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An Experimental Investigation of How Peer Criticism and Praise Affect Urges for Self-Injury

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An Experimental Investigation of How Peer Criticism and Praise Affect Urges for Self-Injury

A Thesis Presented

by

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ABSTRACT

AN EXPERIMENTAL INVESTIGATION OF HOW PEER CRITICISM AND PRAISE AFFECT URGES FOR SELF-INJURY

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Nonsuicidal self-injury (NSSI) is prevalent among young adults, and is associated with increased suicide risk. The self-punishment hypothesis theorizes that individuals who are highly self-critical may engage in NSSI due to finding the experience of pain as ego-syntonic. Although evidence links self-critical views to NSSI, minimal research has examined how these views are influenced by more proximal social stressors, such as peer criticism, to trigger NSSI urges. The current study addresses the following questions: (1) Will the effects of recalled peer criticism (vs. praise and a neutral interaction) on pain endurance (a proxy measure for NSSI urges) and self-reported NSSI urges be moderated by group status (i.e., whether or not an individual has a history of NSSI)? We hypothesized that group status would moderate the effects of recalled peer criticism on pain endurance and NSSI urges, such that the relationships between these constructs would be stronger among the NSSI group vs. the no NSSI group; (2) If these interaction effects are present, will they be mediated by self-critical views? We hypothesized that the interaction between group status and peer criticism on pain endurance and NSSI urges would decrease in magnitude after accounting for self-critical views. Participants were 137 young adult women with either a recent or recurrent history of NSSI (n = 79) or no

NSSI history (n = 58). Idiographic scripts of a recalled peer interaction involving critical, praising, or neutral feedback were used as the experimental manipulation, and measures of pain endurance (via a pressure algometer) and self-reported NSSI urges were administered at baseline and post-manipulation. The NSSI group demonstrated marginally higher pain endurance and stronger self-critical views than the control group. The overall effects of recalled peer criticism were not moderated by group status in predicting pain endurance or NSSI urges. Exploratory pairwise comparisons revealed that those in the NSSI group who received criticism (vs. the other conditions) demonstrated a significant increase in NSSI urges. Findings highlight peer criticism as one context in which risk for NSSI urges may be elevated among those with a history of NSSI, and underscore self-critical views as an important intervention target.

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INTRODUCTION

Nonsuicidal self-injury (NSSI) is defined as the deliberate destruction of one's own body tissue without the conscious intent to die (Favazza, 1998). Although research on NSSI has received increased attention in recent years (Fox et al., 2015; Nock, 2009), the field is still grappling with the fundamental question of what leads individuals to engage in NSSI. Both theory and empirical research point to self-criticism and defective views of oneself as critical precursors to NSSI (e.g., Glassman, Weierich, Hooley, Deliberto, & Nock, 2007). Yet, less research has been conducted on how such views are influenced by proximal stressors, such as criticism and praise from others, to generate urges for NSSI in the moment. Such research has the potential to highlight how distal vulnerability factors influence responses to proximal social stressors to trigger NSSI in the moment, and highlight potential contexts for intervention.

1.1 NSSI is a Serious Public Health Concern

By definition, NSSI involves the destruction of body tissue and thus this behavior engenders clear risk for physical harm. This is concerning given that lifetime prevalence rates of NSSI specifically within college samples range from 7.0% (Wilcox et al., 2012) up to 39.5% (Hamza, Willoughby, & Good, 2013), and rates are particularly high among female college students (Whitlock et al., 2011). Although individuals who engage in NSSI do not have the conscious intent to die, accidents do occur and injuries may be severe enough to warrant medical attention. In addition to risk for harm in the moment, NSSI is one of the most robust risk factors for future suicide attempts (Klonsky, May, & Glenn, 2013; Wilkinson, Kelvin, Roberts, Dubicka, & Goodyer, 2011). Although by

definition NSSI is not engaged in with suicidal intent, researchers theorize that NSSI may serve as "practice" for the very act of harming oneself, thereby allowing one to overcome innate barriers to engaging in suicidal behaviors (Joiner, 2005). Approximately 273,000 individuals received medical care for self-inflicted injuries at emergency departments across the U.S. in 2016 alone (Centers for Disease Control and Prevention, 2016), while in 2017, suicide was the second leading cause of death among youth between the ages of 10 and 24 (Curtin & Heron, 2019). Thus, NSSI is implicated in the major public health concern that is youth suicide.

1.2 Self-Punishment Theory of NSSI

Various theories have been proposed to explain why individuals choose to engage in the perplexing behavior that is NSSI. Although converging research suggests that NSSI primarily serves to help individuals regulate their negative emotions (Klonsky, 2007; Nock & Prinstein, 2004), the question remains as to why individuals turn to NSSI specifically, rather than other means (e.g., substance use, eating, exercise) to down-regulate their distress. Researchers have posited that, among those individuals who resort to NSSI, this behavior may be ego-syntonic (Hooley, Ho, Slater, & Lockshin, 2010; Nock, 2009) in that it aligns with their negative self-views. This proposal, known as the self-punishment (or defective self) hypothesis, therefore pinpoints negative views of oneself as an essential element that contributes to the development of NSSI (Hooley et al., 2010).

Self-defective views involve beliefs that the self is bad, worthless, or inferior, and deserving of punishment (Hooley et al., 2010). As such, this construct also encompasses the related processes of self-criticism and self-derogation. These self-defective views are

theorized to stem from experiences of childhood abuse or parental criticism and invalidation (Baetens et al., 2015; Glassman et al., 2007; Swannell et al., 2012). Holding these beliefs may lead individuals to gravitate towards NSSI in particular as a coping strategy, given that they experience pain as ego-syntonic and affirming of their sense of self. As such, self-defective beliefs may unconsciously remove individuals' innate barriers to physically harming themselves, thereby increasing the likelihood of choosing NSSI as a viable strategy to regulate distress (Hooley & St. Germain, 2013). Therefore, individuals who hold strong self-defective beliefs may be at heightened risk for choosing NSSI as a method of changing their emotional state in an ego-syntonic, self-punishing manner.

1.3 Empirical Support for the Self-Punishment Theory of NSSI

A wealth of evidence supports the notion that self-punishment is integrally related to NSSI. Many studies identify the motive of self-punishment as among the most commonly cited reasons for engaging in NSSI among samples of community adolescents, college students, and clinical patients (Kleindienst et al., 2008; Klonsky & Glenn, 2009; Lloyd-Richardson, Perrine, Dierker, & Kelley, 2007; Nock & Prinstein, 2004). Indeed, research suggests that when young adults are given the option of indicating primary and secondary reasons for NSSI, they tend to identify affect regulation as a primary motive, and self-punishment as secondary (Klonsky, 2009). Similarly, among college students with a history of NSSI, self-punishment was the second most commonly endorsed motive, following affect regulation (Klonsky & Glenn, 2009). Whereas emotion regulation emerges as the most common motive for NSSI (e.g., Klonsky & Glenn, 2009), there are many ways in which emotions can be regulated, and self-punishment desires,

while perhaps secondary, may be the factor that leads individuals to engage in NSSI over other behaviors. Thus, individuals who hold strong self-defective beliefs may be more likely to choose NSSI as a physical form of self-punishment.

Both cross-sectional and prospective studies provide support for a strong association between defective views of oneself and NSSI. Individuals who engage in NSSI are more highly self-critical than individuals who do not engage in NSSI (Claes, Houben, Vandereycken, Bijttebier, & Muehlenkamp, 2010; Gilbert et al., 2010; Hooley et al., 2010; St. Germain & Hooley, 2012). Self-criticism has also been shown to predict engagement in NSSI among adolescents, even after controlling for major depressive disorder, and is strongly associated with NSSI frequency (Glassman et al., 2007). Low self-esteem, which is conceptually related to self-criticism, also predicted onset of NSSI during adolescence (Tatnell, Kelada, Hasking, & Martin, 2014). More broadly, having a negative cognitive style (i.e., "making pessimistic causal attributions about negative events and inferring negative consequences and self-implications from these events") longitudinally predicted the onset of NSSI over a two-year period among a community sample of young adolescents (Hankin & Abela, 2011, p. 66). Youth who engaged in NSSI during the follow-up period reported a more negative cognitive style than those who did not. Additional longitudinal evidence supports the link between self-criticism and NSSI four weeks (Fox et al., 2018), two months (Perkins, Ortiz, & Smith, 2019), and even six months later (Smith, Wang, Carter, Fox, & Hooley, 2019).

Several studies also highlight the link between self-defective beliefs and one behavioral proxy for NSSI: physical pain endurance. Such pain endurance is often conceptualized as how long individuals are willing to continue to experience pain once

their pain threshold is met. For instance, data show that having a more self-critical cognitive style was the strongest predictor of prolonged physical pain endurance (relative to neuroticism and introversion) within a community sample of adults (Hooley et al., 2010). Similarly, the relationship between NSSI and pain endurance has been statistically accounted for by self-criticism (Glenn, Michel, Franklin, Hooley, & Nock, 2014). Although these studies did not experimentally manipulate self-defective beliefs, they suggest that highly negative views of oneself are associated with greater likelihood of engaging in NSSI and increased willingness to endure physical pain.

An emerging experimental literature provides further evidence of the causal link between negative views of oneself and physical pain endurance. Even among healthy individuals, when participants were reminded of incidents that may elicit self-criticism or feelings of shame, namely their past unethical transgressions (vs. an everyday interaction), participants chose to endure pain for longer amounts of time (Bastian, Jetten, & Fasoli, 2011). More directly, among participants with a history of NSSI, experimentally decreasing self-defective beliefs in the laboratory has been shown to also decrease pain endurance (Hooley & St. Germain, 2013). Furthermore, receiving a brief cognitive intervention to improve feelings of self-worth was significantly associated with decreased willingness to endure pain among those with a history of NSSI. In contrast, participants with no NSSI history showed little change in pain endurance in response to the positive self-worth intervention. Thus, evidence supports the notion that self-defective beliefs are significantly associated with increased preference for enduring physical pain, particularly among those with a history of NSSI.

Taken together, extant research supports the self-punishment model of NSSI. The aforementioned literature helps us make sense of why some individuals turn to NSSI as a strategy for managing or escaping their distress; namely, for individuals with defective views of themselves, who engage in frequent self-criticism and self-derogation, NSSI may be ego-syntonic and self-affirming, and may satisfy needs to self-punish. Not only do individuals with negative views of themselves engage in more frequent NSSI and choose to endure pain for longer amounts of time in the laboratory, but also manipulations in the lab increasing self-worth are associated with subsequent decreases in pain endurance (e.g., Hooley & St. Germain, 2013). Although illuminating, this line of research has not yet addressed how these longstanding defective views of oneself are influenced by more proximal stressors to predict *when* individuals are most likely to engage in NSSI.

1.4 Social Criticism and Praise as Proximal Stressors for NSSI

Broadly, social stressors have been linked with increased urges for NSSI. For example, daily diary studies have demonstrated that individuals who engage in NSSI report stronger urges and increased likelihood for engaging in NSSI in response to interpersonal conflicts in daily life (Turner, Cobb, Gratz, & Chapman, 2016), as well as increased odds for engaging in NSSI when feeling rejected and angry towards another (Nock, Prinstein, & Sterba, 2009). Moreover, individuals with a history of NSSI report increased distress following a social exclusion laboratory task (e.g., Cyberball; Schatten, Andover, & Armey, 2015), and demonstrate deficits in social problem-solving abilities while under distress (Nock & Mendes, 2008). For individuals with highly critical views of themselves, we therefore might expect that criticism from others would be a

particularly potent social stressor setting the stage for NSSI. To date, however, there is minimal laboratory research examining the immediate effect of a range of social stressors on NSSI urges, limiting our ability to precisely pinpoint contextual factors that pose high risk for individuals who engage in NSSI.

1.4.1 Criticism.

Although there is no direct evidence that criticism leads to elevated NSSI urges in the laboratory, there is indirect evidence suggesting this possibility. Several studies suggest that receipt of criticism from others results in elevated distress, assessed via self-report and brain imaging indices. However, there is a dearth of research on the immediate effect of criticism specifically among individuals who engage in NSSI. Among individuals with remitted depression, hearing audio-recordings of personally-relevant criticism from their own mothers while undergoing fMRI scans indicated dysfunctional hypo-activation of the dorsolateral prefrontal cortex, perhaps reflective of emotion regulation difficulties (Beauregard, Levesque, & Bourgouin, 2001), and increased reported negative mood (Hooley, Gruber, Scott, Hiller, & Yurgelun-Todd, 2005). Similarly, another sample of depressed, recovered depressed, and control participants high on perceived criticism who underwent the same criticism task demonstrated differential activation in brain regions associated with emotional reactivity and regulation (e.g., increased amygdala activity, decreased reactions in prefrontal regulatory regions) specifically in response to criticism (Hooley, Siegle, & Gruber, 2012). Further, among participants with generalized social phobia, reading self-critical comments while undergoing fMRI scans led to increased activity in emotion-relevant brain regions (e.g., medial prefrontal cortex, amygdala; Blair et al., 2008). Thus, converging evidence

suggests that criticism from others is associated with differential activity in brain areas involved in emotional and cognitive functioning.

Outside of the laboratory, individuals with borderline personality disorder (BPD) report increases in perceived social rejection and isolation prior to experiencing NSSI urges and behaviors (Snir, Rafaeli, Gadassi, Berenson, & Downey, 2015). Similarly, within-person changes in both feeling rejected (or abandoned, excluded, left out) and feeling criticized (or insulted) predicted increases in the likelihood of subsequent NSSI urges (Victor, Scott, Stepp, & Goldstein, 2018). Longitudinal evidence also supports the link between perceived parental criticism in grades six through eight and increased likelihood of NSSI six years later (Yates, Luthar, & Tracy, 2008). However, this particular finding was limited by the fact that the authors did not assess suicidal intent, and thus results may be accounted for by suicidal behaviors. In addition, the identified pathways also significantly predicted delinquent behavior, and therefore were not specific to NSSI. Nevertheless, criticism may be one proximal cue that triggers self-defective beliefs and associated urges for NSSI. Indeed, research has found that the relationship between parental criticism and adolescent NSSI is especially strong for adolescents who endorse a self-critical cognitive style (Wedig & Nock, 2007). This finding suggests the possibility that criticism may prime self-defective beliefs, which in turn may elicit urges for NSSI, although this has not yet been directly examined. In sum, there is converging evidence linking criticism from others to engagement in NSSI (Baetens et al., 2015; Wedig & Nock, 2007; Yates et al., 2008); however, more research is needed on the immediate effect of receiving criticism on urges for NSSI, as well as the effects of receiving criticism from important others such as peers.

1.4.2 Praise.

Whereas there is some indirect evidence suggesting that criticism may be associated with elevated urges for NSSI, there is almost no research on the effect of other types of social feedback on NSSI urges. On one hand, it may seem that praise would inevitably lead to reduced negative affect and subsequently reduced urges for NSSI. Indeed, existing data suggest that improving self-worth leads to reduced pain endurance (e.g., Hooley & St. Germain, 2013).

