that it is the interaction between temperament and childhood environment that may result in BPD traits.

The results of the current study provide support for the interaction of temperament and negative childhood environmental experiences in predicting increased symptoms of BPD. Specifically, when interactions between (i) HSPS Ease of Excitation (EOE) and environment and (ii) ATQ Negative Affect factors and environment, were added into each model, they predicted scores on the MSI-BPD over and above the temperament and environment variables alone. Since each of the individual interaction terms only had a small effect, I only consider the main interaction terms in this discussion. The significant interaction between HSPS EOE (a factor of the temperament trait of sensory-processing sensitivity; Aron & Aron, 1997) and the environment variables suggests that heightened sensitivity to environmental stressors and the tendency to become overwhelmed by stimulation may be a characteristic that, together with a negative environmental context, contributes to the emergence of BPD. Previous research by Meyer, Ajchenbrenner and Bowles (2005) also found a positive relationship between sensory-processing sensitivity and BPD traits, and between problematic experiences/ attachments with early caregivers and BPD traits; however, Meyer et al. did not examine the interaction between these variables. No other studies have examined the association between sensory-processing sensitivity and BPD.

The significant interaction between ATQ Negative Affect and environment is consistent with previous research (e.g., Arens, Grabe, Spitzer & Barnow, 2011; Joyce et al., 2003). Although these other studies did not examine the ATQ Negative Affect factor directly, they measured Harm Avoidance – a temperament trait that has been found to be highly correlated with the personality factor of Neuroticism (e.g., Aluja & Blanch, 2011; De Fruyt, van de Wiele, & Van Heeringen, 2000). The ATQ Negative Affect factor is similar to the broad dimensions of Negative Emotionality and Neuroticism (Rothbart, Ahadi, & Evans, 2000). Joyce et al. (2003) examined the joint effects of retrospective accounts of early childhood adversity and temperament on the diagnosis of BPD symptoms in a sample of depressed outpatients and found that the combination of (i) neglect and abuse experiences and (ii) temperamental Harm Avoidance (HA) and Novelty Seeking (NS) accounted for significant variance in the development of BPD.

More recently, Arens et al. (2011) examined longitudinally whether temperamental traits HA and NS, internalizing and externalizing disorders, trauma and perceived invalidating parenting style (as measured during adolescence) contributed to the risk of BPD, diagnosed on the basis of standardized clinical interviews 5 years later. They compared individuals with BPD from a community sample of young adults to individuals with depressive disorders and psychiatrically healthy participants. They found that those diagnosed with BPD in young adulthood exhibited an increased level of HA in adolescence; however, there was only a trend in the comparison with depressive subjects. Their analyses also showed that a difficult temperament alone did not predict BPD; however, the interaction of heightened HA and an invalidating parenting style by the mother during adolescence predicted a BPD diagnosis in young adulthood. They did not identify a significant relationship between NS and BPD.

Together, the results of the current study and past research suggest that temperamental traits related to sensitivity (e.g., Aron & Aron's (1997) sensory-processing sensitivity) and negative emotionality (e.g., Rothbart, Ahadi, and Evans' (2000) Negative Affect; Cloninger's (1987) Harm Avoidance) may be among the temperamental variables that, in conjunction with childhood adversity/ environmental stressors, result in increased symptoms of BPD. Thus, these findings support Linehan's (1993) biosocial theory and

the developmental psychopathology perspective in that support was found for the interaction of temperament and psychosocial variables in the prediction of BPD symptoms.

The current study also sought to examine the role of different aspects of emotional experience in predicting BPD traits. The findings suggest that increased attention to emotional state (or absorption), decreased emotional clarity/difficulty identifying feelings and increased affect lability (particularly with respect to anger) predicted the presence of BPD traits in this non-clinical sample. Affect intensity and expressivity did not emerge as significant predictors of BPD traits.

In Gohm and Clore's (Gohm, 2003; Gohm & Clore, 2000, 2002a, 2002b) process model of emotion, an emotional episode/experience begins with an affective reaction to relevant internal or external cues in one's environment. After the detection of affect, the individual directs their attention and awareness to their affective experience; however, the extent to which they do this is related to how much they typically attend to and value affective cues. Attention to one's emotions is followed by attempts to attribute the affective experience to the relevant source, which is related to one's ability to identify and understand his/her emotions (i.e., clarity; Gohm & Clore, 2000, 2002b). Successful identification and attribution of emotion provides direction for adaptive responding. Gohm and Clore (2000) suggest that disruption at any of these levels (detection, attention, clarity) may affect an individual's ability to successfully adapt to internal and external emotional events.

As noted above, the results of the current study suggest that individuals with BPD traits are more likely to report increased attention to their emotional experience. These findings are consistent with that of Study 1a. Although awareness of emotions is an important aspect of emotional experience, the amount of attention one pays to one's emotions may be moderated by both one's sensitivity to physiological changes associated with varying levels of affect (Larsen, 2000) and/or one's ability to identify and label one's emotions once attending to them (Gohm & Clore, 2000). Furthermore, some researchers have suggested that hypervigilance to one's feelings can be associated with negative consequences. For example, Sloan (2005) found that dysphoric individuals report significantly greater levels of self-focused attention than non-dysphoric individuals and concluded that such differences may be related to the maintenance of

negative mood states among dysphoric individuals. Similarly, Swinkels and Giuliano (1995) found that individuals reporting elevated levels of attention to and absorption in emotions scored higher on an index of neuroticism. Therefore, it is possible that excessive attention to emotional state and the tendency to direct awareness inward may contribute to rumination and worrying, whereas moderate levels of awareness/attention towards emotions may allow one to better identify what he or she is feeling and enable an adaptive response to that affective experience.

In contrast, Lischetzke and Eid (2003) suggested that attention to emotions is neither beneficial nor harmful to one's emotional well-being; rather, it is the presence of effective emotional regulation skills that is relevant. They proposed that in individuals who are proficient at regulating their affective experiences, frequent direction of attention inward enhances regulatory abilities and promotes affective well-being. On the other hand, individuals who lack effective emotion regulation skills may experience increased emotional discomfort by turning their attention inward. In the current study, both attention to emotions and affective lability (particularly related to anger) were significant predictors of BPD traits when considered simultaneously. Therefore, it appears that both attention inward and problems regulating emotions contribute to the presence of BPD symptoms.

Gohm (2003) suggested that confusion about one's emotions (i.e., lack of clarity), coupled with high affect intensity, likely produces a particularly aversive emotional experience. In this case, the individual may be routinely flooded with intense emotions but difficulty identifying the feelings prevents them from using the affective information for purposes of adaptive emotion regulation. Gohm (2003) found that individuals who reported high affect intensity and low emotional clarity were the most likely to report engaging in attempts to attenuate their mood when experiencing intense affect. Gohm also found that mood attenuation in these individuals was associated with impaired judgment. Bradley and Lang (2007) suggested that the failure to adaptively regulate emotions, especially those that are intense and negatively valenced, may lead one to experience affect as overwhelming and intolerable, and that such experiences may give rise to the development of maladaptive approaches to regulating emotion. Barrett et al. (2001) found that individuals who experience intense negative emotions and possess the ability to

differentiate among their emotions in a discrete and granular fashion are more likely to engage in adaptive emotion regulation than individuals who do not possess such skills. Thus, as individuals who typically experience their emotions with high intensity may be most motivated to seek a means of attenuating their affective experience, the addition of poor emotion identification and differentiation skills may leave one with few options and lead to the selection of maladaptive strategies for regulating intense affect.

Although affect intensity was not a significant, unique predictor of BPD traits in the current study, lack of emotional clarity/difficulty identifying feelings and affect lability (anger) emerged as significant predictors among the emotional experience variables. These results contribute to recent research examining the role of emotional processing and regulation in BPD and are in line with the findings of a Leible and Snell (2004) study conducted with university students. Leible and Snell (2004) found that higher scores on a BPD index were associated with lower scores on emotional clarity and emotional regulation. Furthermore, Webb and McMurran (2008) found that alexithymia was a significant predictor of BPD traits. Relationships between alexithymia and BPD have been found in both non-clinical (e.g., Modestin, Furrer, & Malti, 2004) and clinical (e.g., Berenbaum, 1996) samples. Although I did not examine all dimensions of alexithymia in the current study, items from the Difficulty Identifying Feelings subscale of the Toronto Alexithymia Scale (TAS; Bagby et al., 1994) were used in the Emotional Clarity subscale. Apfel and Sifneos (1979) conceptualized alexithymia as a multi-faceted construct involving (i) difficulty identifying emotions and distinguishing them from bodily sensations, (ii) difficulty describing emotions, and (iii) a concrete thinking style. Researchers have theorized that the inability to understand affective and physiological experiences inherent in alexithymia might prompt individuals to engage in maladaptive behaviors in an effort to regulate emotions. Among the maladaptive behaviors that have been found to be related to alexithymia include: binge/emotional eating (e.g., Wheeler, Greiner, & Boulton, 2005; Carano et al., 2006; Larsen, van Strien, Eisinga, & Engels, 2006); substance abuse and dependence (e.g., Loas et al., 1997; Taylor, Parker, & Bagby, 1990); and self-injurious behaviors (Zlotnick et al., 1996; Paivio & McCulloch, 2004).

In the current study, the strength of the relationship between emotional clarity and BPD traits diminished once (negative) urgency was introduced into the simultaneous regression. Negative urgency is the tendency to act rashly when experiencing negative affect. Fink and colleagues (2010) found that negative urgency (Whiteside & Lynam, 2001; Cyders et al., 2007) mediated the relationship between alexithymia and dysregulated behaviors in a sample of undergraduate students. They suggested that the relationship between alexithymia and behavior may be explained by a tendency of individuals with high levels of alexithymia to act rashly in an attempt to immediately reduce psychological and physiological sensations associated with negative affect. If this were the case, negative urgency could be thought of as the mechanism that drives dysregulated behaviors in individuals who experience difficulty recognizing and expressing their emotions.

There are, however, studies that have found no relationship between alexithymia and BPD (e.g., Bach, de Zwaan, Ackard, & Nutzinger, 1994; De Rick & Vanheule, 2007). Semerari et al. (2005) have suggested that there may be different malfunctioning profiles within the diagnostic category of BPD and that alexithymia may be characteristic of only some individuals, most probably those with dissociative symptoms. Research using more detailed analyses of both BPD traits and facets of alexithymia with clinical populations would be required to clarify the relationship.

The finding that affect instability, particularly with respect to anger, is related to BPD is consistent with both theoretical perspectives of BPD and other research. Trull et al. (2008) compared affective instability in patients diagnosed with BPD and those diagnosed with Major Depressive Disorder (MDD) in their natural environments and found that the degree of variability and instability of affect, the frequency of mood changes, and the amplitude of these changes distinguished patients with BPD from those with MDD. The findings were consistent with the conceptualization of affective changes in BPD being rather abrupt, large in magnitude, and likely brought on by external events. Trull and colleagues also found that hostility was the only negative affect in which the probability of acute change distinguished the groups. Similarly, McGlashan and colleagues (2005) found that anger and affective instability were among the

most prevalent and least changeable criteria over a two-year period among individuals diagnosed with BPD; the other criterion was impulsivity.

Several theorists, including Linehan (1993), suggest that affective instability (or emotional dysregulation) may in fact be the driving force behind many of the behaviors exhibited by individuals with BPD traits. Linehan views these behaviors as maladaptive attempts to regulate intense affective states or to control problematic outcomes associated with these affective states. According to this perspective, the impulsive behaviors (including suicidal gestures, substance abuse, binge eating) may be conceived as maladaptive solutions to the experience of painful negative affect; identity disturbance is proposed to result from a lack of emotional consistency and predictability; and disturbed interpersonal relationships may result from difficulties regulating emotional states and impulses. As another example, it has been proposed that those with BPD may be especially vulnerable to developing substance use disorders because alcohol or drugs may be used to cope with negative affective states. Therefore, affective instability can be quite dysfunctional in its own right and may well contribute to other symptoms and features of BPD.

The other construct assessed in the current study was distress tolerance. Distress tolerance refers to the actual or perceived ability to withstand negative emotional states (Simons & Gaher, 2005). Difficulties tolerating distress have been conceptualized by some researchers as a specific type of emotion regulation difficulty (Gratz & Roemer, 2004). The results of the current study suggest that individuals with BPD traits tend to evaluate themselves and their experience negatively when feeling distressed - they have trouble accepting feelings of distress, they are more likely to feel ashamed when distressed, and they perceive their ability to cope with distress as inferior to that of others. Furthermore, they are less likely to foresee situations that may produce feelings of distress and distract themselves from distressing emotions. Previous studies have also found that BPD traits are associated with lower levels of distress tolerance (as measured by persistence on stressful behavioral tasks) (Bornovalova et al., 2008; Gratz, Rosenthal, Tull, Lejuez, & Gunderson, 2006).

As noted previously, I also measured negative urgency, a form of impulsivity, in the present study and it was found to be a strong predictor of BPD features. Within the sample as a whole, negative urgency

was associated with poor distress tolerance - efforts to avoid negative emotions, a desire to rapidly alleviate negative emotions experienced, and reports of being consumed by distressing emotions when they cannot be alleviated (i.e., attention is absorbed by the presence of distressing emotions and functioning is significantly disrupted by the experience of negative emotions). It is possible that individuals with BPD traits develop a belief that they cannot tolerate negative affective states because they have a tendency to act rashly when feeling distressed, thus escaping from the negative affective experience. It is also possible that poor distress tolerance temporally predicts higher levels of impulsivity over time in that the immediate relief of distress becomes reinforcing (Cyders & Smith, 2008). Further research would be needed to examine the differential and temporal associations among behavioral and self-report indices of distress tolerance and negative urgency.

A recent study by Iverson, Follette, Pistorello, and Fruzzetti (2011) examined the association between self-reported emotion dysregulation, distress tolerance, and BPD symptom severity. They found that both emotional dysregulation and poor distress tolerance uniquely predicted symptom severity. Unlike the current study, the researchers also measured experiential avoidance - the unwillingness to remain in contact with uncomfortable private events (e.g., thoughts, emotions, sensations, memories, urges) and the tendency to escape or avoid these experiences (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). Some researchers (e.g., Boulanger, Hayes, & Pistorello, 2010) suggest that experiential avoidance may be understood as a function of emotion dysregulation and poor distress tolerance. Consistent with this argument, Iverson and colleagues found that emotional dysregulation, distress tolerance, and experiential avoidance were strongly related; however, experiential avoidance was the only construct that remained a unique contributor to BPD symptom severity after controlling for depressive symptoms and emotion dysregulation. Their findings replicated and extended previous research that demonstrated an association between experiential avoidance and BPD symptom severity (Chapman, Specht, & Cellucci, 2005; Gratz, Tull, & Gunderson, 2008) and research showing that reducing experiential avoidance is an important mechanism of change in the treatment of BPD (Berking, Neacsiu, Comtois, & Linehan, 2009).

The final construct examined was that of self-soothing and self-attacking, which consisted of self-compassion, self-criticism and self-hatred. When these indexes were entered simultaneously, self-hatred emerged as the only significant predictor of BPD traits. However, self-hatred did not contribute to predicting BPD symptoms over and above the other variables reviewed (i.e., temperament, environment, emotional experience, distress tolerance and urgency).

Overall, the results of the current study and past research suggest that a complex array of factors are associated with BPD symptoms. These include: temperament, environment, the interaction between temperament and environment, increased attention to emotional state, affect lability (particularly anger), poor distress tolerance, and negative urgency. The association between BPD symptoms and difficulties identifying feelings/lack of emotional clarity seemed to be mediated by affect lability and negative urgency. Self-soothing and self-attacking did not predict BPD traits over and above the other variables.

4.3.1 Limitations

In the current study, I was able to obtain an adequate sample size with a minimal amount of missing data. Also, I utilized a non-clinical sample, which resulted in a broad range of symptoms. The use of a non-clinical sample was also a limitation of this study as the childhood backgrounds and symptom profiles of the participants may differ from that in clinical populations. For example, the sample included low base rates of childhood sexual abuse and certain aspects of dysregulated behaviors (e.g., self-injury, suicide attempts). Only 4.8% of participants reported a history of childhood sexual abuse; however, even with a low incidence of childhood sexual abuse, a significant relationship was found between childhood sexual abuse and BPD symptoms. These limitations were likely compounded by studying a relatively homogenous group of university students, whose level of distress was likely lower than that of the average clinical sample. Together, these limitations affect the generalizability of the findings.

Another limitation was reliance on self-report and retrospective accounts of childhood experiences. Participants may over- or under-estimate symptoms, or may have different thresholds for what is, for example, neglectful parental behavior. Retrospective reports of past events may be influenced by cognitive biases and research suggests that individuals with BPD traits may be particularly prone to misinterpreting

and misremembering previous social interactions (e.g., Bailey & Shriver, 1999). Nevertheless, retrospective reports are a common, useful, and often necessary methodology in research. Furthermore, it has been argued that retrospective self-reports may be the best assessment method available for childhood sexual abuse as family members, friends and government agencies are often unaware that the abuse is occurring (Hulme, 2004).

Another potential limitation is the measurement of temperament in adulthood and using it as an index of lifelong and relatively stable traits. There is empirical evidence that suggests that certain aspects of temperament (e.g., negative affect) are moderately stable from birth to age twelve (Roberts & DelVecchio, 2000) and within early adulthood (Vaidya, Gray, Haig, & Watson, 2002). Although measurements of temperament in early adulthood may be accepted as reasonable indicators of temperament throughout the lifespan, longitudinal studies beginning in childhood and extending into adulthood would allow for a more thorough test of the hypotheses in this study. For example, the nature of the interaction between temperament and negative childhood environmental experiences could be outlined more clearly.

Another limitation related to the psychometric properties of some of the scales. Specifically, several of the C-DTS and ATQ subscales have shown low internal reliability in previous studies (e.g., Corstorphine et al., 2007; Evans & Rothbart, 2007; Raykos, Byrne, & Watson, 2009) and in the current study. When reliabilities are low, the strength of the associations between variables can be underestimated.

It should also be noted that there were a large number of statistical tests run in these analyses. Whenever multiple tests are performed, one must consider the possibility that one or more of the significant findings is actually a false discovery (i.e., familywise or experimentwise error rate). Given that this research was conducted in the context of exploration rather than confirmation of the relationships between these constructs, I did not want to be overly conservative in controlling the type I error rate. It will be important to replicate the findings in future research with more conservative criteria.

4.3.2 Study Implications & Future Directions

Despite the limitations noted above, the current study has important scientific and clinical implications. First, the findings provide empirical support for Linehan's (1993) biosocial theory and the role of temperament, the environment, and the interaction between the two in predicting symptoms of BPD. Additional studies need to be done to replicate the associations found in a larger and more representative sample. It would also be useful to compare the associations in clinical and non-clinical samples with BPD traits. Longitudinal studies examining the predictive role of temperament and environment in the development of BPD traits would also be beneficial.

Second, this study adds to existing research characterizing emotional experience and impulsivity in individuals with BPD traits. The results suggest that hypervigilance to one's internal state, lack of emotional clarity, affect lability and negative urgency play an important role in predicting BPD symptoms. These findings have implications for treatment in that, to improve emotional regulation, individuals with BPD traits may benefit from therapy that focuses on helping them to identify and discriminate their feelings/somatic sensations, describe their emotions and feelings to themselves/others, and better understand the source of their feelings. Helping them identify and discriminate emotions may help reduce the feelings of generalized distress that may trigger episodes of lability (particularly anger/hostility) or impulsive behavior. Dialectical behavior therapy (Linehan, 1993), mentalization-based therapy (Bateman & Fonagy, 2008), schema-focused therapy (Young, Klosko, & Weishaar, 2003) and transference-focused psychotherapy (Kernberg, Yeomans, Clarkin, & Levy, 2008) all incorporate emotion regulation strategies that encourage the patient to focus on identifying the feelings that he/she is experiencing in the moment. Considering the positive association between impulsivity (urgency) and low tolerance for distress, individuals with BPD traits may also benefit from treatment strategies designed to improve distress tolerance (e.g., distress tolerance component of Dialectical Behavior Therapy; Linehan, 1993).

Some clinicians and researchers (e.g., Gratz et al., 2006; Linehan, Bohus, & Lynch, 2007) suggest that the impulsivity and self-harm behaviors observed in patients with BPD are attempts to self-regulate emotional experience, including feelings of distress. This perspective suggests that intense emotion may be

interfering with cognitive functioning and effective problem solving (e.g., Wagner & Linehan, 1999). Other researchers have also suggested that the repetitive, self-damaging behavior occurring in the context of BPD may reflect impairments in decision-making and planning cognition. For example, behaviors such as rash and regretted sexual promiscuity, suicidal gestures and substance abuse can be reflective of impulsivity and a failure to consider future consequences (e.g., van Reekum, Links, & Fedorov, 1994). Proponents of this view suggest that individuals with BPD show greater intensity and lability in their emotional response to their environment because they are unable to inhibit or moderate their emotional urges.

A prominent theory in decision making research is the somatic marker hypothesis (SMH; Bechara, Damasio, Damasio, & Anderson, 1994). According to the SMH, physiological states of the body (emotions) guide decisions, often outside of conscious awareness. Given that the findings from the current study suggest that individuals with BPD traits may be hypervigilant to their physiological state but lack clarity into what feelings they are experiencing, it is possible that they would demonstrate impairments in decision making. It is also possible that problems with inhibition or lack of premeditation underlie decision making deficits.

The current study did not explore other forms of impulsivity (e.g., sensation seeking, lack of premeditation) or decision-making. To further explore the associations between different aspects of emotional experience, impulsivity and decision making, I designed an additional study. The third study was designed was to ascertain the relative contribution of individual differences in the following areas to deficits in decision making in individuals with BPD:

(1) Emotional experience (e.g., poor emotional awareness and clarity; increased affective reactivity)

(2) Reinforcement sensitivity (e.g., attention to gains/losses; sensitivity to reward and/or punishment)

(3) Impulsivity

(4) Effortful control/executive functioning

(5) Reversal learning

Chapter 5

Study 3

5.1 Introduction

5.1.1 Implications of Emotional Experience Deficits on Cognitive Processes in BPD

As noted previously, Linehan (1993) suggests that difficulties with the experience and management of emotion (e.g., intensity of affect activation and the lack of affect control) underlie the instability in identity, relationships and behavior that define BPD. Specifically, the potentially harmful behaviors observed in patients with BPD are viewed as attempts to self-regulate emotional experience (e.g., Gratz et al., 2006; Linehan et al., 2007). From this perspective, intense emotion is proposed to interfere with cognitive functioning and effective problem solving, resulting in the observed behavior (e.g., Wagner & Linehan, 1999).

Other researchers have also suggested that the repetitive, self-damaging behavior occurring in the context of BPD may reflect impairments in decision-making and planning cognition. For example, behaviors such as rash and regretted sexual promiscuity, suicidal gestures and substance abuse can be reflective of impulsivity and a failure to consider future consequences (e.g., van Reekum et al., 1994). Proponents of this view suggest that individuals with BPD show greater intensity and lability in their emotional response to their environment because they are unable to inhibit or moderate their emotional urges.

5.1.2 Decision-Making and BPD: Empirical Findings

Preliminary research examining decision-making in BPD suggests that these individuals use suboptimal strategies in situations characterized by ambiguity or uncertainty. For example, Bazanis et al. (2002) found that patients with BPD had problems (1) making appropriate choices related to uncertain outcomes on a decision-making task and (2) arriving at optimal solutions on a planning task. Their performance was characterized by both reduced accuracy and increased response time. Based on these results, Bazanis et al. concluded that BPD is likely associated with impairments in dissociable cognitive processes that are dependent on frontal lobe circuitry. Furthermore, they suggested that these

difficulties may underlie some of the symptoms of behavioral dysregulation that characterize the disorder.

More recently, Haaland and Landrø (2007) assessed decision making in patients with BPD using the Iowa Gambling Task (IGT; Bechara, Damasio, Damasio, & Anderson, 1994). The IGT is an experimental neuropsychological task that has been used to study the integration of emotion and cognition in decision processes by simulating real-life decision making. The task involves making decisions in the context of uncertainty concerning premises and outcome, as well as reward and punishment. Participants are presented with 4 decks of cards and told that each time they choose a card they will either win or lose some game money. They are instructed to try to win as much game money as possible. Every card drawn earns the participant a reward and occasionally a card also has a penalty. The participants are not informed that the decks differ from each other in (1) the size of the rewards and losses and (2) the number of trials over which the losses are distributed. The task includes both "bad decks" and "good decks" – some lead to losses over the long run, while others lead to gains.

Haaland and Landrø (2007) found that participants in the BPD group showed fewer advantageous choices on the IGT than the healthy control group. More specifically, individuals diagnosed with BPD and a substance use disorder (SUD) exhibited the poorest performance, followed by those with BPD without SUD. Participants in the healthy control group had the best performance. In discussing their results, Haaland and Landrø (2007) identified some important limitations in their study that influence the generalizability of their findings. Specifically, their sample size was small, most of the BPD patients (i.e., 19 out of 20) were taking psychotropic medication and there was substantial comorbidity in the group. In addition, the study did not address whether the deficits in decision making in the BPD group were related to mechanisms associated with affective dysregulation, reinforcement sensitivity, impulsivity, or other neuropsychological functions that have been found to be present in BPD (e.g., deficits in executive functioning).

5.1.3 Study 3 Purpose

The overall aim of Study 3 was to clarify the nature of decision making deficits in individuals with BPD traits. The first goal of the study was to determine whether Haaland and Landrø's (2007) finding of decision-making deficits on the IGT could be replicated in a non-clinical sample of individuals with BPD traits. The second aim of the study was to characterize the nature of these deficits further, from both a categorical and a dimensional perspective. Specifically, I was interested in exploring the deficits in categorically defined groups (i.e., individuals scoring above and below the recommended cut-off on the MSI-BPD), as well as by symptom dimensions (i.e., interpersonal problems, self-harm, identity disturbance, emptiness, etc.). The third goal was to ascertain the relative contribution of individual differences in the following areas to deficits in decision making in this population: emotional experience; reinforcement sensitivity; impulsivity; effortful control/executive functioning; and reversal learning.

5.1.4 Literature Review

Behavioral decision research recognizes both individual and situational variability in the study of decision making. When presented with outcomes that are certain, an individual is thought to base decisions according to the most attractive set of outcomes. In contrast, when outcomes are uncertain, the individual must predict the outcomes of possible actions based on their past experiences.

5.1.4.1 Dual-Process Theories of Decision-Making

The notion that the brain may be employing multiple levels of processing when making judgments and decisions is consistent with dual-processing theories across domains in psychology (e.g., Epstein, Lipson, Holstein, & Huh, 1992; Sanfey & Chang, 2008). Many theorists suggest that automatic and controlled components of information processing are dissociable and research has provided compelling support for the distinction between the two modes (Evans, 2008; Ochsner & Gross, 2007; Reyna & Rivers, 2008). Controlled information processing is proposed to be deliberative and requires the effortful allocation of attention and necessary resources. In contrast, automatic information processing is thought to be reflexive and require minimal effort, processing capacity, and resources.

Self-regulation of emotion, cognition, and behavior is assumed to be associated with the former. By contrast, spontaneous, emotional reactions and certain subtypes of attention (e.g., alerting, orienting) are thought to be associated with the latter (Fan, McCandliss, Sommer, Raz, & Posner, 2002; Goel & Dolan, 2003).

More recently, there has been a growing interest in examining the role of automatic processes in decision making, or the interface of affect, motivation, and cognition in judgment and reasoning. Although the literature on the interaction between automatic and controlled aspects of information processing in BPD is scarce, preliminary research suggests that individuals diagnosed with this illness exhibit impairments on tasks that rely not only on deliberate, but also intuitive, processing (e.g., Bazanis et al., 2002; Fertuck, Lenzenweger, & Clarkin, 2005; Haaland & Landrø, 2007). In the pages that follow, I present a summary of theoretical perspectives and empirical findings related to affective, motivational and cognitive factors that have been proposed to underlie decision making in both healthy controls and patients diagnosed with BPD.

5.1.4.2 Emotional Experience, Intuition and Decision Making

A number of researchers have suggested that affective states may precede and guide higher level cognitive processes, particularly in the context of uncertainty (Bechara, Damasio, Tranel, & Damasio, 1997; Damasio, 1994; Wagar & Dixon, 2006). According to Damasio, Bechara and colleagues, normal decision making in complex, uncertain environments depends on affective signals (somatic markers) that warn us when important events are about to occur and guide our decisions accordingly. According to the somatic marker hypothesis (SMH; Damasio, 1994), somatic markers can be manifested both unconsciously (when one exhibits a behavioral preference for a possible course of action in the absence of conscious knowledge) and consciously (when one exhibits a consciously accessible gut feeling or affective response that guides behavior).

The SMH suggests that the dimensions of valence and arousal associated with a feeling state provide important information that can be used to guide behavior. Whereas arousal is hypothesized to signal the degree of self-relevance or uncertainty related to a behavioral choice, valence indicates

whether a particular option is beneficial or harmful to one's interests. Some researchers suggest that individual differences in emotional awareness and clarity affect one's ability to discriminate between subtle feelings that may guide decision-making (e.g., Bechara, 2004; Bechara, Damasio, & Damasio, 2000). Emotional awareness can be defined as the ability to access one's feelings, while emotional clarity relates to the accurate identification or labeling of the feelings (Salovey et al., 1995). Deficits in the ability to discriminate among subtle emotional signals along either valence or arousal dimensions may have important implications for the integrity of the decision-making process and consequently, adaptive behavior.

The neurobiological substrates implicated in the somatic marker circuitry include the amygdala, the ventromedial prefrontal cortex (VMPFC), and the insular-somatosensory cortices (Bechara & Damasio, 2005; Damasio, 1994). A number of studies have found that individuals with BPD exhibit reduced volume and functional differences in the amygdala and the orbitofrontal cortex (Donegan et al., 2003; Soloff et al., 2003; Tebartz van Elst et al., 2003). However, unlike patients with damage to the VMPFC, who exhibit a flattening of emotional responses (Bechara, Damasio, & Damasio, 2000), patients with BPD have been found to demonstrate intensified affective reactivity (Donegan et al., 2003; Rosenthal et al., 2008; Schnell & Herpertz, 2007). Thus, one question that arises is whether any dysregulation of the affective systems could result in dysfunctional decision-making abilities.

The results of Study 2 of this dissertation provide evidence for both increased attention to emotional state and decreased emotional clarity in a non-clinical sample with BPD traits. Considering the results of Study 2 within the context of the SMH, it is possible that individuals with BPD traits attend to the dimension of arousal associated with their affective state but have difficulty identifying subtle differences in valence. Given that arousal is hypothesized to signal the degree of self-relevance or uncertainty related to a behavioral choice, individuals with BPD may experience higher levels of indecisiveness when trying to choose between alternatives and/or misinterpret situations as personally relevant. Assuming that these deficits in emotional experience have a negative impact on the decision-making process, maladaptive behavioral choices would be expected. In addition, their difficulty

discriminating between emotional signals may be associated with difficulties determining whether a particular option is beneficial or harmful to their interests – either in the short-term or long-term.

5.1.4.3 Reinforcement Sensitivity, Behavioral Impulsivity and Decision Making

Models of decision making have also considered the role of behavioral choice in the context of reward and punishment. Dysfunctional reinforcement processing has been suggested to underlie difficulties making advantageous choices based on previous experience and environmental feedback (Rolls, 2000; Rolls, Hornak, Wade, & McGrath, 1994). Busemeyer and Stout's (2002) Expectancy-Valence Learning Model (EVLM) is a reinforcement learning model of decision making that can be applied to the Iowa Gambling Task (IGT; Bechara et al., 1994; Bechara, Damasio, & Damasio, 2000). According to the EVLM, decision making involves the integration of the gains and losses experienced on each trial into a single affective reaction called a valence. Expectancies about the valence produced by each deck are learned by an adaptive learning mechanism. In other words, the valences and expectancies (accumulated reactions to a deck) are updated after each selection on the basis of the outcome of the selection and the simulated attributes of the participant.

Busemeyer and Stout (2002) suggest that when participants are first presented with the four decks in the IGT, they should have no preference because there is no information available to them about the decks. As a result, initial selection of cards is based on random choice. However, in subsequent trials, the participant's response should depend on the outcome from the previous trial. For example, if a participant chooses from the disadvantageous decks, characterized by higher immediate gains coupled with higher infrequent losses, the individual may be focusing more on gains than losses.

The prefrontal and medial temporal cortices have been hypothesized to be associated with response to loss, whereas the ventral striatum, dopaminergic midbrain, amygdala and orbitofrontal cortex have been implicated as neuronal correlates of financial reward (Sanfey & Chang, 2008; Völlm et al., 2007). According to Bechara and colleagues (1997), the performance of patients with lesions in the VMPFC on the IGT appears to be guided solely by immediate prospects. To illustrate this point, they refer to the preference of these patients for decks that carry an ''immediate'' reward of $100,

regardless of the larger ‘‘future’’ loss associated with those decks. In other words, VMPFC patients seem to be oblivious to the future consequences of their actions and may have problems delaying gratification.

Sevy et al. (2006) suggest that a reduction in the level of the neurotransmitter dopamine (DA), which has a central role in reward learning, may be associated with the tendency to select alternatives that produce high gains, regardless of potential losses, on the IGT. Similarly, Blum et al. (2000) suggest that patients with impulsive-spectrum disorders have reduced rather than increased reward sensitivity. They propose that genetic deficits in reward pathways resulting in a “reward deficiency syndrome” play an important role in addictive behavior and other conditions characterized by impulsivity.

Yechiam and colleagues have conducted preliminary research examining the association of EVLM parameters and performance in the IGT. In one study, Yechiam et al. (2006) examined the association between the EVLM parameters and self-report measures of motivation, the Behavioral Inhibition System and Behavioral Activation System Scales (BIS/BAS Scales; Carver & White, 1994). The results showed a significant association between attention to losses and high BIS scores, denoting increased behavioral inhibition. In a more recent study of decision-making processes underlying performance in the IGT, Yechiam et al. (2008) found that incarcerated criminals failed to learn from repeated mistakes. Furthermore, they found that the mechanisms that contributed to these decisions varied based on the nature of the offence. For example, drug and sex offenders were more likely to respond to potential gains as compared with losses, while perpetrators of assault and/or murder tended to focus on immediate outcomes and made less consistent choices.

Haaland and Landrø (2007) suggested that hyposensitivity to reinforcement (either negative or positive) and rates of associative learning may affect one’s performance on the IGT. In their study, they examined the learning curves of three groups of participants (BPD with substance use disorder (SUD), BPD without SUD, healthy controls) across the task. They found the performance of the BPD without SUD group fell between that of the healthy controls and the BPD with SUD group. Their learning curve

was similar in shape to that of the controls but they appeared to require more experience (i.e., additional trials) to learn from their own behavior and gain behavior control.

Berlin, Rolls and Iversen (2005) investigated whether aspects of BPD, in particular impulsivity, are associated with orbitofrontal cortex (OFC) dysfunction. They administered several measures, including those measuring emotion, impulsivity and sensitivity to reinforcers, to patients with OFC lesions, patients with PFC lesions outside the OFC, patients with BPD and healthy controls. A major finding in their study was that patients with OFC lesions and those with BPD were both significantly more impulsive than healthy participants and patients with PFC lesions outside the OFC. They also found that insensitivity to punishment and reward was a prominent feature of patients with OFC lesions but not patients with BPD. The authors suggested that increased sensitivity to punishment might make those with BPD more emotional and the higher level of emotionality, rather than a lack of regard for consequences, might contribute to their impulsive behavior.

Consistent with the conclusions of Berlin and colleagues (2005), the results of Studies 1 and 2 of this dissertation and previous research (e.g., Whiteside et al., 2005) suggest that urgency, more so than other aspects of impulsivity (i.e., lack of premeditation, low perseverance, sensation seeking), is strongly associated with BPD. Urgency refers to the tendency to experience strong impulses, frequently under conditions of negative affect (Whiteside & Lynam, 2001). Thus, it is possible that those with BPD engage in impulsive behaviors in order to alleviate negative emotions despite the long-term harmful consequences of some of their actions.

Overall, the role of reinforcement learning, reward/punishment sensitivity and impulsivity in decision-making in BPD remains unclear. It is possible that various BPD symptom dimensions (e.g., impulsivity versus fears of abandonment) may be associated with different patterns in reinforcement sensitivity.

5.1.4.4 Effortful Control, Cognitive Impulsivity and Decision Making

A key feature of cognitive development is the gradual ability to suppress competing thoughts and actions in favor of goal oriented ones. This ability has been referred to as cognitive or effortful

control (e.g., Botvinick et al., 2001; Derryberry & Rothbart, 1997) and has been linked to performance on spatial conflict tasks (e.g., flanker task), measures of inhibition (e.g., colour Stroop), set-shifting (e.g., Wisconsin Card Sort Test), and emotional and behavioral regulation (e.g., Fan, McCandliss, Sommer, Raz, & Posner, 2002; Silbersweig et al., 2007). Neuroimaging studies involving attention-conflict tasks suggest that activity in regions of the anterior cingulate gyrus may be associated with the effortful control of attention (Bush, Luu, & Posner, 2000; Fan & Posner, 2004).

In their neurobiological model of personality disorders, Depue and Lenzenweger (2001) frame the etiology of BPD from a dual-process perspective. They suggest that neuropsychological studies with BPD patients have found signs of neurological impairment consistent with problems in the effortful processing of information. Other, more recent research supports this view; compared to healthy controls, patients with BPD have been found to perform worse on tasks associated with the prefrontal cortex and executive functioning, such as such as decision making and planning (Bazanis et al., 2002; Depue & Lenzenweger, 2001; Lenzenweger, Clarkin, Fertuck, & Kernberg, 2004). Deficits have also been identified in domains such as inhibition, attentional control, cognitive flexibility, and self-monitoring (van Reekum, 1993; van Reekum, Conway, Gansler, & White, 1993).

Depue and Lenzenweger (2001) have proposed that deficits in effortful control may underlie difficulties regulating emotions in patients with BPD. To test this hypothesis, Posner et al. (2002) used the Attention Network Test (ANT) to compare the efficiency of three aspects of the attentional network (alerting, orienting, conflict resolution)[7] in BPD patients (n = 39) and two control groups. The first group (n = 22) included participants who were matched to the patients in having very low self-reported effortful control (EC) and very high negative emotionality (NE) and the second group (n = 30) consisted of participants who were average in these two temperamental dimensions. EC, as measured in the Posner et al. study, was based on the temperament model developed by Rothbart and colleagues

[7] Posner et al. (2002): Alerting was produced by presenting a warning signal that contained no information about where the target would occur. Orienting was induced using a spatial cue that indicated where the target would be located. Conflict was produced by the presentation of flankers around the target that were incongruent with the target.

(e.g., Rothbart, Ahadi, & Evans, 2000) which subdivided the construct into activation control (the capacity to perform an action when there is a strong tendency to avoid it), attention control (the capacity to focus attention as well as to shift attention when desired), and inhibitory control (the capacity to plan and to suppress inappropriate responses). Based on previous research conducted by Rothbart, Ahadi, and Evans (2000), Posner et al. hypothesized that the NE and EC constructs would be closely associated with the overwhelming negative feelings (e.g., dysphoria, anxiety, anger) and poor control of emotion and behavior (e.g., interpersonal conflict, attempts to avoid abandonment) that are characteristic of BPD.

The results of the Posner et al. (2002) study suggest that the BPD patients exhibited significantly greater difficulty in their ability to resolve conflict among stimulus dimensions in the ANT than did average controls. However, they did not demonstrate deficits in overall reaction time or accuracy on the alerting and orienting components of the task. The temperamentally matched group did not differ significantly from either group. In addition, a significant correlation was found between measures of the ability to control conflict in the reaction-time task and self-reported effortful control. Posner et al. interpreted the results as indicative of a specific abnormality in BPD patients in attentional mechanisms underlying conflict resolution and more generally, effortful control. In conclusion, they suggested that poor socialization conditions (e.g., childhood abuse, neglect) may interact with this deficit to produce symptoms that characterize BPD (e.g., emotional and behavioral dysregulation).

The results of the second study of this dissertation were consistent with the hypotheses put forth by Posner et al. (2002) with respect to the association between high NE, low EC and BPD. Collectively, the research literature and the results from Study 2 suggest that BPD traits are associated with impairment in the effortful control of attention, especially cognitive inhibition. Furthermore, while individuals with BPD are more prone to experiencing problems with cognitive control, the presence of emotional distress appears to make them particularly vulnerable to engaging in maladaptive behaviors. The tendency to engage in rash behavior in an attempt to reduce negative affect was illustrated in both

Studies 1 and 2 of this dissertation via the strong, positive association between the construct of urgency and BPD traits.

Although the IGT was originally presented as a measure of intuitive, emotion-based learning that is affected by lesions to the VMPFC (Bechara et al., 1994), recent studies suggest that more effortful processes play a role in one's success on the task. Fellows and Farah (2005) pointed out that deficits on the IGT have been found to be associated with not only VMPFC lesions but also those in the dorsolateral (DL) and dorsomedial (DM) PFC (e.g., Manes et al., 2002). Manes et al. found that, in addition to IGT deficits, DL patients showed pronounced impairment on tasks assessing working memory, planning, and attentional shifting and DM patients exhibited planning deficits. The role of the DLPFC in working memory processes has been well established in both animal (Petrides, 1996; Fuster, 1997) and human (Owen, 1997; Smith & Jonides, 1999) studies.

Problems with effortful control, or executive functioning, may impact performance on the IGT in several ways. For example, difficulties focusing attention or working memory deficits could affect one's ability to keep track of gains/losses within decks and impact deck selection preferences negatively. In addition, if an individual has a strong approach tendency and is drawn to reward, the ability to overcome the tendency could be affected by both inhibitory control and the capacity to shift attention/strategy (e.g., trying a new deck). The ability to maintain an advantageous selection preference could also be affected by the integrity of the DLPFC processes.

5.1.4.5 Reversal Learning and Decision Making

Critics of the Somatic Marker Hypothesis (e.g., Maia & McClelland, 2004, 2005) propose that problems with reversal learning, rather than missing somatic markers, may drive the deficit that VMPFC patients demonstrate on the IGT. The results of studies conducted by Fellows and Farah (2005) and Rolls et al. (1994) provide support for this argument. Reversal learning tasks require the participant to inhibit responding to a previously rewarded option, and instead select a new or previously unrewarded stimulus. Rolls and colleagues found that patients with VMPFC damage were impaired on a simple reversal task which involved the presentation of one of two simple patterns on a touch screen.

For one pattern, touching the screen was associated with receiving one point and failing to touch it was associated with a loss. For the other pattern, the rules were switched. The participant would lose a point for touching the screen and gain a point when they refrained from touching it. After patients had learned these contingencies, the contingencies were reversed. The researchers found that VMPFC patients were able to report that the contingencies had changed but were unable to adapt their behavior accordingly. Fellows and Farah (2005) also showed that reversal learning deficits contributed to impaired IGT performance of patients with VMPFC lesions but not in patients with damage to the DLPFC.

One study examining reversal learning in BPD was found in the literature. Berlin, Rolls and Iversen (2005) found that patients with orbitofrontal cortex (OFC) lesions but not patients with BPD were impaired at reversing stimulus-reinforcer associations. They concluded that OFC dysfunction is not an essential aspect of BPD and that different symptoms of the borderline syndrome may be related to different cognitive deficits, and potentially to different brain systems.

5.1.5 Current Study

As noted previously, the overall aim of Study 3 was to characterize the nature of decision making deficits in individuals with BPD traits using a non-clinical sample from both a categorical and dimensional perspective. Specifically, the relationship between decision making and the following constructs was investigated: (i) emotional experience, (ii) reinforcement sensitivity, (iii) impulsivity, (iv) effortful control/executive functioning, and (v) reversal learning. A subset of self-report measures used in Studies 1 and 2 were selected for use in Study 3 to provide indexes of emotional experience, reinforcement sensitivity, impulsivity, and effortful control.

Decision making and reinforcement sensitivity were assessed using two versions of the IGT – ABCD (Bechara et al., 1994) and EFGH (Bechara, Tranel, & Damasio, 2000). The IGT-ABCD investigates the possibility that problems with decision-making are the result of hypersensitivity to reward (i.e., large immediate gain outweighs even larger future loss). In contrast, the IGT-EFGH investigates the possibility that impairments in decision-making are due to hypersensitivity to punishment (i.e., large immediate loss outweighs even larger future gain). Bechara and colleagues

(2000) showed that patients with VMPFC lesions selected disadvantageous decks in both variants of the IGT, suggesting that these patients were insensitive to future consequences regardless of whether they involved punishment or reward. In contrast, a subgroup of patients with substance dependence disorders demonstrated intact performance on the EFGH version of the task but selected disadvantageous decks on the IGT-ABCD (Bechara et al., 2002); these patients were classified as hypersensitive to reward. Intact performance on the IGT-ABCD and impairments in the EFGH version of the task would be expected in individuals who are hypersensitive to punishment.

To address the various issues discussed in the literature review, the study included modified versions of the IGT that incorporated indexes of reversal learning (based on Turnbull, Evans, Kemish, Park, & Bowman, 2006) and a computerized, analogue version of the Wisconsin Card Sorting Test (Mueller, 2009a). The WCST is a measure of executive functioning that involves attentional set-shifting. This kind of shifting has been found to be associated with the DLPFC and has been doubly dissociated from reversal learning, which involves the VMPFC (Manes et al., 2002). As such, the WCST is thought to measure a component of executive functioning that is different from that measured by the IGT but can also influence behavior. For example, those who perform well on the WCST may have good conceptual reasoning skills, the ability to maintain an adaptive strategy/behavior and the cognitive flexibility required to change their behavior when it is no longer adaptive to the situation at hand.

5.2 Method

5.2.1 Participants

Two-hundred and twenty participants were recruited from the University of Waterloo Mass Testing pool based on their scores on two self-report measures of borderline personality traits, the McLean Screening Instrument for BPD (MSI-BPD) and IPDE Screening Questionnaire (IPDE-SQ) BPD subscale. To be eligible for the study, participants had to score above (for the BPD group) a cut-off or below (for the Control group) a cut-off on both the MSI-BPD and IPDE-SQ BPD.

Based on previous research by Zanarini and colleagues (2003) and the results of Study 1, a cut-off of 7 (out of 10) on the MSI-BPD (M = 3.09, SD = 2.69) was used to select participants for the BPD group. With respect to the IPDE-SQ, Loranger (1999) suggests that any personality disorder scale score on the IPDE-SQ equal to or greater than 3 should be followed up by a corresponding diagnostic interview. Several researchers (e.g., Álvaro-Brun & Vegue-González, 2008; Verardi et al., 2008) suggest that the best cut-off for the IPDE-SQ BPD subscale is 4 (out of 9). However, considering that the version of the IPDE-SQ BPD used is supposed to reflect the nine DSM-IV criteria and the DSM-IV cutoff for BPD diagnosis is 5, we decided that the more conservative cut-off identified in Study 1 would be appropriate. Therefore, participants scoring more than 6 (out of 9) on the IPDE-SQ BPD (M = 2.68, SD = 2.04) were selected. Participants for the Control group were selected from those who scored less than or equal to 1 on both the MSI-BPD and the IPDE-SQ BPD.

Twelve of the participants who completed the online portion of the study declined to attend the lab portion and were excluded from the study. Therefore, the final sample consisted of 208 participants (65 male, 143 female), 88 of which were in the BPD group and 120 in the Control group. All participants received partial course credit for their participation.

5.2.2 Measures

5.2.2.1 Screening Measures

5.2.2.1.1 Borderline personality traits. Participants were selected based on their scores on screening questionnaires used to identify individuals with Borderline Personality Disorder (BPD), the McLean Screening Instrument for BPD (MSI-BPD; Zanarini et al., 2003) and IPDE Screening Questionnaire (IPDE-SQ; Loranger, 1999) BPD subscale. The MSI-BPD is a 10-item, forced-choice self-report screening measure based on the DSM-IV (APA, 1994) criteria for BPD. The IPDE-SQ-BPD is a 9-item, forced-choice questionnaire that is also based on the DSM-IV criteria.

These scales were administered as part of a Mass Testing survey completed by students taking first, second and third year psychology courses. For the full sample of BPD and Control participants

combined (N = 208), we found high internal consistency for both the MSI-BPD (α = .96) and the IPDE-SQ-BPD (α = .93).

5.2.2.2 Part 1 (Online) Questionnaires

5.2.2.2.1 Borderline personality traits. The Borderline Personality Questionnaire (BPQ; Poreh et al., 2006), an 80-item true/false self-report measure, was administered in Part 1. This was the same scale that was administered in Study 2. The reliabilities of the BPQ scales in the sample of 208 are listed in Table G1 and ranged from α = .61 to α = .91.

5.2.2.2.2 Temperament. The Adult Temperament Questionnaire – Short Form (ATQ-SF; Evans & Rothbart, 2007) was used to measure temperament. This was the same scale that was administered in Study 2. The reliabilities of the four broad constructs ranged from.74 to.86; the alphas for the general and sub-constructs are listed in Table G2.

5.2.2.2.3 Affect intensity. The Affect Intensity Scale - Short (AIS-S; Geuens & De Pelsmacker, 2002), a 20-item brief version of the 40-item Affect Intensity Scale (AIS; Larsen, 1984), was used as an index of general affective intensity. This was the same scale that was administered in Study 2 and consists of three factors: Positive Intensity, Negative Intensity, and Serenity. The reliabilities of the three subscales ranged from.69 to.89 in the current sample; the alphas are listed in Table G3.

5.2.2.2.4 Attention to emotions. Two questionnaires were used to measure individual differences in attention to emotional states, the Private Self-Consciousness subscale (PSCS) and the Monitoring subscale of the Mood Awareness Scale (MAS-M). These were the same questionnaires that were administered in Study 2. The reliabilities of the indexes were .70 and .89, respectively. The alphas are listed in Table G3.

5.2.2.2.5 Discrimination and identification of feelings. The Difficulty Identifying Feelings subscale of the Toronto Alexithymia Scale-20 (TAS-20; Bagby, Parker, & Taylor, 1994) and the Clarity subscale of the Trait Meta-Mood Scale (TMMS) (TMMS-C; Salovey et al., 1995) were used to assess

emotional clarity. These were the same questionnaires that were administered in Study 2. The reliabilities of the two subscales ranged from .66 to .87; the alphas are listed in Table G3.

5.2.2.2.6 Emotional dysregulation. The Affective Lability Scales – Short Form (ALS-SF; Oliver & Simons, 2004), an 18-item version of the 54–item Affective Lability Scales (Harvey et al., 1989) questionnaire, was used to measure overall dysregulated affective functioning. The respondents rated each item on a 5-point scale ranging from 1 ("extremely uncharacteristic of me") to 5 ("extremely characteristic of me"). The reliability of the overall scale was .94.

5.2.2.2.7 Reinforcement sensitivity. Sensitivity to appetitive and aversive stimuli was measured using two questionnaires, the Behavioral Inhibition System and Behavioral Activation System (BIS/BAS; Carver & White, 1994) scales and Sensitivity to Punishment (SP) and Sensitivity to Reward (SR) Questionnaire – Short (SPSRQ-S; Cooper & Gomez, 2008). The questions from these measures were presented on separate pages of the online survey because the response scales differ; respondents use a dichotomous yes/no response format for the SPSRQ-S and a 4-point Likert scale ranging from 1 ("Strongly Disagree") to 4 ("Strongly Agree") for the BIS/BAS. The BIS/BAS questionnaire consists of 20 items and four subscales: a single subscale based upon Gray's Behavioral Inhibition System (BIS, see Gray & McNaughton, 2000) and three scales based upon the BAS. The BIS scale comprises 7 items measuring sensitivity to aversive events. The three BAS scales are Reward Responsiveness (5 items), Drive (4 items), and Fun Seeking (4 items). The 24-item SPSRQ-S is the short form of the 48-item SPSRQ (Torrubia et al., 2001), a measure of sensitivity to positive/appetitive and negative/aversive reinforcement/stimuli. The reliabilities of the subscales ranged from .70 to .88; the alphas are listed in Table G4.

5.2.2.2.8 Impulsivity. The UPPS Impulsive Behaviour Scale (UPPS; Whiteside & Lynam, 2001) was used to measure impulsive behavior. Factor analytic investigations of the 45-item scale suggest the questionnaire measures four areas of impulsivity that have been identified in the psychological literature: (i) urgency, (ii) (lack of) planning/premeditation, (iii) (lack of) perseverance,

and (iv) sensation seeking. The reliabilities of the subscales in the current sample ranged from .80 to .91; the alphas are listed in Table G4.

5.2.2.2.9 Self-soothing, self-attacking and mood repair. The Forms of Self-Criticizing/ Attacking and Self-Reassuring Scale (FSCRS; Gilbert et al., 2004) was used to measure self-criticism and the ability to self-reassure. This was one of the questionnaires that was used in Study 2 and it is made up of three components. Two of the components reflect self-criticizing (Inadequate Self, Hated Self) and the third reflects self-reassurance ('I am able to remind myself of positive things about myself'). Responses were given on a 5-point Likert scale (1 = "not at all like me" to 5 = "extremely like me").

The six-item Repair subscale of the Trait Meta-Mood Scale (TMMS, Salovey et al., 1995) was used to assess the extent to which the respondent uses positive thinking to repair negative moods (Repair). The items were rated on a 5-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree").

The reliabilities of these four subscales ranged from .85 to .92; the alphas are listed in Table G3.

5.2.2.3 Part 2 (In-Lab) Questionnaires

5.2.2.3.1 Emotional state. The 20-item Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) was used to assess participants' affective state at the start of the in-lab component of the study. The questionnaire consists of two 10-item subscales, measuring PA and NA. These subscales have been validated in several settings and have been shown to be reliable measures of their respective constructs (e.g., Melvin & Molloy, 2000).

In the current study, participants were asked to indicate to what extent they were feeling each of the 20 emotions at the present moment. Responses were recorded using a 5-point Likert scale (1 = "very slightly or not at all" to 5 = "extremely"). Reliability statistics for the subscales were comparable; the co-efficient alphas were .86 for the PA subscale and .85 for the NA subscale.

5.2.2.3.2 Borderline personality traits. The McLean Screening Instrument for BPD (MSI-BPD; Zanarini et al., 2003) was re-administered in the lab to check for test-retest reliability and ensure that the participants were assigned to groups appropriately (i.e., BPD, Control). The co-efficient alpha for the in-lab administration of the MSI-BPD was .90. The MSI-BPD total scores for the in-lab and Mass Testing administrations correlated at r = .92.

