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Article *in* Clinical Psychological Science · April 2013

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2014, Vol. 2(3) 297–305

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Nonsuicidal Self-Injury, Pain, and Self-Criticism: Does Changing Self-Worth Change Pain Endurance in People Who Engage in Self-Injury?

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Abstract

People who engage in nonsuicidal self-injury (NSSI) endure physical pain for longer periods than do noninjuring individuals. Pain endurance is also predicted by the presence of highly self-critical beliefs. We tested the hypothesis that changing beliefs about the self would change pain endurance in NSSI individuals. NSSI (n = 50) and control (n = 84) participants were randomly assigned to hear positive music, to receive a brief cognitive intervention designed to improve feelings of personal self-worth, or to a neutral condition. Pain endurance was measured before and after the experimental manipulations. As predicted, there was a significant Group × Condition × Time interaction. After the cognitive intervention, NSSI participants showed a 69-s decrease in pain endurance compared with a 9-s decrease for control participants. For NSSI participants, improvement in self-worth was also significantly correlated with decreased willingness to endure pain. Cognitive approaches that focus on self-worth may provide a new treatment direction for NSSI.

Keywords

NSSI, pain, emotion regulation, cognitive therapy, schemas

Received 8/22/13; Revision accepted 9/18/13

Nonsuicidal self-injury (NSSI) involves behaviors that harm body tissue, such as cutting or burning, but that occur in the absence of intent to die (Hooley, 2008; Nock, 2010). NSSI is a serious and far from uncommon problem. Klonsky (2011) recently reported a lifetime prevalence rate of 5.9% in a sample of 439 adults drawn from a regionally and sociodemographically diverse sample. Prevalence rates were especially high (19%) in people aged 30 and younger and were comparable with the prevalence estimates of 17% previously reported for U.S. college students (Whitlock, Eckenrode & Silverman, 2006). Although the possibility that younger people are more able to recall having engaged in NSSI cannot be ruled out, the higher prevalence rates in younger people may indicate that NSSI is becoming increasingly common (Jacobson & Gould, 2007; Nock, 2010). This potential is of particular concern because individuals who engage in NSSI are at increased risk for suicide (Andover & Gibb, 2010; Guan, Fox, & Prinstein, 2012; Nock, Joiner, Gordon, Lloyd-Richardson, & Prinstein, 2006; Wilkinson, Kelvin, Roberts, Dubicka, & Goodyear, 2011).

It is not clear why people engage in NSSI. Current theoretical models suggest that NSSI behaviors are important for regulating negative affect and reducing emotional distress (Klonsky, 2009; Nock & Prinstein, 2004). Although this is likely true, a central and as yet unanswered question is why some people choose NSSI as an emotion-regulation strategy. A wide range of emotion-regulation strategies exist (e.g., venting, exercising, seeking social support, having a glass of wine) that do not cause deliberate and direct harm to the body. Why then, in preference to these approaches to emotion regulation, do some people select NSSI?

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People who engage in NSSI often report that one reason they do it is to punish themselves (Brown, Comtois, & Linehan, 2002; Gunderson & Ridolfi, 2001; Nock & Prinstein, 2004). Consistent with this finding, results from a series of studies to which we have contributed have demonstrated that participants who engage in NSSI are much more highly self-critical than are healthy control participants (Glassman, Weierich, Hooley, Deliberto, & Nock, 2007; Hooley, Ho, Slater, & Lockshin, 2010). People who engage in NSSI are also more highly self-critical than are people who engage in more indirect forms of self-injury (e.g., abusing substances, depriving themselves of food, remaining in abusive relationships) but who do not engage in NSSI (St. Germain & Hooley, 2012). In a related program of research, Gilbert et al. (2010) also noted that self-harming behaviors are associated with self-criticism and negative feelings about the self. A form of self-criticism (evaluative concerns perfectionism) has also been linked to NSSI in a sample of inpatients with eating disorders (Claes, Soens, Vansteenkiste, & Vandereycken, 2011). Moreover, using ecological momentary assessments, Nock, Prinstein, and Sterba (2009) reported that, in adolescents, the odds of engaging in NSSI were significantly increased in the presence of feelings of self-hatred and anger toward the self.

