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Correlates of Adolescent Nonsuicidal Self-Injury:
Adolescent Emotional Reactivity and Maternal Parenting Behaviors

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By

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An abstract of
A dissertation submitted to the Faculty of the
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Abstract

Correlates of Adolescent Nonsuicidal Self-Injury:
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By Meaghan E. McCallum

Developmental theories of Borderline Personality Disorder (BPD) posit that borderline pathology develops as the result of the transaction between biologically-based vulnerabilities to emotion dysregulation and chronic exposure to high levels of emotional invalidation, particularly within the family context. This dissertation reports on two studies aimed at (1) characterizing adolescent emotional reactivity in response to maternal invalidation and (2) better understanding parenting behaviors associated with adolescent risk for BPD. Participants in both studies included two groups of mother-daughter dyads, one group of dyads including adolescents at risk for BPD (i.e. repetitive engagement in self-injury) and one group including healthy control adolescents. Study 1 assessed adolescents' subjective and psychophysiological responses to maternal invalidation. Results indicated that relative to controls, self-injuring adolescents perceived maternal invalidation as more distressing according to self-report measures, but not psychophysiological reactivity. Study 2 took advantage of a multi-method, multi-informant assessment of maternal parenting behaviors. Results indicated that adolescent self-injury status was not related to mothers' parenting behaviors. For the sample as a whole, adolescent reports of high maternal invalidation in combination with low validation were associated with higher levels of borderline pathology, suggesting a potential protective role of maternal validation. Results from both studies support preventive intervention efforts focused on reducing maternal invalidation, enhancing maternal validation, and altering adolescent perceptions of parenting behaviors.

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Correlates of Adolescent Nonsuicidal Self-Injury:
Adolescent Emotional Reactivity and Maternal Parenting Behaviors

Borderline personality disorder (BPD) is a psychological disorder characterized by a pervasive pattern of instability in emotion regulation, impulse control, interpersonal relationships, and self-image across a variety of contexts (American Psychiatric Association, 2013). The disorder is associated with severe psychosocial impairment (Grant et al., 2008) and increased rates of attempted and completed suicide (Black, Blum, Pfohl, & Hale, 2004) and self-injury (American Psychiatric Association, 2004). Although individuals with BPD make high use of mental health treatment (Zanarini, Frankenburg, Hennen, & Silk, 2004), BPD continues to be considered one of the most difficult disorders to treat, with high rates of patient dropout, therapist burnout, and persistence of suicidality and symptoms of psychopathology following intervention (Linehan, Comtois, Murray, & et al., 2006; Linehan, Dexter-Mazza, & Barlow, 2008). Given the severity and impairment of BPD in adulthood and its intractability to treatment, researchers have begun to recognize the potential advantages of identifying the developmental trajectories that lead to BPD in adulthood. Such knowledge would inform the identification of at-risk youth and targets for early intervention. Studying adolescents at risk for, or showing early signs of BPD, appears to be particularly promising, as adolescents demonstrate considerable flexibility and malleability of BPD traits (Lenzenweger & Castro, 2005) and their BPD features respond well to intervention (Chanen et al., 2008; Marieke Schuppert et al., 2012; Schuppert et al., 2009).

Despite a lack of prospective studies characterizing the trajectories leading to BPD in adulthood, theories describing the proposed development of BPD have been well developed (Crowell, Beauchaine, & Linehan, 2009; Fruzzetti, Shenk, & Hoffman, 2005; Linehan, 1993).

The most thoroughly delineated theory, Linehan's Biosocial Theory (1993), proposes that BPD emerges as the result of a transaction between individual characteristics, a biological predisposition to emotion dysregulation (indexed by sensitivity, reactivity, and slow recovery), and exposure to an invalidating environment. There are few published studies providing empirical support for Linehan's Biosocial Theory (for review, see Crowell et al., 2009), however. Empirical studies are needed not only to test the validity of this model, but also to improve our understanding and identification of youth at risk for BPD. Moreover, Dialectical Behavior Therapy (DBT), an empirically supported intervention for adolescents (Miller, Rathus, Linehan, Wetzler, & Leigh, 1997) and adults with BPD features (Linehan, 1993), is firmly based in Linehan's theoretical model of the development of BPD. For example, one of the adaptations implemented in the DBT program for adolescents is parent involvement in DBT skills training, which, in part, is designed to intervene in the theorized environmental adversities imposed on adolescents by their parents. Without empirical support for key components of the biosocial model, it may be that aspects of this intervention are misdirected. Thus the primary aims of the current studies were to identify the extent to which mothers of adolescents at risk for the development of BPD exhibit skills deficits during face-to-face interactions with their daughters and to examine adolescents' emotional reactivity in response to maternal behaviors. These aims were addressed by two studies. Study 1 assessed adolescents' emotional and physiological reactivity in response to invalidating feedback from mothers. Study 2 examined parenting behaviors associated with adolescent risk for BPD, indexed by engagement in nonsuicidal self-injury.

Adolescents' Emotional and Physiological Responses to Maternal Invalidation

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Abstract

Adolescents engaging in nonsuicidal self-injury (NSSI) appear to be at heightened risk for the development of Borderline Personality Disorder. Theories guiding interventions for these at-risk adolescents posit that borderline pathology develops as the result of the transaction between biologically-based characteristics, including heightened sensitivity, exaggerated reactivity, and slow recovery in response to stress, and exposure to chronic emotional invalidation. Yet we found no studies assessing self-injuring adolescents' emotional responses to parental invalidation. Thus, we investigated both subjective and physiological responses to standardized invalidation stimuli in a sample of 53 mother-daughter dyads, 24 of whom included adolescents with histories of repetitive NSSI and 29 of whom included healthy controls. Heart rate and adolescent reports of affective states were collected at multiple time points while adolescents listened to audio recordings of their own mothers providing neutral, invalidating, and/or validating feedback. Consistent with hypotheses, relative to controls, adolescents with a history of NSSI demonstrated increased sensitivity, reactivity, and slower recoveries in response to maternal feedback according to self-reported emotional arousal. Inconsistent with hypotheses, these results were not reflected in psychophysiological data. Results indicate that adolescents with a history of NSSI perceived maternal invalidation as more distressing compared to healthy controls according to self-report measures, but not physiological reactivity. These findings provide partial empirical support for targeting parental invalidation through interventions.

Adolescents' Emotional and Physiological Responses to Maternal Invalidation

Borderline personality disorder (BPD) is a chronic and impairing psychological disorder (Grant et al., 2008) characterized by pervasive and persistent emotion dysregulation, impulsivity, interpersonal problems, and identity disturbance, and is associated with high rates of engaging in suicidal and self-injurious behaviors (American Psychiatric Association, 2013; Black, Blum, Pfohl, & Hale, 2004). Linehan and colleagues have proposed that individuals at risk for developing BPD have innate biologically-based vulnerabilities to emotion dysregulation that are identifiable by adolescence (e.g., Crowell, Beauchaine, & Linehan, 2009; Linehan, 1993). Yet few studies have examined these claims in adolescents at risk for BPD. Identifying biological indices associated with risk for BPD would not only provide empirical validation of theories describing the development of BPD, but would also enhance understanding of youth at risk for BPD, informing the identification of at-risk adolescents and treatment targets for early preventive interventions. Thus, the current study aimed to characterize biological vulnerabilities of adolescents at risk for BPD.

Studying adolescents at risk for, or showing early signs of BPD, holds promise since adolescents demonstrate considerable variability of BPD traits over time (Lenzenweger & Castro, 2005) and their symptoms of BPD respond well to intervention (Chanen et al., 2008; Marieke Schuppert et al., 2012; Schuppert et al., 2009). Thus, better understanding adolescents at risk for developing BPD has the potential to inform the identification of adolescents who would most benefit from receiving preventive interventions during this developmental period, prior to the onset of full blown BPD, while also highlighting etiological mechanisms that might be targets of intervention. Self-injurious behaviors are not only one diagnostic criterion of BPD, but accumulating evidence also suggests that engagement in nonsuicidal self-injury (NSSI), the

direct, deliberate destruction of body tissue without suicidal intent (Zlotnick, Donaldson, Spirito, & Pearlstein, 1997), is indicative of risk for BPD (Crowell et al., 2009). NSSI and BPD share several biological vulnerabilities, contextual risk factors, personality traits, and acquired coping strategies, and are believed to be derived from a common etiology (Derbidge & Beauchaine, 2014). Further, adolescents engaging in self-injury have been shown to exhibit higher levels of BPD symptoms relative to adolescents with axis I psychopathology alone (Crowell et al., 2012) and approximately half of adolescents engaging in NSSI can be diagnosed with BPD without adjustment to adult criteria (Nock, Joiner Jr, Gordon, Lloyd-Richardson, & Prinstein, 2006). Finally, engagement in NSSI during adolescence has been prospectively associated with increased risk for several psychological disorders (Mars et al., 2014). Therefore, NSSI has been considered an early behavioral indicator of risk (Crowell et al., 2009; Lamph, 2011). Based on this, the current study aimed to better understand the biological vulnerabilities for emotion dysregulation in adolescents engaging in NSSI, a group at heightened risk of developing BPD.

Biosocial Theories of the Development of BPD

Despite a lack of prospective empirical studies characterizing the trajectories leading to BPD in adulthood, theories describing the development of BPD have been well developed (e.g., Crowell et al., 2009; Fruzzetti, Shenk, & Hoffman, 2005; Linehan, 1993). Each of these theoretical models emphasize the emergence of BPD as the result of a transaction between one's biological predisposition to emotion dysregulation and exposure to an invalidating environment, i.e. one that delegitimizes, punishes, or minimizes expressions of emotion. The most thoroughly delineated etiological model of borderline pathology, Linehan's Biosocial Theory (1993), forms the basis of the current study. The biological predisposition to emotion dysregulation that Linehan refers to is the presence of three biologically-based individual characteristics:

heightened emotional sensitivity (*sensitivity*), difficulty regulating the intensity of emotional responses (*reactivity*), and prolonged emotional responses (*recovery*). As reviewed below, despite rich theoretical underpinnings, few published reports were found to have empirically examined these biological vulnerabilities to emotion dysregulation in adolescents with and without histories of NSSI.

Sensitivity. The first characteristic of individuals predisposed to emotion dysregulation, high sensitivity to environmental stress, refers to an individual's tendency to experience an emotional reaction quickly, with a low threshold necessary in order to provoke an emotional reaction (Linehan, 1993). This is also thought to reflect a heightened state of baseline arousal, in part a result of long-lasting emotional responses and the individual having not yet recovered from a previous stressor (see below).

Lab-based studies have linked indices of adolescents' sensitivity with engagement in NSSI and symptoms of BPD, providing some support for this component of the Biosocial Theory. One study showed that relative to controls, adolescents with histories of NSSI discontinued their participation in performance-based lab tasks sooner (Cohen's d= .52), indicating a poorer ability to tolerate distress and thus, more sensitivity to stress (Nock & Mendes, 2008). In addition, performance on dot-probe tasks revealed that relative to controls, youth with BPD features were faster to respond to congruent than to incongruent fear stimuli (Cohen's d = .25) and were slower to respond to incongruent rather than paired neutral trials (Cohen's d = .24), indicative of greater attentional biases for fearful faces and difficulty disengaging attention from threatening information (Jovev et al., 2012). Thus adolescents at risk for BPD may be hypervigilant to threat cues and have difficulty tolerating distress relative to healthy controls.

In addition to performance on lab-based tasks, adolescents' sensitivity to distress has also been studied via assessments of psychophysiological arousal during rest. Specifically, in comparison to healthy controls, adolescents engaging in self-harm, including both suicidal and nonsuicidal self-injury, have demonstrated reduced resting high frequency heart rate variability (HF-HRV), with a large effect size (Cohen's d = 1.11; Crowell et al., 2005). Although this supports the emotional sensitivity component of the Biosocial Theory (Linehan, 1993), the extent to which reduced resting HF-HRV corresponds to subjective ratings of emotional arousal remains unknown. Thus, the current study investigated both psychophysiological and subjective measures of resting emotional arousal in adolescents with histories of NSSI.

Reactivity. The second characteristic of individuals predisposed to emotion dysregulation as proposed by Linehan's Biosocial Theory (1993), high reactivity, refers to heightened intensity of emotional reactions. In line with this idea, adolescents who engage in NSSI have reported higher levels of subjective emotional distress in response to stressful events compared to controls (Najmi, Wegner, & Nock, 2007; Nock, Wedig, Holmberg, & Hooley, 2008). In addition to subjective self-reports, a limited number of lab-based studies have differentiated self-harming adolescents from healthy controls in terms of their psychophysiological reactivity to stressors. More specifically, relative to healthy adolescents, adolescents engaging in NSSI have been shown to exhibit exaggerated reactivity in skin conductance levels (Cohen's *d*= .57; Nock & Mendes, 2008) and increased HF-HRV in response to lab stressors (Cohen's d = 1.29; Crowell et al., 2005), suggesting that adolescents who engage in NSSI experience standardized, lab-based stressors to be more distressing than healthy controls. This interpretation is in line with models proposing that NSSI primarily serves to reduce the intensity of intense negative emotions (Nock, Prinstein, & Sterba, 2009) and studies

of adults with BPD showing that experimenter-administered cuts decrease physiological arousal (Reitz et al., 2015).

An additional approach to psychophysiological reactivity, reflected by neuroendocrine functioning, demonstrated altered physiological arousal for adolescents who engage in NSSI, albeit with a different direction of findings (Kaess et al., 2012). Specifically, among female adolescents, those who engaged in NSSI and suicidal self-injury showed attenuated cortisol reactivity in response to the Trier Social Stress Test compared to healthy controls, with a large effect size (Cohen's *d*= .75; Kaess et al., 2012). This finding is in line with one study of attenuated cortisol reactivity in adults with BPD compared to healthy controls (Nater et al., 2010). It has been suggested that the hyporesponsivity is the results of down regulation of the hypothalamic pituitary adrenocortical (HPA) axis following chronic stress or early life stress in adolescents who engage in NSSI, as seen in individuals exposed to chronic stress or those with Post Traumatic Stress Disorder (Kaess et al., 2012).

Taken together, there is some evidence to support the Biosocial Theory's tenet that adolescents at risk for BPD demonstrate heightened reactivity (Linehan, 1993) in that adolescents who self-harm were found to experience heightened subjective and physiological reactivity in response to stressors. In contrast, the single study examining HPA reactivity revealed a pattern of HPA hyporeactivity in self-harming adolescents. Because these lab-based studies relied on short film clips or performance-based stressors, an important unanswered question remains regarding the reactivity of self-harming adolescents in response to emotional invalidation. Further, the extent to which exposure to emotional validation may attenuate emotional reactivity also remains unknown. These are particularly important gaps in the literature given that one aim of empirically supported treatment for adolescents engaging in

NSSI is to increase parenting validation and decrease invalidation via skills training based on the premise that invalidation serves to heighten emotional distress and fails to model appropriate emotion regulation skills (Miller, Rathus, Linehan, Wetzler, & Leigh, 1997). Therefore, we examined adolescents' reactivity using theoretically derived, ecologically valid stimuli, audio recordings of participants' own mothers delivering invalidating and validating feedback.