Alternatively, some research and theory suggests that, paradoxically, the reverse may also be true. Namely, it is possible that individuals who engage in NSSI experience negative emotions and urges for NSSI in response to praise, in addition to criticism. According to self-verification theory (Swann & Read, 1981), humans tend to seek self-verifying information, as this makes the world appear more coherent and predictable. As such, individuals prefer others to see them as they see themselves, and process feedback in ways that support their self-beliefs. In fact, one meta-analytic review revealed that both motives for self-enhancement (i.e., the desire to increase the positivity of self-views) and self-verification (i.e., the desire to confirm and stabilize firmly held self-views) are important, yet self-verification motives have greater effects on cognitive processes such as attributions of successes and failures to internal causes (Kwang & Swann, 2010). It is possible that self-verification motives may be particularly salient for individuals suffering from psychological difficulties associated with stably poor self-views. For example, studies have shown that individuals with dysphoria and depression prefer to interact with others who appraise them unfavorably, and actively solicit this negative feedback from others (Swann, Wenzlaff, Krull, & Pelham, 1992; Swann, Wenzlaff, & Tafarodi, 1992).

Thus, in relation to NSSI, receiving praise from others may directly contradict views of the self as defective and bad, and may lead to distress among those who engage in NSSI. Given that individuals with a history of NSSI often report experiencing chronic parental criticism during childhood (Baetens et al., 2015; Wedig & Nock, 2007; Yates et al., 2008), criticism as compared to praise may be experienced as particularly comforting and familiar. Individuals may in turn develop increased urges for NSSI in order to reduce the aversive feelings associated with praise. There is, however, a dearth of empirical research examining the relationship between praise and NSSI. This line of research has implications for treatment, such as pinpointing contexts that pose high risk for NSSI, as well as strategies for providing feedback to clients receiving psychotherapy.

1.5 Limitations of the Current Literature

Although the field has made large strides in identifying risk factors for NSSI, further research is needed surrounding how proximal stressors lead to increased imminent risk for NSSI. Thus, it is relatively clear *who* is at risk for engaging in this behavior, but not necessarily *when* they are at greatest risk. Recent literature on suicidal behaviors has recognized the importance of examining the joint influence of static (i.e., distal) and dynamic (i.e., proximal) risk factors in predicting when individuals are at highest risk for shifting from thinking about suicide to actually engaging in suicidal behaviors (Bryan & Rudd, 2016; May & Klonsky, 2016). However, there has been less of a focus on examining the temporal dynamics of this shift among those who engage in NSSI. Furthermore, it is unclear *why* social criticism and other interpersonal contexts lead to negative outcomes such as NSSI. Given the relevance of social stressors to NSSI, and evidence that criticism from others is associated with negative affect generally (Cuellar,

Johnson, & Ruggero, 2009; Esdale, Jahoda, & Pert, 2015; Hooley et al., 2005) and NSSI in particular (e.g., Wedig & Nock, 2007; Yates et al., 2008), perhaps by priming self-defective beliefs, social criticism is an important proximal stressor to consider in the context of NSSI. Theory also suggests that praise could unexpectedly confer elevated risk for imminent NSSI, a prospect that warrants further investigation.

Extant literature points to several important directions for next steps in this line of research. Despite evidence suggesting that both self-defective beliefs and criticism are associated with retrospective, self-reported NSSI (e.g., Baetens et al., 2015; Gilbert et al., 2010), studies are needed that examine the immediate effect of criticism as well as praise on urges to engage in NSSI. Pain proxy measures, which involve presenting a pain-inducing stimulus to participants and assessing endurance (i.e., the amount of time between onset of pain and termination of the painful stimulus; Hooley et al., 2010), offer an important next step as an ethical and valid way to assess urges for NSSI behaviorally in the laboratory. Indeed, research has shown that participants with a history of NSSI tend to exhibit greater pain endurance on pressure pain tasks compared to those without a history of NSSI (Glenn et al., 2014; Hooley et al., 2010), further underscoring the utility and importance of this measure as a proxy for NSSI urges. Moreover, much of the research examining relationships between criticism, self-defective beliefs, and NSSI has been correlational in design (e.g., Baetens et al., 2015), with only a few studies using experimental methods to examine criticism directly (e.g., Hooley & St. Germain, 2013). Additional experimental studies are needed to draw causal conclusions regarding the interrelations of these variables. Furthermore, much of the literature on criticism and NSSI stems from research on parent-child dyads (e.g., Baetens et al., 2015; Wedig &

Nock, 2007; Yates et al., 2008). Given the increased importance of peer relationships during young adulthood (Arnett, 2000), as well as the high rates of NSSI among this population (Klonsky & Olino, 2008), examination of the specific impact of criticism and praise from peers on young adults' urges for NSSI is needed.

An important next step in this line of research is to examine the relationship between criticism, praise, and NSSI in a controlled setting in order to isolate their unique effects. Manipulating criticism and praise within the lab allows for increased confidence of a causal relationship between these constructs and NSSI. Further, given that it is unclear what explains the relationship between both criticism (and potentially praise) and NSSI urges, examining mediators of this relationship, such as self-defective beliefs, is necessary to situate these variables in emerging models of the development and maintenance of NSSI.

1.6 The Proposed Model

The proposed model extends the current literature by modeling when individuals are at increased risk for experiencing urges for NSSI. This model (see Figure 1) incorporates consideration of distal vulnerability factors (i.e., self-defective beliefs) and proximal social stressors (i.e., criticism or praise from peers) on urges for NSSI in the moment. Given research demonstrating the negative consequences of criticism (e.g., Blair et al., 2008; Cuellar et al., 2009; Esdale et al., 2015; Hooley et al., 2005, 2012; Wedig & Nock, 2007; Yates et al., 2008), and that individuals who engage in NSSI demonstrate increased emotional reactivity to interpersonal stressors (Nock et al., 2009; Schatten et al., 2015; Turner et al., 2016), we posited that individuals with a history of NSSI would both report increased urges for NSSI and demonstrate increased physical pain endurance

in response to criticism from a close friend, relative to a neutral social interaction. In contrast, we hypothesized that individuals without a history of NSSI would demonstrate a relatively weaker association between peer criticism and both reported NSSI urges and pain endurance.

Hypotheses regarding praise were more exploratory in nature. On the one hand, in line with self-verification theory (Swann & Read, 1981), we posited a tentative pathway from praise to elevated NSSI urges and pain endurance among those with a history of NSSI. The dissonance between highly negative views of oneself and positive feedback from others may trigger urges for NSSI among those who are not afraid to use this strategy to regulate distress. Given that individuals without a history of NSSI were not expected to hold highly negative self-views, and should theoretically still have inherent barriers in place to physically harming themselves, we posited a relatively weaker association between praise from peers and NSSI urges and pain endurance in this group. On the other hand, we acknowledged the possibility that receipt of praise among both groups may instead elicit increased positive affect (given that those who engage in NSSI are highly sensitive to social feedback in general; Perini et al., 2019), and therefore lead to reduced NSSI urges and pain endurance (Campbell, Lackenbauer, & Muise, 2006; Hooley & St. Germain, 2013).

These anticipated effects of recalled criticism (and possibly praise) were theorized to lead to elevated NSSI urges and pain endurance among those with a history of NSSI due to their elevated self-defective beliefs. Namely, these preexisting beliefs could lead to either heightened sensitivity to criticism (given the stronger criticism—NSSI association among those with negative self-beliefs; Wedig & Nock, 2007), or potentially greater

dissonance with praise (e.g., Kwang & Swann, 2010) among participants with a history of NSSI. Thus, this model proposed that NSSI group status would interact with type of peer feedback in the prediction of reported NSSI urges and pain endurance. Further, self-defective beliefs were proposed to mediate this moderation effect.

1.7 Present Study Aims and Hypotheses

The current study tested this model, extending research in several ways. First, addressing the limitations of correlational study designs (e.g., Baetens et al., 2015), we compared recalled peer interactions experimentally in the lab, by randomly assigning participants to listen to a recalled critical, praising or complimentary, or neutral interaction with a close friend. Second, overcoming the historical reliance on retrospective self-reported measures of NSSI (e.g., Baetens et al., 2015; Glassman et al., 2007), we not only assessed state urges for NSSI via self-report, but also via a behavioral measure of pain endurance that has been shown to differ among those with and without a history of NSSI (e.g., Hooley et al., 2010). Thus, the data had increased ecological validity, and were less subject to error due to participants' potentially biased recall and social desirability. Third, our focus on recalled peer interactions expanded the focus beyond parent-child dyadic interactions, an important next step in this line of research given the increased likelihood that peer interactions would affect NSSI urges in daily life among young adults, a particularly high-risk group. Given that young adulthood involves an increased emphasis on peer relationships (Arnett, 2000), more understanding of how criticism and praise from peers is related to NSSI urges among young adults is sorely needed.

Taken together, two study aims guided the present research. First, this study addressed the question of whether the effects of recalled peer interactions (i.e., criticism, praise, or neutral feedback) on pain endurance (a behavioral proxy measure for NSSI urges) and self-reported NSSI urges, would be moderated by NSSI group status (i.e., whether or not an individual had a history of NSSI). We hypothesized that (1) NSSI group status would moderate the effects of peer interaction on both pain endurance and reported NSSI urges. Specifically, we anticipated a positive association between criticism (vs. the other conditions) and increased pain endurance and NSSI urges for both the NSSI and control groups, but that the association would be stronger among the NSSI group. Given our lack of a priori hypotheses regarding praise in the NSSI group, we explored whether there would be a positive or negative association between praise (vs. the other conditions) and both pain endurance and NSSI urges among the NSSI group, and anticipated a negative association among the control group. Furthermore, this study examined the second question of whether self-defective beliefs would account for the interaction of peer feedback condition and NSSI group status on pain endurance and reported NSSI urges. We hypothesized that (2) the interaction effect between peer feedback (i.e., recalled criticism or praise versus the other conditions) and NSSI group status on pain endurance and reported NSSI urges would decrease in magnitude after accounting for the presence of self-defective beliefs.

CHAPTER 2

METHOD

2.1 Participants

Participants were 137 college-aged women recruited from a large Northeastern university and its surrounding community. Participants were eligible for the study if they spoke fluent English, were able to read and complete online questionnaires, were between 18 and 35 years of age, and were enrolled either currently or within the past year in a college course. The average age of the sample was 20.96 years (*SD* = 3.17), with the majority (69.34%) identifying their racial background as White, 19.71% identifying as Asian/Southeast Asian, 7.30% identifying as Black/African American, 5.84% identifying as Hispanic/Latinx, 4.38% identifying as Multiracial, and 2.19% identifying as Native American. Additional demographic information about the sample can be found in Table 1.

In line with previous research involving pain perception, exclusion criteria of participants included: (1) pain or sensory disorders or medical diseases likely to affect the pain task (e.g., Raynaud's disease, heart problems, physical problems with participants' dominant hands, McCoy, Fremouw, & McNeil, 2010; peripheral vascular disease, Bohus et al., 2000); and (2) male sex, given sex differences in pain perception (Gratz et al., 2011; Klatzkin et al., 2010; Riley III et al., 1998). Participants were recruited into one of two groups:

2.1.1 NSSI group.

Partially consistent with Gratz and colleagues (2016), the NSSI group consisted of 79 individuals who reported recurrent past NSSI (i.e., ≥ 5 lifetime episodes) *and* thoughts

or urges to engage in NSSI over the past year *or* recent (i.e., past-year) NSSI behavior (Gratz, Chapman, Dixon-Gordon, & Tull, 2016).

2.1.2 Control group.

58 participants with no history of NSSI made up the control group (Bresin & Gordon, 2013; Gratz et al., 2011; Hamza, Willoughby, & Armiento, 2014; Nock & Banaji, 2007).

2.2 Procedure

Participants were recruited one of three main ways: (1) via introductory psychology classes that included a research participation option via SONA; (2) via the psychology departmental prescreen questionnaires, which asked about history of NSSI; and (3) via the surrounding community through posted fliers and online postings. Fliers were posted in local community areas (e.g., nearby coffee shops, libraries, book stores, cooperating medical clinics) that provided permission or allowed for public postings. The recruitment ad stated that we were interested in examining how emotions affect pain perception. All prospective participants completed a phone screen to confirm inclusion and exclusion criteria. Those who met study criteria were invited to participate in the study, and were provided written informed consent before engaging in any lab-related activities. Participants were explicitly told to avoid taking any illicit/non-prescribed substances prior to attending their lab sessions.

2.2.1 Baseline assessment session.

As part of the baseline assessment session, all participants engaged in a semi-structured interview with an assessor during which they were asked to think of three recent interpersonal interactions with a close friend. Specifically, participants were

instructed to think of a recent situation during which they felt criticized by a close friend, or that their close friend was being critical of some important aspect of who they are. Participants were also instructed to think of a recent situation during which they felt praised or complimented by a close friend, or that their close friend was praising or complimenting some important aspect of who they are. Finally, participants were instructed to think of a recent situation with a close friend during which they felt mostly neutral, and had neither unpleasant nor pleasant feelings. Participants were instructed to imagine each of these interactions and describe in detail the events surrounding them (e.g., the close friend, the environment in which the interaction took place, what they were feeling and thinking during the interaction). The interview, which lasted approximately 30 minutes, was audio-recorded and used to generate a 90-second personalized script of either the recent critical, praising/complimentary, or neutral interaction with a peer to use for the experimental manipulation during the laboratory session (Gratz et al., 2011; Suvak et al., 2012). This procedure has been found to reliably induce emotional responses across various types of samples (e.g., Gratz et al., 2011; Pitman, Orr, Forgue, de Jong, & Claiborn, 1987; Suvak et al., 2012).

Participants were randomly assigned to one of the three peer feedback conditions prior to this initial assessment session. In order to reduce the potential impact of carryover effects, participants began with describing their assigned condition, and the other two conditions were then counterbalanced across participants. We tried to ensure an approximately even split of individuals with a history of NSSI in each of the three peer feedback conditions.

During this initial session, participants also completed various self-report questionnaires (e.g., Difficulties in Emotion Regulation Scale, DERS; Deliberate Self-Harm Inventory, DSHI; Personality Assessment Inventory – Borderline Features Scale, PAI-BOR; Depression Anxiety and Stress Scale, DASS-21) as well as structured clinical interviews (i.e., M.I.N.I. International Neuropsychiatric Interview 7.0.2, MINI; Structured Clinical Interview for DSM-IV Axis II disorders, SCID-II; see Figure 2 for the order of procedures).

2.2.2 Laboratory session.

On a separate day, which was scheduled either during the initial phone screen or the baseline assessment session, participants engaged in a laboratory session (see Figure 2 for flow of procedures). During this session, participants completed a range of questionnaires and paradigms to examine responses to the critical, praising, or neutral interpersonal scripts, and measure pain endurance. Participants were told that they would be listening to a recorded script of one of the events they described in the initial session (although it was always the first interaction they described). Participants were instructed to imagine that the tape-recorded situation was actually occurring, and to sit quietly once the tape ended and visualize the situation as vividly as possible for one minute (Gratz et al., 2011).