5.2.2.3.3 Childhood neglect and abuse. The presence of neglect and/or abuse in childhood was assessed using the Multidimensional Neglectful Behavior Scale – Short Form (MNBS-SF; Straus, Kinard, & Williams, 1995) and the Childhood Trauma Questionnaire – Short Form (Bernstein et al., 2003). These were the same questionnaires used in Study 2. A reliability estimate was calculated for the MNBS-SF total scale; the co-efficient alpha was equal to .90.

5.2.2.3.4 Invalidating environment. The Invalidating Childhood Environment Scale (ICES; Mountford et al. 2007) was used to measure specific parental behaviors believed to represent the overall construct of invalidation. This was the same questionnaire used in Study 2. The reliabilities of the 14-item scales were .87 for the Mother subscale and.89 for the Father subscale.

5.2.2.3.5 Sensory processing sensitivity. The Highly Sensitive Person Scale (HSPS; Aron & Aron, 1997) was used to measure sensory processing sensitivity (SPS). This was the same questionnaire used in the Studies 1 and 2 and based on the findings of these studies, two of the items were removed to improve the reliability of the scale. As such, we refer to the 25-item questionnaire as HSPS-R. We calculated both a total scale score and three subscale scores labeled Ease of Excitation (EOE), Low Sensory Threshold (LST) and Aesthetic Sensitivity (AES). The reliabilities of the three subscales ranged from .59 to .83; the alphas are listed in Table G2.

5.2.2.4 Card-sorting and gambling tasks

All participants completed the two IGT tasks and the WCST. Participants were assigned to one of two orders of test administration. With the exception of the first 20 participants, who completed the IGT-ABCD task first, those with even-numbered subject numbers were assigned to Order 1 and those with odd-numbered subject numbers were assigned to Order 2. The sequence of administration of all

components was the same with one exception – the IGT-ABCD task was completed first by those in Order 1 and third by those in Order 2. The WCST was always completed second by participants. Thus, Order 1 participants completed the IGT-ABCD task first, then the WCST, and then the IGT-EFGH. Order 2 participants completed the tasks in the following order: IGT-EFGH, WCST, IGT-ABCD.

5.2.2.4.1 IGT-ABCD

The IGT-ABCD task used in this study was designed and administered using E-Prime version 1.2 software (Psychology Software Tools). The task consisted of 220 trials, split into two phases: 100 trials of the standard version of the task followed by 120 trials of a modification of the IGT involving three successive shifts of the reinforcement contingencies. In the standard version of the IGT (i.e., Bechara et al., 1994) advantageous decision making entails foregoing immediate gains with higher long-term losses for lower immediate gains and lower long-term losses.

Phase 1. The standard administration procedure for the IGT was used for Phase 1. Specifically, participants completed 100 trials using the reinforcement schedule described by Bechara et al. (1994). The task involved four decks of cards labeled A, B, C and D, each of which consisted of 100 cards. In two decks (A and B) choosing a card is followed by a high gain of money, however at unpredictable points the selection of a card is followed by a high penalty so that in the long run these decks are disadvantageous. In the other two decks (C and D) the immediate gain is smaller than in decks A and B, however, the future loss is also smaller so that in the long run these decks are advantageous. To score the participants' performance on the IGT the number of cards picked from decks A and B were added in each block of 20 card selections yielding a total score of advantageous selections. Similarly, the number of cards picked from decks C and D were added separately in each block of 20 cards, producing a total score of disadvantageous selections. A net score was computed by subtracting the total number of cards selected from advantageous minus disadvantageous decks $(C + D) - (A + B)$ for each block of 20 card selections (i.e., five blocks in total for Phase 1). Table G6 depicts the reinforcement schedule across the first 40 cards of each deck in Phase 1. Table G7 summarizes the overall losses and gains for the Phase 1 decks.

Phase 2. Phase 2 consisted of 120 trials and was based on the modified administration procedure for the IGT described by Turnbull et al. (2006). The phase was divided into three sub-phases (2a, 2b, 2c), each of which consisted of 40 trials. Participants were informed explicitly on the computer screen (i.e., "the rules about which decks are good and bad may have changed)" that the nature of the game might change between Phase 1 and Phase 2a, as well as prior to each sub-phase.

In summary, participants completed five 20-trial learning blocks (Phase 1) which were followed by three shift periods (Phases 2a, 2b, 2c), each consisting of two 20-trial blocks (see Appendix H, Figure H1). Whereas decks C and D had been good decks during Phase 1, decks A and D, A and B, and B and C successively became good decks during the three shift periods of Phase 2. Thus, in these shift periods the participant had an emotion-based learning history of previous decisions (e.g., C and D still feel good) played off against the set of novel contingencies (e.g., A and D are now good). If the participants were to rely extensively on their emotion-based history of contingency learning, they would be expected to favor decks that were recently advantageous.

5.2.2.4.2 IGT-EFGH

The IGT-EFGH task used in this study was designed and administered using E-Prime version 1.2 software (Psychology Software Tools). The structure of the IGT-EFGH task (i.e., 220 trials, split into two phases) was similar to that of the IGT-ABCD. However, the reinforcement schedule was based on the variant of the original IGT (i.e., EFGH) described by Bechara, Tranel and Damasio (2000). The order of the rewards and punishments in Bechara, Tranel and Damasio's (2000) EFGH task is reversed; the punishment is immediate and the reward is delayed. Therefore, advantageous decision making entails foregoing lower immediate losses and lower long-term gains for higher immediate losses and higher long-term gains. The advantageous decks (E and G) have high immediate punishment and high future reward; the disadvantageous decks (F and H) have low immediate punishment but lower future reward. The 100 trials in Phase 1 were based on this order of reinforcements. As in the IGT-ABCD task in this study, Phase 1 was followed by 120 trials involving three successive shifts of the reinforcement contingencies.

Phase 1. Bechara, Tranel, and Damasio's (2000) administration procedure for the IGT-EFGH was used for Phase 1. The task involved four decks of cards labeled E, F, G and H, each of which consisted of 100 cards. In two decks (E and G), choosing a card is followed by a higher penalty (i.e., "monetary" loss), but at unpredictable points the selection of a card is followed by a higher reward (i.e., "monetary" win) so that in the long run these decks are advantageous. In the other two decks (F and H) the immediate loss is smaller; however, the future gain is also smaller so that in the long run these decks are disadvantageous. To score the participants' performance on the IGT-EFGH, the number of cards picked from decks E and G were added in each block of 20 card selections, and the number of cards picked from decks F and H were added separately in each block of 20 cards. A net score was computed by subtracting the total number of cards selected from advantageous minus disadvantageous decks (E + G) − (F + H) for each block of 20 card selections (i.e., five blocks in total for Phase 1). Table G8 depicts the reinforcement schedule across the first 40 cards of each deck in Phase 1. Table G9 summarizes the overall losses and gains for the Phase 1 decks.

Phase 2. As in the IGT-ABCD task, participants completed three shift periods (Phases 2a, 2b, 2c), each consisting of two 20-trial blocks, after the five 20-trial EFGH learning blocks (Phase 1). Whereas decks E and G had been good decks during Phase 1, decks F and H, E and G, and F and H successively became good decks during the three shift periods of Phase 2 (See Appendix H, Figure H2). Participants were informed explicitly on the computer screen (i.e., "the rules about which decks are good and bad may have changed)" that the nature of the game might change between Phase 1 and Phase 2a, as well as prior to each sub-phase.

5.2.2.4.3 Card Sort Test: WCST

Each participant was administered Berg's "Wisconsin Card Sort" Test (WCST) Version 0.4 (Mueller, 2009a) using the Psychology Experiment Building Language (PEBL) Version 0.10 software (Mueller, 2009b). The development of the WCST was based on the card sorting task described in Berg (1948) and Grant and Berg (1948). The task is considered to be a measure of executive functioning,

particularly "set-shifting" (i.e. flexibility in behavior in response to changing schedules of reinforcement).

In this task, participants were presented with four “key” cards on the computer screen, each of which varied on three dimensions: colour, form/shape, and number. They were then presented with individual cards on the screen and asked to match each card to one of the four key cards. The computer provided feedback (“right” or “wrong”) after each card, depending on whether or not the card was sorted according to the pre-determined rule (colour, form/shape, or number). The participants were never informed of the rules and the order of the rules was generated randomly by the program for each participant. After the participant categorized 10 consecutive cards correctly (completed one category), the sorting principle was changed. The previous sorting strategy then received negative feedback and the participant was expected to shift their strategy to a new categorization principle. Participants were not informed of the length of the sets (i.e., 10 correct sorts) or the shift in the rules. They were provided with a maximum of 128 trials (cards) to complete the nine categories (three of each rule).

The WCST program generated a report for each participant that calculated number of trials used, number of categories experienced, number of categories completed, number of correct responses, number of perseverative responses (both correct and incorrect), total errors (included perseverative errors, non-perseverative errors), number and mean of perseverative runs. Definitions of these indexes are presented in Appendix F Figure F1. The WCST was always administered in between the IGT tasks.

5.2.3 Procedure

Participants were selected for the study based on their scores on the online BPD screening measures administered during Mass Testing. Eligible participants were able to sign up for the two-part study (entitled Temperament, Emotional Experience and Reasoning) for course credit using the Sona Experiment Management System. Part 1 of the study consisted of a series of online questionnaires that measured different aspects of temperament (ATQ-SF, BIS/BAS Scales, SPSRQ-S), experience of emotions (AIS-S, ALS-SF, PSCS, MAS-MM, TMMS – Clarity and Repair, TAS), self-compassion (FSCRS), impulsivity (UPPS Scale) and borderline personality traits (BPQ). Part 2 of the study

required the participant to come into the lab and complete the following: a brief questionnaire assessing mood (PANAS), three computerized decision-making tasks (IGT-ABCD, WCST, IGT-EFGH) and two brief paper-and-pencil questionnaires which included questions regarding family background, three measures that explored different aspects of their childhood (ICES, MNBS-SF, CTQ-SF), one measure of temperament (HSPS-R) and a BPD screening questionnaire (MSI-BPD). As in Study 2, participants were informed about the limits to confidentiality of their responses.

5.2.4 Statistical Analyses

The sample was divided into two groups—BPD participants and Control participants. Performance on the IGT and WCST tasks was compared using ANOVAs. Effect sizes for all significant main effects and interactions in repeated-measures ANOVAs are reported with partial eta squared (η^2) which describes the proportion of total variability attributable to that factor. A η^2 of .01 denotes a small effect size, .059 a medium effect size, and .138 a large effect size (Cohen, 1988). All analyses were completed with IBM SPSS Statistics 19.0.

5.3 Results

5.3.1 Data Screening and Preparation

The following sections summarize the data screening and preparation measures. This includes an assessment of incomplete and missing data, departures from normality, outlier analyses and reliability of measures.

5.3.1.1 Incomplete/Missing Data and Random Responding

Although 208 participants completed the entire study, several participants were excluded at various levels of analysis. First, a comparison of scores on the MSI-BPD completed during Mass Testing (Time 1) and in the lab (Time 2) revealed discrepancies in participants' scores ranging from -6 to +8. Thirty-six (i.e., 17.31%) participants obtained difference scores greater than the absolute value of 3 (out of a total score of 10) and were identified as suspect cases with respect to group membership. To further assess the appropriateness of the participants' placement in the two groups (i.e., Control and BPD), their total scores on the Borderline Personality Questionnaire (BPQ-Total) were examined. For

participants designated as Controls (n = 120), 90 percent scored 15 or less on the BPQ (M = 7.61, SD = 5.20); two extreme BPQ-Total scores were identified in the Control Group and these participants were removed from all further analyses. Of the participants designated as members of the BPD group (n = 88), approximately 90 percent obtained BPQ-Total scores of 24 or more (M = 39.40, SD = 11.23); no extreme outliers were identified in the BPD group.

The BPQ-Total scores were examined for each of the 36 participants with discrepant MSI-BPD Time 1(T1) and Time 2 (T2) scores. Of the suspect participants initially identified as Controls, four obtained BPQ-Total scores greater than 15 and were removed from all further analyses. Of the suspect participants initially identified as BPD, six obtained BPQ-Total scores that were below 19 and were removed from further analyses. Therefore, six participants were removed from each group, decreasing the sample size to 196.

For the most part, the data from both online and lab measures was complete for both groups. Three of the participants did not identify a significant male caregiver in their lives and did not complete the father-specific items on the ICES. There was no missing data for the IGT-ABCD and WCST computer tasks; however, the first 10 participants (8 Control, 2 BPD) did not complete the IGT-EFGH task. We were initially concerned about time constraints and only decided to include both the ABCD and EFGH versions of the IGT after it was clear that the entire study could be completed within the two-hour time frame.

An examination of response patterns on the computer tasks revealed that some participants responded in a careless or arbitrary manner to the stimuli. On the WCST, completion of one or fewer categories (out of a possible nine categories) and a high rate of non-perseverative errors were used to identify participants with suspect response styles. Using these criteria, five participants (3 Control, 2 BPD) were identified and removed from all further analyses. On the IGT Task, deck selection frequencies across blocks of 5 trials were examined for evidence of abnormal responding. For example, some participants selected each of the four decks (A, B, C, D), in order, repeatedly throughout the entire task (e.g., ABCDABCDABCDABCD; or, ABCDCBABCDCBABCD). Other participants selected

from only one deck across multiple phases, regardless of the reinforcements. Eleven participants (5 Control, 6 BPD) were found to exhibit response patterns suggestive of non-compliance with task instructions on the IGT and were removed from further analyses. Therefore, the final sample consisted of 180 participants (111 Control, 79 BPD). Demographic information for the sample is presented in Table G10.

5.3.1.2 Normality and Outlier Analyses

5.3.1.2.1 Univariate normality. Univariate normality was explored by examining absolute values of univariate skew and kurtosis and the Kolmogorov-Smirnov test of normality (i.e., as a goodness-of-fit test of the sample distribution). These were the same procedures used in Studies 1 and 2 (e.g., p. 37). A summary of the skew, kurtosis, Kolmogorov-Smirnov statistics and significance values for the total scale and subscales are provided in Table G11.

Considering the manner in which our sample was selected (i.e., low and high scorers on the MSI-BPD and IPDE-SQ BPD) and the nature of the variables studied (e.g., neglect and invalidation in childhood), there were a number of scales for which we did not expect a normal distribution in our combined sample. In line with this expectation, several of these totals were identified as non-normal by the Kolmogorov-Smirnov statistic. For example, the BPQ-Total score was expected to have a bimodal distribution due to our method of participant selection. As well, for scales with low endorsement rates of items, such as the childhood neglect (MNBS-SF) and invalidation (ICES) questionnaires, we expected to find a positively skewed distribution.

To determine if additional measures (e.g., transformations) were required to address departures from univariate normality, we informally examined distribution plots of the total scores against the normal curve. We decided to leave scales with non-normal distributions untransformed given our sample size and difficulties with the interpretation of transformed variables.

5.3.1.2.2 Univariate and multivariate outliers. Univariate and multivariate outliers were examined separately for the BPD and Control groups. Cases with scores more than three standard deviations away from the mean were identified for each variable ($z > 3.29$, $p < .001$; Tabachnick &

Fidell, 2007). In the BPD group, two participants were identified as extreme outliers on the PANAS – NA scale and one participant on the HSPS – EOE scale. One participant in the Control group was identified as a univariate outlier on several of the environmental measures and another participant was identified as a univariate outlier on the FSCRS – Reassuring Self and the BAS – Reward Responsiveness scales. These cases were flagged and given the high number of combinations of multivariate variables, additional analyses were conducted for multivariate outliers in the two groups separately.

A series of multivariate analyses of all of the scales of interest was conducted using IBM SPSS Amos version 19 (Arbuckle, 2010). The analyses were divided by constructs: (1) temperament and environment variables, (2) reinforcement sensitivity and impulsivity variables, (3) emotion and self-compassion, (4) IGT and (5) WCST. The univariate variables in each category were simultaneously entered to examine the Mahalanobis distance (d-squared) for each observation, along with Mardia's coefficient of multivariate kurtosis. This analysis requires complete data for all variables; therefore missing values were imputed using mean substitution (less than 2% of the data was estimated).

Using a chi-squared distribution with $p < .01$ and degrees of freedom based on the number of variables in the sample, we identified a critical value (χ^2 critical) for each analysis. Participants scoring above this criterion were identified as multivariate outliers. Six Control and four BPD participants were identified as multivariate outliers (χ^2 critical = 29.14, $df = 14$) in the temperament and early environment analysis. Four Control and three BPD participants were identified as multivariate outliers (χ^2 critical = 23.21, $df = 10$) on indexes measuring reinforcement sensitivity and impulsivity. In the emotion and self-compassion analysis, five Control and three BPD participants were identified as multivariate outliers (χ^2 critical = 32.00, $df = 16$). Several of the participants identified as multivariate outliers were also found to be outliers in the univariate analyses described earlier.

Multivariate outlier analyses were run separately, by order of completion (i.e., first or last), for the ABCD and EFGH versions of the IGT task. Since the number of variables was the same in each

analysis, the critical value (χ^2 critical = 24.73, *df* = 11) was identical for the same across analyses. A total of seven Control and two BPD participants were identified as multivariate outliers on the IGT-ABCD scores. One BPD and four Control participants were identified as multivariate outliers on the IGT-EFGH indexes. An examination of scores on the WCST variables resulted in the identification of three Control and two BPD multivariate outliers (χ^2 critical = 16.81, *df* = 6).

Values of Mardia's coefficient of multivariate kurtosis above 1.96 suggest significant non-normality (Arbuckle, 2006). Unsurprisingly (given the number of outliers) we found high values for this indicator on all multivariate normality analyses. The multivariate normality analyses were re-run with the identified outliers excluded and Mardia's coefficient appeared to remain elevated for all analyses.

5.3.1.3 Reliability and Descriptive Statistics

The internal consistency reliabilities (Cronbach's alphas) for the psychometric variables are provided in Tables G1 to G5 for all measures completed by participants (range .60 to .96). Reliability indexes were also computed for IGT-ABCD and IGT-EFGH tasks by entering the eleven 20-trial blocks as "items." The values are presented in Table G12.

The descriptive statistics for the psychometric variables are presented in Table G13. Several of the variables (e.g., childhood environment, some temperament variables) were excluded from the study from this point forward as they did not directly relate to the Study 3 hypotheses. Means and standard deviations for the relevant variables were calculated separately for the BPD and Control groups. T-tests were used to compare means between the two groups and the *t* values are presented in Table G13. BPD participants demonstrated higher average scores on measures of state negative affect, trait negative affect, negative affect intensity, emotional awareness, affect lability, behavioral inhibition, behavioral activation, sensitivity to punishment, sensitivity to reward, and urgency. BPD participants had lower mean scores on measures of state positive affect, surgency/extraversion, emotional clarity, perseverance, premeditation, and effortful control.

5.3.2 Results from the WCST

The WCST was scored in a manner similar to that detailed in Grant and Berg (1948) and Heaton, Chelune, Talley, Kay, and Curtiss' (1993) manual. The following outcome indexes were computed by the computer program: Number of Trials Completed, Categories Completed, Categories Experienced, Number of Trials to Completion of First Category, Percentage of Correct Responses, Percentage of Perseverative Responses (both correct and incorrect perseverative responses), Percentage of Perseverative Errors, Percentage of Non-perseverative Errors, Percentage of Total Errors, and Mean Perseverative Runs. The remaining indexes (Percentage of Conceptual Level Responses, Failure to Maintain Set, Learning to Learn) were computed by the experimenter using the raw data. Definitions of these indexes are provided in Appendix F Figure F1. Five participants (4 Controls, 1 BPD) were identified as outliers on several of the WCST outcome variables and were not included in the WCST analyses. Therefore, the following results are based on a sample of 175 (102 Controls, 73 BPD).

The performance levels of the BPD and Control participants on the WCST were compared using a one-way ANOVA. In general, the two groups scored similarly on the WCST indexes; Table G14 presents the means and standard deviations of each index by group (BPD, Control). There was a trend towards a statistically significant difference between the groups on *Percentage of Perseverative Responses* and *Mean Perseverative Runs*, with the BPD participants incurring a higher number of perseverative responses and runs, $F(1, 173) = 3.25$, $p = .073$ and $F(1, 173) = 3.97$, $p < .05$, respectively. This finding suggests that those in the BPD group may have had more difficulty shifting attentional set throughout the task. There were no differences between the two groups on the other indexes.

5.3.3 Results from the IGT

As in Bechara et al.'s (1994) study, performance for the card selections was subdivided into blocks of 20 cards each: five blocks for Phase 1 and three shift periods, each consisting of two 20-card blocks, for Phase 2. For each block, the net score was derived by subtracting the number of good from bad card selections. Tables G15 and G16 represent the net scores (total number of cards selected from advantageous minus disadvantageous decks) as a function of group (BPD, Control) and block (11

blocks in total). A net score above zero implied that the participants were selecting cards advantageously, and a net score below zero implied disadvantageous selection.

The data were analyzed using repeated measures analysis of variance (RM-ANOVA). For each analysis, the results of Mauchly's test were used to determine whether the assumption of sphericity had been violated. If the assumption was violated (i.e., the χ^2 value was statistically significant), degrees of freedom were adjusted using the Greenhouse-Geisser correction.

5.3.3.1 IGT-ABCD

A repeated measures analysis of variance (RM-ANOVA) was run with Order (1, 2) and Group (BPD, Control) as the between-subject factors and Block (11 in total) as the within-subject factor. The results revealed a statistically significant interaction between Order and Block, $F(8.00, 1408.57) = 2.18$, $p < .05$ (Greenhouse-Geisser adjusted), indicating an order effect. Thus, separate analyses were run for each Order.

5.3.3.1.1 IGT-ABCD Phase 1

Order 1. A repeated measures analysis of variance (RM-ANOVA) was run with Group (BPD, Control) as the between-subject factors and Block (5 in total) as the within-subject factor. The results revealed a main effect for Block, $V = 0.50$, $F(3.14, 292.29) = 31.17$, $p < .001$, $\eta^2 = .25$ (Greenhouse-Geisser adjusted), and a statistically significant interaction between Block and Group, $V = 0.11$, $F(3.14, 292.29) = 3.05$, $p < .05$, $\eta^2 = .03$ (Greenhouse-Geisser adjusted). There was no main effect of group.

These results are depicted in Figure H3. In general, Control participants gradually shifted their preference towards the good decks (C and D), and away from the bad decks (A and B), as reflected by the shift of the net scores towards positive. Figure H3 reveals that, in contrast to Control participants, BPD participants failed to demonstrate a steady, progressive shift in behavior. Although there was a clear positive slope from Phase 1i to Phase 1ii, their performance seemed to plateau for the three remaining Phase 1 blocks.

To further investigate selection preferences across the two groups during Phase 1, a 5 (Block) × 2 (Group) ANOVA was performed for each deck. A trend toward an interaction effect was detected for Order 1 Deck B selections, $V = 0.11$, $F(3.05, 283.36) = 2.51$, $p = .058$, $\eta^2 = .023$ (Greenhouse-Geisser adjusted) and a main effect of Group was found for Order 2 Deck B selections, $F(1, 74) = 4.36$, $p < .05$, $\eta^2 = .056$. The data for Deck B, presented in Table G17, suggests that the frequency of selecting from this deck was higher for BPD participants.

Order 2. As noted earlier, 76 participants completed the EFGH task first, followed by the WCST and then ABCD. Thus, unlike participants in Order 1, those in Order 2 had previous exposure to an IGT task before completing the ABCD version. As with data from Order 1, a 2 (Group) by 5 (Block) RM-ANOVA was run. The results revealed a main effect for Block, $V = 0.57$, $F(4, 296) = 30.28$, $p < .001$, $\eta^2 = .57$, with participants selecting more advantageous decks across time. There was no main effect of Group identified. Although there was no interaction effect detected, the overall pattern of responses over time within each Group was similar to that observed in Order 1. In general, the Control participants demonstrated a learning slope that was more positive and consistent over time (refer to Figure H4).

5.3.3.1.2 IGT-ABCD Phase 2

Order 1. A repeated measures analysis of variance (RM-ANOVA) was run with Group (BPD, Control) as the between-subject factor and Block (6 in total) as the within-subject factor. The results revealed a main effect for Block, $V = 0.24$, $F(3.69, 343.20) = 4.48$, $p = .002$, $\eta^2 = .046$ (Greenhouse-Geisser adjusted). No Group main effect or interaction was found.

The results depicted in Figure H3, however, suggest possible interactions within sub-phases 2a and 2b. As such, three additional RM-ANOVAs were conducted for each sub-phase with Group as the between-subject factor and Block (2) as the within-subject factor. The results of these analyses are presented in Table G18. A main effect for Block was detected in Phase 2c, $F(1, 93) = 8.17$, $p = .005$, and to a lesser degree in Phase 2a, $F(1, 93) = 2.86$, $p = .094$; in general, participants' performance

improved across time within Phases 2a and 2c. Although no statistically significant interaction effects or main effects of Group were found, there were trends toward interactions effects in Phases 2a and 2b. In both sub-phases, the BPD participants demonstrated steeper performance slopes than the Control participants. In addition, unlike the Control participants, the BPD participants showed an unexpected *decrease* in performance from Phase 2b.i to 2b.ii.

To further examine response patterns in Phase 2b, deck selection frequency scatterplots were generated. For each Group, the number of selections made from each deck (A, B, C, D) was calculated in five-trial blocks across Phase 2b. Phase 2b was unique in that it represented a complete reversal of contingencies; decks that were previously advantageous (C and D) were now disadvantageous and decks that were previously disadvantageous (A and B) were now advantageous. The deck selection frequencies for both Groups are presented in Figures H5 to H8.

An examination of the scatterplots suggests subtle differences in deck preferences between the two groups. Although both seemed to favour deck B (good; infrequent, moderate punishment and smaller reward) and avoid deck C (bad; frequent, moderate punishment and larger reward), the BPD participants were slower to make the shift to deck A (good; frequent, small punishment and smaller reward) and continued to select from D (bad; infrequent, large punishment and larger reward) at a higher frequency. In contrast, the Control participants finished the sub-phase selecting mostly from the two good decks (A and B). This pattern was similar in both Order 1 and 2 and suggests that the BPD participants may have been avoiding decks with frequent punishment, regardless of the reward, more than Control participants.

Order 2. A RM-ANOVA was run with Group (BPD, Control) as the between-subject factor and Block (6 in total) as the within-subject factor. The results revealed a main effect for Block, $V = 0.29$, $F(3.56, 671.48) = 7.39$, $p < .001$, $\eta^2 = .091$ (Greenhouse-Geisser adjusted). No Group main effect or interaction was found.

Similar to the results of Order 1, the results depicted in Figure H4 suggest possible interactions within sub-phases 2a and 2b. Once again, three additional RM-ANOVAs were conducted for each sub-

phase with Group as the between-subject factor and Block (2) as the within-subject factor. The results of these analyses are presented in Table G19. A main effect for Block was detected in Phases 2a and 2c, $F(1, 74) = 12.68$, $p < .001$ and $F(1, 74) = 15.16$, $p < .001$; in general, participants' performance improved across time within Phases 2a and 2c. Similar to Order 1, there was a trend toward an interaction effect in Phase 2b. The Control participants demonstrated improved performance across time and the BPD participants demonstrated an unexpected *decrease* in performance from Phase 2b.i to 2b.ii. The deck selection frequency plots for Phase 2b (presented in Figures H9 to H12) illustrate selection patterns similar to that identified in participants assigned to Order 1 (refer to above section).

5.3.3.1.2.1 IGT-ABCD Phase 2 Contingency Shift Learning. To explore the possibility of cognitive perseveration, previous researchers (e.g., Cella et al., 2010; Turnbull et al., 2006) have analyzed participants' patterns of deck selection across shifts. For example, Turnbull et al. (2006) examined participants' selections in the shifting period (Phase 2) in the context of their preferences in the standard phase (Phase 1). Turnbull et al.'s approach was used to examine the degree to which participants retained a preference for the decks that were originally good (C and D), as opposed to those that acquire good characteristics during various periods of the shifting phase.

For this analysis, choices were calculated in the shifting phase of decks that were previously good (C and D) so that the once-good-now-bad decks were C (in Shift 1), C and D (in Shift 2), and D (in Shift 3). The results of mixed factor ANOVAs conducted separately for Orders 1 and 2 revealed a main effect of Shift in both cases but no main effect of Group or interaction effect was found. These results suggest that neither Group was more likely to select from decks that had previously been good in Phase 1. Therefore, these findings do not support a cognitive perseveration on "previously good decks" account of the differences between the two groups.

We also examined the data using Cella et al.'s (2010) approach of comparing two indexes: levels of Previously Good-Now-Bad (PGNB) and Previously Bad-Now-Good (PBNG) selections. Unlike Turnbull et al. (2006), Cella and colleagues focused on retention of preference for decks that were advantageous in the previous block of trials. In other words, they examined participants'

selections in each shifting period (Phases 2a, 2b, 2c) in the context of their preferences in the block prior to the switch (i.e., Phases 1, 2a, 2b, respectively). Selections were categorized as PGNB when they were chosen from a deck that was advantageous in the previous block of trials and is now disadvantageous (i.e., deck C for Shift 1, deck D for Shift 2 and Deck A for shift 3). Selections were categorized as PBNG when participants chose cards from decks that were disadvantageous in the previous block of trials and were now advantageous (i.e. deck A for Shift 1, deck B for Shift 2 and deck C for Shift 3).

The 2 (Group) × 3 (Shift) ANOVA conducted on PGNB selections revealed a main effect for Shift, $V = 0.10$, $F(2, 186) = 5.32$, $p = .006$, $\eta^2 = .054$, with PGNB selections decreasing across Shifts. No Group or interaction effect was detected. The results of the PGNB selections analysis suggest that the BPD and Control participants are not particularly attached to the affective consequences of previous positive contingencies; both Groups demonstrated flexibility in shifting towards new advantageous behaviors and were able to disengage from previously good contingencies when they became bad.

In contrast, the 2 (Group) × 3 (Shift) ANOVA comparing PBNG selections revealed a significant main effect for Shift, $V = 0.08$, $F(2, 186) = 4.81$, $p = .009$, $\eta^2 = .049$, and a trend toward a significant interaction effect, $V = 0.07$, $F(2, 186) = 2.95$, $p = .055$, $\eta^2 = .031$. Overall, the number of cards selected from the PBNG decks increased across Shifts; however, the increase from Shifts 1 to 3 was more prominent in the BPD group than in the Controls. No main effect of Group was detected. These results suggest that the ability to shift from bad to good contingences is more dramatic for the BPD than the Control participants. Unlike the Control participants whose selection frequency did not change significantly across time, the BPD participants demonstrated a significantly greater preference for the PBNG deck when comparing their selection frequencies between the first and third Shift.

5.3.3.1.2.2 IGT-ABCD Phase 2 Flexible Contingency Shift Learning. As noted previously and demonstrated in Figure H1, each contingency-shift period involves two of the decks changing contingencies (from “bad” to “good,” and vice versa) and two of the decks retaining the same

contingency (i.e., "good" or "bad") from the previous shift period. To examine differences in performance as a function of absolute and progressive contingency shifts, Dymond et al.'s (2010) method for calculating indexes of flexible contingency-shift learning for each deck was adopted. The index of flexible learning (IOFL) was calculated for every block of 20 trials, for a total of 11 blocks.

To generate the IOFL, the cumulative number of selections from the deck within a particular block was divided by the total number of trials for which that deck had that particular contingency (i.e., "good" or "bad"). For example, in the first block of 20 trials in Shift Period 1, the number of selections of Deck C was divided by 20 as this was the cumulative number of trials for which this deck had been "bad" (i.e., it changed from being "good" in the original phase of the IGT, to "bad" in the first shift block). In the same block of trials, the cumulative number of selections from Deck B was divided by 120, as the contingency for this deck had not changed from the original phase. Therefore, the IOFL provided a measure of deck selection weighted by the number of trials for which a deck had been associated with "good" or "bad" contingencies. The weighted scores ranged from 0 (no selections were made from the deck in that particular block) to 1 (all selections were made from the same deck since that contingency came into effect). The results of the 6 (Block) × 2 (Group) RM-ANOVA analyses for Orders 1 and 2 did not show any statistically significant main effects of Group or two-way interactions.

5.3.3.2 IGT-EFGH

A RM-ANOVA was run with Order (1, 2) and Group (BPD, Control) as the between-subject factors and Block (11 in total) as the within-subject factor. The results revealed a statistically significant interaction between Order and Block, $F(7.42, 1231.33) = 2.16$, $p < .05$ (Greenhouse-Geisser adjusted), indicating an order effect. Thus, separate analyses were run for each Order.

5.3.3.2.1 IGT-EFGH Phase 1

Order 1. A RM-ANOVA was run with Group (BPD, Control) as the between-subject factors and Block (5 in total) as the within-subject factor. The results revealed a main effect for Block, $F(4, 352) = 15.38$, $p < .001$; net scores increased gradually across time for both Control and BPD

participants. There was no main effect of Group or interaction detected. The results are depicted in Figure H13.

Order 2. As noted earlier, 76 participants completed the EFGH task first, followed by the WCST and then ABCD. Thus, unlike participants in Order 1, those in Order 2 had no previous exposure to an IGT task before completing the EFGH version. As with EFGH data from Order 1, a 2 (Group) by 5 (Block) RM-ANOVA was run. The results revealed a main effect for Block, $F(3.34, 244.12) = 13.50$, $p < .001$ (Greenhouse-Geisser adjusted), with participants selecting more advantageous decks across time. There was no main effect of Group or interaction effect detected. The results are presented in Figure H14.

5.3.3.2.2 IGT-EFGH Phase 2

Order 1. A RM-ANOVA was run with Group (BPD, Control) as the between-subject factor and Block (6 in total) as the within-subject factor. The results revealed a main effect for Block, $F(3.99, 351.04) = 33.34$, $p < .001$ (Greenhouse-Geisser adjusted). No Group main effect or interaction was found.

Three additional RM-ANOVAs were conducted for each sub-phase with Group as the between-subject factor and Block (2) as the within-subject factor. The results of these analyses are presented in Table G20. A strong main effect for Block was detected in each analysis, with performance of both Groups improving within each sub-phase. Although no statistically significant main effects of Group were found, there was one trend toward an interaction effect in Phases 2c. Specifically, the BPD participants demonstrated a steeper performance slope than the Control participants; the average net score for the BPD participants was lower than that of the Control participants in Phase 2c.i but they finished the task with a higher score than the Control participants in Phase 2c.ii. To further examine response patterns in Phase 2c, we generated deck selection frequency scatterplots for both Groups. There were no clear differences visible from the plots; both Groups showed the strongest preference for deck F (good), followed by deck H (good).

Order 2. A RM-ANOVA was run with Group (BPD, Control) as the between-subject factor and Block (6 in total) as the within-subject factor. The results revealed a main effect for Block, $F(3.54, 258.07) = 14.24$, $p < .001$ (Greenhouse-Geisser adjusted), and an interaction of Block and Group, $F(3.54, 258.07) = 3.34$, $p = .014$ (Greenhouse-Geisser adjusted). No Group main effect was found.

Three additional RM-ANOVAs were conducted for each sub-phase with Group as the between-subject factor and Block (2) as the within-subject factor. The results of these analyses are presented in Table G21. A main effect for Block was detected in each sub-phase, with the strongest effect in Phase 2c, $F(1, 73) = 30.44$, $p < .001$. No main effect of Group was found in the analyses but one interaction effect was identified in Phase 2b, $F(1, 73) = 7.07$, $p = .01$. The Control participants demonstrated a strong improvement in performance across time, whereas the BPD participants demonstrated a substantially smaller increase in slope in the positive direction in performance from Phase 2b.i to 2b.ii.

The deck selection frequencies for Phase 2b are presented in Figures 15 to 18. Although both Groups favoured deck E (good; frequent, moderate reward and larger punishment) from the start, the Control participants seemed to shift more of their selections toward deck E sooner than the BPD participants. Similarly, both Groups showed a gradual decrease in deck F (bad; infrequent, moderate reward and smaller punishment) selections and a slow increase, followed by a plateau, in deck G (good; infrequent, large reward and larger punishment) selections. Once again, the Control participants appeared to change their selection strategy at an earlier point in time than the BPD participants. The most noticeable difference was in the selection frequency for deck H (bad; frequent, small reward and smaller punishment); whereas the Control participants selected from this deck at a rate that was below chance throughout the sub-phase, the BPD participants exhibited a gradual, steady increase in selections from deck H (bad) across time. The preference of the BPD group for decks E (good) and H (bad) may be related to the frequency of gains in these two decks; both decks had a higher frequency of "wins", with deck H providing gains that were much smaller than that in deck E.

5.3.4 Associations Between Performance on the WCST and the IGT

Associations between performance on the WCST and performance on the IGT were examined using correlational analyses. Separate correlations, by Order of administration (i.e., Order 1 and Order 2), were computed for the Phase 1 net scores for ABCD and EFGH versions of the IGT. Correlations were examined for the sample as a whole, as well as by Group (i.e., BPD and Control). The results of the analyses for IGT-ABCD and IGT-EFGH are presented in Tables G22 and G23, respectively.

Although there were some statistically significant associations identified in the analyses for IGT-ABCD, they were not consistent across Orders for either group of participants.[8] Therefore, no meaningful conclusions could be made about the association between performances on the WCST and IGT-ABCD Phase 1 Net Score. Results were more consistent for the BPD participants in the IGT-EFGH condition. Positive associations were found between the IGT-EFGH Phase 1 Net Score and two WCST indexes among the BPD participants: the number of categories completed (r = .20 to .32) and Learning to Learn (r = .25 to .30). In addition, negative associations were identified between the IGT-EFGH Phase 1 Net Score and two WCST indexes among the BPD participants: number of perseverative errors (r = -.25 to -.32) and failure to maintain set (r = -.23 to -.46). The associations were weaker and less consistent for the Control participants.

5.3.5 BPQ Dimensions and Performance on the IGT

Correlational analyses were conducted to explore whether there were any associations between performance on the IGT and symptom dimensions on the BPQ. The results of the analyses for IGT-ABCD and IGT-EFGH are presented in Tables G24 and G25, respectively. There were no consistent, significant associations identified between the BPQ dimensions and performance on the IGT.

5.3.6 Psychometric Correlates of the IGT

Correlational analyses were used to identify which psychometric variables may be associated with differences in performance on the IGT. The variables included measures of emotional experience

[8] All correlational analyses were also run using the net score computed from only IGT-ABCD Phases 1iv and 1v. The pattern of associations was similar to that obtained with the IGT-ABCD Phase 1 Net Score.

(e.g., state and trait negative/positive emotionality, affect intensity, emotional awareness, clarity, lability), reinforcement sensitivity (e.g., sensitivity to reward and/or punishment), impulsivity, and effortful control. The results of the analyses between the affect variables and IGT-ABCD and IGT-EFGH are presented in Tables G26 and G27, respectively. Associations between the remaining variables and IGT-ABCD and IGT-EFGH are presented in Tables G28 and G29, respectively.

No consistent, meaningful associations were identified between the psychometric variables and the IGT-ABCD Phase 1 Net Score. There were negative associations identified between the IGT-EFGH Phase 1 Net Score and state negative affect (reported during the in-lab portion of the study) (r = -.19 to -.41) and sensitivity to punishment (r = -.22 to -.36) among BPD participants. In addition, positive associations were identified between the IGT-EFGH Phase 1 Net Score and private self-consciousness (r = .27 to .39), BAS Fun Seeking (r = .25 to .42), and UPPS Sensation Seeking (r = .28 to .46) among BPD participants. The Control participants exhibited a small positive association between the IGT-EFGH Phase 1 Net Score and UPPS Perseverance (r = .23 to .25).

5.4 Discussion

5.4.1 Summary of Results

As demonstrated in other studies using repetitive administration of the IGT (e.g., Bechara, Tranel, & Damasio, 2000), prior exposure to an IGT task resulted in improved performance on the subsequent administration. In the current study, performance on the IGT-ABCD was better for participants assigned to Order 2 (i.e., completed IGT-EFGH first) and performance on the IGT-EFGH was better for those assigned to Order 1 (i.e., completed IGT-ABCD first). Furthermore, interaction effects were more frequent in Order 1, suggesting that the completion of the IGT-ABCD may have had a different carry-over effect on the groups of participants than did completion of the IGT-EFGH first.

The lack of a main effect of Group in both the IGT-ABCD and EFGH analyses suggests that the performance of the BPD and Control participants did not differ overall (i.e., net scores were similar). As indicated by the main effect of Block found in all analyses, participants in both groups selected more advantageous decks as they progressed through the task. However, this overall pattern

was qualified by an interaction between Group and Block in Phase 1 (i.e., first 100 trials) of the IGT-ABCD task. Specifically, the Control participants demonstrated gradual, steady improvement in performance across Blocks. In contrast, the BPD participants exhibited an initial steep positive slope, followed by a plateau in performance across the remaining Blocks. This interaction effect was more defined for participants in Order 1 (i.e., those who completed IGT-ABCD first). The participants in Order 2 (i.e., those with previous exposure to the IGT-EFGH task) showed a similar pattern but the interaction was not statistically significant. Thus, the main finding from IGT-ABCD Phase 1 analysis was the failure of BPD participants to demonstrate a steady, progressive improvement in performance across time. The performance of participants on the IGT-ABCD Phase 1 was not consistently associated with any psychometric variables (i.e., emotional experience, reinforcement sensitivity, impulsivity, effortful control). There were also no meaningful associations between BPD symptom dimensions and performance on the task.

Performance in Phase 2 of the IGT-ABCD was characterized by similar improvement across time for both Groups. However, the shifts in reinforcement contingencies that occurred every 40 trials appeared to impact the two Groups differently. In particular, the BPD participants demonstrated an unexpected *decrease* in performance within Phase 2b, which represented a complete reversal of contingencies - decks that were previously advantageous (C and D) were now disadvantageous and decks that were previously disadvantageous (A and B) were now advantageous. Whereas the Control participants completed Phase 2b selecting from the two decks that were advantageous (A and B), the BPD participants selected primarily from deck B (good; low immediate reward and infrequent, moderate punishment) and deck D (bad; high immediate reward and infrequent, large punishment). This finding was detected in both Order 1 and 2 analyses and suggests that the BPD participants may have been avoiding decks with frequent punishment, regardless of the reward, more than Control participants.

There were no significant differences in performance between the two groups during Phase 1 of the IGT-EFGH in either Order. The results from Phase 2 of the IGT-EFGH varied by Order. The

performance of participants in Order 1 (i.e., those who had previous exposure to the IGT-ABCD) did not differ by Group and there were no significant interaction effects identified. There were also no Group differences identified in Order 2; however, there was a significant interaction detected in Phase 2b with Controls demonstrating much steeper positive slope across the two blocks than BPD participants. An examination of participants' deck preferences in this phase showed that Controls selected from deck H (bad; low immediate punishment and frequent, small reward) at a rate that was below chance throughout the sub-phase. In contrast, the BPD participants exhibited a gradual, steady increase in selections from deck H across time. Thus, participants in the Control group completed the Phase selecting decks E (good; high immediate punishment, frequent moderate reward) and G (good; high immediate punishment, infrequent large reward) with greatest frequency whereas BPD participants selected decks E (good) and H (bad; low immediate punishment, frequent small reward). The preference of the BPD group for decks E and H may be related to the frequency of gains in these two decks as both had "wins" at a higher frequency than decks F and G.

5.4.2 Interpretation

Consistent with the results of Haaland and Landrø (2007), participants in the BPD group demonstrated deficits in decision-making as measured by the ABCD version of the IGT. Specifically, they failed to exhibit a steady rate in improvement across the five blocks of Phase 1. In contrast, their performance on Phase 1 of the IGT-EFGH was comparable to that of Control participants. According to Bechara, Tranel and Damasio (2000), this particular pattern of results from the ABCD and EFGH versions of the tasks (i.e., poor performance on the former, intact performance on the latter) suggests hypersensitivity to reward. It does not suggest hypersensitivity to punishment or insensitivity to all future consequences as the BPD participants performed comparably to Controls on the IGT-EFGH.

Although the pattern of performance across the two tasks suggests that those in the BPD group were hypersensitive to reward, an examination of the participants' deck preferences indicated that reward sensitivity may not be the underlying reason for their difficulties on the IGT-ABCD. According to Bechara and colleagues (1994), one would expect preference for decks A and B – those with high

immediate reward but even higher future loss – in individuals that are hypersensitive to reward. In the current study, those in the BPD group selected decks B and D with greatest frequency. What these decks have in common is infrequent punishment (approximately 1 loss every 10 cards) rather than high immediate reward. Therefore, BPD participants appeared to be avoiding decks associated with frequent punishment, regardless of the size of the reward, more than Control participants. This selection pattern is not consistent with that observed in VMPFC patients (Bechara et al., 1994; Bechara, Damasio, & Damasio, 2000).

Past studies have found that some individuals prefer options for which the delayed punishment is infrequent (10%) and large, rather than options for which the delayed punishment is frequent (50%) but smaller in magnitude (e.g., Crone, Bunge, Latenstein, & van der Molen, 2005; Lee et al., 2007; Toplak, Jain, & Tannock, 2005; Wilder, Weinberger, & Goldberg, 1998). However, this strategy results in a greater proportion of disadvantageous choices. If we were to attribute our findings, at least in part, to this notion, we would conclude that individuals with BPD traits are generally guided by the prevalence of unexpected punishment and prefer options for which the chances for punishment are low (although high in magnitude). In opting for low probability of punishment, individuals in the BPD group failed to consider future consequences (i.e., they did not choose advantageously more often as the task progressed). This interpretation is partially consistent with the somatic marker hypothesis (SMH), which asserts that recent experience of choice outcomes impacts future decision making (Damasio, 1994) and that individuals are guided away from certain decisions due to the negative valence associated with them (Bechara, Damasio, Tranel, & Damasio, 2005).

Another plausible explanation for the preference for decks B and D in the BPD group is the "frequency of gain" (FOG) model (e.g., Chiu, Lin, Huang, Lin, Lee, & Hsieh, 2008; Lin, Chiu, Lee, & Hsieh, 2007). Applied to the IGT, the FOG model suggests that participants base their decisions on an analysis of the number of wins associated with each deck relative to the number of losses for that same deck. According to this model, decks B and D are considered high FOG decks as only one random loss is incurred every 10 card sections; decks A and C are considered low FOG decks because losses are

incurred 50% of the time. Using the FOG model, selections from decks B and D would be considered advantageous. Thus, individuals end up choosing more cards that frequently return gains despite their long-term outcome.

The preference for the disadvantageous deck with infrequent punishment (i.e., Deck B) could also be associated with the tendency of the BPD participants to discount the value of punishment more quickly. Although they may experience the punishment as aversive, it is possible that they 'forget' the negative consequences more quickly when punishment is infrequent and switch back to making disadvantageous choices. This interpretation is partially supported by the trend toward a significant Group x Shift interaction effect in the PBNG (previously bad – now good) deck analysis in Phase 2 of the IGT-ABCD. Specifically, the results suggested that the ability to shift from bad to good contingences improved substantially for the BPD participants from the first to third Shift. Although the Control participants also showed improvement across shifts, the shift was more exaggerated for the BPD group.

It is also possible that individuals with BPD traits had problems remembering that a deck was "bad" when punishment was infrequent. This would suggest that problems with memory impacted learning. Since memory function was not measured directly in this study, it is difficult to comment with any certainty on this explanation. There were two decks on the IGT-EFGH version of the task that consisted of large punishment on every trial and either (i) infrequent, large reward or (ii) frequent, medium reward. The overall net gain of the two decks was identical but the BPD participants selected the latter deck significantly more. Participants in the Control group also showed this selection pattern. Thus, it does not appear that problems in memory for infrequent punishment/reward could explain differences between the two groups.

Results from the reversal learning component of the IGT-ABCD (i.e., Phase 2b) indicated differences in performance between the two groups, with the BPD showing a negative rather than positive learning slope across the blocks in this phase. If their poor performance was the result of deficits in reversal learning (i.e., inability to abandon the habitual response set that was initiated by the

decks that were previously "good"), we would expect them to show a preference for decks C and D. However, the decks that were selected with greatest frequency were decks B and D, the decks with infrequent punishment. These were the same decks that they showed a preference for in Phase 1. There was also no evidence for problems with reversal learning in the EFGH task as there were no differences between groups in the phases with complete reversal of contingencies (2a and 2c). Therefore, problems with reversal learning were not identified in the BPD group.

With respect to executive functioning, there was a trend towards a statistically significant difference between the Control and BPD participants on one index of the WCST (i.e., higher number of perseverative responses in BPD). BPD participants also scored significantly lower than Controls on the psychometric measure of effortful control. Nevertheless, these differences did not account for the decision-making problems of the BPD group on the IGT-ABCD. In fact, there were no consistent associations identified between executive functioning or effortful control and performance on the IGT-ABCD. This is not to say that executive functioning does not impact performance on the IGT as small associations were found between performance on the WCST and scores on the IGT-EFGH among BPD participants. However, since the BPD group demonstrated intact performance on the IGT-EFGH, any differences in executive functioning between the Control and BPD participants did not seem to impact their performance significantly.

Results from correlational analyses between other psychometric variables and performance on the IGT-ABCD were mixed across Orders. There were no consistent, meaningful associations identified between measures of emotional experience, impulsivity, and performance on the ABCD version of the IGT. Interestingly, there were also no associations identified between psychometric measures of reinforcement sensitivity and performance on the IGT-ABCD, despite evidence from deck selection preferences that BPD participants seemed to avoid decks with frequent punishment (or prefer decks with higher frequency of gain). The lack of consistent findings between psychometric measures of affect, impulsivity and reinforcement sensitivity and the IGT is not surprising as previous research examining similar correlates has produced mixed results (e.g., Desmeules, Bechara & Dubé, 2008;

Franken & Muris, 2005; Suhr & Tsanadis, 2007). Furthermore, the results from correlational analyses with performance on the IGT-EFGH suggested small to moderate effects among the BPD participants across the various factors (e.g., negative affect, sensitivity to reward/punishment, impulsivity). However, since performance on the EFGH version did not differ between the two groups, these correlates did not appear to have a major impact on overall performance. Nevertheless, rather than discount the role of emotional factors and impulsivity in performance on the IGT, future studies should examine these variables from both psychometric and behavioral perspectives.

The other goal of Study 3 was to examine the role of different BPD symptom dimensions on IGT performance. The results failed to show any consistent, meaningful associations between symptoms and performance on either version of the IGT. Previous studies examining decision-making in BPD (e.g., Haaland, Esperaas, Landrø, 2009; Haaland & Landrø, 2007) did not explore associations between the various symptom dimensions and IGT performance. There have, however, been studies that have explored decision making in groups with a specific symptom (e.g., self-harm, dissociation, substance abuse/dependence). Findings from these studies suggest possible associations between problems with decision making and current (rather than past history of) deliberate self-harm (Oldershaw et al., 2009), recent history of suicide attempts (Maurex et al., 2009), and dissociation (Haaland & Landrø, 2009).

5.4.3 Limitations

This study has extended previous research by demonstrating that the impairments in decision-making identified in patients with BPD are also observed in non-clinical groups with elevated scores on the MSI-BPD and the BPQ. It further shows that the contingency-shift version of the IGT (Turnbull et al., 2006) may represent a valuable tool in examining some of the deficits that underlie risky decisions in BPD. It should be noted, however, that the current study has some limitations.

First, the sample size was only moderate in size, particularly when the groups were divided by Order for the IGT analyses. Second, the generalizability of the study is restricted because only undergraduate university students were included in the sample. More specifically, the sample consisted

primarily of females (69.4%) between 17 and 21 years of age. Thus, the results may not be representative of individuals in the general population that possess BPD traits. The potential applicability of these findings to research using clinical groups (e.g., BPD patients) is also limited as diagnosis was not confirmed using structured interviewing (e.g., Diagnostic Interview for Borderlines – Revised, Gunderson & Zanarini, 2006). Third, data were not obtained on comorbid psychiatric disorders, history of drug abuse, current (rather than past history of) self-harm/suicidal ideation, or IQ, all of which may impact IGT performance.

Another potential limitation was the considerable individual variation in performance on the IGT. In fact, many of the Control and BPD participants scored in the impaired range on the IGT-ABCD (i.e., 44.4% and 47.2%, respectively, had Phase 1 net scores < or = 10). Both groups performed somewhat better on the IGT-EFGH; 29.8% of Control participants and 38.0% of BPD participants had scores in the "impaired" range. It is possible that some of the variability in scores was associated with the inclusion of both genders in our sample as previous research has found that women perform more disadvantageously than men on the IGT (e.g., Overman, 2004; Reavis & Overman, 2001). Regardless of whether gender differences contributed to the impairments or not, such findings raise questions about the ecological validity of the IGT paradigm, as comparison participants can perform badly on the task yet presumably function adequately in terms of everyday decision making (Dunn, Dalgleish, & Lawrence, 2006).

Other limitations relate to using a single behavioral measure to assess decision making. In the current study, significant order effects were identified for both versions of the IGT. This suggests that using the IGT in a repeated-measures design may be problematic due to carry-over between different versions of the task. The exact nature of the learning effect was not examined but the performance generally improved with the second administration of the IGT (regardless of version).

5.4.4 Future Directions

The current study suggests that for individuals with BPD traits, decision making under uncertainty may be guided by gain-loss frequency rather than long-term outcome. Since previous

research assessing IGT performance in BPD patients has not reported on selection frequency patterns by deck, it is difficult to know whether this is a novel finding. Additional IGT studies that include analyses of deck selection patterns across trials are required in both non-clinical and clinical samples with BPD traits. Future studies should also examine performance on the IGT in relation to other behavioral measures of decision-making and tests of neuropsychological functioning (e.g., memory, attention) in individuals with BPD. It is recommended that learning effects be considered in studies using repeated administration of the IGT.

It was not our goal to study gender-related differences in the IGT, however, these differences have been documented (Overman, 2004; Reavis & Overman, 2001). Considering that BPD is a diagnosis that is more frequently diagnosed among females within clinical samples (e.g., Korzekwa, Dell, Links, Thabane, & Webb, 2008), it would be interesting to determine whether the deficits identified in patients with BPD are gender-related or specific to BPD. Since epidemiological studies suggest that BPD is as common in men as in women in the general population (e.g., Grant et al., 2008), it may be useful to look at this relationship in both patient and community samples.

The question of whether current affective states mediate decision making should also be addressed in future research. The strong association between the construct of urgency and BPD suggests that the behavior of individuals with BPD may be more strongly affected by the experience of negative emotion. In the current study, there was a small, positive association identified between negative affect reported at the time of the experiment and performance on the IGT-EFGH in the BPD group. Priming a negative emotional state prior to completion of decision making tasks may enhance the size of the effect and provide more insight as to the impact of negative affect on the behavior of individuals with BPD traits. It would also be interesting to determine whether the type of negative emotion (e.g., sadness, anger) elicited affects decision making differently.

