RANAWEERA, SUDHEERA T., M.A. Associations Among Borderline Personality Disorder Traits, Distress Tolerance, and Interpersonal Functioning. (2018)
Directed by Dr. Rosemery Nelson Gray. 64 pp.

The current study utilized a diverse sample of 231 female undergraduate students to explore if a task intended to produce distress impacts the interpersonal problem solving ability of participants higher in borderline personality disorder (BPD) traits more than those lower in BPD traits. Undergraduate participants were randomly assigned to a distressing task (Paced Auditory Serial Addition Task-Computerized; PASAT-C) or a control task. As a check on the manipulation, they were given a one-item State Distress Measure before and after participating in either the distressing task or control task. Additionally, all participants were given the Means End Problem Solving Task (MEPS), an outcome measure of interpersonal problem-solving ability. It was hypothesized that: 1) Higher BPD traits would be associated with poorer interpersonal problem solving, 2) Lower distress tolerance would be associated with poorer interpersonal problem solving, (3) The interaction of borderline traits and distressing condition would significantly predict poorer interpersonal problem solving. Unexpectedly, none of these hypotheses was confirmed; possible reasons are discussed.

ASSOCIATIONS AMONG BORDERLINE PERSONALITY DISORDER TRAITS, DISTRESS TOLERANCE, AND INTERPERSONAL FUNCTIONING

by

Sudheera T. Ranaweera

A Thesis Submitted to
the Faculty of The Graduate School at
The University of North Carolina at Greensboro
in Partial Fulfillment
of the Requirements for the Degree
Master of Arts

Greensboro
2018

Approved by

Dr. Rosemery Nelson Gray
Committee Chair

APPROVAL PAGE

This thesis written by SUDHEERA T. RANAWEERA has been approved by the following committee of the Faculty of The Graduate School at The University of North Carolina at Greensboro.

Committee Chair_____
Dr. Rosemery Nelson Gray

Committee Members_____
Dr. Levi Baker

_____
Dr. Blair Wisco

June 7, 2018
Date of Acceptance by Committee

June 7, 2018
Date of Final Oral Examination

TABLE OF CONTENTS

Page

LIST OF TABLES

Page

LIST OF FIGURES

Page

CHAPTER I

INTRODUCTION

The prevalence of borderline personality disorder (BPD) in the general population is estimated to be between 1.6 and 5.9% (APA, 2013), and approximately three-quarters of the individuals receiving a BPD diagnosis are women (APA, 2013). There are a number of characteristics that those with BPD may exhibit including, and not limited to, unstable emotional experiences and impairments in interpersonal problem solving. Virtually everyone has experienced distress or displayed deficits in interpersonal problem solving at some point. However, an individual with borderline personality disorder (BPD) may feel or act this way sporadically or constantly depending on the severity of their BPD. Consequently, understanding the potential interplay of the areas of distress tolerance and interpersonal problem solving in BPD and developing specialized treatments and interventions targeting these areas may have a life changing impact on sufferers.

Distress Tolerance

Distress tolerance has been defined as the ability to persist in goal-directed activity despite negative emotional states (e.g., uncomfortable bodily sensations, psychological stress). It has been considered a malleable personality trait, depending on the influence of other variables (e.g., therapeutic interventions; Leyro, Zvolensky, &

Bernstein, 2010; Lillis, Hayes, Bunting, & Masuda, 2009). High distress tolerance is associated with increased adaptive coping skills when enduring negative emotions and is associated with other psychological benefits as well (Bujarski, Norberg, & Copeland, 2012; Daughters et al., 2005; Marshall et al., 2008). Conversely, low distress tolerance has been found to be associated with increased substance misuse, antisocial behavior, personality disorders, non-suicidal self-injury, and binging/purging behavior (Cummings et al., 2013; Leyro et al, 2010). Conceptual models of distress tolerance suggest that the construct may be hierarchical in nature. Specifically, there may be one global "experiential distress tolerance" construct that incorporates other, specific lower-order constructs (see Figure 1; Zvolensky et al., 2010).

According to Linehan's (1993) proposed biosocial model, individuals with BPD are raised in an invalidating environment and also have a biological tendency to react emotionally. Low distress tolerance (i.e., perceiving distress as unbearable) is thought to contribute to emotion dysregulation. Individuals with low distress tolerance are characterized as using great effort to avoid negative emotion. Additionally, these individuals tend to employ quick methods to alleviate the negative emotions that they do experience. In the case that an individual with low distress tolerance is unable to alleviate their negative emotions, they typically report that their attention becomes absorbed by the presence of distressing emotions and their functioning becomes significantly disrupted by the experience of negative emotions (Simons & Gaher, 2005). Linehan's proposed model also proposes that distress tolerance is expected to influence affect regulation styles, such that extreme measures may be taken to alleviate distress,

such as self-harm, binge-eating, or substance abuse. Distress tolerance is theorized to result in individual differences in the appraisal of distress. This may result in an increase in perceived intensity and aversiveness of negative emotions (Simons & Gaher, 2005).

Distress tolerance has been conceptualized primarily through self-report scales and behavioral measures. In self-report measures, distress tolerance is depicted as a cognitive construct, consisting of the perceptions of individuals in regards to their perceived capacities to withstand aversive states. Individuals with borderline features also exhibit decreases in appraisal and acceptability (i.e., the belief that one's coping abilities are ineffective and inferior to others) as well as negative emotion regulation (Budner, 1962; Buhr & Dugas, 2002; McHugh et al., 2010; Rydel & Rosen, 1966; Simons & Gaher, 2005).

Researchers have postulated that individuals who have low self-reported distress tolerance also have decreases in tolerance as manifested behaviorally (Budner, 1962; Buhr & Dugas, 2002; McHugh et al., 2010; Rydel & Rosen, 1966; Simons & Gaher, 2005). Behavioral measures of distress tolerance aim to assess the ability of an individual to tolerate distress. Individuals are told to persist in a stressful task for as long as they can, and when they can no longer tolerate it, they are instructed (verbally or digitally) that they can discontinue the task. This assessment of distress tolerance is based on the length of time an individual is able to persist on a given stressful task. Typically participants are exposed to either a prolonged physical stressor or a prolonged mental stressor (Brown, Lejuez, Kahler, & Strong, 2002; Jones, Spindler, Jørgensen, & Zachariae, 2002; Leyro et al., 2010; McHugh et al., 2010). An example of a prolonged

mental stressor is the computerized Paced Auditory Serial Addition Task (PASAT-C; Lejuez, Kahler, & Brown, 2003). In this task, the participant is instructed to sum two numbers presented on the computer screen. After the participant provides a response, a new number appears and the participant must sum the new digit with the prior digit, ignoring the initial digit. As the task progresses, the latency decreases between digits, and errors made by the participant are followed by a noise blast. In addition to mental or cognitive stressors, physical stressors have also been used in past distress tolerance studies, such as the cold pressor task (Leyro et al., 2010). For this task, participants are instructed to keep their hand in below freezing water temperatures for as long as possible.

Research on distress tolerance and BPD is still in its infancy. Self report and behavioral distress tolerance tasks have been used examine distress tolerance and BPD, specifically through the use of the self-report Distress Tolerance Scale (Simons & Gaher, 2005), and the use of behavioral measures such as the PASAT-C and the Computerized Mirror Tracing Task (Anestis, Gratz, Bagge, & Tull, 2012; Bornovalova et al., 2011; Gratz, Rosenthal, Tull, Lejuez, & Gunderson, 2006; Iverson, Follette, Pistorello, & Fruzzetti, 2012). Past work has shown that in patients with BPD, those exhibiting low distress tolerance were at the greatest risk for engaging in chronic and medically serious suicidal behavior (Anestis, Gratz, Bagge, & Tull, 2012). In addition, researchers have found that negative emotionality and negative affect intensity were related to levels of BPD among those with low distress tolerance (Bornovalova et al., 2011). While a validated self- report measure of trait distress tolerance exists (Distress

Tolerance Scale [DTS]; Simons & Gaher, 2005), to date it has not been used extensively with a BPD sample.

Past work that has examined reactivity to interpersonal stressors suggest that individuals with BPD have greater self-reported emotion reactions to interpersonal stressors when compared to non-interpersonal stressors, as well as greater reactions compared to the reactions of other participants. Physiological studies have provided researchers and clinicians with more information on how BPD and interpersonal functioning may affect an individual physically. Individuals with BPD have been found to have different biological reactions to social stress, including greater cortical response to social stressors (Lazarus et al., 2014). Borderline personality features were positively associated with interpersonal dysfunction and greater skin conductance reactivity to a social rejection stressor (Gordon, Yiu, & Chapman, 2013).

Interpersonal Problem Solving

Style of interpersonal functioning is one key determinate for the diagnosis of BDP (Lazarus, Cheavens, Festa, & Rosenthal, 2014). For instance, individuals with BPD may engage in intense attempts to prevent real or imagined abandonment by the individuals in their lives. Additionally, individuals with BPD can alternate between idealizing and devaluing individuals ranging from family members and friends to romantic partners.