The flow of the lab procedures (see Figure 2) during this session involved (1) completing baseline self-report measures of emotional state (i.e., Positive and Negative Affect Schedule, PANAS), state self-defective views (i.e., Self-Rating Scale, SRS), state dissociation (i.e., Dissociation Tension Scale – short instrument, DSS-4), emotion regulation (ER) strategy use (i.e., Responses to Emotions Questionnaire, REQ), and

intensity of NSSI urges using a visual analogue scale (VAS); (2) completing a baseline measure of pain endurance (i.e., pressure algometer task); (3) completing the PANAS, SRS, DSS-4, REQ, and VAS; (4) listening to either the critical, praising, or neutral audio-recorded interpersonal script; (5) completing the PANAS, SRS, DSS-4, REQ, and VAS; (6) completing a follow-up pressure algometer task; (7) completing the PANAS, SRS, DSS-4, REQ, and VAS; and (8) debriefing.

At the beginning and end of the lab session, each participant was administered an adapted version of the University of Washington Risk Assessment Protocol (UWRAP; Linehan, Comtois, & Murray, 2000) by Master's-level clinicians and trained research assistants to assess emotional state and urges for NSSI [with a scale ranging from 1 (no distress) to 7 (high distress)]. Any participant who reported urges for NSSI or suicide greater than or equal to a 4, or who demonstrated an increase in distress of greater than two points, was offered the opportunity to engage in a mood improvement protocol (Linehan, 1993), which has been proven effective in reducing distress (Reynolds, Lindenboim, Comtois, Murray, & Linehan, 2006). Participants' distress was then re-assessed to determine whether or not their mood returned to baseline levels. Previous studies utilizing this procedure (e.g., Chapman, Rosenthal, & Leung, 2009; Dixon-Gordon, Chapman, Lovasz, & Walters, 2011; Gratz, Bardeen, Levy, Dixon-Gordon, & Tull, 2015) have found that all participants reported a reduction of distress to baseline levels after the use of coping skills. However, if a participant continued to report heightened distress, this procedure was repeated, and the participant was assisted in identifying other coping skills. A trained clinical psychologist or master's-level clinicians (under the psychologist's supervision) were available to meet with the participant when

necessary. Participants were also provided with the contact information for the principal investigator (PI) at the beginning of the study, and they were encouraged to contact the PI with any questions or concerns at any point with regard to their participation.

Participants who were students at the university and who completed the protocol had the option of earning either experimental credit or monetary compensation for their participation. If participants chose experimental credit, they were rewarded with 1 experimental credit for each ½ hour of participation, rounded up to the nearest ½ hour, up to a total of 6 credits for completion of the study. Participants recruited from the community were compensated with $15 for completing the baseline assessment session, and $20 for completing the lab session. This study was approved by the University of Massachusetts Amherst Institutional Review Board.

2.3 Measures

2.3.1 Demographics.

Participants completed a self-report measure of demographics created for the current study, which assessed relevant variables such as age, height/weight, gender, race/ethnicity, socioeconomic status, and psychiatric medication history. These variables were used to describe the sample, and considered as potential covariates.

2.3.2 Psychopathology.

Trained Master's-level clinicians administered the M.I.N.I. International Neuropsychiatric Interview (MINI 7.0.2; Sheehan, 2016) to assess participants for DSM-5 psychiatric disorders. The previous version of this interview (MINI 6.0 for DSM-IV) demonstrated good inter-rater (κ = .88 – 1.0) and test-retest reliability (κ = .76 – .93), and had high concordance with the Composite International Diagnostic Interview (CIDI;

Lecrubier et al., 1997). Master's-level clinicians also administered the Structured Clinical Interview for DSM-IV Axis II disorders (SCID-II; First, Spitzer, Gibbon, Williams, & Benjamin, 1994) to assess for personality disorder symptoms. The SCID-II has demonstrated good inter-rater reliability ($\kappa = .77 – .94$; Lobbestael, Leurgans, & Arntz, 2011), and internal consistency ($\alpha = .71 – .94$; Maffei et al., 1997). The SCID-II has also been compared to other established personality assessments and demonstrated high diagnostic power (Skodol, Rosnick, Kellman, Oldham, & Hyler, 1988). Assessment sessions were audio recorded to establish reliability on over 4% of the interviews, and all interviews were reviewed by at least one other independent reviewer; any discrepancies that arose were discussed together as a team. Psychopathology was used to describe the sample, and considered as a potential covariate.

2.3.3 Pain endurance.

Physical pain was created using a pressure algometer (Forgione & Barber, 1971), as has been successfully utilized in numerous previous studies (e.g., DeWall & Baumeister, 2006; Glenn et al., 2014; Gratz et al., 2011; Hooley et al., 2010; McCoy et al., 2010; Schoenleber, Berenbaum, & Motl, 2014). This finger pressure algometer consisted of a 30-cm-long hinge connected to a 40 cm long X 8 cm wide base. The algometer was calibrated to apply a constant 2 kg of pressure at a 1 cm X 2 mm Lucite edge (Schoenleber et al., 2014). When the apparatus is placed on the participant's finger between the first and second knuckles (where there is little muscle or fat), the pressure point exerts a constant focal pressure (i.e., 2 kg), creating the sensation of a dull butter

knife being pressed into the skin (Hooley et al., 2010; Schoenleber et al., 2014). Over time, this pressure creates an ongoing aching pain (Forgione & Barber, 1971).

A pressure algometer was chosen as the method of inducing pain within this study for several reasons: (1) this type of focal pressure is less influenced by physiological factors (e.g., heart rate, blood pressure) than are other methods of pain stimulation such as a cold pressor task (Forgione & Barber, 1971); (2) the pressure algometer does not result in tissue damage (Hooley et al., 2010); (3) previous research has found that using this instrument is valid in assessing pain perception (e.g., Hooley & Delgado, 2001; Hooley et al., 2010); (4) pain created with pressure most closely approximates the pain involved in cutting (Glenn et al., 2014), the most commonly cited method of NSSI (Klonsky, 2011); and (5) although menstrual cycle phase has been found to impact pain sensitivity among females, previous studies that have used pressure pain have not found any differences related to menstrual cycle (Fillingim & Ness, 2000).

During the lab session, the participant was situated in a room with an assessor. The participant engaged in one pain task trial at both baseline and post-experimental manipulation which was timed with a stopwatch; participants were randomly assigned to complete the baseline and follow-up pain task with either their index or middle finger of the dominant hand, the order of which was counterbalanced across participants (Hooley et al., 2010). Participants were asked to indicate when they first began to experience the pressure as painful by stating aloud the word “pain.” The time between initiation of the trial and this point indicated participants’ pain threshold (Hooley et al., 2010). Participants were then asked to indicate when the pain became so unpleasant that they wished to terminate the trial by stating aloud the word “stop.” The time between the pain

threshold point and the termination of the trial (i.e., pain tolerance) indicated participants' pain endurance (Hooley et al., 2010). In the current study, pain endurance was considered a behavioral proxy measure of NSSI urges. If the participant had not terminated a trial after 10 minutes (Schoenleber et al., 2014), the assessor ended the task by lifting the hinge. The stability of assessing pain across two repeated measures (15 seconds apart) has been established (Chesterton, Barlas, Foster, Baxter, & Wright, 2003). Additionally, this instrument has demonstrated good inter-rater and test-retest reliability over a three-week period (Jensen, Andersen, Olesen, & Lindblom, 1986; Merskey & Spear, 1964; Reeves, Jaeger, & Graff-Radford, 1986).

2.3.4 NSSI.

Participants were asked to complete the Deliberate Self-Harm Inventory (DSHI; Gratz, 2001) at baseline. The DSHI is a 17-item measure that assesses lifetime history of NSSI, including frequency, duration, and type (i.e., method) of behavior. Participants were asked whether, how often, and the last time they engaged in a variety of NSSI behaviors intentionally. The DSHI has demonstrated good internal consistency (Cronbach's $\alpha = .82$), adequate test-retest reliability, and adequate construct, discriminant, and convergent validity among both clinical and undergraduate samples (Fliege et al., 2006; Gratz, 2001). For analyses, we focused on overall frequency of NSSI based on this measure. Where NSSI reported on this measure diverged from other self-reports (e.g., the initial phone screen, diagnostic interview, and other measures of NSSI),

we evaluated discrepancies on a case-by-case basis, and relied on the DSHI and the diagnostic interview as our most valid indices of reported NSSI.

2.3.5 Self-criticism.

During the initial assessment session, participants completed the Self-Rating Scale (SRS; Hooley et al., 2010) to assess the presence of a trait 'defective self' cognitive schema. The SRS is an eight-item measure, with items directly relating to masochistic ideation, self-directed anger, and feelings of worthlessness (St. Germain & Hooley, 2012). This measure was edited for the purposes of this study to also assess state self-defective beliefs throughout the lab session. Example items include: "sometimes I feel completely worthless," and "others are justified in criticizing me." Participants rated how strongly they agreed with each statement on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The SRS has demonstrated good internal consistency (Cronbach's $\alpha = .73 – .88$) in samples of community adolescents, young adults, and adults (Glassman et al., 2007; Glenn et al., 2014; Hooley et al., 2010), and has been shown to successfully discriminate between individuals who engage in NSSI and healthy controls (Hooley et al., 2010). In the current sample, trait SRS items at baseline (Cronbach's $\alpha = .89$), state SRS items at the start of the lab session (Cronbach's $\alpha = .91$), and state SRS items post-induction (Cronbach's $\alpha = .92$) demonstrated good to excellent internal consistency.

2.3.6 NSSI urges.

Participants completed a Visual Analogue Scale (VAS) four times throughout the lab session to rate the intensity of their urges for NSSI. The scale ranged from 0 (no urge) to 100 (extreme urge). VAS scales have been used in various studies (e.g., Svaldi, Dorn,

Matthies, & Philipsen, 2012), and tend to be more sensitive than verbal descriptive scales (McCoy et al., 2010).

2.3.7 Emotional state.

The Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) was used to assess current subjective emotional state throughout the lab session for use as a manipulation check. Participants rated how much they felt each of 10 positive emotions (i.e., enthusiastic, interested, determined, excited, inspired, alert, active, strong, proud, attentive) and 10 negative emotions (i.e., scared, afraid, upset, distressed, jittery, nervous, ashamed, guilty, irritable, hostile) at the present moment on a Likert scale ranging from 1 (very slightly or not at all) to 5 (extremely). An average score was calculated for each affect type, with a high average score indicating higher levels of affect. The PANAS has shown acceptable to good test-retest reliability over eight weeks (r = .68 for Positive Affect; r = .71 for Negative Affect) among a sample of undergraduate students (Watson et al., 1988), and good convergent validity (Mackinnon et al., 1999). In the current sample, the PANAS demonstrated good internal consistency at baseline (Positive Affect, Cronbach's α = .83; Negative Affect, Cronbach's α = .75) and post-induction (Positive Affect, Cronbach's α = .81; Negative Affect, Cronbach's α = .74).

2.4 Potential covariates

2.4.1 Dissociation.

Participants completed the Dissociation Tension Scale – short instrument (DSS-4) throughout the lab session, a 4-item measure of state dissociation (Stiglmayr, Schmahl, Bremner, Bohus, & Ebner-Priemer, 2009). Dissociation was considered a potential

covariate given the established links between dissociation and pain threshold (Ludäscher et al., 2007) and frequency of NSSI (Gratz, Conrad, & Roemer, 2002). The Likert scale ranges from 0% (never) to 100% (constantly). The DSS-4 has demonstrated good internal consistency (Cronbach's $\alpha = .87$), split-half reliability ($r = .91$), and discriminative validity in terms of differentiating between patients with BPD, major depression, panic disorder, and healthy controls (Stiglmayr et al., 2009). In the current sample, the DSS-4 demonstrated good internal consistency at baseline (Cronbach's $\alpha = .81$) and questionable internal consistency post-induction (Cronbach's $\alpha = .55$).

2.4.2 BPD features.

Participants completed the Personality Assessment Inventory – Borderline Features scale (PAI-BOR; Morey, 1991) at baseline as a potential covariate. The PAI-BOR is a 24-item measure of BPD symptomatology that yields an overall score, as well as four subscales corresponding to DSM diagnostic criteria: (1) affective instability; (2) identity disturbance; (3) negative relationships; and (4) self-harm. Items are rated on a 4-point Likert scale, ranging from 0 (completely false) to 3 (completely true). After reverse scoring certain items, items were added to a total score. A high total score indicates high levels of BPD symptomatology. The PAI-BOR has well-established reliability and validity within both nonclinical and clinical samples (Chapman, Leung, & Lynch, 2008; Chapman et al., 2009; Trull, 1995). PAI-BOR items demonstrated excellent internal consistency in the current sample (Cronbach's $\alpha = .90$).

2.4.3 Difficulties with emotion regulation.

Participants completed the Difficulties in Emotion Regulation Scale at baseline (DERS; Gratz & Roemer, 2004). The DERS is a 36-item measure that assesses individuals' typical levels of emotion dysregulation. The DERS yields an overall score, as well as scores across six domains: (1) nonacceptance of negative emotions; (2) difficulties engaging in goal-directed behavior when distressed; (3) impulse control difficulties when distressed; (4) lack of emotional awareness; (5) limited access to emotion regulation strategies perceived as effective; and (6) lack of emotional clarity. Items are rated on a 5-point Likert scale, with 1 indicating almost never, and 5 indicating almost always. After reverse-scoring certain items, a total sum was calculated, with a high total score indicating greater emotion dysregulation. The DERS has demonstrated excellent internal consistency among a sample of undergraduates (Cronbach's $\alpha = .93$), good test-retest reliability over four to eight weeks ($\rho = .88$), and good construct and predictive validity (Gratz & Roemer, 2004; Gratz & Tull, 2010). The DERS had excellent internal consistency in the current sample (Cronbach's $\alpha = .95$).

2.4.4 Depressive symptoms.

At baseline, participants also completed the Depression Anxiety and Stress Scale (DASS-21; Lovibond & Lovibond, 1995), a 21-item measure of past-week depression, anxiety, and stress symptoms. The 4-point Likert scale ranges from 0 (did not apply to me at all) to 3 (applied to me very much, or most of the time). Consistent with Gratz and colleagues (2011), the DASS-21 was included as a possible covariate to control for the potential influence of depressive symptoms on physical pain tolerance (Willoughby, Hailey, Mulkana, & Rowe, 2002). Similar to the original 42-item measure, the DASS-21 has demonstrated good internal consistency (Cronbach's α for Depression subscale = .94;

Cronbach's α for Anxiety subscale = .87; Cronbach's α for Stress subscale = .91), and good concurrent validity within both clinical and community samples (Antony, Bieling, Cox, Enns, & Swinson, 1998). Both the full measure (Cronbach's α = .93) and the depression subscale (Cronbach's α = .91) demonstrated excellent internal consistency in the current sample.

