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Using the Scrambled Sentences Test to Examine Relationships Between Cognitive Bias, Thought Suppression and Borderline Personality Features

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USING THE SCRAMBLED SENTENCES TEST TO EXAMINE RELATIONSHIPS BETWEEN
COGNITIVE BIAS, THOUGHT SUPPRESSION AND BORDERLINE PERSONALITY FEATURES

THESIS

A thesis submitted in partial fulfillment of the
requirements for the degree of Master of Sciences in the
College of Arts and Sciences
at the University of Kentucky

By

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2012

ABSTRACT OF THESIS

USING THE SCRAMBLED SENTENCES TEST TO EXAMINE RELATIONSHIPS BETWEEN
COGNTIVE BIAS, THOUGHT SUPPRESSION, AND BORDERLINE PERSONALITY FEATURES

Cognitive bias and thought suppression are two maladaptive patterns of thinking that have been associated with borderline personality disorder (BPD). Negative cognitive biases related to BPD include thoughts that they are bad, powerless, or vulnerable and that the world is dangerous. Thought suppression is a maladaptive emotion regulation strategy where unwanted thoughts are intentionally pushed out of one's consciousness. However, previous research has connected thought suppression and cognitive biases to BPD only via self-report measures. The present study examined whether a laboratory task meant to measure cognitive bias and thought suppression (Scrambled Sentences Test) would predict BPD features over and above self report measures of cognitive bias and thought suppression. A sample of 153 undergraduates completed self-report measures of BPD features, thought suppression, and negative cognitive biases, as well as the Scrambled Sentences Test (SST). Results showed that while the SST was a good predictor of cognitive biases, it did not predict thought suppression when self report measures were included. Recognizing the importance of negative cognitive bias in BPD may be useful in continued treatment development. Further research into other ways of measuring thought suppression and cognitive biases in the lab may be warranted.

KEYWORDS: Borderline Personality Disorder, Thought Suppression, Cognitive Bias

Paul J. Geiger

September 6, 2012

USING THE SCRAMBLED SENTENCES TEST TO EXAMINE RELATIONSHIPS BETWEEN COGNITIVE BIAS, THOUGHT SUPPRESSION AND BORDERLINE PERSONALITY FEATURES

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Chapter One**:** Introduction

Borderline Personality Disorder is defined as "a pervasive pattern of instability of interpersonal relationships, self-image, and affects, and marked impulsivity beginning by early adulthood and present in a variety of contexts" (DSM-IV; American Psychiatric Association, 1994). Individuals with Borderline Personality Disorder (BPD) often have unstable interpersonal relationships, severe externalizing behavior (e.g. suicide, self-injury, drug use), cognitive difficulties including dissociation, and heightened emotional reactivity (APA, 1994). BPD is a severe mental illness that is estimated to occur in less than 2% of the population, yet occurs in as much as 20% of inpatients in the United States (Kroll, Sines, & Martin, 1981). Up to 40% of those who repeatedly seek inpatient treatment are diagnosed with BPD.

Biosocial Theory of BPD

A well established model of BPD is Linehan's biosocial theory, which purports that BPD is a result of an invalidating environment and a biologically based emotional vulnerability, which interact over time to produce emotion dysregulation (difficulties regulating one's emotions) and related maladaptive behaviors (Linehan, 1993). An invalidating environment typically occurs in childhood and is characterized by caregivers who frequently criticize, minimize, and erratically reinforce communication of internal experiences including thoughts and emotions. In addition, parental figures often fail to teach proper problem solving skills due to oversimplification of problem solving. An invalidating environment can also include sexual, physical, and emotional abuse (Wagner & Linehan, 1997). Emotional vulnerability is a biologically based predisposition

for heightened emotional sensitivity and reactivity to stimuli, as well as a slow return to an emotionally stable baseline after an emotional episode. Studies have shown that individuals with BPD have more intense and variable emotional experiences when compared to non-BPD controls (e.g. Koenigsberg et al., 2002). In combination, emotional vulnerability and an invalidating environment lead to deficits in the skills required to regulate emotions in a reasonable way. The lack of adaptive skills for managing emotions leads to the behavioral dysregulation typically seen in BPD, including self-harm, substance abuse, binge eating, and impulsive spending. These behaviors are conceptualized as maladaptive ways in which people with BPD attempt to reduce or avoid their intense negative affect. A recent longitudinal study found that affective instability was the strongest and most consistent predictor of BPD symptoms over time (Tragesser, Solhan, Schwartz-Mette, & Trull, 2007), lending support to the idea that emotion dysregulation is the central feature of BPD and that the other symptoms follow from this core dysfunction.

BPD and Cognitive Processing Biases

Recent research suggests that cognitive processing biases contribute in important ways to the development, maintenance, or exacerbation of emotional disorders (Mathews and MacLeod, 2005). Cognitive biases shown to be related to emotional dysfunction include selective attention to threatening stimuli, selective memory for negative information, and distortions in the content of beliefs, assumptions, and interpretations (Wilson, MacLeod, & Campbell, 2007). Repeated negative ideation, such as worry and rumination, and attempts to inhibit negative ideation through

thought suppression, has also been extensively studied. Most of this literature concerns

Axis I disorders. For example, panic disorder is associated with catastrophic

misinterpretation of bodily sensations, whereas social anxiety involves a self-focused

attentional bias and depression is associated with a self-blaming attributional style and

rumination (see Mathews & MacLeod, 2005, for a recent review). More recent research

has extended this line of inquiry to BPD. Two forms of cognitive processing bias have

particularly strong support for relationships with BPD: negative distortions in cognitive

content and thought suppression.