The Latin word for punishment is *poena*. It is interesting that the same word is also used to refer to pain. Laboratory research has demonstrated that participants who engage in NSSI (e.g., cutting and burning) are more willing to endure physical pain than are healthy control participants (Franklin, Hessel, & Prinstein, 2011; Hooley et al., 2010). In previous work, we have further demonstrated that willingness to endure pressure pain is predicted by highly self-critical beliefs (Hooley et al., 2010). We have also theorized that a cognitive style that involves highly negative feelings about the self may be a specific risk factor for the development of NSSI (Hooley et al., 2010; St. Germain & Hooley, 2012) because a highly negative attitude toward the self (self-criticism or, more extremely, self-hatred) removes a potential barrier to self-injury. Such an attitude does this by allowing the person to consider strategies for emotion regulation, such as cutting and burning, that other people (who value themselves and their bodies much more) would immediately reject. People who hold core beliefs about being bad, flawed, or defective may therefore have less resistance to the idea of NSSI than may people who have self-schemas that are more positive.

On the basis of this theory, one might expect that changing beliefs about the self could change pain endurance in people who engage in NSSI. In the present experimental study, we tested the hypothesis that changing beliefs about the self would change pain endurance in people who engage in self-injury. Specifically, we predicted that pain endurance would decrease in people who engaged in NSSI after they were exposed to a brief cognitive intervention designed to improve their sense of positive self-worth. We did not expect that the same would be true for people with no history of self-injury (because they are much less self-critical than are people who engage in NSSI). Accordingly, we included a comparison sample of healthy control participants to test the specificity of our intervention. Use of a control sample also allowed us to ascertain whether exposure to the cognitive intervention would normalize pain endurance in those NSSI participants who received it. We further hypothesized that NSSI participants assigned to a positive-mood induction or to a neutral task condition would show no change in pain endurance and that healthy control participants would also demonstrate no change in pain endurance across any of the three conditions. In short, we predicted a significant Group × Condition × Time interaction.

Method

Participants

The final sample comprised 134 individuals (101 females, 33 males; mean age = 24.09 years, *SD* = 8.07, range = 18–57) recruited from the local community by means of postings and e-mail advertisements. No data on ethnicity were collected. The control group consisted of 84 participants (58 females, 26 males; mean age = 24.81 years, *SD* = 9.08) who had never engaged in any form of self-injurious behavior and who had no current Axis I disorder on the basis of an assessment using the clinical version of the Structured Clinical Interview for *DSM–IV* Axis I Disorders (SCID-CV; First, Spitzer, Gibbon, & Williams, 1996). The NSSI group consisted of 50 participants (43 females, 7 males), all of whom engaged in cutting without the intent to die. The mean age of onset of NSSI was 16.34 years (*SD* = 3.68), and the average duration of self-injury in this group was 5.89 years (*SD* = 4.97). Participants in the NSSI group were more likely to be female than were participants in the control group (NSSI: 86% female, 14% male; control: 69% female, 31% male), $\chi^2(1, 134 = y) = 4.85$, $p = .028$, $r = .19$, and were also slightly younger than were the control participants (mean age of NSSI participants = 22.54 years, *SD* = 5.55), $t(132) = 1.80$, $p = .075$, $d = 0.31$. All participants provided written informed consent to a research protocol approved by the Harvard University Committee on the Use of Human Subjects and received remuneration for their participation.

Procedure

Participants who expressed interest in the study were contacted and asked to complete an initial telephone interview to confirm eligibility. We used a standardized

semistructured interview (see Hooley et al., 2010) to question participants who reported NSSI about the specific type, frequency, and severity of the reported self-injurious behaviors. This interview covered content similar to that contained in the Self-Injurious Thoughts and Behaviors Interview (Nock, Holmberg, Photos, & Michel, 2007). Participants were also screened for the presence of *DSM–IV* Axis I disorders using the SCID-CV (First et al., 1996). To be considered for inclusion, we required self-injuring participants to have engaged in this behavior at least once (without being motivated by an intent to die) in the past month. Control participants with current Axis I disorders were excluded.

After the phone screening, we scheduled eligible individuals to participate in a single 2-hr experimental session. After providing informed consent, participants completed a laboratory procedure designed to measure pain threshold and pain endurance. Next, participants were randomly assigned to one of three experimental conditions (positive mood, positive self-worth, and neutral), described in the Experimental Manipulations section. Pain threshold and pain endurance were then measured again using the same procedures as before. Data were collected by research assistants who were unaware of participants' group membership.