2.5 Data Analytic Plan

2.5.1 Preliminary analyses.

All study variables were first evaluated for normality and outliers. Descriptive statistics were then calculated for primary study variables (i.e., self-defective beliefs, pain endurance, NSSI urges) and demographic characteristics of the sample. We next examined the correspondence between data missingness on relevant study variables (i.e., lab session attendance, NSSI frequency, pain endurance at baseline and post-induction, NSSI urges) and demographic characteristics. To determine possible covariates for analyses, zero-order Pearson correlations between the dependent variables (i.e., pain endurance and NSSI urges) and demographic characteristics (e.g., age, height/weight) as well as psychopathology variables (e.g., depressive symptoms, BPD features, MINI diagnoses) were run, and we examined inter-correlations among all study variables. As per the guidelines of Miller and Chapman (2001), variables were only considered as statistical controls if they were correlated with the dependent variables (i.e., pain endurance and NSSI urges post-induction) and not the independent variables (i.e., group and condition; Miller & Chapman, 2001).

Differences in self-defective beliefs, pain endurance, and NSSI urges at baseline for those with and without a history of NSSI were examined with a series of analyses of

variance (ANOVAs). In order to examine within-group differences in self-defective beliefs, pain endurance, and NSSI urges after receiving the critical, praising, or neutral interpersonal feedback, a series of ANOVAs were run within each group. Specifically, after selecting either the NSSI or control group samples, experimental condition (i.e., recalled criticism, praise, or neutral interaction) was entered as the between-subjects factor, and self-defective beliefs, pain endurance, and NSSI urges post-induction were entered as separate dependent variables.

To evaluate the effectiveness of the recalled peer interaction condition in eliciting different emotional responses, we conducted a series of Group (NSSI vs. Control) X Condition (Neutral vs. Praise vs. Criticism) X Time (Baseline vs. Post-induction) repeated measures ANOVAs with negative and positive emotions on the PANAS as dependent variables.

2.5.2 Main analyses.

In order to answer our two-part research question (i.e., *Will NSSI group status moderate the effects of recalled peer criticism or praise (vs. a neutral interaction) on pain endurance or reported NSSI urges? If so, will these interaction effects be mediated by self-defective beliefs?*), we conducted a mediated moderation analysis using the SPSS Process macro (Hayes, 2013). As delineated by Muller, Judd, and Yzerbyt (2005) and consistent with other research (Chapman, Dixon-Gordon, & Walters, 2013; Gratz, Tull, et al., 2009), the mediated moderation effect would be considered present if the following outcomes were achieved (Muller, Judd, & Yzerbyt, 2005): (1) there was a significant interaction between interpersonal condition and NSSI group status in predicting pain endurance or NSSI urges (addressing Hypothesis 1); (2) there was a significant

interaction between interpersonal condition and NSSI group status on self-defective beliefs *and* an effect of self-defective beliefs on pain endurance or NSSI urges, when controlling for the NSSI group status X interpersonal condition interaction and the NSSI group status X self-defective beliefs interaction; *or* there was an effect of interpersonal condition on self-defective beliefs, *and* a significant interaction of self-defective beliefs and NSSI group status on pain endurance or NSSI urges, when controlling for the NSSI group status X interpersonal condition interaction; and (3) there was a significant indirect effect of the NSSI group status X interpersonal condition interaction on pain endurance or NSSI urges via self-defective beliefs (addressing Hypothesis 2).

In order to address Step 1, we conducted a series of Group (NSSI vs. Control) X Condition (Neutral vs. Praise vs. Criticism) X Time (Baseline vs. Post-induction) repeated measures ANOVAs separately with pain endurance and reported NSSI urges post-induction as the dependent variables, controlling for both baseline and change from baseline to post-induction dissociation levels (given theoretical and correlational links to the dependent variables). If findings from Step 1 were not supportive of the mediated moderation model, we planned to conduct several exploratory analyses. First, we planned to examine whether self-defective beliefs would act as a moderator of the relationships between interpersonal condition and both pain endurance and reported NSSI urges, such that perhaps the relationships between criticism (vs. the other conditions) and both outcomes would be stronger for those who endorse higher (vs. lower) self-defective beliefs. To address this question, we ran a series of multiple regression analyses with Group (NSSI vs. Control), dummy-coded condition variables (Criticism vs. other conditions, and Praise vs. other conditions in separate models), mean-centered self-

defective beliefs post-induction, and all combinations of 3-way interaction terms (i.e., dummy-coded Condition X Group, Self-defective Beliefs X Group, Self-defective Beliefs X dummy-coded Condition, Group X dummy-coded Condition X Self-defective Beliefs) as the independent variables, baseline self-defective beliefs as a covariate, and pain endurance and reported NSSI urges post-induction as separate dependent variables; baseline pain endurance and NSSI urges were controlled for in their respective models.

Second, we planned to examine whether NSSI characteristics would moderate the relationships between interpersonal condition and both pain endurance and reported NSSI urges, such that the relationships between criticism (vs. the other conditions) and both outcomes would be stronger for those who endorsed relevant NSSI motives (e.g., self-punishment), engaged in more types of NSSI behaviors, reported a higher frequency of NSSI behaviors, and endorsed more medically severe NSSI behaviors. To investigate this, we restricted the sample to just those in the NSSI group, and ran a series of multiple regression analyses with dummy-coded condition variables (Criticism vs. other conditions, Praise vs. other conditions), mean-centered NSSI characteristics (i.e., motives, frequency, types of behaviors, medical severity), and condition X mean-centered NSSI characteristics interaction terms as the independent variables, and pain endurance and reported NSSI urges post-induction as separate dependent variables. We did not control for baseline levels of the dependent variables given that we were not comparing groups.

Third, we planned to examine whether self-defective beliefs would still mediate the relationship between NSSI group status and both pain endurance and reported NSSI urges, but at baseline without considering the effects of the interpersonal condition. We

used the SPSS Process macro to run these mediation models with group (NSSI vs. Control) as the independent variable, self-defective beliefs at baseline as the mediator, and pain endurance and reported NSSI urges at baseline as separate dependent variables. We examined the bootstrap confidence intervals to determine significance of the indirect effects.

CHAPTER 3

RESULTS

3.1 Preliminary Analyses

3.1.1 Evaluating data for normality and outliers.

All variables were normally distributed with acceptable skew and kurtosis values (skew < |2|; kurtosis < |4|) except for the following: pain threshold at baseline and post-induction, and reported NSSI urges at baseline and post-induction. These variables were log-transformed (base 10) and subsequently displayed acceptable skew and kurtosis values (skew < |2|; kurtosis < |4|). Supplemental non-parametric tests were also conducted with untransformed variables, the results of which can be found in Table 1 of the Appendix. Outliers among the pain variables were reviewed on a case-by-case basis to ensure adequate interpretability; none were excluded.

3.1.2 Descriptive statistics of participant characteristics.

Descriptive statistics of participant characteristics, including demographic and psychopathology variables, can be found in Tables 1 and 2. The control group was significantly older than the NSSI group. Significantly more participants in the NSSI group reported current psychiatric medication use as well as a history of psychiatric treatment. More participants in the NSSI group met diagnostic criteria for current and lifetime major depressive disorder, social anxiety disorder, alcohol use disorder, substance use disorder, as well as generalized anxiety disorder, lifetime posttraumatic stress disorder, bipolar I disorder, and borderline personality disorder. The NSSI group also reported significantly higher BPD features, emotion dysregulation, depression, anxiety, and stress, and trait self-defective beliefs.

3.1.3 Group and condition differences in dependent variables.

Tables 3 and 4 display the means of the outcome variables (i.e., self-defective beliefs, pain endurance, reported NSSI urges) for each group at baseline and for each condition post-induction. Of note, the range of NSSI urges reported within the control group was 0-4 at baseline (vs. 0-51 in the NSSI group), and 0-10 post-induction (vs. 0-54 in the NSSI group). At baseline, the NSSI group demonstrated significantly higher NSSI urges and trait and state self-defective beliefs than the control group. The difference in pain endurance between the two groups at baseline was trending, with the NSSI group displaying higher pain endurance than the control group (p = .075). Post-induction, the overall ANOVA for condition differences on state self-defective beliefs was significant in the control group. Pairwise comparisons using Tukey HSD for multiple comparisons revealed that those who received criticism reported significantly higher state self-defective beliefs post-induction than those who received praise (p = .041), and higher state self-defective beliefs than those who received neutral feedback at the trend level (p = .065).

3.1.4 Missing and excluded data.

Participants were excluded from analyses if: (1) they attended the initial session but did not attend the lab session (n = 19), in which case they did not have any data on the dependent variables; (2) they completed only part of the lab session due to external circumstances, and therefore we did not have full outcome data (n = 1); or (3) their responses on the diagnostic interview and questionnaires assessing NSSI history indicated that they should not have been eligible for either the NSSI or control group

despite initial phone screening (n = 2). After excluding these individual cases, the final sample size was n = 137.

Correspondence between missingness on relevant study variables (i.e., lab session attendance, NSSI frequency, pain data, reported NSSI urges) and demographic characteristics (i.e., age, minority racial status, group) were examined with a series of chi-square analyses and *t*-tests within the sample of individuals who attended at least the initial session and fell into either the control or NSSI group (n = 156). Results revealed no significant differences between those who did not attend the lab session (vs. those who did) in minority racial status (i.e., White vs. non-White-identifying participants), χ^2 = 0.17, p = .678, or age, $t(142) = -0.42$, p = .679. There were significant differences between those who did not attend the lab session (vs. those who did) in group status (i.e., NSSI vs. control), $\chi^2 = 4.94$, p = .026 (more individuals in the NSSI group missed the lab session than expected, whereas fewer individuals in the control group missed the lab session than expected), and on both the pain variables (*p*s < .001) and NSSI urges at baseline, $\chi^2 = 147.12$, $p < .001$ (fewer individuals who attended the lab session were missing baseline NSSI urges and pain data than expected). There were no significant differences between those who had missing data on the pain variables or NSSI urges at baseline (vs. those who did not) in age or minority racial status (*p*s > .05), but there were for those in the NSSI vs. control group (*p*s < .05; more individuals in the NSSI group were missing baseline NSSI urges and pain data than expected, whereas fewer individuals in the control group were missing baseline NSSI urges and pain data than expected). Within just the NSSI group, there were no significant differences between those who attended the lab session (vs. those who did not) in NSSI frequency, $t(82) = -$

0.28, $p = .777$. Table 5 includes the rates of missing data within the final sample for all relevant study variables.

3.1.5 Correlations among study variables.

Table 6 contains the correlations among study variables at both baseline and post-induction. Although various demographic and psychopathology variables were significantly correlated with the dependent variables, all were correlated with the independent variables as well, and therefore were not included in the statistical models as covariates. However, dissociation was considered an exception given theoretical and empirical associations with pain perception and self-injury. As such, statistical models examining pain endurance and reported NSSI urges post-induction included both baseline levels of dissociation and reactivity (i.e., change from baseline to post-induction levels of dissociation; both log base 10 transformed due to nonnormal distributions).

3.1.6 Manipulation check.

In order to assess the effectiveness of the experimental manipulation, a series of repeated measures Group (NSSI vs. Control) X Condition (Neutral vs. Praise vs. Criticism) X Time (Baseline vs. Post-Induction) ANOVAs were conducted with negative and positive emotions on the PANAS as dependent variables using the Sidak adjustment for multiple comparisons. As can be seen in Table 7, results demonstrated that the recalled peer interaction was effective in eliciting emotions. Specifically, there was a main effect of condition that was modified by a Time X Condition interaction on negative affect such that individuals in the criticism condition reported a significant increase in negative affect ($M_{\text{difference}} = 0.24$, $SE = 0.053$, $p < .001$), while those in the neutral condition reported a significant decrease in negative affect ($M_{\text{difference}} = 0.10$, $SE = 0.051$,

p = .049); no significant changes were found for those who received praise (p = .487). There was also a significant Time X Condition interaction on positive affect such that individuals in both the criticism ($M_{difference}$ = 0.32, SE = 0.073, p < .001) and neutral ($M_{difference}$ = 0.22, SE = 0.069, p = .002) conditions reported a significant decrease in positive affect; no significant changes were found for those who received praise (p = .459). Please see Figure 3 for a visual depiction of these findings.

3.2 Main Analyses

3.2.1 Mediated moderation step 1.

In order to examine whether self-defective beliefs mediated the interaction between group status and interpersonal condition in predicting both pain endurance and reported NSSI urges post-induction, we first conducted a series of Group (NSSI vs. Control) X Condition (Neutral vs. Praise vs. Criticism) X Time (Baseline vs. Post-induction) repeated measures ANOVAs separately with pain endurance and reported NSSI urges post-induction as the outcomes, controlling for both mean-centered baseline and change from baseline to post-induction levels of dissociation. As can be seen in Table 8, there were no Group X Condition X Time interactions in predicting either pain endurance or reported NSSI urges post-induction.[1] The Group X Condition interaction in predicting NSSI urges was marginally significant (p = .089). In exploring the pairwise comparisons using the Sidak correction, those in the NSSI group who received criticism displayed a significant increase in NSSI urges post-induction ($M_{difference}$ = 0.19, SE = 0.073, p = .013); no other pairwise comparisons were significant (see Figure 4 for a graphical depiction of these findings). The graphical depiction of the findings with pain

[1]See Table 9 for results of this repeated measures ANOVA without including covariates.

endurance can be found in Figure 3. Given the lack of significant Time X Group X Condition and Group X Condition interactions, we could not move forward in testing the full mediated moderation model.[2]

3.3 Exploratory Analyses

3.3.1 Self-defective beliefs as a moderator.

The first set of exploratory analyses we conducted was to examine whether self-defective beliefs would act as a moderator of the condition—pain endurance and reported NSSI urges post-induction relationships. As can be seen in Table 10, no significant Group X Condition X Self-defective Beliefs interactions were found in predicting either outcome.

3.3.2 NSSI characteristics as moderators.

The second set of exploratory analyses involved running a series of multiple regression analyses with Criticism (vs. the other conditions) or Praise (vs. the other conditions) and mean-centered NSSI characteristics (i.e., motives, frequency, types of behaviors, medical severity) as independent variables and pain endurance and reported NSSI urges post-induction as separate dependent variables within the NSSI group only. As can be seen in Table 11, four significant interactions were found. First, the effect of receiving criticism (vs. the other conditions) on reported NSSI urges post-induction was stronger for those who reported high self-punishment motives for NSSI, $B = 0.22$, $SE = 0.067$, $p = .001$. Second, the effect of criticism (vs. the other conditions) on pain endurance post-induction was weaker for those who reported high self-punishment

[2]Additional supplementary analyses, including a nonparametric test of condition effects on pain endurance and reported NSSI urges by group, and the use of pain threshold and tolerance as outcomes, can be found in the Appendix.

motives for NSSI, *B* = -62.32, *SE* = 26.91, *p* = .024. Third, the effect of receiving criticism (vs. the other conditions) on pain endurance post-induction was weaker for those who reported higher NSSI frequency, *B* = -161.55, *SE* = 77.30, *p* = .040. Fourth, the effect of receiving criticism (vs. the other conditions) on pain endurance post-induction was stronger for those who reported a more medically severe NSSI history, *B* = 130.52, *SE* = 62.38, *p* = .040.