Recovery. The third characteristic of individuals predisposed to emotion dysregulation, a slow recovery from an emotional response, refers to long durations of heightened emotional reactions (Linehan, 1993). This extended recovery is also believed to contribute to high sensitivity to the next perceived stressor. We found no published reports supporting longer recovery times following exposure to a stressor among adolescents engaging in NSSI compared to healthy controls. In the one published study we found on this topic, the recovery of self-harming adolescents, as indexed by HF-HRV and skin conductance levels, did not differ significantly from healthy controls following a brief sadness induction task (Crowell et al., 2005), as all participants tended to return to baseline within 30 seconds of termination of the film clip. The extent to which adolescents engaging in NSSI may show an extended recovery relative to controls following exposure to emotional invalidation from their parents remains unknown.

Invalidating Environment

In addition to the presence of biologically-based individual characteristics predisposing individuals to emotion dysregulation, the other theoretical component essential to risk for developing BPD is exposure to an invalidating environment, particularly in the family context (Fruzzetti et al., 2005; Linehan, 1993). Invalidating environments are characterized by intolerance of the expression of internal experiences and communicate the message that emotional displays are unwarranted and should be coped with internally (Linehan, 1993).

Whereas validating responses communicate acceptance and legitimacy of the individual's personal experiences, invalidating responses delegitimize, minimize, and/or fail to acknowledge the existence of expressions of internal experiences (Fruzzetti et al., 2005; Linehan, 1993). Within the transactional processes proposed by the Biosocial Theory, it is posited that receiving validating feedback in response to expressions of negative emotions leads to attenuated emotional distress, whereas receiving invalidating feedback leads to heightened distress (Linehan, 1993). Empirical support for these claims comes from a single experimental study that linked invalidation to heightened emotional responses among a sample of college students (Shenk & Fruzzetti, 2011). More specifically, participants randomized to receive invalidating feedback from experimenters following a performance-based stressor showed significant increases, relative to baseline, in both subjective (self-reported negative affect) and physiological arousal (heart rate and skin conductance levels) compared to participants randomized to receive validating feedback (Shenk & Fruzzetti, 2011). Although this study did not include adolescents at risk for BPD, it does provide clear support for the proposed relationship between exposure to invalidation and emotional reactivity. Further, if this finding was extended to self-harming adolescents it would lend support to interventions focused on reducing parents' invalidating behaviors and increasing validating behaviors. Yet we found no studies investigating adolescent reactivity in response to parental invalidating feedback. This is a particularly important question for self-harming adolescents, as ecological momentary assessment of adolescent NSSI has highlighted family arguments, conflict, and criticism as common precipitants of engagement in NSSI (Nock et al., 2009). Thus, the current study aimed to examine adolescents' sensitivity, reactivity, and recovery following exposure to parental invalidation and validation.

Current Study

Despite strong theoretical support, there are few studies demonstrating that adolescents at risk for developing BPD differ from healthy controls in terms of their vulnerabilities to emotion dysregulation, heightened sensitivity and reactivity, and a slow return to baseline arousal. Further, there is no empirical evidence that adolescents who engage in NSSI differ in terms of their emotional reactivity in response to parental invalidation and validation compared to healthy controls. Thus the aims of the current study were to examine subjective and objective measures of arousal at rest, in response to invalidation, and following validation, in a sample of adolescents with histories of NSSI and are considered to be at risk for developing BPD. We expected (1) that relative to healthy controls, subjective self-reports and objective psychophysiological measures of adolescents with histories of NSSI would demonstrate heightened resting arousal (sensitivity), (2) exaggerated reactivity in response to receiving invalidating feedback (reactivity), and a (3) prolonged emotional response following the termination of invalidation (recovery). In addition, we tested an exploratory hypothesis (4), based in Linehan's Biosocial Theory (1993), that adolescents exposed to validating feedback would show attenuated responses, both in terms of physiological and self-reported arousal, compared to those who received neutral feedback.

In order to test these hypotheses, we conducted a multi-method cross-sectional study with two groups of parent-adolescent dyads, those that included an adolescent with repetitive NSSI and those that included a healthy adolescent with no history of NSSI. Further, the current study included personally relevant stimuli with high ecological validity by using participants' own parents as a source of stimuli for a lab stressor protocol. Although correlational studies are limited in that they cannot test etiology of BPD or direction of associations, they are crucial in providing initial empirical theoretical validation. Such findings would further our understanding

of adolescents who engage in NSSI, yielding both important theoretical and clinical implications. Further, given BPD's relatively low prevalence in the general population (2-6 %; American Psychiatric Association, 2013), prospective longitudinal studies of the etiology of BPD would require very large samples and would be cost-prohibitive.

In order to minimize variability that might be associated with age, we included only 14-18-year-old adolescents, given that prospective studies have shown age 14 to be the mean age of onset of NSSI (Yates, Carlson, & Egeland, 2008) and that the prevalence of NSSI is highest during teenage years (Swannell, Martin, Page, Hasking, & St John, 2014). The sample was further restricted to female adolescents, given that females are significantly more likely to engage in NSSI than males (odds ratio = 1.5; Bresin & Schoenleber, 2015) and that males tend to report different functions of NSSI (Zetterqvist, Lundh, Dahlström, & Svedin, 2013). In addition, the sample size of the current study hindered our ability to conduct adequately powered tests of moderation by sex of participants. In line with this, the study further focused on mothers, since mothers have been shown to be more engaged in their adolescents' emotional lives than fathers (Klimes-Dougan et al., 2007).

Method

Participants

Participants included 53 mothers and their 14-18-year-old adolescent daughters. Participants were recruited through outpatient mental health clinics (30%), a database of community members willing to be contacted regarding research studies (43%), flyers in the community (23%), and word of mouth (4%). For all participants, inclusion criteria were English being the primary language spoken at home and adolescents living at least part-time with their mothers. Exclusion criteria were maternal histories of participation in psychotherapies focused

on altering parenting strategies (e.g., Dialectical Behavior Therapy, parent training) and adolescents' diagnosis of a serious developmental disability. In an attempt to match participants on stimulant medication use, healthy controls were included if they had a diagnosis of Attention Deficit Hyperactivity Disorder (ADHD). Controls were excluded if they endorsed a lifetime history of any other Axis I disorder or any lifetime history of NSSI. Because many adolescents engaging in NSSI were prescribed psychotropic medications (n = 18, 75%), these participants were not excluded based on this criterion. Chi-Square analyses indicated that the proportion of adolescents in each group using stimulant medications was not significantly different ($p > .05$). A total of 58 mother-adolescent dyads were recruited and consented, 24 in the NSSI group and 35 controls. Of the controls, five were excluded due to Axis-I diagnoses and/or a single instance of NSSI. Thus the final sample included 53 mother-adolescent dyads, 24 with a history of repetitive NSSI and 29 healthy controls.

On average, teens were 15.8 years old (SD = 1.4) and mothers were 47.4 years old (SD = 4.7). Dyads tended to be of a high socioeconomic status, with a mean annual household income of 139 thousand dollars (SD = 80 thousand dollars) and 17 years (SD = 2.4) of maternal education. Teens primarily identified as Caucasian (n = 38, 72%), followed by multi-racial (n = 10, 19%) or African American (n = 5, 9%). Mothers tended to be married (n = 46, 87%). With the exception of one dyad in each group that included an adoptive mother-daughter pair, all other dyads were biologically related (n = 51, 96%). There were no significant group differences between the adolescents with a history of NSSI and healthy controls in terms of any of these variables.

Power Calculations and Sample Size

An *a priori* sample size calculation was performed with G*Power. Effect size was calculated from the group differences in initial HF-HRV reported by Crowell et al. (2005; d = 1.11), with an alpha error probability set to .05 and a corresponding power of .95. The total sample size needed in order to detect significant between-subjects effects for two groups was estimated to be at least 46 participants, with 23 participants per group. The final sample in the current study included 53 mother-adolescent dyads, 24 with adolescents engaging in NSSI and 29 controls.

Procedure

Eligible mother-adolescent dyads participated in a one-time, 2.5 hour laboratory visit and were provided with a $60 payment. While adolescents completed structured clinical interviews regarding psychiatric diagnoses and history of self-harm, mothers created audio recordings of neutral, invalidating, and/or validating statements. Finally, adolescents completed the emotional challenge protocol, during which they listened to their mothers' audio recordings. Adolescents' ratings of their subjective affective state and psychophysiological data were collected throughout this protocol. The study was approved by the Emory University Institutional Review Board. All adolescents and their mothers provided written informed assent and consent, respectively.

Emotional Challenge Protocol. Adolescents completed an emotional challenge during which they listened to audio recordings of their mothers providing various auditory feedback while HF-HRV data were collected. Participants were seated at a desk where they listened to audio recordings via headphones. Using a laptop, they completed ratings of their positive and negative affective states six times total, once following each block of rest, recovery, or blocks of three 30-second audio recordings (see Figure 1). Adolescents listened to white noise recordings during all rest and recovery periods.

Following the application of electrodes, adolescents were instructed to sit quietly for 5 minutes (*rest*). Next, adolescents listened to a series of statements from their mothers, beginning with the block of three neutral segments. Next, adolescents were instructed to imagine that they have just experienced a series of stressors and have elicited support from their mothers. The stressors mentioned in the prompt are all commonly endorsed stressors by adolescents: problems with school, parents, friends, and romantic partners (Stark, Spirito, Williams, & Guevremont, 1989). Adolescents were then presented with the block of invalidating segments (*invalidation*) and then sat quietly for a 5-minute recovery period (*recovery 1*). At this point, participants were randomized to one of two conditions, stratified by NSSI status. Approximately half of the participants (n = 27; 51%) were presented with a block of neutral audio recordings, whereas the other half (n = 26, 49%) heard a block of validating segments (*experimental condition*). Finally, both groups completed a second five-minute recovery period (*recovery 2*).

Emotional Challenge Stimuli. The audio recording stimuli for the emotional challenge were provided by participating adolescents' own mothers during lab visits. Each statement began with the adolescent's first name followed by scripted statements. Mothers were encouraged to practice reading each statement several times, receiving feedback from a research assistant in between trials in order to fit the statements to 30 seconds and make them sound as natural as possible. Each mother recorded a total of 9 statements, three with neutral content, three with invalidating content, and three with either validating or novel neutral content, depending on condition randomization. Neutral content included descriptions of routine situations or recent events, such as the weather, similar to the protocol of Hooley et al. (2009). The invalidating and validating statements were based off of validating and invalidating responses in the Children's Negative Emotions Scale, a self-report measure assessing parental

validation and invalidation (Remmes & Ehrenreich-May, 2014). Audio stimuli were rated for affective tone using a -3 to +3 scale in order to ensure that there were no significant differences between mothers of self-harming adolescents and healthy controls in terms of the tone of recordings (*p*'s > .10).

Measures

Self-Harm Behaviors. Adolescents completed the Lifetime Parasuicide Count (Linehan & Comtois, 1996), a structured interview that assessed frequency and severity of self-harm behaviors. The interview was assisted by a timeline followback methodology, where participants used personally relevant events over the past year as anchors in a calendar-based interview. The total number of self-harm incidents were computed for the past year and lifetime.

Adolescent Emotional Reactivity. Adolescents reported on their subjective emotional responses during the emotional challenge protocol using the state version of the Positive Affect and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). The PANAS consists of 20 items (10 positive items and 10 negative items), with response options on a 5-point Likert scale. The measure yielded two scores for each time point, the sum of the positive and negative affect scales, with higher scores indicative of more intense subjective affect. The positive and negative affective state scales have demonstrated high internal consistency (Cronbach's alphas = .89 and .85, respectively), expected test-retest reliability (*r* = .54 and .45, respectively), and good discriminant validity (*r* = -.15). For the current study, internal consistencies ranged from .81-.91 for positive affective states and from .67-.88 for negative affective states across time points.

Psychophysiology Data. Heart rate was recorded continuously throughout the emotional challenge protocol using the Biopac MP150 system for Windows. Data were collected

using a standard two lead configuration with a sampling rate of 2000 Hz. Spectral analyses were performed, which involved decomposing the electrocardiographic R-wave time series using fast Fourier transformations (Berntson et al., 1997). Vagal influences on cardiac activity were examined by extracting the spectral power within the high frequency band component (.15-.40 Hz; HF-HRV). Spectral densities were calculated in 30-second epochs and normalized using log transformations, as is customary for spectral data. As outlined by Kemper, Hamilton, and Atkinson (2007), a single outlier value greater than five standard deviations from the mean was excluded for one baseline 30-second epoch, given that removal of outliers produces only minimal changes in values as compared to interpolation. Mean HF-HRV values were computed for each segment of the emotional challenge (*rest, neutral, invalidation, recovery 1, experimental condition, recovery 2*). Following Crowell et al. (2005), for the rest segment, we focused on the last minute of the 5-minute period, when adolescents were most likely to be acclimated to the lab setting. The validity of HF-HRV as an index of parasympathetic activation has been well-established (Berntson et al., 1997). HF-HRV provides a reliable estimate of parasympathetic vagal influences on cardiac activity and is frequently used as a measure of emotion regulatory ability (Porges, 1995, 1997).

Planned Analyses

Preliminary analyses were conducted in order to characterize the NSSI in our sample. Descriptive statistics for all variables are presented in Table 1. In order to test our first hypothesis, that adolescents who engage in NSSI would demonstrate higher resting arousal relative to controls, we conducted independent samples *t* tests comparing adolescents' resting positive and negative affective states and their resting HF-HRV values. In order to test our hypotheses that adolescents who engage in NSSI would demonstrate exaggerated reactivity and a

prolonged response to hearing maternal invalidation, we conducted repeated measures analyses of variance (ANOVA) with group (NSSI status) X time interactions separately for positive affective ratings, negative affective ratings, and HF-HRV values. When appropriate, we corrected for group differences in initial rest values by computing change scores from rest, so that dependent variables included in model testing reflected changes from the rest segment. Because departures from the sphericity assumptions of repeated measures ANOVA are common with psychophysiological data (Vasey & Thayer, 1987), all interactions and main effects were computed with the Greenhouse-Geisser corrected degrees of freedom. Follow-up comparisons were performed as indicated. Finally, in order to test the hypothesis that exposure to validating feedback would decrease arousal relative to neutral feedback, we conducted additional repeated measures ANOVA with positive and negative affective ratings and HF-HRV from relevant time points, examining condition X group X trial, condition X trial, and group X trial interactions.

Results

Characteristics of Self-Harm

Participants with a history of NSSI (n = 24) engaged in an average of 33 (SD = 60) episodes of NSSI in the past year and 390 lifetime episodes (SD = 878, range = 4 – 3,170), with an average age of onset of NSSI at age 12.78 (SD = 2.20). Among methods of NSSI, nearly all self-harming participants reported engaging in cutting and/or severe scratching (96%; 23 of 24 participants) and most participants described cutting and/or severe scratching as their primary method of NSSI (83%; 20 of 24). The majority of self-harming participants reported engaging in multiple forms of NSSI during their lifetimes (n = 17, 70%), however. Although adolescents were recruited solely on the basis of engagement in repetitive episodes of NSSI, one quarter of

the self-harmers reported making a suicide attempt in the past year (n = 6) and approximately half reported at least one lifetime suicide attempt (n = 13; 54%).

Subjective Emotional Reactivity to Emotional Challenge

In support of our hypothesis that adolescents engaging in NSSI would endorse higher levels of resting arousal compared to controls, indicative of higher sensitivity to stress, group comparisons indicated significant between subjects effects in participants' initial negative affective states. More specifically, adolescents engaging in NSSI endorsing statistically higher levels of negative affect at rest compared to controls, $t(51) = 3.29$, $p = .002$, Cohen's $d = .91$, with a large effect size. There were no significant differences in levels of positive affect at rest according to NSSI status, however, $t(51) = 1.25$, $p = .22$, Cohen's $d = 0.09$.