Cognitive distortions in BPD

Several models of biased beliefs in BPD have been proposed. Beck & Freeman

(1990) suggested that people with BPD are likely to endorse a wide range of negative

beliefs, including beliefs that they are bad, powerless, and vulnerable, and that the

world is dangerous. Similarly, Pretzer (1990) proposed that a set of three core beliefs

underlie borderline pathology: the world and other people are dangerous and

malevolent, the self is powerless and vulnerable, and the self is unacceptable,

unlovable, and deserving of punishment. Empirical studies suggest that people with BPD

endorse many negative beliefs, including those typical of many other disorders (Arntz,

Dietzel, & Dreeson, 1999). However, particular beliefs have been shown to be especially

common in BPD. Butler, Brown, Beck, & Grisham (2002) reported that patients with BPD

were more likely than those with other personality disorders to endorse beliefs of

dependency, helplessness, distrust of others, and fears of losing emotional control.

Factor analysis of the Personality Beliefs Questionnaire (PBQ) in a sample of patients

diagnosed with BPD suggested three factors: distrust of others, dependency and neediness, and need for self-protection in relationships (Bhar, Beck, and Brown, 2008). The Personality Disorder Beliefs Questionnaire (PDBQ; Dreeson & Arntz, 1995) measures beliefs associated with several personality disorders, including BPD (Arntz et al., 1999). The BPD subscale reflects themes of loneliness, unlovability, rejection by others, lack of self-control, and the self as bad and deserving of punishment. Patients with BPD showed elevation on all of the subscales, but scored higher than those with other PDs on the BPD subscale (Arntz et al., 1999). Overall, this literature suggests that BPD symptoms are strongly associated with negative beliefs.

Thought suppression in BPD

Thought suppression is the intentional attempt to push unpleasant or unwanted cognitions out of one's consciousness. It is conceptualized as a maladaptive emotion regulation strategy. Many studies show that thought suppression paradoxically increases the frequency of the unwanted thoughts (see Abramowitz, Tolin, & Street, 2001, for a review). This effect, known as the *rebound effect,* has been explained by ironic process theory which suggests that thought suppression requires two mental processes: a conscious search for distracters that is ultimately cognitively draining, and an unconscious search for the unwanted thought that is not cognitively draining (Wegner, 1992). These two processes often work in tandem: high sensitivity and vigilance to unwanted thoughts activate the more conscious process of thought suppression anytime unwanted thoughts are found. In essence, in order to suppress a thought, it is necessary to monitor whether the unwanted thought is present. In a

famous study by Wegner & Zanakos (1994), participants were asked to suppress thoughts of a white bear. However, in stream of consciousness reports, subjects showed difficulty suppressing that thought, and even mentioned the white bear numerous times when this would likely have never been thought of, had the instructed thought suppression task not been implemented.

A number of studies have linked thought suppression to borderline personality disorder and suggest it to be a key contributor to the manifestations of BPD symptomatology and severity. Chapman et al. (2005) reported that the self-reported tendency to suppress thoughts was associated with greater frequency of unwanted thoughts and triggers for self-harm. Cheavens et al. (2005), found that thought suppression, measured by the White Bear Suppression Inventory (WBSI; Wegner & Zanakos, 1994), fully mediated the relationship between negative affect intensity/reactivity and a composite score of BPD features (including measures of impulsivity, aggression, and interpersonal sensitivity). In addition, thought suppression partially mediated the relationship between perceived parental criticism and BPD features. Findings suggest that individuals who are more emotionally vulnerable and have a history of unsupportive parenting may be more prone to developing BPD features when thought suppression is used as an emotion regulation strategy. The authors conclude that, because childhood experiences and biological predispositions are not readily subject to change, therapeutic strategies that encourage reductions in thought suppression and teach more adaptive emotion regulation strategies may be beneficial (Cheavens et al., 2005).

A follow-up study by Rosenthal et al. (2005) replicated these findings using a structured interview (SCID-II) rather than self-report measures to assess BPD features. Chronic thought suppression fully mediated the relationship between negative affectivity and BPD symptoms, even after controlling for variance related to childhood sexual abuse. Rosenthal et al. note that thought suppression probably persists because it relieves negative affect in the short term. Over the long term, however, the repeated use of thought suppression as an emotion regulation strategy may lead to increased frequency of the unwanted thoughts and more intense negative emotions, requiring more severe emotion regulation strategies such as parasuicidal behavior and drug use (Rosenthal et al., 2005).

Sauer and Baer (2009) expanded on this literature by using measures that more specifically capture childhood emotional vulnerability and invalidating environment. Results showed that thought suppression fully mediated the relationship between invalidating childhood environment and symptoms of BPD. The authors noted that an invalidating childhood environment may lead the child to believe that his or her emotions are harmful or bad, and that losing control of these emotions could lead to severe consequences. In line with this hypothesis, the study showed that fear of emotions partially mediated the relationship between emotional vulnerability and thought suppression, and completely mediated the relationship between invalidating childhood environment and thought suppression. Findings suggest that individuals who grow up fearing their own emotions are likely to use thought suppression as a strategy for avoiding or escaping them (Sauer and Baer 2009).

On balance, this body of literature strongly suggests that thought suppression is a commonly used but maladaptive emotion regulation strategy in people with BPD. It is associated with BPD features and may mediate relationships between childhood precursors to BPD and current severity of BPD symptoms.

Assessment of Cognitive Distortions and Thought Suppression

Cognitive distortions and thought suppression are most commonly assessed using self-report methods. For beliefs associated with BPD, the most commonly used measures are the Personality Beliefs Questionnaire-BPD subscale (PBQ-BPD; Butler et al., 2002) and the Personality Disorder Beliefs Questionnaire (Arntz et al., 1995), in which respondents rate the extent to which they believe statements such as "I am needy and weak" and "I cannot trust other people." Thought suppression is most often measured using the WBSI (Wegner & Zanakos, 1994), a self-report instrument with 15 items such as "There are things I prefer not to think about" and "I always try to put things out of my mind." To provide an alternative to self-report methods, which may be susceptible to self-presentation strategies or demand characteristics, some authors have explored the use of the Scrambled Sentences Test (SST; Wenzlaff & Bates, 1998). In this task, participants are given strings of six words and asked to rearrange them to create 5-word sentences (leaving one word out). The six-word strings are constructed so that the valence of the unscrambled sentence can be positive or negative, depending on which word is omitted. For example, "looks future my bright very dismal" can be "my future looks very bright" or "my future looks very dismal." The task is timed and participants are encouraged to work as quickly as possible. In its original form, the task