3.3.3 Self-defective beliefs as a mediator without condition effects.

We explored whether self-defective beliefs would still help explain the relationship between group status and both pain endurance and reported NSSI urges at baseline, regardless of interpersonal feedback condition. As can be seen in Table 12, both trait and state baseline self-defective beliefs significantly mediated the relationship between group status and reported state NSSI urges at baseline by demonstrating indirect effects significantly greater than 0.[3] The mean difference between the control and NSSI groups on reported NSSI urges that resulted from the influence of group on state self-defective beliefs which in turn affected NSSI urges was 2.02 (*SE* = 0.95; 95% CI: 0.49-4.14). The mean difference between the control and NSSI groups on reported NSSI urges that resulted from the influence of group on trait self-defective beliefs was 0.059 (*SE* = 0.032; 95% CI: 0.0015-0.13).

[3]These analyses were also run controlling for baseline log (base 10) transformed NSSI frequency. When controlling for NSSI frequency, none of the mediation models remained significant.

CHAPTER 4

DISCUSSION

The current study aimed to better understand whether certain situations increase risk for NSSI by examining the joint influence of self-defective beliefs and proximal social stressors on NSSI urges in the moment among those with and without histories of NSSI. In particular, given the importance of social stressors as precipitants of NSSI urges (e.g., Turner et al., 2016) and peer interactions as linked to NSSI (Vergara, Stewart, Cosby, Lincoln, & Auerbach, 2019; Victor, Hipwell, Stepp, & Scott, 2019), in combination with the relative scarcity of research on peer-related feedback on NSSI urges, we developed a novel paradigm wherein participants were presented with idiographic recordings of recalled peer criticism, praise, or neutral feedback. To supplement our reliance on self-reported NSSI urges, we also incorporated pain endurance on a pressure pain task as a behavioral index of urges for NSSI. We hypothesized that NSSI group status (i.e., recent or recurrent NSSI vs. no NSSI history) would moderate the effects of recalled peer criticism (and possibly praise, vs. a neutral interaction) on pain endurance and reported NSSI urges, and that, if present, this interaction effect would be explained by the presence of self-defective beliefs. Our hypotheses were only partially supported.

Given that NSSI is particularly prevalent among females attending college (Whitlock et al., 2011), we focused our recruitment efforts on recruiting college-aged women (between the ages of 18-35 years), with and without recent or recurrent histories of NSSI. In the present study, we conceptualized recent or recurrent NSSI history as at least five lifetime episodes of NSSI behavior *and* thoughts or urges to engage in NSSI

within the past year, *or* past-year NSSI behavior. This definition aligns with past work that delineates five or more instances of NSSI as frequent or repetitive (Gratz & Chapman, 2007; Manca, Presaghi, & Cerutti, 2014), but balances "recent" by including even recent (i.e., past-year) urges for NSSI. Thus, this definition also aligns with the spirit of NSSI disorder, which includes (among other criteria) urges for NSSI (American Psychiatric Association, 2013). Consistent with our recruitment efforts, the resulting NSSI group displayed greater clinical acuity than the control group in a number of ways. For instance, the NSSI group reported higher levels of current psychiatric medication use and history of psychiatric treatment, as well as higher endorsement of a range of psychological disorders. The NSSI group also reported higher levels of emotion dysregulation and trait and state self-defective beliefs than the control group. Other studies examining samples with a similar makeup (i.e., non-clinical, college-aged) have also found that compared to controls, individuals who engage in NSSI are more likely to report a history of major depression, more psychological symptoms in general and greater symptom intensity, more substance use and risky drinking, and more avoidant coping strategies (Hasking, Momeni, Swannell, & Chia, 2008). Those with a history of NSSI (vs. without) also endorse a greater number of BPD symptoms (Brickman, Ammerman, Look, Berman, & McCloskey, 2014) and more intense self-defective beliefs (Hooley et al., 2010). Of note, however, consistent with other studies, BPD was not the most common diagnosis held by those in the NSSI group (In-Albon, Ruf, & Schmid, 2013). Overall, these data suggest that our recruitment strategies resulted in a reasonable and representative NSSI group.

Pain endurance on the pain pressure task differed between those with and without NSSI histories. In particular, at baseline, the NSSI group demonstrated higher pain endurance at the trend level than the control group. This finding, although only marginally significant, is consistent with past research that suggests that those who engage in NSSI tend to show an increased willingness to endure physical pain, particularly on behavioral tasks that involve the administration of pressure pain (Glenn et al., 2014; Hooley et al., 2010). Various theories with mixed to strong empirical support provide possible explanations for this finding. First, consistent with the self-punishment hypothesis of NSSI (Hooley et al., 2010), individuals who endorse high levels of self-criticism may find the experience of pain to be ego-syntonic and in line with desires to self-punish. Indeed, self-criticism has been found to explain the relationship between NSSI and pain endurance (Glenn et al., 2014). Second, the pain-offset relief hypothesis suggests that the removal of physical pain (after engaging in NSSI) may incidentally offset emotional pain, thereby providing both physical and emotional relief, and there is some experimental evidence to support this assertion (Franklin et al., 2013). Third, it is possible that individuals with NSSI histories are able and willing to tolerate pain for longer given their "practice" in doing so, or through habituation. By engaging in the same behavior over and over again, those who engage in NSSI may become either less sensitive or grow more accustomed to the pain inherent in physically harming themselves. Stemming from the interpersonal-psychological theory of suicide (Joiner, 2005), NSSI has been tested as a painful and provocative event that increases one's acquired capability for suicide by generating habituation to the fear inherent in and the painfulness associated with harming oneself (Franklin, Hessel, & Prinstein, 2011).

Researchers have in fact found that the duration and frequency of NSSI is associated with higher pain thresholds (Hooley et al., 2010) and endurance (St. Germain & Hooley, 2013), respectively, and that those who engage in NSSI report pressure pain to be less intense than controls (McCoy et al., 2010).

Contrary to our main hypotheses, the overall effects of recalled peer criticism and praise were not moderated by NSSI group status in predicting either pain endurance or self-reported NSSI urges post-induction. However, when examining the pairwise comparisons in an exploratory fashion, those in the NSSI group who received criticism (vs. the other conditions) demonstrated a significant increase in reported NSSI urges in response to the induction, which was consistent with our hypotheses. Given the lack of significance of the 3-way interaction between group, condition, and time, these pairwise findings must be interpreted with caution. Of note, this pattern was replicated at the trend level in a supplementary analysis using a nonparametric test (given the nonnormality of the NSSI urge outcome) evaluating condition differences in NSSI urges post-induction within each group. Findings revealed that within the NSSI group, there were trend-level condition differences on reported NSSI urges, with the criticism condition displaying the highest mean rank NSSI urges, followed by the praise, and then neutral conditions.

These findings, although in need of replication, are consistent with research highlighting acute interpersonal stressors broadly, and criticism or social rejection more specifically, as antecedents of increases in NSSI urges and behaviors. Indeed, daily interpersonal conflict and feelings of rejection have been associated with stronger same-day NSSI urges (Turner et al., 2016) and increased odds for engaging in NSSI (Nock et al., 2009). Furthermore, increases in perceived social rejection and isolation, as well as

within-person changes in feeling rejected and criticized, precede NSSI urges and behaviors (Snir et al., 2015) and predict increased likelihood of NSSI urges (Victor et al., 2018), respectively. When considering both perceptions of rejection and criticism simultaneously, feeling criticized no longer predicted NSSI urges, yet feeling rejected remained significant; furthermore, negative affect mediated the relationships between both feeling criticized and feeling rejected and NSSI urges, suggesting one potential mechanism by which acute social stressors lead to NSSI (Victor et al., 2018). Receiving critical feedback has also been shown to increase impulsive decision-making during a gambling task among individuals with a history of NSSI, while decision-making in the context of critical feedback predicted past-week, past-year, and lifetime NSSI frequency (Allen, Fox, Schatten, & Hooley, 2019). Other studies using retrospective, self-report methods have found that perceived daily troubles with peers over the past month mediated the effects of shame and self-criticism on the frequency of NSSI behaviors (Xavier, Gouveia, & Cunha, 2016). Taken together, these findings highlight social rejection and criticism as frequently-cited triggers of NSSI urges and behaviors in the real-world, and critical feedback as one specific context in which those who engage in NSSI may be at increased risk for making impulsive decisions, increasing their likelihood of choosing a risky, self-destructive coping strategy such as NSSI to regulate distress.

The absence of an interactive influence of NSSI group status and peer feedback condition on pain endurance is inconsistent with previous research demonstrating that particularly in the context of interpersonal distress (vs. a neutral condition), individuals with recent NSSI demonstrate heightened physical pain tolerance (Gratz et al., 2011). This calls into question the validity of this behavioral task as a proxy measure of NSSI

urges. The lack of zero-order associations between pain endurance and self-reported NSSI urges in the current sample indeed supports the questioning of our conceptualization. Although it is well-established that individuals who engage in NSSI demonstrate greater willingness to endure physical pain (e.g., Glenn et al., 2014; Hooley et al., 2010), it is possible that we were tapping into a different construct entirely. For instance, some have conceptualized measures of pain perception as assessing the related yet distinct construct of distress tolerance (e.g., Anestis et al., 2012), and have examined the relationship between pain perception and the construct of experiential avoidance. Indeed, performance on a pressure algometer task was positively correlated with both self-report and behavioral (i.e., card sorting task) measures of distress tolerance, and negatively correlated with a measure of discomfort intolerance (Anestis et al., 2012). Similarly, individuals who report high levels of experiential avoidance demonstrate less willingness to endure pain on a cold pressor task (Feldner et al., 2006). Women with recent NSSI (compared to controls) also demonstrate less willingness to experience emotional distress on a behavioral mirror-tracing persistence task in the context of interpersonal distress (vs. a neutral condition; Gratz et al., 2011). The fact that the pain task could be conceptualized in numerous ways other than a behavioral proxy measure of NSSI urges is one possible explanation for the lack of findings with regards to pain endurance. Furthermore, it is possible that elevated pain endurance is a stable characteristic of those who engage in chronic NSSI, or that the interpersonal induction was not potent enough to elicit changes in willingness to endure pain within the span of a couple of minutes.

Furthermore, there was no evidence that receipt of praise interacted with NSSI history in predicting either pain endurance or reported NSSI urges post-induction. Given the absence of research on the immediate effects of praise on NSSI urges, our thoughts were based on research suggesting the importance of self-verification motives (Kwang & Swann, 2010), and that depressed individuals prefer peers who evaluate them unfavorably and seek out this negative feedback (Swann et al., 1992), while also working to reaffirm their low self-esteem in response to feedback that challenges these negative self-views (Swann et al., 1992). Given the well-established finding that individuals who engage in NSSI hold highly negative and critical self-beliefs (Hooley et al., 2010), this body of literature indirectly suggests that these individuals might feel extreme discomfort in response to receiving positive feedback such as praise, and may actively seek to reaffirm their negative self-views, perhaps by turning to NSSI as a means of self-punishment or emotion regulation. It is possible that rather than relying on NSSI to re-affirm self-defective beliefs, these individuals might turn to other maladaptive coping strategies (e.g., substance use, eating), or may attempt to elicit reaffirming feedback via interpersonal behaviors, such as criticizing the interaction partner or seeking negative reassurance. Furthermore, although participants in the current study were prompted to identify a recent social interaction with a close friend, experimenter observation suggested that the closeness of the relationship varied widely, and research indicates that at least in the context of romantic relationships, self-verification may be more important in longer- (vs. shorter) term relationships (Campbell et al., 2006). Of note, some conflicting evidence exists, such that individuals with negative self-perceptions were found to report *greater* positive affect after receiving enhancing (vs. verifying) feedback

from romantic partners (Campbell et al., 2006). Also, pulling from the parenting literature, positive parenting, which includes behaviors such as verbal praise, predicted decreased likelihood of next-year NSSI onset among adolescent girls (Victor et al., 2019). As such, more research on the effects of self-disconfirming feedback broadly, and praise specifically, on NSSI is needed.

Our first set of exploratory analyses did not find that self-defective beliefs (controlling for baseline levels) moderated the NSSI group status by interpersonal condition interaction in predicting either of our outcomes. However, there were main effects of self-defective beliefs on NSSI urges post-induction in both the criticism (vs. other conditions) and praise (vs. other conditions) models; controlling for baseline levels, increases in self-defective beliefs post-induction predicted increases in NSSI urges. This finding is consistent with past research linking self-criticism to engagement in both NSSI cross-sectionally (Gilbert et al., 2010) and over time (Fox et al., 2018; Perkins et al., 2019; et al., 2019). Self-criticism has also been found to mediate the link between perceived parental expressed emotion and history of NSSI (Ammerman & Brown, 2018), and to moderate the mediating effect of negative emotion in the relationship between BPD features and NSSI (You, Lin, & Leung, 2015). Although we were unable to explore whether self-defective beliefs explained the interaction between group status and interpersonal condition in predicting NSSI urges and pain endurance post-induction, research consistently underscores the role of negative self-views in NSSI.

Our second set of exploratory analyses revealed that for individuals who report engaging in NSSI for self-punishment reasons, receiving criticism (vs. praise or neutral feedback) was more strongly associated with NSSI urges post-induction. Indeed, daily

thoughts about deserving punishment have been shown to explain the link between self-criticism and NSSI urge intensity (Lear, Wilkowski, & Pepper, 2019). It is therefore possible that the receipt of critical or rejecting feedback from important others is an acute social stressor that activates negative cognitions about the self as inherently wrong or bad, thereby increasing distress and the desire to fulfill these self-punishing motives with a behavior that functions as such and is aligned with one's sense of self.

Medical severity of NSSI was also found to moderate the association between receipt of criticism (vs. the other conditions) and pain endurance post-induction. Specifically, receiving criticism (vs. praise or neutral feedback) was more strongly associated with increased willingness to endure physical pain among those with more a more medically severe NSSI history. As such, critical feedback from others may be more closely tied to NSSI urges for those who tend to engage in more severe forms of NSSI that result in hospitalization or are severe enough to require medical attention. This finding is consistent with prior research suggesting that suicide proneness, linked to more frequent and severe NSSI (Andover & Gibb, 2010; see Hamza, Stewart, & Willoughby, 2012 for a review), is positively associated with pain endurance (St. Germain & Hooley, 2013). It is possible that these individuals are either more "used to" inflicting pain upon themselves and therefore are more willing to tolerate it or are even less sensitive to it, or that these individuals are perhaps more ambivalent about suicide. Although more research is needed to better understand the mechanisms underlying the connection between medical severity of NSSI and elevated pain endurance, this finding highlights criticism as a critical precursor to increased NSSI urges among those with more potentially dangerous NSSI behaviors.

Contrary to expectations, both individuals who reported high self-punishment motives for NSSI and individuals who endorsed a more frequent NSSI history displayed *less* willingness to endure physical pain in response to criticism (vs. praise or neutral feedback). The former finding is inconsistent with past research indicating that individuals who engage in NSSI for self-punishment motives demonstrate higher pain tolerance and report lower pain intensity at tolerance in the context of distress than individuals who engage in NSSI for other motives and non-injuring controls (Hamza et al., 2014). Furthermore, research indicates that both individuals who engage in NSSI to self-punish (vs. for other motives) and individuals who report high levels of self-criticism (regardless of NSSI history) demonstrate greater affective improvements (i.e., decreased guilt and sadness; reduced negative mood and increased positive mood) during and after the experience of pain (Fox, O'Sullivan, Wang, & Hooley, 2018; Hamza & Willoughby, 2018). As such, we would expect those who desire to hurt themselves and who believe they deserve to be punished to evidence greater willingness to endure pain. The latter finding is situated within a mixed literature in which some studies have found a link between NSSI frequency and pain endurance (St. Germain & Hooley, 2013), while others have not (Glenn et al., 2014).