In support of our hypothesis predicting altered reactivity in response to invalidation among adolescents engaging in NSSI, a repeated measures ANOVA revealed a significant group X trial interaction predicting changes in negative affect (relative to rest) across trials, $F(1.62) = 6.39$, $p = .01$, partial $\eta 2 = .11$, as depicted in Figure 2. Follow-up group comparisons indicated that relative to controls, self-injurers reported greater increases in negative affect from rest to invalidation trials, with a medium effect size, $t(51) = 2.17$, $p = .04$, $d = .59$. Our third hypothesis that relative to controls, adolescents engaging in NSSI would exhibit prolonged emotional responses to invalidation as reflected by elevated scores during the Recovery 1 segment was not supported. Controls and adolescents engaging in NSSI did not significantly differ in their negative affect endorsed after the Recovery 1 period, $t(43.46) = 1.67$, $p = .10$, Cohen's $d = 0.47$, although there was a medium effect size.

Repeated measures ANOVA with positive affective responses failed to detect a significant Group X Trial interaction, $F(3) = 1.67$, $p = .18$, partial $\eta 2 = .03$, indicating that participants' positive affect did not differ over time according to self-harm status (see Figure 3).

With regard to our exploratory hypotheses re altered responses to validation versus neutral feedback, repeated measures ANOVAs did not detect significant Trial X Group X Condition, $F(1.79) = 1.17$, $p = .31$, partial $\eta^2 = .02$, or Trial X Condition interactions, $F(1.79) = 0.75$, $p = .46$, partial $\eta 2 = .02$, indicating that the type of feedback received (validation versus neutral) did not alter participants' negative affect, regardless of NSSI status. A significant Group X Trial interaction emerged, however, $F(1.79) = 3.61$, $p = .04$, partial $\eta 2 = .07$, indicating that ratings of negative affect differed across trials depending on NSSI status. Follow up analyses indicated that adolescents engaging in NSSI endorsing significantly higher negative affect during the experimental, $t(31.77) = 2.34$, $p = .03$, Cohen's $d = 0.66$, and recovery 2 segments, $t(25.27) = 2.73$, $p = .01$, Cohen's $d = 0.78$, relative to controls, regardless of receiving validating or neutral feedback during the experimental condition.

A repeated measures ANOVA failed to detect any significant Group X Trial X Condition interactions, $F(1.60) = 0.70$, $p = .47$, partial $\eta 2 = .01$, Group X Condition, $F(1.60) = 0.18$, $p = .79$, partial $\eta 2 = .004$, or Trial X Group interactions, $F(1.60) = 018$, $p = .79$, partial $\eta 2 = .004$, in the prediction of positive affect, indicating that there were no significant differences between positive affective responses of adolescents engaging in NSSI and controls in response to receiving validating as compared to additional neutral feedback.

Psychophysiological Reactivity in Response to Emotional Challenge

Contrary to our hypothesis, analyses failed to detect significant group differences in participants' resting HF-HRV values according to NSSI status, $t(51) = 1.60$, $p = .12$, Cohen's $d =$

0.44, although analyses indicated a medium effect size. In addition, also contrary to hypotheses, a repeated measures ANOVA failed to detect significant Group X Trial interactions of HF-HRV across rest, neutral, invalidation, and recovery 1 segments, $F(2.35) = 0.66$, $p = .54$, partial $\eta^2 = .01$, (see Figure 4). Similarly in contrast to hypotheses, repeated measures ANOVA failed to detect significant Group X Trial X Condition, $F(1.93) = 0.23$, $p = .79$, partial $\eta^2 = .01$, Group X Trial, $F(1.93) = 0.38$, $p = .68$, partial $\eta^2 = .01$, or Trial X Condition interactions, $F(1.93) = 0.01$, $p = .99$, partial $\eta^2 < .001$, in the prediction of HF-HRV across recovery 1, experimental condition, and recovery 2 segments.

Discussion

This study provided an empirical test of several components of a theoretical model of the development of BPD that proposes risk for BPD emerges, at least in part, as the result of biologically-based individual differences in sensitivity, reactivity, and recovery regarding stressors (Linehan, 1993). Further, this model proposes that receiving emotionally invalidating feedback serves to heighten emotional arousal. In support of this model, we found that, compared to healthy controls, adolescents with a history of NSSI who were considered to be at risk for BPD displayed heightened sensitivity and reactivity, as indexed by subjective reports of negative affect. Further, we found some evidence that adolescents with a history of NSSI show prolonged emotional responses to maternal feedback, indicative of difficulty recovering following stressors. Contrary to expectations, we found no evidence of heightened psychophysiological sensitivity, reactivity, or a prolonged recovery associated with engagement in NSSI, as indexed by HF-HRV.

Our finding that adolescents with a history of NSSI demonstrate higher sensitivity than healthy controls, as reflected by higher self-reported negative affect during rest, is consistent

with theories describing heightened sensitivity among youth at risk for BPD (Linehan, 1993). To our knowledge, our study provides the first evidence of altered patterns of reactivity among adolescents with a history of NSSI following exposure to standardized delivery of invalidation within a lab task. Our finding that adolescents with a history of NSSI endorsed exaggerated negative emotional responses to invalidation is consistent with reports of heightened emotional responses among adolescents with a history of NSSI (Najmi et al., 2007; Nock et al., 2008) and associations between parental rejection and invalidation and adolescent anger and frustration (Crowell et al., 2013). Further, increased distress has long been proposed to be a major precipitant of NSSI (e.g., Favazza, 1996), and models of NSSI models propose that NSSI primarily serves to reduce the intensity of intense negative emotions (Nock et al., 2009). These claims are supported by ecological momentary assessments showing that adolescent NSSI tended to occur in the context of negative emotional experiences, including feelings of rejection, anger, self-hatred, numbness, and anger (Nock et al., 2009), and studies of adults with BPD showing that experimenter-administered cuts decrease physiological arousal following lab-based stressors (Reitz et al., 2015). Finally, our finding that following exposure to maternal invalidation, adolescents with a history of NSSI responded to additional maternal feedback with increased negative affect, regardless of the feedback being neutral or validating in content, and remained at an elevated level of distress following a recovery period appear to suggest that any additional feedback from mothers following invalidation may be perceived as stressful, even if supportive in tone and content. This interpretation is supported by Linehan's theory that youth at risk for BPD have difficulty recovering from stressors, particularly following repeated stressors (1993), and also by empirical studies demonstrating that youth with BPD features exhibit attentional biases and difficulty disengaging attention from threatening information (Jovev et al., 2012).

Our findings regarding altered emotional reactivity among adolescents engaging in NSSI have several important implications for interventions and clinical settings. First, these findings may help clinicians and families to better understand the experiences of adolescents engaging in NSSI. Second, it is important to note that despite the absence of group differences in levels of rejection and invalidation between parents of self-injuring adolescents and healthy controls (Crowell et al., 2008), adolescents with histories of NSSI appear to be more emotionally reactive to invalidation and therefore may differ from healthy adolescents in terms of the parenting behaviors that would be most supportive. Thus, our results support treatment approaches focused on reducing parenting invalidation as one way to reduce emotional distress among adolescents at risk for BPD. Although some empirically supported interventions for adolescents engaging in NSSI include skills training in validation for parents (Rathus & Miller, 2014), these skills are typically mentioned during only four of approximately thirty sessions over the course of six months. Our results indicate that a greater emphasis on altering parenting behaviors may be warranted. Third, the finding that adolescents with histories of NSSI have difficulty regulating their emotional responses to maternal feedback delivered after invalidation supports targeting emotion regulation skills in treatment.

Our findings regarding psychophysiological reactivity among adolescents with a history of NSSI are inconsistent with studies reporting elevated resting psychophysiological arousal (Crowell et al., 2005) and heightened psychophysiological reactivity in response to lab tasks among adolescents with histories of self-injurious behaviors (Crowell et al., 2005; Nock & Mendes, 2008). It is possible that the altered psychophysiological reactivity noted by these studies is the result of use of longer stressors, given that differences between healthy controls and adolescents with histories of NSSI did not emerge until the eighth minute the card sorting task

employed by Nock and colleagues (2008). Further, Crowell et al. used a three-minute sad film clip. In contrast, the ninety-second exposure to maternal invalidating feedback used in the current study, although ecologically valid, may not have been long enough to induce psychophysiological reactivity. Nock et al. proposed that psychophysiological reactivity experiences by adolescents with a history of NSSI may not be immediate, but rather after several minutes (2008). Future studies are needed in order to examine psychophysiological reactivity in response to longer exposure to invalidation, perhaps in the context of face-to-face interactions where parents or confederates are trained to respond to adolescents with invalidating feedback. Further, heart rate analyses may provide a more time sensitive approach to characterizing psychophysiological reactivity.

The current study took advantage of personally relevant stimuli, with high ecological validity, by using participants' own mothers as a source of stimuli for the emotional challenge protocol. Further, the content of our lab-based stressor, exposure to invalidation, was theory-driven in its content, based in Linehan's claims that invalidation contributes to emotion dysregulation among youth at risk for BPD.

The findings from this study should be interpreted in the context of several limitations that may be addressed by future research in this area. First, all participants in the current study were presented with invalidating feedback prior to randomization to conditions in which they received additional neutral or validating feedback. As such, although adolescents with histories of NSSI showed difficulty regulating their emotional responses to feedback subsequent to invalidation, it remains unknown the extent to which validation may have attenuated emotional arousal if delivered prior to invalidation. Future studies with larger samples should consider order effects of delivery of validating and invalidating feedback.

Second, the current sample was relatively small and primarily recruited self-injuring adolescents from an outpatient mental health clinic. Studies have shown that treatment-seeking youth tend to be more impaired, have parents with higher levels of education, and are more likely to be Caucasian compared to non-treatment-seeking youth (Goodman et al., 1997). Thus our findings may not generalize to the broader population of adolescents engaging in NSSI. Further, our sample was exclusively comprised of adolescent females and their mothers since our sample size precluded adequately powered tests of moderations by gender of adolescent and parent. Future studies should recruit larger samples from diverse referral sources, including both female and male adolescents and parents. Additionally, although our sample only included adolescents engaging in repetitive NSSI, there was considerable variability in the frequency of NSSI within our sample and our sample size precluded analyses investigating associations between severity of NSSI and study outcomes. Establishing a better understanding the heterogeneity within adolescent NSSI remains an important goal of future research.

Third, it is unclear the extent to which our findings are specific to NSSI. Our results may reflect a pattern of altered reactivity associated with psychopathology, broadly speaking, and/or psychotropic medication use. Future studies with larger samples and clinical control groups should address these questions.

Finally, our data were cross-sectional and correlational in nature, limiting our ability to draw causal inferences. Although theoretical models support engagement in NSSI as a result of individual characteristics predisposing adolescents to increased emotional arousal, it may be possible, albeit unlikely, that prior engagement in NSSI resulted in increased emotional arousal. Further, it is also possible that adolescents with a history of NSSI were more reactive to maternal invalidation because they have experienced higher levels of emotional invalidation

from their mothers in the past. Further it is unclear the extent to which adolescents' sensitivity, reactivity, and recovery are stable and/or responsive to interventions. Thus prospective studies are needed in order to establish temporal relationships among these constructs.

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Appendix A: Manuscript 1 Tables

Table 1

Descriptive Statistics

Variables	Healthy Controls *M* (*SD*)	NSSI Group *M* (*SD*)	Overall Sample *M* (*SD*)
Positive Affect			
Rest	19.90 (7.80)	19.29 (6.16)	19.62 (7.04)
Neutral	20.31 (7.76)	17.92 (5.72)	19.23 (6.95)
Invalidation	15.90 (4.24)	15.96 (6.42)	15.92 (5.28)
Recovery 1	16.72 (6.82)	17.17 (7.14)	16.92 (6.90)
Experimental Condition: Overall	20.69 (8.70)	20.38 (7.28)	20.55 (8.02)
Experimental Condition: Validation	20.36 (10.36)	21.92 (7.49)	21.08 (9.01)
Experimental Condition: Neutral	21.00 (7.18)	18.83 (7.04)	20.04 (7.07)
Recovery 2	16.34 (7.92)	16.00 (6.01)	16.19 (7.05)
Negative Affect			
Rest	12.03 (3.08)	14.96 (3.38)**	13.36 (3.51)
Neutral	10.79 (1.05)	13.42 (4.67)*	11.98 (3.46)
Invalidation	17.83 (5.01)	25.13 (8.85)**	21.13 (7.85)
Recovery 1	11.45 (2.21)	12.63 (2.79)	11.98 (2.54)
Experimental Condition: Overall	11.28 (1.79)	13.21 (3.71)*	12.15 (2.96)
Experimental Condition: Validation	11.86 (2.25)	13.42 (4.14)	12.58 (3.29)
Experimental Condition: Neutral	10.73 (1.03)	13.00 (3.38)	11.74 (2.60)
Recovery 2	10.97 (1.40)	14.25 (5.75)*	12.45 (4.29)
HF-HRV			
Rest	2.10 (0.49)	1.88 (0.48)	2.00 (0.49)
Neutral	2.13 (0.41)	1.92 (0.47) †	2.04 (0.45)

Invalidation	2.03 (0.42)	1.89 (0.46)	1.97 (0.44)
Recovery 1	2.08 (0.32)	1.91 (0.45)	2.01 (0.39)
Experimental Condition Overall	2.07 (0.36)	1.87 (0.51) †	1.98 (0.44)
Experimental Condition: Validation	2.07 (0.34)	1.86 (0.58) †	1.98 (0.47)
Experimental Condition: Neutral	2.08 (0.39)	1.88 (0.46) †	1.99 (0.42)
Recovery 2	2.05 (0.36)	1.89 (0.41)	1.98 (0.39)

Notes. NSSI = Nonsuicidal Self-Injury. HF-HRV = High Frequency Heart Rate Variability (ms^2/Hz), Log Transformed Values. Healthy Control $n = 29$. NSSI Group $n = 24$. Overall sample $n = 53$. Experimental Condition: Validation $n = 26$. Experimental Condition: Neutral $n = 27$.

†$p < .10$, * $p < .05$, ** $p < .01$

Appendix B: Manuscript 1 Figures

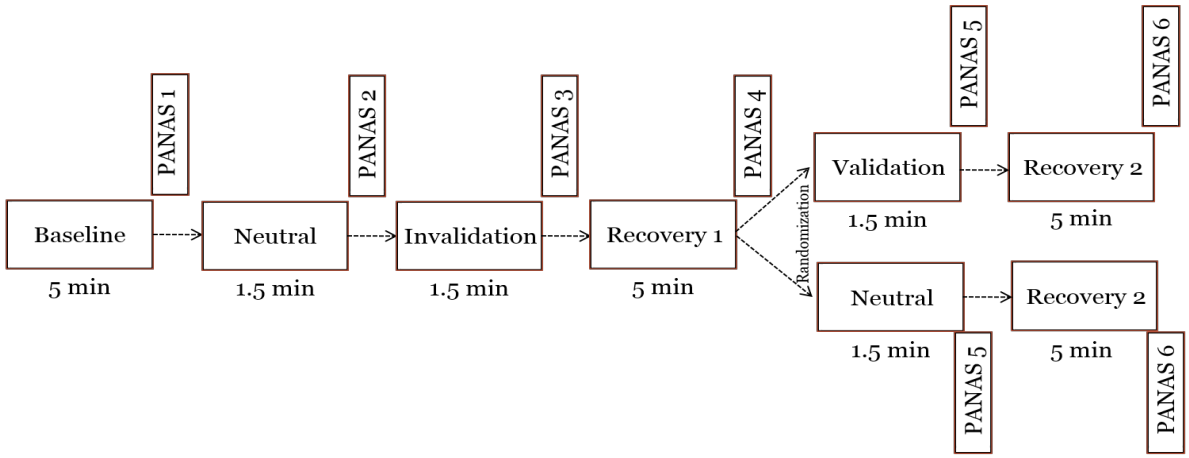

Figure 1. Emotional Challenge Protocol.