Interpersonal dysfunction in BPD has large focused on social cognition and interpersonal problem solving as specific areas of potential impairment. Social cognition focuses on the cognitive process involved in social interactions. Related to social cognition is empathetic accuracy, which refers to one's ability to correctly identify the

emotions of others. Studies have found that individuals with BPD are less accurate in recognizing facial expression of emotion displayed even if displayed at full intensity (neutral or negative), and have trouble discriminating among negative emotions, in particular fear and anger (Bland et al., 2004; Guitart-Masip et al., 2011; Levine et al., 1997; Unoka et al., 2011)

One factor influencing interpersonal functioning is the ability to respond flexibly to common problems encountered during social interactions. This ability involves functions related to Theory of Mind (i.e., the ability to acquire an accurate understanding of social context) as well as problem- solving skills needed to develop appropriate solutions to interpersonal difficulties. The means-end problem-solving task (MEPS; Platt, Spivak, & Bloom, 1971) has been used in several studies as an assessment of interpersonal problem solving in BPD. In this task, participants identify sequential steps or "means" necessary to satisfy a need or achieve a particular goal. The number of relevant means has been the most common MEPS score used in the literature (D'Zurilla, Nezu, & Maydeu-Olivares,2004). The results of past work suggests that BPD is associated with more passive social problem-solving means in individuals with diagnosed BPD (Kehrer & Linehan, 1996; Kremers, Spinhoven, Van der Does, & Van Dyck, 2006); and women with diagnosed BPD provide responses on the MEPS that are less relevant to the problem compared to healthy controls (Maurex et al., 2010). Further, in a sample of individuals with BPD who were chronically suicidal, researchers found that inappropriate means on the MEPS (i.e., substance abuse, lying, parasuicidal behavior) at four and eight months significantly predicted subsequent non suicidal self -

injury (i.e., parasuicidal) behaviors (Kehrer & Linehan, 1996). In addition, there was a reduced specificity of means on the MEPS in those who suffer from BPD in comparison to those with other personality disorders. Additionally, researchers have found that individuals who were high in BPD features (as opposed to BPD diagnosis) had a significant reduction in identifying relevant solutions to social problems and more inappropriate solutions following a negative emotion induction (Dixon-Gordon, Chapman, Lovasz, & Walters, 2011). The MEPS has been coded in a variety of ways by various researchers. Some researchers have coded for relevancy and irrelevancy by coding responses for relevant means or relevant steps towards a given solution on the MEPS (Dixon-Gordon et al., 2011; Kehrer & Linehan, 1996; Kremers, Spinhoven, Van der Does, & Van Dyck, 2006; Maurex et al., 2010). Of these researchers, a few have gone even further and coded relevant means or relevant steps into active (subject initiates the action) and passive (another individual initiates actions) steps or means (Dixon-Gordon et al., 2011; Kehrer & Linehan, 1996; Kremers, Spinhoven, Van der Does, & Van Dyck, 2006). Also, responses on the MEPS have been coded for inappropriate strategies or means conceptualized as dysfunctional behaviors such as substance use and aggression and positive self-regulation, which were self soothing behaviors done by the protagonist to regulate negative emotions (Dixon-Gordon et al., 2011; Kehrer & Linehan, 1996). At least one study has coded for overall effectiveness of MEPS responses (Maurex et al., 2010).

The MEPS has been completed both verbally and nonverbally. Specifically, some past work involved experimenters reading scenarios to the participants and

recording the verbal response that was given by participants (Dixon-Gordon et al., 2011;Maurex et al., 2010). Other work has involved a time constraint of 5 minutes for participants to type their responses to given MEPS scenarios (Jing, Madore, & Schacter, 2016; Madore & Schacter, 2014). The way in which the specific scenarios from the MEPS were selected for various studies appears to be random, although in a couple of studies, three scenarios were intentionally chosen after pilot work reflected that they were the most ecologically valid for the given samples (Kehrer & Linehan, 1996; Kremers, Spinhoven, Van der Does, & Van Dyck, 2006).

Theories Relating BPD to Interpersonal Disturbances

There are several theories that explain interpersonal disturbances in BPD. In one interpersonal theory of BPD, object relations theorists (e.g., Jacobson, 1964; Kernberg, 1980; Klein, 1957) posit that self and other representations form in early relationships, particularly between the infant/child and the primary caregiver. These cognitive representations play a central role in personality development. Some have argued that the emotions and expectations attached to these representations are critically important determinants of functioning in interpersonal relationships as dyads are linked by the affective valence of the representations (Lazarus et al., 2014; Westen, 1991).

Another way of understanding the interpersonal behavior associated with BPD is related to attachment theory. In this theory, children are thought to develop internal models of the self and others that guide their expectations and beliefs in relationship, particularly during stressful times (Bowlby, 1973). These internal models are

developed primarily based on their interactions with primary caregivers. Secure attachment with their caregiver enables a child to develop and maintain a coherent and positive sense of self and expectations for responsive and caring behavior from others (Lazarus et al., 2014). In contrast, BPD is typically characterized by disturbed attachment and representations of the self and others that are inconsistent and negative (Agrawal, Gunderson, Holmes, & Lyons-Ruth, 2004).Linehan's proposed biosocial model is an alternative account of the development of interpersonal problems in BPD (Linehan, 1993). According to this model, an underlying biological vulnerability to emotional dysregulation transacts with environmental stressors, notably an invalidating environment, and contributes to emotional and interpersonal impairments. The transactional interplay between these biological and social factors is believed to adversely influence the development of one's sense of self and other, disrupting the development of healthy relationships. In this model, disrupted (or less than ideal) relationships function as both a risk factor for the development of BPD and a consequence of the disorder (Lazarus et al., 2014).

Relationship Between Distress Tolerance and Interpersonal Problem Solving

Surprisingly, research has not investigated the potential interplay between distress tolerance and interpersonal problem solving in those with BPD. The logic for this interplay, as elaborated in a later section and examined in the present study, is as follows. Individuals who are higher in borderline traits have poorer distress tolerance and poorer interpersonal problem solving than those lower in borderline traits. Hence, when put in a situation creating distress, interpersonal problem solving further declines in

those higher in borderline traits. As an example, the PASAT task typically serves to distress individuals. For individuals higher in BPD traits who typically are poor in distress tolerance, this additional distress may lead to poorer manifestations of interpersonal problem solving.

In a relevant study by Dixon-Gordon and colleagues (2011), it was found that individuals who were high in BPD features had a significant reduction in identifying relevant solutions to social problems and more inappropriate solutions following negative emotion induction. The present study was not intended to replicate or systematically modify the Dixon-Gordon et al. (2011) study; it was independently conceptualized as a study investigating BPD features, distress tolerance, and interpersonal problem solving. However, there are some similarities to the study by Dixon-Gordon et al. (2011). In the Dixon-Gordon et al. study, the negative emotion induction was an imaginal task intended to simulate social rejection, whereas in the present study, the negative emotion induction was a laboratory task that was intended to produce distress. The present study used an actual distressing task presented in vivo in a laboratory setting (i.e., the PASAT-C), and not an imaginal social rejection stressor. Additionally, this present study used a larger sample size of females (n=231 vs. n=161) and both a state measure of distress and a trait measure of distress tolerance, allowing an examination of interpersonal problem solving as related to distress tolerance, as well as borderline traits. The inclusion of a trait measure of distress tolerance was important because it allowed the researchers to see if there is something over and above state distress that could explain differences in

interpersonal problem solving abilities of participants. Notably, Dixon Gordon's study did not utilize any measures of distress tolerance

Goal and Hypotheses

Some of the hallmark features of individuals with borderline personality disorder (BPD) include intolerance of distress and poor interpersonal problem solving. Research has suggested that individuals with borderline personality disorder have insufficient interpersonal skills and difficulty tolerating distress (Wolff et al., 2007). Two of the four behavioral skills taught in Dialectical Behavior Therapy (DBT, Linehan, 1980), the primary empirically substantiated treatment for individuals with BPD, include distress tolerance and interpersonal effectiveness because these are notable areas of impairment for those with BPD. While studies have linked distress tolerance and poor interpersonal problem solving to BPD, to date few studies have explored the interplay between these facets. The logic for this interplay, as examined in the present study, is as follows. The PASAT task, used in the present study, typically serves to distress individuals. For individuals higher in BPD traits who typically are poor in distress tolerance, this additional distress may lead to poorer interpersonal problem solving.

The present study attempted to investigate if a task intended to produce distress impacted the interpersonal problem solving ability of participants higher in BPD traits more than those lower in BPD traits. This study incidentally extended past research (Dixon-Gordon et al., 2011) that has shown that borderlines are generally worse at the MEPS when a negative state emotion is induced. These extensions include using an actual controlled laboratory task to induce distress, using a larger sample size, and

including a state measure of distress and a trait measure of distress tolerance. The use of a distressing lab task that involved working memory could add to the types of specific stressors that are impairing (i.e., social rejection) to interpersonal problem solving in those with BPD features. It was hypothesized that: 1) Higher BPD traits would be associated with poorer interpersonal problem solving, 2) Lower distress tolerance would be associated with poorer interpersonal problem solving and, 3) The interaction of higher borderline traits and distressing condition would significantly predict poorer interpersonal problem solving, such that individuals with higher borderline personality traits in the distressing condition would have poorer interpersonal problem solving (as reflected on the MEPS) than those with higher borderline personality traits who are not in the distressing condition.