Chapter 6

General Discussion

In the current studies, I examined the reliability and validity of a select number of BPD screening measures within an undergraduate sample. I also explored some of the tenets of Linehan's (1993) biosocial theory of BPD in several samples of undergraduate university students and identified potentially important aspects of temperament and childhood experiences that predict BPD traits within this population. In addition, I attempted to characterize the emotional sensitivity, problems with emotional regulation and impulsivity that have been proposed to underlie BPD. Finally, I explored the impact of these characteristics on decision making among individuals with BPD.

6.1 Measurement of BPD Traits in an Undergraduate Sample

Consistent with previous research (e.g., Gardner & Qualter, 2009; Trull, 1995), the findings from the current set of studies suggest that there are several viable self-report methods of identifying nonclinical young adults who present with significant BPD features. Specifically, the McLean Screening Instrument for Borderline Personality Disorder (MSI-BPD; Zanarini et al., 2003), International Personality Disorder Examination DSM-IV Screening Questionnaire (IPDE-S; Loranger, 1999) and Borderline Personality Questionnaire (BPQ; Poreh et al., 2006) were all found to be internally consistent and valid (in terms of convergent validity) screening measures. For the MSI-BPD, I found that a higher cut point (>7 vs. >6) than that reported in the original study by Zanarini et al. (2003) gave the best balance of sensitivity and specificity. This higher cut point (>7) was also identified by Chanen et al. (2008) in their study comparing BPD screening measures against a criterion diagnosis from the Structured Clinical Interview for DSM-IV Axis II Disorders (SCID-II) BPD module in a sample of outpatient youth (aged 15 -25 years).

One key difference between the current study and those of Zanarini et al. (2003) and Chanen et al. (2008) is the size and nature of the sample used. Zanarini and colleagues advertised for participants and selected those with treatment histories. Chanen and colleagues selected their sample from acute referrals to a frontline youth mental health service. Whereas 69.5% of participants met criteria for BPD

in the Zanarini et al. study and 21.8% in the Chanen et al. study, the prevalence was much lower in the current sample. In fact, when the original criteria for the DIB-R (Revised Total Score >7) and IPDE-I (Criteria >4) were used, no participants were diagnosed with BPD. With the criteria each reduced by one (i.e., >6 for DIB-R and >3 for IPDE), one participant (1.8%) met the adapted DIB-R criterion and three participants met the adapted IPDE-I criterion (5.4%).

With respect to the criterion diagnosis, the data suggest that some sections of the DIB-R may be more relevant than others in a non-clinical sample. For example, items under sections querying behavioral regression, countertransference and the formation of "special" relationships during the course of psychiatric hospitalization or psychotherapy were rarely, if ever, endorsed by participants. For future use of the DIB-R as a criterion in non-clinical, undergraduate samples, I recommend: (i) removing sections 21 & 22, (ii) altering the possible values for the Interpersonal Scaled Score from 0, 2, 3 to 0, 1, 2, (iii) reducing the range of the Revised Total Score from 0-10 to 0-9, and (iv) lowering the cut-off to >6.

6.2 Linehan's (1993) Biosocial Theory of BPD

According to Linehan's (1993) biosocial theory, BPD is a disorder of emotion dysregulation that emerges from transactional interactions between individuals with biological vulnerabilities (i.e., a highly arousable temperament, sensitive to both positive and negative emotional stimuli) and specific environmental influences (i.e., a childhood environment that invalidates their emotional experience). Linehan suggested that the invalidating environment is characterized by intolerance toward the expression of private emotional experiences and intermittent reinforcement of extreme expressions of emotion. In effect, the child receives the message that displays of emotion are unwarranted and that emotions should be coped with internally and without parental support. Consequently, the child does not learn how to understand, label, regulate, or tolerate emotional responses and instead learns to oscillate between emotional inhibition and extreme emotional lability. Linehan proposed that the dysregulation affects all aspects of emotional responding, resulting in (i) heightened emotional sensitivity, (ii) intense and more frequent responses to emotional stimuli, and (iii) slow return to

emotional baseline. Furthermore, Linehan suggested that the emotion dysregulation leads to dysfunctional response patterns during emotionally challenging events and failure to learn how to solve the problems contributing to these emotional reactions.

6.3 Temperament and the Environment

The results from the current research suggest that BPD traits are associated with numerous dimensions of temperament [e.g., higher levels of negative affect; lower levels of positive affect; lower levels of effortful control; low sensory threshold (i.e., greater sensitivity) for both sensory and affective stimuli; ease of excitation (higher amplitude of emotional response (i.e., greater reactivity) to sensory and affective stimuli] and childhood environment (e.g., authoritarian parenting style, invalidating parenting, neglect, abuse). However, an examination of the interactions between dimensions of temperament and childhood environment suggested that only interactions between (i) ease of excitation (greater reactivity to sensory and affective stimuli) and environment and (ii) trait negative affect and environment, predicted BPD symptoms over and above the temperament and environment variables alone.

The significant interaction between ease of excitation (a factor of the temperament trait of sensory-processing sensitivity; Aron & Aron, 1997; Smolewska, McCabe & Woody, 2006) and the environment variables suggests that heightened sensitivity to environmental stressors and the tendency to become overwhelmed by stimulation may be a characteristic that, together with a negative environmental context, contributes to the emergence of BPD. Previous research by Meyer, Ajchenbrenner and Bowles (2005) also found a positive relationship between sensory-processing sensitivity and BPD traits, and between problematic experiences/ attachments with early caregivers and BPD traits; however, Meyer et al. did not examine the interaction between these variables. No other studies have examined the association between sensory-processing sensitivity and BPD.

The significant interaction between trait negative affect and environment is consistent with previous research (e.g., Arens, Grabe, Spitzer & Barnow, 2011; Joyce et al., 2003). Although these other studies did not examine the same factor (i.e., ATQ Negative Affect) directly, they measured Harm Avoidance – a temperament trait that has been found to be highly correlated with the personality factor of

Neuroticism (e.g., Aluja & Blanch, 2011; De Fruyt et al., 2000). The ATQ Negative Affect factor is similar to the broad dimensions of Negative Emotionality and Neuroticism (Rothbart, Ahadi, & Evans, 2000). Joyce and colleagues (2003) examined the joint effects of retrospective accounts of early childhood adversity and temperament on the diagnosis of BPD symptoms in a sample of depressed outpatients and found that the combination of (i) neglect and abuse experiences and (ii) temperamental Harm Avoidance (HA) and Novelty Seeking (NS) accounted for significant variance in the development of BPD.

More recently, Arens et al. (2011) examined longitudinally whether temperamental traits HA and NS, internalizing and externalizing disorders, trauma and perceived invalidating parenting style (as measured during adolescence) contributed to the risk of BPD, diagnosed on the basis of standardized clinical interviews 5 years later. They compared individuals with BPD from a community sample of young adults to individuals with depressive disorders and psychiatrically healthy participants. They found that those diagnosed with BPD in young adulthood exhibited an increased level of HA in adolescence; however, there was only a trend in the comparison with depressive subjects. Their analyses also showed that a difficult temperament alone did not predict BPD; however, the interaction of heightened HA and an invalidating parenting style by the mother during adolescence predicted a BPD diagnosis in young adulthood. They did not identify a significant relationship between NS and BPD.

Together, the results of the current study and past research suggest that temperamental traits related to sensitivity (e.g., Aron & Aron's (1997) sensory-processing sensitivity) and negative emotionality (e.g., Rothbart, Ahadi, and Evans' Negative Affect; Cloninger's Harm Avoidance) may be among the temperamental variables that, in conjunction with childhood adversity/ environmental stressors, result in increased symptoms of BPD. Thus, these findings provide partial support for Linehan's (1993) biosocial theory and the developmental psychopathology perspective in that evidence was found for the interaction of temperament (i.e., increased sensitivity to environmental and affective stimuli) and psychosocial variables in the prediction of BPD symptoms. In contrast to Linehan's theory, the results suggested that environmental factors in combination with the tendency to experience negative affect, rather than both positive and negative affect, were predictive of BPD traits.

6.4 Emotional Experience

The current research also sought to examine the role of different aspects of emotional experience in predicting BPD traits. According to Linehan (1993), individuals with BPD experience emotional dysregulation characterized by (i) heightened emotional sensitivity, (ii) intense and more frequent responses to emotional stimuli, and (iii) slow return to emotional baseline. The findings provide partial support for Linehan's (1993) theory in that the following factors (as measured by self-report questionnaires) were positively associated with BPD symptoms: greater temperamental sensitivity for both sensory and affective stimuli; higher intensity of negative but not positive emotional experience; higher levels of state negative affect; increased attention to emotional state (or absorption); decreased emotional clarity/difficulty identifying feelings; and increased affect lability (particularly with respect to anger). Return to emotional baseline was not measured in any of the studies.

Negative affect intensity has been implicated as a risk factor for BPD. In contrast to negative emotionality, which refers to a heritable trait reflecting a tendency toward depression, anxiety, and poor reaction to stress (Bornovalova, Matusiewicz, & Rojas, 2011), negative affect intensity refers to the strength of an individual's negative affective response (Larsen & Diener, 1987). Previous studies have found that higher levels of self-reported negative affect intensity are associated with BPD symptoms (e.g., Cheavens & Heiy, 2011; Cheavens et al., 2005; Rosenthal, Cheavens, Lejuez, & Lynch, 2005); however, several studies suggest that an individual's *response* to intense negative affect may be as important, if not more so, than affect intensity in predicting BPD symptoms. For example, Herpertz and colleagues (1999) examined the physiological correlates of emotion among those with BPD and found that individuals with BPD reported elevated subjective reactions to emotional stimuli but did not demonstrate increased physiological reactivity relative to individuals without BPD. Similarly, the results of several studies (e.g., Cheavens et al., 2005; Cheavens et al., 2011; Gratz et al., 2008) suggest that the relationship between affect intensity and BPD symptoms is moderated or mediated by variables that relate to emotional regulation and tolerance and acceptance of emotional distress. Consistent with these findings, the results of the current research suggest that the association between negative affect

intensity and BPD symptoms is weakened once other emotional experience variables are introduced. Specifically, emotional absorption, lack of emotional clarity and affect lability appear to be stronger predictors of BPD symptoms than affect intensity alone.

As noted above, the results of the current research suggest that individuals with BPD traits are more likely to report increased attention to their emotional experience. Although awareness of emotions is an important aspect of emotional experience, the amount of attention one pays to one's emotions may be moderated by both one's sensitivity to physiological changes associated with varying levels of affect (Larsen, 2000) and/or one's ability to identify and label one's emotions once attending to them (Gohm & Clore, 2000). Furthermore, some researchers have suggested that hypervigilance to one's feelings can be associated with negative consequences. For example, Sloan (2005) found that dysphoric individuals report significantly greater levels of self-focused attention than non-dysphoric individuals and concluded that such differences may be related to the maintenance of negative mood states among dysphoric individuals. Similarly, Swinkels and Giuliano (1995) found that individuals reporting elevated levels of attention to- and absorption in emotions scored higher on an index of neuroticism. Therefore, it is possible that excessive attention to emotional state and the tendency to direct awareness inward may contribute to rumination and worrying, whereas moderate levels of awareness/attention towards emotions may allow one to better identify what he or she is feeling and enable an adaptive response to that affective experience.

In contrast, Lischetzke and Eid (2003) suggested that attention to emotions is neither beneficial nor harmful to one's emotional well-being; rather, it is the presence of effective emotional regulation skills that is relevant. They proposed that in individuals who are proficient at regulating their affective experiences, frequent direction of attention inward enhances regulatory abilities and promotes affective well-being. On the other hand, individuals who lack effective emotion regulation skills may experience increased emotional discomfort by turning their attention inward. In the current study, both attention to emotions and affective lability (particularly related to anger) were significant predictors of BPD traits when considered simultaneously. Therefore, it appears that both attention inward and problems regulating emotions contribute to the presence of BPD symptoms.

Gohm (2003) suggested that confusion about one's emotions (i.e., lack of clarity), coupled with high affect intensity likely produce a particularly aversive emotional experience. In this case, the individual may be routinely flooded with intense emotions but difficulty identifying the feelings prevents them from using the affective information for purposes of adaptive emotion regulation. Gohm (2003) found that individuals who reported high affect intensity and low emotional clarity were the most likely to report engaging in attempts to attenuate their mood when experiencing intense affect. Gohm also found that mood attenuation in these individuals was associated with impaired judgment. Bradley and Lang (2007) suggested that the failure to adaptively regulate emotions, especially those that are intense and negatively valenced, may lead one to experience affect as overwhelming and intolerable, and that such experiences may give rise to the development of maladaptive approaches to regulating emotion. Barrett and colleagues (2001) found that individuals who experience intense negative emotions and possess the ability to differentiate among their emotions in a discrete and granular fashion are more likely to engage in adaptive emotion regulation than individuals who do not possess such skills. Thus, as individuals who typically experience their emotions with high intensity may be most motivated to seek a means of attenuating their affective experience, the addition of poor emotion identification and differentiation skills may leave one with few options and lead to the selection of maladaptive strategies for regulating intense affect.

Although affect intensity was not a significant, unique predictor of BPD traits in the current study, lack of emotional clarity/difficulty identifying feelings and affect lability (anger) emerged as significant predictors among the emotional experience variables. These results contribute to recent research examining the role of emotional processing and regulation in BPD and are in line with the findings of Leible and Snell (2004). In a sample of university students, Leible and Snell (2004) found that individuals who reported a higher number of BPD symptoms reported less emotional clarity and poorer emotional regulation. Furthermore, Webb and McMurran (2008) found that alexithymia was a significant predictor of BPD traits. Relationships between alexithymia and BPD have been found in both non-clinical (e.g., Modestin, Furrer, & Malti, 2004) and clinical (e.g., Berenbaum, 1996) samples. Although I did not examine all dimensions of alexithymia in the current study, items from the Difficulty Identifying Feelings

subscale of the Toronto Alexithymia Scale (TAS; Bagby et al., 1994) were used in the Emotional Clarity subscale.

There are, however, studies that have found no relationship between alexithymia and BPD (e.g., Bach, de Zwaan, Ackard, & Nutzinger, 1994; De Rick & Vanheule, 2007). Semerari and colleagues (2005) have suggested that there may be different malfunctioning profiles within the diagnostic category of BPD and that alexithymia may be characteristic of only some individuals, most probably those with dissociative symptoms. Research using more detailed analyses of both BPD traits and facets of alexithymia with clinical populations would be required to clarify the relationship.

The finding that affect instability, particularly with respect to anger, is related to BPD is consistent with both theoretical perspectives of BPD and other research. Trull and colleagues (2008) compared affective instability in patients diagnosed with BPD and those diagnosed with Major Depressive Disorder (MDD) in their natural environments and found that the degree of variability and instability of affect, the frequency of mood changes, and the amplitude of these changes distinguished patients with BPD from those with MDD. The findings were consistent with the conceptualization of affective changes in BPD being rather abrupt, large in magnitude, and likely brought on by external events. Trull and colleagues also found that hostility was the only negative affect in which the probability of acute change distinguished the groups. Similarly, McGlashan and colleagues (2005) found that anger and affective instability were among the most prevalent and least changeable criteria over a two-year period among individuals diagnosed with BPD; the other criterion was impulsivity.

Several theorists, including Linehan (1993), suggest that affective instability (or emotional dysregulation) may in fact be the driving force behind many of the behaviors exhibited by individuals with BPD traits. Linehan views these behaviors as maladaptive attempts to regulate intense affective states or to control problematic outcomes associated with these affective states. According to this perspective, the impulsive behaviors (including suicidal gestures, substance abuse, binge eating) may be conceived as maladaptive solutions to the experience of painful negative affect; identity disturbance is proposed to result from a lack of emotional consistency and predictability; and disturbed interpersonal relationships may

result from difficulties regulating emotional states and impulses. As another example, it has been proposed that those with BPD may be especially vulnerable to developing substance use disorders because alcohol or drugs may be used to cope with negative affective states. Therefore, affective instability can be quite dysfunctional in its own right and may well contribute to other symptoms and features of BPD.

6.5 Impulsivity

The results of the current research suggest that BPD traits are related to certain aspects of impulsivity more than others. Specifically, there were consistent positive associations identified between urgency (tendency to experience strong impulses, often under conditions of negative affect) and all BPD indexes; much weaker positive associations with lack of perseverance (tendency to give up in the face of boredom, fatigue, or frustration) and lack of premeditation (tendency to act without consideration of the potential consequences of the behavior); and no positive associations with sensation seeking (tendency to pursue activities that are exciting and novel). According to Whiteside and Lynam (2001), urgency is the one impulsivity factor that has been found to be associated with Neuroticism and they suggest that high scorers on urgency are likely to engage in impulsive behaviors in order to alleviate negative emotions despite the long-term harmful consequences of these actions.

The magnitude of the correlations between BPD indexes and urgency in the current research was similar to that reported by Tragesser and Robinson (2009) who studied the association between urgency and BPD features (as measured by the Personality Assessment Inventory—Borderline Features scale, Morey, 1991) in an undergraduate sample. Whiteside, Lynam, Miller, and Reynolds (2005) also found that the UPPS Urgency subscale was the only significant correlate of the four impulsivity subscales in a sample of BPD patients.

The finding of weaker, positive associations between lack of perseverance and indexes of BPD in the current study was also similar to that of Tragesser and Robinson (2009) and suggests that individuals with BPD may have trouble with sustained attention and may experience distractibility, boredom and/or frustration when working on tasks for a prolonged period of time. In the current study, lack of premeditation was only positively associated with one BPD index - the BPQ-R Impulsivity

subscale - which was not measured in the Tragesser and Robinson study. This finding suggests that the tendency toward poor planning and lack of deliberation, outside of the context of the experience of negative affect, may not be a significant contributor to the BPD presentation.

Both this study and that of Tragesser and Robinson failed to find consistent associations between UPPS Sensation Seeking and BPD features. In this study, sensation seeking was associated negatively with only one BPD index, the BPQ-R Emptiness subscale. The lack of association between UPPS Sensation Seeking and general indexes of BPD is consistent with other studies (e.g., Lynam, Miller, Miller, Bornovalova, & Lejuez, 2011; Whiteside et al., 2005) and suggests that seeking novelty or excitement does not underlie the impulsive behavior seen in those with BPD symptoms.

Overall, the results from the current studies and past research suggest that impulsive behavior in those with BPD traits is likely to occur within the context of negative affect and may be associated with the desire to alleviate negative emotions or distress.

6.6 Urgency, Distress Tolerance, and Emotional Experience

The results of the current research suggest that urgency is associated with poor distress tolerance - efforts to avoid negative emotions, a desire to rapidly alleviate negative emotions experienced, and reports of being consumed by distressing emotions when they cannot be alleviated (i.e., attention is absorbed by the presence of distressing emotions and functioning is significantly disrupted by the experience of negative emotions). Difficulties tolerating distress have been conceptualized by some researchers as a specific type of emotion regulation difficulty (Gratz & Roemer, 2004) and previous studies have found that BPD traits are associated with lower levels of distress tolerance (as measured by self-report questionnaires and persistence on stressful behavioral tasks) (e.g., Bornovalova et al., 2008; Gratz et al., 2006). The present findings suggest that individuals with BPD traits tend to engage in negative evaluations of themselves and their feelings when feeling distressed. Specifically, they have trouble accepting feelings of distress, they are more likely to feel ashamed when distressed, and they perceive their ability to cope with distress as inferior to that of others. They are also less likely to anticipate distress and shift their attention away from strong negative affective experiences.

A recent study by Iverson and colleagues (2011) examined the association between self-reported emotion dysregulation, distress tolerance, and BPD symptom severity. They found that both emotional dysregulation and poor distress tolerance uniquely predicted symptom severity. Whereas the current studies measured urgency, Iverson and colleagues measured experiential avoidance - the unwillingness to remain in contact with uncomfortable private events (e.g., thoughts, emotions, sensations, memories, urges) and the tendency to escape or avoid these experiences (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). Some researchers (e.g., Boulanger et al., 2010) suggest that experiential avoidance may be understood as a function of emotion dysregulation and poor distress tolerance. Consistent with this argument, Iverson and colleagues found that emotional dysregulation, distress tolerance, and experiential avoidance were strongly related; however, experiential avoidance was the only construct that remained a unique contributor to BPD symptom severity after controlling for depressive symptoms and emotion dysregulation. Their findings replicated and extended previous research that demonstrated an association between experiential avoidance and BPD symptom severity (Chapman et al., 2005; Gratz, Tull, & Gunderson, 2008) and research showing that experiential avoidance is an important mechanism of change in the treatment of BPD (Berking, Neacsiu, Comtois, & Linehan, 2009).

In the current research, urgency and affect lability mediated the relationship between emotional clarity and BPD traits. Similarly, Fink and colleagues (2010) found that urgency (Whiteside & Lynam, 2001; Cyders et al., 2007) mediated the relationship between alexithymia and dysregulated behaviors in a sample of undergraduate students. They suggested that the relationship between alexithymia and behavior may be explained by a tendency of individuals with high levels of alexithymia to act rashly in an attempt to immediately reduce psychological and physiological sensations associated with negative affect. If this were the case, negative urgency could be thought of as the mechanism that drives dysregulated behaviors in individuals who experience difficulty recognizing and expressing their emotions.

With respect to the relationship between emotional experience, distress tolerance and urgency, it is possible that individuals with BPD traits develop a belief that they cannot tolerate negative affective states because they have a tendency to act rashly when feeling distressed and thus escape from the negative

affective experience. It is also possible that poor distress tolerance temporally predicts higher levels of impulsivity over time in that the immediate relief of distress becomes reinforcing (Cyders & Smith, 2008). Further research would be needed to examine the differential and temporal associations among behavioral and self-report indices of emotional experience, distress tolerance and negative urgency.

6.7 Implications of Emotional Experience Deficits and Impulsivity on Decision-Making in BPD

Another purpose of the current research was to explore the impact of the identified emotional experience deficits and impulsivity on decision making in individuals with BPD traits. As noted previously, Linehan (1993) suggests that difficulties with the experience and management of emotion (e.g., intensity of affect activation and the lack of affect control) underlie the instability in identity, relationships and behavior that define BPD. From this perspective, intense emotion is proposed to interfere with cognitive functioning and effective problem solving, resulting in poor decisions and the observed harmful behaviors (e.g., Wagner & Linehan, 1999). Other researchers have suggested that the repetitive, self-damaging behavior occurring in the context of BPD may reflect impairments in planning and failure to consider future consequences (e.g., van Reekum et al., 1994). Proponents of this view suggest that individuals with BPD show greater intensity and lability in their emotional response to their environment because they are unable to inhibit or moderate their emotional urges.

Haaland and Landrø (2007) assessed decision making in patients with BPD using the Iowa Gambling Task (IGT; Bechara, Damasio, Damasio, & Anderson, 1994), an experimental neuropsychological task that has been used to study the integration of emotion and cognition in decision processes by simulating real-life decision making. Haaland and Landrø found that participants in the BPD group showed fewer advantageous choices on the IGT than the healthy control group. However, their study had some important limitations that influenced the generalizability of their findings (i.e., small sample size; most of the BPD patients were taking psychotropic medication; substantial comorbidity) and the study did not address whether the deficits in decision making in the BPD group were related to mechanisms associated with affective dysregulation, reinforcement sensitivity,

impulsivity, or other neuropsychological functions that have been found to be present in BPD (e.g., deficits in executive functioning).

The first goal of Study 3 was to determine whether Haaland and Landrø's (2007) finding of decision-making deficits on the IGT could be replicated in a non-clinical sample of individuals with BPD traits. The second aim of the study was to characterize the nature of these deficits further, from both a categorical and a dimensional perspective. Specifically, I was interested in exploring the deficits in categorically defined groups (i.e., individuals scoring above and below the recommended cut-off on the MSI-BPD), as well as by symptom dimensions (i.e., interpersonal problems, self-harm, identity disturbance, emptiness, etc.). The third goal was to ascertain the relative contribution of individual differences in the following areas to deficits in decision making in this population: emotional experience (e.g., poor emotional awareness and clarity; increased affective reactivity or lability); reinforcement sensitivity (e.g., attention to gains/losses; sensitivity to reward and/or punishment); impulsivity; effortful control/executive functioning; and reversal learning.

Consistent with the results of Haaland and Landrø (2007), participants in the BPD group demonstrated deficits in decision-making as measured by the ABCD version of the IGT. Specifically, they failed to exhibit a steady rate in improvement across the five blocks of Phase 1. The performance of participants on the IGT-ABCD Phase 1 was not consistently associated with any psychometric variables (i.e., emotional experience, reinforcement sensitivity, impulsivity, effortful control). There were also no meaningful associations between BPD symptom dimensions and performance on the task. In contrast, their performance on Phase 1 of the IGT-EFGH was comparable to that of Control participants. According to Bechara, Tranel, and Damasio (2000), this particular pattern of results from the ABCD and EFGH versions of the tasks (i.e., poor performance on the former, intact performance on the latter) suggests hypersensitivity to reward. It does not suggest hypersensitivity to punishment or insensitivity to all future consequences as the BPD participants performed comparably to Controls on the IGT-EFGH.

Although the pattern of performance across the two tasks suggests that those in the BPD group were hypersensitive to reward, an examination of the participants' deck preferences indicated that reward sensitivity may not be the underlying reason for their difficulties on the IGT-ABCD. According to Bechara and colleagues (1994), one would expect preference for decks A and B – those with high immediate reward but even higher future loss – in individuals that are hypersensitive to reward. In the current study, those in the BPD group selected decks B and D with greatest frequency. What these decks have in common is infrequent punishment (approximately 1 loss every 10 cards) rather than high immediate reward. Therefore, BPD participants appeared to be avoiding decks associated with frequent punishment, regardless of the size of the reward, more than Control participants. In other words, for individuals with BPD traits, decision making under uncertainty appeared to be guided by low probability of punishment rather than punishment magnitude or long-term outcome. This interpretation is partially consistent with the somatic marker hypothesis (SMH), which asserts that recent experience of choice outcomes impacts future decision making (Damasio, 1994) and that individuals are guided away from certain decisions due to the negative valence associated with them (Bechara, Damasio, Tranel, & Damasio, 2005).

Another plausible explanation for the preference for decks B and D in the BPD group is the "frequency of gain" (FOG) model (e.g., Chiu et al., 2008; Lin, Chiu, Lee, & Hsieh, 2007). Applied to the IGT, the FOG model suggests that participants base their decisions on an analysis of the number of wins associated with each deck relative to the number of losses for that same deck. According to this model, decks B and D are considered high FOG decks as only one random loss is incurred every 10 card sections; decks A and C are considered low FOG decks because losses are incurred 50% of the time. Using the FOG model, selections from decks B and D would be considered advantageous. Thus, individuals end up choosing more cards that frequently return gains despite their long-term outcome.

The preference for the disadvantageous deck with infrequent punishment (i.e., Deck B) could also be associated with the tendency of the BPD participants to discount the value of punishment more quickly. Although they may experience the punishment as aversive, it is possible that they 'forget' the

negative consequences more quickly when punishment is infrequent and switch back to making disadvantageous choices. This explanation suggests that they may have problems learning from their mistakes.

The results of Study 3 were not indicative of problems with reversal learning. With respect to executive functioning, there was a trend towards a statistically significant difference between the Control and BPD participants on one index of the WCST (i.e., higher number of perseverative responses in BPD). BPD participants also scored significantly lower than Controls on the psychometric measure of effortful control. Nevertheless, these differences did not account for the decision-making problems of the BPD group on the IGT-ABCD. In fact, there were no consistent associations identified between executive functioning or effortful control and performance on the IGT-ABCD.

The lack of consistent findings between psychometric measures of affect, impulsivity and reinforcement sensitivity and the IGT is not surprising as previous research examining similar correlates has produced mixed results (e.g., Desmeules, Bechara & Dubé, 2008; Franken & Muris, 2005; Suhr & Tsanadis, 2007). Future studies should examine emotional factors and impulsivity variables using both psychometric and behavioral methodology.

6.8 Limitations

The limitations related to the individual studies have been reviewed in the previous discussions. Here, I will review the limitations that apply to all three studies. In the current research, the use of a non-clinical, relatively homogeneous sample of university students affects the generalizability of the findings as the childhood backgrounds and symptom profiles of the participants may differ from that in clinical populations. For example, the sample included low base rates of childhood sexual abuse and certain aspects of dysregulated behaviors (e.g., self-injury, suicide attempts). It is also likely that the level of distress in these samples may have been lower than that of the average clinical sample.

Another limitation was reliance on self-report for most of the constructs examined (i.e., temperament, childhood experiences, impulsivity, emotional experience, distress tolerance) and the poor psychometric properties of some of the measures used. When reliabilities are low, the strength of the

associations between variables can be underestimated. Future studies should examine these constructs using a range of methodologies (e.g., diary studies, observer reports, behavioral tasks).

Another potential limitation is the measurement of temperament in adulthood and using it as an index of lifelong and relatively stable traits. There is empirical evidence that suggests that certain aspects of temperament (e.g., negative affect) are moderately stable from birth to age twelve (Roberts & DelVecchio, 2000) and within early adulthood (Vaidya et al. 2002). Although measurements of temperament in early adulthood may be accepted as reasonable indicators of temperament throughout the lifespan, longitudinal studies beginning in childhood and extending into adulthood would allow for a more thorough test of the hypotheses in this study. For example, the nature of the interaction between temperament and negative childhood environmental experiences could be outlined more clearly.

In the current research, I did not examine the role of co-morbid Axis I or Axis II disorders. Axis I comorbidity has been estimated to occur in approximately 75% of patients with BPD, the most common being depressive, anxiety, substance use, and eating disorders (e.g., Barrachina, Pascual, Ferrer, Soler, Rufat et al., 2011; Zanarini et al., 1998). Moreover, between 70 to 80% of patients with BPD have a co-occurrent axis II disorder (Barrachina et al., 2011; Zanarini et al., 2004). Thus, it may be important for future studies to consider comorbid diagnoses in the analyses of the data.

6.9 Study Implications & Future Directions

Despite the limitations noted above, the current study has important scientific and clinical implications. First, the findings provide empirical support for Linehan's (1993) biosocial theory and the role of temperament, the environment, and the interaction between the two in predicting symptoms of BPD. Additional studies need to be done to replicate the associations found in a larger and more representative sample. It would also be useful to compare the associations in clinical and non-clinical samples with BPD traits. Longitudinal studies examining the predictive role of temperament and environment in the development of BPD traits would also be beneficial.

Second, this study adds to existing research characterizing emotional experience and impulsivity in individuals with BPD traits. The results suggest that hypervigilance to one's internal state, lack of

emotional clarity, affect lability, poor distress tolerance and negative urgency play an important role in predicting BPD symptoms. In particular, the findings that negative urgency was (i) a consistent predictor of BPD symptoms and (ii) more highly correlated with BPD traits than other forms of impulsivity (i.e., lack of premeditation, lack of perseverance, sensation seeking) provided support for Linehan's (1993) theory of BPD and the notion that certain symptoms may be serving emotion regulatory functions (e.g., a reduction in emotional distress, relief of negative emotion).

These findings have important implications for treatment in that, to improve emotional regulation, individuals with BPD traits may benefit from therapy that focuses on helping them to identify and discriminate their feelings/somatic sensations, describe their emotions and feelings to themselves/others, and better understand the source of their feelings. Helping them identify and discriminate emotions may help reduce the feelings of generalized distress that may trigger episodes of lability (particularly anger/hostility) or impulsive behavior. Dialectical behavior therapy (Linehan, 1993), mentalization-based therapy (Bateman & Fonagy, 2008), schema-focused therapy (Young, Klosko, & Weishaar, 2003) and transference-focused psychotherapy (Kernberg, Yeomans, Clarkin, & Levy, 2008) all incorporate emotion regulation strategies that encourage the patient to focus on identifying the feelings that he/she is experiencing in the moment. Considering the positive association between urgency and low tolerance for distress, individuals with BPD traits may also benefit from treatment strategies designed to improve distress tolerance (e.g., distress tolerance component of Dialectical Behavior Therapy; Linehan, 1993). It may also be useful to incorporate interventions focused on reducing chronic and baseline negative affect reported by those with BPD symptoms. Although the participants in this study were recruited from a non-clinical sample, those with BPD traits reported significantly higher levels of both trait and state negative affect. The high baseline negative emotionality in individuals with BPD may cause them to be more vulnerable to difficulties regulating their emotions (Kuo & Linehan, 2009).

Although the current research examined several aspects of impulsivity, it did not include the newer construct of positive urgency (Cyders et al., 2007; Cyders & Smith, 2008). Positive urgency refers to the tendency to engage in rash action in response to extreme positive affect and has been found to be predict

problems associated with drinking, risky sexual behavior and illegal drug use during the first year of college (Cyders, Flory, Rainer, & Smith, 2009; Zapolski, Cyders, & Smith, 2009). Cyders and Smith (2008) suggest that both positive urgency and negative urgency are facets of a broader urgency factor and are related to emotionality and affective dyscontrol. It would be interesting to explore the role of positive urgency in future research on BPD and compare its predictive value to that of negative urgency.

Future studies examining emotional processes associated with BPD should investigate the variables from multiple perspectives including laboratory-based paradigms and experiential-sampling methodology or ecological momentary assessment to examine emotional processing in the real world. An increased understanding of mechanisms and processing underlying BPD can help target and focus future treatments for this psychiatric condition.

The findings from the current studies have also extended previous research by demonstrating that the impairments in decision-making identified in patients with BPD are also observed in non-clinical groups with elevated scores on the MSI-BPD and the BPQ. Specifically, the current study suggests that for individuals with BPD traits, decision making under uncertainty may be guided by gain-loss frequency rather than long-term outcome. Future research assessing IGT performance in those diagnosed with BPD (or exhibiting symptoms) should report on selection frequency patterns by deck and include analyses of deck selection patterns across trials. The use of the contingency-shift version of the IGT (Turnbull et al., 2006) may be helpful in delineating the nature of some of the deficits that underlie risky decisions in BPD and other disorders. Additional studies comparing performance on the IGT in relation to other behavioral measures of decision-making and tests of neuropsychological functioning (e.g., memory, attention) in individuals with BPD are also required. Furthermore, it is recommended that learning effects be considered in studies using repeat administrations of the IGT as the current research and past studies have shown order effects.

The question of whether current affective states mediate decision making should also be addressed in future research. The strong association between the construct of negative urgency and BPD suggests that the behavior of individuals with BPD may be more strongly affected by the

experience of negative emotion. In the current study, there was a small, positive association identified between negative affect reported at the time of the experiment and performance on the IGT-EFGH in the BPD group. Priming a negative emotional state prior to completion of decision making tasks may enhance the size of the effect and provide more insight as to the impact of negative affect on the behavior of individuals with BPD traits. It would also be interesting to determine whether the type of negative emotion (e.g., sadness, anger) elicited affects decision making differently.

Across the studies described, a number of observations in relation to selection criteria came to light. First, when screening for BPD, it is important to consider age in future studies. In the current samples, problems with self-identity and direction may have been elevated as many of the participants were in their late adolescent years and many reported uncertainty with respect to their academic and career goals at this stage. Furthermore, since longitudinal studies of BPD suggest that all nine DSM-IV criteria decline significantly over a 10-year period (e.g., Gunderson et al., 2011), age may be an important factor to consider in participant selection.

Second, although gender was not a variable of interest in the present research, it would be interesting to consider this variable in future studies. Considering that BPD is a diagnosis that is more frequently diagnosed among females within clinical samples (e.g., Korzekwa, Dell, Links, Thabane, & Webb, 2008) but as common in men as in women in the general population (e.g., Grant et al., 2008), it would be interesting to determine whether the differences identified in participants with BPD traits in the current studies are gender-related or specific to BPD. In addition, gender differences have been documented in IGT performance (Overman, 2004; Reavis & Overman, 2001) and should be considered in future research.

Third, it may be important to screen for certain conditions in selecting participants with BPD traits. For example, individuals that have suffered a traumatic brain injury should be excluded from studies because the emotional and behavioral sequelae of head injuries can resemble BPD traits (e.g., emotional lability, impulsivity) (Gagnon, Bouchard, & Rainville, 2006). Furthermore, researchers may want to exclude individuals diagnosed with certain Axis I conditions (e.g., Cyclothymic Disorder or

Bipolar I/II Disorder) as observations made over the course of the current research suggest that individuals with these diagnoses may present with high scores on BPD screening measures.

Considering its prevalence in psychiatric inpatient programs and the high suicide rate (around 10%) associated with BPD (Gunderson & Ridolfi, 2001; Paris & Zweig-Frank, 2001), it is important that the etiological mechanisms contributing to BPD be better understood. By increasing our knowledge of the underlying causes, we may better understand the nature of BPD and be better able to develop preventive measures or early treatments. Additional studies are required to further validate Linehan's (1993) biosocial theory and to provide specificity with regard to the environmental variables and predisposing variables involved.

6.10 Implications for the DSM-V

During the course of this research, the *DSM-5* Personality Disorders Workgroup presented a proposed revision for the diagnosis of BPD.[9] The Workgroup proposed a hybrid model of BPD (i.e., categorical and dimensional) that combines the notion of a borderline "type" with supplemental dimensional ratings of relevant personality traits. For an individual to meet criteria for BPD, the following criteria must be met:

A. Significant impairments in personality functioning manifest by:

1. Impairments in self functioning (a or b):

a. Identity: Markedly impoverished, poorly developed, or unstable self-image, often associated with excessive self-criticism; chronic feelings of emptiness; dissociative states under stress.

b. Self-direction: Instability in goals, aspirations, values, or career plans.

AND

2. Impairments in interpersonal functioning (a or b):

a. Empathy: Compromised ability to recognize the feelings and needs of others associated with interpersonal hypersensitivity (i.e., prone to feel slighted or insulted); perceptions of others selectively biased toward negative attributes or vulnerabilities.

b. Intimacy: Intense, unstable, and conflicted close relationships, marked by mistrust,

[9] http://www.dsm5.org/proposedrevision/pages/proposedrevision.aspx? rid=17

neediness, and anxious preoccupation with real or imagined abandonment; close relationships often viewed in extremes of idealization and devaluation and alternating between over involvement and withdrawal.

B. Pathological personality traits in the following domains:

1. Negative Affectivity, characterized by:

a. Emotional lability: Unstable emotional experiences and frequent mood changes; emotions that are easily aroused, intense, and/or out of proportion to events and circumstances.

b. Anxiousness: Intense feelings of nervousness, tenseness, or panic, often in reaction to interpersonal stresses; worry about the negative effects of past unpleasant experiences and future negative possibilities; feeling fearful, apprehensive, or threatened by uncertainty; fears of falling apart or losing control.

c. Separation insecurity: Fears of rejection by – and/or separation from – significant others, associated with fears of excessive dependency and complete loss of autonomy.

d. Depressivity: Frequent feelings of being down, miserable, and/or hopeless; difficulty recovering from such moods; pessimism about the future; pervasive shame; feeling of inferior self-worth; thoughts of suicide and suicidal behavior.

2. Disinhibition, characterized by:

a. Impulsivity: Acting on the spur of the moment in response to immediate stimuli; acting on a momentary basis without a plan or consideration of outcomes; difficulty establishing or following plans; a sense of urgency and self-harming behavior under emotional distress.

b. Risk taking: Engagement in dangerous, risky, and potentially self-damaging activities, unnecessarily and without regard to consequences; lack of concern for one's limitations and denial of the reality of personal danger.

3. Antagonism, characterized by:

a. Hostility: Persistent or frequent angry feelings; anger or irritability in response to minor slights and insults.

C. The impairments in personality functioning and the individual's personality trait expression are relatively stable across time and consistent across situations.

D. The impairments in personality functioning and the individual's personality trait expression are not better understood as normative for the individual's developmental stage or socio-cultural environment.

E. The impairments in personality functioning and the individual's personality trait expression are not solely due to the direct physiological effects of a substance (e.g., a drug of abuse, medication) or a general medical condition (e.g., severe head trauma).

Although the results of the current research do not have clear implications with respect to proposed Criteria A, C, D, and E, the findings do support Criterion B (i.e., the identification of "pathological personality traits"). Consistent with the recent emphasis on dimensional models of personality disorders (e.g., Widiger & Frances, 2002), the results of the current studies suggest that BPD can be conceptualized using the five-factor model of normal personality. Specifically, similar to past research (e.g., Pukrop, 2002; Samuel & Widiger, 2008; Saulsman & Page, 2004), higher scores on the BPD measures were associated with higher scores on neuroticism (negative emotionality) and lower scores on conscientiousness, agreeableness and extraversion.

As proposed under Criterion B, the results of the current research support the inclusion of Negative Affectivity as a relevant personality trait, as well as the factors of Emotional Lability and Depressivity. The factor of Anxiousness was less clearly supported by my results; however, I did identify distress and its intolerance as important in the prediction of BPD symptoms. Based on the results of the current studies, I would suggest that distress/distress intolerance be incorporated into the Negative Affectivity dimension. Since the current study did not focus on relationships or adult attachment, I am unable to comment on the inclusion of Separation Insecurity under Negative Affectivity.

The results of the current research provide mixed support for the inclusion of Disinhibition as a relevant personality trait. My results suggest that the impulsivity and "risk-taking" observed in BPD may be linked to strong negative emotion and the desire to escape from or avoid the negative emotional experience (or distress). The results also suggest that the decisions made by those with BPD symptoms may be driven by an attempt to avoid frequent (or immediate) punishment, regardless of the long-term outcome. Thus, I would concur with the factor of Impulsivity including: acting on the spur of the moment in response to immediate stimuli; acting on a momentary basis without a plan or consideration of outcomes. However, I would not necessarily include "a sense of urgency and self-harming behavior under emotional distress" under one subpoint. The results of the current study suggest that the sense of urgency may drive impulsive behavior, including self-harming behavior, and I propose that it would

make more sense to refer to Urgency rather than Impulsivity as the overarching factor. Furthermore, "difficulty establishing or following plans" does not seem to fit well under the proposed outline. Instead of referring to "Impulsivity" and "Risk taking" under the heading of Disinhibition, I would propose that the Workgroup consider Whiteside and Lynam's (2001) and Cyders and Smith's (2008) research into the three/four different traits that result in impulsive behavior and reformulate the criterion as follows:

B. 2. Impulsivity, characterized by:

a. Urgency: tendency to engage in ill-considered or rash actions when experiencing heightened level of (positive)/negative emotion or distress.

b. Lack of Premeditation: Acting on the spur of the moment in response to immediate stimuli; acting on a momentary basis without a plan or consideration of outcomes

c. Lack of Perseverance: Difficulty establishing or following plans; difficulty following through due to poor frustration tolerance, boredom or distractibility.

d. Sensation Seeking: Engagement in dangerous, risky, and potentially self-damaging activities; related to novelty or excitement-seeking

Given that the current studies and past research have not found a clear association between sensation seeking and BPD symptoms, it may not be as relevant to include under the Impulsivity dimension.

Although the current research did not measure Antagonism or Hostility directly, I did find that affect lability, particularly with respect to anger, was a significant predictor of BPD symptoms. Therefore, I do think it would be useful to include a dimension related to anger and/or irritability within Criterion B. However, I wonder if it would be more appropriate to include it under Negative Affectivity as anger is a form of negative affect. In contrast, if the Workgroup was considering Antagonism on the spectrum of the Five Factor Model Agreeableness dimension, it would be reasonable to leave Antagonism as a separate factor and possibly include other aspects of this dimension in addition to hostility.

6.11 Conclusion

The goals of my thesis were to explore some of the tenets of Linehan's (1993) biosocial theory of BPD within a nonclinical sample, to identify aspects of temperament and childhood experiences that predict BPD traits, to characterize the emotional sensitivity and problems with self-regulation that have been proposed to underlie BPD, and to explore the impact of these characteristics on decision making among individuals with BPD. The results from the current research suggest that BPD traits are associated with numerous dimensions of temperament and childhood environment, and that the interactions between (i) ease of excitation and environment and (ii) trait negative affect and environment predicted BPD symptoms over and above the temperament and environment variables alone. Thus, the findings provide partial support for Linehan's biosocial theory in that evidence was found for the interaction of temperament and psychosocial variables in the prediction of BPD symptoms.

Positive associations between the following temperamental and emotional experience variables and BPD symptoms provided additional support for the theory: greater temperamental sensitivity for both sensory and affective stimuli; higher intensity of negative emotional experience; higher levels of state negative affect; increased attention to emotional state (or absorption); decreased emotional clarity/difficulty identifying feelings; and increased affect lability (particularly with respect to anger). The results also suggested that the association between negative affect intensity and BPD symptoms is weakened once other emotional experience variables are introduced. Specifically, emotional absorption, lack of emotional clarity and affect lability appear to be stronger predictors of BPD symptoms than affect intensity alone. Furthermore, the results suggest that both attention inward and problems regulating emotions predict BPD symptoms. The results also indicated that BPD traits may be related to certain aspects of impulsivity (i.e., urgency) more than others and that the desire to alleviate negative emotions or distress may be associated with the impulsive behaviours observed. In addition, urgency and affect lability mediated the relationship between emotional clarity and BPD traits suggesting that

both urgency and affect lability may drive dysregulated behaviors in individuals who experience difficulty recognizing and expressing their emotions.

With regard to decision-making, participants in the BPD group demonstrated deficits in decision-making as measured by the ABCD version of the IGT. Specifically, they failed to exhibit steady improvement across the five blocks of Phase 1. The performance of participants on the IGT-ABCD Phase 1 was not consistently associated with any psychometric variables (i.e., BPD symptom dimensions, emotional experience, reinforcement sensitivity, impulsivity, effortful control) but there was a negative association between perseveration on the WCST and performance on the IGT ABCD in those who completed the ABCD task before the EFGH task. Closer examination of their deck choices revealed that BPD participants may have been avoiding decks associated with frequent punishment, regardless of the size of the reward, more than Control participants. In other words, for individuals with BPD traits, decision making under uncertainty appeared to be influenced by either low probability of punishment (rather than punishment magnitude or long-term outcome) or the tendency to discount the value of punishment more quickly.

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APPENDIX A

Figure A1

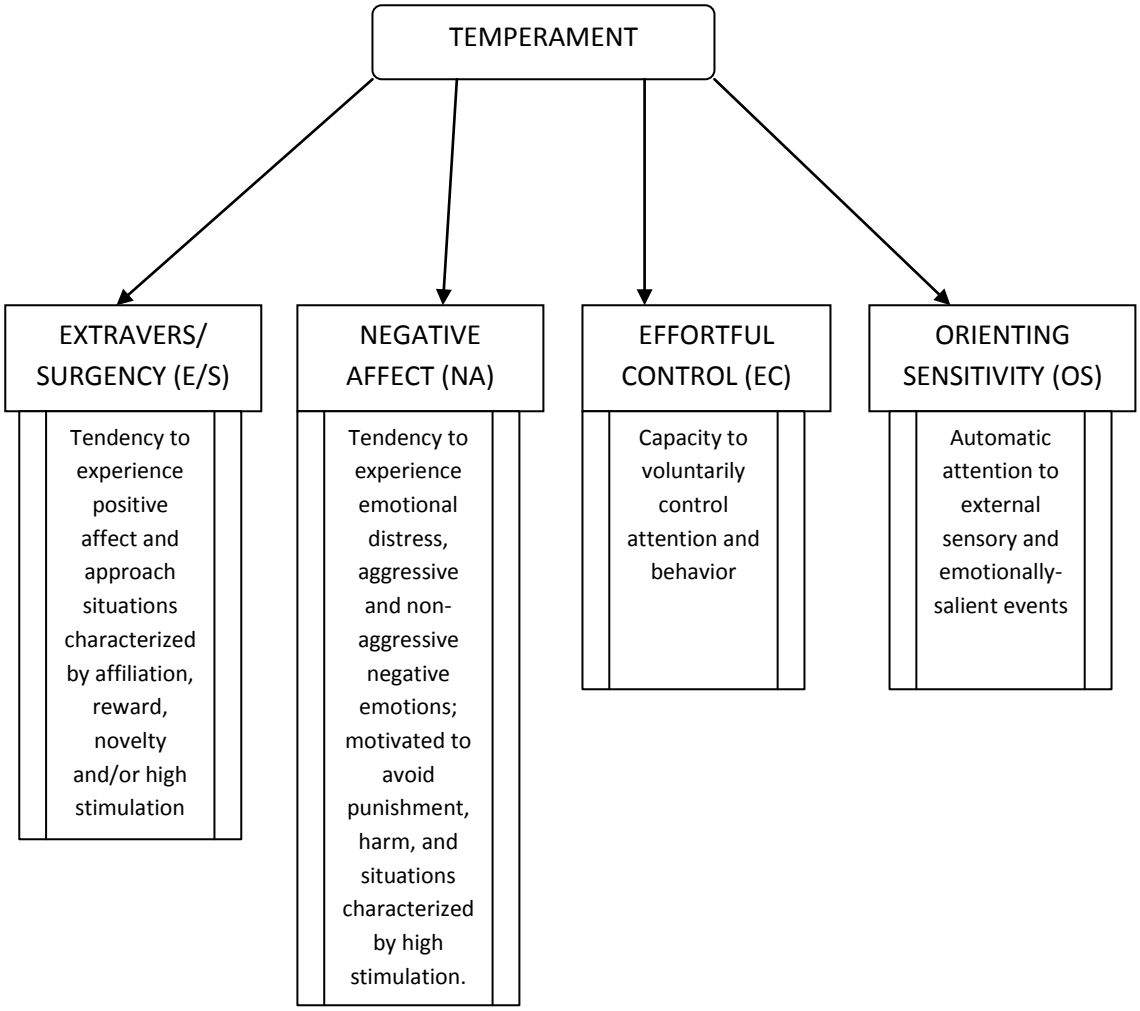

TEMPERAMENT
EXTRAVERS/ SURGENCY (E/S)
Tendency to experience positive affect and approach situations characterized by affiliation, reward, novelty and/or high stimulation
NEGATIVE AFFECT (NA)
Tendency to experience emotional distress, aggressive and non-aggressive negative emotions; motivated to avoid punishment, harm, and situations characterized by high stimulation.
EFFORTFUL CONTROL (EC)
Capacity to voluntarily control attention and behavior
ORIENTING SENSITIVITY (OS)
Automatic attention to external sensory and emotionally-salient events

Figure A2

NEGATIVE AFFECT

Fear: Negative affect related to anticipation of distress.

Sadness: Negative affect and lowered mood and energy related to exposure to suffering, disappointment, and object loss.

Discomfort: Negative affect related to sensory qualities of stimulation, including intensity, rate or complexity of visual, auditory, smell/taste, and tactile stimulation.

Frustration: Negative affect related to interruption of ongoing tasks or goal blocking.

EXTRAVERSION/SURGENCY

Sociability: Enjoyment derived from social interaction and being in the presence of others.

Positive Affect: Latency, threshold, intensity, duration, and frequency of experiencing pleasure.

High Intensity Pleasure: Pleasure related to situations involving high stimulus intensity, rate, complexity, novelty, and incongruity.

EFFORTFUL CONTROL

Attentional Control: Capacity to focus attention as well as to shift attention when desired.

Inhibitory Control: Capacity to suppress inappropriate approach behavior.

Activation Control: Capacity to perform an action when there is a strong tendency to avoid it.

ORIENTING SENSITIVITY

Neutral Perceptual Sensitivity: Detection of slight, low intensity stimuli from both within the body and the external environment.

Affective Perceptual Sensitivity: Spontaneous emotionally valenced, conscious cognition associated with low intensity stimuli.

Associative Sensitivity: Spontaneous cognitive content that is not related to standard associations with the environment.

APPENDIX B

Table B1

Univariate Normality Indexes for Study 1a Descriptive and Dependent Measures

Variables	*N*	Skew	Kurtosis	K-S	*p*
MSI-BPD-R	147	1.21	.77	2.33	<.001
BPI Cut-20	73	.81	.22	1.07	.206
BPQ-R Total Scale Score	145	.89	.12	1.72	.005
Abandonment	146	1.29	.78	2.73	<.001
Affective Instability	146	.76	-.70	2.42	<.001
Intense Anger	147	.89	-.16	2.55	<.001
Emptiness	145	.70	-.49	2.04	<.001
Impulsivity	144	1.18	1.25	2.28	<.001
Quasi-Psychotic States	147	1.12	.80	2.78	<.001
Relationships	145	.33	.57	2.61	<.001
Self-Image	146	1.04	-0.02	2.77	<.001
HSPS Total Scale Score	146	.06	-.52	.84	.484
Ease of Excitation	146	-.09	-.50	.78	.571
Low Sensory Threshold	146	-.16	-.80	.98	.290
Aesthetic Sensitivity	141	.18	-.22	1.31	.063
Big Five Inventory					
Neuroticism	147	-.32	-.44	1.36	.050
Extraversion	147	-.16	.09	1.10	.174
Openness	147	-.14	.29	0.72	.675
Agreeableness	147	-.08	-.79	0.91	.373
Conscientiousness	147	.34	-.02	0.88	.419
Trait Meta-Mood Scale					
Attention	144	-.29	-.32	1.01	.263
Clarity	145	-.01	-.43	0.82	.513
Repair	145	-.42	-.23	1.11	.167
UPPS Impulsive Behaviour Scale					
Urgency	73	-.35	-.23	0.85	.460
Perseverance	73	-.35	-.29	0.75	.621
Premeditation	72	-.48	-.18	0.72	.672
Sensation Seeking	73	-.38	-.71	0.87	.436

Note. MSI-BPD-R = McLean Screening Instrument for Borderline Personality Disorder – Revised; BPI = Borderline Personality Inventory; BPQ-R = Borderline Personality Questionnaire – Revised; HSPS = Highly Sensitive Person Scale.