One interpretation of our unexpected findings relates back to our conceptualization of the pain task; if we were tapping into the construct of distress tolerance rather than NSSI urges, it might make sense that after receiving criticism, those who engage in NSSI to self-punish would be less willing to tolerate distress given already heightened levels of emotional pain and discomfort. Additionally, those who engage in NSSI more frequently (perhaps to escape distressing emotions) may be even less willing

to tolerate distress after an acute social stressor. Another factor that may help explain this inconsistency is that the assessment of NSSI motives was completed at baseline as a trait measure; it is possible that in response to receiving peer criticism within the laboratory, individuals who tend to engage in NSSI to self-punish may have differing motives for NSSI in that moment, weakening the link between typical self-punishment motives and a proxy for NSSI urges. Indeed, individuals often report engaging in NSSI for multiple different motives (e.g., Kleindienst et al., 2008; Lloyd-Richardson et al., 2007). Other methodological differences between the current study and others that may help explain the absence of a relationship between both self-punishment motives and NSSI frequency and heightened pain endurance is the application of different kinds of pain (e.g., pressure vs. cold water; Hamza et al., 2014) as well as the use of female-only vs. mixed-sex samples (Hamza et al., 2014). The latter is important given established sex differences in pain perception (Gratz et al., 2011; Klatzkin et al., 2010), which, if not accounted for statistically, may influence the average level of pain threshold and tolerance across the sample as a whole.

Our third set of exploratory analyses found that both trait and state self-defective beliefs significantly mediated the relationship between group status (i.e., NSSI vs. control) and reported NSSI urges at baseline (but not pain endurance). However, when controlling for history of NSSI frequency, neither of the mediation models remained significant. These findings are somewhat in line with research that failed to find links between trait self-criticism and later NSSI (Daly & Willoughby, 2019; You et al., 2017), and between trait self-criticism and NSSI urge intensity and behavior over a two-week period after controlling for the order in which the surveys were completed (Lear et al.,

2019). The fact that the mediation effects disappeared when controlling for NSSI history suggests that history of repeated engagement in NSSI may be so closely tied to negative self-views that it is difficult to parse apart their unique effects on NSSI urges.

This study had several limitations that warrant mention. First, with two groups and three conditions, our cell sizes were relatively small (range of *n*s = 17-28); as such, we may not have had sufficient power to detect small yet meaningful effects. Second, one of our main dependent variables (i.e., NSSI urges) was assessed via a single-item measure. This brief measure allowed for repeated assessment during the laboratory session while only minimally interfering with the effects of the interpersonal induction. With that said, reliability is severely limited in this case, and this single-item measure may not have adequately captured the construct of interest. Similarly, as might be somewhat expected, the control group reported a restricted range of NSSI urges throughout the lab session, limiting the amount of variability on this variable within the control group. Third, although we chose to use idiographic, rather than standardized interpersonal scripts for a number of reasons (e.g., more personally meaningful and potent), this methodology comes with drawbacks. Given their personalized nature, the content and participants within the individual social interactions were highly variable across participants, and some scripts may have been more effective than others in eliciting the desired emotions. Based on the manipulation check, the praise condition was not significantly related to negative or positive affect, which may have dampened potential condition-related effects on our outcomes. Fourth, although use of a behavioral proxy measure for NSSI urges has many strengths (e.g., lack of reliance on self-report), it is ultimately a proxy and differs from the behavior of NSSI as it occurs in the real world.

Due to obvious ethical reasons, it is highly challenging to study the phenomenon of NSSI in real time (especially within the controlled setting of a laboratory), so studying proxy behaviors are at times necessary, and ultimately help move the field forward in better understanding this clinically-relevant behavior. Furthermore, our two dependent variables were behavioral and self-report measures of NSSI urges rather than NSSI behaviors, and it is important to not assume that factors that predict one will automatically predict the other. With that said, NSSI urges are associated with frequency of behaviors (Washburn, Juzwin, Styer, & Aldridge, 2010), and greater intensity of NSSI thoughts is associated with increased likelihood of NSSI behaviors (Nock et al., 2009). Finally, there were various aspects about our sample that limit generalizability. First, we did have some missing data, and more individuals in the NSSI group were likely to have missed the lab session and have incomplete data on the dependent variables compared to those in the control group. As such, the sample we captured may not be generalizable to others, and replication studies are needed to increase confidence in the current findings. Second, our sample was exclusively made up of college-aged (i.e., ages 18-35) females, and therefore researchers are encouraged to replicate findings in samples including males who self-injure, other age groups that endorse high rates of NSSI (e.g., adolescents), and individuals with varying clinical acuity. Third, although our inclusion criteria for the NSSI group (i.e., past-year behaviors or at least five lifetime behaviors and past-year thoughts or urges) was relatively stringent, it is possible that findings may differ within samples of more chronic, severe self-injurers.

Moving forward, researchers are encouraged to expand upon this current line of research by utilizing longitudinal study designs to better understand associations between

social stressors and trajectories of NSSI urges and behaviors over time. It will also be important to further assess these constructs outside of a controlled laboratory setting and within real-world contexts. For instance, experience sampling methods continue to allow us to capture NSSI urges and behaviors as they occur in real-time, and obtain a more nuanced understanding of the timeline on which NSSI typically unfolds along with the proximal stressors that tend to precipitate NSSI. Future studies should also include more comprehensive measures of NSSI urges, rather than relying on a single-item assessment, and incorporate measures of both NSSI thoughts and behaviors. Not only would this function to increase reliability and validity of our measurement, but this would also help distinguish between situations that tend to put individuals at heightened risk for the experience of urges vs. behaviors, and identify contexts in which urges tend to then escalate to behaviors. Although the current study relied on pressure pain to stimulate pain in participants, other forms of pain may be relevant to NSSI samples (e.g., cold pressor tasks, electric shocks; Franklin et al., 2013; Franklin, Aaron, Arthur, Shorkey, & Prinstein, 2012) and should be explored in future studies, especially as they may serve as proxy measures of NSSI urges and behaviors. In addition to using behavioral measures of reactivity to social stressors, physiological measures (e.g., heart rate variability, electrodermal activity) would be important to incorporate in order to gather a more comprehensive picture of intrapersonal factors that may increase one's risk for turning to NSSI as a means of coping, as well as understanding differences that exist between those with and without NSSI histories. Physiological measures could also be used in response to the experience of pain stimuli themselves among those with and without NSSI as another way of clarifying the physiological changes that occur when an individual

engages in this risky behavior, and why it tends to be so addicting for some. Furthermore, while the current study utilized social feedback from peers given their heightened level of influence in young adulthood (e.g., Gardner & Steinberg, 2005), critical feedback may also come from others, such as romantic partners and family members, and is equally important to study in the context of eliciting NSSI urges. Finally, other possible moderators of the relationships between NSSI status, social feedback, and pain endurance/NSSI urges are worth exploring, such as rejection sensitivity, emotion regulation capabilities, self-efficacy and confidence, and levels of social support.

Despite the aforementioned limitations, the current findings have important clinical implications. Clinicians treating individuals who engage in NSSI as a maladaptive way of coping are encouraged to consider the experience of an acute social stressor as a critical moment during which intervention may be necessary. Individuals who engage in NSSI may benefit from learning more effective ways of coping with negative social feedback, such as with distress tolerance skills (e.g., reducing physiological arousal, distracting from the situation), advocating for support from loved ones, or using cognitive strategies such as reappraising the situation to foster a more benign and less painful interpretation. Individuals who engage in NSSI also tend to hold highly negative views of themselves, and may benefit from use of cognitive strategies that directly challenge and reframe these beliefs, engagement in self-compassion exercises, as well as increased opportunities for experiences that help promote feelings of mastery and achievement. A recent randomized controlled trial evaluated a novel cognitive intervention for NSSI that focuses on reducing self-criticism and enhancing self-worth via month-long daily diary entries reflecting on one's positive characteristics

(i.e., Autobiographical Self-Enhancement Training or ASET; Hooley, Fox, Wang, & Kwashie, 2018). ASET was associated with significant improvements in self-criticism post-treatment and suicidal ideation at 3-month follow-up compared to daily journaling and expressive writing group conditions, although the former finding did not remain significant at follow-up. All three conditions were associated with reductions in NSSI episodes, depression, and suicidal ideation by the end of treatment, although there were no treatment effects on suicide plans or behaviors, desire to discontinue NSSI, or likelihood of future NSSI. Mobile technology also presents a unique opportunity to target NSSI urges and behaviors in a brief manner on a widespread scale. For instance, a series of randomized controlled trials examined a mobile game-like app (Therapeutic Evaluative Conditioning; TEC) designed to increase aversion to suicidal and nonsuicidal self-injurious thoughts and behaviors and decrease aversion to the self (through pairing with unpleasant and pleasant stimuli, respectively) over a one-month period (Franklin et al., 2016). Researchers found that TEC (vs. a control app) led to moderate reductions in self-cutting, suicide plans and behaviors; however, these gains were not maintained at one-month follow-up. As such, continued research in this area is vital to treating the increasingly prevalent and potentially dangerous behavior that is NSSI, and eventually preventing it from occurring altogether.

Table 1. Descriptive Statistics of Demographic Variables

Variable	Full sample (n = 137)	NSSI group (n = 79)	Control group (n = 58)	F or χ^2
Age (*M, SD*)	20.96 (3.17)	20.32 (2.23)	21.82 (3.96)	7.77**
Sexual orientation				17.77**
Straight	52.55%	41.77%	67.24%	
Bisexual	24.82%	30.38%	17.24%	
Lesbian or gay	8.03%	7.59%	8.62%	
Pansexual	5.84%	10.13%	0.00%	
Other	3.65%	6.33%	0.00%	
Asexual	2.92%	1.27%	5.17%	
Relationship status				0.10
Single	86.13%	86.08%	86.21%	
Living with partner	8.76%	8.86%	8.62%	
Legally partnered	2.92%	2.53%	3.45%	
Race/Ethnicity				4.08
White/Caucasian	69.34%	74.68%	62.07%	
Asian/Southeast Asian	19.71%	17.72%	22.41%	
Black/African American	7.30%	5.06%	10.34%	
Hispanic/Latinx	5.84%	6.33%	5.17%	
Multiracial	4.38%	5.06%	3.45%	
Native American	2.19%	2.53%	1.72%	
Education status				17.97**
High school graduate	4.38%	3.80%	5.17%	
Some college	72.99%	83.54%	58.62%	
College graduate	5.84%	6.33%	5.17%	
Some graduate school	10.22%	2.53%	20.69%	
Graduate or professional degree	4.38%	1.27%	8.62%	
Current psychiatric medication (yes)	34.31%	45.57%	18.97%	10.84**
Lifetime psychiatric treatment (yes)	43.80%	59.49%	22.41%	19.36***

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Table 2. Descriptive Statistics of Psychopathology Variables

Variable	Full sample (n = 137)	NSSI group (n = 79)	Control group (n = 58)	F or χ^2
Psychiatric diagnoses				
Major Depressive Disorder Current	15.33%	21.52%	6.90%	5.51*
Major Depressive Disorder Lifetime	63.50%	82.28%	37.93%	28.38***
Bipolar I Disorder Lifetime	6.57%	10.13%	1.72%	3.85^{+}
Bipolar II Disorder Lifetime	0.73%	1.27%	0.00%	0.74
Panic Disorder Current	7.30%	10.13%	3.45%	2.20
Panic Disorder Lifetime	17.52%	22.78%	10.34%	3.58
Agoraphobia Current	2.92%	5.06%	0.00%	3.01
Agoraphobia Lifetime	7.30%	10.13%	3.45%	2.19
Social Anxiety Disorder Current	16.06%	22.78%	6.90%	6.26*
Social Anxiety Disorder Lifetime	24.09%	31.65%	13.79%	5.83*
Generalized Anxiety Disorder	14.60%	21.52%	5.17%	7.17**
Obsessive Compulsive Disorder Current	0.73%	1.27%	0.00%	0.74
Obsessive Compulsive Disorder Lifetime	2.92%	3.80%	1.72%	0.51
Posttraumatic Stress Disorder Current	8.76%	12.66%	3.45%	3.55
Posttraumatic Stress Disorder Lifetime	25.55%	35.44%	12.07%	9.61**
Alcohol Use Disorder Current	24.82%	36.71%	8.62%	14.14***
Alcohol Use Disorder Lifetime	35.77%	48.10%	18.97%	12.36***
Substance Use Disorder Current	30.66%	43.04%	13.79%	13.46***
Substance Use Disorder Lifetime	35.04%	43.04%	24.14%	5.25*
Borderline Personality Disorder	18.25%	29.11%	3.45%	38.93***
PAI-BOR total score (*M, SD*)	26.50 (12.37)	31.92 (11.86)	21.38 (10.62)	22.16***
DERS total score (*M, SD*)	94.53 (24.97)	103.57 (22.43)	82.31 (23.10)	28.69***
DASS total score (*M, SD*)	17.75 (12.93)	21.82 (12.98)	12.33 (10.78)	20.04***
SRS total score (*M, SD*)	28.07 (11.84)	31.88 (11.21)	23.02 (10.78)	21.38***
DSHI types of behaviors (*M, SD*)	--	4.04 (2.46)	--	--
DSHI frequency (*M, SD*)	--	337.56 (2273.14)	--	--
DSHI medical severity (*M, SD*)	--	0.51 (1.00)	--	--

Note. PAI-BOR = Personality Assessment Inventory – Borderline Features Scale. DERS = Difficulties in Emotion Regulation Scale. DASS = Depression Anxiety and Stress Scale. SRS = Self-Rating Scale. DSHI = Deliberate Self-Harm Inventory.
+p = .05. *p < 0.05. **p < 0.01. ***p < 0.001.