CHAPTER II

METHOD

Participants

There were a total of 263 participants who took part in this study. Of this number, data from 32 participants had to be discarded due to research assistants noticing the participants actively being off task during the study (e.g., sounds of cell phone use) or finishing the study earlier (15-20 minutes) than is typical (30-45 minutes). The final sample included 231 undergraduate female students (*M*age =18.7, *SD*age = 1.39; 40.9% African American, 40.0% White/Caucasian, 8.3% Asian, 2.2% Hispanic or Latino, 3.5% Other) who were recruited from the University of North Carolina at Greensboro introductory psychology participant pool over one semester of data collection. Of these 231 undergraduates, 10 did not complete the trait distress tolerance measure. The decision to recruit only females for this study is a reflection of the fact that 75% of BPD diagnoses occur in females (*DSM-5*; APA, 2013). The study was open to females who signed up for the study through the psychology participant recruitment site SONA, as well as to female participants who were invited to sign up based on higher borderline trait scores, as described below.

Materials

Wisconsin Personality Disorders Inventory-Borderline Features. The WISPI-BOR (contains 18 self-report items measuring borderline traits (Appendix B; Klein et al., 1993). Items are self-descriptive and are rated on a 10-point Likert scale ranging from *never/not at all* to *always/extremely.* The WISPI-BOR was used to identify individuals in mass screening who score .5 standard deviations above the mean on the Borderline subscale relative to the current mass screening sample. All the WISPI-BOR raw scores were averaged, the standard deviation was calculated, and email invitations were sent to those who scored at least .5 standard deviations above the mean for that semester (as approved by the IRB). These individuals were invited by e-mail to participate in the study in order to oversample those who are higher in borderline personality disorder traits relative to the average from this student sample.

Personality Assessment Inventory-Borderline Features. The Personality Assessment Inventory-Borderline Features (PAI-BOR; Appendix C; Morey, 1991) is a 24-item self-report measure of borderline personality disorder traits. These items are rated on a 4-point scale ranging from 1 (*false*) to 4 (*very true*). This measure provides subscales for 4 symptom clusters: identity problems, affective instability, negative relationships, and self- harm. The identity problems subscale measures fears of abandonment and malleability of self- image. The affective instability measures sudden shifts in mood and intensity of emotion. The negative relationship subscale focuses on feelings of betrayal, loneliness, and instability in relationships, whereas the self- harm subscale focuses on impulsive and reckless behavior. PAI-BOR scores 1-4 were

converted to scores 0-3 so that the norms for college and clinical samples could be used. The PAI-BOR has been shown to have a test-retest reliability coefficient of .73 and has been demonstrated to have good internal consistency with an alpha coefficient of .84 (Trull, 1995). The PAI-BOR is considered to be a gold standard questionnaire measure of borderline traits. The Personality Assessment Inventory Professional Manual provides descriptive statistics for the PAI-BOR in a college sample (n = 1051, M=22.93, SD=10.33) (Morey, 1991). Trull (1995) suggests using PAI-BOR scores of 38 or higher as indicative of the possible presence of borderline personality features. The PAI-BOR was administered only at the time of the study because it is copyrighted and each administration incurs a cost. Of the final sample, 73.3% were above the mean (M=29.2,SD=10.9) PAI-BOR score of a typical college sample, and 19.4% met the clinically significant raw score of 38 on the PAI-BOR recommended by Trull (1995).

Distress Tolerance Scale. The Distress Tolerance Scale (DTS; Appendix D; Simons & Gaher, 2005) is a 15-item scale used as a trait measure to assess an individual's perceived capacity to withstand negative emotional events. Individuals are asked to respond on a 5-point Likert scale (1 being *strongly agree* and 5 being *strongly disagree*) about how much a given statement describes their beliefs about feeling distressed or upset. This scale is divided into four subscales that reflect different aspects of distress tolerance: tolerance, appraisal, absorption, and regulation. The total score was calculated by adding up the raw scores; higher scores indicated higher tolerance for distress. Sample items included: "When I feel distressed or upset, I must do something about it immediately" and "When I feel distress or upset, I cannot help but concentrate

on how bad the distress actually feels." The DTS has been shown to be reliable in a college-student population with adequate test-re-retest reliability over a 6-month interval (α = 0.61; Simons & Gaher, 2005). There is evidence to suggest that the DTS has good convergent and discriminant validity. The DTS is negatively associated with measures of affective distress (i.e., negative affectivity, $r = -.59$) and dysregulation (i.e., reliability, $r=-.51$) and positively correlated with positive affectivity (r = .26; Simons & Gaher, 2005).

State Distress Measure. This was a pre-post one-item measure that was created to assess the distress level of the PASAT-C or the control task (Appendix E). This measure asked, "How distressed do you currently feel?" Responses for this item ranged from 1 (*Not Distressed*) to 10 (*Very Distressed*). This measure was a check on the manipulation that the experimental condition (PASAT-C) produced more distress than the control condition (control task).

Paced Auditory Serial Addition Task Computerized. A computerized version of the Paced Auditory Serial Addition Test (PASAT-C; Appendix F; Gronwall, 1974) was used in this study. During the PASAT-C, participants were presented with a series numbers, and instructed to add the number immediately presented to them to the number just previously presented, providing what they believe to be the correct sum of the two numbers before they were exposed to the next number in the series. For example, if the participant saw "3, "and then "2", then she would type "5." If the next number presented was "4", then the participant would respond "6." Participants worked through three levels. Each level increased the speed of digit presentation. In the first level, the digits

were presented once every 3 seconds for 3 minutes. In the second level, the digits were presented once every 2 seconds for 5 minutes. In the third level, the digits were presented once every 1.5 seconds for 10 minutes. The last level (3) provided an escape button from the task. Once participants started with level 1, the pacing was automatic and not under participants' control (with the exception of the provided quit button during level 3). Every time a participant answered a question wrong, a 64-decibel noise blast occurred that lasted for 100 milliseconds. This was adjusted from the proposed 85-decibel noise blast due to the fact that, as measured on the application dB meter, the lab computers available for use could only go up to 65-decibels of noise through the speakers. Graduate students and research assistants from the lab listened to this sound and determined the sound was in fact distressing. However, there was a lack of proper assessment of decibel level through the headphones. The first level was used to assess overall performance, and the time spent in milliseconds (which was converted to seconds) on the third level was used to assess distress tolerance (as adapted from Winward, Bekman, Hanson, Lejuez, & Brown, 2014). Participants who completed the whole task had two tickets entered into a raffle. Participants who did not complete the whole task but did any portion of it received one raffle ticket. At the end of data collection, four raffle tickets were drawn and winners were notified via email. Participants were given these instructions prior to starting the PASAT. One outcome measure was the number of correct answers per participant (PASAT Correct; M=142, SD=57.7) across all three levels, and another outcome measure was how long in seconds participants persisted during the third level (PASAT Quit; M= 17.4 SD=54.0).

Control Task. This task was identical to the PASAT task except that participants did not hear any noise blast for incorrect answers. Those in the control condition also had the opportunity to be awarded one or two raffle tickets, depending on how far they progressed. There were four $25 prizes awarded, two for those in PASAT condition and two for those in control condition.

Means Ends Problem Solving Task (MEPS). The Means Ends Problem Solving Task (MEPS; Appendix G; Platt & Spivack, 1975) presents participants with a series of hypothetical social problems encountered by fictional individuals, such as meeting new people or handling a situation at work, along with solutions to those problems. The participants were asked to generate steps or means that lead to the problem solutions. It has been described by its authors as a measure of means ends thinking, which has three components: (a) the ability to conceptualize the sequential steps or "means" that are necessary to satisfy a need or achieve a particular goal, (b) the ability to anticipate obstacles to goal attainment, and (c) the ability to appreciate that successful problem solving takes time or that appropriate timing is important for successful solution implementation. All research participants were presented with the same three hypothetical interpersonal problems in the same order, consisting of incomplete stories that have only a beginning and an ending. The problems presented involved friendships and relationships (See Appendix G). These problems were selected due to their relevance to our sample. Undergraduates in our lab assessed all seven of the MEPS scenarios and rated which three were most relevant to them and their college aged peers. Participants were provided with the following instructions: "You will be presented

with a number of different problem situations. You will be told the beginning and the end of the situation. Your task is to come up with a plan of the ideal strategy to solve each of these problems so that the ending described for each situations is reached" (adapted from Maccallum & Bryant, 2010). The whole responses were coded for success (1 poor success to 5 excellent success). Sentences within the whole response were coded for relevance (irrelevant and relevant), and active or passive (relies on actions of others). Relevance and active-passive scores were decimals calculated by adding the number of sentences in a participant's response that are relevant/irrelevant and active/passive over the total number of complete sentences in the participant's response. Sentences could not be both relevant and irrelevant. Sentences could be both active and passive (actions of main character and others) and counted for both active and passive scores. Some sentences were neither active nor passive (i.e. a thought or feeling). The coders did code responses even if it were just sentence fragments if that was all that the participant provided. However, if a participant responded with a whole paragraph and the last sentence was incomplete, the incomplete sentence was not coded while everything else was coded. In the case that a participant had a mixture of complete sentences and fragments, then only the complete sentences were coded. The participants had 5 minutes to type each response to the hypothetical scenarios. The computer did not advance to the next scenario until 5 minutes have elapsed.