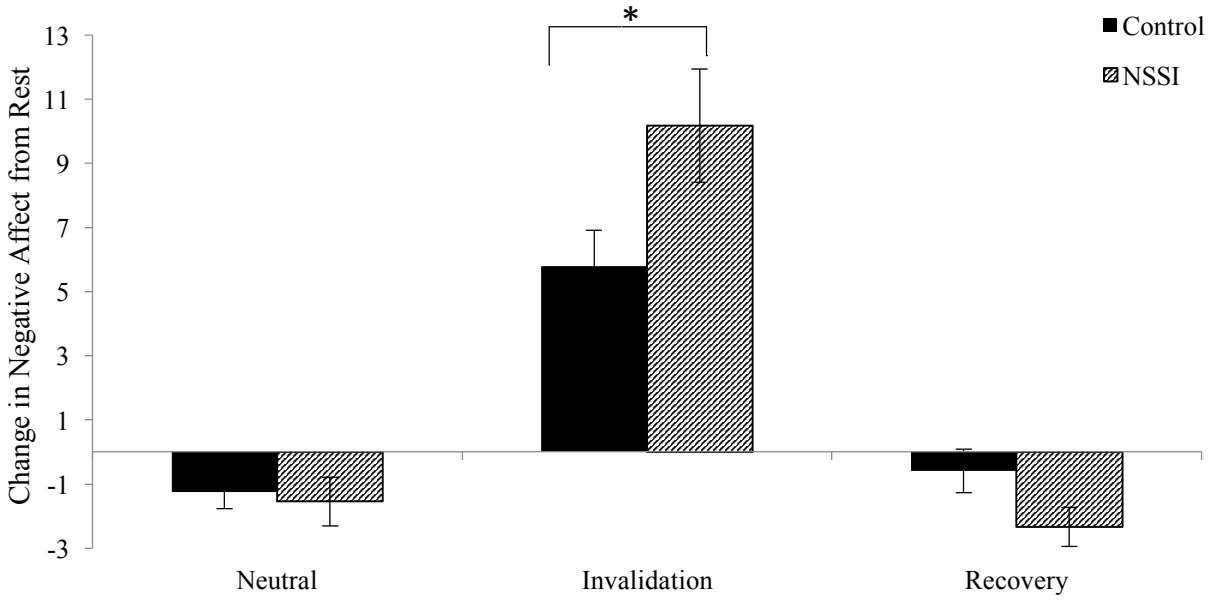

Figure 2. Subjective Ratings of Negative Affect during Emotional Challenge by Nonsuicidal Self-Injury Status.
Notes. NSSI = Nonsuicidal Self-Injury.
* denotes $p < .05$.

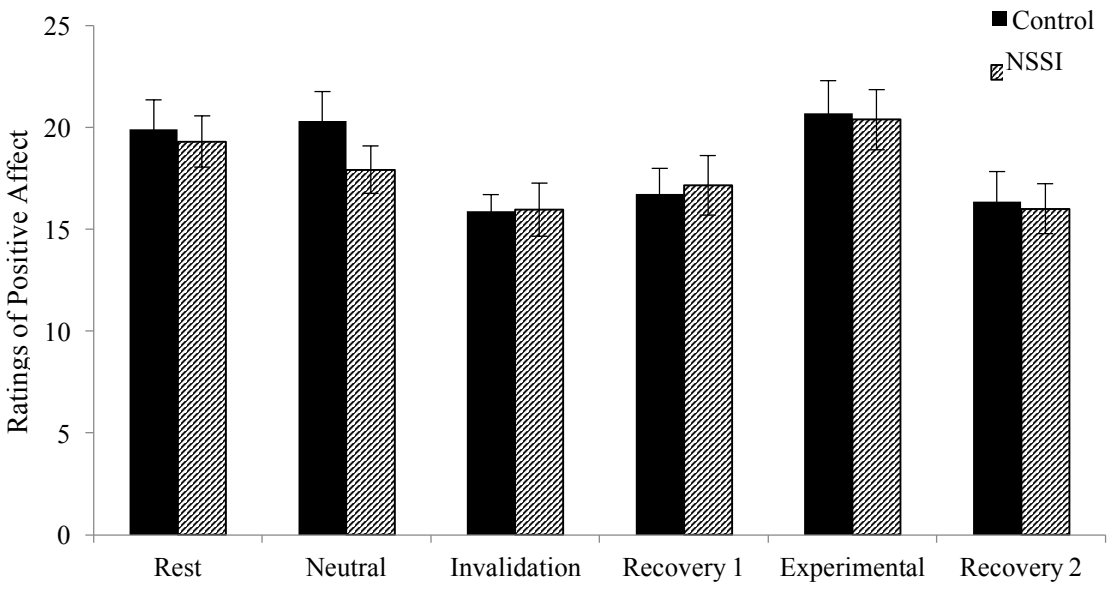

Figure 3. Subjective Ratings of Positive Affect during Emotional Challenge by NSSI Status.
Notes. NSSI = Nonsuicidal Self-Injury.

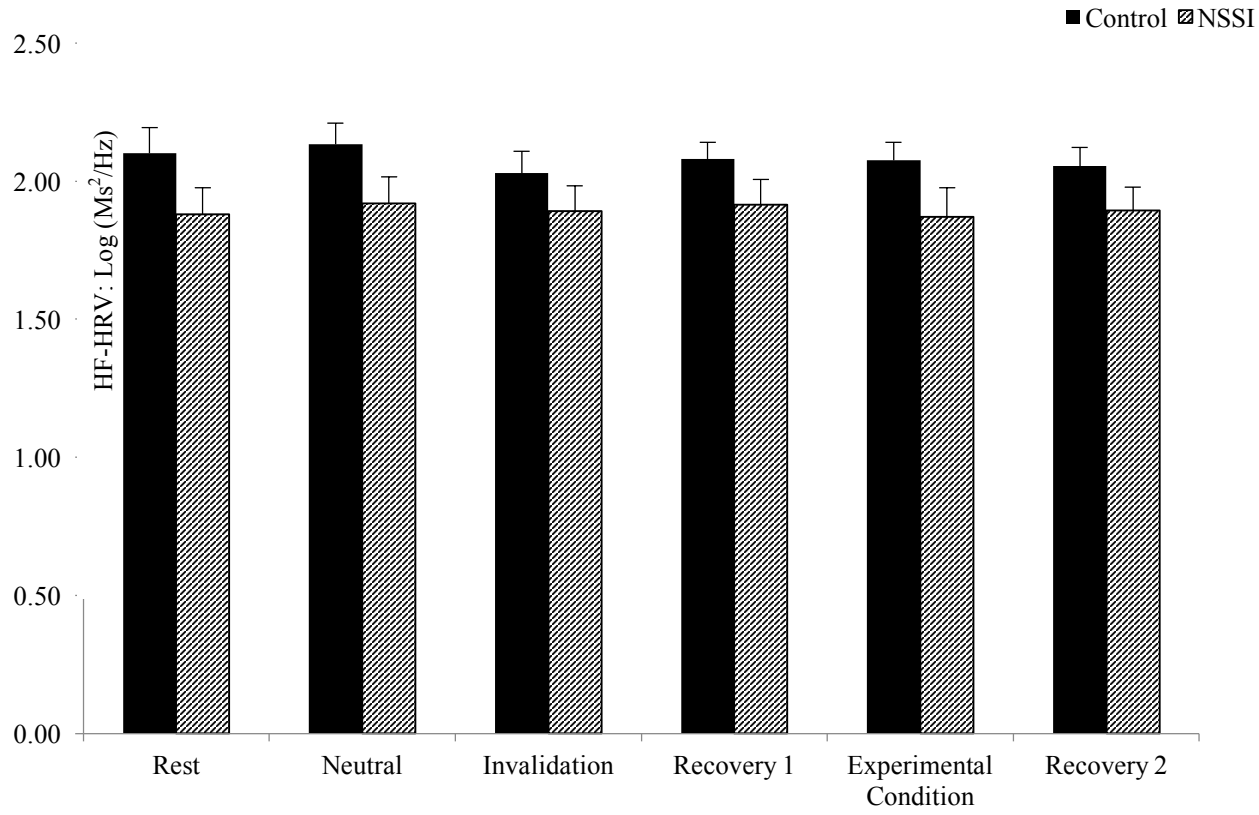

Figure 4. High Frequency Heart Rate Variability during Emotional Challenge.
Notes. HF-HRV = High Frequency Heart Rate Variability. NSSI = Nonsuicidal Self-Injury.

Parenting of Adolescents Engaging in Nonsuicidal Self-Injury:

A Multimethod, Multi-Informant Investigation

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Abstract

Developmental theories of Borderline Personality Disorder posit that borderline pathology develops as the result of the transaction between biologically based vulnerabilities to emotion dysregulation and chronic exposure to high levels of emotional invalidation and low levels of validation, particularly within the family context. The current study aimed to characterize parenting behaviors in mothers of adolescents at risk for BPD, those engaging in repetitive nonsuicidal self-injury (NSSI), and to examine associations between parenting behaviors and adolescent psychopathology. Mothers and their 14-18-year-old daughters, 24 of whom had a history of NSSI and 27 of whom were healthy adolescents, completed self-reports of perceived maternal validation and invalidation and participated in face-to-face interactions, which were later rated for maternal validation and invalidation. Results did not reveal significant group differences in parenting related to adolescent NSSI status. For the sample as a whole, results indicated that adolescent reports of high maternal invalidation in combination with low validation were associated with higher levels of borderline pathology. Findings suggest a potential protective role of maternal validation with regards to adolescent psychopathology, and borderline pathology in particular. Results support intervention efforts focused on targeting reducing maternal invalidation, enhancing maternal validation, and altering adolescent perceptions of parenting behaviors.

Parenting of Adolescents Engaging in Nonsuicidal Self-Injury: A Multimethod, Multi-Informant Investigation

Borderline personality disorder (BPD) is a chronic psychological disorder associated with severe psychosocial impairment (Grant et al., 2008), high treatment utilization (Zanarini, Frankenburg, Hennen, & Silk, 2004), and high rates of suicide (Black, Blum, Pfohl, & Hale, 2004) and self-injury (American Psychiatric Association, 2004). Despite the severity of BPD, little is known regarding its etiology. There is evidence to suggest, however, that individuals at risk for developing BPD can be identified as adolescents (Crowell, Beauchaine, & Linehan, 2009). In addition to an emerging understanding of adolescent risk factors for the development of BPD in the literature, there are theoretical accounts of the development of BPD, whereby the symptoms of BPD are proposed to develop in the context of chronic exposure to an adverse social environment, typically a family context characterized by invalidation of the child's expression of internal experiences (Crowell et al., 2009; Fruzzetti, Shenk, & Hoffman, 2005; M. M. Linehan, 1993). Although such theoretical models guide interventions for adolescents with BPD features (Rathus & Miller, 2014), we found no publications providing empirical evidence of parents of adolescents at risk of BPD exhibiting high levels of invalidation. Further, the few studies conducted within this area of research have focused on risk associated with invalidation but have not examined the potential protective roles of parental validation. Therefore, the current study aimed to characterize parenting behaviors in mothers of adolescents at risk for BPD and to examine associations between those parenting behaviors and adolescents' psychopathology.

A better understanding of the family environments of adolescents at risk for BPD has the potential to inform the identification of at-risk adolescents who may benefit from interventions,

and to also validate treatment targets for preventive interventions. Adolescence in particular appears to be a key developmental period in the understanding of BPD, since adolescents demonstrate considerable malleability of BPD traits (Lenzenweger & Castro, 2005) and their BPD features respond well to intervention (Chanen et al., 2008; Marieke Schuppert et al., 2012; Schuppert et al., 2009).

Among adolescents, there is evidence to support studying one group of individuals at particularly high risk, adolescents engaging in nonsuicidal self-injury (NSSI). NSSI can be defined as the direct, deliberate destruction of body tissue without suicidal intent (Zlotnick, Donaldson, Spirito, & Pearlstein, 1997) that is often used as a means to attenuate or escape from negative affective states, thoughts, and/or memories (Nock, Prinstein, & Sterba, 2009). NSSI and BPD are theorized to share several biological vulnerabilities, contextual risk factors, personality traits, and maladaptive coping strategies, and are believed to be derived from a common etiology (Derbidge & Beauchaine, 2014). This is further reflected by the finding that approximately half of adolescents engaging in NSSI can be diagnosed with BPD without adjustment to adult criteria (Nock, Joiner Jr, Gordon, Lloyd-Richardson, & Prinstein, 2006). Further, adolescent engagement in NSSI appears to be more specifically associated with borderline pathology, as adolescents engaging in NSSI have been shown exhibit more borderline features relative to adolescents with an Axis I diagnosis and no history of NSSI (d = 7.43; Crowell et al., 2012). In addition to associations with BPD features, engaging in self-harm during adolescence has been associated with increased risk for mood (odds ratio [OR] = 2.21) and anxiety disorders (OR = 2.06), problematic substance use (OR = 1.92-3.21; Mars et al., 2014), and future suicide attempts (OR = 12.63; Scott, Pilkonis, Hipwell, Keenan, & Stepp, 2015) compared to adolescents with no history of self-harm. Therefore, NSSI has been

considered an early behavioral indication of risk, broadly defined, as well as a potential developmental precursor to BPD, specifically (Crowell et al., 2009; Lamph, 2011). Thus, we investigated parenting behaviors of adolescents at risk for BPD, reflected by adolescents' engagement in repetitive NSSI.

As previously mentioned, theoretical models of the development of BPD emphasize the etiological role of chronic exposure to invalidation, particularly by youth's parents (Fruzzetti et al., 2005; M. M. Linehan, 1993). Invalidation may be characterized as parents' intolerance of children's expression of internal experiences, communicating that emotional displays are unwarranted and should be coped with internally and/or serve to judge, delegitimize, minimize, or fail to acknowledge such experiences. According to such models, invalidating responses lead to increased emotion dysregulation among youth, and the eventual problems characteristic of BPD, by both increasing youth's distress and failure to teach emotion regulation skills (Linehan, 1993; Fruzzetti et al., 2005). These developmental models of BPD are consistent with broader models linking validating emotion socialization practices to the development of emotion regulation capabilities (Eisenberg, Cumberland, & Spinrad, 1998; Gottman, Katz, & Hooven, 1996; Morris, Silk, Steinberg, Myers, & Robinson, 2007). Such theories posit that invalidating reactions teach children that emotions are unacceptable, limit opportunities for modeling of adaptive emotion regulation strategies, model emotional avoidance, and/or punish the expression of emotions, encouraging the inhibition of expression of emotions in the future. In contrast, validating parenting responses are expected to reduce the intensity of youth's distress, instill beliefs that parents are available to help youth cope with distress, and help youth develop adaptive coping skills, including understanding, expressing, and regulating emotional experiences. Overall, there is strong theoretical support for links between children's exposure to

invalidation and development of poor emotion regulation skills. It should be noted that these theoretical associations are specific to invalidating behaviors, and not hostile, harsh, or critical parenting more broadly, which we consider negative parenting, and validating behaviors, not warm and responsive parenting more broadly, which we consider positive parenting. We found no studies empirically supporting this purported specificity of invalidation and validation, however. Thus, the current study includes assessments of invalidation, validation, and negative and positive parenting, in an effort to better understand their unique or shared relationships with adolescent psychopathology.