is considered a measure of negative cognitive bias; accordingly, people with depressive disorders have been shown to create more negative sentences than do nondepressed controls. In a variation on this task designed to assess thought suppression, participants are asked to unscramble two sets of sentences: one set while remembering a six-digit number (cognitive load condition) and another set without a cognitive load. Because remembering the six-digit number is effortful, it reduces the cognitive resources available for distracting attention from unwanted thoughts. It has therefore been hypothesized that people who are attempting to suppress negative thoughts will find it more difficult to do so in the cognitive load condition. As a result, they will create more negative sentences under cognitive load than in the no-load condition. Thus the difference between the two conditions in the proportion of negative sentences created is considered a measure of thought suppression (Wenzlaff & Bates, 1998).

Research using the Scrambled Sentences Test

The SST has been used in several studies, mostly with depressed populations. Wenzlaff & Bates (1998), who developed this task, compared currently depressed patients, previously depressed patients in remission, and never-depressed persons. Under the no-load condition, the currently depressed participants created more negative sentences than the never-depressed and the previously depressed groups, which did not differ from each other. This finding suggested a lack of cognitive bias in the remitted group and was consistent with many self-report studies showing that people who have recovered from depression do not show evidence of depressive cognitive distortions (e.g. Gotlib & Cane, 1987; Hollon et al., 1986). However, under the

cognitive load condition, the remitted group produced significantly more negative sentences than they had produced with no load, and significantly more than the nondepressed group. In contrast, the nondepressed participants produced equally low numbers of negative sentences in both the load and no-load conditions. Results were interpreted to mean that the remitted group had negative cognitive biases that they were suppressing, and that the suppression efforts failed under the cognitive load condition.

Rude et al. (2002) used the SST to study the relationship between negative processing biases and future depressive episodes in an undergraduate sample. Participants completed the SST, the Beck Depression Inventory and White Bear Suppression Inventory. Results showed that high scores on the SST (which indicate a negative processing bias) predicted depressive symptoms that were measured 4 to 6 weeks later. The SST load condition predicted future depressive episodes in both men and women, while the no-load condition only predicted future depressive episodes in women. Interestingly, the difference scores (difference between load and no-load conditions) predicted future depression in men only. Additionally, the combination of self-report measures of thought suppression (WBSI) with SST difference scores or load condition scores was an even stronger indicator of future depression in men. It was hypothesized that these gender differences were due to different self-presentation strategies in self-report measures.

A follow-up study by Rude et al (2003) utilized the SST with a large undergraduate student sample. Results showed that the number of negative sentences

produced in the load condition predicted depression in an 18-28 month follow-up assessment (even after controlling for depressive symptoms at the initial meeting). Negative sentences produced in the no-load condition were not predictive of future depression. The difference score (load vs. no-load) was a marginally significant predictor.

Rude et al (2010) utilized the SST alongside the Dysfunctional Attitudes Scale (DAS; Weissman & Beck, 1978) to predict future episodes of major depressive disorder (MDD) in a community-based sample of currently non-depressed women. This study found that, when analyzed separately, both the SST (with cognitive load) and the DAS were significant predictors of future depression. When examined together, after controlling for Time 1 depression scores, the SST (load condition) was a significant predictor of MDD status, whereas the DAS was a marginally significant predictor. SST scores with no cognitive load were not predictive of MDD. Because many of the participants had been depressed in the past, these findings were consistent with Wenzlaff & Bates (1998) previous work, which suggested that thought suppression is a strategy used to control mood in people at risk for future depression.

Although previous studies have used the SST primarily in the study of depression, the SST may also be useful in the study of BPD features. Thought suppression is associated with both disorders, and the cognitive distortions typical of depression appear to be very similar to those seen in BPD. That is, both populations endorse beliefs that they are weak, helpless, vulnerable, unlovable, and unworthy. Thus, use of a task that does not rely on self-report of general tendencies may contribute to

knowledge of the relationships between these important cognitive biases and BPD features.

Current Study

The purpose of the current study is to extend previous findings on cognitive bias and thought suppression as measured by the SST to the study of borderline personality features. The current literature strongly suggests that individuals with BPD endorse many cognitive distortions and engage in thought suppression as a form of emotion regulation, which is maladaptive in the long run and exacerbates symptom severity. However, these studies have assessed cognitive bias and thought suppression only with self-report methods. No study has examined whether the tendency to suppress thoughts is weakened under cognitive load in this population. The proposed study used a student sample that had been screened and selected to include a wide range of BPD features, including many scoring above a previously established threshold for clinically significant BPD symptoms. The primary goal was to test whether SST scores are related in expected ways to severity of BPD features. Several hypotheses were tested.

Hypothesis 1: Under both load and no-load conditions, participants with higher levels of BPD features will create fewer positive sentences on the SST. If this hypothesis is supported, findings will be consistent with previous research suggesting negative cognitive content biases in BPD.

Hypothesis 2: Differences between the load and no-load condition in number of positive sentences created (SST difference score) will be significantly negatively correlated with severity of BPD features. High-BPD participants are expected to be more

consistently trying to suppress dysfunctional thoughts and to have more difficulty doing so under cognitive load conditions. In contrast, low-BPD participants are not expected to be engaging in high rates of thought suppression due to the absence of cognitive biases and therefore should produce roughly equivalent numbers of positive sentences under both conditions.

Hypothesis 3: Thought suppression as measured by the WBSI will be significantly correlated with thought suppression as measured by the SST difference score.

Hypothesis 4: Self-reported dysfunctional beliefs (Personality Beliefs Questionnaire – BPD subscale) will be significantly negatively correlated with the SST score (both load and no-load conditions).