Of the data collected, 5% were coded and scored for practice by two independent research assistants, who were blind to the experimental conditions. Interrater agreement was calculated for these practice trials with discussion allowed

between assistants to achieve greater reliability. The two assistants coded the remainder of the data independently, and reliability was checked weekly during the coding process. If the reliabilities for any of the scores fell below 0.70, meetings were held to discuss how the coding was being done and the protocol was further refined. The scores of the participants across each of the three hypothetical scenarios by the two coders were averaged so that each participant had a total success score, a total relevancy score, a total irrelevancy score, a total active score, and a total passive score. Two coders coded the MEPS scenarios independently; Table 1(κ = 0.683-0.984) depicts the kappa statistic for all the coded content (Table 1 and all subsequent tables are in Appendix A). Overall, interpersonal problem solving overall (IPSSO) was calculated by averaging success score, relevant score, and active score across three scenarios. A participant's overall interpersonal problem solving score was conceptualized as reflecting their overall interpersonal problem solving ability.

Procedure

In a laboratory research setting, each participant was assigned to one of four small rooms that contained a table, computer, and chair. Data from up to four participants could be collected simultaneously, but there was no planned interaction among the participants. Using a computer, participants first completed demographics (age, race) and the PAI-BOR, followed by the Distress Tolerance scale. Then participants completed the one item State Distress Measure (pre) and were randomly assigned through the Qualtrics software system to either do the PASAT-C or the control task. After completing the PASAT-C or the control task, participants again completed the one item State Distress Measure (post).

Finally, all the participants completed the three MEPS situations in the same order. Participants were thanked and awarded SONA credit. The raffle was real, and four $25 prizes were awarded, two for those in PASAT condition and two for those in the control condition.

CHAPTER III

RESULTS

Preliminary Analyses

Descriptive statistics for all major study variables are found in Table 2 with the conditions combined, and in Table 3 for the conditions separately. Cronbach's alpha was calculated in order to examine internal consistency for the PAI-BOR measure and the DTS measure; the alphas were within the acceptable to excellent range. One item on the Trait DT scale "I can tolerate being upset or distressed as well as most people" was systematically missing due to experimenter error. Without this item, the Cronbach's alpha was .91. Due to the high level of internal consistency between items, the mean of each participant's distress tolerance items was used as the score on the missing item.

First, zero order correlations were conducted to examine the associations between all the study variables. Next, t-tests for independent samples were conducted to determine if there are significant differences between the participants in the explosion versus the no explosion condition. Descriptive statistics for the t tests equality of means is shown in Table 3. The participants did not differ in any significant way on any study variables, with the exception on the post state distress measure ($p <$. 05), where surprisingly, more distress was reported following the control condition than the explosion condition. Finally, hierarchical multiple linear regressions were run to investigate the potential contribution of BPD traits, trait scores were 1.35 points lower than post state distress

scores (95% CI [-1.737 and -0.963]). Finally, a paired samples t test was run in order to compare the pre and post state distress scores for the sample. There was a significant average difference between pre state distress and post-state distress (t231 = -10.256, p < 0.001). On average, pre state distress scores were 1.46 points lower than post state distress scores (95% CI [-1.744 and -1.182]).

Predicting Interpersonal Problem Solving. Three hierarchal multiple regressions (See Table 5), as approved in the thesis proposal, were performed to examine the unique contributions of BPD traits, trait distress tolerance, condition, and the interaction in the explanation of overall interpersonal problem solving.

Hypothesis 1. Hypothesis one was that higher borderline traits would be associated with lower interpersonal problem solving. Contrary to expectations, there was not a significant relationship between borderline traits and overall interpersonal problem solving (β = -.002, p= -.764, ΔR^2 =0.00).

Hypothesis 2. Hypothesis two was that lower distress tolerance would be associated with poorer interpersonal problem solving. Contrary to expectation, there was not a significant relationship between trait distress tolerance and interpersonal problem solving (**β** = .005, p =.363, ΔR^2 =.00).

Hypothesis 3. Hypothesis three was that the interaction of borderline traits and distressing condition would significantly predict poorer interpersonal problem solving. Contrary to expectations, this interaction did not significantly predict poorer overall interpersonal problem solving (β = -.011, p = .251, ΔR^2 =. 01).

Post Hoc Analyses

Post hoc analyses were done in order to further explore the data. First, the interpersonal problem solving scores per scenario were calculated for each participant. There were no differences in these scores between the experimental group and the control group on any of the three scenarios as evaluated by t-tests for independent samples (Table 3). Additionally, a correlation was done among the various components (active average, relevant average, and success average) of the IPPSO. All averages were calculated across the three scenarios that participants responded to and were all moderately to strongly correlated with one another.

The active average score and the relevant average score were strongly correlated, r (229) = .80, $p < .001$. The active average score and the success average score were moderately correlated, r (229) = .39, $p < .001$. Also, the relevant average score and the success average score were moderately correlated, r (229) = .42, $p < .001$. Therefore, the discrete success, relevant, irrelevant, passive, and active averages were examined across participants. There were no differences in these scores between the experimental group and the control group, as evaluated by t-tests for independent samples (Table 3). Additionally, all the scenarios answered by participants were coded 1 or 0 for effort or no effort, and were coded 1 or 0 for specificity of means (SOM) or lack of specificity of means. These codes were determined based on the participant's success scores and relevant scores. Specifically if a participant scored at or above the mean success score of the overall sample (Msuccess = 2.28) and at or above the mean relevant score of the overall sample (Mrelevant = 0.69), she was given a score of 1 for effort and SOM,

respectively. There were no significant differences in these scores between the experimental group and the control group, as evaluated by t-tests for independent samples (Table 3). Finally, a correlation was done between the PAI BOR scores and State Difference in distress regardless of experimental condition. Arbitrarily, to be considered a notable increase in distress, the State Difference in DT score had to be a positive difference of two or more units on the 10-point scale; 108 participants showed this notable increase in distress. This correlation showed a modest relationship between the PAI-BOR scores and reactivity to PASAT, $r =$. 17, $n = 108$, $p = .070$.

Other researchers have scored the MEPS in several different ways (Appendix K). These different methods were examined as outcomes with regards to the main study hypotheses (Table 6-7). Hierarchical linear regressions examined the effects of BPD traits, experimental condition, and their interaction on MEPS overall success, relevant and irrelevant sentences, active and passive sentences, effort, and specificity of means. No significant findings emerged. Finally, because the PAI BOR scores and trait distress tolerance were significantly correlated for participants in each condition, an additional relationship was examined investigating whether trait distress tolerance and distressing condition would significantly predict poorer interpersonal problem solving. This regression was run without the inclusion of the PAI-BOR scores in order to see if trait distress tolerance and its interaction with distressing condition helped account for the variance in participants' interpersonal problem solving. We found this interaction did not significantly predict poorer overall interpersonal problem solving ($\beta = .011$, $p =.159$,

ΔR^2 =. 02). In an effort to be thorough, all hypotheses were tested with multiple methods of scoring the MEPS as outcome variables.

CHAPTER IV

DISCUSSION

It has been proposed (Linehan, 1993) and found (Lazarus et al., 2014) that the interpersonal skills of those with BPD are deficient. Additionally, it has been proposed (Linehan, 1993) and found (e.g., Gratz et al., 2006) that BPD is associated with lower distress tolerance. The goal of this study was to examine if the interpersonal problem-solving skills of those with higher levels of BPD traits become worse under distressing conditions, more so than the interpersonal problem-solving skills of those with lower levels of BPD traits. Previous research using the Means-End Problem Solving Task (MEPS) has largely shown that BPD is associated with more passive and less relevant interpersonal problem solving means (Kehrer & Linehan, 1996; Kremers, Spinhoven, Van der Does, & Van Dyck, 2006; Maurex et al., 2010). Additionally, Dixon-Gordon and colleagues (2011) found that those with higher levels of BPD were generally worse on the MEPS task, especially after a negative mood induction produced by imaginal rejection. No previous study has examined the relationship between distress induced by an in vivo laboratory task, that is, the PASAT task, and interpersonal problem solving, in relation to levels of BPD traits. The use of the PASAT task allowed us to investigate if there are specific stressors beyond social rejection, such as distress from an in vivo

working memory distress tolerance task, which impacts the interpersonal functioning of those with BPD. In addition, no prior study related to this research question utilized a state measure of distress trait, a measure of distress tolerance, and a large sample size.