Pain perception

Pain was induced using a pressure algometer (a weighted metal lever with a blunt focal point). The pressure applied by the apparatus is standard and constant. However, when lowered onto the finger, the focal pressure creates a constantly growing "aching" pain (Forgione & Barber, 1971). Pressure pain is less influenced by physiological factors, such as heart rate, than are other methods of pain stimulation, such as thermal methods (Forgione & Barber, 1971). Previous research has demonstrated that the pressure algometer is a reliable way to induce pain (Hooley & Delgado, 2001; Hooley et al., 2010). It is important to note that the use of this instrument results in no tissue damage.

During the procedure, the participant was alone in a testing room and was observed by the experimenter through a one-way mirror. Participants were instructed to place the pressure point of the algometer between the knuckle and the tip of the index finger of their left hand. Participants were asked to use their right hand to move a switch (which turned on a light visible to the experimenter behind the mirror) when the pressure was experienced as painful. The participant was asked to again flip a switch when the pain was experienced as no longer tolerable (pain tolerance). At this point, the participant removed his or her finger from the device. Throughout the procedure, the participant was in full control and could terminate the trial at any time.

Pain threshold was recorded as the time (in seconds) it took a participant to report pain (i.e., to turn on the indicator light). *Pain endurance* was defined as duration of time that the participant experienced pain and was calculated by subtracting the time taken to reach pain threshold from the time taken to terminate the trial (pain tolerance).

Experimental manipulations

Positive self-worth condition. The positive self-worth condition was developed specifically for this study by the first author. In other work with different samples of participants, we have demonstrated that people who engage in NSSI are highly self-critical and hold beliefs about being bad or flawed as a person (Glassman et al., 2007; Hooley et al., 2010). We have also shown that this self-critical cognitive style is associated with longer durations of pain endurance (Hooley et al., 2010). Accordingly, this experimental manipulation was specifically designed to undermine negative beliefs about the self by activating positive self-schemas.

We anticipated that thinking about themselves in a more positive way might be challenging for people who engage in NSSI. We therefore first asked all participants assigned to this condition to complete a short checklist. This checklist contained 21 commonly occurring positive traits or characteristics (e.g., loyal, kind, insightful, dependable). Participants were asked to check any that they thought applied to them. If participants had difficulty doing this, they were asked what someone close to them (e.g., a best friend) might say. Participants were also reminded that not everyone is 100% good all the time and that just because they might be able to think of an occasion during which they had not exhibited the positive trait in question, that was not a reason not to endorse the trait if it was generally true.

After a minimum of three positive traits had been identified by the participant, a trained research assistant selected a trait from the list. The researcher then asked the participant to provide a specific example of a time when the participant had behaved in that particular way, for example, "Tell me about a time when you were especially loyal and you felt proud of what you did." Participants were encouraged to tell a story about a specific event. The fact that the event cast the participant in a very positive light was also expressly acknowledged by the interviewer. After one specific example had been provided and if there was time remaining, the researcher selected another positive trait and asked the participant to talk about that trait. The total duration of this experimental manipulation (including completion of the checklist and discussion of specific situations) was 5 min.

Positive-mood condition. Participants were asked to listen to 5 min of upbeat music (selections from *Belize*

Tropical, Brazil Classics 1, compiled by David Byrne). This music has been used as a positive-mood induction in previous research (Wenzlaff, Wegner, & Klein, 1991). Participants were instructed to listen to the music through headphones and to use the music to get themselves into a good mood.

Neutral condition. To control for the possibility that, in a simple test-retest design, participants might respond differently at the second pain assessment, we also used a neutral distraction condition. Participants were asked to read a written passage about Ecuador. To ensure that they were paying attention to the text, we asked participants to cancel all the C and E letters that they encountered. As with the other experimental manipulations, this task lasted 5 min.

Measures

Visual analog scales were used to measure the effects of the experimental manipulations. Before and after each experimental condition, participants were instructed, "Please make a slash mark on the line below reflecting how positive your mood is at this particular moment." The anchor points on the scale were *not at all positive* and *extremely positive*. A second instruction to participants requested, "Please make a slash mark on the line below reflecting how positively you are feeling about yourself (i.e., who you are as a person) at this moment." The same anchor points were used. Research assistants later measured the placement of each mark on the line, noting its position in millimeters. Scores from the first assessment were subtracted from scores obtained at the second assessment to provide a measure of overall change. Because these scales were added after data collection was already under way, sample sizes are reduced for these measures.