Table 3. Descriptive Statistics of Pain Variables by Group at Baseline

	Full sample (n = 137)	NSSI group (n = 79)	Control group (n = 58)	
Variable	*M* (SD)	*M* (SD)	*M* (SD)	$F(df_w)$
Pain threshold[a] (sec)	28.18 (93.52)	23.16 (73.73)	34.01 (114.11)	0.45 (134)
Pain tolerance (sec)	179.85 (235.61)	201.20 (243.00)	145.34 (221.16)	1.90 (134)
Pain endurance (sec)	151.66 (217.40)	178.04 (226.13)	111.33 (198.23)	3.21 (134)
State SRS	24.23 (11.37)	28.05 (11.40)	19.02 (9.11)	24.78*** (135)
NSSI urges[a]	2.42 (7.19)	4.01 (9.17)	0.28 (0.85)	9.54** (134)

Note. SRS = Self-Rating Scale. NSSI = nonsuicidal self-injury.
[a]Presented as seconds, but log (base 10) transformed for all analyses.
*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Table 4. Descriptive Statistics of Pain Variables by Group and Condition Post-induction

	Full sample	NSSI group				Control group			
		Criticism (n = 26)	Praise (n = 26)	Neutral (n = 27)		Criticism (n = 18)	Praise (n = 19)	Neutral (n = 21)	
Variable	*M* (SD)	*M* (SD)	*M* (SD)	*M* (SD)	*F* (df_w)	*M* (SD)	*M* (SD)	*M* (SD)	*F* (df_w)
Pain threshold[a] (sec)	13.87 (38.79)	9.89 (13.46)	26.04 (78.47)	13.49 (22.40)	0.83 (73)	7.17 (12.70)	5.32 (9.13)	19.47 (42.54)	1.62 (55)
Pain tolerance (sec)	137.23 (208.57)	202.07 (252.39)	104.39 (170.49)	192.33 (238.92)	1.51 (76)	130.44 (200.24)	55.42 (134.62)	106.61 (192.12)	0.87 (55)
Pain endurance (sec)	125.33 (197.86)	192.18 (249.43)	87.20 (136.87)	178.84 (227.90)	1.79 (74)	123.28 (201.13)	50.10 (133.95)	87.14 (163.13)	0.88 (55)
State SRS	22.46 (11.91)	29.46 (11.97)	23.12 (11.22)	25.96 (12.98)	1.80 (76)	22.22 (11.16)	14.84 (8.19)	15.57 (7.57)	3.77* (55)
NSSI urges[a]	3.27 (9.45)	8.23 (13.16)	4.23 (11.58)	3.93 (11.03)	1.06 (76)	0.61 (2.35)	0.16 (0.50)	0.19 (0.68)	0.60 (55)

Note. SRS = Self-Rating Scale. NSSI = nonsuicidal self-injury.
[a]Presented as seconds, but log (base 10) transformed for all analyses.
*$p < 0.05$.

Table 5. Rates of Missing Data across Study Variables by Group

Measure	NSSI group (n = 79)	Control group (n = 58)	Reason(s)
Demographics	n = 2-3	n = 0-1	Incomplete baseline data
Self-report baseline measures	n = 2-3	n = 0-1	Incomplete baseline data
PAI-BOR	n = 30	n = 6	Loss of data / insufficient saving
Diagnostic data	n = 0-1	n = 0-1	Insufficient querying by diagnostic interviewer
Pain endurance at baseline	n = 1	n = 0	Researcher recording error
Pain endurance post-induction	n = 2	n = 0	Missing threshold time due to participant error
Lab measures	n = 0-1	n = 0	Participant skipped item (i.e., baseline NSSI urge)

Note. PAI-BOR = Personality Assessment Inventory – Borderline Features Scale.

Table 6. Correlations among Demographic and Study Variables at Baseline and Post-induction

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
1. Group (NSSI = 1)	--																		
2. Age	-.24**	--																	
3. Minority race (1= White)	.07	-.10	--																
4. Height	.002	.01	.30**	--															
5. Weight	.14	-.03	.22*	.48***	--														
6. Current psych medication	.28**	-.12	.23**	.12	-.01	--													
7. Psych treatment history	.38***	-.13	.22*	.04	.09	.60***	--												
8. BL Pain endurance	.15	-.03	.02	-.08	.03	.17	.09	--											
9. PAI-BOR	.43***	-.16	-.09	-.03	.15	.15	.36***	.17	--										
10. DERS	.42***	-.06	.11	-.03	.004	.23**	.32***	.19*	.61***	--									
11. DASS depression	.36***	.02	.02	.04	.08	.20*	.31***	.19*	.60***	.68***	--								
12. BL State SRS	.39***	.16	.12	.05	.09	.23**	.32***	.17*	.53***	.61***	.53***	--							
13. BL NSSI urge	.26**	-.04	.09	.02	.04	.28**	.22*	.06	.22*	.24**	.19*	.39***	--						
14. BL State DSS	.22**	-.07	.07	.09	.23**	.19*	.27**	.16	.51***	.33***	.46***	.38***	.36***	--					
15. Trait SRS	.37***	.06	.13	-.02	.11	.18*	.32***	.19*	.49***	.68***	.54***	.80***	.25**	.34***	--				
16. PI Pain endurance	.17*	-.08	-.05	-.05	.11	.22*	.13	.62***	.09	.08	.18*	.14	.08	.07	.15	--			
17. PI State SRS	.37***	.09	.13	.04	.13	.29**	.43***	.17*	.48***	.55***	.52***	.81***	.37***	.42***	.73***	.18*	--		
18. PI NSSI urge	.27**	-.14	.03	-.02	.07	.25**	.21*	-.01	.27**	.16	.16	.28**	.66***	.23**	.19*	.06	.39***	--	
19. PI State DSS	.16	-.08	-.07	.11	.12	.19*	.24**	-.02	.36***	.28**	.38***	.31***	.29**	.63***	.24**	-.03	.35***	.25**	--

Note. BL = Baseline. PI = Post-induction. PAI-BOR = Personality Assessment Inventory – Borderline Features Scale. DERS = Difficulties in Emotion Regulation Scale. DASS = Depression Anxiety and Stress Scale. SRS = Self-Rating Scale. NSSI = nonsuicidal self-injury. DSS = Dissociation Tension Scale.
*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Table 7. Results of Repeated Measures ANOVA for Manipulation Check

Negative Affect	*MS*	*F* (η^2)
Group	0.013	0.048 (.0004)
Condition	1.31	4.95** (.070)
Time	0.076	1.26 (.010)
Group X Condition	0.013	0.050 (.001)
Time X Group	0.004	0.064 (.0005)
Time X Condition	0.71	11.79*** (.15)
Time X Group X Condition	0.054	0.90 (.013)
Positive Affect	*MS*	*F* (η^2)
Group	1.09	1.76 (.013)
Condition	0.12	0.20 (.003)
Time	1.69	15.08*** (.10)
Group X Condition	0.089	0.14 (.002)
Time X Group	0.00002	0.0002 (.000001)
Time X Condition	0.79	7.05** (.10)
Time X Group X Condition	0.011	0.097 (.001)

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Table 8. Results of Group X Condition X Time Repeated Measures ANOVAs in Predicting Post-induction Outcomes

Pain Endurance	*MS*	*F* (η^2)
Time	46865.88	2.73 (.021)
Group	254304.37	3.78^{+} (.029)
Condition	133312.53	1.98 (.030)
BL Dissociation	18251.31	0.60 (.002)
Change in Dissociation	142211.16	2.12 (.016)
Group X Condition	9449.94	0.14 (.002)
Time X BL Dissociation	4629.62	0.27 (.002)
Time X Change in Dissociation	10252.67	0.60 (.005)
Time X Group	1218.34	0.71 (.001)
Time X Condition	4415.40	0.26 (.004)
Time X Group X Condition	11609.93	0.68 (.011)
[a]NSSI Urges	*MS*	*F* (η^2)
Time	0.024	0.37 (.003)
Group	2.49	12.68** (.090)
Condition	0.15	0.74 (.011)
BL Dissociation	8.034	41.00*** (.25)
Change in Dissociation	1.41	7.17** (.053)
Group X Condition	0.48	2.47 (.037)
Time X BL Dissociation	0.031	0.48 (.004)
Time X Change in Dissociation	0.13	2.067 (.016)
Time X Group	0.046	0.72 (.006)
Time X Condition	0.085	1.32 (.020)
Time X Group X Condition	0.085	1.33 (.020)

Note. NSSI = nonsuicidal self-injury. BL = Baseline. All analyses controlled for log transformed mean-centered baseline dissociation levels and log transformed mean-centered change from baseline to post-induction dissociation levels.
[a]These analyses used the log (base 10) transformed NSSI urges variable.
+p = .05. *p < 0.05. **p < 0.01. ***p < 0.001.

Table 9. Results of Group X Condition X Time Repeated Measures ANOVAs in Predicting Post-induction Outcomes without Covariates

Pain Endurance	*MS*	*F* (η^2)
Time	45047.28	2.63 (.020)
Group	290748.63	4.32* (.032)
Condition	150949.62	2.24 (.034)
Group X Condition	5163.22	0.077 (.001)
Time X Group	16.31	0.001 (.000007)
Time X Condition	4783.16	0.28 (.004)
Time X Group X Condition	8356.77	0.49 (.008)
[a]NSSI Urges	*MS*	*F* (η^2)
Time	0.022	0.35 (.003)
Group	5.96	23.35*** (.15)
Condition	0.47	1.83 (.027)
Group X Condition	0.22	0.87 (.013)
Time X Group	0.052	0.81 (.006)
Time X Condition	0.082	1.28 (.019)
Time X Group X Condition	0.064	1.00 (.015)

Note. NSSI = nonsuicidal self-injury.
[a]These analyses used the log (base 10) transformed NSSI urges variable.
*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Table 10. Results of Moderator Analyses including Group, Criticism or Praise, and Self-defective Beliefs in Predicting Post-induction Outcomes

	NSSI Urges[a]		Pain Endurance[b]			NSSI Urges[a]		Pain Endurance[b]	
Effects	*B* (*SE*)	95% CI	*B* (*SE*)	95% CI	Effects	*B* (*SE*)	95% CI	*B* (*SE*)	95% CI
Group	0.073 (.082)	-.089-.24	32.17 (41.62)	-50.20-114.53	Group	0.15^{+} (.074)	-.0005-.29	51.96 (36.22)	-19.72-123.63
Criticism	-0.048 (.099)	-.24-.15	15.98 (50.66)	-84.28-116.24	Praise	0.006 (.12)	-.23-.24	-13.55 (57.92)	-128.19-101.09
BL SRS	-0.011* (.004)	-.019--.002	-1.20 (2.12)	-5.39-2.99	BL SRS	-0.012** (.004)	-.021--.004	-1.31 (2.080)	-5.43-2.81
PI SRS	0.015* (.007)	.001-.029	-0.23 (3.62)	-7.40-6.93	PI SRS	0.018** (.006)	.006-.029	-2.09 (2.95)	-7.92-3.75
Group X Criticism	0.12 (.13)	-.14-.38	-12.91 (66.06)	-143.64-117.83	Group X Praise	-0.069 (.14)	-.35-.21	-46.91 (69.51)	-184.48-90.66
Group X PI SRS	-0.001 (.007)	-.016-.013	2.45 (3.71)	-4.88-9.79	Group X PI SRS	0.001 (.006)	-.012-.013	5.43 (3.10)	-.71-11.56
Criticism X PI SRS	0.003 (.009)	-.015-.022	-3.98 (4.71)	-13.29-5.33	Praise X PI SRS	-0.003 (.011)	-.024-.018	1.53 (5.25)	-8.85-11.91
Group X Criticism X PI SRS	0.008 (.011)	-.014-.030	6.60 (5.71)	-4.71-17.90	Group X Praise X PI SRS	0.004 (.013)	-.020-.029	-3.25 (6.21)	-15.55-9.047

Note. SRS = Self-Rating Scale. NSSI = nonsuicidal self-injury. BL = Baseline. PI = Post-induction. Post-induction SRS was mean centered in these analyses.

[a]These analyses used the log (base 10) transformed NSSI urges variables and controlled for baseline NSSI urges.

[b]These analyses controlled for baseline pain endurance.

+p = .05. *p < 0.05. **p < 0.01. ***p < 0.001.

Table 11. Results of Regressions with Criticism and Praise (vs. Other Conditions) and NSSI Characteristics Predicting Outcomes within the NSSI Group Only (n = 79)

	NSSI Urges[a]		Pain Endurance			NSSI Urges[a]		Pain Endurance	
Criticism X	*B* (*SE*)	95% CI	*B* (*SE*)	95% CI	Praise X	*B* (*SE*)	95% CI	*B* (*SE*)	95% CI
NSSI motives					NSSI motives				
Affect Regulation	0.14 (.080)	-.024-.30	-40.61 (32.67)	-105.77-24.55	Affect Regulation	-0.004 (.10)	-.20-.19	3.70 (40.39)	-76.85-84.25
Interpersonal Boundaries	0.11 (.093)	-.076-.29	-21.092 (37.11)	-95.10-52.92	Interpersonal Boundaries	-0.071 (.097)	-.26-.12	24.57 (37.52)	-50.26-99.41
Self-punishment	0.22** (.067)	.091-.36	-62.32* (26.91)	-115.99--8.64	Self-punishment	-0.026 (.072)	-.17-.12	44.51 (28.14)	-11.63-100.66
Self-care	0.013 (.10)	-.19-.21	44.18 (39.82)	-35.24-123.59	Self-care	0.039 (.095)	-.15-.23	-3.76 (36.71)	-76.97-69.46
Anti-dissociation	-0.015 (.067)	-.15-.12	-10.46 (27.27)	-64.86-43.93	Anti-dissociation	0.061 (.068)	-.075-.20	-8.65 (27.19)	-62.88-45.59
Anti-suicide	-0.077 (.072)	-.22-.066	23.39 (29.01)	-34.49-81.27	Anti-suicide	0.002 (.075)	-.15-.15	-10.70 (29.61)	-69.77-48.36
Sensation-seeking	-0.10 (.11)	-.32-.12	-43.94 (43.79)	-131.27-43.40	Sensation-seeking	0.084 (.088)	-.092-.26	31.19 (34.10)	-36.83-99.21
Peer-bonding	0.93 (.76)	-.58-2.44	-94.51 (304.42)	-701.66-512.65	Peer-bonding	-1.13 (.78)	-2.68-.42	109.64 (302.97)	-494.62-713.91
Interpersonal Influence	-0.037 (.10)	-.24-.17	-58.58 (40.85)	-140.04-22.88	Interpersonal Influence	0.053 (.093)	-.13-.24	13.60 (36.17)	-58.53-85.73
Toughness	-0.002 (.086)	-.17-.17	-20.79 (34.39)	-89.38-47.81	Toughness	0.079 (.072)	-.064-.22	-20.43 (28.025)	-76.32-35.47
Marking Distress	-0.001 (.074)	-.15-.15	-6.23 (28.83)	-63.74-51.28	Marking Distress	0.11 (.071)	-.029-.25	18.89 (27.40)	-35.77-73.54
Revenge	-0.002 (.10)	-.21-.20	-59.88 (40.59)	-140.83-21.06	Revenge	-0.062 (.10)	-.27-.14	38.86 (40.021)	-40.96-118.68
Autonomy	0.036 (.12)	-.20-.28	-43.80 (46.60)	-136.77-49.17	Autonomy	0.039 (.10)	-.17-.25	25.16 (38.69)	-52.016-102.34
Interpersonal	0.004 (.024)	-.044-.052	-10.34 (9.37)	-29.02-8.35	Interpersonal	0.020 (.024)	-.027-.067	2.029 (9.001)	-15.93-19.99
Intrapersonal	0.035 (.027)	-.019-.089	-11.90 (10.24)	-32.34-8.54	Intrapersonal	0.016 (.027)	-.037-.069	4.54 (10.00)	-15.41-24.50
Types of Behaviors	0.094 (.054)	-.015-.20	13.47 (21.87)	-30.13-57.078	Types of Behaviors	-0.062 (.056)	-.17-.048	-9.89 (21.81)	-53.38-33.59

Frequency of Behaviors	-0.18 (.19)	-.56-.21	-161.55* (77.30)	-315.68--7.43	Frequency of Behaviors	0.21 (.24)	-.26-.68	31.070 (94.63)	-157.63-219.77
Medical Severity	-0.043 (.14)	-.33-.25	130.52* (62.38)	5.87-255.17	Medical Severity	-0.010 (.14)	-.30-0.28	-12.45 (63.42)	-139.18-114.28

Note. NSSI = nonsuicidal self-injury. Frequency of Behaviors was log transformed. All continuous NSSI characteristics predictors were centered around their means.