Specifically, this thesis examined the following three research questions: (1) Does the degree of BPD traits predict interpersonal problem solving ability? (2) Does trait distress tolerance predict interpersonal problem solving ability? and (3) Does the interaction between degree of BPD traits and condition predict interpersonal problem solving ability? In total, three hypotheses were tested in order to investigate these questions. An additional post hoc hypothesis was tested in order to investigate the question: Does the interaction between degree of trait distress tolerance and condition predict interpersonal problem solving ability?

BPD Traits and Interpersonal Problem Solving

First, it was hypothesized that those participants with higher BPD traits would have lower interpersonal problem solving abilities. This was not found to be the case. There was not a significant relationship between BPD traits and lower interpersonal problem solving scores as measured in a variety of ways, using coding of response to three MEPS scenarios. Past work utilizing the MEPS with regards to BPD had samples of passive and actively suicidal women in inpatient and outpatient settings diagnosed with BPD (Kehrer & Linehan, 1996; Kremers, Spinhoven, Van der Does, & Van Dyck, 2006; Maurex et al., 2010). Conversely, the sample used in this study consisted of college females who were not diagnosed with BPD meaning

that this sample differed significantly from the samples used by past researchers. Due to the fact that our sample consisted of female college students with varying levels of BPD features, it is possible that these participants were higher functioning with regards to interpersonal problem solving than those of the other studies mentioned.

Distress Tolerance and Interpersonal Problem Solving

It was hypothesized that participants with lower (state and trait) distress tolerance would have lower interpersonal problem solving abilities. This was not found to be true. There was not a significant relationship between trait distress tolerance and lower interpersonal problem solving scores. This may be because the participants did not complete the MEPS task prior to and after the experimental condition (as in Dixon-Gordon's study), which would have allowed for the researchers to better and more specifically assess if there was a relationship between trait distress tolerance and lower interpersonal problem solving. The study done by Dixon-Gordan and colleagues did use a college-aged sample that was not diagnosed with BPD. The reason our results may have differed from that study could be because a working memory task intended to distress individuals did not have the same impact on individuals as an imaginal social rejection task. Individuals in college are used to experiencing distress related to tasks in the college setting such as studying for an exam in a difficult class or working to meet deadlines for various classes. This may have made the PASAT task easier to handle than a social rejection scenario would have been.

BPD Traits, Distress Tolerance, and Interpersonal Problem Solving

Additionally, it was hypothesized that the interaction of borderline traits and distressing condition would significantly predict poorer interpersonal problem solving. Unexpectedly, there was not a significant relationship between this interaction and interpersonal problem solving abilities. An additional post hoc hypothesis tested whether the interaction of trait distress tolerance and distressing conditioning significantly predicted poorer interpersonal problem solving. There was not a significant relationship between the interaction and interpersonal problem solving abilities.

There may be several reasons why these results emerged, one being that the experimental condition and control condition were not sufficiently different. Participants were significantly distressed following the task, in both the explosion and the control condition. This may be because the PASAT involves rapid math computations and holding information in working memory, which may be distressing by itself to a college-aged sample, regardless of whether or not they experienced an explosion noise. Additionally, the explosion sound may have been viewed by participants in the experimental condition as corrective feedback that encouraged them to learn and persist since participants in the explosion condition had more PASAT problems correct and took longer to quit on the third level of the PASAT.

Post Hoc Analyses

Finally, post hoc analyses were done, all of which did not have any significant results. Specifically, we thought breaking down the IPSSO would allow for any differences to emerge. However, this was not the case. This may be because MEPS was

scored in a very detailed method in order to capture as much detail as possible. In that way, the IPSSO was successful in capturing interpersonal solving ability of participants and breaking this score down further did not provide any more detailed information.

Strengths

There are several notable strengths of this study. One was the large sample size that was gathered, allowing the study to be very high in power. Another strength of this study was the dimensional approach that was used to assess for borderline traits. This allowed us to capture individuals who were higher in BPD traits rather those who met the minimum of five of nine diagnostic criteria required for a diagnosis of BPD. This dimensional approach likely allowed us to include more individuals who nonetheless were high in borderline features than if we had recruited only individuals categorically with a BPD diagnosis. In fact, our recruitment methods resulted in approximately 73.3% of the sample that had PAI-BOR scores above the normative mean PAI-BOR score for college students. Additionally, use of the MEPS task, despite being self reported problem solving, was used to assess interpersonal problem solving which allowed us to obtain a rich qualitative data set that could be reliably coded into different types of quantitative data.

Limitations

The current study also had several limitations, which may help explain why all the results were contrary to our expectations. This study was limited in that the sample consisted entirely of individuals who were in college, who, despite their relatively high borderline scores, are likely to be a higher functioning group.

Additionally, the lack of assessment of sound decibel level through the study headphones used by the study's participants was a limitation of this study. Also, although the difference in pre-post state distress was higher in the explosion condition in comparison to the no explosion condition, this was not a significant difference ($p >$ .05), suggesting only a modest difference between the experimental (PASAT with explosion) and control (PASAT without explosion) conditions. Furthermore, this study involved participants from a college sample rather than individuals with diagnosed BPD in inpatient and outpatient settings as in several other studies.

Previous work examining the MEPS in relation to samples that have individuals with BPD traits or a BPD diagnosis have coded the MEPS in various ways. For instance, Lehrer and Linehan (1996) used the MEPS in their work with chronically parasuicidal outpatient who met the criteria for BPD. Dixon-Gordon also used the MEPS in a study; however, in a sample of college students who had varying levels of BPD traits. In both of these studies, the MEPS were coded for the following means: irrelevant, relevant, active, passive, and inappropriate. Inappropriate means were defined as behaviors that were performed by the protagonist that were maladaptive. Examples included lying, aggression, and substance use. These inappropriate means were further coded for suicidal and nonsuicidal. Additionally, positive self-regulation, defined as "self-soothing behaviors engaged in by the protagonist to deal with negative affect", was coded. Another study, conducted by Maurex and colleagues (2010), used the MEPS with a sample of women who had a diagnosis of BPD (in addition to at least 2 past suicide attempts) and healthy controls, coding for relevant means and effectiveness. Finally, in a study by Kremers and

colleagues (2006) with psychiatric inpatients with BPD and orthopedic patients the MEPS was coded for the following means: irrelevant, relevant, active, and passive. The present study coded for the MEPS in various ways. These included coding for success, relevant means, irrelevant means, active means, passive means, overall interpersonal problem solving (relevant +active + success), effort, and specificity of means. The way that the MEPS scenarios were coded in this study may have impacted the results. Specifically, positive self-regulation was not coded for in this study although it has been coded in previous studies; however, success was coded for this study. While the way in which past researchers have defined positive self regulation in regards to responses to the MEPS is not identical to what success meant in this study, there are similarities. Specifically, positive self-regulation involves the subject taking steps to regulate negative emotions. Success in this study was conceptualized as the degree of effort the subject put into reaching the solution. It would be challenging if not impossible for a participant to receive a high success score that did not involve some level of positive self-regulation. However, had the MEPS responses been coded specifically for positive self-regulation, there may have been some differences found. Additionally, participants' responses to various MEPS scenarios have often been recorded in past work (Dixon-Gordon et al., 2011; Maurex et al., 2010). This study had the participant's type out their responses. In regards to coding, there were instances of incomplete sentences that were not coded in the present coding system. Since the medium by which participants responded to the MEPS differed in this study from some previous work, the quality of what was captured may have differed and impacted the results that were found.

Future Directions

The study of the constructs of BPD traits, distress tolerance, and interpersonal problem solving is important for both clinical and theoretical applications. Additional research is important in helping further the understanding how these constructs are related. The current study incidentally extended work that was previously conducted by Dixon-Gordon and colleagues (year). They found evidence to support that social rejection impacts the interpersonal problem solving ability of individuals with BPD features. There was no evidence found in the present study to support that distress, as induced by the PASAT, impacts the interpersonal problem solving ability of individuals with BPD traits. This may suggest that the way that negative emotionality is induced can differentially impact interpersonal problem solving in these individuals. Specifically, an imaginal social rejection manipulation may impair individuals to a greater extent than distress induced by an in vivo working memory task. Unlike Dixon-Gordon and colleagues (year), this study did not involve participants responding to interpersonal problem solving scenarios prior to and after the manipulation. The inclusion of pre and post assessment would have strengthened this study and served as a check on the manipulation that was used.

Future studies should consider using a stronger or different manipulation to produce distress. In this study, the experimental and control conditions were both found to be distressing for participants which meant that the conditions were too similar; specifically, the experimental and control manipulations differed only by one aspect, which was the noise blast. Additionally, the type of distress induced was more physical and mental rather than interpersonal or social in nature. This may help explain why

participants' subsequent performance on the MEPS did not seem to be influenced by the preceding distressing task that was used in this study.