Hypothesis 5: Consistent with the findings of Rude et al. (2010) in the study of depression, both WBSI and SST difference score will account for significant variance in BPD symptom severity when both are entered into a regression model. If this hypothesis is supported, findings will suggest that self-reported thought suppression and the behavioral measure of thought suppression capture variance in BPD features that is not entirely overlapping.

Hypothesis 6: Both dysfunctional beliefs and SST score will account for significant variance in BPD severity when both are entered into regression models. As with the previous hypothesis, this finding will suggest that self-reported cognitive bias and the behavioral measure of cognitive bias capture non-overlapping variance in BPD symptom severity.

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A secondary goal of the proposed study is to replicate previous research (Rosenthal et al., 2005; Cheavens et al., 2005; Sauer & Baer, 2009) showing that thought suppression mediates the relationship between Linehan's childhood precursors to BPD (emotional vulnerability and an invalidating environment) and severity of BPD symptoms. The proposed study will expand on this previous literature by using the SST difference score to assess thought suppression. The following hypotheses will be tested:

Hypothesis 7: Measures of childhood emotional vulnerability and an invalidating environment will be positively correlated with the SST difference score and with severity of BPD features.

Hypothesis 8: Using regression analysis, beta coefficients for the childhood precursor measures in predicting BPD features will be significantly reduced when the SST difference score is included in the model.

Chapter Two: Methods

Participants

Participants for this study included 153 undergraduate students recruited from the Introduction to Psychology pool at the University of Kentucky. In a mass screening procedure early in the semester, students filled out the Personality Assessment Inventory—Borderline Features Scale (PAI-BOR; Morey, 1991) as part of a larger questionnaire packet. Individuals with scores of 38 or higher (T > 70) were considered to have high BPD features (Trull, 1995), and were oversampled. Using undergraduate samples to study BPD provides useful information, as a wide range of clinically significant BPD features can be found in college students. Additionally, it is helpful to study BPD symptoms in early adulthood to better understand how the disorder develops (Trull, 1995). Power calculations revealed that 95 participants would yield acceptable power for detecting a small to medium effect size (α = .05 and 1 − β = .80).

Self- Report Measures

Personality Assessment Inventory—Borderline Features Scale (PAI-BOR; Morey, 1991). PAI-BOR includes 24 items rated on a 4-point scale (false, slightly true, mainly true, and very true). It provides a total score and subscale scores for four core features of BPD symptomology including self harm, difficult relationships, identity problems, and affective instability. The PAI-BOR is widely used and has shown excellent psychometric properties (Morey, 1991).

White Bear Suppression Inventory (WBSI) (Wegner & Zanakos, 1994). The WBSI is used to assess the general tendency to suppress thoughts. This measure consists of

15 items, rated on a 5 point Likert-type scale (1= strongly disagree, 5= strongly agree).

Scores may range from 15 to 75, with higher scores indicating a greater proclivity to

suppress unwanted thoughts. The authors of this scale reported good internal

consistency (α = .89) and test-retest reliability (r = .80).

Personality Beliefs Questionnaire – BPD subscale (Arntz et al., 1999). The PBQ-

BPD subscale is used to measure beliefs most commonly associated with BPD. The

measure consists of 14-items, in which respondents rate how much they believe each

statement. These statements include, "I am needy and weak" and "I cannot trust other

people."

Emotional Vulnerability in Childhood (EV-Child). This measure was created by

Sauer & Baer (2010) by adapting the Affect Intensity Measure (Bryant, Yarnold, &

Grimm, 1996; Larson & Diener, 1987), which assesses current emotional intensity in

adult respondents. The EV-Child adapted the items and instructions so that respondents

rate their own emotional vulnerability during their childhood years. Research with the

EV-Child (Sauer & Baer, 2009; 2010) shows high internal consistency (α = .92), a clear

single-factor structure, and significant correlations with current BPD features and

related variables, after controlling for general distress. Significant agreement between

student and parent reports also was noted.

The *Positive Affect Negative Affect Schedule* (PANAS; Watson, Clark, & Tellegen,

1988). The PANAS includes 20 mood adjectives: ten for positive affect (e.g., *happy*) and

ten for negative affect (e.g., *irritated*). To provide a state-level indication of negative

affect, participants rated how much they were feeling each of these items "right now"

or at the present moment. Only the negative affect score was included in the present study.

Socialization of Emotion Scale (SES) (Sauer & Baer, 2010). The SES is used to measure childhood invalidation by asking respondents to report retrospectively on their parents' responses to their childhood negative affect. The measure presents several commonplace childhood situations (e.g., losing a prized possession and becoming upset) and asks respondents to rate the extent to which their parent responded in various ways, some of which are validating or supportive (helping to look for the item) whereas others are invalidating (saying that the child is over-reacting). A total of 33 items are summed to create two scores: validation and invalidation. Each item is answered twice, so that ratings are obtained for both the mother and father. Sauer & Baer (2010) reported strong internal consistencies for both scales for reports of both parents (alphas ranging from .88 to .95), a clear two-factor structure (validation and invalidation), and significant correlations with severity of BPD symptoms.

The Scrambled Sentences Task (SST). The SST (Wenzlaff, 1998; 1993) is a laboratory task used to assess negative cognitive biases or the suppression of unwanted thoughts. The SST asks respondents to unscramble sentences from a scrambled phrase (e.g. "usually like people not me do"). This phrase can be unscrambled in one of two ways: either with a positive valence ("Usually people do like me") or a negative valence ("People do not like me"). Respondents are instructed to write a number (1-5) above five of the six words to indicate their sequence. Participants are presented with two blocks of 25 scrambled sentences, and are given 3.5 minutes to complete each block.

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They are asked to complete as many sentences as possible in the time provided and to refrain from correcting errors. In addition, a cognitive load is randomly assigned to one of the two blocks. In the cognitive load condition, participants are asked to remember a six digit number while completing the block of sentences.