[a]These analyses used the log (base 10) transformed NSSI urges variable.

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Table 12. Results of Mediation Analyses of Self-defective Beliefs on the Relationship between Group and Outcomes at Baseline

	NSSI Urges[a]		Pain Endurance	
Effects	*B* (*SE*)	95% CI	*B* (*SE*)	95% CI
Group → DV	0.22 (0.072)**	0.073-0.36	47.12 (40.22)	-32.44-126.68
Group → Trait SRS	9.049 (1.92)***	5.25-12.84	8.89 (1.93)***	5.073-12.71
Trait SRS → DV	0.0065 (0.0030)*	0.0005-0.013	2.69 (1.68)	-0.64-6.018
Group → Trait SRS → DV	0.059 (0.032)	**0.0015-0.13**	23.90 (16.21)	-3.94-58.89
Group → DV	1.72 (1.25)	-0.76-4.20	43.38 (40.37)	-36.48-123.24
Group → State SRS	9.21 (1.81)***	5.63-12.80	9.11 (1.82)***	5.50-12.72
State SRS → DV	0.22 (0.055)***	0.11-0.33	2.56 (1.76)	-0.91-6.034
Group → State SRS → DV	2.016 (0.95)	**0.49-4.14**	23.34 (15.82)	-6.019-56.52

Note. DV = dependent variable. SRS = Self-Rating Scale. NSSI = nonsuicidal self-injury. Bolded confidence intervals do not contain 0.
[a]These analyses used the log (base 10) transformed NSSI urges variable.
*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

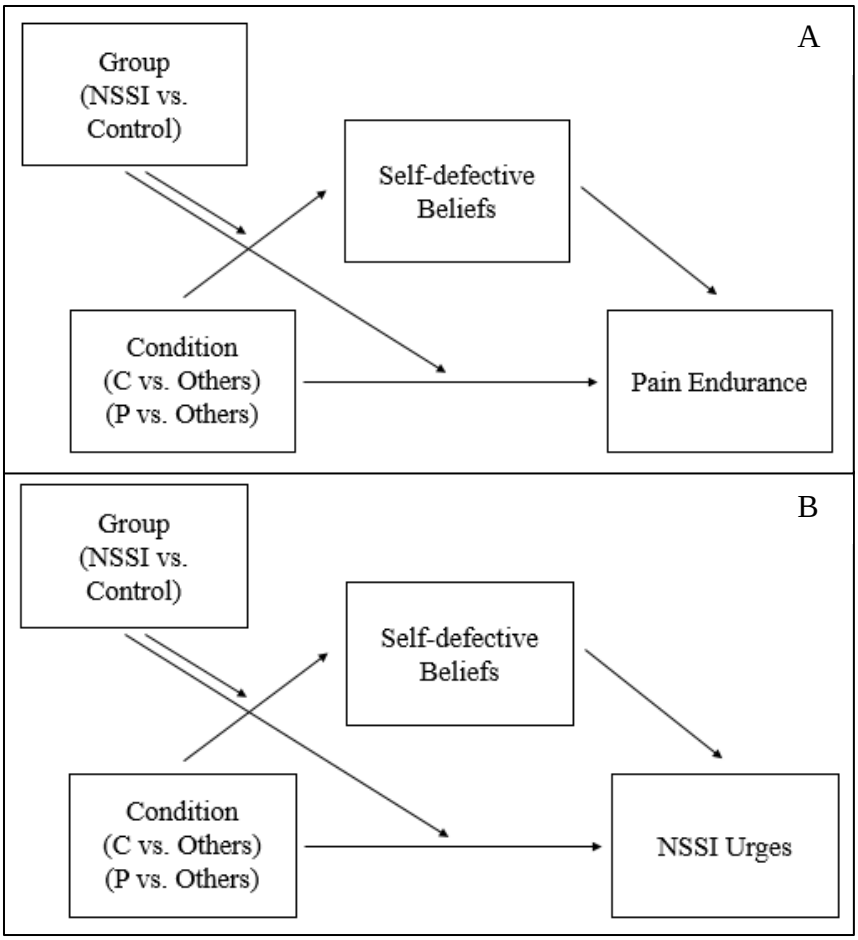

Figure 1. (A) The proposed mediated moderation model predicting pain endurance. (B) The proposed mediated moderation model predicting reported NSSI urges.
Note. C = criticism. P = praise. NSSI = nonsuicidal self-injury.

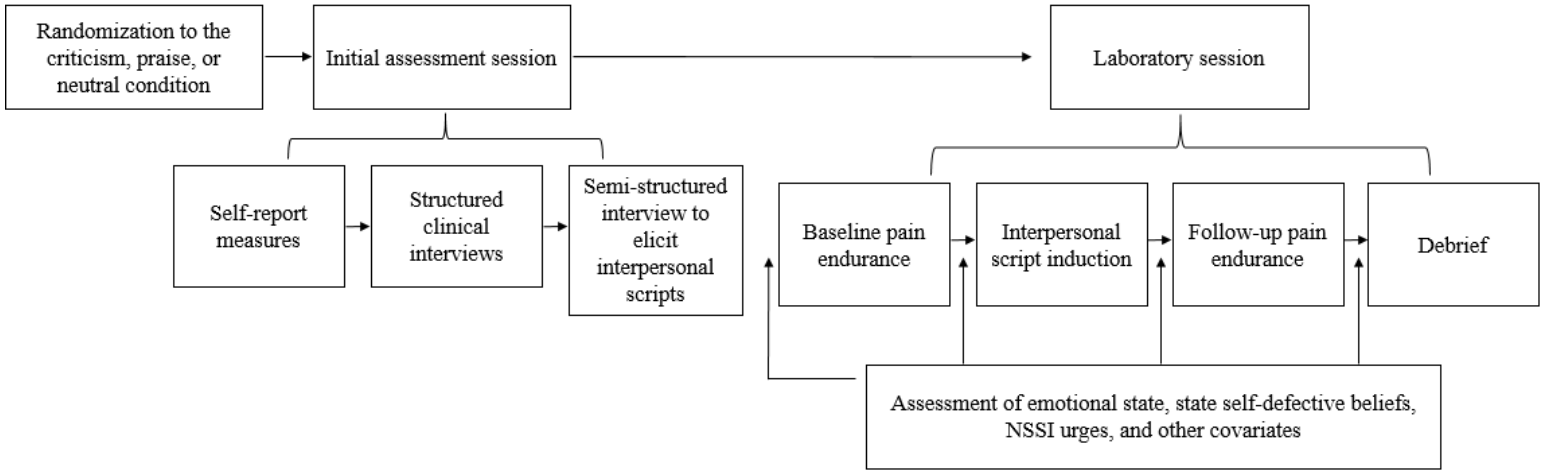

Figure 2. Flow of procedures for the initial assessment and laboratory sessions.

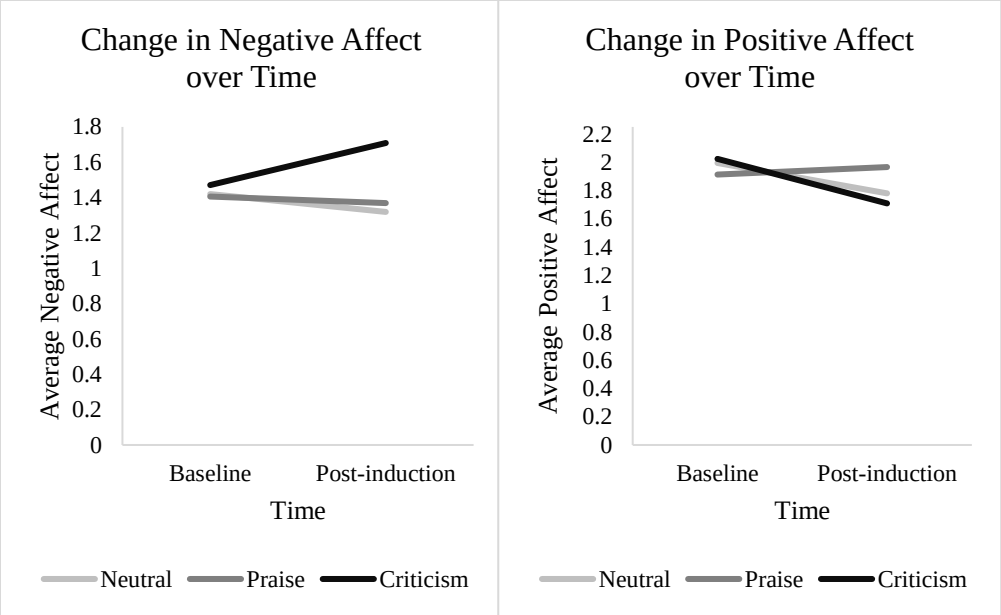

Figure 3. The recalled peer interactions were effective in eliciting emotions based on the manipulation check.

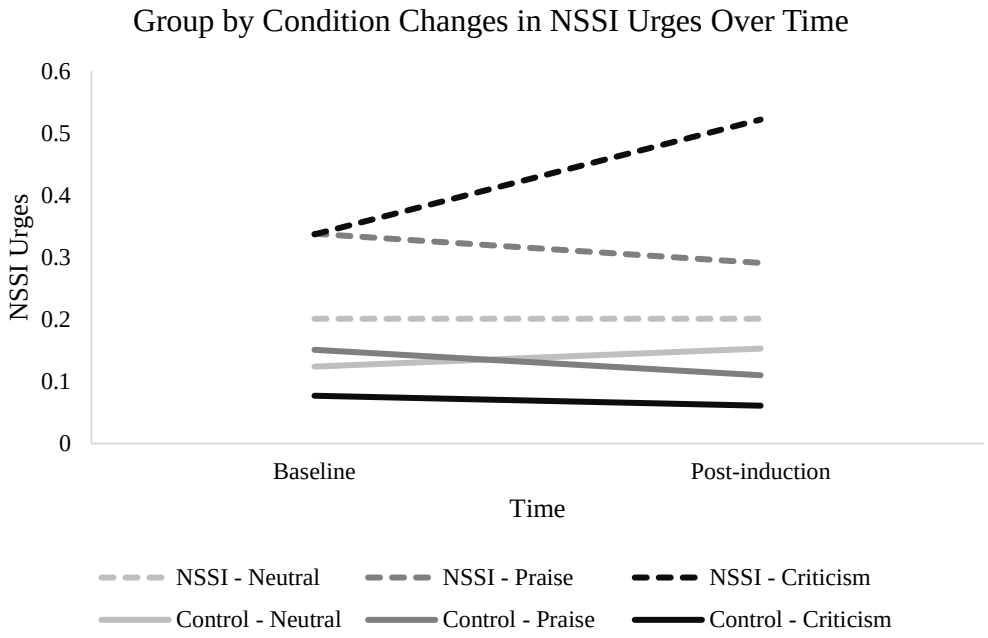

Figure 4. Those in the NSSI group who received criticism displayed a significant increase in NSSI urges from baseline to post-induction.

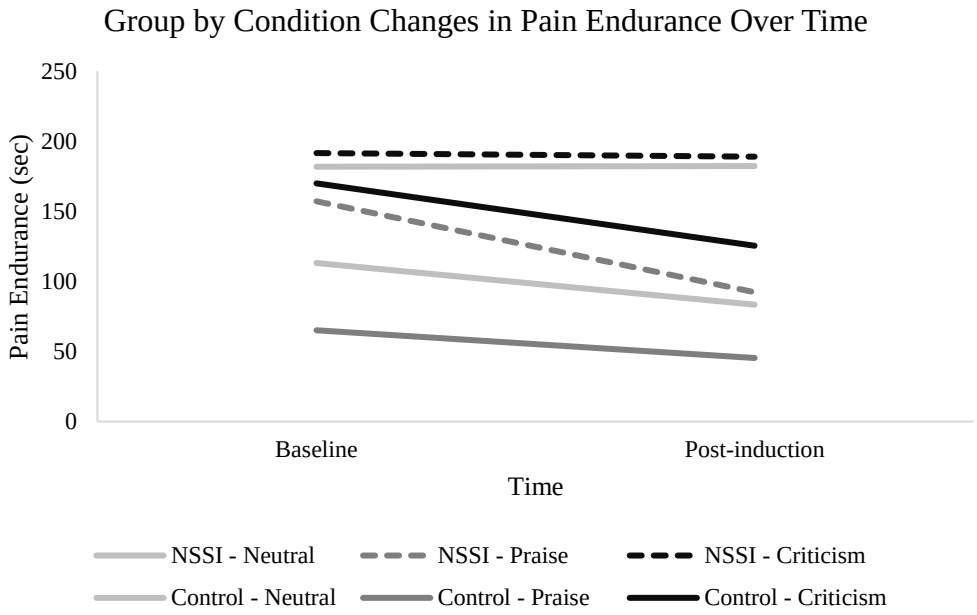

Figure 5. No support was found for the 3-way interaction in predicting pain endurance.

APPENDIX

SUPPLEMENTAL ANALYSES

Table 13. Results of Nonparametric Kruskal-Wallis Test of the Effect of Condition on Post-induction Outcomes by Group

Group	Pain Endurance, χ^2	NSSI Urges, χ^2
NSSI	1.78	5.62[a]
Condition	Mean Rank	Mean Rank
Neutral	40.67	34.74
Praise	34.00	37.65
Criticism	41.88	47.81
Control	2.00	0.032
Condition	Mean Rank	Mean Rank
Neutral	29.14	29.26
Praise	25.89	29.50
Criticism	33.72	29.78

Note. NSSI = nonsuicidal self-injury.
[a]This finding was trending at the $p = .060$ significance level.

Table 14. Results of Group X Condition X Time Repeated Measures ANOVAs in Predicting Pain Threshold and Tolerance

[a]Pain Threshold	*MS*	*F* (η^2)
Time	0.15	1.30 (.010)
Group	1.00	2.54 (.019)
Condition	0.29	0.75 (.012)
Group X Condition	0.11	0.28 (.004)
Time X Group	0.10	0.87 (.007)
Time X Condition	0.098	0.84 (.013)
Time X Group X Condition	0.17	1.47 (.022)
Pain Tolerance	*MS*	*F* (η^2)
Time	114227.51	6.56* (.048)
Group	252273.98	3.19 (.024)
Condition	233539.73	2.96^{+} (.044)
Group X Condition	9808.52	0.12 (.002)
Time X Group	4705.057	0.27 (.002)
Time X Condition	17750.17	1.020 (.015)
Time X Group X Condition	13733.65	0.79 (.012)

[a]These analyses used the log (base 10) transformed pain threshold variable.
$+p = .05$. $*p < 0.05$.

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