In future studies, it may be valuable to include more than three MEPS scenarios, since past work has found that increasing the number of scenarios given to participants increased the predictive power of MEPS procedure that was utilized (Kehrer & Linehan, 1996). Participants in this study could not move on to the next MEPS scenario until they spent 5 minutes on a given scenario. Future studies could give participants no time limit in responding to a scenario, allowing the participant to proceed onwards after writing as much or as little as they desired to. This modification would allow additional outcome measures, that is, time spent in producing responses, as well as the quality and quantity of responses for those higher in versus lower in BPD traits. Alternatively, participants could verbally respond to the MEPS scenarios presented as done in past studies (Dixon-Gordon et al., 2011; Maurex et al., 2010). This may aid in increasing the quality and the quantity of the responses that participants give. Additionally, future studies could better tailor the MEPS scenarios to college-aged students; for example, scenarios that deal with moving into a new dorm or getting into a conflict with a classmate. Finally, it may be important for future studies to include psychophysiological measures to further strengthen the validity of any distress induction.

Conclusion

In summary, the current study contributed to the literature by utilizing a large, subclinical sample of college-aged students to examine the association between BPD traits, distress tolerance, and interpersonal problem solving. This study contained both

state and trait measures of distress tolerance. There was evidence to support that higher BPD traits were associated with lower distress tolerance in both the explosion and no explosion condition. In fact, both the explosion and no explosion conditions were distressing for participants. There was not sufficient evidence to support the hypothesis that a distressing working memory task impacts the interpersonal problem solving ability of participants higher in borderline personality disorder (BPD) traits more than those lower in BPD traits.

REFERENCES

Agrawal, H. R., Gunderson, J., Holmes, B.M., & Lyons-Ruth, K. (2004). Attachment studies with borderline patients: A review. Harvard Review of Psychiatry, 12, 94–104.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (DSM-5®)*. American Psychiatric Publication.

Anderson, R. J., Goddard, L., & Powell, J. H. (2009). Social problem-solving processes and mood in college students: An examination of self-report and performance-based approaches. *Cognitive Therapy and Research*, *33*(2), 175-186.

Anestis, M. D., Gratz, K. L., Bagge, C. L., & Tull, M. T. (2012). The interactive role of distress tolerance and borderline personality disorder in suicide attempts among substance users in residential treatment. *Comprehensive Psychiatry*, (8), 1208.

Baumeister RF. The self. In: Gilbert DT, Fiske ST, Gardner L, editors. The Handbook of Social Psychology. Vol. 1. McGraw-Hill; New York, NY: 1998. 680–740.

Bland, A. R., Williams, C. A., Scharer, K., & Manning, S. (2004). Emotion processing in Borderline Personality Disorders. *Issues in Mental Health Nursing*, 25, 655-67.

Brown, R. A., Lejuez, C. W., Kahler, C. W., & Strong, D. R. (2002). Distress tolerance and duration of past smoking cessation attempts. *Journal of Abnormal Psychology*, *111*(1), 180-185.

Budner, S. (1962). Intolerance of ambiguity as a personality variable. *Journal of personality*.

Buhr, K., & Dugas, M. J. (2002). The intolerance of uncertainty scale: Psychometric properties of the English version. *Behaviour Research and Therapy*, *40*(8), 931-945.

Bornovalova, M. A., Gratz, K. L., Daughters, S. B., Nick, B., Delany-Brumsey, A., Lynch, T. R., & Lejuez, C. (2008). A multimodal assessment of the relationship between emotion dysregulation and borderline personality disorder among inner-city substance users in residential treatment. *Journal Of Psychiatric Research*, 42717-726.

Bornovalova, M. A., Matusiewicz, A., & Rojas, E. (2011). Distress tolerance moderates the relationship between negative affect intensity with borderline personality disorder levels. *Comprehensive Psychiatry*, (6), 744.

Bowlby, J. (1973). Attachment and loss: Vol. 2: Separation, anxiety, and anger. NewYork: Basic Books.

Bujarski, S. J., Norberg, M. M., & Copeland, J. (2012). The association between distress tolerance and cannabis use-related problems: the mediating and moderating roles of coping motives and gender. *Addictive Behaviors*, *37*(10), 1181–4.

Chang, E. C., D'Zurilla, T. J., & Sanna, L. J. (2004). *Social problem solving: Theory, research, and training*. American Psychological Association.

Chapman, A. L., Dixon-Gordon, K. L., Layden, B. K., & Walters, K. N. (2010). Borderline personality features moderate the effect of a fear induction on impulsivity. *Personality Disorders: Theory, Research, and Treatment*, 1, 139 – 152.

Cohen, J., Cohen, P., West, S.G., & Aiken, L.S. (2003). Applied multiple regression/correlation analysis in the behavioral sciences (Third Edition).

Cummings, J. R., Bornovalova, M. A., Ojanen, T., Hunt, E., MacPherson, L., & Lejuez, C. (2013). Time Doesn't Change Everything: The Longitudinal Course of Distress Tolerance and its Relationship with Externalizing and Internalizing Symptoms During Early Adolescence. *Journal of Abnormal Child Psychology*, *41*(5), 735– 748.

Das, P., Calhoun, V., & Malhi, G. S. (2014). Bipolar and borderline patients display differential patterns of functional connectivity among resting state networks. *Neuroimage*, 73.

Daughters, S. B., Lejuez, C. W., Strong, D. R., Brown, R. A., Breen, R. B., & Lesieur, H. R. (2005). The relationship among negative affect, distress tolerance, and length of gambling abstinence attempt. *Journal of gambling studies / co-sponsored by the National Council on Problem Gambling and Institute for the Study of Gambling and Commercial Gaming*, *21*(4), 363–78

Daughters, S.B., Sargeant, M., Gratz, K.L, Bornovalova, M.A., & Lejuez, C.W. (2008). The relationship between distress tolerance and antisocial personality disorder among male residential treatment seeking inner-city substance users. *Journal of Personality Disorders*, 22(5), 509-524.

Dixon-Gordon K, Chapman A, Lovasz, N, & Walters K (2011). Too upset to think: the interplay of borderline personality features, negative emotions, and social problem solving in the laboratory. *Personality Disorders: Theory, Research, and Treatment*. 2:243–260.

Dixon-Gordon, K. L., Yiu, A., & Chapman, A. L. (2013). Borderline personality features and emotional reactivity: The mediating role of interpersonal vulnerabilities. *Journal of Behavior Therapy and Experimental Psychiatry*, (2). 271.

Donegan, N. H., Sanislow, C. A., Blumberg, H. P., Fulbright, R. K., Lacadie, C., & Skudlarski, P. (2003). Amygdala hyperreactivity in borderline personality disorder: Implications for emotional dysregulation. *Biological Psychiatry*, 54(11), 1284-1293.

D'Zurilla, T. J., Nezu, A. M., & Maydeu-Olivares, A. (2004). Social Problem Solving: Theory and Assessment.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, *41*, 1149-1160.

Gratz, K. L., Rosenthal, M. Z., Tull, M. T., Lejuez, C. W., & Gunderson, J. G. (2006). An experimental investigation of emotion dysregulation in borderline personality disorder. *Journal of Abnormal Psychology*, 115, 850–855.

Gratz, K. L., Tull, M. T., & Gunderson, J. G. (2008). Preliminary data on the relationship between anxiety sensitivity and borderline personality disorder: The role of experiential avoidance. *Journal of Psychiatric Research*, 42, 550–559.

Gronwall, D. (1977). Paced Auditory Serial-Addition Task: A measure of recovery from concussion. *Perceptual and Motor Skills*, 44, 367–373.

Guitart-Masip M., Fuentemilla L., Bach D.R., Huys Q.J., Dayan P., Dolan R.J. & Duzel E. (2011). Action dominates valence in anticipatory representations in the human striatum and dopaminergic midbrain. *Journal of Neuroscience*.2011;31:7867–7875.

Iverson, K. M., Follette, V. M., Pistorello, J., & Fruzzetti, A. E. (2012). An investigation of experiential avoidance, emotion dysregulation, and distress tolerance in young adult outpatients with borderline personality disorder symptoms. *Personality Disorders: Theory, Research, and Treatment*, *3*(4), 415.

Jacobson, E. (1964). The self and the object world.

Jing, H. G., Madore, K. P., & Schacter, D. L. (2016). Worrying about the future: An episodic specificity induction impacts problem solving, reappraisal, and well being. *Journal of Experimental Psychology: General*, *145*(4), 402.

Jones, A., Spindler, H., Jørgensen, M. M., & Zachariae, R. (2002). The effect of situation–evoked anxiety and gender on pain report using the cold pressor test. *Scandinavian Journal of Psychology*, *43*(4), 307-313.

Kaviani, H. (2011). Overgeneral memory retrieval and ineffective problem-solving in depressed patients with suicidal ideation: Implications for therapy. *Revista Internacional de Psicología y Terapia Psicológica*, *11*(3), 413-423.

Kehrer, C. A., & Linehan, M. M. (1996). Interpersonal and emotional problem solving skills and parasuicide among women with borderline personality disorder. *Journal of Personality Disorders*, 10, 153–163.

Kernberg, O. F. (1980). *Internal world and external reality: Object relations theory applied*. J.Aronson.

Klein, M. (1957). Envy and gratitude. New York.

Korfine, L., & Hooley, J. M. (2000). Directed forgetting of emotional stimuli in borderline personality disorder. *Journal of Abnormal Psychology*, 109, 214–221.