In addition to a strong theoretical basis, studies of both community and clinical samples have provided empirical support for the association between parental invalidation and adolescents' emotion regulation problems. For instance, in community samples, adolescents' reports of parental invalidation have been positively associated with adolescent self-reported emotion regulation problems (r = .42; Buckholdt, Parra, & Jobe-Shields, 2014) and mothers' reports of her own invalidation are positively associated with adolescents' self-reported use of maladaptive emotion regulation strategies (R^2 = .19; Yap, Allen, & Ladouceur, 2008). Corroborating the findings from these studies that relied on self-reports are observational studies, which have also demonstrated associations between parental invalidation and youth emotion dysregulation. Specifically, parents of adolescents receiving services at an outpatient clinic were observed to display significantly less validation (Cohen's d = .77) and more invalidation (Cohen's d= 1.49) compared to parents of healthy controls, and together, observational ratings of both parental validation and invalidation accounted for a significant proportion of the variance in adolescents' self-reported emotion regulation problems (R^2 = .27; Shenk & Fruzzetti, 2013). This study did not include ratings of positive and negative parenting behavior more broadly, so it

remains unclear the extent to which specific parenting strategies of validation and invalidation contribute to emotion regulation problems versus broader parenting constructs. In sum, there appears to be initial evidence of small to moderate associations between parental invalidation and adolescent emotion regulation problems.

Despite rich theoretical underpinnings, as well as empirical support from normative and clinical studies for the importance of emotional validation and invalidation, these constructs have been studied infrequently with adolescents engaging in NSSI. One study relying demonstrated prospective associations between adolescent reports of parental invalidation and the occurrence of NSSI (You & Leung, 2012). In addition to this study relaying on self-reports, we found a single observational study of parenting behaviors during parent-adolescent interactions, comparing self-injuring female adolescents with age-matched controls (Crowell et al., 2008). Although Crowell et al. reported several differences during face-to-face interactions, including higher levels of negative affect (Cohen's d = .86) and lower levels of positive affect (Cohen's d = 1.53) and cohesiveness (Cohen's d = 1.06) in dyads including a self-injuring adolescent relative to controls, there was not a significant group difference observed in terms of parents' use of rejecting and invalidating statements (Cohen's d = .33; Crowell et al., 2008). It should be noted, however, that the rejection and invalidation scale employed by Crowell et al. is heavily influenced by criticism, put-downs of character, and use of hostile tone, rather than invalidation alone. For example, in order to receive an elevated score on this subscale, parents must exhibit moderately intense insults or put-downs about the adolescent's personality or character, rather than her behavior (e.g., "It makes me sick just to look at you," "You're such a slob, how can you stand to have your room that messy?"). Thus emotional invalidation that judges, ignores, or delegitimizes without harsh criticism was likely not adequately measured. Further, this single

observational study did not measure parents' validating behaviors, despite the fact that validation is proposed to deescalate emotional arousal and act as a protective factor for individuals at risk for developing BPD (Linehan, 1993). Thus the extent to which parents of adolescents who do and do not engage in NSSI differ in their expression of invalidation and validation still remains unclear. Further, there are no published studies employing multi-method, multi-informant approaches to the measurement of validation and invalidation, each of which has the potential to provide a more complete and valid assessment relative to a single method or single informant. Given that chronic exposure to parental invalidation is a key tenet of current theories of the development of BPD (Crowell et al., 2009; Fruzzetti et al., 2005; M. M. Linehan, 1993), and reducing parental invalidation is a key target of interventions for adolescents with BPD features, it is essential to investigate the extent to which parental invalidation differs in families of adolescents with and without NSSI.

In addition to invalidation (and validation), other aspects of parenting also appear to differentiate families of self-injuring adolescents relative to healthy controls. These include more conflict escalation and negative emotions (Crowell et al., 2013), less positive affect (Cohen's $d = 1.53$), lower cohesiveness (Cohen's d = 1.06) more negative affect (Cohen's $d = 0.86$; Crowell et al., 2008), and less warmth (Cohen's d = 0.64; Tschan, Schmid, & In-Albon, 2015) compared to control participants. It is possible that parenting behaviors other than invalidation function to reinforce self-injuring adolescents emotional lability, as has been shown in the context of externalizing disorders (Beauchaine, Gatzke-Kopp, & Mead, 2007). Thus we aim to extend the literature by relating parenting behaviors to adolescent emotion regulation problems, borderline personality disorder features, and internalizing and externalizing problems

among adolescents engaging in NSSI, investigating the specificity of the constructs of validation and invalidation versus broader constructs of positive and negative parenting behaviors.

Current Study

We found no empirical evidence that adolescents who engage in NSSI are exposed to significantly higher levels of parental invalidation and lower levels of validation compared to healthy adolescents, despite the centrality of parental invalidation in theoretical accounts and the focus on reducing parental invalidation in interventions for adolescents at risk for BPD. Further, the to which validation and invalidation are associated with adolescent emotion regulation problems and BPD features remains unknown, nor that specificity of such an association, relative to the broader constructs of internalizing and externalizing problems. Thus, the aims of the proposed study are to address these questions in a sample of adolescents engaging in repetitive NSSI and therefore considered to be at risk for the development of BPD. We built on the published literature by designing a multi-method, multi-informant study, measuring observed and perceived levels of both validation and invalidation according to both parents and adolescents. Further, we include observational and self-reported measures of positive and negative parenting more broadly, in order to test the unique contributions of invalidating and validating behaviors to adolescent psychopathology. Given that we found no studies including multimethod, multi-informant measurements of validation and invalidation, we also sought to examine the consistency of these parenting behaviors across informants and methods of assessment.

Participants included two groups of parent-adolescent dyads, those that included an adolescent who has engaged in repetitive NSSI and those that included an adolescent with no history of NSSI and no psychopathology. In order to minimize variability that might be

associated with age, the current study included adolescents between 14 and 18 years old, given that prospective studies have shown age 14 to be the mean age of onset of NSSI (Yates, Carlson, & Egeland, 2008) and that the prevalence of NSSI is higher during teenage years compared to other developmental periods (Swannell, Martin, Page, Hasking, & St John, 2014). The sample was further restricted to female adolescents, given that females are significantly more likely to engage in NSSI than males (OR = 5.43; Zetterqvist, Lundh, Dahlström, & Svedin, 2013). Further, the study focused on mothers as the source of invalidating environments, since mothers have been shown to be more engaged in their adolescents' emotional lives than fathers (Klimes-Dougan et al., 2007).

Given that most studies have relied on single measures or informants to provide assessments of validation and invalidation, we (1) explored the consistency of maternal validation and invalidation across informants (mothers and adolescents) and methods of assessment (observational ratings and self-reports). Since exposure to invalidation has been linked with youths' emotion regulation problems, we predicted that (2) mothers of adolescents who engage in NSSI would exhibit significantly higher levels of invalidation and lower levels of validation. Further, we explored the extent to which these group differences were unique to validation and invalidation versus positive and negative parenting, respectively. Given associations between invalidation and emotion regulation problems, we hypothesized that maternal use of invalidation would be positively associated with adolescent emotion regulation problems, BPD features, and, specifically for self-harming adolescents, NSSI frequency. Finally, relying on theoretical support, we expected (4) that maternal validation would moderate the association between use of invalidation and adolescent psychopathology.

Method

Participants

Participants included 51 mothers and their 14-18-year-old female daughters, 24 of whom included an adolescent with NSSI and 27 of whom included healthy control adolescents. Participants were recruited through an outpatient mental health clinic (31%), a university database of community members willing to be contacted regarding research studies (43%), flyers in the community (24%), and word of mouth (2%). For all participants, inclusion criteria were English being the primary language spoken at home and adolescents living at least part-time with their mothers. Adolescents were included in the NSSI group if they had engaged in repetitive episodes of NSSI. A single exclusion criterion for all mothers was participation in psychotherapy focused on altering parenting behaviors (e.g., parent training), including validation specifically (e.g., Dialectical Behavior Therapy). Adolescents in the control group were excluded if they endorsed a lifetime history of NSSI or Axis I disorders, with the exception of Attention Deficit Hyperactivity Disorder (ADHD), which was permitted. A total of 58 mother-adolescent dyads were recruited and consented, 24 in the NSSI group and 35 controls. Of the controls, five were excluded due to Axis-I diagnoses and/or a single instance of NSSI. An additional two controls were excluded due to equipment failure to record face-to-face interactions. Thus the final sample included 51 mother-adolescent dyads, 24 with a history of NSSI and 27 controls.

On average, teens were 15.8 years old (*SD* = 1.4) and mothers were 47.3 years old (*SD* = 4.8). Dyads tended to be of a high socioeconomic status, with a mean annual household income of $142,286 (*SD* = 80,133) and 17 years (*SD* = 2.4) of maternal education. Teens primarily identified as Caucasian (*n* = 37, 72%), followed by multi-racial (*n* = 9, 18%) and African American (*n* = 5, 10%). Mothers tended to be married (*n* = 44, 86%). With the exception of one

dyad in each group that was an adoptive mother-daughter pair, all other dyads were biologically related (*n* = 49, 96%). There were no significant group differences between adolescents with a history of NSSI and healthy control adolescents on any of these variables.

Power and Sample Size Calculation

An *a priori* sample size calculation was performed with G*Power. Using the effect size based on Shenk and Fruzzetti's observed group differences in invalidation (Cohen's *d*= 1.49; 2013) with an alpha error probability set to .05 and a corresponding power of .95, the total sample size needed in order to detect significant between-subjects effects for two groups in a multiple analysis of variance (MANOVA) model was estimated to be at least 30 participants, with 15 participants per group. Using the effect size based on the association between parental validation and invalidation with adolescent emotion dysregulation (R^2 = .27; Shenk & Fruzzetti, 2013) with an alpha error probability set to .05 and a corresponding power of .95, the total sample size needed in order to detect a Pearson's correlation was estimated to be at least 42 participants. Thus the final sample of 51 mother-adolescent dyads was considered to be an adequately powered sample size.

Procedure

Eligible mother-adolescent dyads participated in a one-time laboratory visit and were provided with a monetary incentive. Prior to initiation of the lab visit, all mothers and adolescents completed computer-based questionnaires, either at home or in the lab, related to activities they found enjoyable, areas of conflict for the dyad, perceptions of their relationships, perceptions of mothers' use of validation and invalidation, and adolescent psychopathology. Adolescents also completed questionnaires regarding their emotion regulation problems and BPD features. Next, mothers and their daughters participated in two 10-minute face-to-face

interaction tasks, one designed to elicit positive affect and one designed to elicit negative affect. Following other Yap et al. (2008), the order of interaction tasks was fixed across participants, since it was expected that it would be easier for participants to switch from positive affective states to negative affective states and because negative affective states are typically longer in duration relative to positive affective states (Gilboa & Revelle, 1994). During the positive interaction task, dyads discussed up to five activities they both indicated to be enjoyable in the Pleasant Events Checklist (MacPhillamy & Lewinsohn, 1982). Next, during the negative interaction task, dyads discussed up to five topics they both endorsed as recent, conflictual issues on the Issues Checklist (Prinz, Foster, Kent, & O'Leary, 1979). Interactions were video-recorded and later rated for maternal behaviors and interactive qualities. Finally, teens completed a clinical interview of current and past psychopathology and self-injury. The study was by the Emory University Institutional Review Board. All adolescents and their mothers provided informed assent and consent, respectively.

Measures

Interaction topics. Mothers and adolescents both completed the Pleasant Events Checklist (MacPhillamy & Lewinsohn, 1982), a self-report measure assessing recent engagement and enjoyment of activities. Mothers and adolescents also completed the Issues Checklist (Prinz et al., 1979), a self-report measure assessing recent areas of conflict. These measure were solely used to select discussion topics for the positive and negative interaction tasks, respectively.

Clinical interviews. Adolescents were interviewed individually regarding the presence of mood, anxiety, and behavioral disorders using the Mini International Neuropsychiatric Interview for Children and Adolescents (MINI-KID; Sheehan et al., 2010), a semi-structured diagnostic clinical interview. All interviews were administered by a masters level clinician and

reviewed with a licensed doctoral level clinician in order to confirm diagnoses. Evidence for its validity comes from its high concordance with the Schedule for Affective Disorders and Schizophrenia for School Aged Children. It also has been found to have high interrater reliability (r = .89-.94) and good test-retest reliability over 1-5 days (r = .75-1.00). Diagnoses from the MINI-KID were solely used to confirm eligibility for the study.

Adolescents were also interviewed using the Lifetime-Suicide Attempt Self-Injury (L-SASI; formerly the Lifetime Parasuicide Count; Linehan & Comtois, 1996), a structured interview assessing frequency, severity, and lethality of self-harm behaviors, as well as specific details about the first, most recent, and most severe self-harm episodes. Engagement in self-harm over the past year was assisted by a timeline follow-back methodology, where participants used personally relevant events as anchors in a calendar-based interview. We focused on two scores from this measure, the frequency of NSSI over the past year and lifetime number of episodes. There are no reports of the L-SASI's psychometric properties, however, items of the L-SASI are identical to a longer measure, the Suicide Attempt Self-Injury Interview, which has demonstrated adequate validity and very good inter-rater reliability (Linehan, Comtois, Brown, Heard, & Wagner, 2006). Inter-rater reliability is not presented because all interviews were administered by a single researcher.

Self-reports of adolescent psychopathology. Adolescents' psychopathology, behavior problems, and emotion regulation problems were assessed using the Youth Self Report (Achenbach, 1991b), Child Behavior Checklist (CBCL; Achenbach, Vermont, & Edelbrock, 1983), Borderline Personality Features Scale for Children (BPFSC; Crick, Murray–Close, & Woods, 2005), and Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004). Mothers and adolescents completed parallel versions of the CBCL and YSR questionnaire,

respectively, well-validated and widely used measures of adolescents' psychopathology and behavior problems with reliabilities ranging from α = .72 to .96 and stability coefficients ranging from *r* = .70 to .74 in previous studies (Achenbach, 1991a). Each measure includes 112 items rated on a 3-point scale (0 = not true, 1 = somewhat or sometimes true, 2 = very true or often true) based on adolescents' behavior over the last 6 months. We focused on two scores from each questionnaire, the broadband measures of internalizing and externalizing problems.

Adolescents completed the BPFSC (Crick et al., 2005), a 24-item self-report measure that assesses borderline personality features in children and adolescents. Items were rated on a 1 (Not at all True) to 5 (Always True) scale, reflecting affective instability, identity problems, negative relationships, and self-harm. Higher total sum scores, which may range from 1 to 120, are indicative of more borderline personality features. The BPFSC has demonstrated good criterion validity (Chang, Sharp, & Ha, 2011), test-retest reliability over a one-year period, and has been uniquely associated with borderline pathology, rather than psychopathology more broadly (Crick et al., 2005). The BPFSC demonstrated excellent internal consistency in the current study (Cronbach's α = .92), consistent with prior studies (Cronbach's α= .76; Crick et al., 2005).