Table B2

Psychometric Properties (Cronbach's Alphas) for Study 1a

Variables	Number of Items	Alpha *N* = 127 to 147	Alpha *N* = 64 to 73
MSI-BPD-R	9	.75	.80
BPI CUT-20	20	----	.85
BPQ-R-Total Scale	73	.90	.94
Abandonment	10	.81	.84
Affective Instability	10	.87	.88
Intense Anger	10	.76	.79
Emptiness	10	.82	.83
Impulsivity	9	.60	.68
Quasi-Psychotic States	7	.66	.67
Relationships	8	.79	.81
Self-Image	9	.83	.80
HSPS – Total Scale	27	.82	.83
Ease of Excitation	12	.74	.71
Low Sensory Threshold	7	.70	.67
Aesthetic Sensitivity	6	.66	.64
Big Five Inventory			
Neuroticism	8	.81	.82
Extraversion	8	.85	.87
Openness	9	.78	.73
Agreeableness	9	.79	.79
Conscientiousness	9	.75	.73
Trait Meta-Mood Scale			
Attention	12	.81	.84
Clarity	11	.81	.81
Repair	6	.80	.80
UPPS Impulsive Behaviour Scale			
Urgency	11	-----	.90
Perseverance	10	-----	.85
Premeditation	11	-----	.88
Sensation Seeking	12	-----	.90

Note. MSI-BPD-R = McLean Screening Instrument for Borderline Personality Disorder – Revised; BPI = Borderline Personality Inventory; BPQ-R = Borderline Personality Questionnaire – Revised; HSPS = Highly Sensitive Person Scale.

Table B3

Zero-Order Correlations between the BPD Questionnaires (MSI-BPD-R, BPI CUT-20, BPQ-R)

			Borderline Personality Questionnaire – Revised							
	MSI-BPD-R	BPI Cut-20[1]	Total	ABAN	AFF	ANG	EMP	IMP	QP	REL
BPI Cut-20	.73 (.88)									
BPQ-R Total	.80 (.97)	.73 (.82)								
ABAN	.68 (.87)	.57 (.67)	.80 (.90)							
AFF	.72 (.89)	.60 (.69)	.83 (.94)	.58 (.69)						
ANG	.64 (.85)	.58 (.71)	.58 (.70)	.55 (.70)	.66 (.81)					
EMP	.59 (.75)	.55 (.65)	.79 (.92)	.55 (.67)	.60 (.71)	.45 (.57)				
IMP	.43 (.64)	.40 (.53)	.54 (.73)	.40 (.57)	.37 (.51)	.44 (.65)	.23 (.33)			
QP	.40 (.57)	.46 (.61)	.55 (.71)	.43 (.59)	.37 (.49)	.37 (.52)	.33 (.45)	.38 (.60)		
REL	.45 (.58)	.42 (.51)	.54 (.64)	.45 (.56)	.35 (.42)	.33 (.43)	.32 (.40)	.26 (.38)	.27 (.37)	
S-IM	.59 (.75)	.53 (.64)	.78 (.90)	.54 (.66)	.57 (.67)	.47 (.59)	.77 (.93)	.22 (.31)	.34 (.46)	.37 (.46)

Note. Disattenuated estimates of the correlations are provided in parentheses.
MSI-BPD-R = McLean Screening Instrument for Borderline Personality Disorder – Revised; BPI = Borderline Personality Inventory; BPQ-R = Borderline Personality Questionnaire – Revised; ABAN = Abandonment; AFF = Affective Instability; ANG = Intense Anger; EMP = Emptiness; IMP = Impulsivity; QP = Quasi-Psychotic States; REL = Relationships; S-IM = Self-Image.
All p-values are < .01.
[1] The CUT-20 was administered to only half of the participants. For correlations associated with this scale, n = 70 to 73. For all other correlations, n = 144 to 147.

Table B4

Zero-Order Correlations between BPD Questionnaires (MSI-BPD-R, CUT-20, BPQ-R) and Sensory Sensitivity (HSPS), Personality (BFI), Emotional Intelligence (TMMS) and Impulsive Behaviour (UPPS)

			Borderline Personality Questionnaire – Revised								
	MSI-BPD-R	Cut-20[1]	Total	ABAN	AFF	ANG	EMP	IMP	QP	REL	S-IM
HSPS											
Total	.25**	.29*	.33**	.17*	.35**	.20*	.37**	.09	.24**	.02	.27**
EOE	.15	.22	.23**	.10	.25**	.07	.37**	.00	.08	.05	.23**
LST	.28**	.31**	.40**	.25**	.38**	.35**	.36**	.13	.34**	.02	.33**
AES	.01	.06	-.05	-.08	.00	-.03	-.03	-.01	.11	-.10	-.10
BFI											
NEU	.45**	.37**	.53**	.31**	.57**	.34**	.54**	.26**	.21*	.17*	.46**
EXT	-.26**	-.25*	-.28**	-.14	-.20*	-.14	-.50**	.03	-.14	-.10	-.40**
OPN	-.10	.01	-.19*	-.22**	-.08	-.12	-.23**	-.04	.01	-.11	-.23**
AGR	-.39**	-.27*	-.45**	-.35**	-.34**	-.53**	-.26**	-.27**	-.18*	-.20*	-.28**
CON	-.40**	-.42**	-.48**	-.27**	-.45**	-.40**	-.44**	-.31**	-.31**	-.22**	-.35**
TMMS											
ATT	.05	.05	-.01	-.06	.10	-.04	.04	-.14	-.05	.01	.02
CLR	-.41**	-.35**	-.39**	-.25**	-.35**	-.27**	-.41**	-.18*	-.11	-.08	-.41**
REP	-.56**	-.35**	-.58**	-.55**	-.46**	-.32**	-.57**	-.24**	-.16*	-.28**	-.56**
UPPS[1]											
URG	.45**	.43**	.47**	.39**	.50**	.47**	.25*	.41**	.18	.15	.28*
PERS	-.33**	-.31**	-.40**	-.27*	-.35**	-.33**	-.40**	-.24*	-.19	.07	-.36**
PREM	.01	-.15	-.18	-.11	-.13	-.21	.03	-.28*	-.19	-.07	-.09
SS	-.02	-.07	-.14	-.11	-.12	-.08	-.27*	.04	-.04	.03	-.15

Note. MSI-BPD-R = McLean Screening Instrument for Borderline Personality Disorder – Revised; BPI = Borderline Personality Inventory; BPQ-R = Borderline Personality Questionnaire – Revised; ABAN = Abandonment; AFF = Affective Instability; ANG = Intense Anger; EMP = Emptiness; IMP = Impulsivity; QP = Quasi-Psychotic States; REL = Relationships; S-IM = Self-Image; HSPS = Highly Sensitive Person Scale; EOE = Ease of Excitation; LST = Low Sensory Threshold; AES = Aesthetic Sensitivity; BFI = Big Five Inventory; NEU = Neuroticism; EXT = Extraversion; OPN = Openness; AGR = Agreeableness; CON = Conscientiousness; TMMS = Trait Meta Mood Scale; ATT = Attention; CLR = Clarity; REP = Repair; UPPS = UPPS Impulsive Behaviour Scale; URG = Urgency; PERS = Perseverance; PREM = Premeditation; SS = Sensation Seeking.

** $p < .01$, * $p < .05$.

[1] The UPPS and CUT-20 were administered to only half of the participants. For correlations associated with these scales, n = 69 to 73. For all other correlations, n = 138 to 147.

Table B5

Model Summaries for Three Regression Analyses: Big Five Inventory Factors Predicting Total Scores on the Three BPD Questionnaires (MSI-BPD-R, CUT-20, BPQ-R)

Dependent Variable	Predictor Variables	*B*	Std. Error of *B*	*t*	R	R Square	F	df1	df2
MSI-BPD-R					.57	.33	13.77**	5	141
	NEU	0.13	0.03	4.25**					
	EXT	-0.04	0.03	-1.39					
	AGR	-0.09	0.03	-2.74**					
	CON	-0.09	0.04	-2.27*					
	OPN	0.02	0.03	0.79					
BPQ-R					.66	.44	22.02**	5	139
	NEU	0.78	0.15	5.27**					
	EXT	-0.18	0.14	-1.24					
	AGR	-0.45	0.17	-2.72**					
	CON	-0.64	0.19	-3.44**					
	OPN	-0.05	0.16	-0.34					
BPI Cut-20					.51	.26	4.80**	5	67
	NEU	0.17	0.08	2.16*					
	EXT	-0.07	0.08	-0.97					
	AGR	-0.10	0.09	-1.04					
	CON	-0.23	0.11	-2.10*					
	OPN	0.07	0.10	0.75					

Note. *B* = unstandardized regression coefficient; MSI-BPD-R = McLean Screening Instrument for Borderline Personality Disorder – Revised; BPI = Borderline Personality Inventory; BPQ-R = Borderline Personality Questionnaire – Revised; NEU = Neuroticism; EXT = Extraversion; AGR = Agreeableness; CON = Conscientiousness; OPN = Openness.
** $p < .01$, * $p < .05$.

Table B6

Study 1b Demographics

	Mean/Frequency	Standard Deviation
Age	20.93	3.86
Min.	17	
Max.	39	
Gender		
Female	50 (89.3%)	
Male	6 (10.7%)	
Ethnicity/Race		
Caucasian	28 (50%)	
East Asian	14 (25%)	
South Asian	7(12.5%)	
Black	3 (5.4%)	
Middle Eastern	1 (1.4%)	
Other	4 (7.2%)	
Education (years)	13.89	2.08

Table B7

Study 1b Characteristics of Sample in the Top and Bottom Percentiles on the MSI-BPD-R

	Bottom 20th Percentile MSI-BPD-R Score = 0 or 1 out of 9	Top 20th Percentile MSI-BPD-R Score = 7 or 8 out of 9
Gender		
Female	*n* = 10	*n* = 10
Male	*n* = 1	*n* = 1
Age – Mean (Std. Dev.)	21.27 (1.79)	19.27 (1.01)
Ethnicity/Race		
Caucasian	*n* = 6	*n* = 4
East Asian	*n* = 1	*n* = 3
South Asian	*n* = 1	*n* = 1
Black	*n* = 0	*n* = 1
Middle Eastern	*n* = 2	*n* = 1
Other	*n* = 1	*n* = 1
Self-Reported History of Personal Psychiatric Illness		
Depression &/or Anxiety Disorder	*n* = 3	*n* = 6
Substance Abuse/Dependence	*n* = 0	*n* = 1
Self-Reported History of Familial Psychiatric Illness		
Mood &/or Anxiety Disorder	*n* = 6	*n* = 5
Psychotic Disorder	*n* = 1	*n* = 1
Substance Abuse/Dependence	*n* = 0	*n* = 1
Eating Disorder	*n* = 1	*n* = 0
Currently Taking Psychotropic Medications	*n* = 0	*n* = 0

Table B8

Univariate Normality Indexes for Study 1b Measures

Variables	*N*	Skew	Kurtosis	K-S	*p*
MSI-BPD	56	0.16	-1.32	1.10	.178
BPQ Total	55	0.53	-0.44	0.77	.598
IPDE-S BPD	56	0.34	-0.93	1.03	.238
IPDE BPD – Interview					
DSM Criteria Total	56	1.54	1.51	2.62	<.001
Dimensional Total	56	1.14	0.51	1.61	.011
DIB-R					
Revised Total	56	1.29	0.58	2.43	<.001
Section Score Total	56	0.79	-0.19	1.13	.155

Note. MSI-BPD = McLean Screening Instrument for Borderline Personality Disorder; BPQ = Borderline Personality Questionnaire; IPDE-S BPD = International Personality Disorder Examination DSM-IV Screening Questionnaire for Borderline Personality Disorder; DIB-R = Revised Diagnostic Interview for Borderlines.

Table B9

Psychometric Properties (Cronbach's Alphas) for Study 1b BPD Measures

Variables	Number of Items	Alpha *N* = 55 to 56
MSI-BPD	10	.80
BPQ – Total	80	.95
IPDE-S BPD	8	.75
IPDE – BPD Interview		
DSM Criteria Total	9	.58
Dimensional Total	9	.79
DIB-R		
Revised Total	4	.65
Section Score Total	21[1]	.83

Note. MSI-BPD = McLean Screening Instrument for Borderline Personality Disorder; BPQ = Borderline Personality Questionnaire; IPDE-S BPD = International Personality Disorder Examination DSM-IV Screening Questionnaire for Borderline Personality Disorder; DIB-R = Revised Diagnostic Interview for Borderlines.

[1]The total number of items entered was 22; however, 1 item (#120 S.21) was removed from the scale analysis because it had a variance of zero.

Table B10

Study 1b Summary of Scores on the BPD Questionnaires and Interviews

	MSI BPD	BPQ SUM	IPDE-S BPD	IPDE-I BPD Dimensional Total	IPDE-I BPD Criteria Total	DIB-R Section Scores	DIB-R Revised Total
Maximum Possible Score	10	80	9	18	9	44	10
Mean	4.20	21.65	3.04	3.60	0.78	8.09	1.60
St.Dev.	2.80	13.76	2.23	3.49	1.21	6.38	1.96
Range	0-9	1-54	0-8	0-13	0-4	0-25	0-7

Note. MSI-BPD = McLean Screening Instrument for Borderline Personality Disorder; BPQ = Borderline Personality Questionnaire; IPDE-S BPD = International Personality Disorder Examination DSM-IV Screening Questionnaire for Borderline Personality Disorder; IPDE-I BPD = International Personality Disorder Examination DSM-IV Interview Borderline Personality Disorder Section; DIB-R = Revised Diagnostic Interview for Borderlines.
N = 55 except for BPQ Sum where N = 54.

Table B11

Study 1b Zero-Order and Partial Correlations between BPD Questionnaires (MSI-BPD, BPQ, IPDE-S) and Interview Indexes (DIB-R, IPDE Interview)

	BPQ	IPDE-S BPD	IPDE-I BPD Dimensional Total	IPDE-I BPD Criteria Total	DIB-R Section Scores	DIB-R Revised Total
MSI BPD	.77** (.48**)[1]	.70** (.16)[2]	.70** (.40**)[1,2]	.61** (.32*)[1,2]	.82** (.59**)[1,2]	.74** (.52**)[1,2]
BPQ	------	------	.65** (.13)[1,3]	.57** (.18*)[1,3]	.73** (.24*)[1,3]	.61** (.09)[1,3]
IPDE-S BPD	.83** (.64**)[3]	------	.60** (.08)[2,3]	.48** (-.06)[2,3]	.62** (-.07)[2,3]	.54** (-.03)[2,3]

Note. $N = 55$. MSI-BPD = McLean Screening Instrument for Borderline Personality Disorder; BPQ = Borderline Personality Questionnaire; IPDE-S BPD = International Personality Disorder Examination DSM-IV Screening Questionnaire for Borderline Personality Disorder; IPDE-I BPD = International Personality Disorder Examination DSM-IV Interview Borderline Personality Disorder Section; DIB-R = Revised Diagnostic Interview for Borderlines.
[1] Controlling for the effect of IPDE-S BPD
[2] Controlling for the effect of BPQ
[3] Controlling for the effect of MSI-BPD
** $p < .01$, * $p < .05$.

Table B12

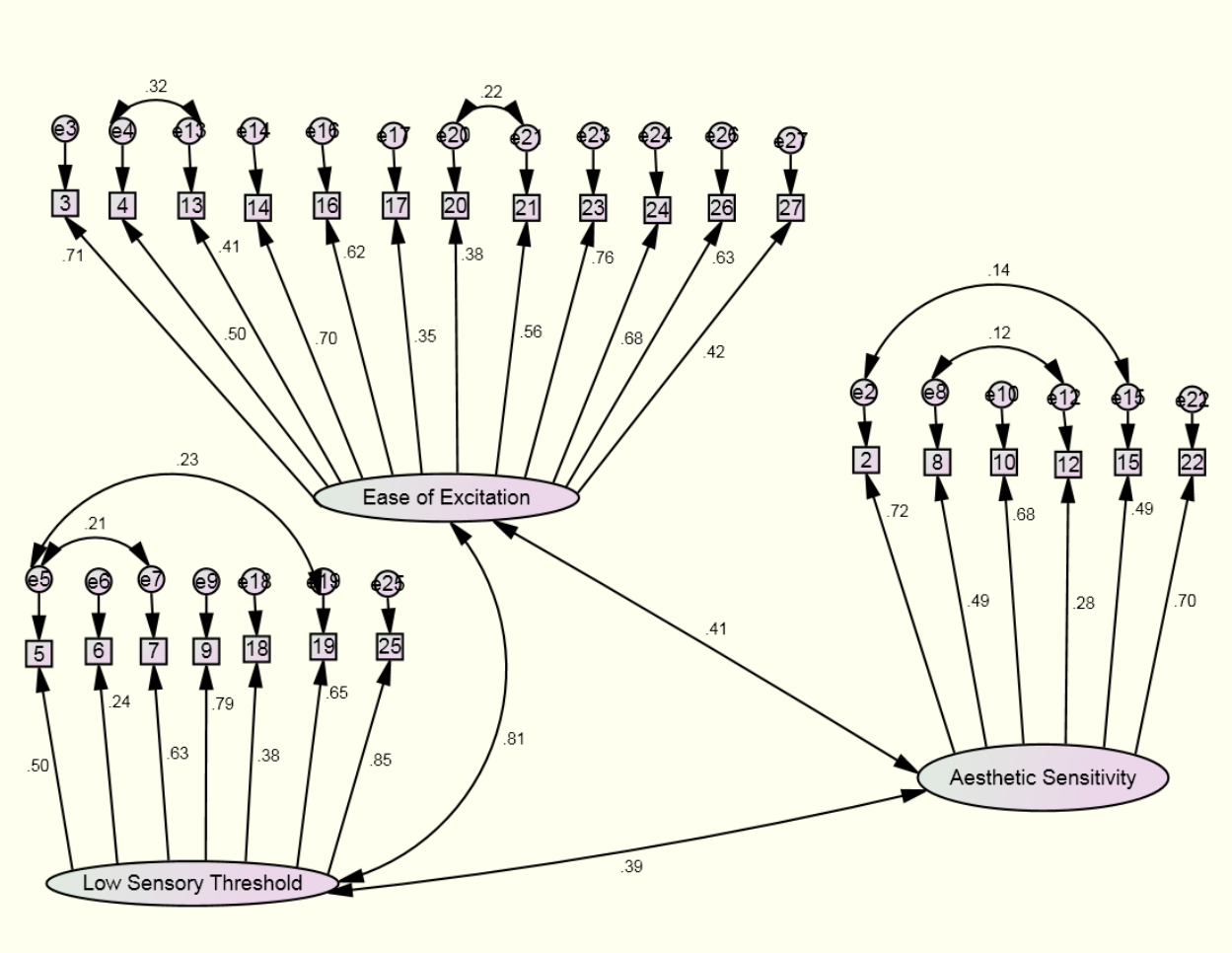
Cut-Points and Diagnostic Accuracy Parameters Derived from Study 1b Data

Criterion Used & Measures	Cut Point	Sensitivity	Specificity	Negative Predictive Value	Positive Predictive Value	Overall Diagnostic Accuracy	Kappa
DIB-R[1]							
BPQ	>47	1.00	0.96	1.00	0.33	0.96	0.49
	>43	1.00	0.92	1.00	0.20	0.93	0.31
	>41	1.00	0.89	1.00	0.14	0.89	0.22
MSI-BPD	>7	1.00	0.83	1.00	0.10	0.84	0.15
	>6	1.00	0.70	1.00	0.06	0.71	0.08
IPDE-S BPD	>6	.00	0.93	0.98	0.00	0.91	-0.03
	>5	1.00	0.85	1.00	0.11	0.85	0.17
IPDE-I[2]							
BPQ	>47	0.33	0.96	0.96	0.33	0.93	0.29
	>43	0.67	0.94	0.98	0.40	0.93	0.46
	>41	1.00	0.92	1.00	0.43	0.93	0.57
MSI-BPD	>7	1.00	0.86	1.00	0.30	0.87	0.41
	>6	1.00	0.73	1.00	0.18	0.74	0.23
IPDE-S BPD	>6	1.00	0.98	1.00	0.75	0.98	0.85
	>5	1.00	0.88	1.00	0.33	0.89	0.45

Note. *N* = 54 to 55. MSI-BPD = McLean Screening Instrument for Borderline Personality Disorder; BPQ = Borderline Personality Questionnaire; IPDE-S BPD = International Personality Disorder Examination DSM-IV Screening Questionnaire for Borderline Personality Disorder; IPDE-I BPD = International Personality Disorder Examination DSM-IV Interview Borderline Personality Disorder Section; DIB-R = Revised Diagnostic Interview for Borderlines.
[1]DIB-R Revised Total Score > or = 7; [2]IPDE-Interview BPD Criteria > or = 4

APPENDIX C

Figure C1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.76
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e8
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e22
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.68
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e5
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Ease of Excitation
Aesthetic Sensitivity
Low Sensory Threshold
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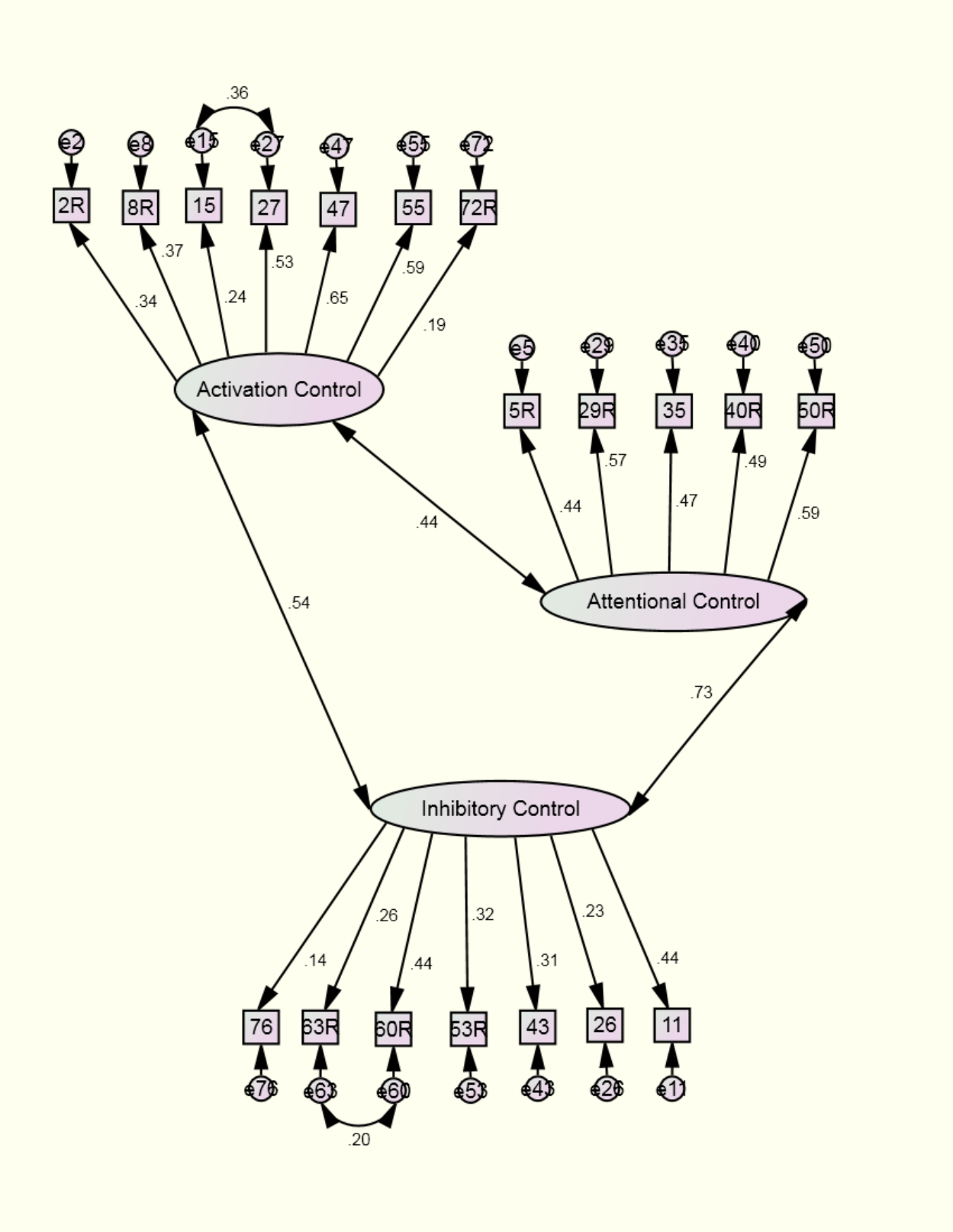
Figure C2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2R
8R
15
27
47
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72R
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.59
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.65
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Activation Control
5R
29R
35
40R
50R
.57
.49
.44
.47
.59
.44
.54
Attentional Control
.73
Inhibitory Control
.14
.26
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.32
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.44
76
63R
60R
53R
43
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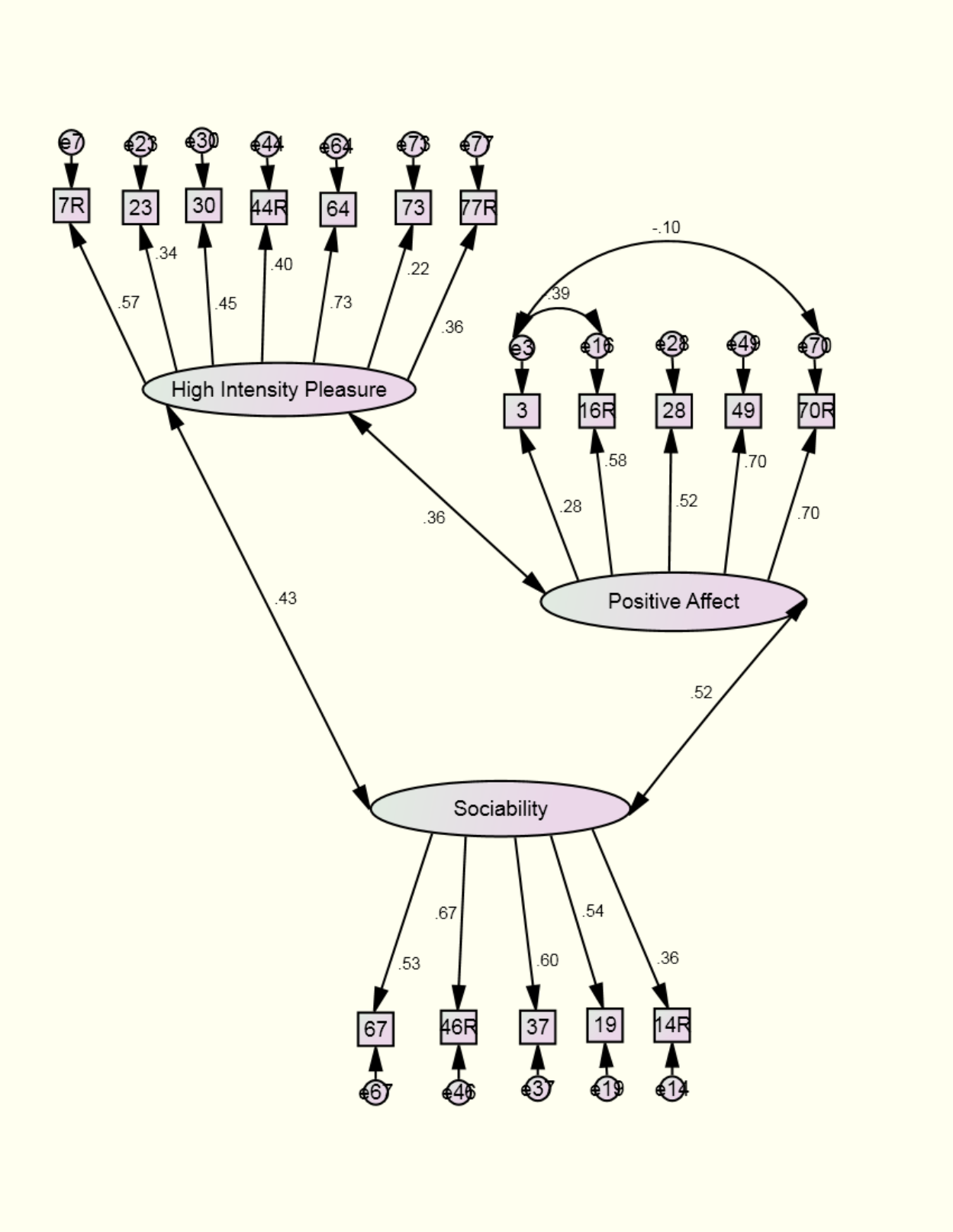
11
.20

Figure C3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23
30
44R
64
73
77R
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.34
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.40
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.22
.36
High Intensity Pleasure
-.10
.39
3
16R
28
49
70R
.28
.58
.52
.70
.70
.36
.43
Positive Affect
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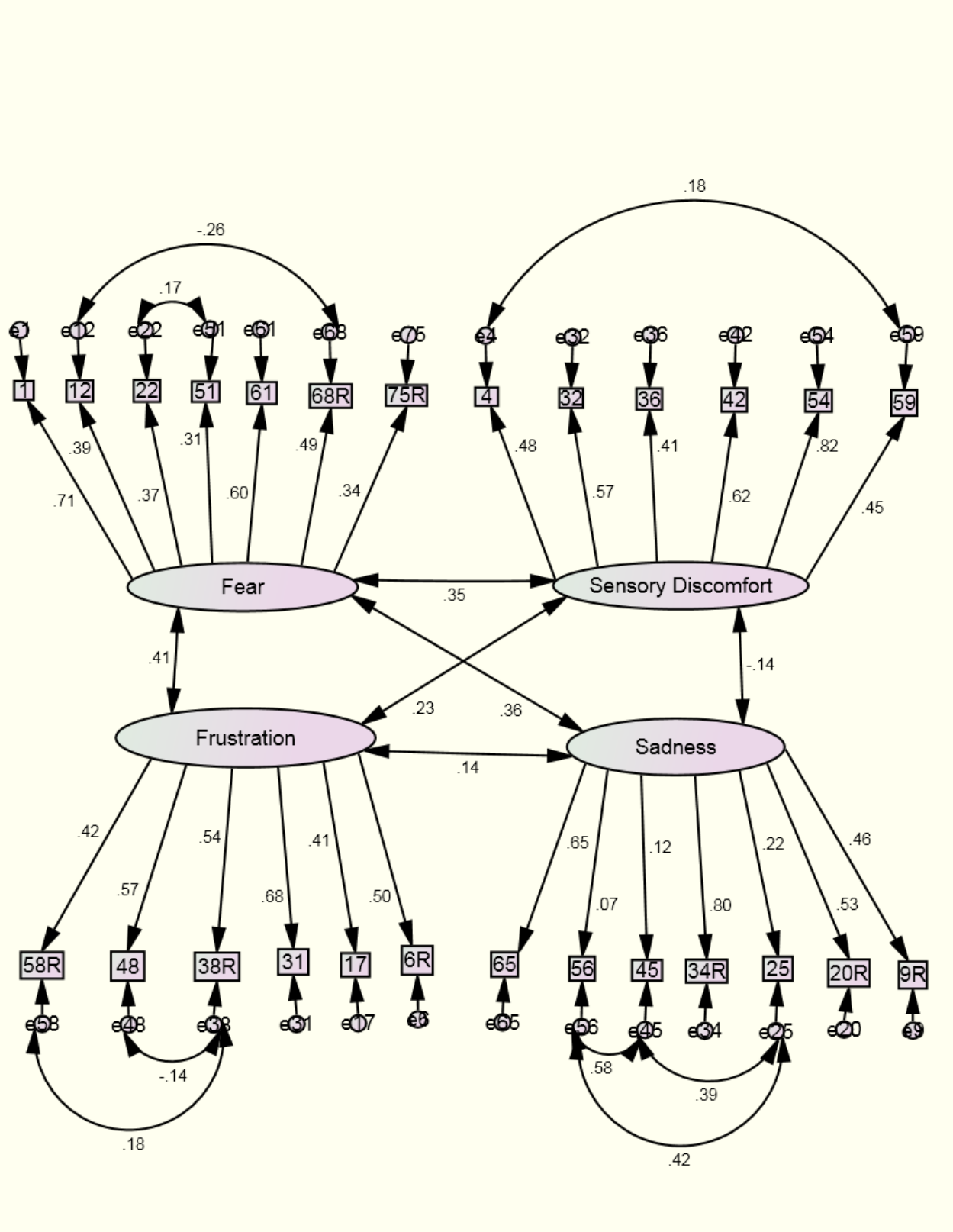
Sociability
.53
.67
.60
.54
.36
67
46R
37
19
14R

Figure C4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1
12
22
51
61
68R
75R
4
32
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42
54
59
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.31
.49
.48
.41
.82
.71
.37
.60
.34
.57
.62
.45
Fear
.35
Sensory Discomfort
.41
-.14
.23
.36
Frustration
.14
Sadness
.42
.54
.41
.65
.12
.22
.46
.57
.68
.50
.07
.80
.53
58R
48
38R
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6R
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20R
9R
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.58
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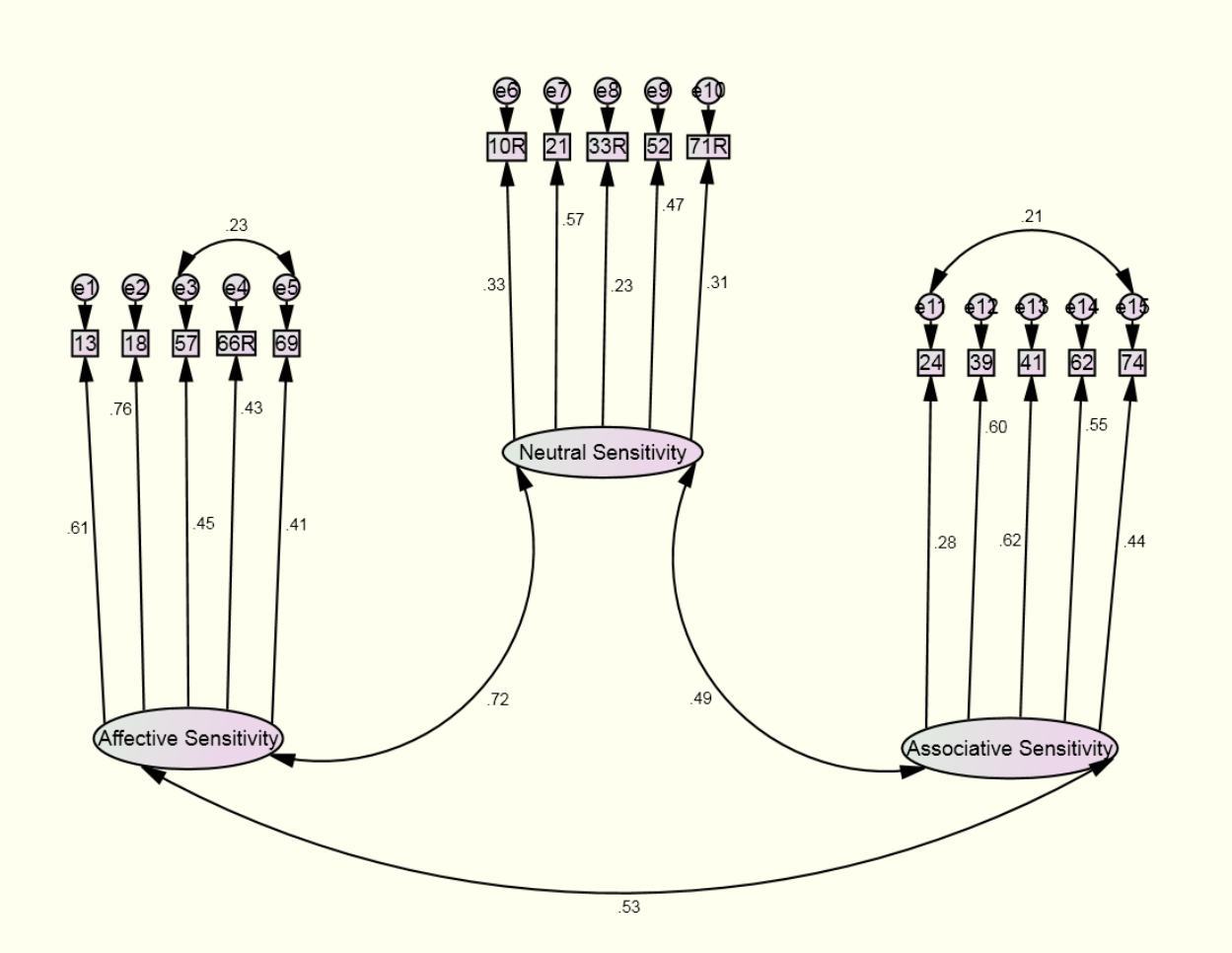
.18
.42

Figure C5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e7
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Neutral Sensitivity
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e1
e2
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e4
e5
13
18
57
66R
69
.76
.43
.61
.45
.41
Affective Sensitivity
.72
.49
.21
e11
e12
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74
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Associative Sensitivity
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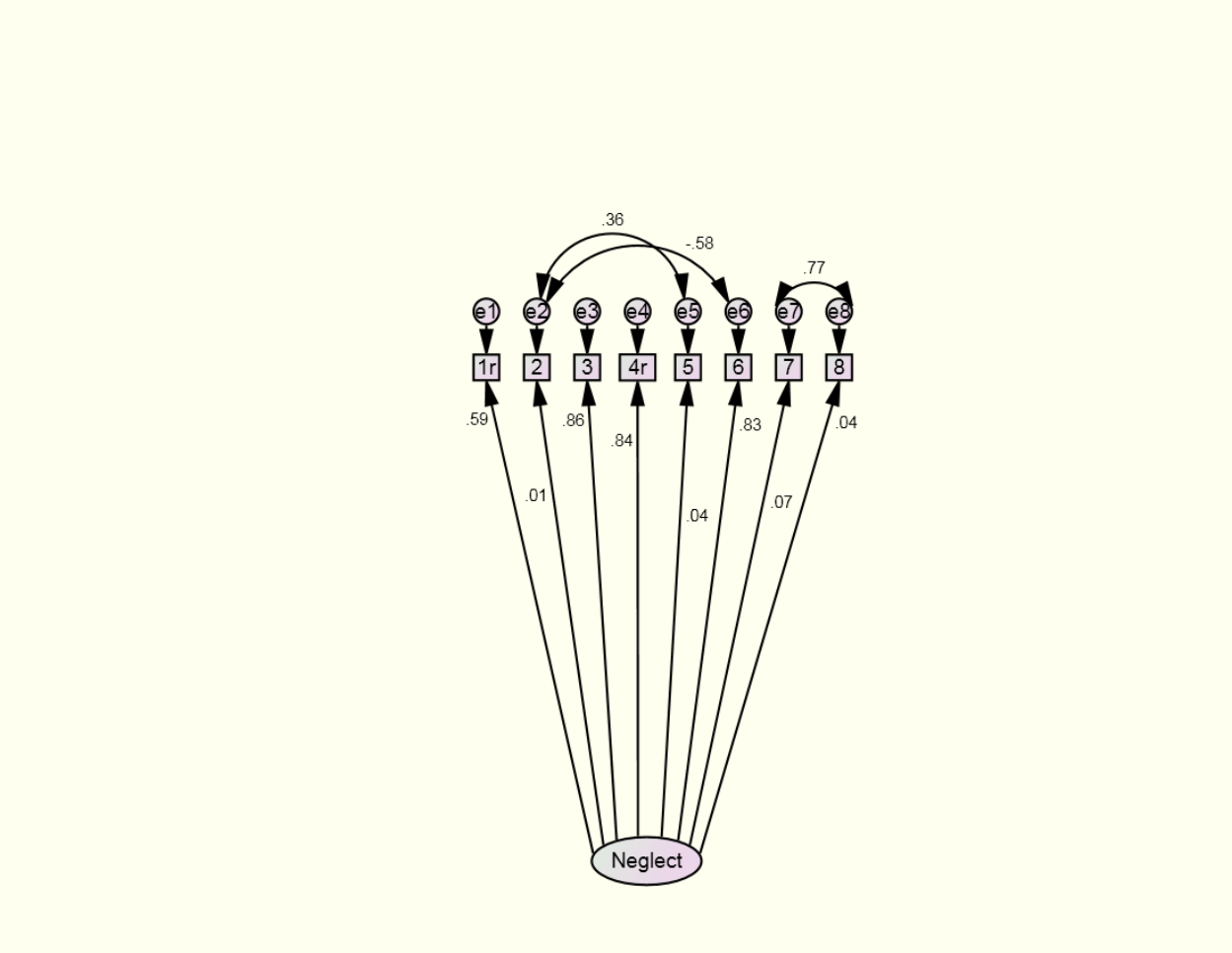
Figure C6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e7
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1r
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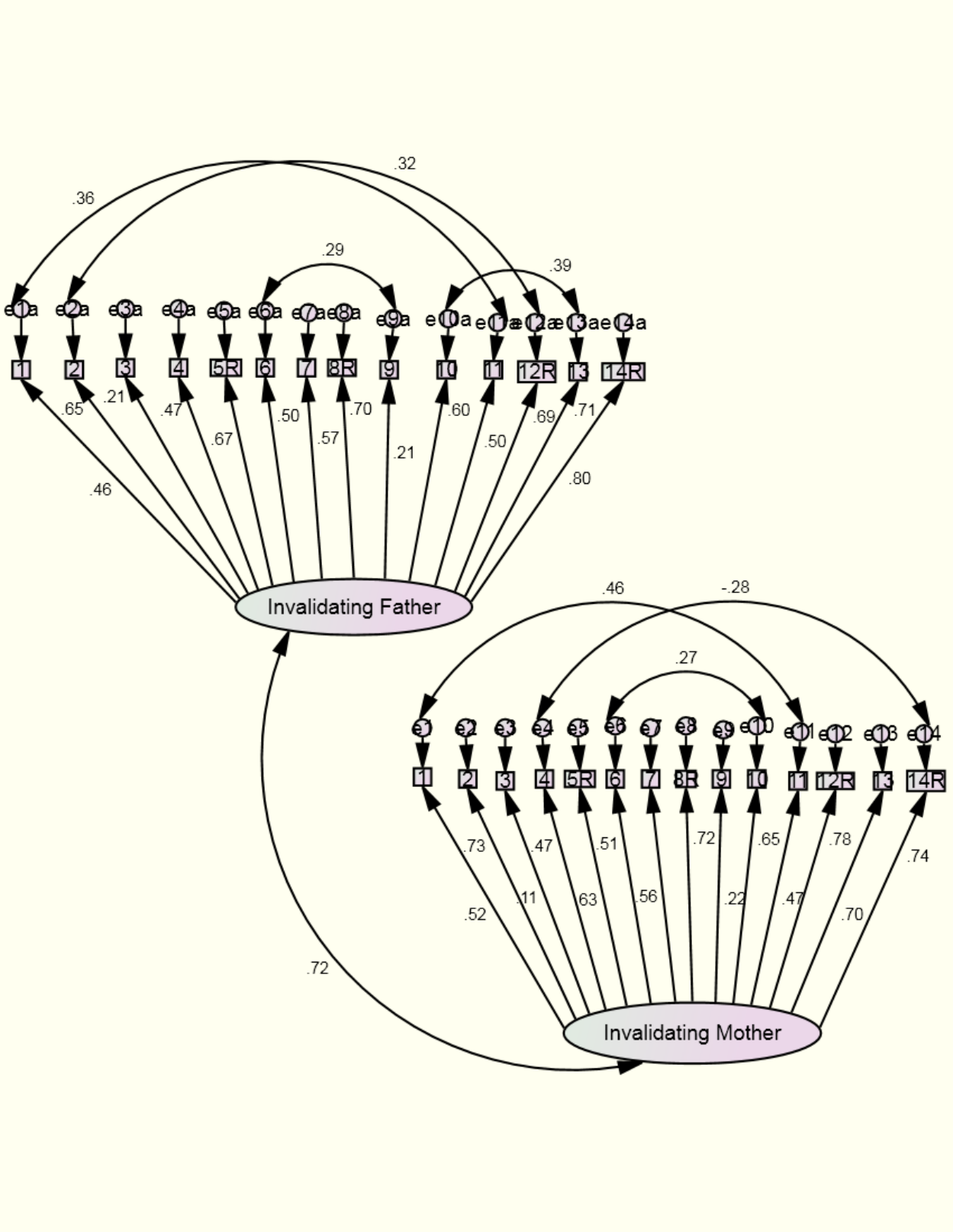
.07
.04
Neglect

Figure C7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.46
Invalidating Father
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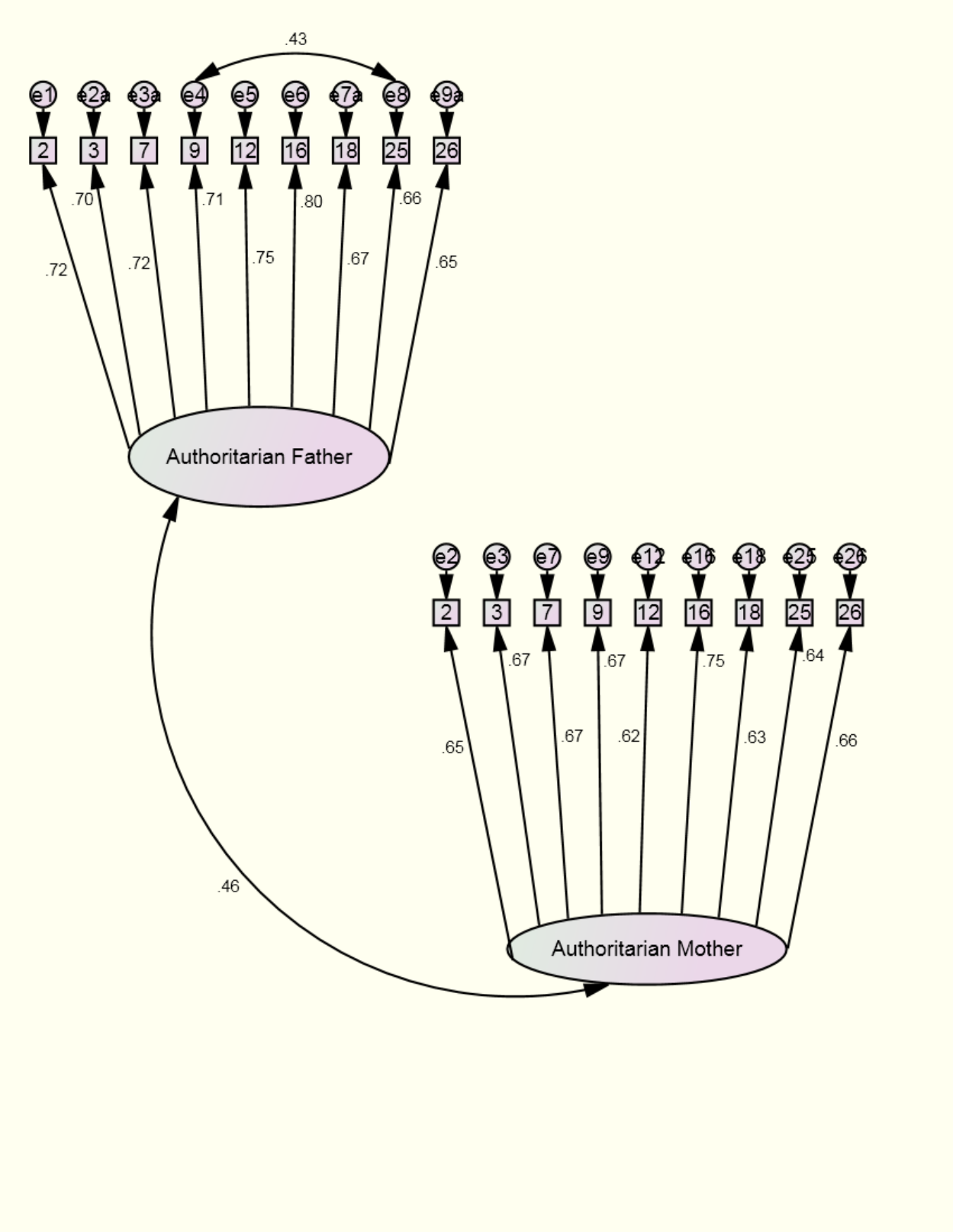
Invalidating Mother

Figure C8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.80
.67
.66
.65
Authoritarian Father
e2
e3
e7
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e12
e16
e18
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e26
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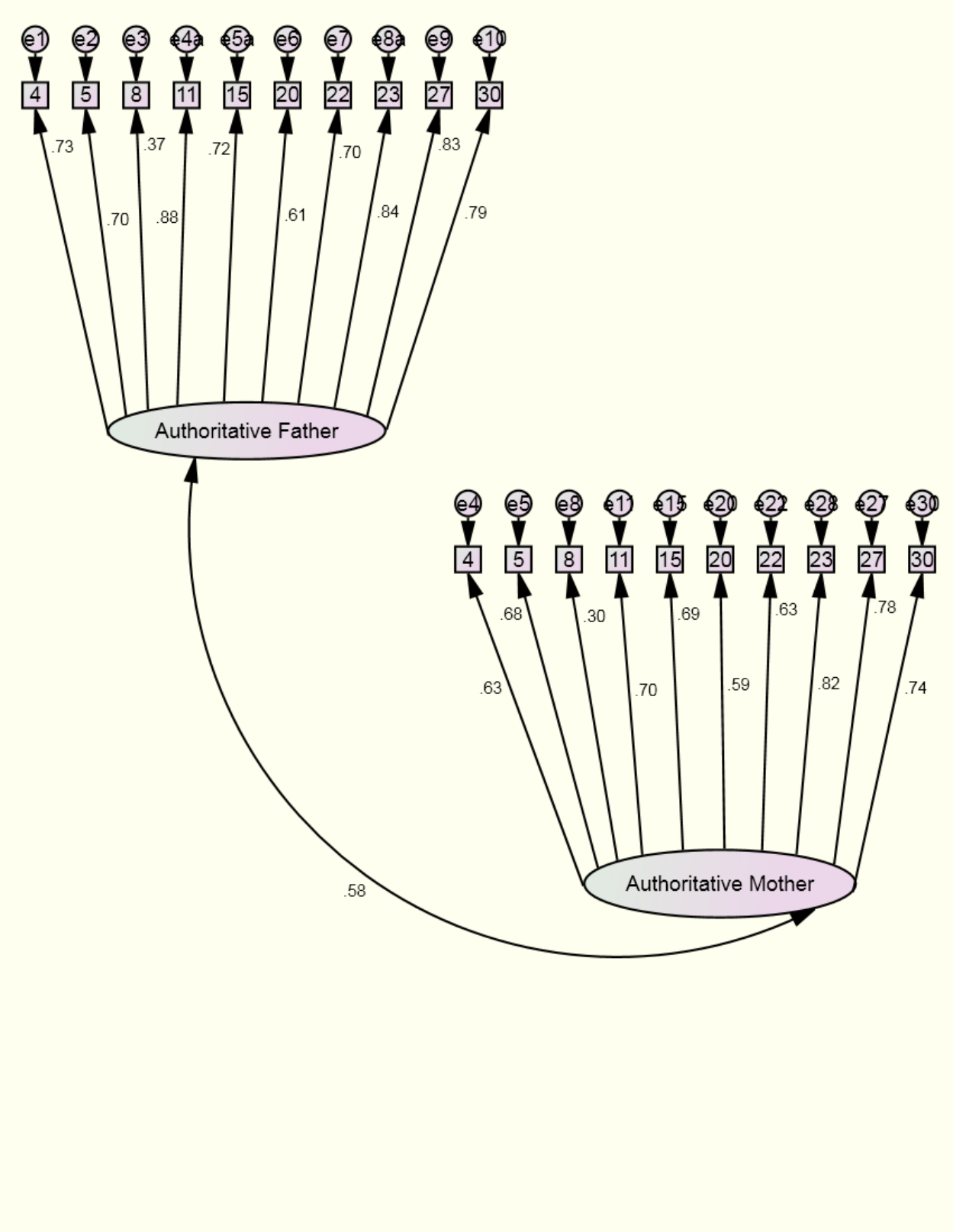
Authoritarian Mother

Figure C9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Authoritative Father
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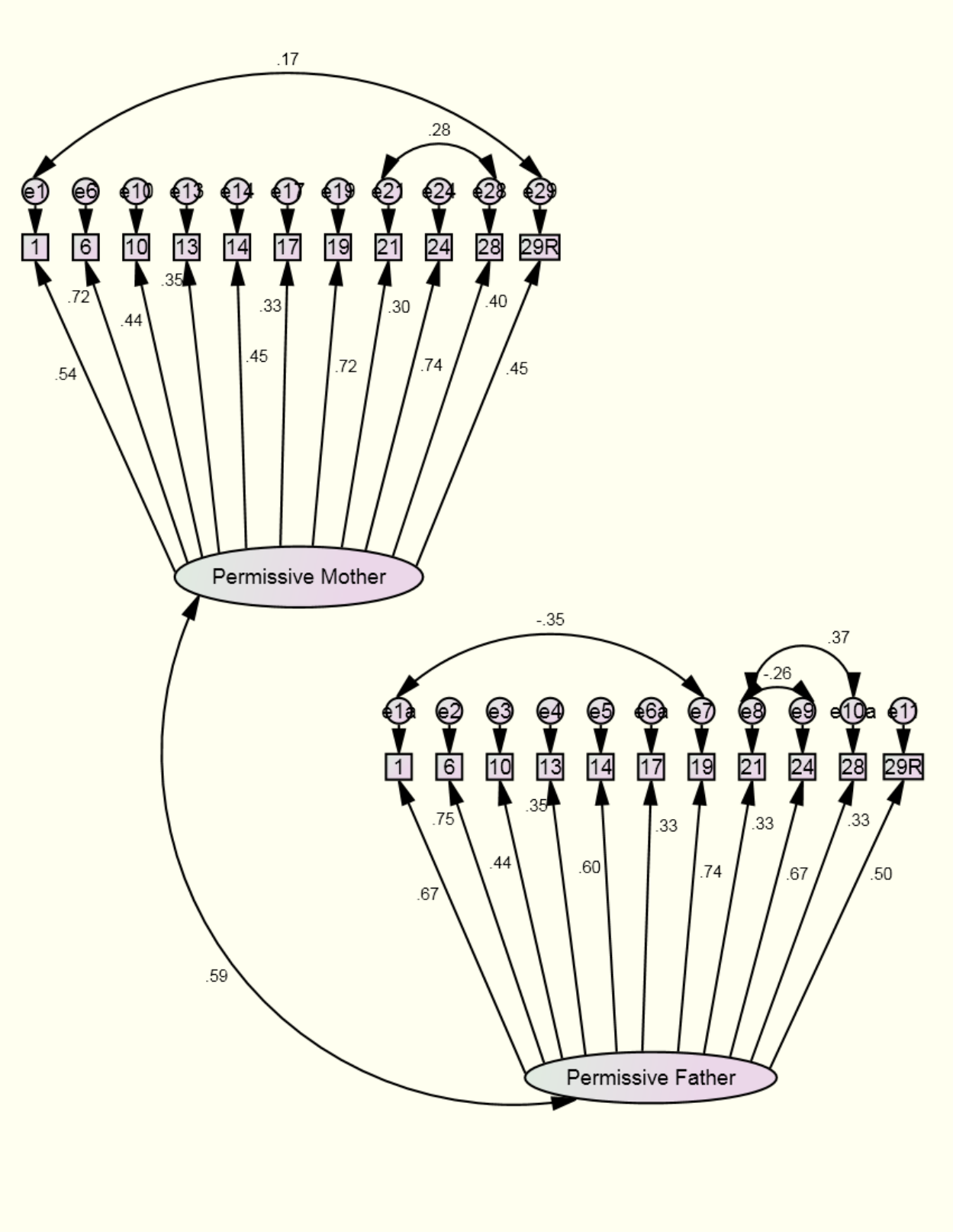
Authoritative Mother
.58