Kremers, I. P., Spinhoven, P., Van der Does, A. J. W., & Van Dyck, R. (2006). Social problem solving, autobiographical memory and future specificity in outpatients with borderline personality disorder. *Clinical Psychology and Psychotherapy*, 13, 131–137.

Kurtz , J.E., & Morey, L.C. (1998). Negativism in Evaluative Judgments of Words Among Depressed Outpatients with Borderline Personality Disorder. *Journal of Personality Disorders*. *12*(4), 351-361

Lazarus, S. A., Cheavens, J. S., Festa, F., & Rosenthal, M. Z. (2014). Interpersonal functioning in borderline personality disorder: A systematic review of behavioral and laboratory-based assessments. *Clinical Psychology Review*, (3), 193.

Leible, T., & Snell, W. (2004). Borderline Personality Disorder and Multiple Aspects of Emotional Intelligence. *Personality and Individual Differences*, 37, 393-404.

Lejuez, C. W.; Kahler, Christopher W. & Brown, Richard A. (2003). A modified computer version of the Paced Auditory Serial Addition Task (PASAT-C) as a laboratory-based stressor. *The Behavior Therapist*,

Levine, D., Marziali, E., & Hood, J. (1997). Emotion processing in borderline personality disorders. *Journal of Nervous and Mental Disease*, 185, 240–246.

Leyro, T. M., Zvolensky, M. J., & Bernstein, A. (2010). Distress tolerance and psychopathological symptoms and disorders: a review of the empirical literature among adults. *Psychological Bulletin*, *136*(4), 576–600.

Lillis, J., Hayes, S. C., Bunting, K., & Masuda, A. (2009). Teaching acceptance and mindfulness to improve the lives of the obese: A preliminary test of a theoretical model. *Annals of Behavioral Medicine*, *37*(1), 58-69.

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

Linehan, M. M. (1993). *Skills training manual for treating borderline personality disorder*. Guilford Press.

Maccallum, F., & Bryant, R. A. (2010). Social problem solving in complicated grief.*British Journal of Clinical Psychology*, *49*(4), 577-590.

Madore, K. P., & Schacter, D. L. (2014). An episodic specificity induction enhances means- end problem solving in young and older adults. *Psychology and aging*, *29*(4), 913.

Marshall, E. C., Zvolensky, M. J., Vujanovic, A. A., Gregor, K., Gibson, L. E., & Leyro, T. M. (2008). Panic reactivity to voluntary hyperventilation challenge predicts distress tolerance to bodily sensations among daily cigarette smokers. *Experimental and Clinical Psychopharmacology*, *16*(4), 313–21.

Maurex, L., Lekander, M., Nilsonne, A., Andersson, E. E., Asberg, M., & Ohman, A. (2010). Social problem solving, autobiographical memory, trauma, and depression in women with borderline personality disorder and a history of suicide attempts. *British Journal of Clinical Psychology*, 49, 327–342.

McHugh, R. K., Daughters, S. B., Lejuez, C. W., Murray, H. W., Hearon, B. A., Gorka, S. M., & Otto, M. W. (2010). Shared Variance Among Self-Report and Behavioral Measures of Distress Intolerance. *Cognitive Therapy and Research*, *35*(3), 266–275.

Mennin, D. S., Holaway, R. M., Fresco, D. M., Moore, M. T., & Heimberg, R. G. (2007). Delineating components of emotion and its dysregulation in anxiety and mood psychopathology. *Behavior Therapy*, (3), 284.

Morey, L. C. (1991). Personality assessment inventory professional manual. *Seoul: Harkgisa*.

Platt, J. J., & Spivack, G. (1975). Manual for the Means- Ends Problem-Solving procedure (MEPS): A measure of interpersonal cognitive problem-solving skills. Philadelphia: Hahnemann Community Mental Health/Mental Retardation Center.

Rydel, S. T., & Rosen, E. (1966). Measurement and Some Correlates Of Need-Cognition Monograph Supplement 1-V19. *Psychological Reports*, *19*(1), 139-165.

Simons J, Gaher R. The Distress Tolerance Scale: development and validation of a self-report measure. *Motivation and Emotion*. 2005;29:83–102.

Trull T.J. (1995). Borderline personality disorder features in nonclinical young adults:Identification and validation. *Psychological Assessment*. *7*(1),33.

Unoka Z., Fogd D., Füzy M., Csukly G. (2011). Misreading the facial signs: specific impairments and error patterns in recognition of facial emotions with negative valence in borderline personality disorder. *Psychiatry Research*. *189*(3), 419-425.

Westen, D. (1991). Social cognition and object relations. *Psychological Bulletin*, *109*(3), 429.

Winward, J. L., Bekman, N. M., Hanson, K. L., Lejuez, C. W., & Brown, S. A. (2014). Changes in emotional reactivity and distress tolerance among heavy drinking adolescents during sustained abstinence. *Alcoholism: Clinical and Experimental Research*, *38*(6), 1761-1769.

Wolff, S., Stiglmayr, C., Bretz, H. J., Lammers, C. H., & Auckenthaler, A. (2007). Emotion identification and tension in female patients with borderline personality disorder. *British Journal of Clinical Psychology*, *46*(3), 347-360.

Yen, S., Zlotnick, C., & Costello, E. (2002). Affect regulation in women with borderline personality disorder traits. *The Journal of nervous and mental disease*, *190*(10), 693-696.

Zvolensky, M. J., Vujanovic, A. A., Bernstein, A., & Leyro, T. (2010). Distress tolerance: theory, measurement, and relations to psychopathology. *Current Directions in Psychological Science*, 19, 406– 414.

APPENDIX A

TABLES

Table 1

Kappa Statistics for MEPS Scenarios

Content	Kappa's
Total Sentences	0.984
Success	0.717
Relevant Sentences	0.843
Irrelevant Sentences	0.711
Active Sentences	0.683
Passive Sentences	0.750

Note. N = 231. Actual values for the current study.

Table 2

Descriptive Statistics for Main Study Variables

Variable	*M*	*SD*	Range	Cronbach's α
PAI-BOR	28.2	10.9	7 - 58	.85
Trait DT	42.4	11.7	14 - 69	.91
State Difference Distress	1.46	2.17	-6-9	__
PASAT Quit	17.4	54.0	0 – 293	__
PASAT Correct	142	57.7	0-316	__
IPSSO	3.47	2.50	1-5.54	__

Note. N = 231. Actual values for the current study. PAI-Bor = Personality Assessment Inventory – Borderline Features scale; Trait DT = Trait Distress Tolerance; State DT =State Difference Distress Tolerance; PASAT Quit = Paced Auditory Serial Addition Task time in seconds till quitting the third level; PASAT Correct= Paced Auditory Serial Addition Task number of correct responses; IPSSO= Interpersonal Problem Solving Score Overall

Table 3

T-test for Equality of Means

	Explosion		No Explosion				
Variable	M	SD	M	SD	*t*-test	*p*	Cohen's *d*
Age	18.6	1.26	18.7	1.50	-.68	.50	.07
PAI-BOR	28.8	10.8	29.5	10.9	-.47	.43	.06
Pre State DT	3.25	2.21	3.88	2.41	-1.92	.23	.27
Post State DT	4.84	2.63	5.23	2.41	-2.07	.04	.15
State Difference DT	1.59	2.20	1.35	2.14	.824	.92	.11
Trait DT	45.9	11.5	44.9	13.4	.58	.56	.08
PASAT Correct	146	59.1	138	56.4	.98	.33	.14
PASAT Quit	20.5	60.9	14.5	46.7	.84	.10	.11
IPS1	3.60	1.41	3.36	1.29	1.36	.17	.18
IPS2	3.28	1.33	3.22	1.29	.35	.72	.05
IPS3	3.70	1.18	3.69	1.11	.03	.98	.01
IPSSO	3.52	.96	3.42	0.90	.84	.41	.11
SA	2.13	.99	2.27	1.01	-1.06	.29	.14
RA	.64	.28	.65	.26	-.34	.73	.04
AA	.43	.23	.45	.24	-.49	.63	.09
PA	.57	.23	.55	.24	.49	.63	.09
IA	.36	.28	.35	.26.	.34	.73	.04
Effort	.43	.50	.51	.50	-1.15	.25	.16
SOM	.50	.50	.48	.50	.32	.75	.04

Note. n = 111 (explosion); n = 120 (no explosion). Age= Average Age of the participants; PAI-BOR = Personality Assessment Inventory – Borderline Features scale; Trait DT = Trait Distress Tolerance; State DT =State Difference Distress Tolerance; PASAT Correct= Paced Auditory Serial Addition Task number of correct responses; PASAT Quit= Paced Auditory Serial Addition Task time in seconds before quitting the third level; IPS1= Interpersonal Problem Solving Scenario 1; IPS2=Interpersonal Problem Solving Scenario 2, IPS3= Interpersonal Problem Solving Scenario 3;IPSSO= Interpersonal Problem Solving Score Overall; SA=Success Average, RA=Relevant Average; AA=Active Average; PA=Passive Average; IA=Irrelevant Average; Effort; SOM=Specificity of Means.
*$p < .05$; **$p < .01$