Data analytic strategy

Baseline pain-endurance data on 63 control and 48 NSSI participants from this sample have been reported elsewhere (St. Germain & Hooley, 2013). As expected, the baseline data showed that NSSI participants had longer pain endurances than did non-self-injuring control participants. Our focus in the present study is on the changes in pain endurance from baseline to the postintervention assessment that resulted from the experimental manipulations. As a manipulation check, we first examined whether participants assigned to the self-worth condition showed an increase in self-worth after this specific intervention. Given the gender and age differences between the control and NSSI groups, we also examined whether change in pain endurance was correlated with these variables. There was no significant association between age and change in pain endurance across time, $r(127) = -.11$, $p = .21$. There was also no relationship between gender and change in pain endurance across the two assessments, $r(127) = .03$, $p = .72$. Accordingly, we tested our main hypothesis using a 2 (Group) × 3 (Condition) × 2 (Time) repeated measures analysis of variance (ANOVA). Because we expected that only the NSSI participants who were assigned to the positive self-worth condition would show a decrease in pain endurance from the first to the second assessment, we predicted a significant three-way interaction and followed this up with post hoc *t* tests. Finally, we examined the extent to which improvement in self-worth was correlated with change in pain endurance from the first to the second pain assessment in both control and NSSI participants.

Results

A 2 (Group) × 3 (Condition) × 2 (Time) repeated measures ANOVA was used to examine the effect of the experimental conditions on participants' ratings of positive self-worth. There was a significant main effect of time, $F(1, 61) = 25.53$, $p < .001$, $\eta_p^2 = .30$, which showed that participants felt better about themselves at the time of the second assessment ($p < .05$). This finding was qualified by a significant Condition × Time interaction, $F(2, 61) = 10.37$, $p < .001$, $\eta_p^2 = .25$, which occurred in the absence of a Group × Time interaction, $F(1, 61) = 1.77$, $p = .19$, $\eta_p^2 = .03$, and a Group × Condition × Time interaction, $F(2, 61) = 1.22$, $p = .30$, $\eta_p^2 = .04$. Post hoc Tukey's honestly significant difference tests revealed that all participants who received the cognitive self-worth intervention reported greater increases in positive self-worth than did participants assigned to either the neutral ($p = .001$) or the positive-mood ($p = .048$) conditions. This result confirmed that our experimental manipulation was having the desired effect on all participants regardless of whether they were in the NSSI or control groups.

There was also a significant main effect of time on change in overall positive mood from the first to the second assessment, $F(1, 61) = 7.69$, $p = .007$, $\eta_p^2 = .11$. However, contrary to expectation, there was no significant Condition × Time interaction, $F(2, 61) = 1.75$, $p = .18$, $\eta_p^2 = .05$. All experimental conditions were associated with increases in positive mood. In other words, reading about Ecuador, listening to positive music, and recalling positive memories about the self were all associated with being in a better mood afterward. Only the latter condition, however, also led to participants' having an increased sense of positive self-worth.

Pain endurance was the amount of time participants exposed themselves to the painful stimulus after reporting the onset of pain. As noted earlier, change in pain

endurance from the first to the second assessment was unrelated to age and gender. Analysis of the pain-endurance data with a 2 (Group) × 3 (Condition) × 2 (Time) repeated measures ANOVA revealed the predicted three-way interaction, $F(2, 121) = 3.09$, $p = .049$, $\eta_p^2 = .049$. Follow-up analyses showed that, after the cognitive intervention, the amount of time that participants with NSSI were willing to endure physical pain decreased by 69.06 s (*SD* = 107.24). This difference represents a 49.8% decrease in pain endurance for NSSI participants relative to their baseline pain-endurance scores. Control participants who received this same intervention showed a 9.13 s (*SD* = 61.53) or 10.4% decrease in pain endurance between the first and the second assessments. As expected, NSSI and control participants differed significantly with respect to how much their pain endurance decreased after the cognitive intervention, $t(45) = 1.96$, $p = .036$ (one-tailed), $d = 0.58$. Exposure to the positive-mood condition was associated with nonsignificant increases in pain endurance in both the NSSI (*M* = 14.81 s, *SD* = 83.15) and the control (*M* = 7.36 s, *SD* = 52.04) participants, $t(40) = 0.32$, $p = .75$, $d = 0.10$. Finally, there was no difference in pain-endurance change between control participants (*M* = −40.32 s, *SD* = 113.38) and NSSI participants (*M* = −0.37 s, *SD* = 119.83) who were assigned to the neutral condition, $t(36) = 0.96$, $p = .34$, $d = 0.32$. Figure 1 illustrates change in pain endurance after each experimental manipulation.