Figure C10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29R
.72
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Permissive Mother
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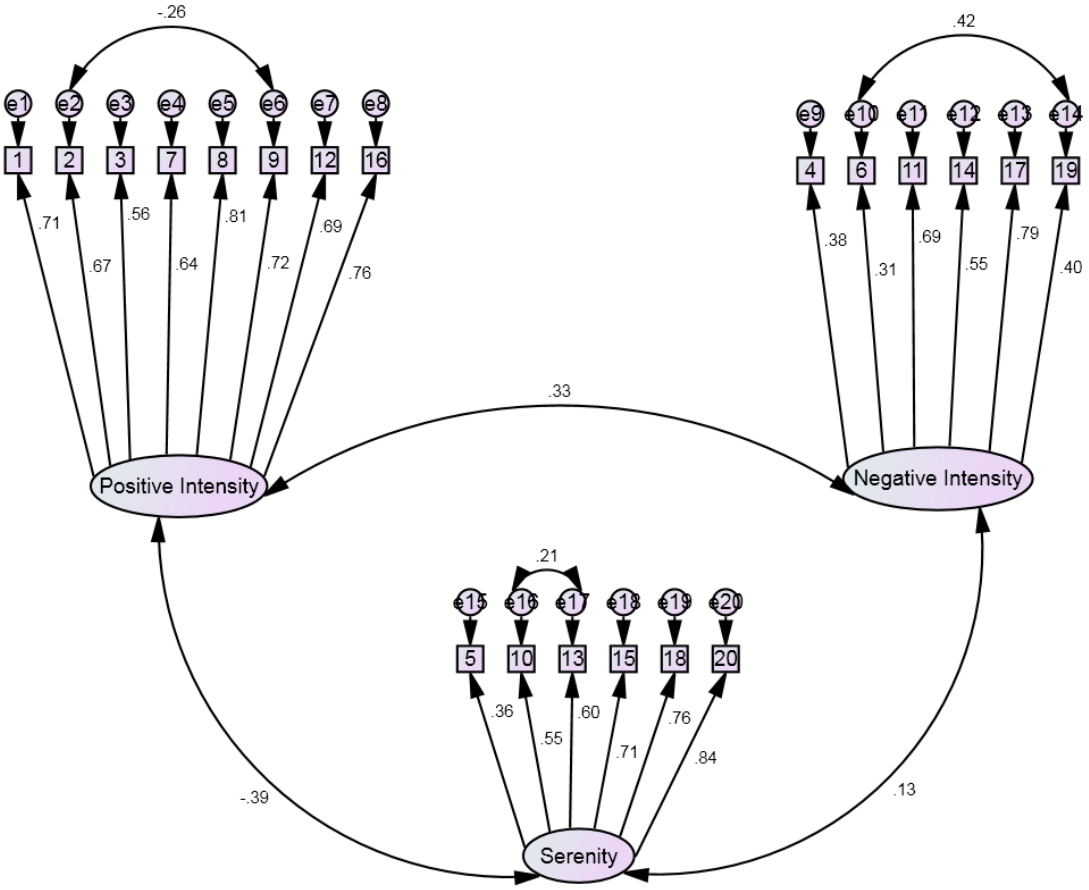
Permissive Father

Figure C11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Positive Intensity
Negative Intensity
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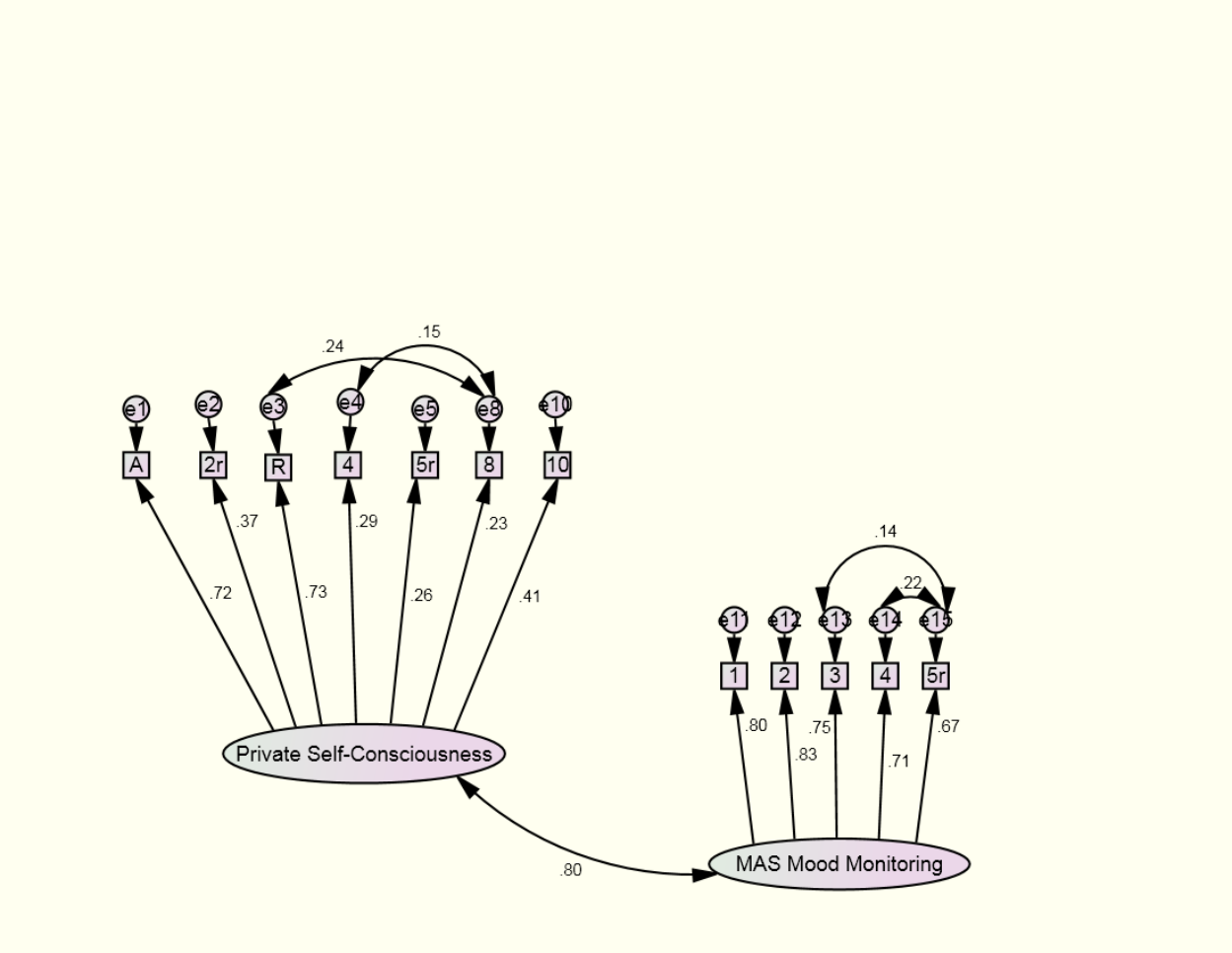
Serenity

Figure C12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R
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.23
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.73
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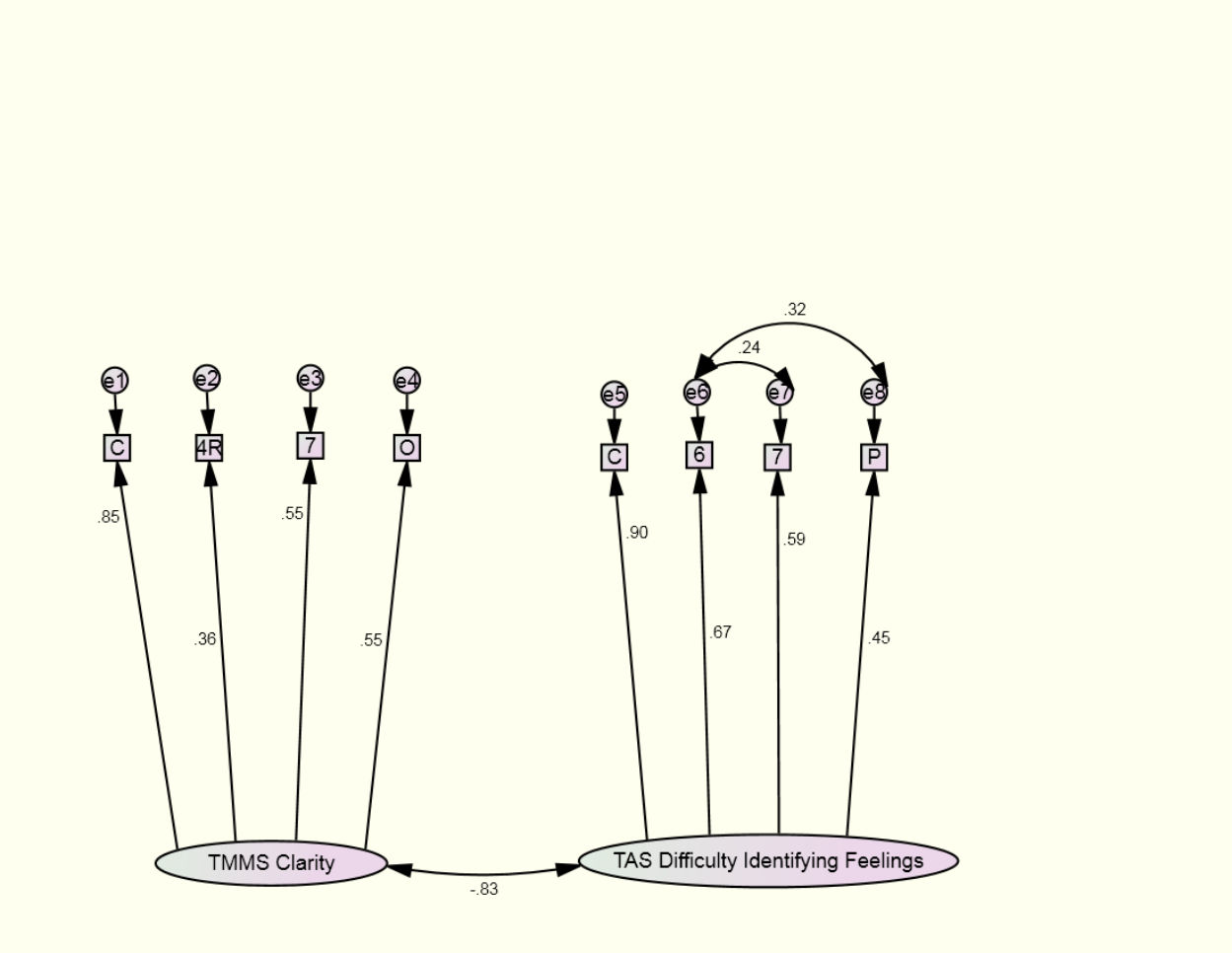
Private Self-Consciousness
.80
MAS Mood Monitoring

Figure C13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e2
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e7
e8
C
4R
7
O
C
6
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TMMS Clarity
TAS Difficulty Identifying Feelings
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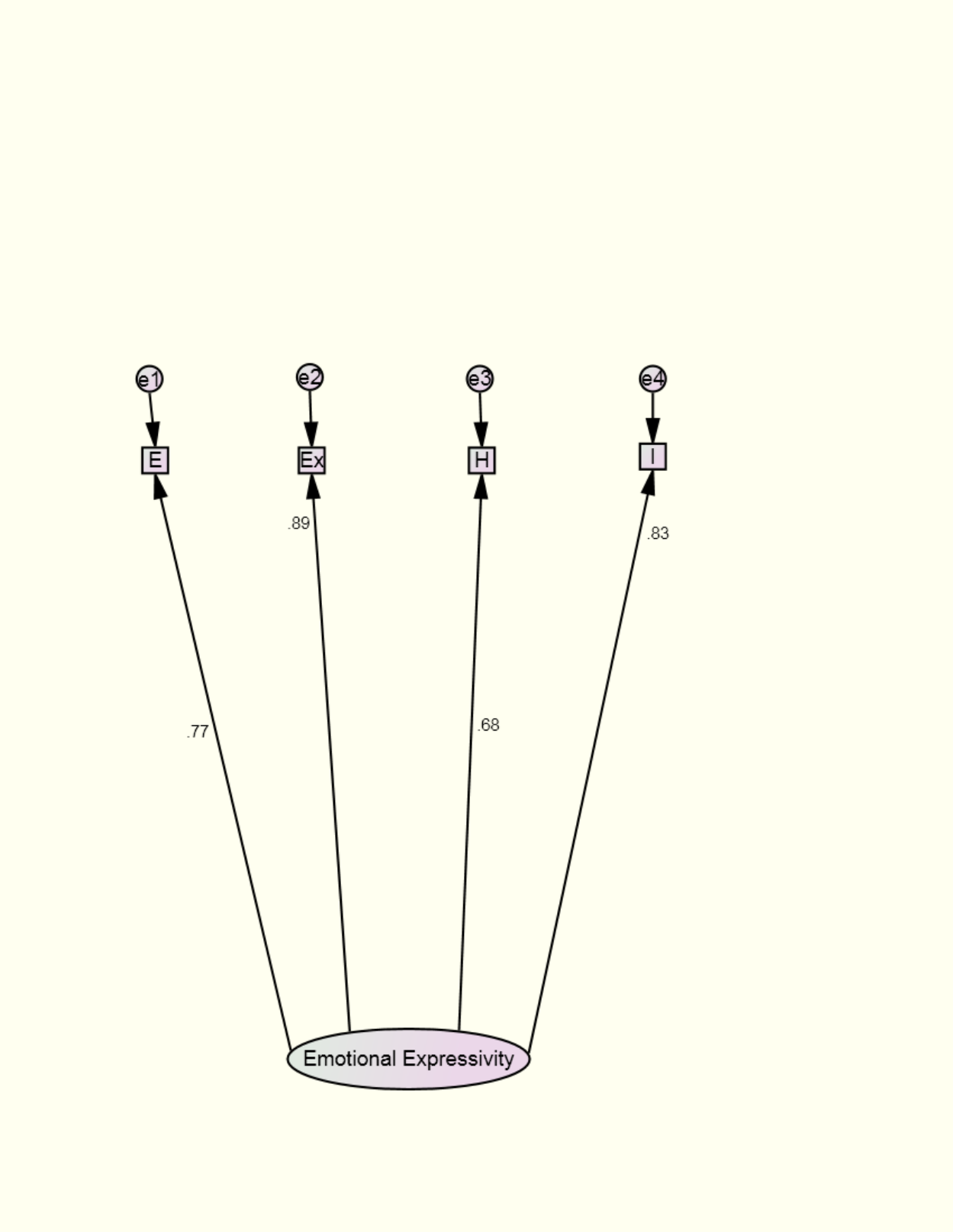
Figure C14



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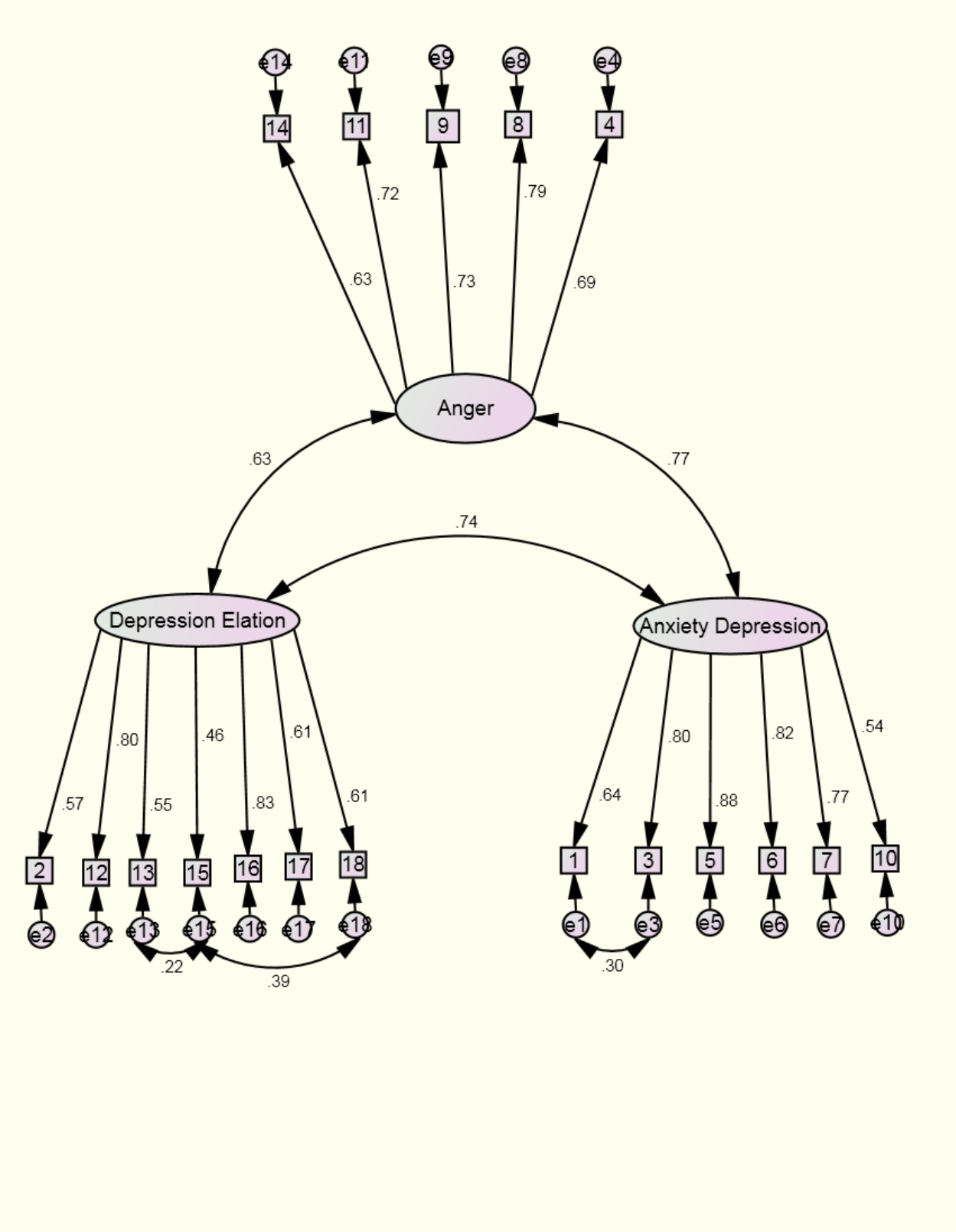
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Depression Elation
Anxiety Depression
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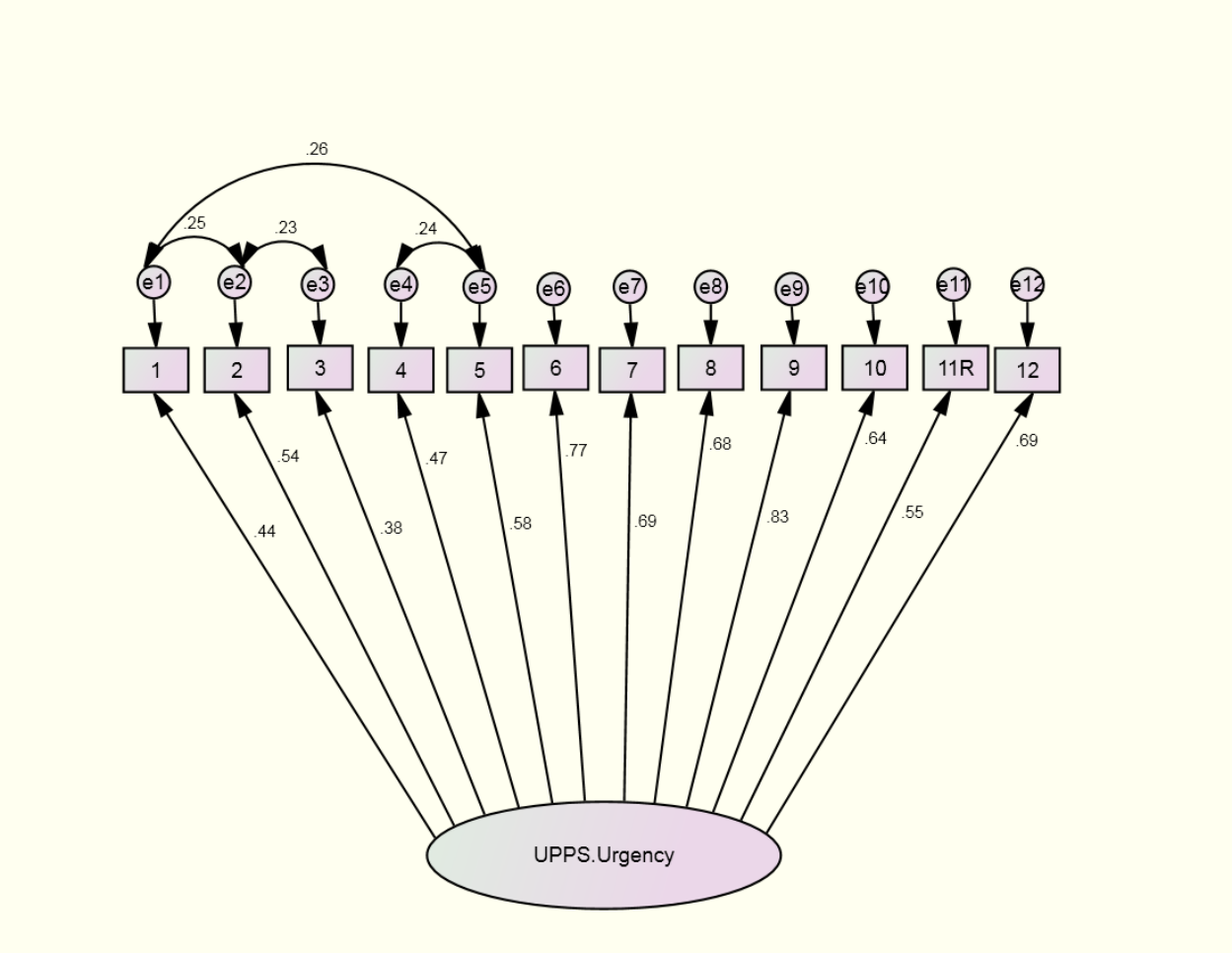
Figure C16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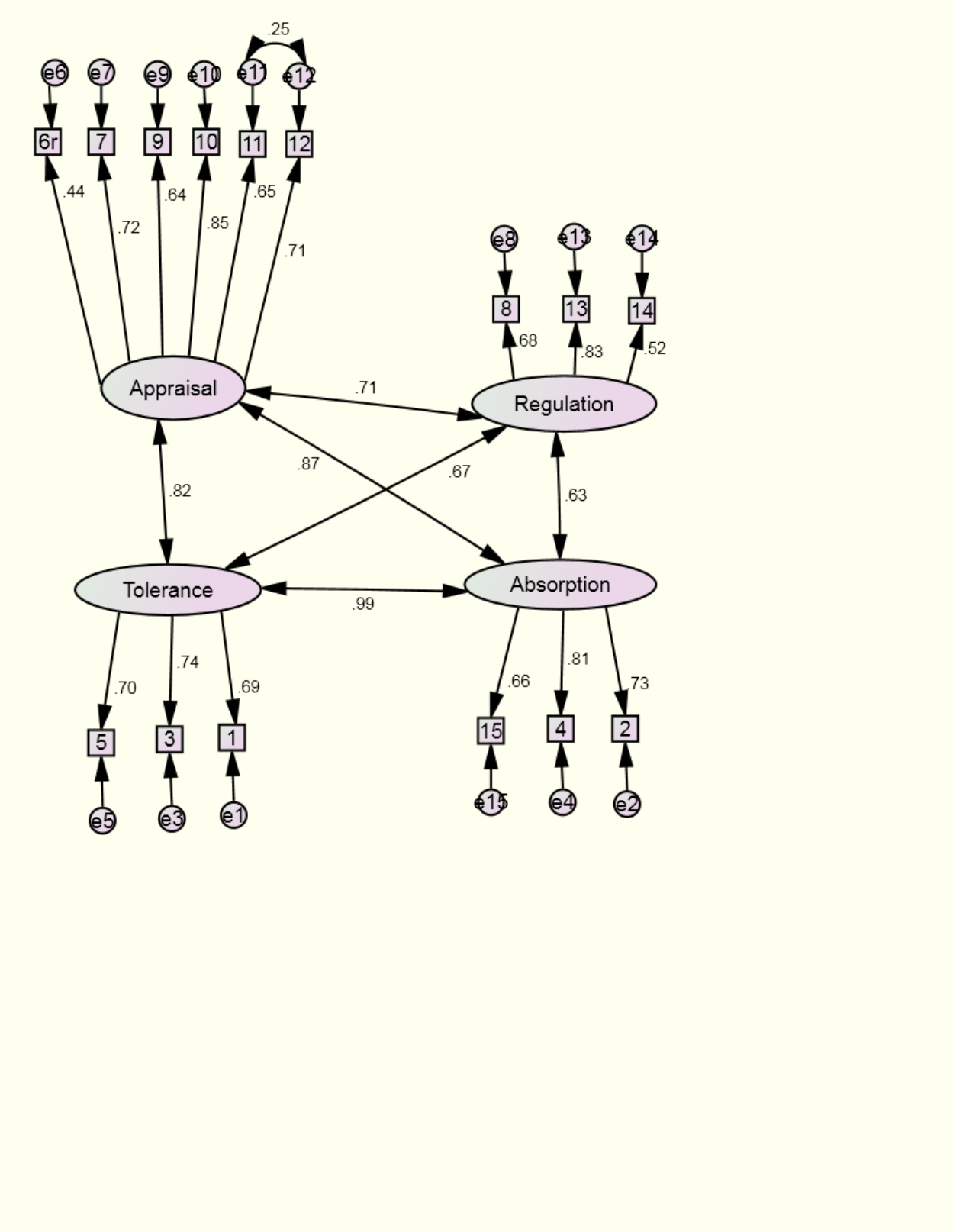
UPPS.Urgency

Figure C17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Appraisal
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Regulation
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Tolerance
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Absorption
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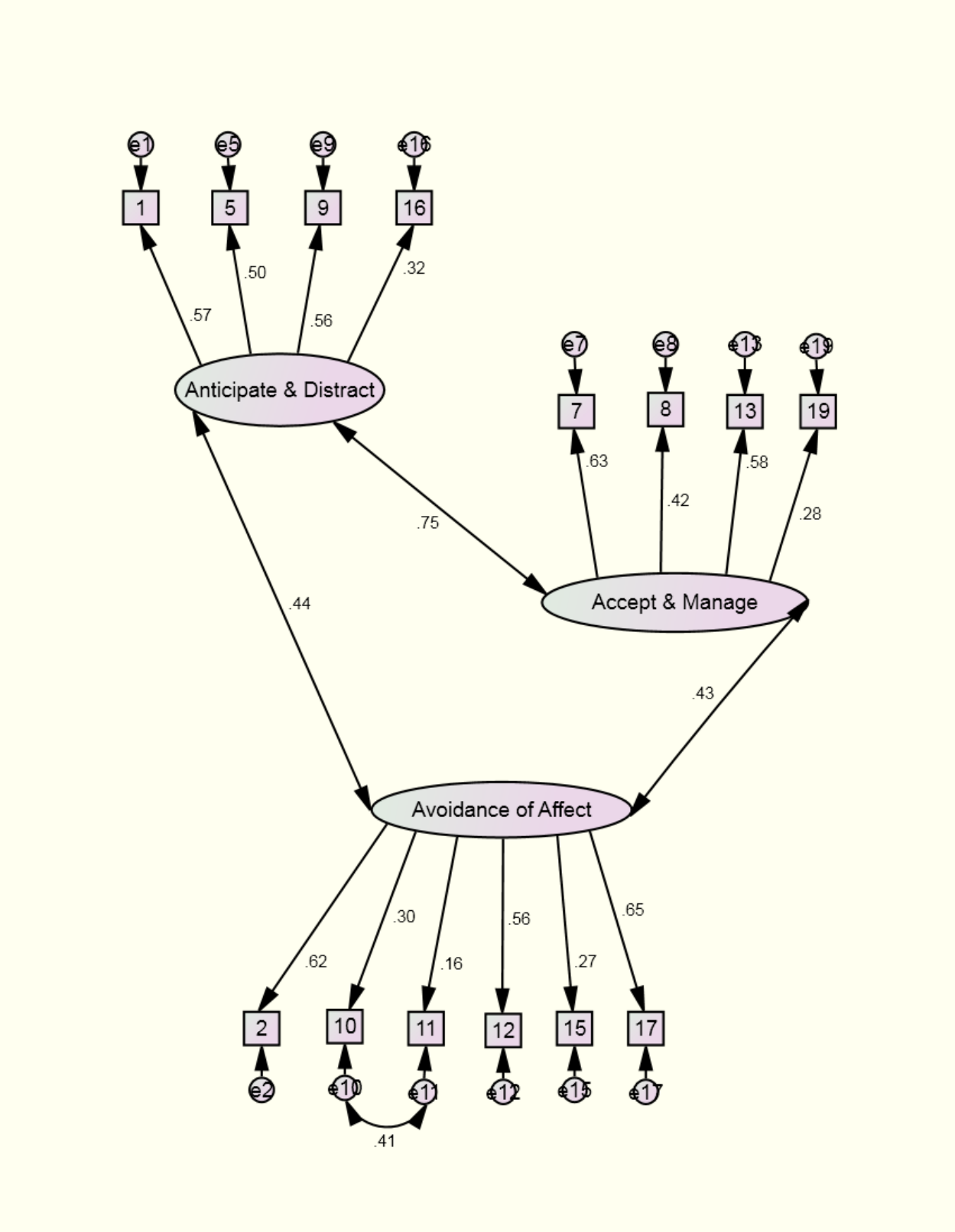
Figure C18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Anticipate & Distract
e7
e8
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e19
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.42
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.28
.75
.44
Accept & Manage
.43
Avoidance of Affect
.62
.30
.16
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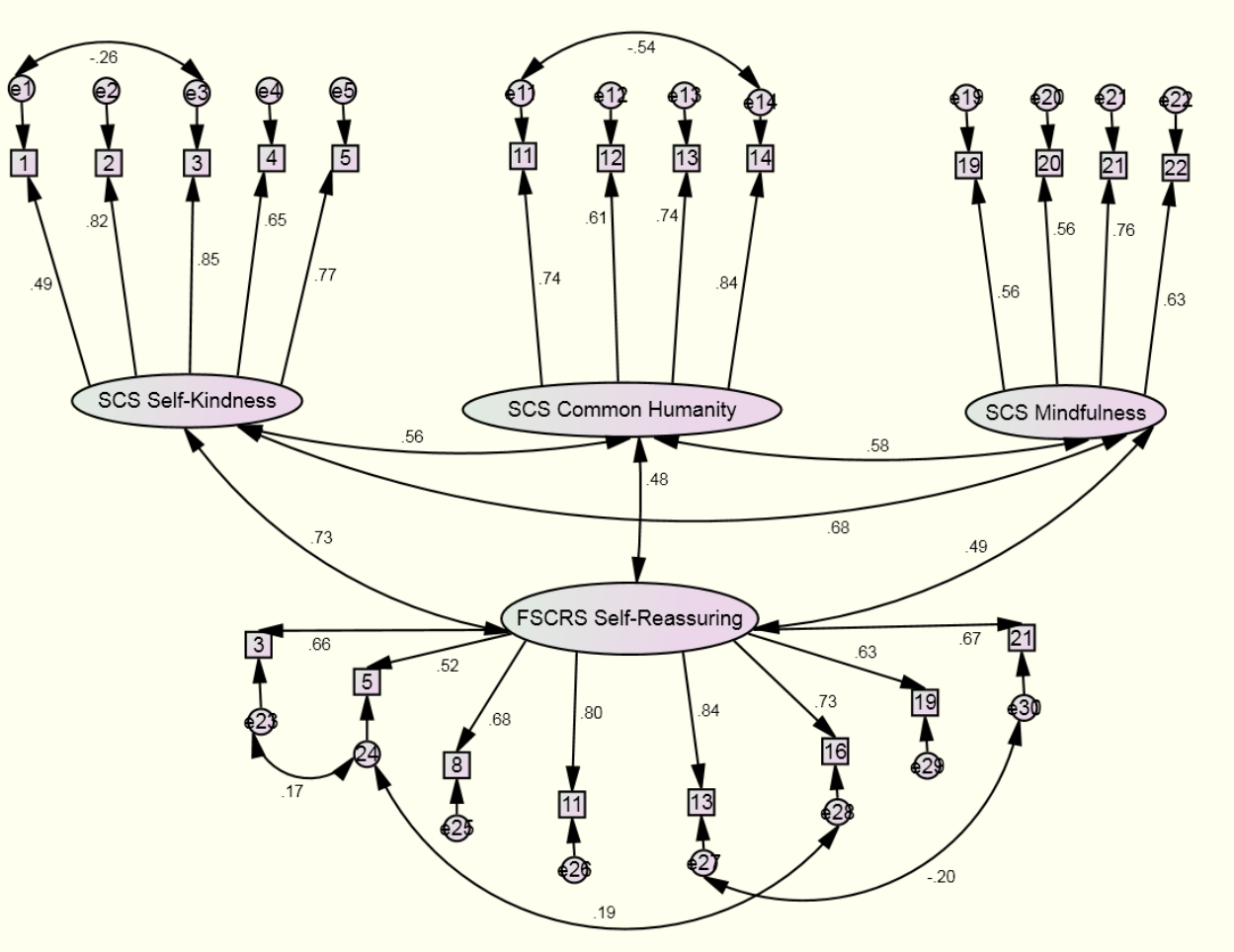
Figure C19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SCS Self-Kindness
SCS Common Humanity
SCS Mindfulness
FSCRS Self-Reassuring
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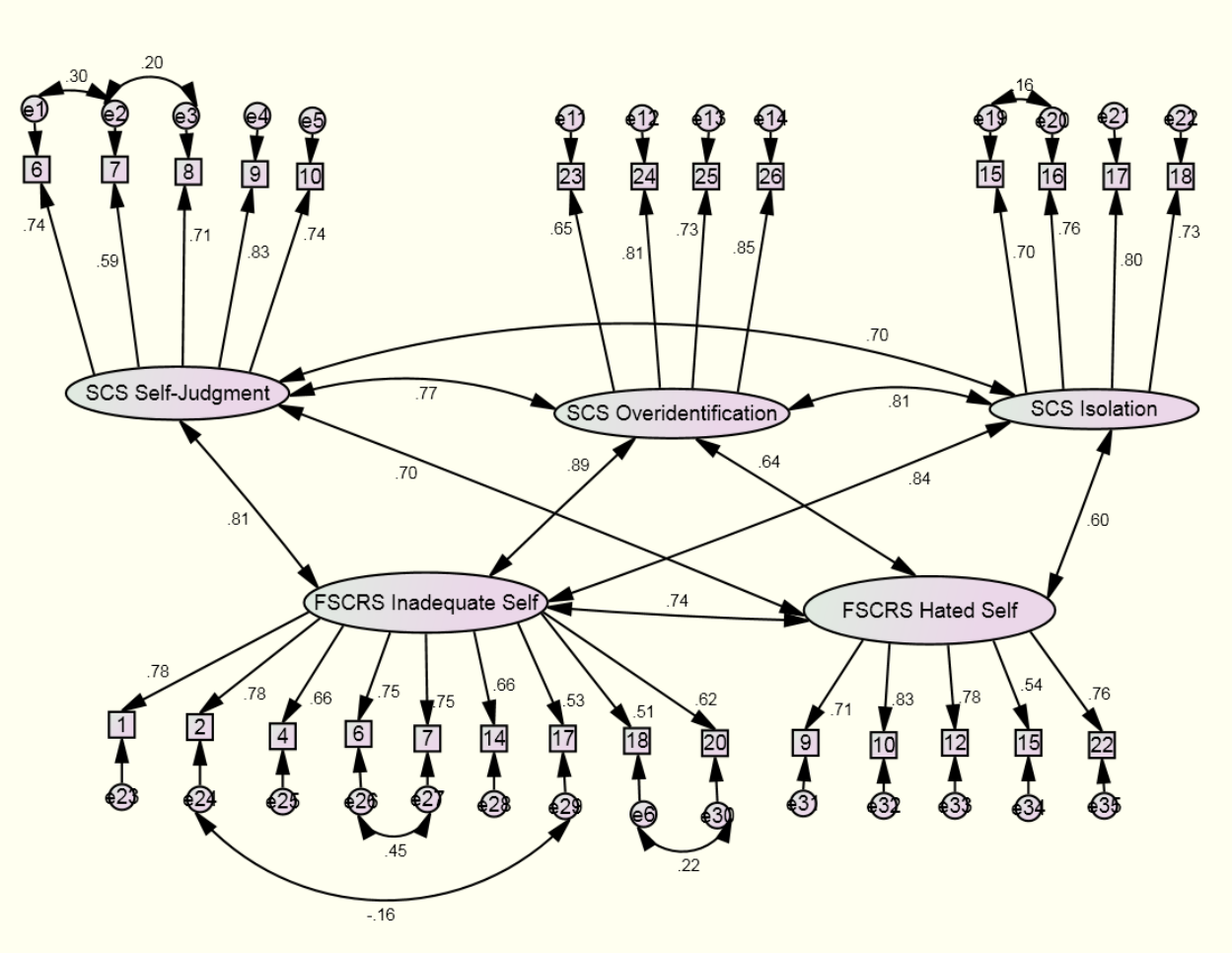
Figure C20


SCS Self-Judgment
SCS Overidentification
SCS Isolation
FSCRS Inadequate Self
FSCRS Hated Self
.30
.20
.16
.74
.59
.71
.83
.74
.65
.81
.73
.85
.70
.76
.80
.73
.70
.77
.81
.70
.89
.64
.84
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.60
.74
.78
.78
.66
.75
.75
.66
.53
.51
.62
.71
.83
.78
.54
.76
.45
.22
-.16

APPENDIX D

Table D1

Univariate Normality Indexes for Study 2 Measures

Variables	*N*	Skew	Kurtosis	K-S	*p*
In-Lab MSI-BPD	225	0.49	-0.80	2.25	<.001
MNBS-SF Neglect	224	1.46	2.61	2.60	<.001
ICES					
Invalidating Father	222	1.12	1.50	1.64	.009
Invalidating Mother	215	1.16	0.99	1.92	.001
PAQ					
Authoritarian Father	222	0.16	-0.83	1.01	.255
Authoritarian Mother	225	0.11	-0.48	0.97	.298
Authoritative Father	222	-0.74	-0.13	1.85	.002
Authoritative Mother	225	-1.01	0.96	1.85	.002
Permissive Father	222	-0.04	-0.74	0.93	.356
Permissive Mother	225	-0.02	-0.31	0.84	.485
HSPS					
Ease of Excitation	224	-0.11	-0.05	0.63	.823
Low Sensory Threshold	224	0.17	-0.46	1.06	.208
Aesthetic Sensitivity	224	-0.37	0.81	1.33	.059
ATQ Effortful Control					
Activation Control	225	-0.08	-0.06	0.78	.571
Attentional Control	225	-0.01	-0.37	0.78	.571
Inhibitory Control	225	-0.01	-0.09	0.83	.498
ATQ Extraversion/Surgency					
Intense Pleasure	225	-0.19	-0.26	1.01	.257
Positive Affect	225	-0.28	0.02	1.24	.094
Sociability	225	-0.33	-0.59	1.41	.037
ATQ Negative Affect					
Fear	225	0.00	-0.16	0.79	.566
Frustration	225	0.05	-0.24	0.69	.730
Sadness	225	0.31	-0.14	1.07	.203
Sensory Discomfort	225	-0.12	0.11	0.82	.508
ATQ Orienting Sensitivity					
Affective Sensitivity	225	-0.29	-0.34	1.25	.089
Associative Sensitivity	225	-0.40	0.31	1.15	.142
Neutral Sensitivity	225	-0.35	0.28	1.19	.116
AIS-S					
Intense Negative Affect	225	-0.10	-0.39	0.90	.393
Intense Positive Affect	225	-0.35	0.33	1.03	.237
Serenity	225	0.29	0.10	1.30	.069

Note. K-S = Kolmogorov-Smirnov.

Table Continued…….

Table D1 continued

Univariate Normality Indexes for Study 2 Measures

Variables	*N*	Skew	Kurtosis	K-S	*p*
Emotional Awareness Index	224	-0.35	-0.03	1.21	.105
Emotional Clarity Index	224	-0.06	-0.63	0.75	.620
EES Expressivity	224	-0.03	0.08	0.60	.866
ALS-SF					
Anger	225	0.50	-0.43	1.36	.050
Depression/Anxiety	225	0.26	-0.52	0.99	.278
Depression/Elation	224	-0.32	-0.48	1.11	.167
S-DTS					
Absorb.Tolerate	221	0.14	-0.36	1.22	.101
Appraise	221	0.29	-0.39	1.19	.115
Regulate	221	0.00	-0.30	1.54	.017
C-DTS					
Accept & Manage	225	-0.02	1.26	1.74	.005
Anticipate & Distract	225	-0.36	0.47	1.67	.007
Avoid Negative Affect	225	-0.09	0.33	1.18	.125
UPPS Urgency	225	-0.15	-0.55	0.79	.562
Self-Criticism Index	225	-0.03	-0.09	0.71	.689
FSCRS Hated Self	225	1.14	1.38	1.99	.001
FSCRS Reassuring Self	225	-0.22	0.23	0.91	.385
SCS					
Common Humanity	224	-0.13	-0.08	1.70	.006
Mindfulness	223	-0.04	0.50	1.41	.037
Self-Kindness	225	0.07	0.10	1.44	.031

Note. K-S = Kolmogorov-Smirnov.

Table D2

Psychometric Properties for Study 2 McLean and Temperament Variables

Variables	Number of Items	Mean	Standard Deviation	Alpha *N* = 224 to 225
McLean Screening Inventory for BPD (MSI-BPD)	10	3.31	2.78	.80
Highly Sensitive Person Scale (HSPS)				
Aesthetic Sensitivity (AES)	6	31.37	4.62	.64
Ease of Excitation (EOE)	12	58.50	9.35	.76
Low Sensory Threshold (LST)	7	26.25	7.22	.70
Adult Temperament Questionnaire (ATQ)				
Effortful Control (ATQ-EC)				
Activation Control	7	29.05	6.46	.61
Attentional Control	5	17.70	4.73	.64
Inhibitory Control	7	28.73	5.88	.46
Extraversion/Surgency (ATQ-E/S)				
Intense Pleasure	7	30.50	6.93	.63
Positive Affect	5	22.84	5.02	.64
Sociability	5	24.47	5.40	.67
Negative Affect (ATQ-NA)				
Fear	7	27.41	6.48	.65
Frustration	6	24.53	6.05	.67
Sadness	7	32.02	6.85	.68
Sensory Discomfort	6	24.67	6.23	.74
Orienting Sensitivity (ATQ-OS)				
Affective Sensitivity	5	23.04	5.21	.68
Associative Sensitivity	5	23.91	4.81	.64
Neutral Sensitivity	5	23.60	4.29	.48

Table D3

Psychometric Properties for Study 2 Environment Variables

Variables	Number of Items	Mean	Standard Deviation	Alpha *N* = 215 to 225
Parental Authority Questionnaire (PAQ)				
Authoritarian Father	9	28.67	8.35	.90
Authoritarian Mother	9	26.49	7.15	.88
Authoritative Father	10	33.30	8.56	.92
Authoritative Mother	10	35.55	7.46	.88
Permissive Father	11	27.19	7.28	.81
Permissive Mother	11	26.72	6.23	.79
Invalidating Childhood Environment (ICES)				
Invalidating Father	14	29.64	9.58	.87
Invalidating Mother	14	26.96	8.79	.87
Multidimensional Neglectful Behaviours Scale - Short Form (MNBS - SF)				
Neglect	8	11.97	4.09	.79
Childhood Trauma Questionnaire – Short Form (CTQ – SF)				
Sexual Abuse (SA)	1	-----	-----	-----
Physical Abuse (PA)	1	-----	-----	-----

Table D4

Psychometric Properties for Study 2 Emotional Experience Variables

Variables	Number of Items	Mean	Standard Deviation	Alpha *N* = 221 to 225
Affect Intensity Scale (AIS) – Short Form				
Negative Intensity	6	24.22	4.95	.72
Positive Intensity	8	31.87	6.73	.88
Serenity	6	22.43	4.70	.80
Emotional Awareness (EA) Index	15	53.71	8.72	.85
Emotional Clarity (EC) Index	18	63.16	11.96	.89
Emotional Expressivity Scale (EES)	17	62.38	13.27	.91
Affect Lability Scale (ALS) – Short Form				
Anger	5	11.42	4.70	.83
Anxiety/Depression	6	15.40	5.59	.88
Depression/Elation	7	19.73	5.77	.84

Table D5

Psychometric Properties for Study 2 Distress Tolerance, Self-Soothing and Self-Attacking Variables

Variables	Number of Items	Mean	Standard Deviation	Alpha *N* = 221 to 225
Distress Tolerance Scale I – C-DTS				
Accept & Manage	4	11.79	2.46	.49
Anticipate & Distract	4	11.47	2.39	.55
Avoidance of Affect	6	15.82	3.08	.60
Distress Tolerance Scale II – S-DTS				
Absorption & Tolerance	6	17.11	5.43	.87
Appraisal	6	15.34	5.04	.84
Regulate (Attempt to Eliminate Distress)	3	8.21	2.59	.70
UPPS Impulsive Behaviour Scale				
Urgency	12	35.52	9.40	.88
Self-Compassion				
FSCRS Reassuring Self	8	27.30	5.61	.88
SCS Common Humanity	4	11.72	3.27	.80
SCS Mindfulness	4	12.32	2.72	.72
SCS Self-Kindness	5	15.51	3.74	.83
Self-Criticism Index	21	67.75	15.98	.94
FSCRS Hated Self	5	9.66	4.11	.84

Note. FSCRS = Forms of Self-Criticizing/Attacking and Self-Reassuring Scale; SCS = Self-Compassion Scale.

Table D6

Zero-Order Correlations between HSPS Scales and ATQ Variables

Variables	HSPS EOE	HSPS LST	HSPS AES	ATQ-SF OS	ATQ-SF NA	ATQ-SF EC	ATQ-SF E/S
HSPS LST	.62**						
HSPS AES	.16*	.26**					
ATQ-SF OS	.13	.13	.54**		.20**	.00	.19**
Neutral	-.01	.00	.35**	.69**	.13	.12	.10
Affective	.18**	.18**	.47**	.80**	.18**	.04	.13
Associative	.10	.10	.36**	.72**	.15*	-.14*	.18**
ATQ-SF NA	.43**	.43**	.04			-.48**	-.27**
Fear	.41**	.36**	.04	.14*	.77**	-.32**	-.14*
Frustration	.26**	.15*	-.07	-.01	.66**	-.47**	-.10
Sadness	.21**	.26**	.07	.26**	.66**	-.26**	-.01
Sensory Discomfort	.29**	.38**	.07	.14*	.58**	-.25**	-.49**
ATQ-SF EC	-.24**	-.25**	.00				.00
Activation	-.06	-.12	.02	.09	-.25**	.79**	.06
Attentional	-.37**	-.36**	-.04	-.10	-.48**	.71**	.12
Inhibitory	-.15*	-.12	.02	-.00	-.38**	.74**	-.17*
ATQ-SF E/S	-.16*	-.29**	.14*				
Sociability	-.10	-.16*	.10	.13*	-.22**	.01	.73**
Int. Pleasure	-.11	-.18**	.09	.13*	-.21**	-.12	.77**
Pos Affect	-.14*	-.27**	.12	.14	-.16*	.15*	.68**

Note. HSPS = Highly Sensitive Person Scale; EOE = Ease of Excitation; AES = Aesthetic Sensitivity; ATQ-SF = Adult Temperament Questionnaire – Short Form; OS = Orienting Sensitivity; NA = Negative
Affect; EC = Effortful Control; E/S = Extraversion/Surgency.
** $p < .01$, * $p < .05$; $n = 224$.

Table D7

Zero-Order Correlations between Environment Variables

Variables	2	3	4	5	6	7	8	9
1. MNBS Neglect	.53**	.56**	.22**	.22**	-.42**	-.49**	.00	-.04
2. Invalidating Father		.62**	.63**	.38**	-.65**	-.55**	-.31**	-.20**
3. Invalidating Mother			.25**	.65**	-.34**	-.66**	-.03	-.31**
4. Authoritarian Father				.41**	-.54**	-.26**	-.62**	-.30**
5. Authoritarian Mother					-.20**	-.48**	-.18**	-.56**
6. Authoritative Father						.57**	.28**	.15*
7. Authoritative Mother							.08	.31**
8. Permissive Father								.56**
9. Permissive Mother								

Note. N = 212 to 225.
** $p < .01$, * $p < .05$

Table D8

Zero-Order Correlations between Emotional Experience Variables

	1. AIS Positive Intensity	2. AIS Negative Intensity	3. AIS Serenity	4. Emot. Awaren.	5. Emot. Clarity	6. EES Emot. Expr.	7. ALS Anger	8. ALS Anx./ Dep.	9. ALS Dep./ Elation
2	.28**								
3	-.29**	.10							
4	.14*	.34**	.12						
5	.02	-.28**	-.01	-.04					
6	.20**	.00	-.31**	.06	.29**				
7	.09	.36**	-.02	.26**	-.42**	-.05			
8	.06	.56**	.04	.38**	-.56**	-.14*	.68**		
9	.25**	.38**	-.01	.32**	-.39**	-.14*	.53**	.67**	

Note. AIS = Affect Intensity Scale; EES = Emotional Expressivity Scale; ALS = Affect Lability Scale.

** $p < .01$, * $p < .05$; $n = 223$ to 225.

Table D9

Zero-Order Correlations between Distress Tolerance and Urgency Variables

	1. CDTS Accept & Manage	2. CDTS Anticipate & Distract	3. CDTS Avoid Negative Affect	4. SDTS Absorb/ Tolerate	5. SDTS Appraisal	6. SDTS Regulate	7. UPPS Urgency
2.	.48**						
3.	.31**	.34**					
4.	.01	.10	.33**				
5.	-.05	.05	.41**	.70**			
6.	.15*	.28**	.32**	.55**	.52**		
7.	-.09	.02	.23**	.53**	.54**	.38**	

Note. N = 221 to 225.
** $p < .01$, * $p < .05$

Table D10

Zero-Order Correlations between Self-Soothing, Self-Criticism and Self-Hatred Variables

	1. FSCRS Reassuring Self	2. SCS Self-Kindness	3. SCS Mindfulness	4. SCS Common Humanity	5. Self-Criticism Index	6. FSCRS Hated Self
2.	.69**					
3.	.43**	.54**				
4.	.46**	.50**	.44**			
5.	-.63**	-.57**	-.35**	-.36**		
6.	-.67**	-.50**	-.27**	-.25**	.65**	

Note. N = 222 to 225.
** $p < .01$, * $p < .05$

Appendix E

Table E1

Zero-Order Correlations with McLean Screening Inventory for BPD (MSI-BPD) and Coefficients for Simultaneous Regression Analysis with Temperament Variables Predicting Scores on the MSI-BPD

Variables	Zero-Order Correlation	*Beta*	*t*	*p*
Positive Affect	-.16	-.15	-2.19	.030
Intense Pleasure	.18	.15	1.90	.058
Sociability	-.07	-.06	-0.93	n.s.
Sadness	.33	.22	3.19	.002
Frustration	.27	.08	1.07	n.s.
Fear	.17	-.04	-0.58	n.s.
Sensory Discomfort	.06	-.03	-0.37	n.s.
Associative Sensitivity	.26	.15	2.21	.028
Affective Sensitivity	.22	.09	1.28	n.s.
Neutral Sensitivity	.04	-.05	-0.73	n.s.
Inhibitory Control	-.26	-.13	-1.76	.080
Activation Control	-.24	-.09	-1.39	n.s.
Attentional Control	-.22	.02	0.33	n.s.
Ease of Excitation	.25	.10	1.20	n.s.
Low Sensory Threshold	.24	.07	0.88	n.s.
Aesthetic Sensitivity	.19	.09	1.19	n.s.

Note. N = 223 to 224.

Table E2

Zero-Order Correlations with McLean Screening Inventory for BPD (MSI-BPD) and Coefficients for Simultaneous Regression Analysis with Environment Variables Predicting Scores on the MSI-BPD

Variables	Zero-Order Correlation	*Beta*	*t*	*p*
Authoritarian Father	.33	.06	0.57	n.s.
Authoritarian Mother	.37	.07	0.61	n.s.
Authoritative Father	-.33	-.04	-0.41	n.s.
Authoritative Mother	-.41	-.16	-1.66	.097
Permissive Father	-.24	-.18	-1.78	.077
Permissive Mother	-.26	.03	0.28	n.s.
Invalidating Father	.41	-.02	-0.18	n.s.
Invalidating Mother	.44	.22	1.84	.067
Neglect	.29	.02	0.31	n.s.
Physical Abuse Only	.22	.09	1.38	n.s.
Sexual Abuse (and Physical Abuse)	.16	.13	2.02	.045

Note. N = 212 to 225.

Table E3

Model Summary of Regression Analysis with HSPS Ease of Excitation (HSPS.EOE) and Environment Variables Predicting Scores on the McLean Screening Inventory for BPD

Block	R	R-sq Change	F change	df1	df2
1 HSPS.EOE	.25	.06	13.45**	1	209
2 Environment	.56	.25	6.65**	11	198
3 Interaction	.62	.07	1.80[a]	11	187

Note. [a] $p = .057$.
** $p < .01$, * $p < .05$

Table E3a.