Because the SST was developed for the study of depression, the sentences are consistent with depression-related cognitive distortions. For the present study, all 60 of the original sentences were rated for how much they resemble the cognitive distortions typical of BPD using a 4-point Likert scale (1= not at all; 4 = very much). Three advanced graduate students with clinical training and experience treating people with BPD features rated each sentence. The sentence was kept for this study if all therapists rated the sentence either a 3 or 4. This resulted in 17 out of 60 sentences being removed due to depression-specific cognitive distortions. The PI then created 7 new sentences using the PBQ-BPD as a guide.

Procedure

Individuals who obtained a raw score over 37 on the PAI-BOR in the mass screening session were contacted via phone or e-mail and asked to participate in the study. The study was also available to all students in the participant pool through SONA, the online registration system for experiments. Those who signed up through SONA were expected to fall primarily within the average range of BPD features. The screening and invitation procedure was designed to insure that the upper end of the distribution was adequately represented in the sample. Students who signed up through SONA or accepted an invitation to participate were directed to a small group session with

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approximately 10-15 students. At the beginning of the session, the experimenter briefly

explained the study, questions were answered, and the informed consent document

was completed. Each participant was given a packet of materials that included a

demographics questionnaire, two sets of 25 scrambled sentences in counterbalanced

order, and a battery of questionnaires. The first thing completed was the scrambled

sentence test. Participants were instructed to unscramble each sentence to create a

grammatical sentence that has five words (leaving one word out) and to complete as

many as they can in the 3.5 minutes allotted by working as quickly as possible, creating

whatever grammatical sentence came to mind first, and not correcting errors or

changing their responses. They were asked to write the numbers 1 through 5 above five

of the six words to denote the order of their unscrambled sentences, as in the following

example.

    3   2 1 5   4

    has green child the eyes blue

The order of the cognitive load and no-load conditions was counterbalanced by group

session (each group was randomly assigned to either load condition first or no-load

condition first). In the cognitive load condition, all subjects were shown the same six-

digit number for 30 seconds and asked to commit it to memory. They were instructed

to remember this number throughout the task, as they were asked to write it down

when the task is completed.

Chapter Three: Results

Preliminary Analyses

All data were screened for outliers, missing data, and significantly non-normal distributions. Of the 153 participants, 9 were identified as outliers (+/- 3 standard deviations from the mean) and were removed. In addition, 2 participants had missing demographic data and 1 participant did not complete an entire questionnaire and were excluded. The final sample size was 141. Of these, 30 had PAI-BOR raw scores over 37, suggesting clinically significant BPD features. Skewness and kurtosis were examined; no variables were significantly non-normal. Therefore, non-transformed mean scores for all variables were used for testing this study's hypotheses. For all analyses, alpha was set at <.05.

Zero-order correlations were examined between demographic characteristics and all other study variables. There was a small but statistically significant correlation between gender and the difference between load and no-load scores on the SST (r = -.19, p < .05), showing that male participants showed slightly greater differences than female participants between load and no-load conditions. No other demographic characteristics were significantly correlated with any other study variables. Therefore, remaining analyses were conducted without controlling for demographic characteristics.

Hypothesis 1

The first hypothesis was that under both load and no-load conditions, participants with higher levels of BPD features would create fewer positive sentences on the SST.

Table 3.1. *Bivariate Correlations and internal consistencies for Study Variables (N = 141)*

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. PAI BOR Tot	(.89)												
2. PAI BOR AI	.90**	(.85)											
3. PAI BOR IP	.80**	.65**	(.69)										
4. PAI BOR NR	.80**	.66**	.54**	(.73)									
5. PAI BOR SH	.63**	.44**	.31**	.29**	(.77)								
6. SST No Load	-.30**	-.25**	-.29**	-.19*	-.22**	—							
7. SST Load	-.44**	-.32**	-.44**	-.37**	-.25**	.56**	—						
8. SST Diff	.14	.07	.16	.20*	.03	.48**	-.46**	—					
9. PBQ-BPD	.67**	.59**	.56**	.55**	.39**	-.37**	-.43**	.06	(.81)				
10. WBSI	.54**	.45**	.49**	.43**	.32**	-.06	-.23**	.18*	.43**	(.90)			
11. EV Total	.50**	.49**	.34**	.44**	.27**	-.14	-.33**	.20*	.44**	.38**	(.92)		
12. SES (Invalid)	.32**	.34**	.26**	.16	.23**	-.10	-.13	.02	.31**	.19*	.24**	(.87)	
13. PANAS-NA	.44**	.37**	.46**	.29*	.25**	-.26**	-.31**	.04	.44**	.26**	.29**	.12	(.72)

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

Note: Internal consistencies for scales presented on the diagonal.

Correlational analyses supported this hypothesis, as PAI-BOR total score was significantly negatively correlated with SST load score (*r* = -.44, *p* < .001) and SST no-load score (*r* = -.30, *p* < .001). Additionally, all PAI-BOR subscale scores were significantly negatively correlated with both SST load score and SST no-load score. Findings can be seen in Table 3.1 (rows 6 and 7).

Hypothesis 2

The second hypothesis was that the SST difference score would be significantly correlated with severity of BPD features as measured by PAI-BOR total and subscale scores. This hypothesis was partially supported. PAI-BOR Negative Relationships subscale score showed a small but statistically significantly correlation with SST difference score (*r* = .20, *p* < .05). All other PAI-BOR scores were not significantly correlated with the SST difference score.

Differences between load and no-load conditions were further examined by comparing mean proportion of positive sentences in the subsamples with and without elevated PAI-BOR scores (raw score > 37). Findings are shown in Table 3.2. Although participants with elevated PAI-BOR scores created fewer positive sentences in the load condition than in the no-load condition, this difference was not statistically significant. Participants with PAI-BOR scores below the clinically significant range showed no significant difference between load and no-load conditions.