Table 4

Bivariate Correlations among Key Study Variables

Variable	1	2	3	4	5
1. PAI-BOR	—	-.12	-.36**	-.02	-.02
2. State Difference DT	-.13	—	.14	-.02	.07
3. Trait DT	-.53**	.05	—	-.05	.13
4. PASAT Quit	-.02	.09	-.06	—	.04
5.IPSS0	-.08	.08	.001	.12	—

Note. n = 111 (explosion; above diagonal); n = 120 (no explosion; below diagonal). PAI-BOR = Personality Assessment Inventory – Borderline Features scale; Trait DT = Trait Distress Tolerance; State DT =State Difference Distress Tolerance; PASAT = Paced Auditory Serial Addition Task time before quitting the third level; IPSSO= Interpersonal Problem Solving (sum of the averages success, active, and relevant scores).
*p < .05; **p <.01

Table 5

Predicting Interpersonal Problem Solving from Borderline Personality Disorder Traits

Predictor	*B(SE)*	*β*	*t*
Step 1			
R^2		*.00*	
PAI-BOR	-.002(.006)	-.02	-.30
Step 2			
ΔR^2		*.00*	
Condition	-.102(.123)	-.06	-.83
Step 3			
ΔR^2		*.01*	
PAI-BOR X Condition	-.011(.011)	-.20	-.97

Note. n = 231. IPSSO= Interpersonal Problem Solving Score Overall; PAI-BOR = Personality Assessment Inventory – Borderline Features scale; Condition= Explosion or No explosion. **p* < .05; ***p* < .01. ****p* < .001.

Table 6

Predicting Success, Relevancy, and Activeness on an Interpersonal Problem Solving Task from Borderline Personality Disorder Traits.

	SA			RA			AA			PA			IA		
Predictor	*B(SE)*	*β*	*t*	*B(SE)*	*β*	*t*	*B(SE)*	*β*	*t*	*B(SE)*	*β*	*t*	*B(SE)*	*β*	*t*
Step 1															
R^2		*.01*			*.00*			*.00*			*.00*			*.00*	
PAI-BOR	.006(.006)	.07	1.1	001(.002)	.03	.42	000(.001)	.02	.28	.000(.001)	-.02	-.29	-.001(.002)	-.03	-.42
Step 2															
ΔR^2		*.01*			*.00*			*.00*			*.00*			*.00*	
Condition	.136(.132)	.07	1.0	.012(.035)	.02	.33	.015(.031)	.03	.48	-.015(.031)	-.03	-.48	-.012(.035)	-.02	-.33
Step 3															
ΔR^2		*.02*			*.01*			*.01*			*.01*			*.01*	
PAI-BOR X Condition	.019(.012)	.33	1.6	.003(.003)	.20	.96	.004(.003)	.30	1.5	-.004(.003)	-.30	-1.5	-.003(.003)	-.20	-.96

Note. n = 231. SA=Success Average, RA=Relevant Average; AA=Active Average; PA=Passive Average; IA=Irrelevant Average.
*p < .05; **p < .01. ***p < .001.

Table 7

Predicting Effort and Specificity of Means on an Interpersonal Problem Solving Task from Borderline Personality Disorder Traits

Predictor	Effort			SOM		
	B(SE)	*β*	*t*	*B(SE)*	*β*	*t*
Step 1						
ΔR^2		*.01*			*.00*	
PAI-BOR	.004(.003)	.09	1.3	-.004(.003)	-.03	-.40
Step 2						
ΔR^2		*.01*			*.01*	
Condition	.073(.066)	.07	1.1	-.022(.066)	-.02	-.33
Step 3						
ΔR^2		*.01*			*.01*	
PAIBOR X Condition	.005(.006)	.18	.84	.008(.006)	.26	1.3

Note. n = 221.SOM=Specificity of Means; Trait DT = Trait DT ;
PAI-BOR = Personality Assessment Inventory – Borderline Features scale.
**p* < .05; ***p* < .01. ****p* < .00

Table 8

Predicting Interpersonal Problem Solving from Trait Distress Tolerance

IPSSO			
Predictor	*B(SE)*	*β*	*t*
Step 1			
R^2		*.00*	
Trait DT	.005(.005)	.06	.96
Step 2			
ΔR^2		*.01*	
Condition	-.143(.122)	-.08	-1.2
Step 3			
ΔR^2		*.02*	
Trait DT X Condition	-.011(.010)	-.29	-1.1

Note. n = 221. IPSSO= Interpersonal Problem Solving Score Overall; Condition= Explosion or No explosion. *p < .05;**p < .01. ***p < .001.

Table 9

Predicting Success, Relevancy, and Activeness on an Interpersonal Problem Solving Task from Trait Distress Tolerance.

	SA			RA			AA			PA			IA		
Predictor	*B(SE)*	*β*	*t*	*B(SE)*	*β*	*t*	*B(SE)*	*β*	*t*	*B(SE)*	*β*	*t*	*B(SE)*	*β*	*t*
Step 1															
R^2		*.00*			*.01*			*.00*			*.00*			*.01*	
Trait DT	-.001(.006)	-.01	-.14	-.002(.002)	-.08	-1.1	-001(.001)	-.06	-.93	.001(.001)	-.06	.93	.002(.002)	08	1.1
Step 2															
ΔR^2		*.01*			*.01*			*.01*			*.01*			*.01*	
Condition	.175(.136)	.09	1.3	.018(.036)	.03	.50	.020(.032)	.04	.64	-.020(.032)	-.04	-.64	-.018(.036)	-.03	-.50
Step 3															
ΔR^2		*.02*			*.01*			*.01*			*.01*			*.01*	
Trait DT X Condition	-.002(.011)	-.05	-.18	.000(.003)	-.02	-.06	.001(.003)	.13	.49	-.001(-.003)	-.13	-.49	.000(.003)	.02	.06

Note. n = 221.SA=Success Average, RA=Relevant Average; AA=Active Average; PA=Passive Average; IA=Irrelevant Average.
*p < .05; **p < .01. ***p < .001.

Table 10

Predicting Effort and Specificity of Means on an Interpersonal Problem Solving Task from Trait Distress Tolerance

	Effort			SOM		
Predictor	*B(SE)*	*β*	*t*	*B(SE)*	*β*	*t*
Step 1						
ΔR^2		*.00*			*.01*	
Trait DT	.001(.003)	.02	.24	-.004(.003)	-.09	-1.3
Step 2						
ΔR^2		*.01*			*.01*	
Condition	.089(.067)	.09	1.3	-.007(.068)	-.01	-.11
Step 3						
ΔR^2		*.01*			*.01*	
Trait DT X Condition	.003(.006)	.16	.60	-.001(.006)	-.05	-.17

Note. n = 221.SOM=Specificity of Means; Trait DT = Trait DT ;
PAI-BOR = Personality Assessment Inventory – Borderline Features scale.
*$p < .05$; **$p < .01$. ***$p < .00$

APPENDIX B

FIGURES

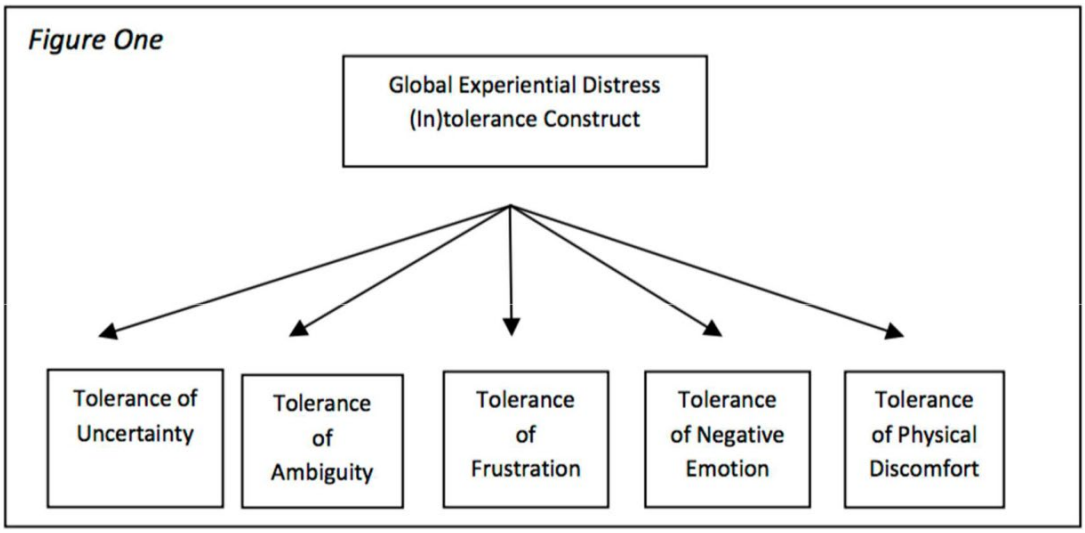

Figure 1. Global Experiential Distress Tolerance Construct and Other Accompanying Lower-Order Constructs