Finally, adolescents completed the DERS (Gratz & Roemer, 2004), a questionnaire that assesses awareness and understanding of one's own emotional experience, acceptance of emotions, ability to modulate emotional arousal, and effective action in the presence of intense emotions. Forty-one items were rated on a 5 point Likert scale, with higher total sum scores indicating more difficulty regulating emotions. Scores may range from 41 to 205. The DERS has shown good construct and predictive validity as well as good test-retest reliability (Gratz & Roemer, 2004; Gratz, Rosenthal, Tull, Lejuez, & Gunderson, 2006; Weinberg & Klonsky, 2009).

In the current study, the DERS demonstrated excellent internal consistency (Cronbach's $\alpha = .97$). The DERS measure was missing for one control participant, resulting in her data being excluded from relevant analyses.

Parenting. Parenting behaviors were assessed using both self-report measures and observational ratings, reflecting maternal use of validation, invalidation, positive parenting, and negative parenting strategies.

Validation. Mother and adolescent perceptions of maternal validation were assessed using parallel questionnaires, the Coping with Children's Negative Emotions Scale (CCNES) and the Socialization of Emotion Scale (SES; Fabes, Poulin, Eisenberg, & Madden-Derdich, 2002). The CCNES, originally developed for younger children, has been adapted for use with parents of adolescents (Remmes & Ehrenreich-May, 2014). Using a 7-point Likert scale, the CCNES prompts mothers to identify how likely they are to use validation strategies in response to nine common scenarios (e.g., "When my teenager gets down because she has had a bad day, I usually:"). Validating strategies include emotion-focused (e.g. "try to get her to think of good things that happened"), problem-focused (e.g. "help her think of things to do to get her problem solved), and expressive encouragement strategies (e.g., "listen to her talk about her feelings"). The parallel version for adolescents, the SES, requires adolescents to rate the likelihood of their mothers' responses using the identical scenarios and scale. Two sum scores were computed, one for mother reports and one for adolescent reports, which reflect mothers' and adolescents' perceived maternal validation. Scores could range from 27 to 189, with higher scores reflecting higher perceived maternal validation. Both scales demonstrated excellent internal consistency (Cronbach's $\alpha = .92$ and .97 for mothers and adolescents, respectively).

Validation was also assessed via observational ratings of face-to-face mother-adolescent interactions using the Validating and Invalidating Behaviors Coding Scale (VIBCS; Fruzzetti, 2001). The VIBCS has been found to significantly predict adolescents' satisfaction with family relationships (R^2 = .39; Shenk & Fruzzetti, 2013). Using an ordinal scale ranging from 1 to 7, trained research assistants, who were blind to study group status, assigned two global ratings of maternal validation, one for the positive and one for the negative interaction tasks.

Research assistants were trained in the VIBCS via participation in didactic instruction, live video ratings, and then independently rating practice files using data from a previous study of parent-adolescent interactions. All raters achieved an intraclass correlation coefficient (ICC) of .80 or higher for practice validation ratings. Once raters began rating participants' data, a subset of videos was randomly selected and assigned to a second rater. Reliability videos were discussed during weekly meetings to ensure maintenance of inter-rater reliability and minimize rater drift. Based on one-way random effects models with consistency of raters, ratings of 15 randomly selected positive mother-adolescent interactions (29%) and 17 randomly selected negative interactions (33%) indicated good inter-rater reliability, with ICCs of .76 and .91 for the positive and negative interactions, respectively.

Invalidation. Perceived maternal invalidation was assessed via the CCNES and SES, as described above. Invalidating maternal responses included minimizing (e.g., "tell her that she really has nothing to be sad about"), distress reactions (e.g., "become obviously uncomfortable when she is down"), and punitive strategies (e.g., "tell her to straighten up and stop sulking around the house"). Sum scores were computed for both mothers' and adolescents' perceived maternal invalidation (Cronbach's alphas = .84 and .94 for mothers and adolescents,

respectively) and had the potential to range from 27 to 189, with higher scores reflecting higher levels of invalidation.

Observational ratings of invalidation were also assigned using the VIBCS, as described above. Mothers received a global rating for each interaction task, based on an ordinal scale ranging from 1 to 7. Prior to rating study data, all raters achieved an ICC of .81 for the invalidation scale on a set of practice videos from a previous study. Inter-rater reliability for the current study was determined using the same subset of files mentioned above, which demonstrated adequate reliability for both positive (ICC = .65) and negative interactions (ICC = .87), according to one-way random effects models with consistency of raters.

Positive parenting. Mothers' engagement in positive parenting strategies was assessed via self-reports and observational ratings. Mothers and adolescents completed parallel parent and child versions of the Parent-Child Relationship Questionnaire (PCRQ; W Furman & Buhrmester, 2001). Each measure included 57 items rated on a 1 (hardly at all) to 5 (extremely much) scale. The PCRQ has demonstrated convergent validity with measures of parent management techniques (Wyndol Furman & Giberson, 1995) and has differentiated treatment groups focused on altering parenting behaviors from community controls (The M. T. A. Cooperative Group, 1999). Although the PCRQ yields scores on five factors, we focused on three: maternal warmth (9 items reflecting nurturance and affection), disciplinary warmth (9 items reflecting democratic parenting and rationale for decision-making), and quality of personal relationship with adolescent (15 items reflecting companionship and intimacy). Higher scores reflect higher levels of each construct included in positive parenting. Cronbach's alphas ranged from .71 - .90 for mothers and from .87 - .92 for adolescents, indicating good internal consistency.

Trained research assistants who were blind to study group status also rated the dyadic interactions using the System for Coding Interactions and Family Functioning (SCIFF; Lindahl & Malik, 1996). The SCIFF is a global observational rating system assessing various characteristics of parent, adolescent, and family functioning. Selected subscales relevant to positive parenting behaviors were of interest in the present study, including responsibility for problem, with higher scores reflecting more acknowledgement of the mother and/or family playing a role in the conflict and engagement in problem-solving, and emotional support, with higher scores reflecting more affective attunement and maternal responsiveness. Responsibility for problem was rated only for negative interaction tasks.

Similar to the VIBCS, research assistants were trained in the SCIFF via participation in didactic instruction, live video ratings, and then independently rating practice files, using data from a previous study of parent-adolescent interactions. All raters achieved an ICC of .80 or higher for practice ratings before rating study data. Once raters began rating participants' data, a subset of videos was randomly selected and assigned to a second rater. Reliability videos were discussed during weekly meetings to ensure maintenance of inter-rater reliability and minimize rater drift. Based on one-way random effects models with consistency of raters, ratings of 14 randomly selected positive mother-adolescent interactions (28%) demonstrated excellent inter-rater reliability for the emotional support scale (ICC = .88). Ratings of 16 randomly selected negative interactions (31%) demonstrated adequate inter-rater reliability for the responsibility for problem (ICC = .64) and emotional support scales (ICCs = .77).

Based on our theoretically based construct of positive parenting, composite scores of positive parenting were computed by summing standardized scores across measures ($M = 0$, $SD = 4.16$).

Negative parenting. Maternal negative parenting behaviors were assessed via two observational rating scales from the SCIFF (as described above) rated for each interaction task: coerciveness, with higher scores reflecting use of threatening tone, gestures, and statements, and rejection/invalidation, with higher scores reflecting more criticism and contempt for adolescent. As reviewed earlier, it should be noted that the SCIFF rejection and invalidation scale is considered an indicator of negative parenting rather than invalidation, given that elevated scores on this scale reflect high intensity criticism, character insults, and/or a mocking or contemptuous tone. Reliability analyses were conducted using the same strategy as described above. Inter-rater reliability was considered adequate for the coerciveness, ICC = .60 and .75 and rejection/invalidation scales, ICC = .92 and .84, for the positive and negative interactions, respectively. Based on our theoretically based construct of negative parenting, composite scores of the four negative parenting measures were computed by summing standardized scores across measures ($M = 0$, $SD = 3.17$).

Manipulation check. Finally, two additional scales from the SCIFF were used in order to ensure that positive and negative interaction tasks elicited higher levels positive and negative affect, as intended. The Positive Affect scale reflects expressions of positive affect via facial expressions, tone of voice, and body language, whereas the Negativity and Conflict scale reflects negative affective facial expressions, tone of voice, and body language. Based on the same subset of reliability videos described above, raters achieved good inter-rater reliability for the Negativity and Conflict (ICCs = .88 and .83 for positive and negative interactions, respectively) and Positive Affect scales (ICCs = .81 for both interactions).

Planned Analyses

Prior to testing our hypotheses, we examined characteristics of NSSI within the sample.

We also compared affective ratings across interaction tasks in order to ensure that activity planning elicited higher levels of positive affect and lower levels of negative affect relative to conflict resolution. Next, in order to examine the consistency of parenting constructs across informants, measures, and contexts (Aim 1), we computed Pearson correlation coefficients. Next, in order to test group differences in parenting behaviors (Aim 2), we conducted one-way multivariate Analyses of Variance (MANOVA). This approach provided control of familywise error rates and increased statistical power to detect significant differences in dependent variables that were correlated with one another. Significant omnibus tests, as reflected by Wilks Λ statistics, were probed for post hoc comparisons. Next, we examined associations between parenting behaviors and adolescent psychopathology (Aim 3), by testing hierarchical linear regression models. Interaction terms were entered in the second step of the model. If interaction terms contributed a statistically significant increase in the proportion of variance explained in dependent variables, moderation relationships were probed by conducting regressions at high and low levels of the moderator, as reflected by a median split. When moderation analyses were not significant, main effects were interpreted. Finally, in order to investigate the relationships between parenting behaviors and frequency of NSSI specifically for the NSSI group (Aim 4), we conducted nonparametric Spearman's rho correlations, given that the frequencies of NSSI in the past year and lifetime occurrences were not normally distributed. Descriptive statistics for all study variables are reported in Table 1.

Results

Preliminary Analyses

Characteristics of NSSI. Participants with a history of NSSI engaged in an average of 33 (*SD* = 60) episodes of NSSI in the past year and 390 lifetime episodes (*SD* = 878, range = 4 –

3,170), with an average age of onset of NSSI at age 12.78 (*SD* = 2.20). Nearly all self-injuring participants reported engaging in cutting and/or severe scratching (96%; 23 of 24 participants) and most participants described cutting and/or severe scratching as their primary method of NSSI (83%; 20 of 24). The majority of self-injuring participants reported engaging in multiple forms of NSSI during their lifetimes (*n* = 17, 70%), however. Although our recruitment strategy focused solely on a history of multiple episodes of NSSI, one quarter of the self-harmers reported making a suicide attempt in the past year (*n* = 6) and approximately half reported at least one lifetime suicide attempt (*n* = 13; 54%).

Manipulation check. Observational ratings confirmed that positive interactions elicited more positive affect compared to negative interactions, $t(50) = 6.03$, $p < .001$ Cohen's $d = 1.06$, and negative interactions elicited more negativity and conflict as compared to positive interactions, $t(50) = 7.04$, $p < .001$, Cohen's $d = 0.80$.

Consistency of Parenting Behaviors across Informants and Measures

First, we examined the associations of parenting behaviors across measures, informants, and contexts (Aim 1). Overall, correlation coefficients demonstrated low to moderate levels of consistency of levels of maternal validation and invalidation across informants, measures, and positive and negative interaction tasks (see Table 2). More specifically, mothers' and adolescents' reports of perceived maternal validation showed moderate consistency and reports of invalidation showed weak consistency. Mothers' reports of perceived validation and invalidation were significantly associated with observational ratings during negative, but not positive interactions. Adolescents' reports of maternal invalidation, but not validation, were associated with observational ratings, although again this was specific to negative interactions. Of note, the magnitude of the association between mothers' reports of validation and

observational ratings of validation during negative interactions was significantly higher than the association between adolescents' perceived maternal validation and observational ratings of validation during negative interactions ($p < .05$). There were no other significant differences in the magnitude of associations between mother and adolescent reports and observational ratings. Further, positive and negative parenting composite scores showed weak to moderate associations with measures of validation and invalidation. Of note, the magnitude of the association between adolescent reports of maternal validation and positive parenting composite scores was statistically higher compared to the association between maternal reports of validation and positive parenting composite scores ($p = .02$).

Group Differences in Parenting Behaviors According to NSSI Status

In order to examine differences in parenting behaviors between controls and adolescents engaging in NSSI, MANOVA were conducted. Contrary to hypotheses, a MANOVA failed to detect any significant group differences between control and NSSI groups in terms of validation and invalidation according to mothers' reports, adolescents' reports, and observational ratings of validation and invaldiation for both positive and negative interactions, Wilks' $\Lambda = .85$, $F(8,42) = .95$, $p = .49$, partial $\eta^2 = .15$. A MANOVA also failed to reveal significant group differences in mothers' positive and negative parenting composite scores, Wilks' $\Lambda = .95$, $F(2,48) = 1.20$, $p = .31$, partial $\eta^2 = .05$.

Associations between Parenting Behaviors and Indices of Adolescent Psychopathology

Validation and Invalidation. In order to test our hypothesis that the interaction between validation and invalidation would be associated with indices of adolescent outcomes (Aim 3), we conducted hierarchical linear regressions, with adolescents' perceptions of maternal validation and entered in the first step and the interaction between these variables entered in the second

step. We relied on adolescent perceptions of validation and invalidation given that they were most strongly associated with indices of adolescent psychopathology in correlation analyses (see Table 3) and in order to reduce to total number of models tested.

Consistent with our hypothesis, adolescent perceived maternal validation moderated the relationship between perceived invalidation and adolescent BPD features; the interaction of validation and invalidation predicted additional variance over and above the main effects of validation and invalidation, $\Delta R^2 = .07$, $\Delta F(1,47) = 4.03$, $p = .05$, with a small effect size. Follow-up analyses indicated that adolescent perceived invalidation was significantly associated with adolescent BPD features in the context of low perceived validation, $\beta = .30$, $F = 8.48$, $p = .008$, but not in the context of high perceived validation, $\beta = .001$, $F < .001$, $p = 1.00$ (see Figure 1). Contrary to hypotheses, adolescent perceived validation did not moderate the association between perceived invalidation and emotion regulation problems, $\Delta R^2 = .01$, $\Delta F(1,46) = .53$, $p = .47$. Multiple linear regression analysis did reveal a significant main effect of validation and invalidation, however, such that adolescent perceived invalidation and validation predicted a significant proportion of the variance in adolescent emotion regulation problems, $R^2 = .12$, $F(2,47) = 3.20$, $p = .05$, with a small effect size. Controlling for adolescent perceived validation, adolescent perceived invalidation was significantly associated with emotion regulation problems, $\beta = .38$, $F = 4.19$, $p = .05$. Adolescent perceived validation was not significantly associated with adolescent emotion regulation problems after controlling for adolescent perceived invalidation, $\beta = -.07$, $F = .32$, $p = .57$.