Prior to the cognitive intervention (i.e., at baseline), NSSI participants assigned to this condition showed significantly elevated pain endurances compared with control participants (NSSI: *M* = 186.45 s; control: *M* = 80.03 s), $t(45) = 2.17$, $p = .044$, $d = 0.65$. However, after the cognitive intervention, there was no significant difference between the NSSI and control participants with respect to pain endurance (NSSI: *M* = 117.38 s; control: *M* = 70.91 s), $t(45) = 1.53$, $p = .13$, $d = 0.46$. In other words, the cognitive intervention served to normalize previously elevated pain endurance in the NSSI group. Finally, we examined the extent to which change in positive self-worth was associated with change in pain endurance. For NSSI participants, improvement in self-worth led to a decrease in pain endurance, $r(28) = -.44$, $p = .018$. This result was not found for healthy control participants, $r(35) = .12$, $p = .48$. These correlations are significantly different, $z = -2.22$, $p = .003$.

Discussion

People who engage in NSSI are much more highly self-critical than are healthy noninjuring individuals (Glassman et al., 2007; Hooley et al., 2010) or people who engage in indirect methods of self-injury (St. Germain & Hooley, 2012). Negative beliefs about the self also predict how long people will endure physical pain (Hooley et al., 2010). In the present study, we tested the hypothesis that improving positive self-image in people who engage in NSSI would make them less willing to tolerate physical pain.

As predicted, when people who engage in NSSI received a brief experimental manipulation designed to improve their sense of positive self-worth, they showed a significant (49.8%) decline in how long they were willing to endure physical pain. The same was not true for NSSI participants who received a positive-mood induction or for those who were assigned to a neutral condition.

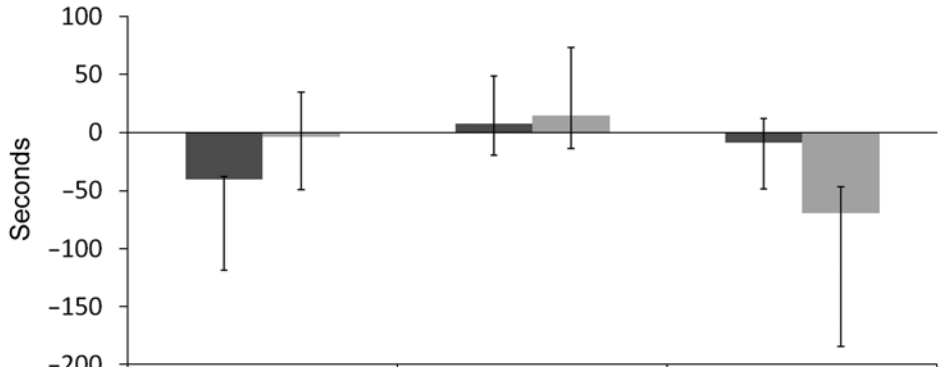

Fig. 1. Change in pain endurance after experimental manipulations. Error bars represent 95% confidence intervals. NSSI = nonsuicidal self-injury.

Across all NSSI participants, improvements in self-worth were correlated with decreases in pain endurance. This result was not found for healthy control participants who instead showed little change in pain endurance after receiving positive-mood or positive self-worth interventions.

A pressing question in the area of NSSI is why some people deal with emotional distress by cutting or otherwise harming the only body they have. Self-criticism may be a key factor in this regard. A cognitive style that involves high levels of self-criticism may be a causal risk factor for the development of NSSI because people who believe that they are bad, flawed, or defective may have less resistance to the idea of hurting themselves than may people who view themselves in a more favorable light. Self-criticism removes a potential barrier to self-injury and, thus, allows a person to consider options, such as cutting and burning, that people with healthier self-images might immediately reject.