Model Summary of Regression Analysis with HSPS Ease of Excitation (HSPS.EOE) and Environment Variables Predicting Scores on the McLean Screening Inventory for BPD without Influential Cases

Block	R	R-sq Change	F change	df1	df2
1 HSPS.EOE	.25	.06	14.08**	1	206
2 Environment	.57	.26	6.90**	11	195
3 Interaction	.63	.07	2.02*	11	184

** $p < .01$, * $p < .05$

Table E4

Zero-Order Correlations with McLean Screening Inventory for BPD (MSI-BPD) and Coefficients for Block 3 of Regression Analysis with HSPS.EOE and Environment Variables Predicting Scores on the MSI-BPD without Influential Cases

Variables	Zero-Order Correlation	*B*	*t*
HSPS EOE	.25	.03	1.55
Authoritarian Mother	.37	.02	0.41
Authoritarian Father	.34	.03	0.82
Authoritative Mother	-.42	-.05	-1.31
Authoritative Father	-.33	-.02	-0.70
Permissive Mother	-.25	-.01	-0.18
Permissive Father	-.23	-.05	-1.45
Invalidating Mother	.44	.07	1.72
Invalidating Father	.41	-.03	-0.80
Neglect	.28	.06	1.04
Physical Abuse Only (D1)	.23	.89	1.67
Sexual Abuse (and PA) (D2)	.19	.98	1.06
EOE x Authoritarian Mother	.14	.02	2.99**
EOE x Authoritarian Father	.19	-.01	-1.68
EOE x Authoritative Mother	-.13	.00	0.95
EOE x Authoritative Father	-.16	.00	-1.41
EOE x Permissive Mother	-.08	.00	1.10
EOE x Permissive Father	-.16	.00	-1.12
EOE x Invalidating Mother	.11	-.01	-2.33*
EOE x Invalidating Father	.19	.00	0.62
EOE x Neglect	.14	.01	1.91
EOE x Physical Abuse Only	.15	-.01	-0.13
EOE x Sexual Abuse (and PA)	.29	.22	2.49*

** $p < .01$, * $p < .05$

Table E5

Model Summary of Regression Analysis with HSPS Low Sensory Threshold (HSPS. LST) and Environment Variables Predicting Scores on the McLean Screening Inventory for BPD

Block	R	R-sq Change	F change	df1	df2
1 HSPS.LST	.24	.06	12.96**	1	209
2 Environment	.55	.24	6.33**	11	198
3 Interaction	.59	.04	1.14	11	187

** $p < .01$

Table E6

Zero-Order Correlations with McLean Screening Inventory for BPD (MSI-BPD) and Coefficients for Block 2 of Regression Analysis with HSPS.LST and Environment Variables Predicting Scores on the MSI-BPD

Variables	Zero-Order Correlation	*B*	*t*
HSPS LST	.24	0.04	1.48
Authoritarian Mother	.37	0.02	0.58
Authoritarian Father	.33	0.02	0.47
Authoritative Mother	-.41	-0.05	-1.51
Authoritative Father	-.33	-0.01	-0.38
Permissive Mother	-.26	0.01	0.16
Permissive Father	-.24	-0.07	-1.85
Invalidating Mother	.44	0.07	1.76
Invalidating Father	.41	-0.01	-0.37
Neglect	.29	0.03	0.50
Physical Abuse Only (D1)	.22	0.81	1.47
Sexual Abuse (and PA) (D2)	.16	1.55	1.91

Table E7

Model Summary of Regression Analysis with HSPS Aesthetic Sensitivity (HSPS.AES) and Environment Variables Predicting Scores on the McLean Screening Inventory for BPD

Block	R	R-sq Change	F change	df1	df2
1 HSPS.AES	.19	.04	8.11**	1	209
2 Environment	.55	.26	6.76**	11	198
3 Interaction	.59	.04	1.12	11	187

** $p < .01$

Table E8

Zero-Order Correlations with McLean Screening Inventory for BPD (MSI-BPD) and Coefficients for Block 2 of Regression Analysis with HSPS Aesthetic Sensitivity (HSPS.AES) and Environment Variables Predicting Scores on the MSI-BPD

Variables	Zero-Order Correlation	*B*	*t*
HSPS AES	.19	0.04	1.14
Authoritarian Mother	.37	0.02	0.47
Authoritarian Father	.33	0.02	0.56
Authoritative Mother	-.41	-0.06	-1.58
Authoritative Father	-.33	-0.01	-0.49
Permissive Mother	-.26	0.01	0.13
Permissive Father	-.24	-0.06	-1.64
Invalidating Mother	.44	0.07	1.84
Invalidating Father	.41	-0.01	-0.35
Neglect	.29	0.03	0.48
Physical Abuse Only	.23	0.76	1.38
Sexual Abuse (and PA)	.16	1.65	2.03*

* $p < .05$

Table E9

Model Summary of Regression Analysis with ATQ Effortful Control and Environment Variables Predicting Scores on the McLean Screening Inventory for BPD

Block	R	R-sq Change	F change	df1	df2
1 ATQ Effortful Control	.31	.10	7.28**	3	206
2 Environment	.58	.24	6.38**	11	195
3 Interaction	.69	.14	1.32	33	162

** $p < .01$

Table E10

Zero-Order Correlations with McLean Screening Inventory for BPD (MSI-BPD) and Coefficients for Block 2 of Regression Analysis with ATQ Effortful Control and Environment Variables Predicting Scores on the MSI-BPD

Variables	Zero-Order Correlation	*B*	*t*
Activation Control	-.24	-0.04	-1.42
Attentional Control	-.22	-0.03	-0.65
Inhibitory Control	-.26	-0.06	-1.78
Authoritarian Mother	.37	0.02	0.41
Authoritarian Father	.34	0.01	0.35
Authoritative Mother	-.41	-0.06	-1.65
Authoritative Father	-.33	0.00	0.03
Permissive Mother	-.26	0.01	0.19
Permissive Father	-.24	-0.07	-1.76
Invalidating Mother	.44	0.06	1.46
Invalidating Father	.41	0.01	0.27
Neglect	.29	0.02	0.33
Physical Abuse Only	.22	0.74	1.35
Sexual Abuse (and Physical Abuse)	.16	1.50	1.86

Table E11

Model Summary of Regression Analysis for ATQ Orienting Sensitivity and Environment Variables Predicting Scores on the McLean Screening Inventory for BPD

Block	R	R-sq Change	F change	df1	df2
1 ATQ Orienting Sensitivity	.30	.09	7.11**	3	208
2 Environment	.58	.24	6.52**	11	197
3 Interaction	.69	.14	1.29	33	164

** $p < .01$

Table E12

Zero-Order Correlations with McLean Screening Inventory for BPD (MSI-BPD) and Coefficients for Block 2 of Regression Analysis with ATQ Orienting Sensitivity and Environment Variables Predicting Scores on the MSI-BPD

Variables	Zero-Order Correlation	*B*	*t*
Neutral Sensitivity	.04	-0.08	-1.84
Affective Sensitivity	.22	0.05	1.48
Associative Sensitivity	.26	0.09	2.39*
Authoritarian Mother	.37	0.02	0.47
Authoritarian Father	.33	0.03	0.81
Authoritative Mother	-.41	-0.06	-1.84
Authoritative Father	-.33	-0.01	-0.26
Permissive Mother	-.26	-0.01	-0.17
Permissive Father	-.24	-0.05	-1.33
Invalidating Mother	.44	0.05	1.46
Invalidating Father	.41	-0.01	-0.44
Neglect	.29	0.04	0.71
Physical Abuse Only	.22	0.76	1.39
Sexual Abuse (and PA)	.16	1.70	2.12*

* $p < .05$

Table E13

Model Summary of Regression Analysis with ATQ Negative Affect and Environment Variables Predicting Scores on the McLean Screening Inventory for BPD

Block	R	R-sq Change	F change	df1	df2
1 ATQ Negative Affect	.37	.14	8.40**	4	205
2 Environment	.63	.26	7.49**	11	194
3 Interaction	.76	.18	1.45[1]	44	150

Note. [1] $p = .053$.
** $p < .01$

Table E13a

Model Summary of Regression Analysis with ATQ Negative Affect and Environment Variables Predicting Scores on the McLean Screening Inventory for BPD without Influential Cases

Block	R	R-sq Change	F change	df1	df2
1 ATQ Negative Affect	.40	.16	9.53**	4	200
2 Environment	.64	.24	7.03**	11	189
3 Interaction	.77	.19	1.54*	44	145

** $p < .01$, * $p < .05$

Table E14

Zero-Order Correlations with McLean Screening Inventory for BPD (MSI-BPD) and Coefficients for Block 3 of Regression Analysis with ATQ Negative Affect and Environment Variables Predicting Scores on the MSI-BPD without Influential Cases

Variables	Zero-Order Correlation	*B*	*t*
Fear	.18	0.00	-0.09
Frustration	.27	0.07	1.93
Sadness	.36	0.09	3.00**
Sensory Discomfort	.09	-0.03	-0.80
Authoritarian Mother	.38	0.04	1.00
Authoritarian Father	.36	-0.03	-0.73
Authoritative Mother	-.46	-0.05	-1.46
Authoritative Father	-.37	-0.01	-0.48
Permissive Mother	-.31	0.05	1.20
Permissive Father	-.30	-0.11	-2.76**
Invalidating Mother	.43	0.04	0.98
Invalidating Father	.43	0.02	0.55
Neglect	.30	0.05	0.77
Physical Abuse Only (D1)	.23	0.38	-0.31
Sexual Abuse (and PA) (D2)	.09	-0.38	-0.31
Fear x Authoritarian Mother	.11	0.00	-0.32
Fear x Authoritarian Father	.08	0.00	0.63
Fear x Authoritative Mother	-.27	0.00	0.18
Fear x Authoritative Father	-.22	-0.01	-1.29
Fear x Permissive Mother	-.07	0.00	-0.14
Fear x Permissive Father	-.03	0.01	1.67
Fear x Invalidating Mother	.22	0.01	1.06
Fear x Invalidating Father	.12	-0.02	-2.00*
Fear x Neglect	.25	0.02	2.02*
Fear x Physical Abuse Only	.01	-0.04	-0.37
Fear x Sexual Abuse (and PA)	.14	0.17	0.72
Frustration x Authoritarian Mother	.11	0.00	-0.11
Frustration x Authoritarian Father	.16	0.01	0.78
Frustration x Authoritative Mother	-.21	-0.01	-0.83
Frustration x Authoritative Father	-.20	0.00	-0.84
Frustration x Permissive Mother	-.14	0.00	-0.23
Frustration x Permissive Father	-.07	0.01	0.87

** $p < .01$, * $p < .05$

Continued…..

Table E14 continued

Zero-Order Correlations with McLean Screening Inventory for BPD (MSI-BPD) and Coefficients for Block 3 of Regression Analysis with ATQ Negative Affect and Environment Variables Predicting Scores on the MSI-BPD without Influential Cases

Variables	Zero-Order Correlation	*B*	*t*
Frustration x Invalidating Mother	.13	0.00	-0.71
Frustration x Invalidating Father	.14	-0.01	-0.92
Frustration x Neglect	.00	0.00	-0.43
Frustration x Physical Abuse Only	.12	0.03	0.24
Frustration x Sexual Abuse (and Physical Abuse)	.19	0.00	-0.01
Sadness x Authoritarian Mother	.10	0.00	0.53
Sadness x Authoritarian Father	.25	0.00	-0.08
Sadness x Authoritative Mother	-.25	0.00	-0.70
Sadness x Authoritative Father	-.29	0.00	0.77
Sadness x Permissive Mother	-.12	0.00	0.51
Sadness x Permissive Father	-.25	-0.01	-0.97
Sadness x Invalidating Mother	.17	-0.01	-0.75
Sadness x Invalidating Father	.28	0.01	2.07*
Sadness x Neglect	.10	-0.02	-2.04*
Sadness x Physical Abuse Only	.13	-0.12	-1.09
Sadness x Sexual Abuse (and Physical Abuse)	.25	0.17	0.61
Discomfort x Authoritarian Mother	.09	0.00	-0.11
Discomfort x Authoritarian Father	.11	0.00	-0.13
Discomfort x Authoritative Mother	-.14	0.00	0.45
Discomfort x Authoritative Father	-.10	0.00	-0.06
Discomfort x Permissive Mother	.00	0.01	1.71
Discomfort x Permissive Father	-.01	-0.01	-0.97
Discomfort x Invalidating Mother	.10	0.00	0.64
Discomfort x Invalidating Father	.12	0.00	-0.65
Discomfort x Neglect	.10	0.01	0.95
Discomfort x Physical Abuse Only	.08	-0.10	-0.78
Discomfort x Sexual Abuse (and Physical Abuse)	.12	-0.20	-0.93

* $p < .05$

Table E15

Model Summary of Regression Analysis with ATQ Extraversion/Surgency and Environment Variables Predicting Scores on the McLean Screening Inventory for BPD

Block	R	R-sq Change	F change	df1	df2
1 ATQ Extraver/Surgency	.30	.09	7.05**	3	206
2 Environment	.63	.30	8.93**	11	195
3 Interaction	.72	.12	1.26	33	162

** $p < .01$

Table E16

Zero-Order Correlations with McLean Screening Inventory for BPD (MSI-BPD) and Coefficients for Block 2 of Regression Analysis with ATQ Extraversion/Surgency and Environment Variables Predicting Scores on the MSI-BPD

Variables	Zero-Order Correlation	*B*	*t*
Intense Pleasure	.20	0.12	5.16**
Positive Affect	-.17	-0.06	-1.69
Sociability	-.08	-0.03	-0.82
Authoritarian Mother	.38	0.00	-.09
Authoritarian Father	.34	0.02	0.47
Authoritative Mother	-.45	-0.09	-2.67**
Authoritative Father	-.35	-0.01	-0.52
Permissive Mother	-.30	-0.02	-0.47
Permissive Father	-.27	-0.07	-1.96
Invalidating Mother	.43	0.06	1.74
Invalidating Father	.41	0.00	0.05
Neglect	.30	0.00	-0.10
Physical Abuse Only	.23	0.79	1.58
Sexual Abuse (and PA)	.09	0.69	0.88

** $p < .01$

Table E17

Zero-Order Correlations with McLean Screening Inventory for BPD (MSI-BPD) and Coefficients for Simultaneous Regression Analysis with Emotional Experience Variables Predicting Scores on the MSI-BPD

Model	Zero-Order Correlation	*Beta*	*t*	*p*
Negative Intensity	.19	-.08	-1.11	n.s.
Positive Intensity	.07	-.02	- 0.36	n.s.
Serenity	-.08	-.10	-1.62	n.s.
Emotional Awareness	.37	.30	4.67	<.001
Emotional Clarity	-.31	-.17	-2.31	.022
Lability - Depression/Elation	.36	.08	1.05	n.s.
Lability - Anxiety/Depression	.41	-.01	-0.11	n.s.
Lability – Anger	.46	.31	3.95	<.001
Emotional Expressivity	-.01	.02	0.25	n.s.

Table E18

Zero-Order Correlations with McLean Screening Inventory for BPD (MSI-BPD) and Coefficients for Simultaneous Regression Analysis with Distress Tolerance Variables Predicting Scores on the MSI-BPD

Model	Zero-Order Correlation	*Beta*	*t*	*p*
S-DTS Absorb.Tolerate	.34	.03	.39	n.s.
S-DTS Appraise	.41	.21	2.38	.018
S-DTS Regulate	.19	-.05	-.74	n.s.
C-DTS Anticipate & Distract	-.13	-.22	-3.19	.002
C-DTS Accept & Manage	-.01	.12	1.78	.076
C-DTS Avoid Negative Affect	.19	.06	.92	n.s.
UPPS Urgency	.47	.35	4.96	<.001

Table E19

Zero-Order Correlations with McLean Screening Inventory for BPD (MSI-BPD) and Coefficients for Simultaneous Regression Analysis with Self-Soothing Variables Predicting Scores on the MSI-BPD

Model	Zero-Order Correlation	*Beta*	*t*	*p*
FSCRS Reassuring Self	-.36	0.04	0.43	n.s.
SCS Self-Kindness	-.32	-0.04	-0.40	n.s.
SCS Mindfulness	-.24	-0.10	-1.42	n.s.
SCS Common Humanity	-.15	0.03	0.50	n.s.
Self-Criticism Index	.41	0.12	1.46	n.s.
FSCRS Hated Self	.50	0.41	4.73	<.001

Table E20

Model Summary of Regression Analysis with Temperament, Environment, Temperament x Environment, Emotional Experience, Responses to Distress, and Self-Soothing Variables Predicting Scores on the McLean Screening Inventory for BPD

Block	R	R-sq Change	F change	df1	df2
1 Temperament	.49	.24	9.31**	7	202
2 Environment	.63	.15	7.10**	7	195
3 Temperament x Environment Interaction	.71	.10	4.88**	8	187
4 Emotional Experience	.74	.05	6.98**	3	184
5 Responses to Distress	.77	.04	5.61**	3	181
6 Self-Soothing	.77	.00	1.26	1	180

** $p < .01$

E20a

Model Summary of Regression Analysis with Environment, Temperament, Temperament x Environment, Emotional Experience, Responses to Distress, and Self-Soothing Variables Predicting Scores on the McLean Screening Inventory for BPD

Block	R	R-sq Change	F change	df1	df2
1 Environment	.51	.26	10.38**	7	202
2 Temperament	.63	.13	6.15**	7	195
3 Temperament x Environment Interaction	.71	.10	4.88**	8	187
4 Emotional Experience	.74	.05	6.98**	3	184
5 Responses to Distress	.77	.04	5.61**	3	181
6 Self-Soothing	.77	.00	1.26	1	180

** $p < .01$

Table E21

Zero-Order Correlations with McLean Screening Inventory for BPD (MSI-BPD) and Coefficients for Block 5 of Regression Analysis with Temperament, Environment, Temperament x Environment, Emotional Experience, and Responses to Distress Variables Predicting Scores on the MSI-BPD

Variables	Zero-Order Correlation	*B*	*t*
HSPS Ease of Excitation (EOE)	.25	0.01	0.42
ATQ Fear	.17	-0.02	-0.89
ATQ Frustration	.27	0.00	0.15
ATQ Sadness	.33	0.04	1.53
ATQ Sensory Discomfort	.06	-0.08	-3.06**
ATQ Positive Affect	-.16	-0.02	-0.58
ATQ Associative Sensitivity	.26	0.06	1.67
ICES Invalidating Father	.41	0.00	-0.11
ICES Invalidating Mother	.44	0.06	1.86
PAQ Authoritarian Father	.33	0.03	1.04
PAQ Authoritarian Mother	.37	0.00	0.06
Neglect	.29	0.10	2.13*
Physical Abuse Only	.22	0.82	1.78
Sexual Abuse (and PA)	.16	0.72	1.03
EOE x Physical Abuse Only	.15	0.12	2.16*
EOE x Sexual Abuse (and PA)	.29	0.08	1.26
EOE x Invalidating Mother	.10	0.00	-0.42
EOE x Authoritarian Mother	.13	0.00	1.82
Fear x Invalidating Father	.15	-0.01	-1.76
Fear x Neglect	.24	0.02	3.32**
Sadness x Invalidating Father	.24	0.01	2.70**
Sadness x Neglect	.08	-0.02	-2.70**
Emotional Awareness	.37	0.04	2.19*
Emotional Clarity	-.31	-0.01	-0.56
Lability – Anger	.46	0.06	1.56
S-DTS Appraise	.41	0.02	0.43
C-DTS Anticipate & Distract	-.13	-0.11	-1.84
UPPS Urgency	.47	0.07	3.44**

** $p < .01$; * $p < .05$

Table E22

Zero-Order and Partial Correlations between Emotional Awareness Index, Emotional Clarity Index, Affect Lability (Anger), Urgency, and McLean Screening Inventory for BPD (MSI-BPD)

Controlled Variable	Variables	MSI-BPD	Emotional Awareness Index	Emotional Clarity Index	Urgency
None	Emotional Awareness Index	.37**			
	Emotional Clarity Index	-.31**	-.04		
	Urgency	.47**	.23**	-.43**	
	Affect Lability – Anger	.46**	.26**	-.42**	.56**
Urgency	Emotional Awareness Index	-.30**			
	Emotional Clarity Index	-.14*	.07		
	Affect Lability – Anger	.28**	.15*	-.24**	
Affect Lability – Anger	Emotional Awareness Index	.29**			
	Emotional Clarity Index	-.14*	.07		
	Urgency	.27**	.11	-.26**	

Note. N = 219 to 224.
** $p < .01$; * $p < .05$

Table E22 continued

Zero-Order and Partial Correlations between Emotional Awareness Index, Emotional Clarity Index, Affect Lability (Anger), Urgency, and McLean Screening Inventory for BPD (MSI-BPD)

Controlled Variable	Variables	MSI-BPD	Emotional Awareness Index	Emotional Clarity Index	Urgency
Emotional Awareness Index	Emotional Clarity Index	-.31**			
	Urgency	.42**		-.44**	
	Affect Lability – Anger	.41**		-.43**	.54**
Emotional Clarity Index	Emotional Awareness Index	.37**			
	Urgency	.38**	.24**		
	Affect Lability – Anger	.38**	.26**		.46**
Urgency & Affect Lability – Anger	Emotional Awareness Index	.27**			
	Emotional Clarity Index	-.08	.11		

Note. N = 219 to 224.
** $p < .01$; * $p < .05$

APPENDIX F

Figure F1

Wisconsin Card Sorting Test – Description of Variables

Number of Trials Completed: Total number of cards/trials used. A fewer number of trials indicated a better performance (i.e., participant correctly complete nine categories in fewer trials). The maximum number of trials was 128.

Categories Completed: A category (or set) was considered "completed" when the participant made 10 consecutive correct responses according to one of the three sorting principles (Colour, Form, Number). *Categories Completed* refers to the number of categories that the participant completed during the task. This index ranges from 0 (no categories completed) to 9 (all categories completed).

Categories Experienced: The number of different rules that were presented to the participant throughout the task, or the number of categories attempted. The maximum number was 9.

Number of Trials to Completion of First Category: The number of trials the participant required to complete the first set of 10 correct sorts. An index of initial conceptualization. The minimum number of trials was 10.

Percentage of Correct Responses: The number of responses that matched the sorting principle divided by the total number of trials.

Percentage of Perseverative Responses: Number of responses that matched the *previous* sorting principle divided by the total number of trials. This index includes both correct and incorrect perseverative responses, as it was possible for some of the cards to be matched on one, two, or three dimensions.

Percentage of Perseverative Errors: Number of incorrect responses that matched the *previous* sorting principle, divided by the total number of trials, multiplied by 100. This index reflects the concentration of perseverative errors in relation to overall test performance.

Percentage of Non-perseverative Errors: Number of incorrect responses that did not match the previous sorting principle, divided by the total number of trials.

Percentage of Total Errors: Number of all incorrect responses divided by the total number of trials.

Percentage of Conceptual Level Responses: Defined as consecutive correct responses occurring in runs of three or more. This index is presumed to represent insight into the correct sorting principles. It is calculated by dividing the total number of conceptual level responses by the total number of trials administered and multiplying the result by 100.

Failure to Maintain Set: Number of times that the participant made five or more consecutive correct responses and then made an error, thereby failing to achieve a category (or set).

Learning to Learn: The participant's average change in conceptual efficiency across the consecutive categories (stages) of the WCST. This score was only calculated for participants who experienced three or more categories. A percent errors score was calculated for each attempted category and percent errors difference scores for each consecutive pair of adjacent categories were calculated. Next, the percent errors difference were summed and averaged to yield an average difference, the Learning to

Learn score. A positive Learning to Learn score indicates improved efficiency across consecutive categories, presumably because of learning.

Mean Perseverative Runs: The sum of the number of perseverative responses at the start of each new category (perseverative run), divided by the number of categories experienced minus 1. Perseverative runs were calculated using only the inappropriate repetitions of responses immediately following the previous category and does not include inappropriate repetitions that occurred after an interruption. This index is presumed to represent difficulties with shifting attentional set (i.e., higher scores represent greater difficulty).

APPENDIX G

Table G1

Psychometric Properties (Cronbach's Alphas) for the Borderline Personality Questionnaire

Variables	Number of Items	Alpha *N* = 199 to 207
BPQ		
Abandonment	10	.78
Affective Instability	10	.91
Intense Anger	10	.88
Emptiness	10	.87
Impulsivity	9	.62
Quasi-Psychotic States	7	.61
Relationships	8	.86
Self-Image	9	.84
Suicide/Self-Mutilation	7	.85

Table G2

Psychometric Properties for Study 3 Temperament Variables

Variables	Number of Items	Alpha *N* = 198 to 207
Adult Temperament Questionnaire (ATQ)		
Orienting Sensitivity (ATQ-OS)	15	.79
Neutral Sensitivity	5	.40
Affective Sensitivity	5	.68
Associative Sensitivity	5	.69
Negative Affect (ATQ-NA)	26	.86
Fear	7	.63
Frustration	6	.75
Sadness	7	.69
Discomfort	6	.72
Effortful Control (ATQ-EC)	19	.82
Activation Control	7	.68
Attentional Control	5	.75
Inhibitory Control	7	.60
Extraversion/Surgency (ATQ-E/S)	17	.74
Sociability	5	.68
Intense Pleasure	7	.57
Positive Affect	5	.65
HSPS – Total Scale	27	.88
Ease of Excitation (EOE)	12	.83
Low Sensory Threshold (LST)	7	.82
Aesthetic Sensitivity (AES)	6	.59

Table G3

Psychometric Properties (Cronbach's Alphas) for Affect and Self-Compassion Variables

Variables	Number of Items	Alpha *N* = 194 to 206
Affect Intensity Scale (AIS) – Short Form		
Positive Intensity	8	.89
Negative Intensity	6	.69
Serenity	6	.83
Emotional Awareness		
Private Self-Consciousness Scale	10	.70
Mood Awareness Scale – Monitoring	5	.89
Emotional Clarity		
Trait Meta-Mood Scale (TMMS)		
- Clarity Subscale	11	.87
Toronto Alexithymia Scale (TAS)		
- Difficulty Identifying Feelings	7	.87
Affect Lability Scale – Short Form		
ALS Total	18	.94
Trait Meta-Mood Scale (TMMS)		
Repair Subscale	6	.85
Forms of Self-Criticism & Reassurance		
FSCRS Reassuring Self subscale	8	.90
FSCRS Inadequate Self subscale	9	.92
FSCRS Hated Self	5	.85

Table G4

Psychometric Properties for Study 3 Reinforcement Sensitivity and Impulsivity Variables

Variables	Number of Items	Alpha *N* = 193 to 206
UPPS Impulsive Behaviour Scale		
Urgency	12	.91
Perseverance	9	.80
Premeditation	11	.85
Sensation Seeking	12	.87
SPSRQ		
Reward	10	.72
Punishment	14	.88
BIS/BAS Scales		
BIS	7	.78
BAS RR	5	.80
BAS Drive	4	.74
BAS FS	4	.70

Table G5

Psychometric Properties for Study 3 In-Lab Measures

Variables	Number of Items	Alpha *N* = 198 to 208
PANAS		
Positive	10	.86
Negative	10	.85
MSI-BPD InLab	10	.90
Multidimensional Neglectful Behaviours Scale (MNBS)	20	.91
Invalidating Childhood Environment (ICES)		
Invalidating Father	14	.89
Invalidating Mother	14	.87

Table G6. *ABCD Phase 1 - Reinforcement Schedule for the First 40 Decks*

Card #	Deck A	(BAD)	Deck B	(BAD)	Deck C	(GOOD)	Deck D	(GOOD)
	Loss	Gain	Loss	Gain	Loss	Gain	Loss	Gain
1	0	100	0	100	0	50	0	50
2	0	100	0	100	0	50	0	50
3	-150	100	0	100	-50	50	0	50
4	0	100	0	100	0	50	0	50
5	-300	100	0	100	-50	50	0	50
6	0	100	0	100	0	50	0	50
7	-200	100	0	100	-50	50	0	50
8	0	100	0	100	0	50	0	50
9	-250	100	-1250	100	-50	50	0	50
10	-350	100	0	100	-50	50	-250	50
11	0	100	0	100	0	50	0	50
12	-350	100	0	100	-25	50	0	50
13	0	100	0	100	-75	50	0	50
14	-250	100	-1250	100	0	50	0	50
15	-200	100	0	100	0	50	0	50
16	0	100	0	100	0	50	0	50
17	-300	100	0	100	-25	50	0	50
18	-150	100	0	100	-75	50	0	50
19	0	100	0	100	-50	50	0	50
20	0	100	0	100	0	50	-250	50
21	0	100	-1250	100	0	50	0	50
22	-300	100	0	100	0	50	0	50
23	0	100	0	100	0	50	0	50
24	-350	100	0	100	-50	50	0	50
25	0	100	0	100	-25	50	0	50
26	-200	100	0	100	-50	50	0	50
27	-250	100	0	100	0	50	0	50
28	-150	100	0	100	0	50	0	50
29	0	100	0	100	-75	50	-250	50
30	0	100	0	100	-50	50	0	50
31	-350	100	0	100	0	50	0	50
32	-200	100	-1250	100	0	50	0	50
33	-250	100	0	100	0	50	0	50
34	0	100	0	100	-25	50	0	50
35	0	100	0	100	-25	50	-250	50
36	0	100	0	100	-75	50	0	50
37	-150	100	0	100	0	50	0	50
38	-300	100	0	100	-50	50	0	50
39	0	100	0	100	-75	50	0	50
40	0	100	0	100	0	50	0	50

Table G7

Overall Losses and Gains for IGT-ABCD Phase 1 Decks

	Deck A	(BAD)	Deck B	(BAD)	Deck C	(GOOD)	Deck D	(GOOD)
	Loss	Gain	Loss	Gain	Loss	Gain	Loss	Gain
Totals Across 100 Trials	-$12500	$10000	-$12500	$10000	-$2500	$5000	-$2500	$5000
Sum	-$2500		-$2500		+$2500		+$2500	

Table G8. *EFGH Phase 1 - Reinforcement Schedule for the First 40 Decks*

Card #	Deck E	(GOOD)	Deck F	(BAD)	Deck G	(GOOD)	Deck H	(BAD)
	Loss	Gain	Loss	Gain	Loss	Gain	Loss	Gain
1	-100	0	-50	0	-100	0	-50	0
2	-100	0	-50	0	-100	350	-50	0
3	-100	1250	-50	0	-100	0	-50	0
4	-100	0	-50	25	-100	250	-50	0
5	-100	0	-50	50	-100	0	-50	0
6	-100	0	-50	0	-100	300	-50	0
7	-100	0	-50	0	-100	200	-50	0
8	-100	0	-50	75	-100	0	-50	250
9	-100	0	-50	25	-100	150	-50	0
10	-100	0	-50	75	-100	0	-50	0
11	-100	1250	-50	50	-100	0	-50	0
12	-100	0	-50	0	-100	0	-50	0
13	-100	0	-50	25	-100	350	-50	0
14	-100	0	-50	0	-100	0	-50	0
15	-100	0	-50	0	-100	250	-50	0
16	-100	0	-50	25	-100	0	-50	0
17	-100	0	-50	75	-100	200	-50	0
18	-100	0	-50	0	-100	150	-50	0
19	-100	0	-50	0	-100	0	-50	0
20	-100	0	-50	75	-100	300	-50	250
21	-100	1250	-50	0	-100	0	-50	0
22	-100	0	-50	0	-100	300	-50	0
23	-100	0	-50	0	-100	0	-50	0
24	-100	0	-50	25	-100	350	-50	0
25	-100	0	-50	75	-100	0	-50	0
26	-100	0	-50	50	-100	150	-50	0
27	-100	0	-50	0	-100	200	-50	0
28	-100	0	-50	0	-100	250	-50	0
29	-100	0	-50	75	-100	0	-50	0
30	-100	0	-50	25	-100	0	-50	250
31	-100	0	-50	0	-100	150	-50	0
32	-100	0	-50	0	-100	200	-50	0
33	-100	1250	-50	0	-100	350	-50	0
34	-100	0	-50	50	-100	0	-50	250
35	-100	0	-50	50	-100	0	-50	0
36	-100	0	-50	0	-100	0	-50	0
37	-100	0	-50	25	-100	200	-50	0
38	-100	0	-50	0	-100	350	-50	0
39	-100	0	-50	75	-100	0	-50	0
40	-100	0	-50	0	-100	0	-50	0

Table G9

Overall Losses and Gains for IGT-ABCD Phase 1 Decks

	Deck E	(GOOD)	Deck F	(BAD)	Deck G	(GOOD)	Deck H	(BAD)
	Loss	Gain	Loss	Gain	Loss	Gain	Loss	Gain
Totals Across 100 Trials	-$10000	$12500	-$5000	$2500	-$10000	$12500	-$5000	$2500
Sum	+$2500		-$2500		+$2500		-$2500	

Table G10

Demographic Information

	BPD (n = 74)		Control (n = 106)	
	Mean/Frequency	Standard Deviation	Mean/Frequency	Standard Deviation
Age	18.84	1.45	19.02	1.60
Min.	17		17	
Max.	25		24	
Gender				
Female	60 (81.1%)		65 (61.3%)	
Male	14 (18.9%)		41 (38.7%)	
Ethnicity/Race				
Caucasian	30 (40.5%)		51 (48.1%)	
East Asian	24 (32.4%)		33 (31.1%)	
South Asian	9 (12.2%)		5 (4.7%)	
SE Asian	3 (4.1%)		6 (5.7%)	
Middle Eastern	1 (1.4%)		4 (3.8%)	
Latino	0		3 (2.8%)	
Other	6 (8.1%)		3 (2.8%)	
Missing	1 (1.4%)		1 (1.4%)	
Handedness				
Right	70 (94.6%)		92 (86.8%)	
Left	3 (4.1%)		12 (11.3%)	
Ambidextrous	1 (1.4%)		2 (1.9%)	

Table G11

Univariate Normality Indexes for Descriptive and Dependent Measures

Variables	*N*	Skew	Kurtosis	K-S	*p*
In-Lab MSI-BPD	180	.62	-1.26	.27	<.001
Mass Testing IPDE BPD	180	.41	-1.70	.33	<.001
Mass Testing MSI-BPD	180	.42	-1.73	.33	<.001
Borderline Personality Questionnaire					
Abandonment	180	1.09	.25	.20	<.001
Affect	180	.53	-1.28	.20	<.001
Anger	180	.95	-.51	.25	<.001
Emptiness	180	.80	-.56	.22	<.001
Impulsivity	180	1.05	.63	.19	<.001
Quasi-Psychotic	180	.89	-.07	.23	<.001
Relationships	180	.84	-.68	.25	<.001
Self-Image Problems	180	1.09	.00	.25	<.001
S/SM/Suicide	180	1.22	.15	.35	<.001
BPQ Total	180	.63	-1.10	.22	<.001
Neglect 20	180	.82	.07	.12	<.001
ICES					
Father	177	1.14	1.57	.09	<.01
Mother	180	.84	.50	.10	<.001
HSPS Total Scale Sum	180	-.09	-.57	.05	.200
Ease of Excitation	180	-.26	-.35	.06	.200
Low Sensory Threshold	180	.05	-.61	.08	<.05
Aesthetic Sensitivity	180	-.34	.02	.09	<.01

Note. K-S = Kolmogorov-Smirnov.

Table G11 Continued

Univariate Normality Indexes for Descriptive and Dependent Measures

Variables	*N*	Skew	Kurtosis	K-S	*p*
Adult Temperament Questionnaire					
Effortful Control	180	-.32	.06	.04	.20
Orienting Sensitivity	180	.08	-.32	.05	.20
Negative Affect	180	.28	.19	.05	.20
Extraversion/Surgency	180	-.03	.48	.06	.20
PANAS					
Positive Affect	180	-.12	-.52	.07	<.05
Negative Affect	180	2.25	6.34	.22	<.001
Affect Intensity Scale					
Negative Intensity	180	.01	-.51	.08	<.05
Positive Intensity	180	-.01	.25	.06	.200
Serenity	180	.26	-.09	.10	<.001
Private Self-Consciousness	180	.09	.02	.07	<.01
MAS Mood Monitoring	180	.01	-1.02	.10	<.001
TMMS Clarity	180	-.37	-.46	.07	<.05
TAS Define	180	.07	-.67	.07	<.05
TAS External Oriented Thinking	180	.03	-.21	.06	<.10
TAS Identify	180	.73	-.19	.11	<.001
TMMS Repair	180	-.44	-.48	.09	<.01

Note. K-S = Kolmogorov-Smirnov.

Table G11 Continued

Univariate Normality Indexes for Descriptive and Dependent Measures

Variables	*N*	Skew	Kurtosis	K-S	*p*
Affect Lability Scale	180	.22	-.86	.07	<.05
BIS/BAS Scale					
BIS	180	-.12	-.12	.09	<.01
BAS Drive	180	.17	-.25	.11	<.001
BAS Fun Seeking	180	.05	.08	.14	<.001
BAS Reward Responsiveness	180	-.69	2.31	.14	<.001
SPSRQ					
Sensitivity to Punishment	180	-.02	-1.18	.10	<.001
Sensitivity to Reward	180	-.04	-.63	.10	<.001
UPPS					
Perseverence	180	-.12	-.59	.07	<.05
Premeditation	180	-.53	.45	.09	<.01
Sensation Seeking	180	-.42	-.28	.07	<.05
Urgency	180	.16	-.68	.09	<.01
FSCRS					
Inadequate Self	180	.28	-.71	.10	<.001
Reassuring Self	180	-.30	-.32	.10	<.001
Hated Self	180	.87	-.38	.19	<.001

Note. K-S = Kolmogorov-Smirnov.

Table G12

Psychometric Properties for Study 3 IGT

Variables	*N*	Number of Items	Alpha	Ave Inter-item Correlation
IGT				
ABCD	180	11	.73	.18
EFGH	170	11	.88	.40

Table G13

Study 3 Psychometric Variables – Descriptives

	BPD (n = 74)	Control (n = 106)	*t*	df
PANAS				
Negative Affect	16.31 (5.78)	11.66 (1.96)	-6.66**	84.77
Positive Affect	24.89 (6.69)	27.79 (6.93)	2.80*	178
ATQ				
Extrav/Surgency	75.91 (12.72)	80.55 (12.71)	2.41*	178
Negative Affect	115.92 (17.40)	89.56 (15.48)	-10.68**	178
AIS				
Negative	25.61 (5.02)	20.97 (4.44)	-6.53**	178
Positive	30.80 (7.09)	31.82 (6.46)	1.00	178
Serenity	22.22 (5.68)	22.74 (4.91)	.67	178
Emotional Awareness				
PSC	37.56 (5.64)	32.90 (4.89)	-5.90**	178
MAS Monitoring	18.96 (4.27)	14.33 (4.22)	-7.20**	178
Emotional Clarity				
TMMS Clarity	33.38 (7.82)	42.42 (6.25)	8.61**	178
TAS Difficulty	19.24 (6.17)	11.78 (3.63)	-9.33**	108.05
Identifying				
Affect Lability	56.31 (11.08)	32.60 (10.30)	-14.73**	178
BIS/BAS				
BIS	22.54 (3.27)	19.37 (2.93)	-6.80**	178
BAS RR	16.33 (2.27)	15.79 (2.30)	-1.56	178
BAS D	10.90 (2.53)	10.19 (2.13)	-1.99*	139.48
BAS FS	12.04 (2.24)	10.63 (1.97)	-4.45**	178
SPSRQ				
Sens to Punish	9.42 (3.24)	4.84 (3.50)	-8.89**	178
Sens to Reward	5.94 (1.89)	4.47 (2.27)	-4.75**	172.61
UPPS				
Urgency	43.89 (6.85)	27.22 (6.87)	-16.03**	178
Perseverance	29.42 (6.17)	34.50 (4.65)	6.11**	128.21
Premeditation	37.68 (7.68)	41.90 (6.01)	4.13**	178
Sensation Seek	42.00 (9.81)	41.03 (9.35)	-.68	178
ATQ				
Effortful Control	70.33 (13.89)	88.72 (10.79)	9.98**	178

*p <.05; **p <.001

Table G14

Descriptive Statistics for WCST – Means and Standard Deviations

Variables	BPD (n = 73)	Control (n = 102)
Number of Trials Completed	124.26 (6.07)	123.93 (6.31)
Categories Completed	7.48 (1.68)	7.72 (1.46)
Categories Experienced	8.10 (1.38)	8.32 (1.16)
Number of Trials to Completion of First Category	14.14 (4.79)	14.33 (7.37)
Conceptual-Level Responses Total & Percentage	94.93 (10.11) 76.64% (9.30)	95.23 (10.07) 77.09% (9.19)
Correct Responses Total & Percentage	100.47 (6.67) 81.01% (6.18)	100.78 (6.84) 81.48% (6.12)
Perseverative Responses Total & Percentage	42.55 (6.41) 34.20% (4.61)	40.80 (7.21) 32.84% (5.13)
Perseverative Errors Total & Percentage	15.51 (5.67) 12.37% (4.21)	14.95 (5.65) 11.97% (4.23)
# of Perseverative Runs Mean	2.04 (.73)	1.85 (.55)
Non-perseverative Errors Total & Percentage	8.29 (4.14) 6.60% (3.16)	8.20 (4.52) 6.53% (3.46)
Total Errors Total & Percentage	23.79 (8.37) 18.98% (6.18)	23.15 (8.27) 18.51% (6.12)
Failure To Maintain Set	2.01 (1.74)	1.79 (1.48)
Learning To Learn	-1.04 (2.74)	-1.35 (2.93)

Table G15

Descriptive Statistics for IGT - ABCD

Variables	Order 1		Order 2	
	BPD (n = 38)	Control (n = 57)	BPD (n = 34)	Control (n = 42)
By Phase				
Phase 1	6.11 (27.58)	6.07 (25.87)	14.59 (25.86)	23.52 (26.87)
Phase 2a	-.53 (7.97)	1.90 (10.96)	5.24 (13.54)	6.91 (13.29)
Phase 2b	3.37 (11.39)	5.23 (11.46)	9.53 (10.78)	9.10 (13.76)
Phase 2c	4.53 (10.98)	5.05 (11.13)	8.94 (15.11)	11.00 (12.99)
By Block				
Phase 1				
Block 1 (1.1)	-4.79 (5.45)	-5.30 (6.53)	-6.82 (7.57)	-4.57 (6.95)
Block 2 (1.2)	2.47 (7.29)	-.88 (6.25)	5.24 (9.80)	3.62 (7.98)
Block 3 (1.3)	3.11 (7.30)	2.53 (7.16)	4.71 (9.57)	5.62 (10.89)
Block 4 (1.4)	2.37 (9.09)	4.42 (7.38)	4.35 (11.11)	8.10 (8.31)
Block 5 (1.5)	2.95 (10.71)	5.30 (9.73)	7.12 (13.30)	10.76 (8.51)
Phase 2a				
Block 1 (2.1)	-2.26 (5.22)	.84 (7.60)	-.59 (6.99)	1.62 (6.95)
Block 2 (2.2)	1.74 (8.00)	1.05 (8.98)	5.82 (10.20)	5.29 (11.25)
Phase 2b				
Block 1 (3.1)	3.58 (8.92)	2.53 (8.31)	5.53 (7.03)	2.38 (9.90)
Block 2 (3.2)	-.21(10.10)	2.70 (8.61)	4.00 (10.49)	6.71 (10.45)
Phase 2c				
Block 1 (4.1)	.95 (6.47)	.95 (6.68)	2.06 (7.52)	2.67 (8.83)
Block 2 (4.2)	3.58(8.12)	4.11 (7.98)	6.88 (10.89)	8.33 (8.97)

Table G16

Descriptive Statistics for IGT – EFGH

Variables	Order 1		Order 2	
	BPD (n = 38)	Control (n = 52)	BPD (n = 33)	Control (n = 42)
By Phase				
Phase 1				
Phase 2a	9.95 (15.02)	12.23 (11.96)	9.09 (11.76)	6.62 (11.46)
Phase 2b	11.00 (16.63)	12.46 (14.61)	8.79 (14.80)	11.67 (12.59)
Phase 2c	12.53 (15.77)	13.62 (15.00)	11.82 (15.08)	14.95 (14.82)
By Block				
Phase 1	26.21 (39.18)	29.15 (37.92)	25.39 (25.95)	25.29 (28.26)
Block 1 (1.1)	.74 (6.81)	3.00 (6.99)	1.58 (5.49)	1.81 (4.57)
Block 2 (1.2)	3.58 (10.57)	5.39 (9.64)	3.03 (6.37)	3.95 (6.33)
Block 3 (1.3)	4.37 (10.42)	5.35 (10.39)	5.94 (7.93)	4.67 (9.98)
Block 4 (1.4)	8.90 (9.96)	7.81 (10.21)	7.33 (7.43)	6.67 (8.88)
Block 5 (1.5)	8.63 (10.74)	7.62 (9.96)	7.52 (8.25)	8.19 (8.54)
Phase 2a				
Block 1 (2.1)	1.26 (8.75)	1.96 (7.11)	2.91 (5.10)	2.10 (5.02)
Block 2 (2.2)	8.68 (9.91)	10.27 (7.53)	6.18 (8.42)	4.52 (8.78)
Phase 2b				
Block 1 (3.1)	2.90 (8.42)	4.35 (7.60)	4.06 (6.57)	2.67 (5.95)
Block 2 (3.2)	8.11 (11.43)	8.12 (8.72)	4.73 (10.22)	9.00 (9.43)
Phase 2c				
Block 1 (4.1)	2.21 (8.28)	4.31 (8.16)	3.88 (7.70)	4.76 (6.57)
Block 2 (4.2)	10.32 (9.73)	9.31 (8.90)	7.94 (9.56)	10.19 (9.31)

Table G17

Order 1 and 2 Deck B Selection Frequencies [Mean, Std. Deviation] Across Phase 1 Blocks

	Order 1				Order 2			
Block	BPD (n = 38)	Control (n = 57)	*t*	df	BPD (n = 34)	Control (n = 42)	*t*	df
1	8.16 (3.23)	7.98 (2.92)	-.28	93	7.91 (3.13)	7.57 (3.79)	-.42	74
2	5.89 (3.28)	7.05 (2.70)	1.88	93	5.26 (3.71)	4.93 (3.53)	-.40	74
3	5.58 (3.18)	5.53 (3.09)	-.08	93	5.09 (4.23)	5.00 (4.54)	-.09	74
4	5.82 (4.07)	4.93 (3.17)	-1.19	93	5.50 (5.10)	3.09 (3.15)	-2.40*	52.53
5	6.21 (5.13)	4.93 (3.88)	-1.31	64.42	4.53 (5.24)	2.38 (2.86)	-2.15*	48.58

* $p < .05$

Table G18

Order 1 ABCD

Phase	Variable	df	Error df	F	*p*
1	Block	3.14	292.29	31.17	<.001
	Group	1	93	0	.99
	Interaction	3.14	292.29	3.05	.03
2a	Block	1	93	2.86	.094
	Group	1	93	1.37	.25
	Interaction	1	93	2.31	.13
2b	Block	1	93	1.60	.21
	Group	1	93	.60	.44
	Interaction	1	93	1.93	.17
2c	Block	1	93	8.17	.005
	Group	1	93	.05	.82
	Interaction	1	93	.07	.80

Note. $n = 95$.

Table G19

Order 2 ABCD

Phase	Variable	df	Error df	F	*p*
1	Block	3.75	277.39	30.28	<.001
	Group	1	74	2.15	.15
	Interaction	3.75	277.39	1.20	.31
2a	Block	1	74	12.68	<.001
	Group	1	74	.29	.59
	Interaction	1	74	.94	.34
2b	Block	1	74	.69	.41
	Group	1	74	.02	.88
	Interaction	1	74	3.00	.09
2c	Block	1	74	15.16	<.001
	Group	1	74	.41	.53
	Interaction	1	74	.10	.76

Note. $n = 76$.

Table G20

Order 1 EFGH

Phase	Variable	df	Error df	F	*p*
1	Block	4	352	15.38	<.001
	Group	1	88	.13	.721
	Interaction	4	352	1.27	.280
2a	Block	1	88	58.05	<.001
	Group	1	88	.64	.424
	Interaction	1	88	.18	.669
2b	Block	1	88	21.00	<.001
	Group	1	88	.20	.66
	Interaction	1	88	.54	.46
2c	Block	1	88	53.01	<.001
	Group	1	88	.11	.74
	Interaction	1	88	2.98	.09

Note. $n = 90$.

Table G21

Order 2 EFGH

Phase	Variable	df	Error df	F	*p*
1	Block	3.34	244.12	13.50	<.001
	Group	1	73	.00	.99
	Interaction	3.34	244.12	.45	.74
2a	Block	1	73	9.19	<.01
	Group	1	73	.84	.36
	Interaction	1	73	.20	.66
2b	Block	1	73	10.79	<.01
	Group	1	73	.83	.37
	Interaction	1	73	7.07	.01
2c	Block	1	73	30.44	<.001
	Group	1	73	.81	.37
	Interaction	1	73	.63	.43

Note. $n = 75$.