In support of our hypothesis, adolescent perceived maternal validation moderated the relationship between adolescent perceived invalidation and mothers' reports of adolescent externalizing problems; the interaction of validation and invalidation predicted additional

variance over and above the main effects of perceived validation and invalidation, $\Delta R^2 = .08$, $\Delta F(1,47) = 5.48$, $p = .02$, with a small effect size. More specifically, there was a statistical trend in which adolescent perceived invalidation was associated with mothers' reports of adolescent externalizing problems in the context of low perceived validation, $\beta = .40$, $F = 3.91$, $p = .06$, but not in the context of high perceived validation, $\beta = -.10$, $F = 0.27$, $p = .61$. These results were specific to maternal reports of adolescent externalizing problems, however, as there was not evidence of moderation in the prediction of adolescents' reports of externalizing problems, $\Delta R^2 = .03$, $\Delta F(1,47) = 1.81$, $p = .19$. According to adolescent reports of externalizing problems, models testing main effects of validation and invalidation showed that adolescent perceived invalidation and validation predicted a significant proportion of the variance in adolescent externalizing problems, $R^2 = .24$, $F(2,48) = 7.55$, $p = .001$, with a small effect size. Controlling for adolescent perceived invalidation, adolescent perceived validation was a statistically significant predictor of externalizing problems, $\beta = -.42$, $F = 14.56$, $p < .001$. Adolescent perceived invalidation was not a significant predictor of adolescent reports of externalizing problems after controlling for adolescent perceived invalidation, however, $\beta = .13$, $F = 0.93$, $p = .34$.

With regard to adolescent internalizing problems, adolescent perceived maternal validation moderated the relationship between adolescent perceived invalidation and mothers' reports of adolescent internalizing problems, predicting additional variance over and above the main effects of perceived validation and invalidation, $\Delta R^2 = .12$, $\Delta F(1,47) = 7.50$, $p = .009$ (see Figure 2). Specifically, adolescents' perceptions of maternal invalidation were associated with mothers' reports of adolescent internalizing problems in the context of low validation, $\beta = .54$, $F = 8.59$, $p = .008$, but not in the context of high validation, $\beta = -.22$, $F = 1.30$, $p = .26$. Similarly, adolescent perceived maternal validation moderated the relationship between adolescent

perceived invalidation and adolescents' reports of internalizing problems, $\Delta R^2 = .10$, $\Delta F(1,47) = 4.95$, $p = .03$. When probed further, however, adolescents' perceptions of maternal invalidation were not associated with mothers' reports of adolescent internalizing problems in the context of low validation, $\beta = .33$, $F = 2.53$, $p = .13$, or in the context of high validation, $\beta = -.13$, $F = 0.42$, $p = .53$.

Positive and Negative Parenting. In order to examine the specificity of findings related to maternal validation, invalidation, and indices of adolescent psychopathology, we tested additional regression models with the broader positive and negative parenting constructs. Supporting the idea that validation and invalidation are specifically related to adolescent BPD features, there was no evidence that positive parenting moderated the association between negative parenting and adolescent BPD features, as the interaction between positive and negative parenting did not predict any additional variance over and above main effects of positive and negative parenting values, $\Delta R^2 < .001$, $\Delta F(1,47) < .001$, $p = .94$. Further, positive and negative parenting did not explain a significant proportion of the variance in adolescent BPD features, $R^2 = .04$, $F(2,48) = 2.10$, $p = .13$. Similarly, there was no evidence that positive parenting moderated the association between negative parenting and adolescent emotion regulation problems, as the interaction between positive and negative parenting did not predict any additional variance over and above the main effects of positive and negative parenting values, $\Delta R^2 < .001$, $\Delta F(1,46) = .02$, $p = .88$. Further, positive and negative parenting did not explain a significant proportion of the variance in adolescent emotion regulation problems, $R^2 = .04$, $F(2,47) = 0.87$, $p = .43$.

With regard to adolescent externalizing problems, there was no evidence that positive parenting moderated the association between negative parenting and mothers' reports of

externalizing problems. The interaction between positive and negative parenting did not account for additional variance in mothers' reports of externalizing problems over and above main effects of positive and negative parenting, $\Delta F(1,47) = 0.02$, $p = .89$, but main effects of positive and negative parenting did account for a significant proportion of the variance in externalizing problems, $R^2 = .27$, $F(2,48) = 8.89$, $p = .001$. Specifically, positive parenting was negatively associated with mothers' reports of adolescent externalizing problems, $\beta = -.46$, $F = 12.70$, $p = .001$, but negative parenting was not, $\beta = .15$, $F = 1.26$, $p = .27$. Similarly, the interaction between positive and negative parenting did not account for additional variance in adolescents' reports of externalizing problems over and above main effects of positive and negative parenting, $\Delta F(1,47) = 0.003$, $p = .95$, but main effects of positive and negative parenting did account for a significant proportion of the variance in adolescent reports of externalizing problems, $R^2 = .13$, $F(2,48) = 4.69$, $p = .01$. Specifically, positive parenting was negatively associated with mothers' reports of adolescent externalizing problems, $\beta = -.38$, $F = 7.48$, $p = .01$, but negative parenting was not, $\beta = .08$, $F = 0.28$, $p = .60$. Finally, a similar pattern of results was observed for adolescents' internalizing problems. There was no evidence that positive parenting moderated the association between negative parenting and adolescents' reports of internalizing problems, as the interaction between positive and negative parenting did not predict any additional variance over and above main effects of positive and negative parenting, $\Delta R^2 < .001$, $\Delta F(1,47) = .001$, $p = .97$. Regression analyses indicated that main effects of positive and negative parenting accounted for a significant proportion of the variance in adolescents' reports of internalizing problems, however, $R^2 = .14$, $F(2,48) = 3.93$, $p = .03$. More specifically, positive parenting was negatively associated with adolescent reports of internalizing problems, $\beta = -.38$, $F = 7.22$, $p = .01$, but negative parenting was not, $\beta = -.22$, $F = 2.37$, $p = .13$. A similar pattern emerged with

regard to mothers' reports of adolescent internalizing problems, such that the interaction between positive and negative parenting did not account for a significant proportion of the variance in internalizing problems over and main effects of positive and negative parenting, $\Delta R^2 = .001$, $\Delta F(1,47) = 0.05$, $p = .83$. Regression analyses indicated that main effects of positive and negative parenting accounted for a significant proportion of the variance in adolescents' reports of internalizing problems, however, $R^2 = .13$, $F(2,48) = 3.63$, $p = .03$, whereby positive parenting was associated with internalizing problems, $\beta = -.37$, $F = 6.73$, $p = .01$, but negative parenting was not, $\beta = -.01$, $F = 0.004$, $p = .95$.

Parenting Behaviors Associated with Frequency of NSSI. In order to examine parenting correlates of adolescent NSSI frequency among the self-harm group, nonparametric Spearman's rank order correlations tested associations between parenting behaviors and frequency of NSSI, given that NSSI frequency was not normally distributed. As shown in Table 4, only adolescent report of perceived maternal validation and the positive parenting composite score were negatively and statistically significantly associated with frequency of NSSI in the past year. Maternal reports of validation and invalidation, observational ratings of validation and invalidation, and negative parenting composite scores were not significantly associated with frequency of NSSI.

Discussion

The current study contributes to the literature by examining parenting behaviors associated with adolescent psychopathology and engagement in NSSI. We improved on the existing literature by including measures of maternal validation and invalidation in addition to positive and negative parenting. Further, we incorporated mother and adolescent reports of maternal parenting behaviors and observational ratings of maternal behaviors during face-to-face

interactions with adolescents. Results did not reveal significant group differences in parenting behaviors across mothers of adolescents engaging in NSSI and mothers of healthy controls. For the sample as a whole, there was some evidence to suggest a protective role of maternal validation and positive parenting behaviors, as well as a detrimental role of maternal invalidation with regard to indices of adolescent psychopathology. Finally, for adolescents engaging in NSSI, adolescents' perceptions of maternal validation and positive parenting behaviors were negatively associated with frequency of NSSI.

To our knowledge, we are the first to report associations of maternal validation and invalidation across multiple informants and methods of assessment. Overall, measures of validation and invalidation showed low to moderate consistency. More specifically, mother and adolescent reports of validation were moderately associated whereas their reports of invalidation were weakly associated with one another. With regards to the consistency of self-reports and observational ratings of validation and invalidation, there was some support for higher levels of consistency among maternal self-reports and observational ratings as compared to consistency between adolescent reports and observational ratings. It is possible that adolescent perceptions of parenting are biased by maladaptive cognitive appraisals of maternal behaviors. Support for this explanation comes from the hypermentalizing literature, in which BPD features are proposed to emerge as the result of difficulties describing mental states of self and others (Fonagy & Luyten, 2009) and evidence that adolescent BPD features are associated with hypermentalizing errors, with higher levels of BPD symptoms associated with more attributions of intentionality and blame to others than deemed contextually appropriate (r = .41; Sharp et al., 2011).

Within the current study, observational ratings of negative interactions tended to be more consistent with self-report measures relative to observational ratings of positive interactions and

self-reports. This may be accounted for by the fact that self-report measures included in the current study assessed mothers' responses to adolescent negative emotions and not positive emotions. Future studies should include self-report measures assessing both maternal responses to adolescent positive and negative emotions in order to better understand the consistency of maternal validation and invalidation across contexts.

On the basis of developmental theories of BPD, we hypothesized that mothers of adolescents engaging in NSSI would exhibit higher levels of invalidation and lower levels of validation relative to mothers of healthy controls. Inconsistent with our hypotheses, we did not observe differences between mothers of adolescents engaging in NSSI and mothers of healthy controls in terms of parenting behaviors, including validation, invalidation, positive parenting, or negative parenting. These findings provide evidence that mothers of adolescents engaging in NSSI do not exhibit parenting deficits. Our findings are corroborated by others who have failed to detect differences in negative parenting across parents of adolescents engaging in self-injurious behaviors and parents of healthy controls (Crowell et al., 2008). Our findings differ from those of Shenk and Fruzzetti (2013), who observed higher levels of invalidation and lower levels of validation among parents of clinic-referred adolescents in comparison to parents of healthy controls. This study relied on a relatively small sample size (n = 29), however, and included adolescents with a range of psychopathology. It is unclear if this sample included adolescents engaging in NSSI, as this was not assessed systematically. It is possible that invalidation and validation are specifically related to adolescent psychopathology only for adolescents with Axis I psychopathology, and not to adolescent personality disorder features. Future studies should investigate differences in parenting behaviors across adolescents with Axis I psychopathology, adolescents engaging in NSSI, and healthy controls.

Despite the absence of group differences in parenting behaviors associated with NSSI status, associations between parenting behaviors and indices of adolescent psychopathology were observed among the sample as a whole. Whereas observational ratings of maternal behaviors and mothers' reports of their own parenting behaviors were largely not associated with indices of adolescent psychopathology, adolescent perceived maternal invalidation was associated with all indices of psychopathology measured. More specifically, adolescent perceived invalidation was positively associated with adolescent emotion regulation problems. This finding is in line with other reports of associations between parental invalidation and adolescent emotion regulation problems (Buckholdt et al., 2014) and theory linking parental invalidating behaviors to the development of youth emotion regulation problems (Eisenberg et al., 1998; Gottman et al., 1996; Morris et al., 2007). Due to the cross-sectional nature of this study, the direction of this association remains unclear, however. It is possible that more emotionally dysregulated adolescents elicit more invalidation and/or are biased in their perceptions of maternal invalidation. Longitudinal research is needed in order to elucidate temporal relationships between parental invalidation and emotion regulation problems.

Further, our results highlight the association between adolescent perceived invalidation and adolescent BPD features, but only in the context of low perceived validation. This finding suggests a potential protective role of validation in the emergence of BPD features, which is in line with developmental theories of BPD linking exposure to high levels of validation and low levels of validation to the emergency of BPD (Linehan, 1993). Due to the cross-sectional nature of our study, however, it is also possible that our findings a tendency for adolescents with elevated BPD features to perceive high levels of invalidation and low levels of validation, more consistent with the hypermentalizing literature (Fonagy & Luyten, 2009), or that adolescent BPD

features elicit high levels of invalidation from the environment, consistent with prospective associations between adolescent BPD symptoms and harsh punishment (Stepp et al., 2014). Finally, there may be a transactional relationship between BPD features and perceptions of validation and invalidation, such that early BPD features and the tendency to interpret behavior as invalidating elicits further invalidation from the environment, contributing to exacerbation of future BPD features. Longitudinal research with multiple assessments of BPD features and parental invalidation and validation are needed in order to investigate the time-lagged associations and temporal relationships among these constructs.

Our findings also indicated that adolescents' perceptions of invalidation were positively associated adolescent internalizing and externalizing problems, but only in the context of low levels of validation. Again, these findings may reflect a potential protective role of validation against the development of psychopathology via modeling and reinforcement of appropriate emotion regulation skills problems (Eisenberg et al., 1998; Gottman et al., 1996; Morris et al., 2007). It is also possible that our findings reflect a tendency for adolescent internalizing and externalizing problems to elicit higher levels of invalidation and lower levels of validation from the environment, supported by studies demonstrating prospective associations between temperament and parenting (e.g., Lengua & Kovacs, 2006) and between externalizing problems and harsh discipline strategies (e.g., Choe, Olson, & Sameroff, 2013).

In addition to highlighting associations between parenting and indices of adolescent psychopathology, over results provide support for the specificity of associations between validation and invalidation and adolescent BPD features and emotion regulation problems. More specifically, positive and negative parenting were not associated with adolescent reports of BPD features and emotion regulation problems. Positive parenting behaviors were negatively

associated with mother and adolescent reports of internalizing and externalizing problems, however. If replicated in a larger, longitudinal study, these findings may suggest that positive parenting is predictive of adolescent Axis I psychopathology, whereas validation and invalidation are associated with BPD features more specifically.

Results of our study have several important implications for preventive intervention efforts aimed at adolescents. First, associations between parenting behaviors and indices of adolescent psychopathology were observed among our sample as a whole, regardless of adolescent history of NSSI. Thus, results suggest that targeting the reduction of parental invalidation and the enhancement of validation and positive parenting behaviors may be fruitful strategies for decreasing or preventing emotion regulation problems among general populations of adolescents. Second, our results highlight the importance of understanding adolescent perspectives of parenting, both with regards to the assessment and intervention work, as adolescent reports of parenting were most highly related to indices of adolescent psychopathology. These findings also suggest that targeting adolescents' appraisals of parenting behaviors within interventions may be warranted, particularly among adolescents with high levels of BPD features. Finally, our findings have important implications for communication with parents of adolescents engaging in NSSI. We did not observe results indicative of parenting deficits among these parents. It should be noted, however, that despite the fact that mothers of adolescents engaging in NSSI did not show significantly higher levels of invalidation and lower levels of validation than mothers of healthy adolescents, the desired levels of validation for adolescents engaging in NSSI may be higher than those of healthy adolescents. Further, increasing validation to meet the needs of the self-injuring adolescent may still be a beneficial treatment target.

The current study took advantage of a multi-method, multi-informant approach to understanding parenting behaviors among adolescents with histories of NSSI. Further, we built on existing literature by incorporating measures of validation, positive parenting, and negative parenting, in addition to measures of invalidation. This allowed us to examine the specificity of associations between particular parenting behaviors and indices of adolescent psychopathology.

Despite these strengths, the findings from the current study should be interpreted in the context of several limitations that may be addressed by future research in this area. First, the current sample was relatively small and primarily recruited self-injuring adolescents from an outpatient mental health clinic. Treatment-seeking youth been shown to be more impaired, have parents with higher levels of education, and are more likely to be Caucasian compared to non-treatment-seeking youth (Goodman et al., 1997). Thus, our findings may not generalize to the broader population of adolescents engaging in NSSI. Further, our sample was exclusively comprised of adolescent females and their mothers since our sample size precluded adequately powered tests of moderations by gender of adolescent and parent. Future studies should recruit larger samples, including both female and male adolescents and parents in order to explore these associations. Second, as noted previously, our data were cross-sectional and correlational in nature, limiting our ability to draw causal inferences. Although theoretical models support high levels of invalidation and low levels of validation as causal risk factors for the emergence of BPD, it is equally likely that BPD pathology among youth elicit these parenting behaviors. In fact, the transactional nature between youth BPD features and invalidation is a core feature of developmental theories of BPD (Fruzzetti et al., 2005; M. M. Linehan, 1993). Thus, prospective studies with multiple assessments of parenting and youth BPD pathology are needed in order to investigate transactional relationships among these constructs.