Removal of this barrier to self-injury may be especially important because being willing to try NSSI allows people to discover something very fundamental: The offset of pain provides emotional benefits. A growing literature has attested to the fact that the removal of pain makes people feel better (Andreatta, Muhlberger, Yarali, Gerber, & Pauli, 2010; Bresin & Gordon, 2013; Bresin, Gordon, Bender, Gordon, & Joiner, 2010; Franklin, Lee, Hanna, & Prinstein, 2013; Franklin, Puzia, et al., 2013). This finding applies regardless of whether the individual has a history of NSSI. Moreover, the offset of pain serves not only a negative-reinforcement function (people experience relief) but also a positive-reinforcement function (Franklin, Lee, et al., 2013). Pain removal has been associated with self-reports of increased pleasantness (Leknes, Brooks, Weich, & Tracey, 2008). Pain removal is also accompanied by an increase in activation in brain areas associated with reward (Becerra & Borsook, 2008; Leknes, Lee, Berna, Andersson, & Tracey, 2011). Furthermore, research has suggested that pain offset relief is an automatic (rather than a conditioned) response that is experienced almost immediately and that lasts several seconds (Franklin, Lee, et al., 2013).

Why should this be? A high degree of overlap exists between the neural circuitry that processes physical pain and emotional pain (Eisenberger, 2012). One consequence of this overlap is that the offset of physical pain is accompanied by the offset of emotional pain. Emotional pain is often difficult to control. However, as Franklin, Puzia, et al. (2013) have noted, the pain that results from self-injurious behavior (e.g., cutting) can be initiated and terminated at will. By taking advantage of the overlap and commandeering the neural circuitry that processes pain, the offset of self-inflicted physical pain will be associated with a decrease in emotional pain through a reduction in negative affect and an increase in positive affect. This observation helps in understanding why people who engage in NSSI commonly report that they use self-injury as a way of getting rid of bad feelings (Nock & Prinstein, 2004; Swannell, Martin, Scott, Gibbons, & Gifford, 2008). Simply put, self-injury "works."

We suggest that highly negative beliefs about the self may provide an initial pathway to NSSI by removing a potential barrier to NSSI and increasing the likelihood that people in emotional distress will learn that NSSI provides a means of affect regulation. Moreover, for people who are highly self-critical, the experience of pain may provide additional benefits. Swannell et al. (2008) reported that 84% of self-injuring adolescents on an inpatient unit reported that a motivation for their self-injury was to punish themselves for being bad. Claes et al. (2011) have also shown that a form of self-criticism (evaluative concerns perfectionism) is linked to patient reports that NSSI serves self-punishing and self-torturing functions for them. Although self-punishment is rarely the primary reason people give for engaging in NSSI (affect regulation is the most often endorsed function), for people with high levels of self-criticism, the experience of pain may be experienced as something they deserve (Hooley et al., 2010). By self-inflicting pain, people with high levels of self-criticism may therefore be able to engage in a behavior that is both self-affirming and reduces their emotional distress.

A recent study has provided additional support for this idea. Bastian, Jetten, and Fasoli (2011) asked a group of undergraduate participants to write about a time they had behaved unethically. Another group of participants wrote about an everyday interaction that they had recently experienced. All participants were then asked to immerse their hand in iced water and keep it there for as long as they could. As might be expected, participants who had written about an unethical experience reported that they felt guiltier than did participants who had written about a routine event. They also reported that the experience of keeping their hands in the iced water was more painful. Despite this result, and relevant to the present discussion, participants who had been made to feel bad, compared with control participants, kept their hands in the iced water for a longer period and experienced a greater decline in guilt afterward. In discussing their findings, Bastian et al. proposed a judicial model of pain and suggested that by punishing the person who is guilty, pain can provide a means of atonement. Consistent with this idea, results reported by Gordon et al. (2010) showed that the more past self-injurious behavior people had engaged in, the more pain they experienced during self-injury but the more soothed they reported being afterward.