Table G22

Zero-Order Correlations for IGT – ABCD Net Score (Phase 1) and WCST Scores

WCST Variables	Order 1 ABCD Net Score			Order 2 ABCD Net Score		
	Entire Sample (n = 95)	BPD (n = 38)	Control (n = 57)	Entire Sample (n =76)	BPD (n = 34)	Control (n = 42)
Categories Completed	.18	.21	.15	.23*	.10	.35*
Correct Responses – Total	.10	.13	.10	.27*	.02	.45**
Perseverative Responses – Total	-.26*	-.50**	-.14	-.12	.11	-.27
Perseverative Errors – Total	-.20	-.28	-.17	-.23*	.03	-.47**
Non-perseverative Errors-Total	-.09	-.10	-.09	-.18	-.05	-.27
Failure To Maintain Set	-.06	-.03	-.09	.00	-.09	.07
Learning To Learn	.07	.06	.08	.13	-.08	.37*

* $p < .05$; ** $p < .01$

Table G23

Zero-Order Correlations for IGT – EFGH Net Score (Phase 1) and WCST Scores

WCST Variables	Order 1 EFGH Net Score			Order 2 EFGH Net Score		
	Entire Sample (n = 90)	BPD (n = 38)	Control (n = 52)	Entire Sample (n = 75)	BPD (n = 33)	Control (n = 42)
Categories Completed	.23*	.32	.15	.13	.20	.08
Correct Responses – Total	.12	.02	.18	.14	.04	.23
Perseverative Responses – Total	-.10	-.11	-.08	-.17	-.32	-.08
Perseverative Errors – Total	-.21	-.32	-.16	-.19	-.25	-.15
Non-perseverative Errors-Total	.02	.00	.03	-.12	.02	-.24
Failure To Maintain Set	-.26*	-.46**	-.06	.00	-.23	.16
Learning To Learn	.18	.25	.15	.12	.30	-.05

* $p < .05$; ** $p < .01$

Table G24

Zero-Order Correlations for IGT – ABCD Net Score (Phase 1) and BPQ Dimensions

BPQ Dimensions	Order 1 ABCD Net Score			Order 2 ABCD Net Score		
	Entire Sample (n = 95)	BPD (n = 38)	Control (n = 57)	Entire Sample (n = 76)	BPD (n = 34)	Control (n = 42)
Abandonment	-.02	-.08	.06	-.18	-.07	-.14
Affect	-.02	-.09	.03	-.21	-.28	.04
Anger	-.06	-.05	-.17	-.10	.04	-.01
Emptiness	.05	.10	.07	-.07	.00	.35*
Impulsivity	-.10	-.18	-.05	-.20	-.25	.04
Quasi-Psychotic	-.11	.02	-.36**	-.23*	-.34*	.05
Relationships	-.10	-.17	-.19	-.05	.21	-.06
Self-Image	-.05	-.14	.02	-.04	.09	.23
S/SM	.10	.19	.16	-.18	-.15	.11

* $p < .05$; ** $p < .01$

Table G25

Zero-Order Correlations for IGT – EFGH Net Score (Phase 1) and BPQ Dimensions

BPQ Dimensions	Order 1 EFGH Net Score			Order 2 EFGH Net Score		
	Entire Sample (*n* = 90)	BPD (*n* = 38)	Control (*n* = 52)	Entire Sample (*n* = 76)	BPD (*n* = 33)	Control (*n* = 42)
Abandonment	.05	.04	.30*	.07	.10	.15
Affect	-.09	-.19	-.05	-.04	-.11	-.07
Anger	-.16	-.33*	.03	.08	.18	.05
Emptiness	-.03	-.11	.20	-.03	.07	-.23
Impulsivity	.11	.19	.11	.00	-.12	.16
Quasi-Psychotic	.19	.48**	-.02	-.12	-.15	-.19
Relationships	.05	.22	-.03	.15	.26	.16
Self-Image	-.09	-.14	-.02	-.01	.00	-.07
S/SM	.04	.08	.22	-.03	-.07	.03

* $p < .05$; ** $p < .01$

Table G26

Zero-Order Correlations for IGT – ABCD Net Score (Phase 1) and Affect Variables

Variables	Order 1 ABCD Net Score			Order 2 ABCD Net Score		
	Entire Sample (n = 95)	BPD (n = 38)	Control (n = 57)	Entire Sample (n = 76)	BPD (n = 34)	Control (n = 42)
State Affect						
PANAS Neg	.02	.09	-.07	-.04	.10	-.04
PANAS Pos	.02	.19	-.10	-.10	-.06	-.19
Trait Affect						
ATQ Extravers/ Surgency	-.10	.09	-.25	-.09	-.08	-.11
ATQ Negative Affect	.20	.37*	.15	-.04	-.10	.26
Affect Intensity						
Negative	.10	.39*	-.12	-.07	-.27	.25
Positive	-.04	.09	-.14	-.06	-.09	-.03
Serenity	-.12	-.20	-.06	.08	-.12	.20
Emotional Awareness						
Private Self-Consciousness	-.05	-.07	-.05	-.03	.02	.04
MAS Mood Monitoring	.05	-.08	.14	-.06	.02	.04
Emotional Clarity						
TMMS Clarity	.00	.03	-.04	.13	.06	.02
TAS Identify	-.02	-.04	.00	-.21	-.29	.05
ALS Affect Lability	-.06	-.15	-.05	-.20	-.12	-.12

* $p < .05$; ** $p < .01$

Table G27

Zero-Order Correlations for IGT – EFGH Net Score (Phase 1) and Affect Variables

Variables	Order 1 EFGH Net Score			Order 2 EFGH Net Score		
	Entire Sample (n = 90)	BPD (n = 36)	Control (n = 49)	Entire Sample (n = 75)	BPD (n = 33 to 34)	Control (n = 42)
State Affect						
PANAS Neg	-.30**	-.41*	-.22	-.04	-.19	.29
PANAS Pos	-.07	.04	-.17	.21	.18	.25
Trait Affect						
ATQ Extravers/ Surgency	.13	.36*	-.03	-.02	.10	-.10
ATQ Negative Affect	-.11	-.28	.04	.10	.23	.06
Affect Intensity						
Negative	-.12	-.02	-.20	-.14	-.33	-.03
Positive	.19	.32*	.07	.01	-.13	.11
Serenity	-.01	.00	-.03	.02	-.08	.10
Emotional Awareness						
Private Self-Consciousness	.09	.39*	-.16	.05	.27	-.23
MAS Mood Monitoring	.06	.37*	-.16	-.05	.14	-.22
Emotional Clarity						
TMMS Clarity	.26*	.43**	.17	-.07	.13	.04
TAS Identify	-.15	-.26	-.06	-.02	.02	-.09
ALS Affect Lability	-.05	-.08	-.07	.02	.04	.00

* $p < .05$; ** $p < .01$

Table G28

Zero-Order Correlations for IGT – ABCD Net Score (Phase 1) and Temperament/Personality Variables

Variables	Order 1 ABCD Net Score			Order 2 ABCD Net Score		
	Entire Sample (n = 95)	BPD (n = 38)	Control (n = 57)	Entire Sample (n = 76)	BPD (n = 34)	Control (n = 42)
Temperament						
ATQ Effortful Control	-.04	-.15	.05	.23*	.15	.18
BIS/BAS						
BIS	-.07	.03	-.16	.00	.02	.19
BAS-RR	-.14	.02	-.27*	-.05	-.21	.15
BAS-D	-.16	-.05	-.27*	-.08	-.18	.06
BAS-FS	-.15	-.06	-.22	-.09	-.10	.07
SPSRQ						
Sens. to Punishment	.04	.04	.05	-.09	-.05	.09
Sens. to Reward	-.09	.14	-.23	-.11	-.35*	.13
UPPS						
Impulsivity						
Urgency						
Perseverance	-.03	.10	-.16	-.21	-.24	-.07
Premeditation	.00	.01	.00	.08	-.13	.11
Sensation	.01	-.16	.16	.16	-.05	.29
Seeking	-.20	-.06	-.29*	-.02	.00	.00

* $p < .05$; ** $p < .01$

Table G29

Zero-Order Correlations for IGT – EFGH Net Score (Phase 1) and Temperament/Personality Variables

Variables	Order 1 EFGH Net Score			Order 2 EFGH Net Score		
	Entire Sample (n = 90)	BPD (n = 36)	Control (n = 49)	Entire Sample (n = 75)	BPD (n = 33)	Control (n = 42)
Temperament						
ATQ Effortful Control	.18	.30	.07	-.07	-.29	.04
BIS/BAS						
BIS	-.01	-.27	.30*	.04	-.03	.08
BAS-RR	.17	.19	.19	.08	.23	-.02
BAS-D	.27**	.17	.30*	.11	.04	.15
BAS-FS	.31**	.42*	.34*	.07	.25	-.07
SPSRQ						
Sens. to Punishment	-.15	-.22	-.12	-.19	-.36*	-.19
Sens. to Reward	.17	.18	.12	.06	-.18	.24
UPPS Impulsivity						
Urgency						
Perseverance	-.10	-.26	.01	.03	.15	.01
Premeditation	.23*	.21	.25	.00	-.37*	.23
Sensation	.08	.03	.13	.13	.12	.09
Seeking	.29**	.46**	.13	.19	.28	.11

* $p < .05$; ** $p < .01$

APPENDIX H

Figure H1

Decks	Phase 1 100 Trials (5 Blocks of 20)	Phase 2a 40 Trials (2 Blocks of 20)	Phase 2b 40 Trials (2 Blocks of 20)	Phase 2c 40 Trials (2 Blocks of 20)
A	BAD* Large immediate gain ($100) and frequent moderate loss	GOOD [D]	GOOD* [C]	BAD [B]
B	BAD Large immediate gain ($100) and infrequent large loss	BAD* [A]	GOOD [D]	GOOD* [C]
C	GOOD* Small immediate gain ($50) and frequent small loss	BAD [B]	BAD* [A]	GOOD [D]
D	GOOD Small immediate gain ($50) and infrequent moderate loss	GOOD* [C]	BAD [B]	BAD* [A]
			Complete Reversal of Contingencies	

* frequent loss

Figure H2

Decks	Phase 1 100 Trials (5 Blocks of 20)	Phase 2a 40 Trials (2 Blocks of 20)	Phase 2b 40 Trials (2 Blocks of 20)	Phase 2c 40 Trials (2 Blocks of 20)
E	GOOD Large immediate loss (-$100) and infrequent large gain	BAD [H]	GOOD* [G]	BAD* [F]
F	BAD* Small immediate loss (-$50) and frequent small gain	GOOD [E]	BAD [H]	GOOD* [G]
G	GOOD* Large immediate loss (-$100) and frequent moderate gain	BAD* [F]	GOOD [E]	BAD [H]
H	BAD Small immediate loss (-$50) and infrequent moderate gain	GOOD* [G]	BAD* [F]	GOOD [E]
		Reversal of Contingencies		Reversal of Contingencies

* frequent gain

Figure H3

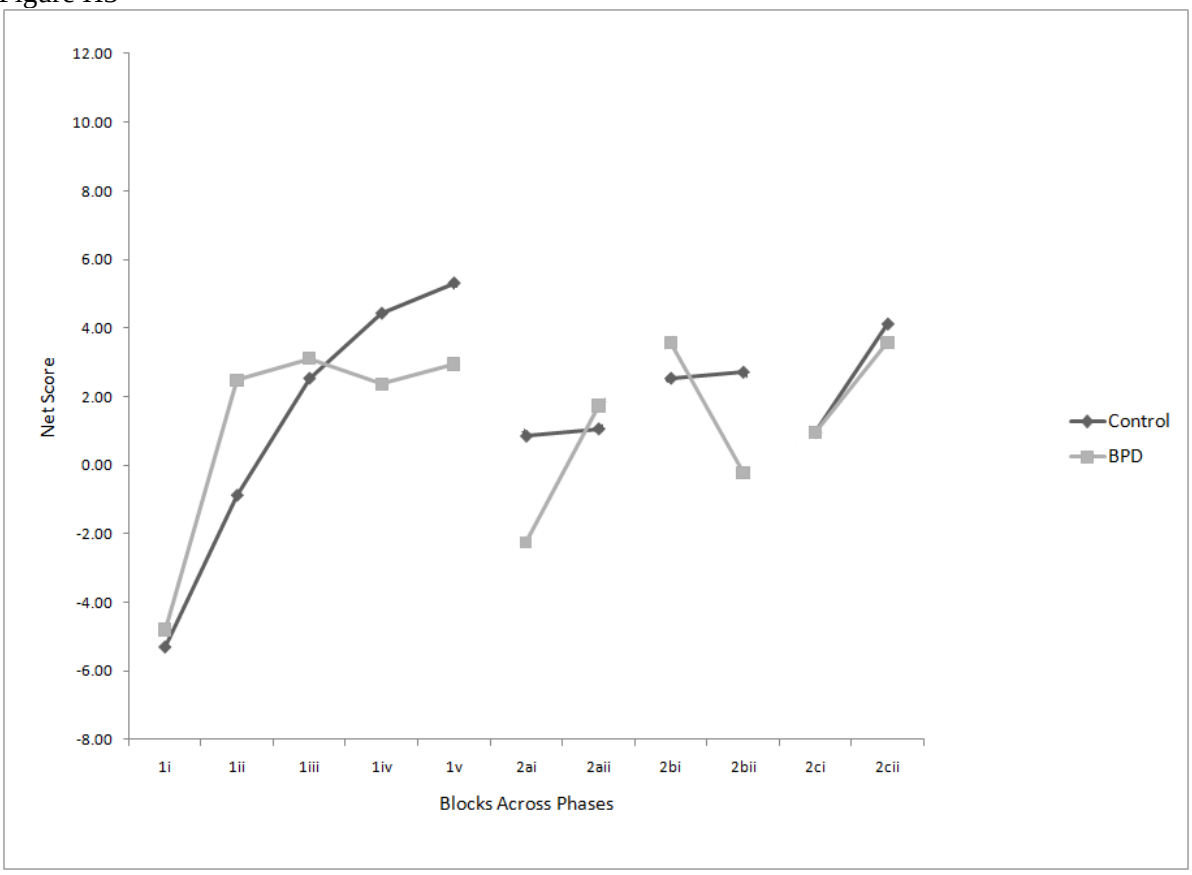

12.00
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
-4.00
-6.00
-8.00
Net Score
1i
1ii
1iii
1iv
1v
2ai
2aii
2bi
2bii
2ci
2cii
Blocks Across Phases
Control
BPD

Figure H4

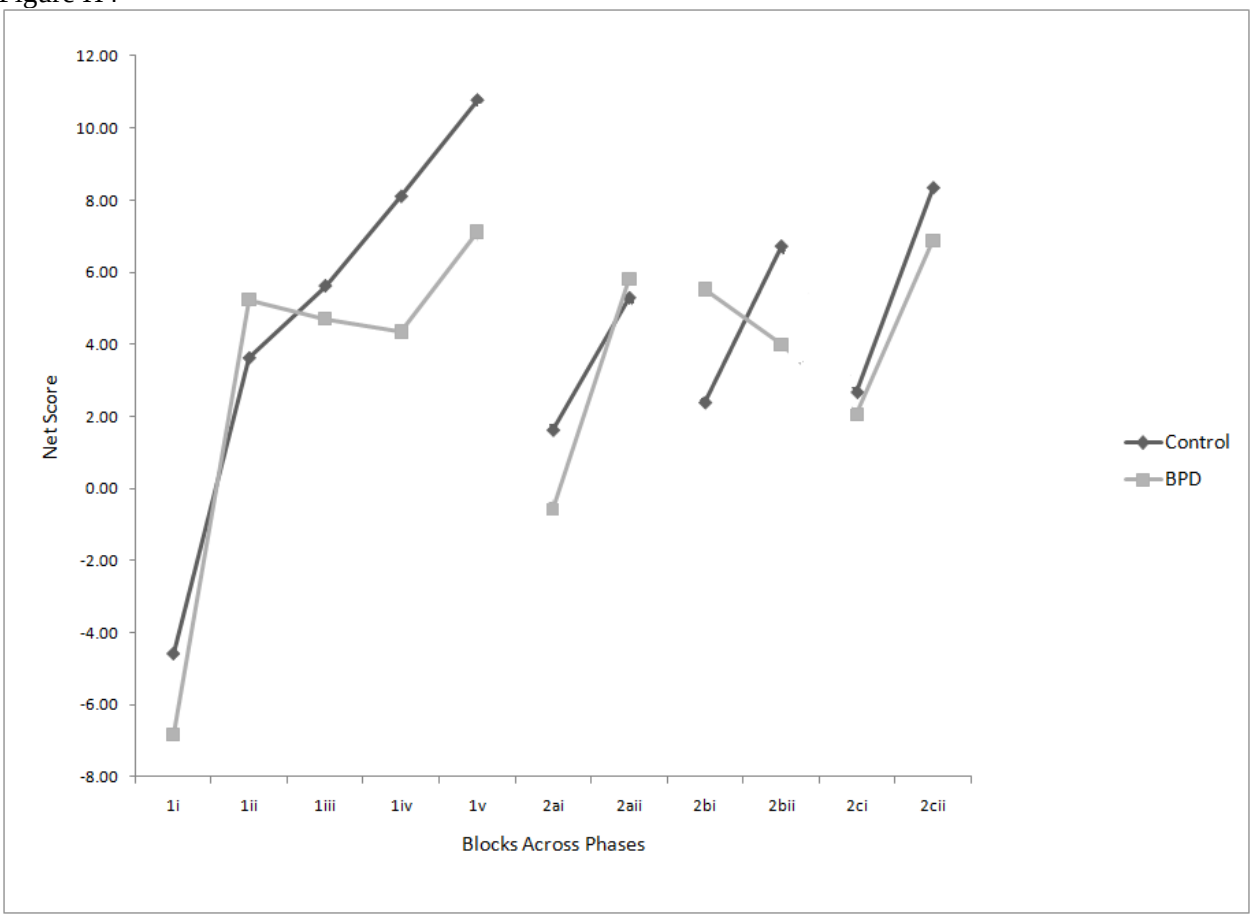
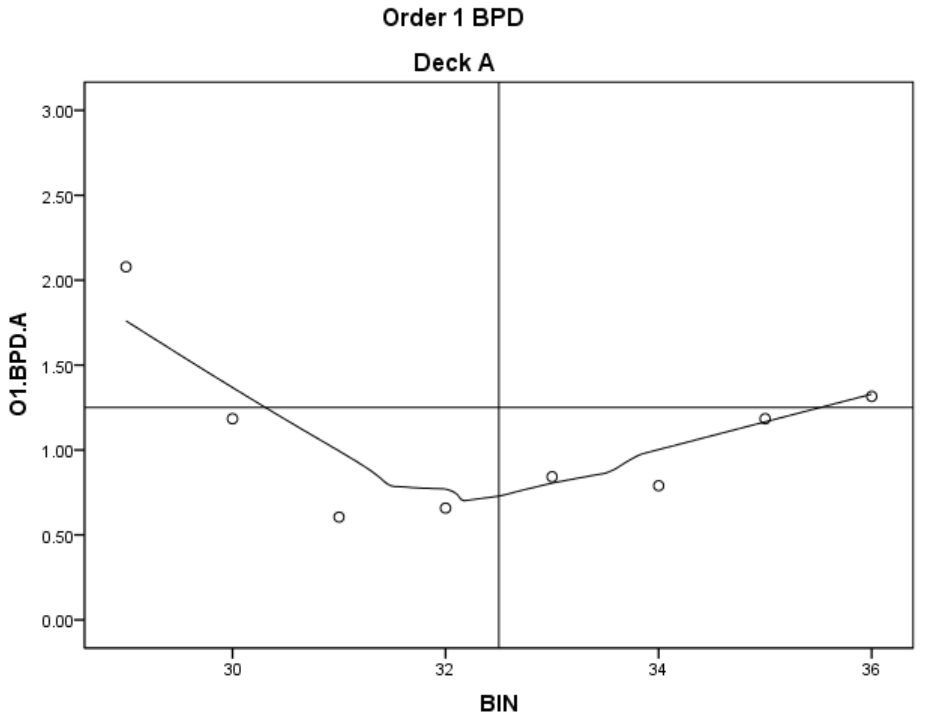

12.00
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
-4.00
-6.00
-8.00
Net Score
1i
1ii
1iii
1iv
1v
2ai
2aii
2bi
2bii
2ci
2cii
Blocks Across Phases
Control
BPD

Figure H5


Order 1 BPD
Deck A
O1.BPD.A
3.00
2.50
2.00
1.50
1.00
0.50
0.00
30
32
34
36
BIN

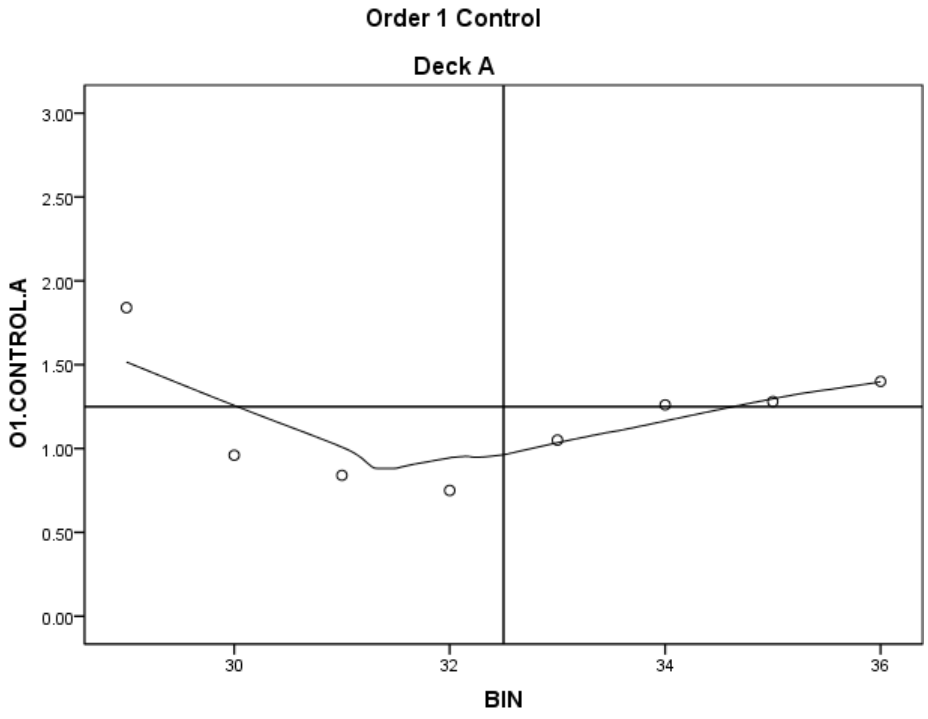
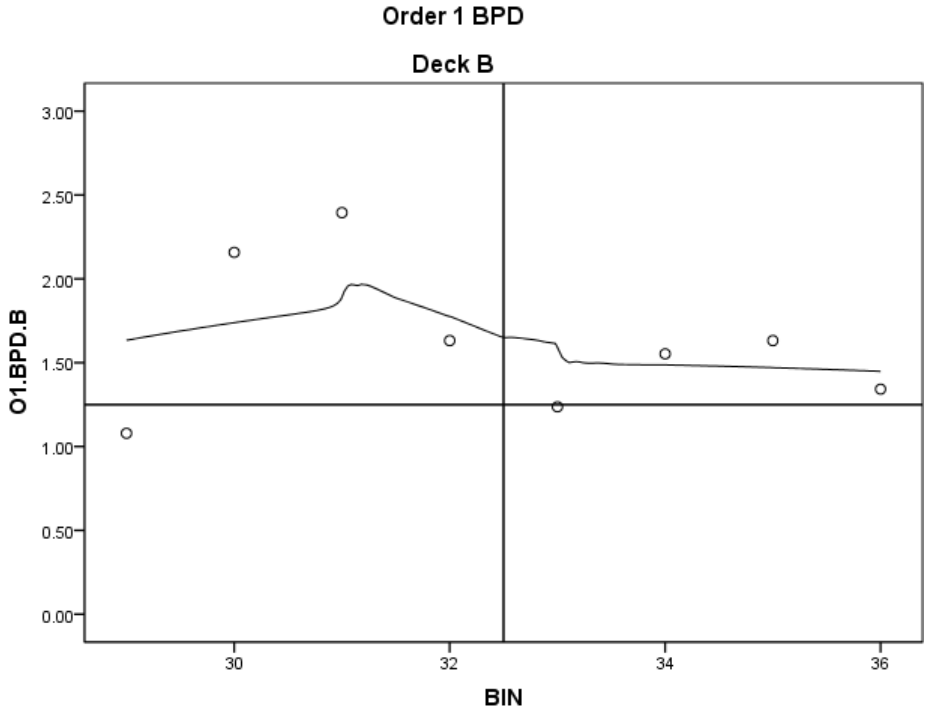

Order 1 Control
Deck A
O1.CONTROL.A
3.00
2.50
2.00
1.50
1.00
0.50
0.00
30
32
34
36
BIN

Figure H6


Order 1 BPD
Deck B
O1.BPD.B
3.00
2.50
2.00
1.50
1.00
0.50
0.00
30
32
34
36
BIN

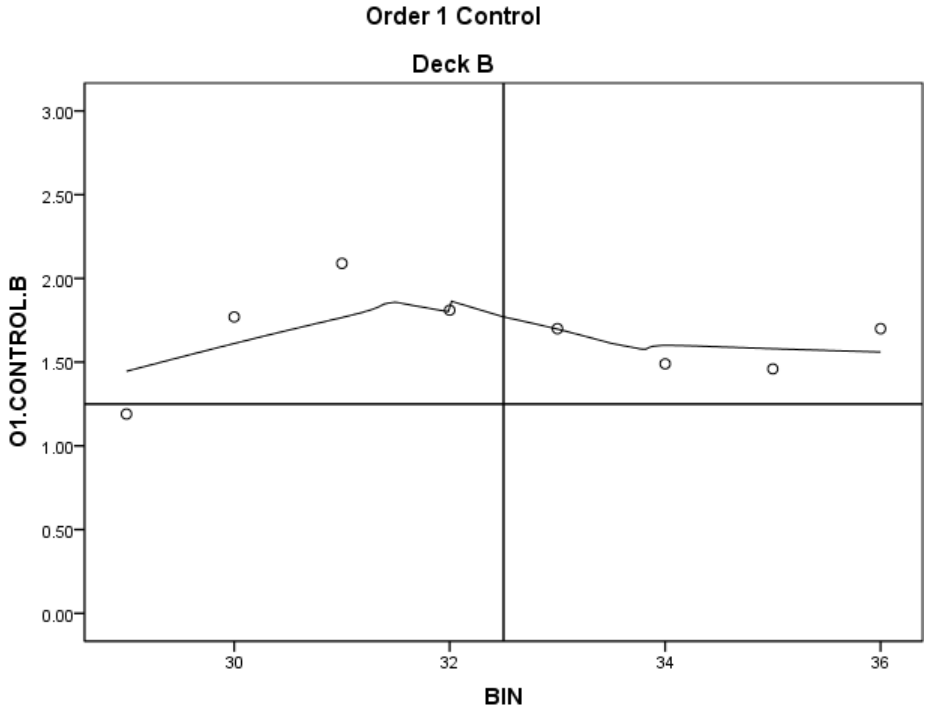
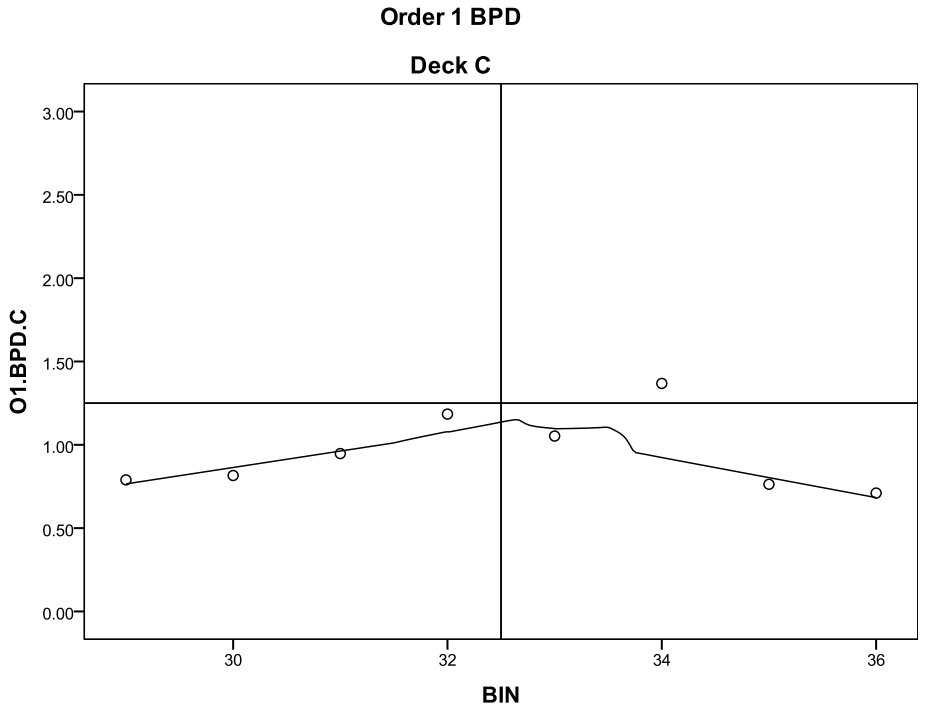

Order 1 Control
Deck B
O1.CONTROL.B
3.00
2.50
2.00
1.50
1.00
0.50
0.00
30
32
34
36
BIN

Figure H7


Order 1 BPD
Deck C
O1.BPD.C
3.00
2.50
2.00
1.50
1.00
0.50
0.00
30
32
34
36
BIN

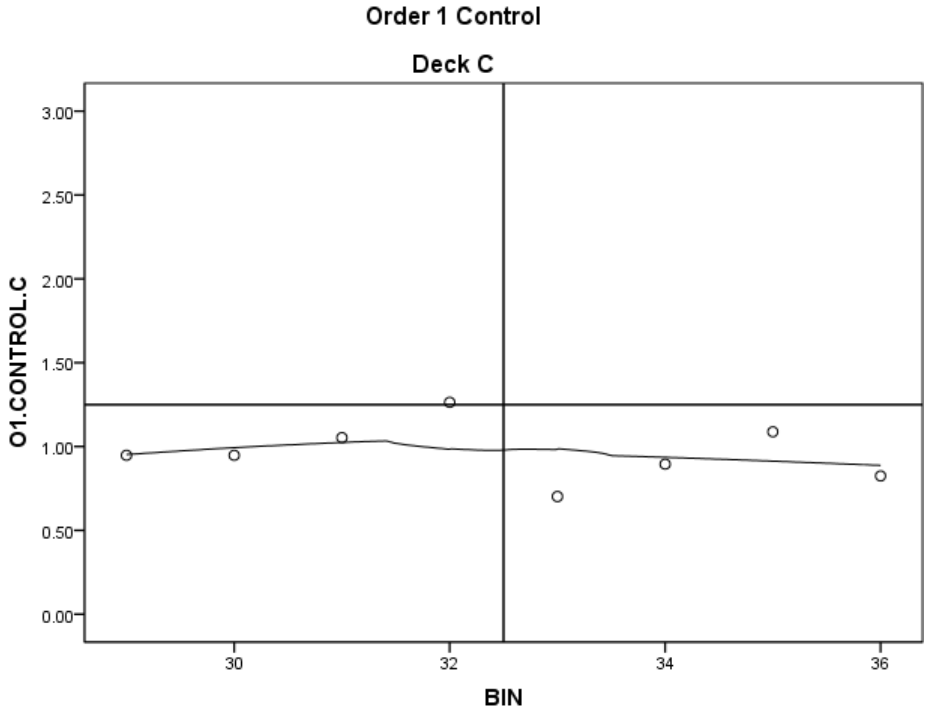
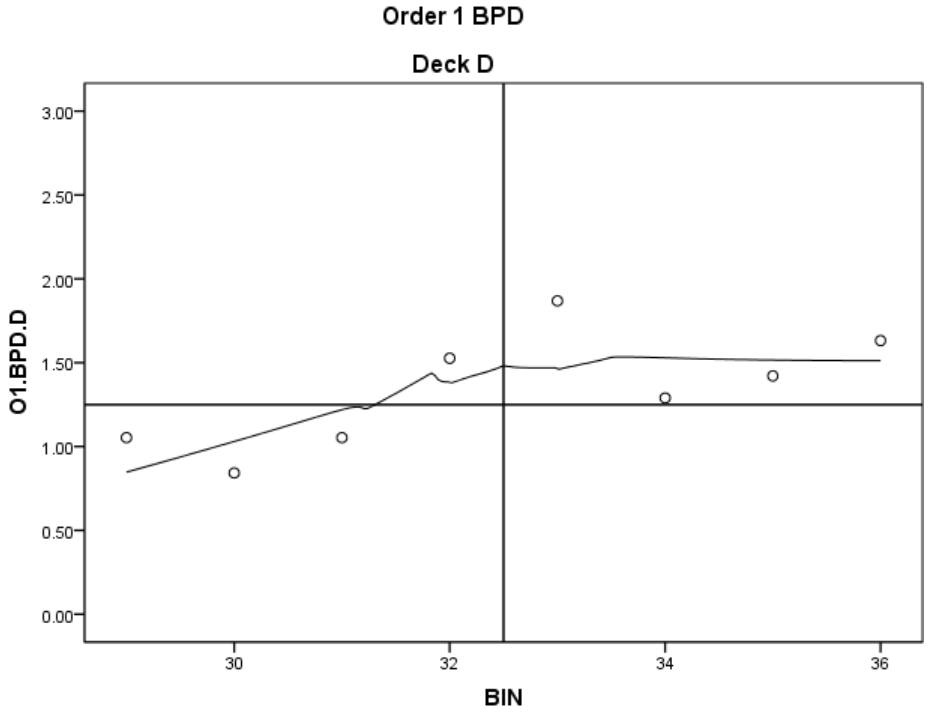

Order 1 Control
Deck C
O1.CONTROL.C
3.00
2.50
2.00
1.50
1.00
0.50
0.00
30
32
34
36
BIN

Figure H8


Order 1 BPD
Deck D
O1.BPD.D
3.00
2.50
2.00
1.50
1.00
0.50
0.00
30
32
34
36
BIN

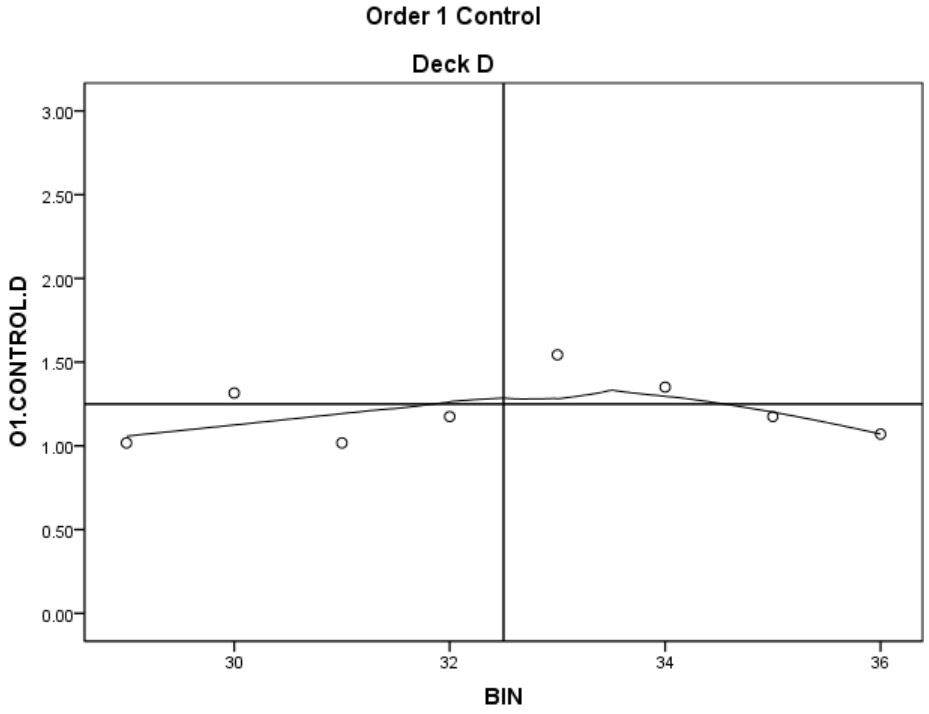
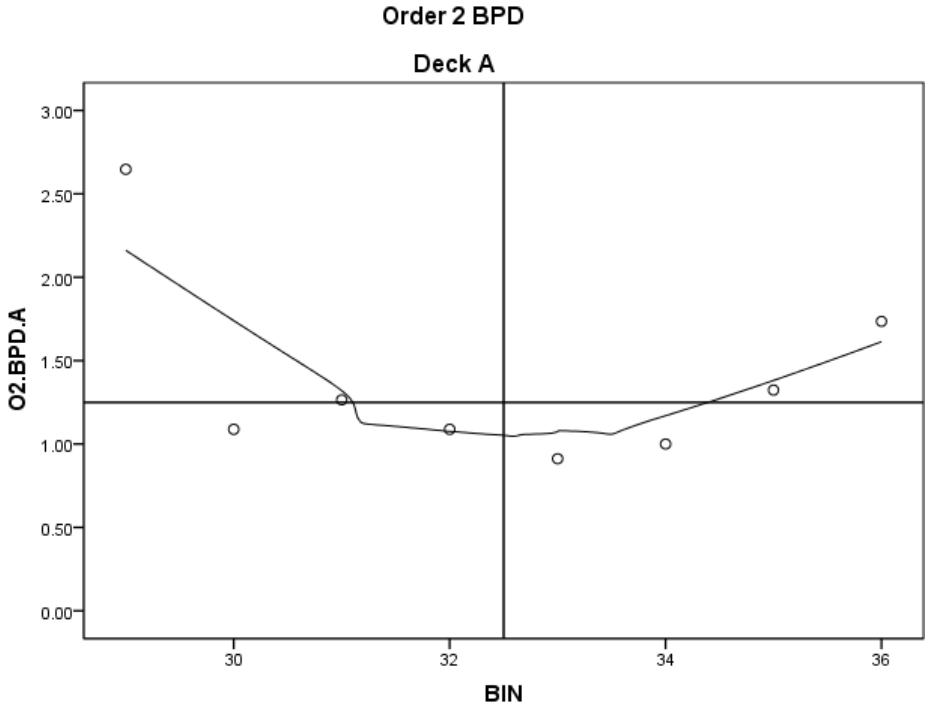

Order 1 Control
Deck D
O1.CONTROL.D
3.00
2.50
2.00
1.50
1.00
0.50
0.00
30
32
34
36
BIN

Figure H9


Order 2 BPD
Deck A
O2.BPD.A
3.00
2.50
2.00
1.50
1.00
0.50
0.00
30
32
34
36
BIN

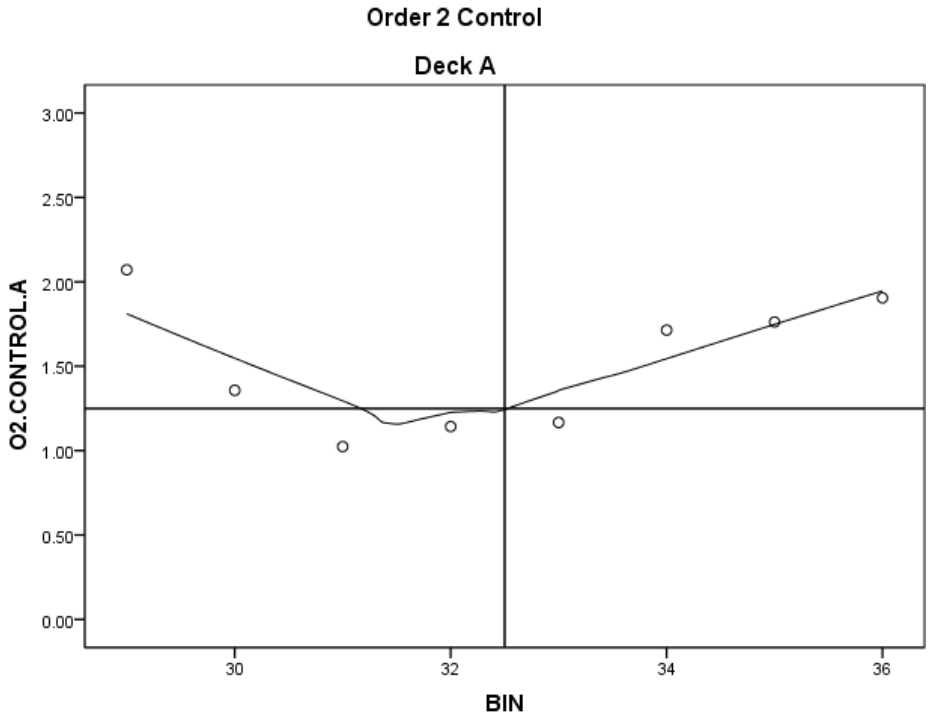
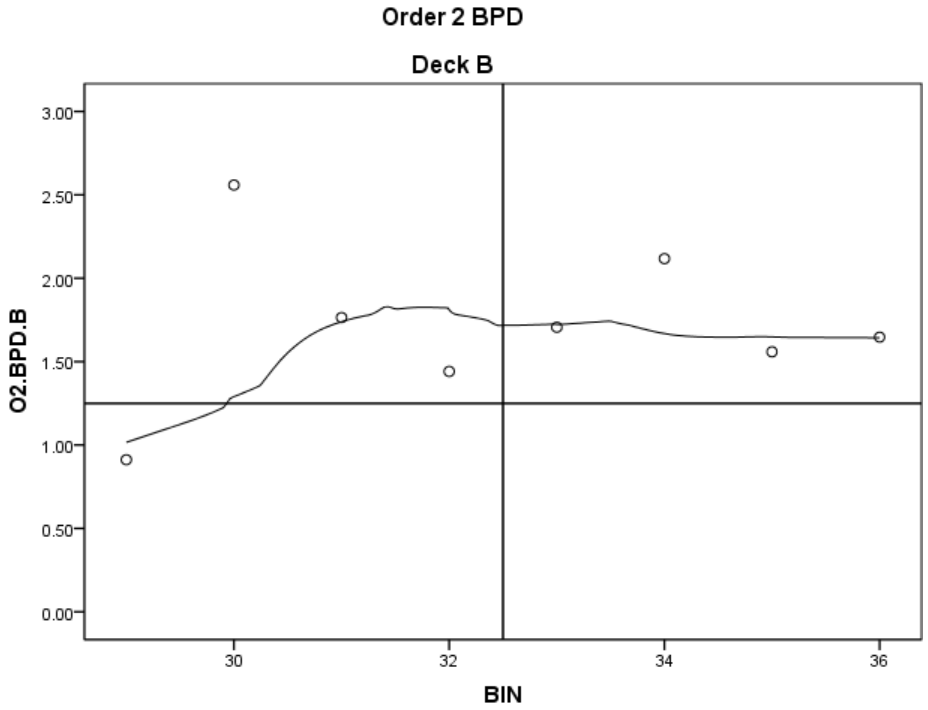

Order 2 Control
Deck A
O2.CONTROL.A
3.00
2.50
2.00
1.50
1.00
0.50
0.00
30
32
34
36
BIN

Figure H10


Order 2 BPD
Deck B
O2.BPD.B
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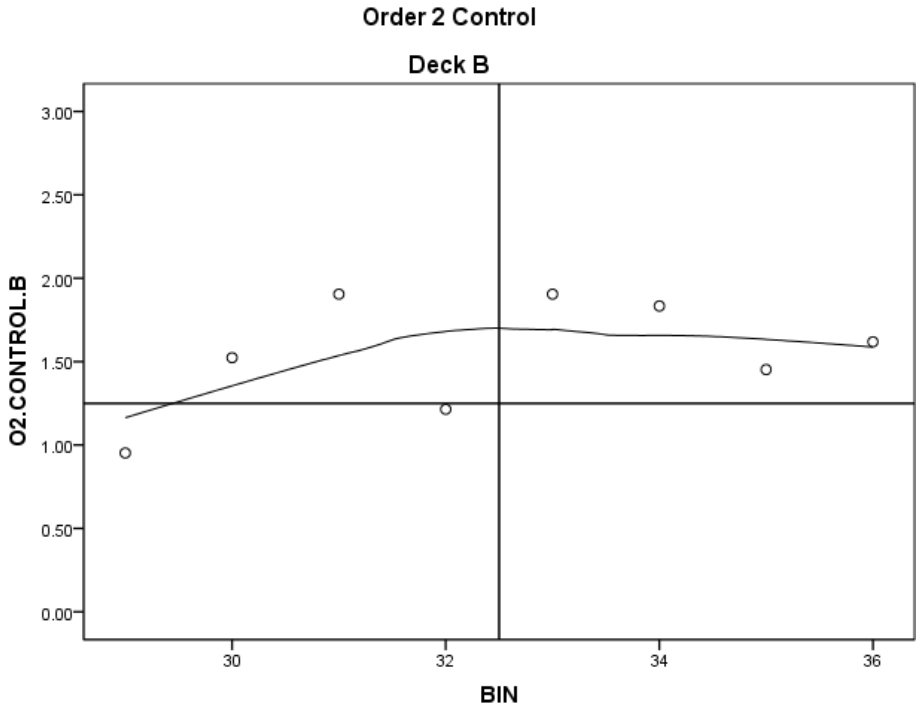
2.00
1.50
1.00
0.50
0.00
30
32
34
36
BIN


Order 2 Control
Deck B
O2.CONTROL.B
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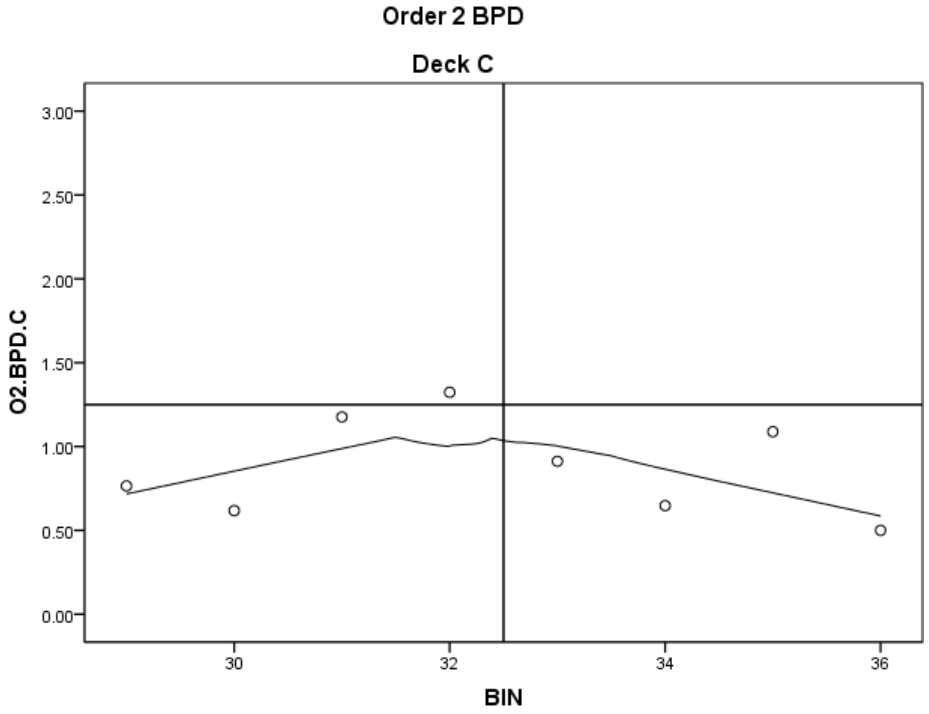
2.50
2.00
1.50
1.00
0.50
0.00
30
32
34
36
BIN

Figure H11


Order 2 BPD
Deck C
O2.BPD.C
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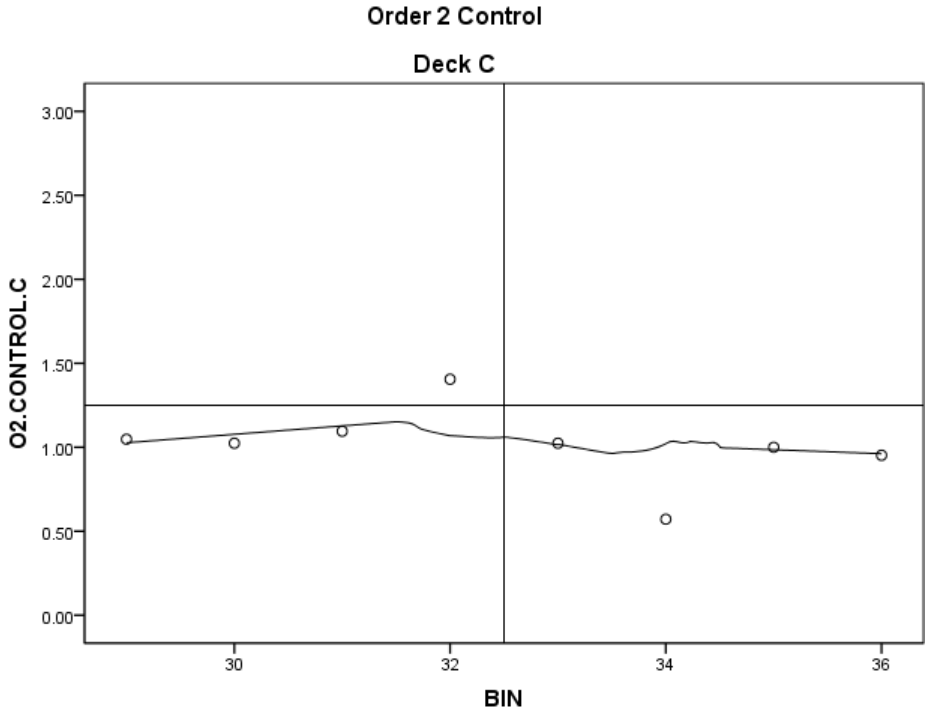
2.50
2.00
1.50
1.00
0.50
0.00
30
32
34
36
BIN


Order 2 Control
Deck C
O2.CONTROL.C
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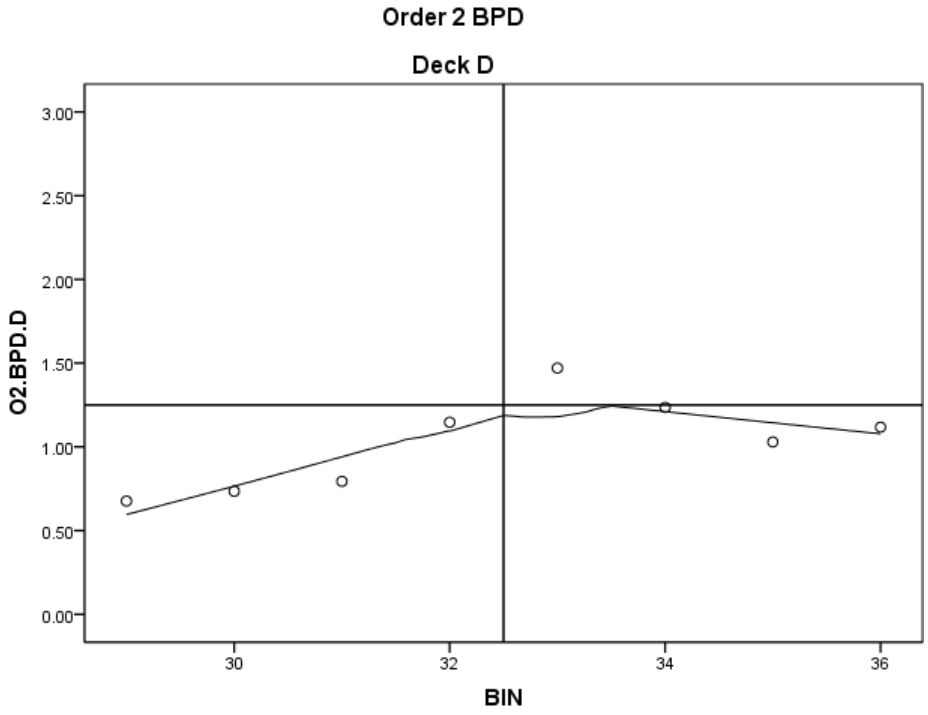
2.50
2.00
1.50
1.00
0.50
0.00
30
32
34
36
BIN

Figure H12


Order 2 BPD
Deck D
O2.BPD.D
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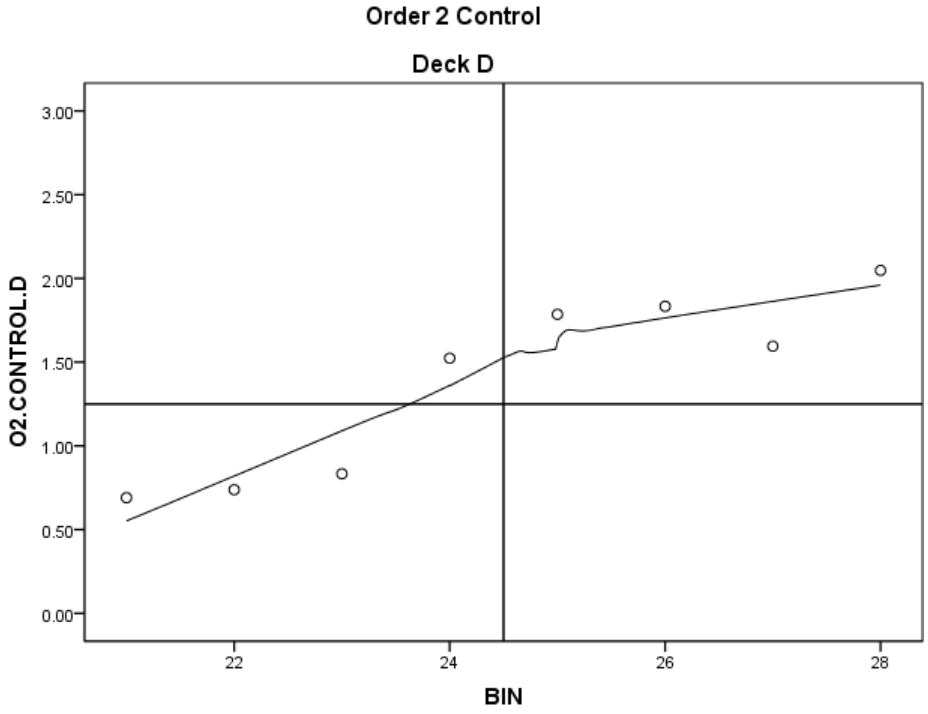
2.00
1.50
1.00
0.50
0.00
30
32
34
36
BIN


Order 2 Control
Deck D
O2.CONTROL.D
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2.50
2.00
1.50
1.00
0.50
0.00
22
24
26
28
BIN

Figure H13

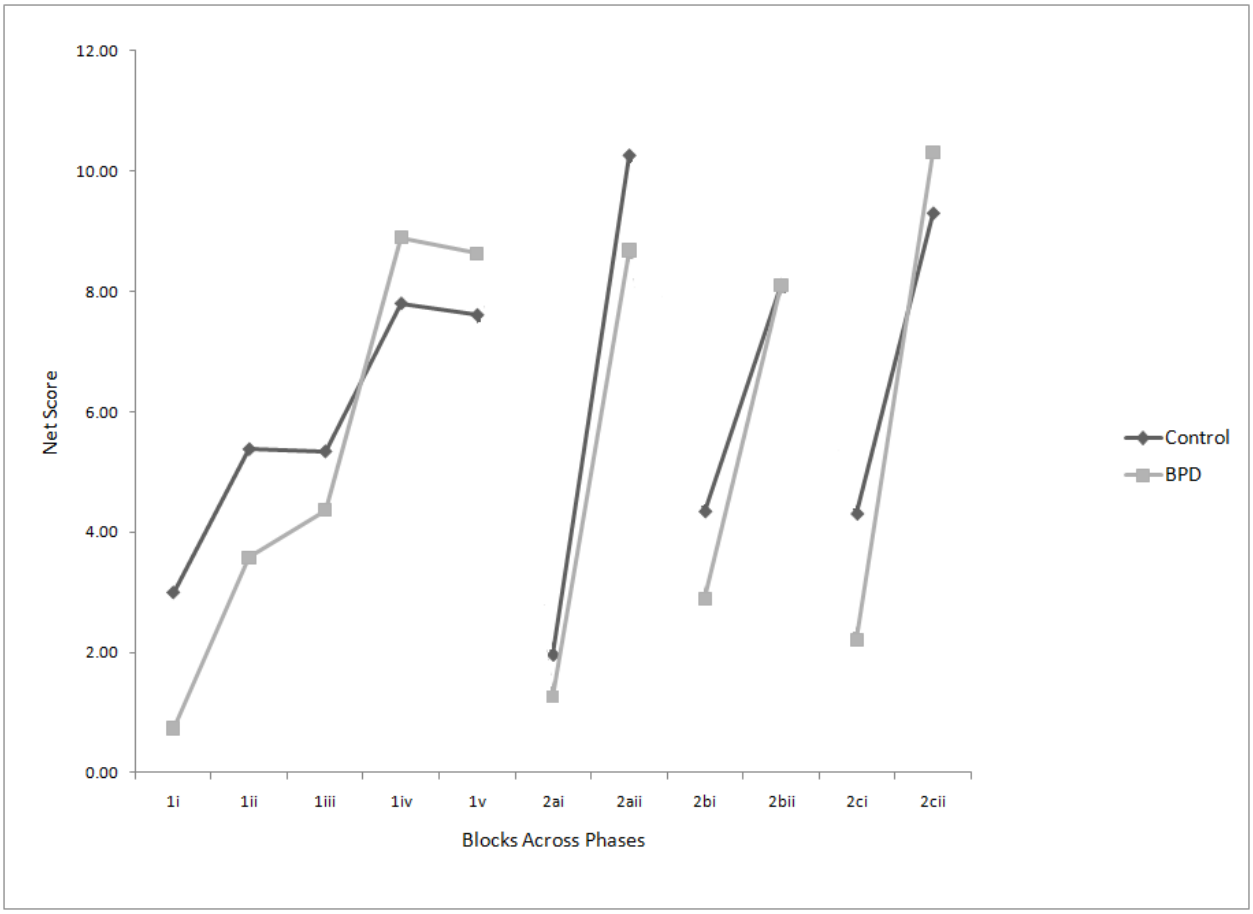

12.00
10.00
8.00
6.00
4.00
2.00
0.00
Net Score
1i
1ii
1iii
1iv
1v
2ai
2aii
2bi
2bii
2ci
2cii
Blocks Across Phases
Control
BPD