Hypothesis 3

The third hypothesis was that thought suppression as measured by the WBSI would be significantly correlated with thought suppression as measured by SST

Table 3.2. Mean proportion of positive sentence created on the SST for load and no-load conditions

	No load		Load		
	M	SD	M	SD	t
PAI-BOR $\leq$ 37	73.81	18.00	73.61	16.39	.13
PAI-BOR > 37	63.62	16.57	58.53	18.71	1.62

difference score. This hypothesis was supported: the WBSI and SST difference scores were significantly correlated ($r = .18$, $p < .05$). However, the correlation was small.

Hypothesis 4

The fourth hypothesis was that negative beliefs as measured by the PBQ-BPD would be significantly negatively correlated with SST scores under both load and no-load conditions. This hypothesis was supported. The PBQ-BPD was significantly negatively correlated with both load ($r = -.43$, $p < .001$) and no-load ($r = -.37$, $p < .001$) scores.

Hypothesis 5

The fifth hypothesis was that both methods of measuring thought suppression (WBSI and SST difference scores) would account for significant variance in BPD symptom severity (PAI-BOR total and subscale scores) after controlling for state-level negative affect. This was tested using one hierarchical regression analysis with the Negative Relationships subscale score as the dependent variable (the remaining PAI-BOR scores were not significantly correlated with SST difference scores, and therefore not examined with regression analyses). To control for state-level negative affect, PANAS-NA scores were entered in Step 1 of the model. Both measures of thought suppression (WBSI and SST difference score) were entered in Step 2. Findings are shown in Table 3.3. Negative affect was a significant predictor of negative relationship symptoms. The addition of the thought suppression measures in Step 2 led to a significant increase in R^2. Overall, this model was statistically significant $R^2 = .23$, $F(3, 137) = 13.74$, $p < .001$. In the final model, both PANAS-NA ($\beta = .19$, $p < .001$) and WBSI score ($\beta = .36$, $p < .001$) were significant

Table 3.3. Summary of Regression Analyses Predicting BPD symptom severity from

measures of Thought Suppression

DV	Predictor	ΔR^2	beta
PAI-BOR	Step 1	.08**	
Negative	PANAS-NA		.29**
Relationships	Step 2	.14**	
	PANAS-NA		.19**
	WBSI		.36**
	SST Diff		.12
	Total R^2	.23**	

*Note. **p < .01*

predictors of PAI-BOR total scores. However, the SST difference score was not a significant predictor (β = .12, p = .11).

Hypothesis 6:

The sixth hypothesis was that both methods of measuring negative cognitive bias (PBQ-BPD and SST scores) would account for significant variance in BPD symptom severity. This hypothesis was tested using five hierarchical regression analyses: one for the PAI-BOR total score and one for each of the PAI-BOR subscale scores. Preliminary correlational analyses showed that the SST load and no-load scores were significantly correlated with each other (r = .56, p < .01), and that the SST load score was consistently more strongly correlated with PAI-BOR scores than was the SST no-load score. A preliminary regression analysis showed that when load and no-load scores were both included in a model predicting PAI-BOR total score, only the load score was significant. Therefore, to avoid potential problems with highly correlated predictors, only SST load scores were used for these analyses. To control for state-level negative affect, PANAS-NA scores were entered in Step 1. Measures of negative cognitive bias were entered in Step 2. Findings are shown in Table 3.4. For all analyses, state-level negative affect (PANAS-NA) was a significant predictor of BPD features at Step 1, and the two cognitive bias measures (PDQB and SST-load) accounted for significant additional variance in Step 2.

In the final model for the first analysis, all three variables were significant independent predictors of PAI-BOR total scores including PANAS-NA (β = .16, p < .05), PBQ-BPD score (β = .53, p < .01), and SST load score (β = -.16, p < .05). In the second

Table 3.4. Regression Analyses Predicting BPD symptom severity from Cognitive Bias

DV	Predictor	ΔR^2	beta
PAI-BOR	Step 1	.19**	
Total score	PANAS-NA		.44**
	Step 2	.30**	
	PANAS-NA		.16*
	PBQ-BPD		.53**
	SST Load		-.16*
	Total R^2	.49**	
PAI-BOR	Step 1	.13**	
Affective Instability	PANAS-NA		.37**
	Step 2	.23**	
	PANAS-NA		.13
	PBQ-BPD		.50**
	SST Load		-.06
	Total R^2	.36**	
PAI-BOR	Step 1	.21**	
Identity Problems	PANAS-NA		.46**
	Step 2	.19**	
	PANAS-NA		.23**
	PBQ-BPD		.36**
	SST Load		-.21**
	Total R^2	.40**	
PAI-BOR	Step 1	.08**	
Negative	PANAS-NA		.29**
Relationships	Step 2	.24**	
	PANAS-NA		.04
	PBQ-BPD		.46**
	SST Load		-.16*
	Total R^2	.33**	
PAI-BOR	Step 1	.06**	
Self-Harm	PANAS-NA		.25**
	Step 2	.10**	
	PANAS-NA		.09
	PBQ-BPD		.31**
	SST Load		-.09
	Total R^2	.16**	

*Note. **p < .01, *p < .05.*

analysis predicting Affective Instability, only the PBQ-BPD was a significant predictor in the final model. In the third analysis predicting Identity Problems, all predictors were significant in the final model, including PANAS-NA (β = .23, p < .01), PBQ-BPD (β = .36, p < .01), and SST load score (β = -.21, p < .01). In the fourth analysis predicting Negative Relationships, the PBQ-BPD (β = .46, p < .01) and SST load score (β = -.16, p < .05) were significant in the final model, whereas the PANAS-NA was not significant. In the fifth analysis predicting Self-Harm, only the PBQ-BPD (β = .31, p < .01) was a significant predictor in the final model.

Hypothesis 7:

The seventh hypothesis was that childhood precursors of BPD (emotional vulnerability and an invalidating environment) would be correlated with PAI-BOR total and subscale scores, and with thought suppression as measured by the SST difference score. This hypothesis was partially supported. Emotional vulnerability as measured by EV-Child was significantly correlated with all PAI-BOR measures and SST difference scores (see Table 3.1). An invalidating environment as measured by the SES invalidation total score was significantly correlated with all PAI-BOR measures except for the Negative Relationships subscale. However, the SES total score was not significantly correlated with SST difference scores.