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Appendix C: Manuscript 2 Tables

Table 1

Descriptive Statistics

Variables	Healthy Controls *M* (*SD*)	Self-Harmers *M* (*SD*)	Overall Sample *M* (*SD*)
Adolescent Variables			.
BPFSC	51.37 (12.10)	75.17 (9.49)***	62.57 (16.17)
DERS	72.00 (19.43)	116.21 (25.77)***	93.22 (31.66)
SES: Invalidation	52.78 (15.59)	67.17 (31.65)	59.55 (25.30)
SES: Validation	133.19 (36.43)	124.29 (37.57)	129.00 (36.87)
PCRQA: Disciplinary Warmth	33.44 (4.74)	28.88 (7.96)	31.29 (0.95)
PCRQA: Personal Relationship	52.41 (8.42)	48.96 (11.58)	50.78 (1.41)
PCRQA: Warmth	39.74 (5.36)	34.21 (8.54)	37.14 (7.50)
YSR: Externalizing Problems	8.22 (6.32)	16.92 (8.22)***	12.31 (8.43)
YSR: Internalizing Problems	13.15 (8.71)	28.29 (11.82)***	20.27 (12.73)
Maternal Variables			
CBCL: Externalizing Problems	3.52 (4.50)	11.63 (9.29)***	7.33 (8.18)
CBCL: Internalizing Problems	4.67 (4.37)	22.04 (11.97)***	12.84 (12.35)
CCNES: Invalidation	55.81 (14.30)	56.71 (19.57)	56.24 (16.82)
CCNES: Validation	146.52 (23.05)	146.21 (19.57)	146.37 (21.27)
PCRQM: Disciplinary Warmth	32.81 (3.54)	33.29 (4.24)	33.04 (3.85)
PCRQM: Personal Relationship	49.56 (7.90)	49.58 (6.97)	49.57 (7.40)
PCRQM: Warmth	37.26 (4.86)	36.38 (6.14)	34.84 (5.46)

Notes. BPFSC = Borderline Personality Features Scale for Children. DERS = Difficulties in Emotion Regulation Scale. SES = Socialization of Emotion Scale. PCRQA = Parent Child

Relationship Questionnaire – Adolescent report. . PCRQM = Parent Child Relationship Questionnaire – Mother report. YSR = Youth Self Report. CBCL = Child Behavior Checklist. CCNES = Coping with Children's Negative Emotions Scale.

*** $p < .001$. * $p < .05$.

Table 2

Correlations among Validation and Invalidation Scales across Informants and Methods of Assessment

Variables	1	2	3	4	5	6	7	8	9
1. CCNES-IV									
2. CCNES-V	-.24†								
3. SES-IV	.29*	-.26†							
4. SES-V	.01	.42**	-.40*						
5. VIBCS-IV-Pos.	.26†	-.33*	.18	-.29*					
6. VIBCS-V-Pos.	-.04	.05	-.10	.06	-.19				
7. VIBCS-IV-Neg.	.34*	-.49***	.36*	-.31*	.35*	.03			
8. VIBCS-V-Neg.	-.33*	.52***	-.28*	.20	-.33*	.33*	-.63***		
9. Positive Parenting	-.30*	.25†	-.38**	.59***	-.15	.13	-.26†	.24†	
10. Negative Parenting	.19	-.34*	.30*	-.41**	.45***	-.10	.57***	-.37**	-.29*

Notes. CCNES = Coping with Children's Negative Emotions Scale (mother report). SES = Socialization of Emotion Scale (adolescent report). VIBCS = Validation and Invalidation Behavior Coding System. IV = Invalidation. V = Validation. Pos. = Positive Interaction. Neg. = Negative Interaction.

†$p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 3

Associations between Maternal Invalidation and Validation and Indices of Adolescent Psychopathology

Variables	BPFSC	DERS	YSR: Internalizing Problems	YSR: Externalizing Problems	CBCL: Internalizing Problems	CBCL: Externalizing Problems
CCNES-IV	.11	-.05	-.01	.25†	.21	.21
SES-IV	.37**	.34*	.22	.30*	.31*	.36*
VIBCS-IV-Pos.	.22	.04	.19	.37**	.07	.25†
VIBCS-IV-Neg.	-.11	-.07	-.10	.12	.06	.12
CCNES-V	-.05	-.03	-.14	-.24†	-.06	-.17
SES-V	-.23	-.20	-.21	-.47***	-.19	-.49***
VIBCS-V-Pos.	.003	.07	-.01	-.02	.16	.07
VIBCS-V-Neg.	.06	.12	.02	-.17	.11	.07
Positive Parenting	-.28*	-.16	-.31*	-.40**	-.36**	-.50***
Negative Parenting	.11	.14	-.11	.18	.10	.28*

Notes. BPFSC = Borderline Personality Features Scale for Children. DERS = Difficulties in Emotion Regulation Scale. SES = Socialization of Emotion Scale. YSR = Youth Self Report. CBCL = Child Behavior Checklist. CCNES = Coping with Children's Negative Emotions Scale. CCNES = Coping with Children's Negative Emotions Scale (mother report). SES = Socialization of Emotion Scale (adolescent report). VIBCS = Validation and Invalidation Behavior Coding System. IV = Invalidation. V = Validation. Pos. = Positive Interaction. Neg. = Negative Interaction.

†$p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 4

Associations between Parenting Behaviors and Frequency of Nonsuicidal Self-Injury

	Spearman's rho	
Variables	NSSI Past 12 Mos.	NSSI Lifetime
CCNES-IV	.16	-.25
SES-IV	.33	.28
VIBCS-IV-Pos.	-.25	.03
VIBCS-IV-Neg.	.25	.01
CCNES-V	-.09	-.20
SES-V	-.46*	-.32
VIBCS-V-Pos.	.27	-.04
VIBCS-V-Neg.	-.03	-.05
Positive Parenting	-.61**	-.38†
Negative Parenting	.02	-.15

Notes. SES = Socialization of Emotion Scale. CCNES = Coping with Children's Negative Emotions Scale. CCNES = Coping with Children's Negative Emotions Scale (mother report). SES = Socialization of Emotion Scale (adolescent report). VIBCS = Validation and Invalidation Behavior Coding System. IV = Invalidation. V = Validation. Pos. = Positive Interaction. Neg. = Negative Interaction.

†$p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Appendix D: Manuscript 2 Figures

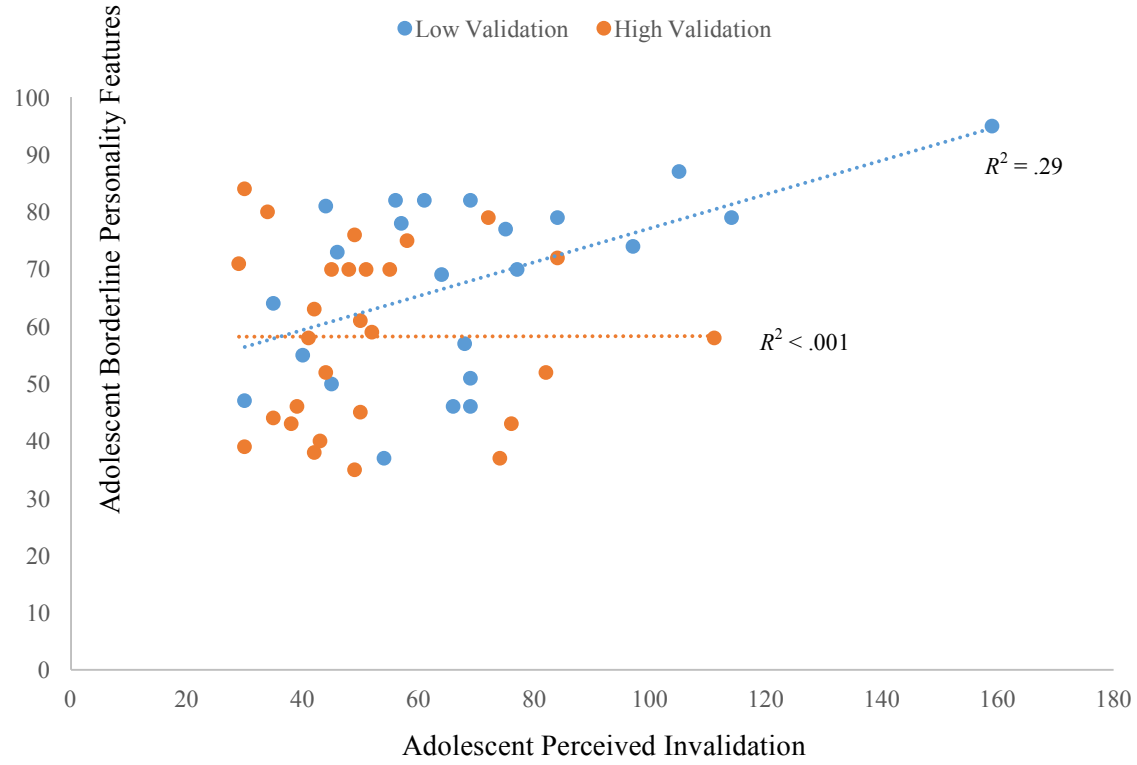

Figure 1. The Association between Adolescent Perceived Maternal Invalidation and Borderline Personality Disorder Features is Moderated by Adolescent Perceived Maternal Validation.

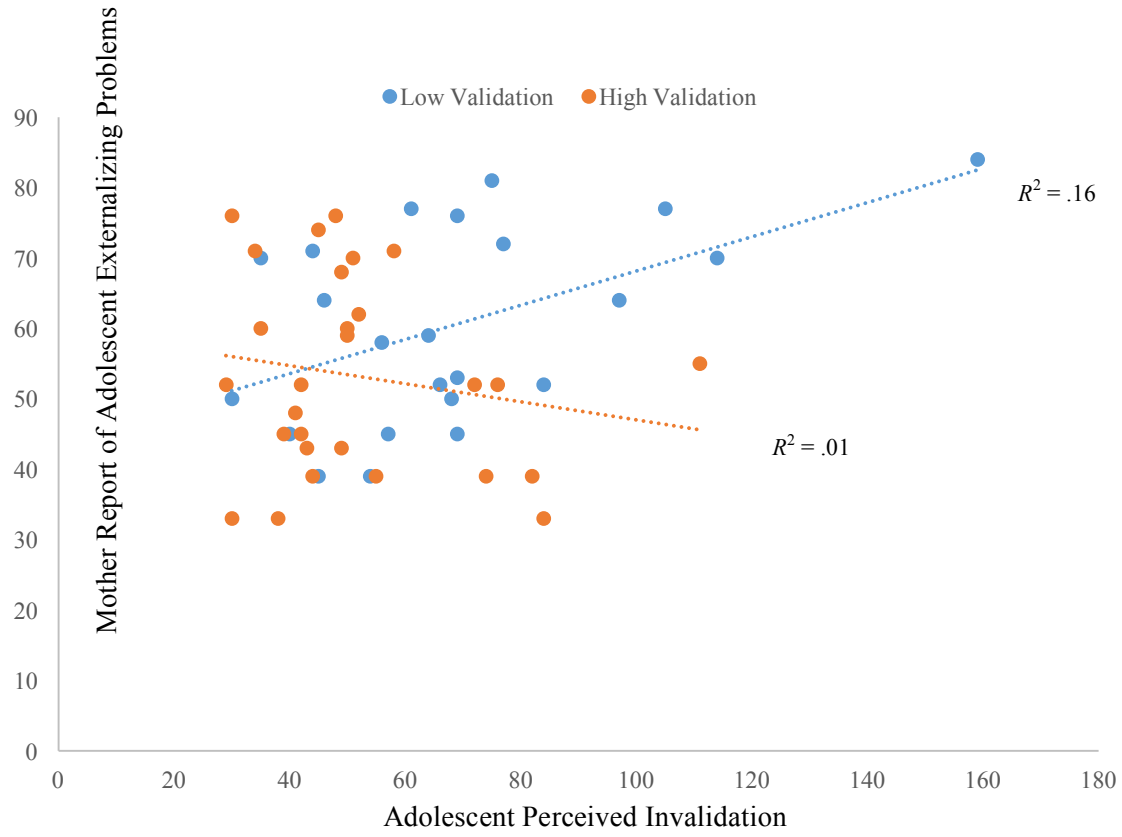

Figure 2. The Association between Adolescent Perceived Maternal Invalidation and Mothers' Reports of Adolescent Externalizing Problems is Moderated by Adolescent Perceived Maternal Validation.

Unifying Discussion

The current dissertation contributes to the literature by examining both biologically-based vulnerabilities to emotion dysregulation and parenting behaviors among adolescents with histories of NSSI. Study 1 demonstrated that self-injuring adolescents perceived maternal invalidation as more distressing according to self-report measures, but not psychophysiological reactivity. Results from study 2 indicated that adolescent self-injury status was not related to mothers' parenting behaviors. For the sample as a whole, adolescent reports of high maternal invalidation in combination with low validation were associated with higher levels of borderline pathology, suggesting a potential protective role of maternal validation.

When results from both studies are considered together, findings appear to suggest that adolescents with histories of NSSI and/or high levels of BPD features exhibit hypersensivity to maternal invalidation. This interpretation is supported by the findings that: (1) adolescent reports of maternal parenting behaviors were less consistent with observational ratings of maternal behaviors compared to mother reports of parenting, (2) indices of adolescent psychopathology were associated with adolescent perceived invalidation and validation, whereas associations between adolescent psychopathology and mother reports and observational ratings of maternal parenting behaviors were largely absent, (3) adolescents with histories of NSSI showed heightened emotional reactivity in response to receiving invalidating feedback from their mothers, and (4) adolescents with histories of NSSI showed heightened emotional reactivity and failure to recovery in response to any additional feedback they received from theirs mothers subsequent to invalidation, regardless if the content of additional feedback was validating or neutral. Interpreting these findings to reflect hypersensitivity to invalidation among youth at risk for BPD is in line with Linehan's theoretical claim that youth at risk for BPD are more sensitive

and reactive to stressors within their environments, including invalidation (1993) and empirical work linking attentional biases for negative stimuli and difficulty disengaging attention from threatening information and youth BPD features (Jovev et al., 2012). Our results may also support claims that individuals with BPD features are both more hypersensitive to social cues and more likely to make errors in interpreting intentionality of others' behaviors (Fonagy & Luyten, 2009). In order to more fully test Linehan's Biosocial Theory (1993), future analyses should examine psychophysiological functioning and exposure to invalidation jointly in the prediction of BPD symptoms.

Although these studies are cross-sectional in nature, results from both studies appear to support preventive intervention efforts focused on reducing maternal invalidation and enhancing maternal validation. It is important to note that our results support altering parenting behaviors in spite of the fact that mothers of adolescents engaging in NSSI did not display parenting deficits. Further, associations between parenting behaviors and indices of psychopathology were observed across both healthy adolescents and those at risk for BPD, suggesting potential benefits of reducing invalidation and enhancing validation within the general population of adolescents, regardless of adolescent history of NSSI.