Figure H14

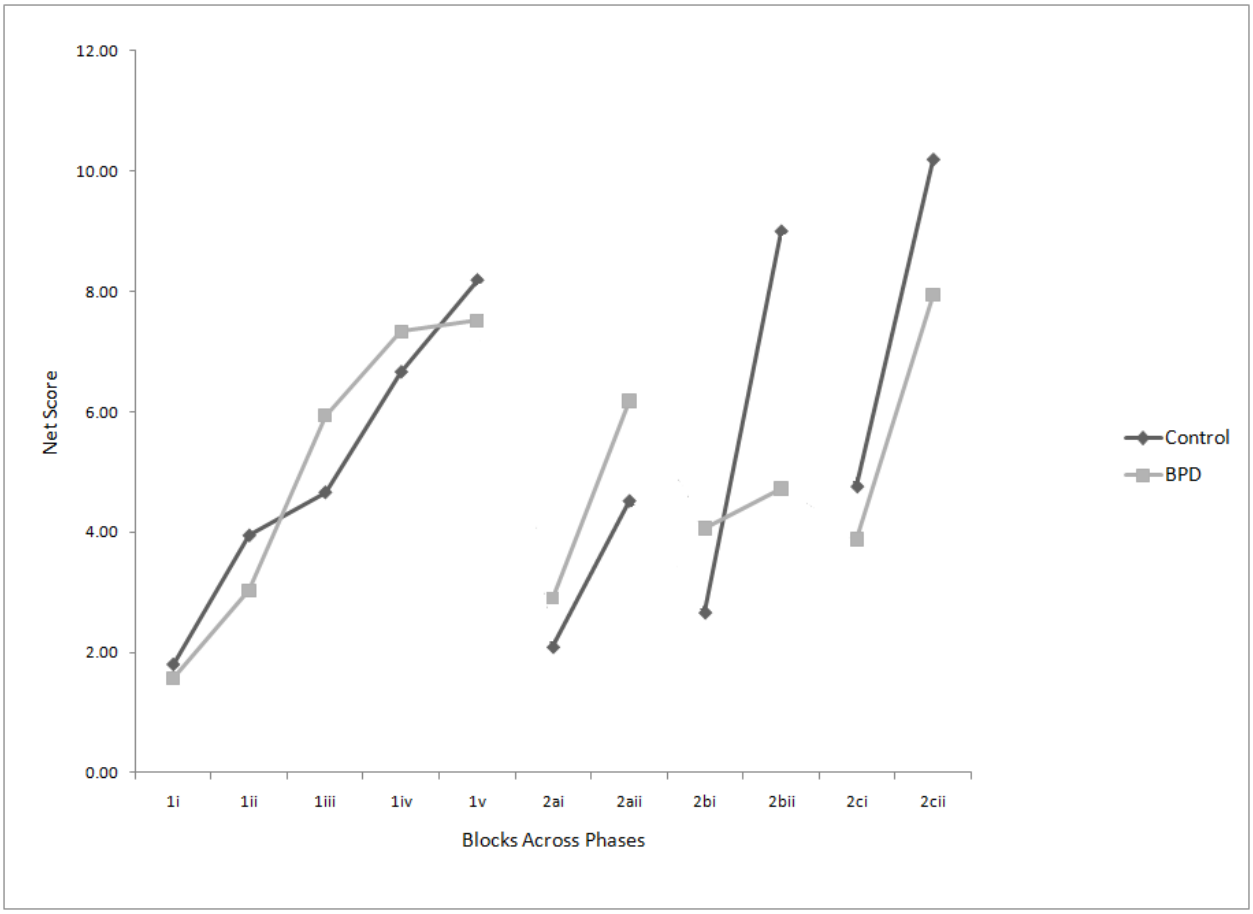

12.00
10.00
8.00
6.00
4.00
2.00
0.00
Net Score
1i
1ii
1iii
1iv
1v
2ai
2aii
2bi
2bii
2ci
2cii
Blocks Across Phases
Control
BPD

Figure H15

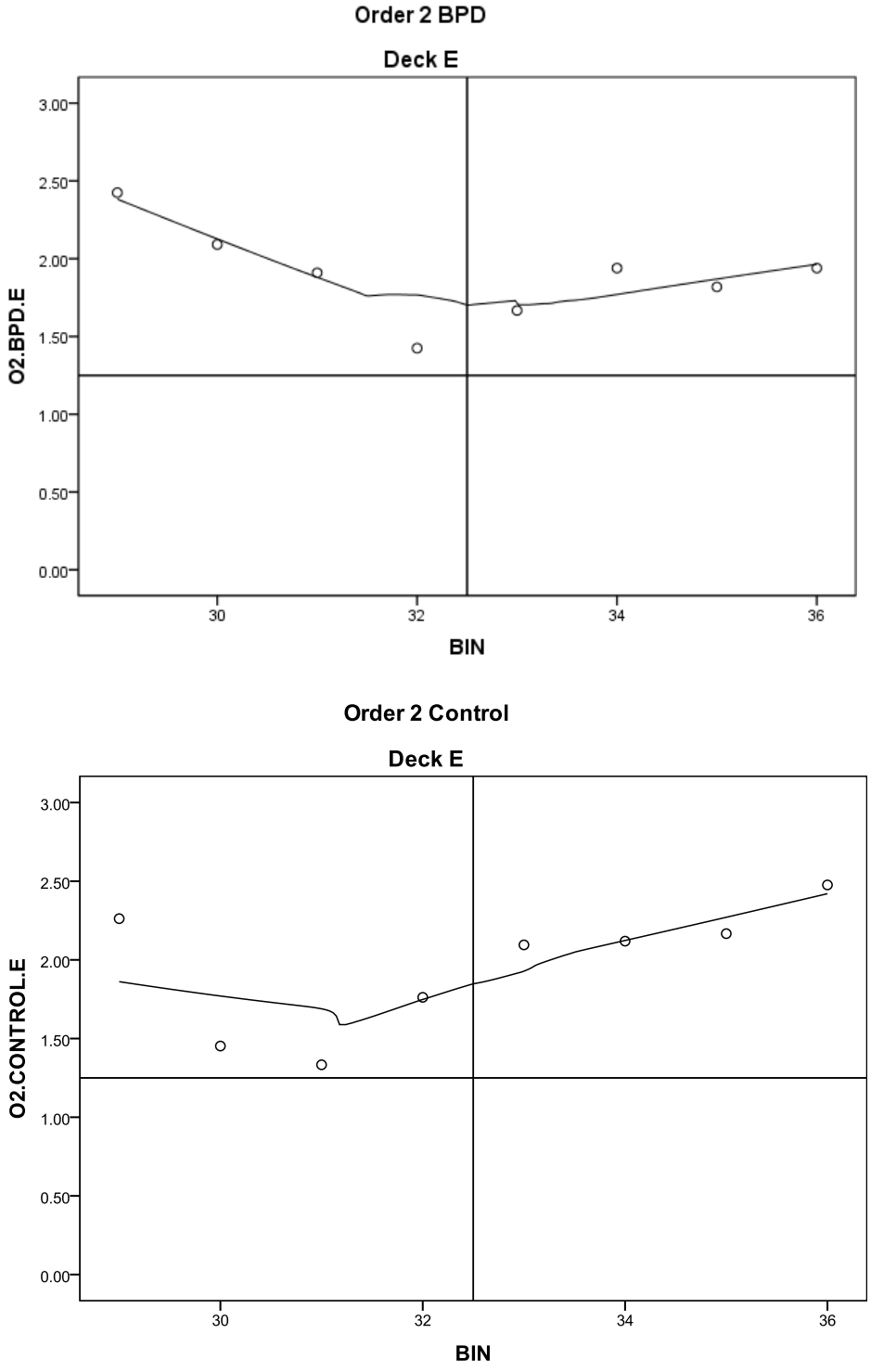
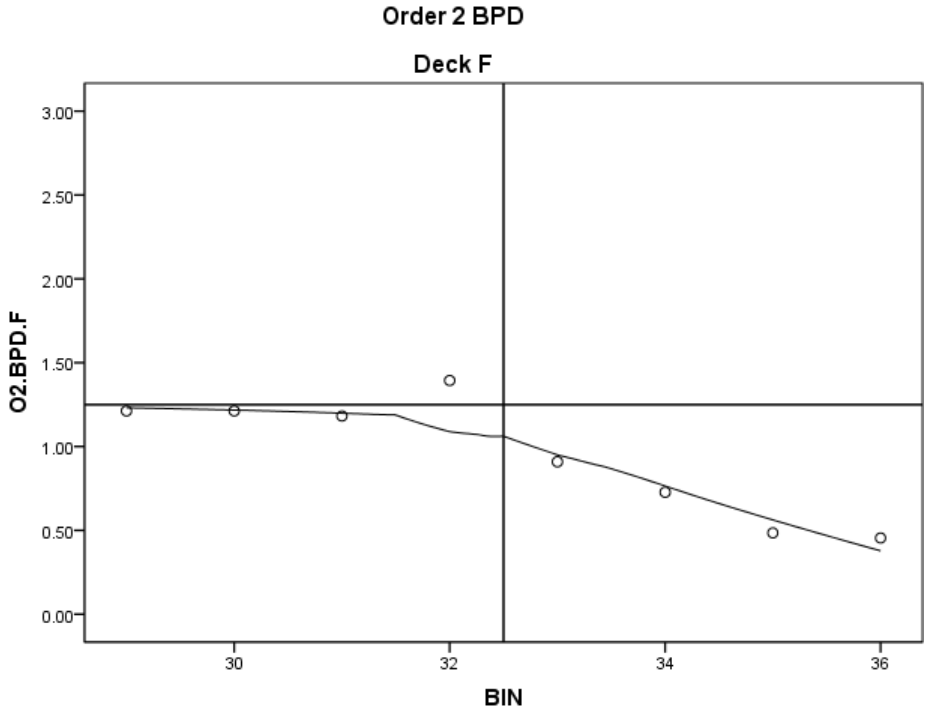

Order 2 BPD
Deck E
O2.BPD.E
3.00
2.50
2.00
1.50
1.00
0.50
0.00
30
32
34
36
BIN
Order 2 Control
Deck E
O2.CONTROL.E
3.00
2.50
2.00
1.50
1.00
0.50
0.00
30
32
34
36
BIN

Figure H16


Order 2 BPD
Deck F
O2.BPD.F
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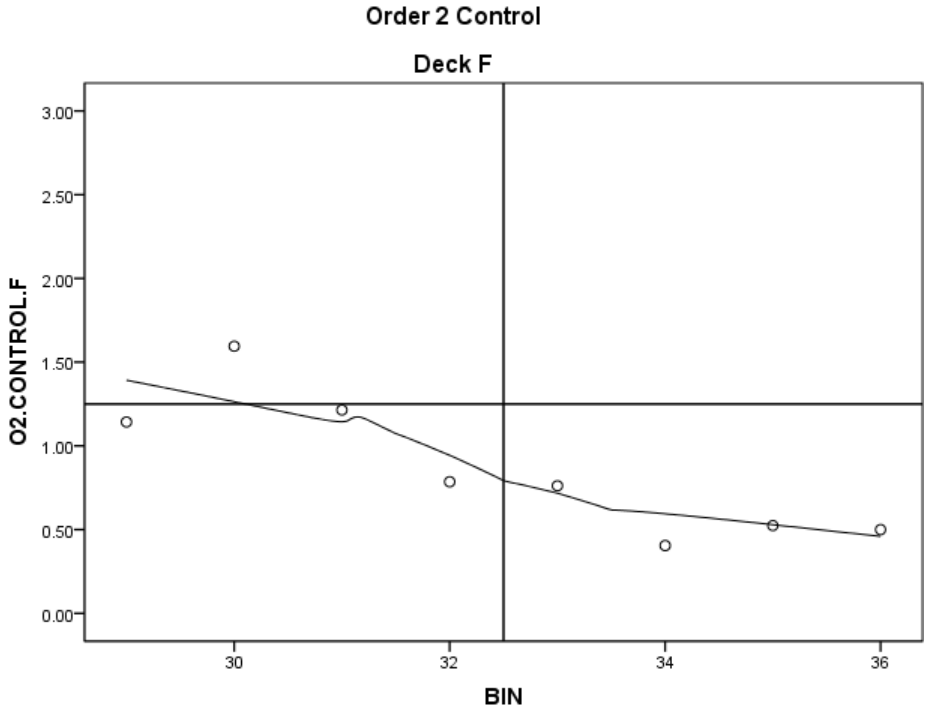
2.00
1.50
1.00
0.50
0.00
30
32
34
36
BIN


Order 2 Control
Deck F
O2.CONTROL.F
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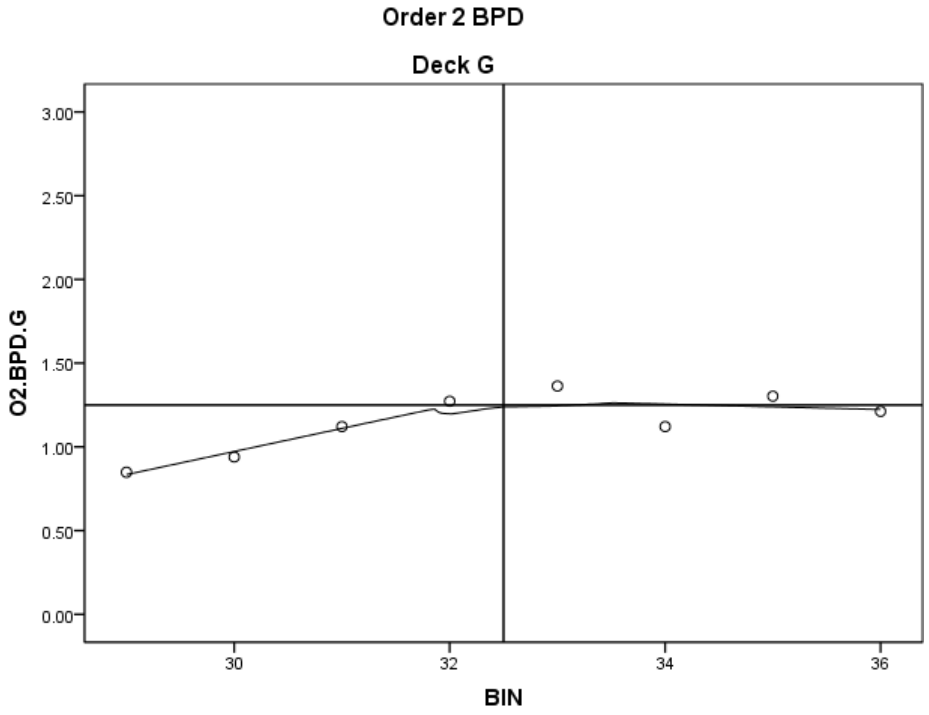
2.50
2.00
1.50
1.00
0.50
0.00
30
32
34
36
BIN

Figure H17


Order 2 BPD
Deck G
O2.BPD.G
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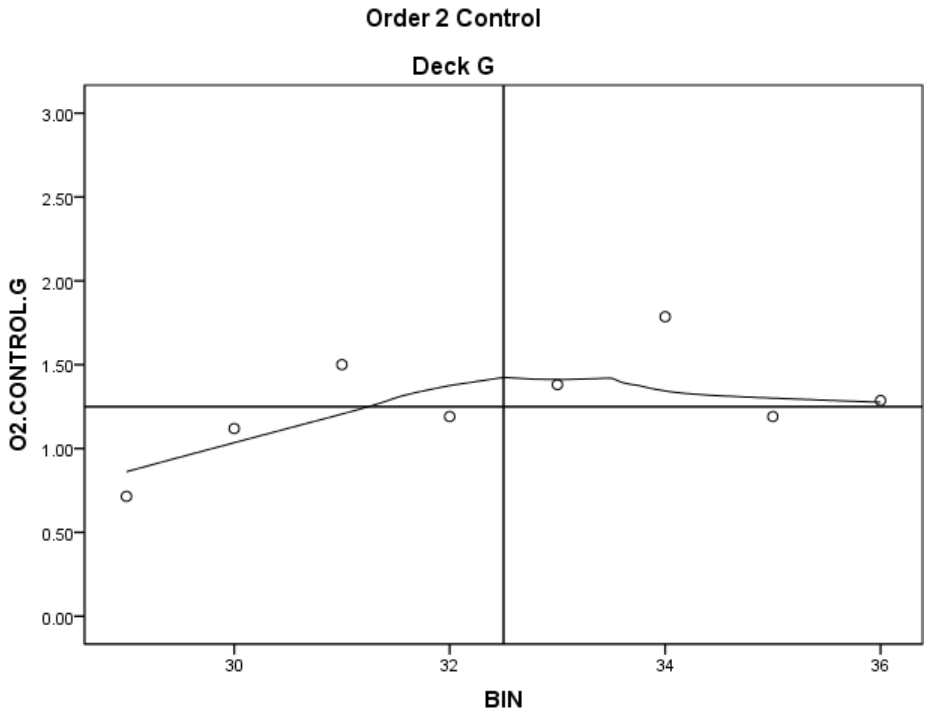
2.00
1.50
1.00
0.50
0.00
30
32
34
36
BIN


Order 2 Control
Deck G
O2.CONTROL.G
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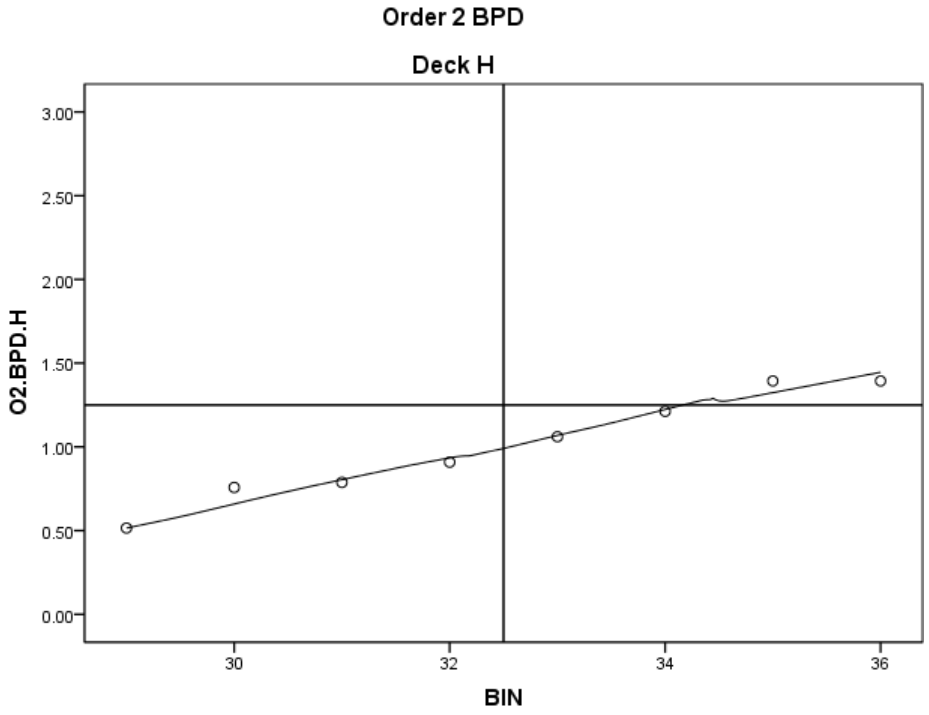
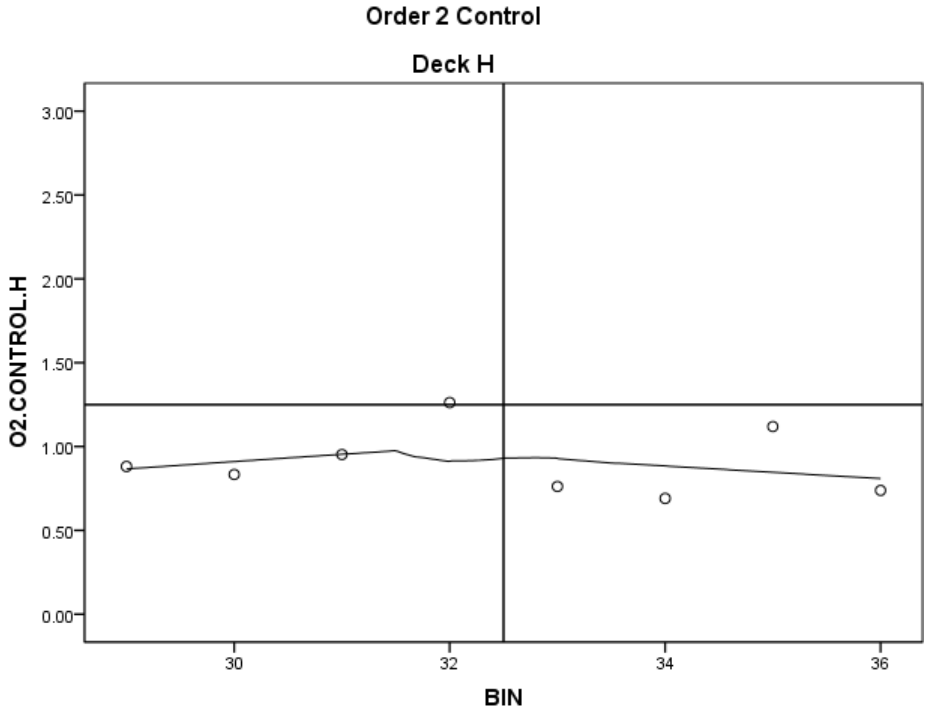
2.50
2.00
1.50
1.00
0.50
0.00
30
32
34
36
BIN

Figure H18


Order 2 BPD
Deck H
O2.BPD.H
3.00
2.50
2.00
1.50
1.00
0.50
0.00
30
32
34
36
BIN


Order 2 Control
Deck H
O2.CONTROL.H
3.00
2.50
2.00
1.50
1.00
0.50
0.00
30
32
34
36
BIN

APPENDIX I

I1. The Highly Sensitive Person Scale (HSPS; Aron & Aron, 1997)

HSPS: Instructions and Items

Please answer each of the following questions according to the way you personally feel. Indicate your level of agreement by selecting one of the seven possible responses (i.e., from Strongly Disagree to Strongly Agree) for each item.
7 Strongly Agree - 6 Agree - 5 Slightly Agree - 4 Neither Agree nor Disagree - 3 Slightly Disagree – 2 – Disagree - 1 Strongly Disagree

1. I am easily overwhelmed by strong sensory input.
2. I seem to be aware of subtleties in my environment.
3. Other people's moods affect me.
4. I tend to be very sensitive to pain.
5. I find myself needing to withdraw during busy days, into bed or into a darkened room or any place where I can have some privacy and relief from stimulation.
6. I am particularly sensitive to the effects of caffeine.
7. I am easily overwhelmed by things like bright lights, strong smells, coarse fabrics, or sirens close by.
8. I have a rich, complex inner life.
9. I am made uncomfortable by loud noises.
10. I am deeply moved by the arts or music.
11. My nervous system sometimes feels so frazzled that I just have to be by myself.
12. I am conscientious.
13. I startle easily.
14. I get rattled when I have a lot to do in a short amount of time.
15. When people are uncomfortable in a physical environment I tend to know what needs to be done to make it more comfortable (like changing the lighting or the seating).
16. I am annoyed when people try to get me to do too many things at once.
17. I try hard to avoid making mistakes or forgetting things.
18. I make a point to avoid violent movies and TV shows.
19 I become unpleasantly aroused when a lot is going on around me.
20. Being very hungry creates a strong reaction in me, disrupting my concentration or mood.
21. Changes in my life shake me up.
22. I notice and enjoy delicate or fine scents, tastes, sounds, works of art.
23. I find it unpleasant to have a lot going on at once.
24. I make it a high priority to arrange my life to avoid upsetting or overwhelming situations.
25. I am bothered by intense stimuli, like loud noises or chaotic scenes.
26. When I must compete or be observed while performing a task, I become so nervous or shaky that I do much worse than I would otherwise.
27. When I was a child, my parents or teachers seemed to see me as sensitive or shy.

I2. Trait Meta-Mood Scale (TMMS; Salovey, Mayer, Goldman, Turvey & Palfai, 1995)

TMMS: Instructions and Items

Please read each statement and rate your level of agreement with each item. Indicate your level of agreement with the statement based on the scale below: 5 = strongly agree 4 = somewhat agree 3 = neither agree nor disagree 2 = somewhat disagree 1 = strongly disagree

ATTENTION
*4. People would be better off if they felt less and thought more.
*7. I don't think it's worth paying attention to your emotions or moods.
*8. I don't usually care much about what I'm feeling.
18. I believe in acting from the heart.
22. The best way for me to handle my feelings is to experience them to the fullest.
*29. One should never be guided by emotions.
*31. I never give into my emotions.
35. I pay a lot of attention to how I feel.
*38. I don't pay much attention to my feelings.
41. I often think about my feelings.
*44. Feelings are a weakness humans have.

CLARITY
*9. Sometimes I can't tell what my feelings are.
*12. I am rarely confused about how I feel.
*19. I can never tell how I feel.
*24. My belief and opinions always seem to change depending on how I feel.
26. I am often aware of my feelings on a matter.
*28. I am usually confused about how I feel.
33. I feel at ease about my emotions.
*37. I can't make sense out of my feelings.
42. I am usually very clear about my feelings.
45. I usually know my feelings about a matter.
48. I almost always know exactly how I am feeling.

REPAIR
2. I try to think good thoughts no matter how badly I feel.
16. Although I am sometimes sad, I have a mostly optimistic outlook.
*17. When I am upset, I realize that the "good things in life" are illusions.
23. When I become upset I remind myself of all the pleasures in life.
*32. Although I am sometimes happy, I have a mostly pessimistic outlook.
43. No matter how badly I feel, I try to think about pleasant things.

FILLER ITEMS (18 items which were not used in the current study)

*Reverse-scored.

I3. UPPS Impulsive Behavior Scale (UPPS; Whiteside & Lynam, 2001)

UPPS: Instructions and Items

Please read each statement and decide whether or not you agree with it. Indicate your level of agreement with the statement based on the scale below: 5 = strongly agree 4 = somewhat agree 3 = neither agree nor disagree 2 = somewhat disagree 1 = strongly disagree

URGENCY
1. Sometimes when I feel bad, I can't seem to stop what I am doing even though it is making me feel worse.
2. I have trouble controlling my impulses.
3. I have trouble resisting my cravings (for food, cigarettes, etc.).
4. I often get involved in things I later wish I could get out of.
5. When I feel bad, I will often do things I later regret in order to make myself feel better now.
6. When I am upset I often act without thinking.
7. When I feel rejected, I will often say things that I later regret.
8. It is hard for me to resist acting on my feelings.
9. I often make matters worse because I act without thinking when I am upset.
10. In the heat of an argument, I will often say things that I later regret.
11. I am always able to keep my feelings under control. (R)
12. Sometimes I do things on impulse that I later regret.

PREMEDITATION
1. I have a reserved and cautious attitude toward life.
2. My thinking is usually careful and purposeful.
3. I am not one of those people who blurt out things without thinking.
4. I like to stop and think things over before I do them.
5. I don't like to start a project until I know exactly how to proceed.
6. I tend to value and follow a rational, "sensible" approach to things.
7. I usually make up my mind through careful reasoning.
8. I am a cautious person.
9. Before I get into a new situation I like to find out what to expect from it.
10. I usually think carefully before doing anything.
11. Before making up my mind, I consider all the advantages and disadvantages.

SENSATION SEEKING
1. I generally seek new and exciting experiences and sensations.
2. I'll try anything once.
3. I like sports and games in which you have to choose your next move very quickly.
4. I would enjoy water skiing.
5. I quite enjoy taking risks.
6. I would enjoy parachute jumping.
7. I welcome new and exciting experiences and sensations, even if they are a little frightening and unconventional.
8. I would like to learn to fly an airplane.
9. I sometimes like doing things that are a bit frightening.
10. I would enjoy the sensation of skiing very fast down a high mountain slope.
11. I would like to go scuba diving.
12. I would enjoy fast driving.

PERSEVERANCE
1. I generally like to see things through to the end.
2. I tend to give up easily. (R)
3. Unfinished tasks really bother me.
4. Once I get going on something I hate to stop.
5. I concentrate easily.
6. I finish what I start.
7. I'm pretty good about pacing myself so as to get things done on time.
8. I am a productive person who always gets the job done.
9. Once I start a project, I almost always finish it.
10. There are so many little jobs that need to be done that I sometimes just ignore them all. (R)

I4. Affect Intensity Scale - Short (AIS-S; Geuens & De Pelsmacker, 2002)

AIS-S: Instructions and Items

Indicate how you typically respond to the following events by selecting a number from 1-6, based on the following scale: 1 (I never feel like that) to 6 (I always feel like that).

AIS1. When I feel happy, it is a strong type of exuberance.
AIS2. My happy moods are so strong that I feel like I'm in heaven.
AIS3. If I complete a task I thought was impossible, I am ecstatic.
AIS4. Sad movies deeply touch me.
AIS5. When I'm happy, it's a feeling of being untroubled and content rather than being zestful and aroused.
AIS6. When I talk in front of a group for the first time, my voice gets shaky and my heart races.
AIS7. When I'm feeling well, it's easy for me to go from being in a good mood to being really joyful.
AIS8. When I'm happy, I feel like I'm bursting with joy.
AIS9. When I'm happy, I feel very energetic.
AIS10. When I succeed at something, my reaction is calm and contentment.
AIS11. When I do something wrong, I have strong feelings of shame and guilt.
AIS12. When things are going good, I feel "on top of the world".
AIS13. When I know I have done something very well, I feel relaxed and content rather than excited and elated.
AIS14. When I do feel anxiety, it is normally very strong.
AIS15. When I feel happiness, it is a quiet type of contentment.
AIS16. When I'm happy, I bubble over with energy.
AIS17. When I feel guilty, this emotion is quite strong.
AIS18. I would characterize my happy moods as closer to contentment than joy.
AIS19. When I am nervous, I get shaky all over.
AIS20. When I am happy, the feeling is more like contentment and inner calm than one of exhilaration and excitement.

I5. Private Self-Consciousness Subscale (PSCS) from The Self-Consciousness Scale (SCS; Fenigstein, Scheier, & Buss, 1975)

PSCS: Instructions and Items

Answer the following questions as honestly and accurately as possible on a scale from 1 to 5, where: 1= extremely uncharacteristic of me (not at all like me) - 5= extremely characteristic of me (very much like me)

1. I'm always trying to figure myself out.
2. Generally, I'm not very aware of myself.
3. I reflect about myself a lot.
4. I'm often the subject of my own fantasies.
5. I never scrutinize myself.
6. I'm generally attentive to my inner feelings.
7. I'm constantly examining my motives.
8. I sometimes have the feeling that I'm off somewhere watching myself.
9. I'm alert to changes in my mood.
10. I'm aware of the way my mind works when I work through a problem.

I6. Monitoring subscale of the Mood Awareness Scale (MAS-M; Swinkels & Giuliano, 1995)

MAS-M: Instructions and Items

Answer the following questions as honestly and accurately as possible on a scale from 1 to 5, where: 1= extremely uncharacteristic of me (not at all like me) - 5= extremely characteristic of me (very much like me)

1. I often evaluate my mood
2. I find myself thinking about my mood during the day
3. On my way home from work or school, I find myself evaluating my mood.
4. I am sensitive to changes in my mood.
5. I don't pay much attention to my moods.

I7. Difficulty Identifying Feelings subscale (TAS-DIF) of the Toronto Alexithymia Scale-20 (TAS-20; Bagby, Parker, & Taylor, 1994)

TAS-DIF: Instructions and Items

Please read each of the statements below and rate your level of agreement with each item. The scale ranges from a score of 1 (strongly disagree) to 5 (strongly agree).

1. I am often confused about what emotion I am feeling.
2. I have physical sensations that even doctors don't understand.
3. When I am upset. I don't know if I am sad, frightened, or angry.
4. I am often puzzled by sensations in my body.
5. I have feelings that I can't quite identify.
6. I don't know what's going on inside me.
7. I often don't know why I am angry.

I8. Emotional Expressivity Scale (EES; Kring, Smith, & Neale, 1994)

EES: Instructions and Items

Please read each of the statements below and rate your level of agreement with each item. The scale ranges from a score of 1 (never true) to 6 (always true).

1. I don't express my emotions to other people. (R)
2. Even when I'm experiencing strong feelings, I don't express them outwardly. (R)
3. I keep my feelings to myself. (R)
4. I am not very emotionally expressive. (R)
5. I display my emotions to other people.
6. People think of me as an unemotional person. (R)
7. I don't like to let other people see how I'm feeling. (R)
8. People can read my emotions.
9. I can't hide the way I'm feeling.
10. I am often considered indifferent by others. (R)
11. I am able to cry in front of other people.
12. Even if I'm feeling very emotional, I don't let others see my feelings. (R)
13. I think of myself as emotionally expressive.
14. I hold my feelings in. (R)
15. Other people believe me to be very emotional.
16. Other people aren't easily able to observe what I'm feeling. (R)
17. The way I feel is different from what others think I feel. (R)

I9. Affective Lability Scales – Short Form (ALS-SF; Oliver & Simons, 2004)

ALS-SF: Instructions and Items

Answer the following questions as honestly and accurately as possible on a scale from 1 to 5, where: 1= extremely uncharacteristic of me (not at all like me) to 5= extremely characteristic of me (very much like me)

ALS1. At times I feel just as relaxed as everyone else and then within minutes I become so nervous that I feel light-headed and dizzy.
ALS2. There are times when I have very little energy and then just afterwards I have about the same energy level as most people.
ALS3. One minute I can be feeling OK and then the next minute I'm tense, jittery, and nervous.
ALS4. I frequently switch from being able to control my temper very well to not being able to control it very well at all.
ALS5. Many times I feel nervous and tense and then I suddenly feel very sad and down.
ALS6. Sometimes I go from feeling extremely anxious about something to feeling very down about it.
ALS7. I shift back and forth from feeling perfectly calm to feeling uptight and nervous.
ALS8. There are times when I feel perfectly calm one minute and then the next minute the least little thing makes me furious.
ALS9. Frequently, I will be feeling OK but then I suddenly get so mad that I could hit something.
ALS10. Sometimes I can think clearly and concentrate well one minute and then the next minute I have a great deal of difficulty concentrating and thinking clearly.
ALS11. There are times when I am so mad that I can barely stop yelling and other times shortly afterwards when I wouldn't think of yelling at all.
ALS12. I switch back and forth between being extremely energetic and having so little energy that it's a huge effort just to get where I am going.
ALS13. There are times when I feel absolutely wonderful about myself but soon afterwards I often feel that I am just about the same as everyone else.
ALS14. There are times when I'm so mad that my heart starts pounding and/or I start shaking and then shortly afterwards I feel quite relaxed.
ALS15. I shift back and forth between being very unproductive and being just as productive as everyone else.
ALS16. Sometimes I feel extremely energetic one minute and then the next minute I might have so little energy that I can barely do a thing.
ALS17. There are times when I have more energy than usual and more than most people and then soon afterwards I have about the same energy level as everyone else.
ALS18. At times I feel that I'm doing everything at a very slow pace but then soon afterwards I feel that I'm no more slowed down than anyone else.

I10. Distress Tolerance Scale (C-DTS; Corstorphine, Mountford, Tomlinson, Waller, & Meyer, 2007)

C-DTS: Instructions and Items

Please read each statement and decide whether or not you agree with it. Indicate your level of agreement with the statement based on the scale below: 5 = strongly agree 4 = somewhat agree 3 = neither agree nor disagree 2 = somewhat disagree 1 = strongly disagree.

Anticipate and distract

1. If I am concerned that I am going to feel anxious, I make sure that I have planned lots of things to do to keep my mind occupied.
5. If I think that I might feel lonely, I will make sure that I am surrounded by people.
9. If I know I am going to be alone for any length of time I will make sure that I have lots of things to so to make the time pass quickly.
16. I don't let myself think about things that would depress me.

Avoidance of affect

2. I avoid situations in which I know I will become over excited.
10. I avoid situations that I know will make me nervous.
11. I tend to avoid situations and people that I know will make me feel sad.
12. I won't engage in activities/relationships about which I know I will become too enthusiastic.
15. When I get angry, I have to leave the situations in order to control my temper.
17. If I feel myself enjoying something too much, I will stop it before I get carried away.

Accepting and managing emotion

7. If I am feeling anxious, I will do something practical to steady my nerves (e.g., clean the house).
8. When I am really angry, I do something to calm myself mentally (e.g., count to 100).
13. If I find I am getting too anxious, I will do something to soothe myself (e.g., listen to music, read a book).
19. I cope with feeling lonely, I do something to remind myself that there are other people there for me (e.g., read letters, look at photographs).

I11. Distress Tolerance Scale (S-DTS; Simons & Gaher, 2005)

S-DTS: Instructions and Items

Please read each statement and decide whether or not you agree with it. Indicate your level of agreement with the statement based on the scale below: 5 = strongly agree 4 = somewhat agree 3 = neither agree nor disagree 2 = somewhat disagree 1 = strongly disagree

(Lack of) Tolerance
1. Feeling distressed or upset is unbearable to me.
3. I can't handle feeling distressed or upset.
5. There's nothing worse than feeling distressed or upset.

Absorption
2. When I feel distressed or upset, all I can think about is how bad I feel.
4. My feelings of distress are so intense that they completely take over.
15. When I feel distressed or upset, I cannot help but concentrate on how bad the distress actually feels.

Appraisal
6. I can tolerate being distressed or upset as well as most people. (R)
7. My feelings of distress or being upset are not acceptable.
9. Other people seem to be able to tolerate feeling distressed or upset better than I can.
10. Being distressed or upset is always a major ordeal for me.
11. I am ashamed of myself when I feel distressed or upset.
12. My feelings of distress or being upset scare me.

Regulation
8. I'll do anything to avoid feeling distressed or upset.
13. I'll do anything to stop feeling distressed or upset.
14. When I feel distressed or upset, I must do something about it immediately.

I12. Forms of Self-Criticizing/Attacking and Self-Reassuring Scale (FSCRS; Gilbert, Clarke, Hempel, Miles, & Irons, 2004)

FSCRS: Instructions and Items

Listed below are a number of statements that describe a person's potential responses to him/herself when things are going wrong for them. Please indicate how similar each of the following responses is to your typical reaction when things are going wrong for you by circling a number from 1 (not at all like me) to 5 (extremely like me).

When things go wrong for me.....

1. I am easily disappointed with myself.
2. There is a part of me that puts me down.
3. I am able to remind myself of positive things about myself.
4. I find it difficult to control my anger and frustration at myself.
5. I find it easy to forgive myself.
6. There is a part of me that feels I am not good enough.
7. I feel beaten down by my own self-critical thoughts.
8. I still like being me.
9. I have become so angry with myself that I want to hurt or injure myself.
10. I have a sense of disgust with myself.
11. I can feel lovable and acceptable.
12. I stop caring about myself.
13. I find it easy to like myself.
14. I remember and dwell on my failings.
15. I call myself names.
16. I am gentle and supportive with myself.
17. I can't accept failures and setbacks without feeling inadequate.
18. I think I deserve my self-criticism.
19. I am able to care and look after myself.
20. There is a part of me that wants to get rid of the bits I don't like.
21. I encourage myself for the future.
22. I do not like being me.

I13. Self-Compassion Scale (SCS; Neff, 2003)

SCS: Instructions and Items

Please indicate how often you have acted in the manner described in each of the items below on a scale of 1 (almost never) to 5 (almost always).

Self-Kindness Subscale
1. I try to be understanding and patient towards those aspects of my personality I don't like.
2. I'm kind to myself when I'm experiencing suffering.
3. When I'm going through a very hard time, I give myself the caring and tenderness I need.
4. I'm tolerant of my own flaws and inadequacies.
5. I try to be loving towards myself when I'm feeling emotional pain.

Self-Judgment Subscale
1. When I see aspects of myself that I don't like, I get down on myself.
2. When times are really difficult, I tend to be tough on myself.
3. I can be a bit cold-hearted towards myself when I'm experiencing suffering.
4. I'm disapproving and judgmental about my own flaws and inadequacies.
5. I'm intolerant and impatient towards those aspects of my personality I don't like.

Common Humanity Subscale
1. When I feel inadequate in some way, I try to remind myself that feelings of inadequacy are shared by most people.
2. I try to see my failings as part of the human condition.
3. When I'm down and out, I remind myself that there are lots of other people in the world feeling like I am.
4. When things are going badly for me, I see the difficulties as part of life that everyone goes through.

Isolation Subscale
1. When I fail at something that's important to me I tend to feel alone in my failure.
2. When I think about my inadequacies it tends to make me feel more separate and cut off from the rest of the world.
3. When I'm feeling down I tend to feel like most other people are probably happier than I am.
4. When I'm really struggling I tend to feel like other people must be having an easier time of it.

Mindfulness Subscale
1. When something upsets me I try to keep my emotions in balance.
2. When I'm feeling down I try to approach my feelings with curiosity and openness.
3. When something painful happens I try to take a balanced view of the situation.
4. When I fail at something important to me I try to keep things in perspective.

Over-Identification Subscale
1. When something upsets me I get carried away with my feelings.
2. When I'm feeling down I tend to obsess and fixate on everything that's wrong.
3. When something painful happens I tend to blow the incident out of proportion.
4. When I fail at something important to me I become consumed by feelings of inadequacy.

I14. Parental Authority Questionnaire (PAQ; Buri, 1991)

PAQ: Instructions and Items

For each of the following statements, circle the number on the 5-point scale (1 = strongly disagree, 5 = strongly agree) that best describes how that statement applies to you and your "mother figure" during your years of growing up at home. There are no right or wrong answers, so don't spend a lot of time on any one item. We are looking for your overall impression regarding each statement. Please try not to omit any items.

1. While I was growing up my mother felt that in a well-run home the children should have their way in the family as often as the parents do.
2. Even if her children didn't agree with her, my mother felt that it was for our own good if we were forced to conform to what she thought was right.
3. Whenever my mother told me to do something as I was growing up, she expected me to do it immediately without asking any questions.
4. As I was growing up, once family policy had been established, my mother discussed the reasons behind the policy with the children in the family.
5. My mother has always encouraged verbal give-and-take whenever I have felt that family rules and restrictions were unreasonable.
6. My mother has always felt that what children need is to be free to make up their own minds and do what they want to do, even if this does not agree with what their parents might want.
7. As I was growing up my mother did not allow me to question any decision she had made.
8. As I was growing up my mother directed the activities and decisions of the children in the family through reasoning and discipline.
9. My mother has always felt that more force should be used by parents in order to get their children to behave the way that they are supposed to.
10. As I was growing up my mother did not feel that I needed to obey rules and regulations of behaviour simply because someone in authority had established them.
11. As I was growing up I knew what my mother expected of me in my family, but I also felt free to discuss those expectations with my mother when I felt that they were unreasonable.
12. My mother felt that wise parents should teach their children early just who is boss in the family.
13. As I was growing up, my mother seldom gave me expectations and guidelines for my behaviour.
14. Most of the time as I was growing up my mother did what the children in the family wanted when making family decisions.
15. As the children in the family were growing up, my mother constantly gave us directions and guidance in a rational and objective manner.
16. As I was growing up my mother would get very upset if I tried to disagree with her.
17. My mother feels that most problems in society would be solved if parents would not restrict their children's activities, decisions, and desires as they are growing up.
18. As I was growing up my mother let me know what behaviour she expected of me, and if I didn't meet those expectations, she punished me.
19. As I was growing up my mother allowed me to decide most things for myself without a lot of direction from her.
20. As I was growing up my mother took the children's opinions into consideration when making family decisions but she would not decide for something simply because the children wanted it.
21. My mother did not view herself as responsible for directing and guiding my behaviour as I was growing up.
22. My mother had clear standards of behaviour for the children in our home as I was growing up, but she was willing to adjust those standards to the needs of each of the individual children in the family.

PAQ continued

23. My mother gave me direction for my behaviour and activities as I was growing up and she expected me to follow her directions, but she was always willing to listen to my concerns and to discuss that direction with me.
24. As I was growing up my mother allowed me to form my own point of view on family matters and she generally allowed me to decide for myself what I was going to do.
25. My mother has always felt that most problems in society would be solved if we could get parents to strictly and forcibly deal with their children when they don't do what they are supposed to as they are growing up.
26. As I was growing up my mother often told me exactly what she wanted me to do and how she expected me to do it.
27. As I was growing up my mother gave me clear direction for my behaviour and activities, but she was also understanding when I disagreed with her.
28. As I was growing up my mother did not direct the behaviours, activities, and desires of the children in the family.
29. As I was growing up I knew what my mother expected of me in the family and she insisted that I conform to those expectations simply out of respect for her authority.
30. As I was growing up, if my mother made a decision in the family that hurt me, she was willing to discuss that decision with me and to admit it if she had made a mistake.

For each of the following statements, circle the number on the 5-point scale (1 = strongly disagree, 5 = strongly agree) that best describes how that statement applies to you and your "father figure" during your years of growing up at home. There are no right or wrong answers, so don't spend a lot of time on any one item. We are looking for your overall impression regarding each statement. Be sure not to omit any items.

1. While I was growing up my father felt that in a well-run home the children should have their way in the family as often as the parents do.
2. Even if his children didn't agree with him, my father felt that it was for our own good if we were forced to conform to what he thought was right.
3. Whenever my father told me to do something as I was growing up, he expected me to do it immediately without asking any questions.
4. As I was growing up, once family policy had been established, my father discussed the reasons behind the policy with the children in the family.
5. My father has always encouraged verbal give-and-take whenever I have felt that family rules and restrictions were unreasonable.
6. My father has always felt that what children need is to be free to make up their own minds and do what they want to do, even if this does not agree with what their parents might want.
7. As I was growing up my father did not allow me to question any decision he had made.
8. As I was growing up my father directed the activities and decisions of the children in the family through reasoning and discipline.
9. My father has always felt that more force should be used by parents in order to get their children to behave the way that they are supposed to.
10. As I was growing up my father did not feel that I needed to obey rules and regulations of behaviour simply because someone in authority had established them.
11. As I was growing up I knew what my father expected of me in my family, but I also felt free to discuss those expectations with my father when I felt that they were unreasonable.
12. My father felt that wise parents should teach their children early just who is boss in the family.
13. As I was growing up, my father seldom gave me expectations and guidelines for my behaviour.

PAQ continued

14. Most of the time as I was growing up my father did what the children in the family wanted when making family decisions.
15. As the children in the family were growing up, my father constantly gave us directions and guidance in a rational and objective manner.
16. As I was growing up my father would get very upset if I tried to disagree with him.
17. My father feels that most problems in society would be solved if parents would not restrict their children's activities, decisions, and desires as they are growing up.
18. As I was growing up my father let me know what behaviour he expected of me, and if I didn't meet those expectations, he punished me.
19. As I was growing up my father allowed me to decide most things for myself without a lot of direction from him.
20. As I was growing up my father took the children's opinions into consideration when making family decisions but he would not decide for something simply because the children wanted it.
21. My father did not view himself as responsible for directing and guiding my behaviour as I was growing up.
22. My father had clear standards of behaviour for the children in our home as I was growing up, but he was willing to adjust those standards to the needs of each of the individual children in the family.
23. My father gave me direction for my behaviour and activities as I was growing up and he expected me to follow her directions, but he was always willing to listen to my concerns and to discuss that direction with me.
24. As I was growing up my father allowed me to form my own point of view on family matters and he generally allowed me to decide for myself what I was going to do.
25. My father has always felt that most problems in society would be solved if we could get parents to strictly and forcibly deal with their children when they don't do what they are supposed to as they are growing up.
26. As I was growing up my father often told me exactly what he wanted me to do and how he expected me to do it.
27. As I was growing up my father gave me clear direction for my behaviour and activities, but he was also understanding when I disagreed with him.
28. As I was growing up my father did not direct the behaviours, activities, and desires of the children in the family.
29. As I was growing up I knew what my father expected of me in the family and he insisted that I conform to those expectations simply out of respect for his authority.
30. As I was growing up, if my father made a decision in the family that hurt me, he was willing to discuss that decision with me and to admit it if he had made a mistake.

I15. Multidimensional Neglectful Behavior Scale – Adult Recall Short Form (MNBS-SF; Straus, Kinard, & Williams, 1995)

MNBS-SF: Instructions and Items

Raising children is difficult. Many parents do not do some things for their children that they should do. For example, a parent might not take an interest in how well the child is doing in school, or they might leave the child alone without supervision.

1. Please indicate the age at which this sort of thing happened or happened the most?
(you may circle more than one category if these types of things happened over a longer period of time)

1 = Before I was 2 years old
2 = Between the ages of 2 to 5 years
3 = Between the ages of 6 to 8 years
4 = Between the ages of 9 to 11 years
5 = Between the ages of 12 to 14 years
6 = Between the ages of 15 to 17 years
7 = Other – Please comment:
_____

2. Please answer the following questions about things your parents did or did not do during this period of time.

If you did not indicate an age range when this happened the most, answer the questions for how often these things ever happened before the age of 17 years.

For each of the following things that parents might do or not do, please circle the answer number which indicates your level of agreement.

1 = strongly disagree ----- 2 = disagree ------ 3 = agree ------ 4 = strongly agree

My parents.....

1. helped me when I had problems	1	2	3	4
2. did not comfort me when I was upset	1	2	3	4
3. did not help me to do my best	1	2	3	4
4. helped me when I had trouble understanding something	1	2	3	4
5. did not care if I got into trouble in school.	1	2	3	4
6. did not care if I did things like shoplifting.	1	2	3	4
7. did not keep me clean.	1	2	3	4
8. did not give me enough clothes to keep me warm	1	2	3	4

I16. Childhood Trauma Questionnaire - Short Form (CTQ-SF; Thombs, Bernstein, Ziegelstein, Bennett, & Walker, 2006)

CTQ-SF: Instructions and Items

Please answer the following two questions about traumatic experiences that may have occurred while you were growing up.

1. When I was growing up, people in my family hit me so hard that it left me with bruises or marks.

YES NO PREFER NOT TO ANSWER

2. When I was growing up, someone tried to touch me in a sexual way or tried to make me touch them.

YES NO PREFER NOT TO ANSWER

I17. Invalidating Childhood Environment Scale (ICES; Mountford, Corstorphine, Tomlinson, & Waller, 2007)

ICES: Instructions and Items

The following questions address your experiences of how your parents responded to your emotions when you were young. For each item, please choose the rating from 1 to 5 that most closely reflects your experience up to the age of 18 years.

1 – Never **2 –** Rarely **3 –** Some of the time **4 –** Most of the time **5 –** All of the time

Because your parents may have been very different, please rate them separately. The left hand column is to rate your "mother figure", and the right hand column is to rate your "father figure".

Mother Figure	***During my childhood …***	***Father Figure***
1.	My parents would become angry if I disagreed with them.	1.
2.	When I was anxious, my parents ignored this.	2.
3.	If I was happy, my parents would be sarcastic and say things like: "What are you smiling at?"	3.
4.	If I was upset, my parents said things like: "I'll give you something to really cry about!"	4.
5.	My parents made me feel OK if I told them I didn't understand something difficult the first time.	5.
6.	If I was pleased because I had done well at school, my parents would say things like: "Don't get too confident".	6.
7.	If I said I couldn't do something, my parents would say things like: "You're being difficult on purpose".	7.
8.	My parents would understand and help me if I couldn't do something straight away.	8.
9.	My parents used to say things like: "Talking about worries just makes them worse".	9.
10.	If I couldn't do something however hard I tried, my parents told me I was lazy.	10.
11.	My parents would explode with anger if I made decisions without asking them first.	11.
12.	When I was miserable, my parents asked me what was upsetting me, so that they could help me.	12.
13.	If I couldn't solve a problem, my parents would say things like: "Don't be so stupid — even an idiot could do that!"	13.
14.	When I talked about my plans for the future, my parents listened to me and encouraged me.	14.

ICES continued

Finally, we would like to know how you saw your whole family when you were younger.

1. Please read the following four descriptions and rate how closely each one matches your experience of growing up in your family (up to the age of 17 years).

1 – not like my family
2 – a little bit like my family
3 – like my family some of the time
4 – like my family most of the time
5 – like my family all of the time

A. During my childhood, my parents were often not available, and I got little time or attention. I was often left to fend for myself or go round to friends/relatives. My parents often got angry if I asked for things. One or both of my parents may have had substance misuse difficulties, mental health problems or financial problems.

1 2 3 4 5

B. During my childhood, I felt listened to and cared for. My parents were interested in my thoughts and ideas and encouraged me to make my own decisions and choices. If things were difficult for me, they supported me and tried to comfort me.

1 2 3 4 5

C. During my childhood, everything in my family was perfect on the surface. However, my parents couldn't stand it if I showed I was upset, scared or angry. They expected me to put hide my feelings and get on with it.

1 2 3 4 5

D. During my childhood, it was important to be able to control your emotions and focus on achievement and success. “Behaving like a grown-up” was desirable.

1 2 3 4 5

I18. Behavioral Inhibition System and Behavioral Activation System Scales (BIS/BAS; Carver & White, 1994)

BIS/BAS Items and Instructions

Please rate how much you agree or disagree with the following statements, using the scale shown below:

1 = Strongly Disagree
2 = Disagree
3 = Agree
4 = Strongly Agree

1) If I think something unpleasant is going to happen, I usually get pretty "worked up."
2) When good things happen to me, it affects me strongly.
3) I worry about making mistakes.
4) When I want something, I usually go all-out to get it.
5) I'm always willing to try smething new if I think it will be fun.
6) Criticism or scolding hurts me quite a bit.
7) When I'm doing well at something, I love to keep at it.
8) When I see an opportunity for something I like, I get excited right away.
9) I feel pretty worried or upset when I think or know somebody is angry with me.
10) If I see a chance to get something I want, I move on it right away.
11) I often act on the spur of the moment.
12) Even if something bad is about to happen to me, I rarely experience fear or nervousness
13) I will often do things for no other reason than that they might be fun.
14) I go out of my way to get things I want.
15) I feel worried when I think I have done poorly at something.
16) I crave excitement and new sensations.
17) When I get something I want, I feel excited and energized.
18) I have very few fears compared to my friends.
19) When I go after something I use a "no holds barred" approach.
20) It would excite me to win a contest.

BIS = 1, 3, 6, 9, 12R, 15, 18R
BAS RR = 2, 7, 8, 17, 20
BAS DRIVE = 4, 10, 14, 19
BAS FS = 5, 11, 13, 16

I19. Sensitivity to Punishment (SP) and Sensitivity to Reward (SR) Questionnaire – Short Form (SPSRQ-S; Cooper & Gomez, 2008)

SPSRQ-S: Instructions and Items

Please answer YES or NO to the following questions.

1. Does the good prospect of obtaining money motivate you strongly to do some things?
2. Are you often afraid of new or unexpected situations?
3. Is it difficult for you to telephone someone you do not know?
4. Do you often do things to be praised?
5. Do you like being the center of attention at a party or a social meeting?
6. In tasks that you are not prepared for, do you attach great importance to the possibility of failure?
7. Are you easily discouraged in difficult situations?
8. When you are in a group, do you try to make your opinions the most intelligent or the funniest?
9. Whenever possible, do you avoid demonstrating your skills for fear of being embarrassed?
10. Do you often take the opportunity to pick up people you find attractive?
11. When you are with a group, do you have difficulties selecting a good topic to talk about?
12. Do you generally give preference to those activities that imply an immediate gain?
13. Do you like to compete and do everything you can to win?
14. Are you often worried by things that you said or did?
15. Do you, on a regular basis, think that you could do more things if it was not for your insecurity or fear?
16. Do you sometimes do things for quick gains?
17. Comparing yourself to people you know, are you afraid of many things?
18. Do you often find yourself worrying about things to the extent that performance in intellectual abilities is impaired?
19. Do you often refrain from doing something you like in order not to be rejected or disapproved of by others?
20. Would you like to be a socially powerful person?
21. Do you often refrain from doing something because of your fear of being embarrassed?
22. Do you like displaying your physical abilities even though this may involve danger?
23. Are you a shy person?
24. Whenever you can, do you avoid going to unknown places?

I20. Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988)

PANAS

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way right now, that is, at the present moment. Use the following scale to record your answers.

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

____ interested
____ distressed
____ excited
____ upset
____ strong
____ guilty
____ scared
____ hostile
____ enthusiastic
____ proud
____ irritable
____ alert
____ ashamed
____ inspired
____ nervous
____ determined
____ attentive
____ jittery
____ active
____ afraid