Do highly self-critical people get more psychological benefit from self-injury? Presently, the answer to this

question is unknown. However, the possibility that NSSI provides a particularly appealing method of coping with emotional distress for people with high levels of self-criticism warrants attention in future research. It would be interesting to investigate, through longitudinal work, the extent to which self-criticism is a risk factor for the onset of NSSI. Cross-sectional studies already have shown that people who engage in NSSI are more highly self-critical than are people who do not engage in NSSI (Claes et al., 2011; Gilbert et al., 2010; Hooley et al., 2010; St. Germain & Hooley, 2012). However, it is quite possible that high levels of self-criticism are a consequence of NSSI rather than an antecedent of NSSI, and this possibility warrants consideration. Suggesting the opposite, however, are unpublished data we obtained from a small sample (n = 7) of people who reported serious and recurrent thoughts about NSSI but who had never actually engaged in the behavior. These NSSI ideators reported levels of self-criticism that were comparable with people who did engage in NSSI. Although preliminary, these findings suggest that high levels of self-criticism may predate rather than follow acts of NSSI.

The idea that self-criticism is a risk factor for NSSI has the potential to provide researchers with much needed leverage in understanding self-injury. NSSI has been linked to childhood maltreatment or abuse (Glassman et al., 2007; Whitlock et al., 2006) as well as to perfectionism (Claes et al., 2011; Hoff & Muehlenkamp, 2009), high levels of perceived parental criticism (Yates, Tracy, & Luthar, 2008), and high levels of parental-expressed emotion in the form of criticism (Wedig & Nock, 2007). All of these experiences might be expected to increase the likelihood of developing pathologically high levels of self-criticism. If this is true, self-criticism (as a mediator) has the potential to provide further insights into why NSSI should be correlated with such a broad range of bad experiences.

A focus on self-criticism is important for other reasons as well. Decades of research on expressed emotion have shown that criticism from others is a reliable predictor of negative clinical outcomes across a range of disorders (see Hooley, 2007), which may be because criticism challenges brain areas involved in emotion regulation (Hooley et al., 2009; Hooley, Gruber, Scott, Hiller, & Yurgelun-Todd, 2005; Servaas et al., 2013). Moreover, people who perceived higher levels of criticism in their closest relationships showed increased limbic reactivity and decreased activity in prefrontal (regulatory) areas when exposed to criticism (Hooley, Siegle, & Gruber, 2012). Compared with people who scored low on a measure of perceived criticism, people who scored high on a measure of perceived criticism also demonstrated impaired executive control of negative emotional information on an attentional task (Masland, Hooley, Tully, Dearing, & Gotlib, 2013). Going forward, it would be interesting to learn more about how actual criticism, perceived criticism, and self-criticism might be related. Another avenue of exploration concerns whether, as is the case for actual and perceived criticism, high levels of self-criticism make people especially vulnerable to aberrant neural functioning in the context of emotional challenges. The neural correlates of self-criticism have been investigated in one preliminary study involving healthy control participants (Longe, Maratos, Gilbert, Evans, & Volker, 2010). Similar research with participants who engage in NSSI is an obvious next step. Also needed are studies showing how NSSI participants respond to being criticized. More specifically, the questions whether self-criticism increases the extent to which neural processing (in functional MRI studies) or cognitive control (in studies of executive function) becomes dysregulated under conditions of social challenge should be addressed.

Limitations of the current study include the small number of participants in some of the experimental groups and the fact that measures of change in self-worth were not collected for all participants. Nonetheless, despite being preliminary, our findings suggest that people who engage in NSSI may be motivated to do bad things to themselves because they feel bad about who they are. The finding that pain endurance can be reduced in these people after a cognitive intervention lasting only 5 min is very provocative. The nature of our experimental design also rules out the possibility that a simple improvement in mood is the reason pain endurance decreases, which highlights the role of cognitive factors. Specific treatments for NSSI are greatly needed. Although much remains to be learned, our findings suggest that cognitively based approaches may hold considerable potential. Clinical interventions designed to increase feelings of positive self-worth on the basis of already available self-knowledge may reduce the extent to which people are inclined to select physically damaging and painful methods to cope with emotional distress.

Author Contributions

J. M. Hooley conceived the study and designed it in collaboration with S. A. St. Germain. S. A. St. Germain conducted data collection and J. M. Hooley and S. A. St. Germain analyzed the data. The manuscript was written by J. M. Hooley and S. A. St. Germain provided critical revisions. Both authors approved the final version of the manuscript.

Acknowledgments

We thank Jason Angel and Jacob Augenstern for their assistance with data collection.

Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

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