Hypothesis 8

The eighth hypothesis was that beta coefficients for the childhood precursor measures in predicting BPD features would be significantly reduced when the SST difference score was included in a regression model. Because the measure of

invalidation in childhood (SES) was not significantly correlated with the SST difference score, this hypothesis was tested only for emotional vulnerability (EV Child). A mediational model utilizing bootstrapping (Preacher & Hayes, 2008) was used to test the indirect effect of thought suppression (SST difference score) in the relationship between emotional vulnerability and BPD features. 95% bias-corrected confidence intervals were generated using 1,000 bootstrap samples. The indirect effect of thought suppression measured by SST difference score was not significant ($p = .33$) and the beta coefficients for the EV total score were not significantly reduced. Bias corrected confidence intervals were -.01 to .05. This finding suggests that thought suppression as measured by SST difference score does not mediate the relationship between emotional vulnerability in childhood and current BPD features.

The SST-load score was much more strongly correlated with the PAI-BOR than was the SST-difference score; therefore, this analysis was repeated with SST-load score as the potential mediator. Childhood emotional vulnerability (EV-Child) significantly predicted PAI-BOR total scores and SST-Load score. When the SST-load score was included in the model, the strength of the relationship between EV-Child and PAI-BOR scores was reduced (beta decreased from .51 to .40, $p < .001$). Bootstrapping results suggest this indirect effect is statistically significant, based on the 95% confidence interval (.03, .19) (See Figure 3.1).

Incremental validity of the SST over both self-report measures of cognitive functioning

Post hoc regression analyses were completed as a more stringent test of the utility of the laboratory task in accounting for variance in BPD features after controlling

Figure 3.1. Test of mediation by SST-Load Scores of the relationship between EV-Child

Total Scores and PAI-BOR Total Scores.
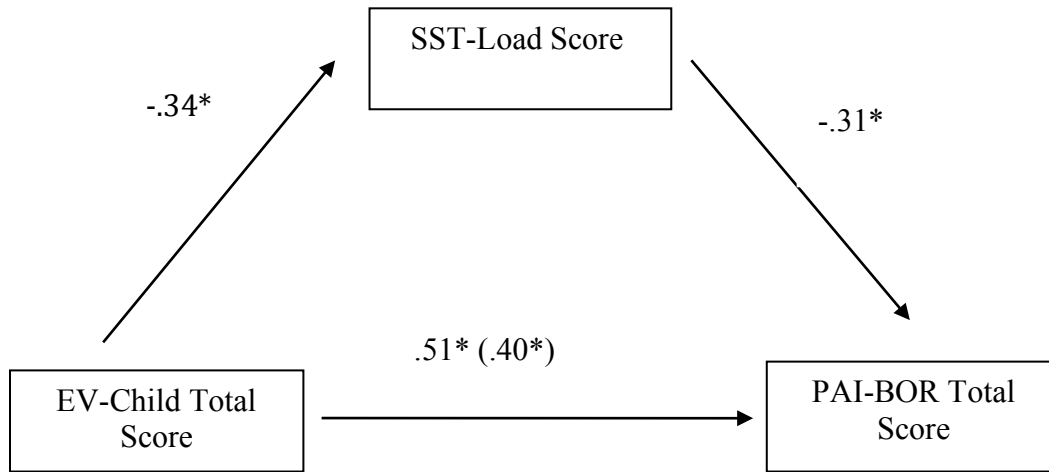
Note. All values are beta coefficients. The value in parentheses represents the beta

value when the mediator is included in the model.

for the two self-report measures of thought suppression and cognitive distortions (WBSI

and PBQ-BPD). The utility of the lab task was tested using five hierarchical regression

analyses: one for the PAI-BOR total score and one for each of the PAI-BOR subscale

scores. To control for state-level negative affect, PANAS-NA scores were entered in Step

1. The two self-report measures of thought suppression (WBSI) and negative cognitive

bias (PDQB) were entered in Step 2. The lab task (SST load score) was entered in Step 3.

Findings are shown in Table 3.5. For all analyses, state-level negative affect (PANAS-NA)

was a significant predictor of BPD features at Step 1, and the self-report measures (WBSI

and PDQB) accounted for significant additional variance in Step 2. The lab task (SST-

Load) accounted for significant additional variance in Step 3 for PAI-BOR total score and

Identity Problems subscale score. In the final models, SST-Load was a significant

independent predictor for the PAI-BOR total score and the Identity Problems subscale.

Table 5. Summary of Regression Analyses Predicting BPD symptom severity from Self-Report Measures of Thought Suppression and Cognitive Bias and a Lab Task Assessing Cognitive Bias.

DV	Predictor	ΔR^2		beta
PAI-BOR	Step 1	.19**		
Total score	PANAS-NA			.44**
	Step 2	.35**		
	PANAS-NA			.15*
	PBQ-BPD			.47**
	WBSI			.30**
	Step 3	.02*		
	PANAS-NA			.13*
	PBQ-BPD			.42**
	WBSI			.29**
	SST-Load			-.15*
	Total R^2	.56**		
PAI-BOR	Step 1	.13**		
Affect Instability	PANAS-NA			.37**
	Step 2	.27**		
	PANAS-NA		.12	
	PBQ-BPD			.44**
	WBSI			.23**
	Step 3	.00		
	PANAS-NA			.11
	PBQ-BPD			.42**
	WBSI			.23**
	SST-Load			-.05
	Total R^2	.39**		
PAI-BOR	Step 1	.21**		
Identity Problems	PANAS-NA			.46**
	Step 2	.22**		
	PANAS-NA			.24**
	PBQ-BPD			.33**
	WBSI			.28**
	Step 3	.03**		
	PANAS-NA			.21**
	PBQ-BPD			.26**

	WBSI		.28**
	SST-Load		-.20**
	Total R^2	.46**	
PAI-BOR Negative Relationships	Step 1	.08**	
	PANAS-NA		.29**
	Step 2	.26**	
	PANAS-NA		.04
	PBQ-BPD		.43**
	WBSI		.23**
	Step 3	.02	
	PANAS-NA		.02
	PBQ-BPD		.38**
	WBSI		.22**
	SST-Load		-.15
	Total R^2	.37**	
PAI-BOR Self-Harm	Step 1	.06**	
	PANAS-NA		.25**
	Step 2	.12**	
	PANAS-NA		.09
	PBQ-BPD		.27**
	WBSI		.18*
	Step 3	.01	
	PANAS-NA		.08
	PBQ-BPD		.24*
	WBSI		.18*
	SST-Load		-.08
	Total R^2	.19**	

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

Chapter Four: Discussion

Negative cognitive biases and thought suppression are two well-established

constructs related to BPD symptom severity. The present study used a written

laboratory task (SST) to study cognitive bias and thought suppression as they relate to

BPD symptom severity in a student sample. As expected, correlational analyses showed

significant relationships between BPD symptom severity and self-report and lab tasks

designed to measure cognitive bias and thought suppression. Additionally, the lab task

measurements of thought suppression and cognitive bias were significantly correlated

with self-report measures of thought suppression and cognitive bias. Although SST-Load

score was somewhat more strongly correlated with BPD symptom severity compared to

the SST-No Load score, a group comparison showed that the difference between the

Load and No-Load conditions was not significant, either for participants with high levels

of BPD features or for those below the clinically significant threshold. However, a

nonsignificant trend was observed for the participants with high BPD features to create

fewer positive sentences under the Load condition than the No-Load condition,

suggesting that the cognitive load (remembering a 6-digit number) may have a

somewhat great impact on participants with high levels of BPD symptoms.

Regression analyses showed that after controlling for state-level negative affect,

the SST-load score measuring cognitive bias significantly predicted a unique portion of

variance in BPD symptoms unaccounted for by PBQ-BPD. While Rude (2010) found the

SST score to be a stronger predictor of future depressive episodes than self-report

measures, the current study found both the SST and self-report measures to remain

significant predictors. To more stringently test the predictive power of the SST-load

score, post hoc analyses entered both self-report measures of interest (PBQ-BPD and

WBSI) followed by the SST-score. Although the two self-report measures remained

significant predictors in the final model, the SST-load score was a significant predictor as

well for the PAI-BOR total score and the Identity Problems subscale. Across all

regression analyses, the SST-load score was the strongest predictor for the Identity

Problems subscale score. This may be a result of the scrambled sentences task and

cognitive distortions related to BPD (the world and other people are dangerous and

malevolent, the self is powerless and vulnerable, and the self is unacceptable,

unlovable, and deserving of punishment) being more heavily weighted towards

distortions of the self and identity. Further examination of the SST-load score in

mediational analyses found that the SST-load score partially mediated the relationship

between a childhood emotional vulnerability and BPD symptom severity, suggesting

that individuals with this emotional vulnerability as a child will be more likely to develop

BPD symptoms when they have negative cognitive biases about themselves.

While the SST difference score intended to measure thought suppression did

significantly correlate with the WBSI, it only significantly correlated with one PAI-BOR

subscale and it did not account for significant variance over and above the WBSI in a

regression model. Furthermore, the SST difference score did not mediate the

relationship between childhood emotional vulnerability and BPD symptom severity.

These insignificant findings may be due to the fact that the lab task is only capturing one

aspect of thought suppression related to BPD. For example, no sentences address

impulsive behaviors (i.e. drugs, alcohol, sex, etc.) or self-harm behavior—two common BPD features. So while the SST difference score may be an accurate measure of thought suppression as it relates to cognitive distortions in BPD, it may not be a good measure for studying overall thought suppression in BPD.

Taken as a whole, this study suggests that the scrambled sentences lab task is a useful supplement to self-report measures in assessing cognitive distortions in BPD. Even after accounting for self-reported cognitive distortions as measured by the PBQ-BPD, the SST-load score still accounted for a significant portion of variance in BPD features, albeit a small amount. The SST did not appear to work as well for studying thought suppression in BPD, in that the SST difference score was only modestly correlated with one feature of BPD and with self-reported thought suppression. This may be a result of using sentences for the SST that focus narrowly on BPD-related distortions alone, as opposed to including thoughts about other symptoms associated with BPD. On the other hand, there was a difference between the load v. no-load conditions for participants with high BPD symptomatology, albeit not statistically significant. Instead of a measure of thought suppression, this difference may expose an already depleted attentional system in BPD. Therefore it is plausible that the SST difference score is not a good measure of thought suppression in BPD.

Although findings from the current study are supportive of the use of laboratory tasks in conjunction with self-report measures, other lab tasks using different methods should be developed. Because the SST studied thought suppression in the specific context of BPD-related cognitive distortions, it may have only captured a portion of the

construct as it relates to BPD, as individuals with BPD may suppress thoughts unrelated to the specific cognitive distortions targeted in the present study. Also, because the SST was originally designed for the study of depression, it may be more effective in capturing thought suppression in a depressed population. Another limitation of the present study is the use of a student sample without any formal diagnoses or diagnostic interviews. The current study was unable to replicate mediational models using an invalidating childhood environment as the independent variable, possibly because the college sample used did not experience a higher range of childhood invalidation. This study's findings would be strengthened if replicated with a clinical population.

Other future research directions could include examining thought suppression in BPD as it compares to other clinical populations. In addition, because BPD is such a heterogeneous disorder, so too would be the types of thoughts that may be suppressed. Therefore, a thought suppression task may show high levels of thought suppression in one BPD subject but not the other because of the vast constellation of symptoms associated with this disorder. Future research may also want to seek out ways for laboratory tasks to remain standardized, yet somehow incorporate personally relevant stimuli into the designs. Overall, this study shows the strong presence of cognitive biases in BPD as evidenced in both self-report and laboratory measures, which can be targeted for future research to better understand this disorder

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