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Negative mood and interference control in nonsuicidal self-injury

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Abstract

People who engage in nonsuicidal self-injury (NSSI) often report high levels of impulsivity. However, results from behavioral tasks measuring impulsivity have been mixed: those with a history of NSSI generally perform comparably to healthy controls. Recent research suggests, however, that people who self-injure have specific deficits in response inhibition to negative emotional stimuli. Here, we extend this work by testing whether negative mood impairs interference control in NSSI. 33 participants reporting a history of NSSI (approximately half in the past year) and 31 age- and gender-matched healthy controls completed the multi-source interference task before and after a written negative mood induction designed to increase feelings of worthlessness, guilt, and shame. After the induction, the NSSI group reported increased negative mood but did not show worse interference control. In other words, increased negative mood did not correspond to increased behavioral impulsivity in participants reporting NSSI. Consistent with past research, the NSSI and healthy control groups showed equivalent task performance. This study adds to evidence that NSSI is not characterized by behavioral impulsivity, even in the context of negative mood.

1. Introduction

Nonsuicidal self-injury (NSSI) is the direct, deliberate destruction of bodily tissue without suicidal intent [1]. These behaviors are alarmingly prevalent, and evidence suggests that their frequency may be increasing: As many as 4% of adults and 23% of adolescents report a history of NSSI [2]. NSSI is associated with various forms of psychopathology, including substance misuse, disordered eating, and depression [3]. It is also a robust longitudinal predictor of suicide attempts [4,5]. Recent work has focused on the characteristics of people who engage in NSSI in an effort to identify potential risk factors.

Impulsivity is a trait frequently reported by people who engage in NSSI [6,7]. However, laboratory tasks designed to assess impulsive behavior often do not corroborate these self-reports. Janis and Nock [6] found no differences between adolescents and female adults who engaged in NSSI and matched controls (recruited from psychiatric clinics and the community) on various behavioral measures of impulsivity, including disinhibition, decision-making, and delay discounting. Similarly, Glenn and Klonsky [8] failed to observe differences in motor response inhibition between college students who reported an NSSI history and those who did not. Using the same motor response inhibition task as Glenn and Klonsky [8], Fikke, Melinder, and Landrø [9] reported that community adolescents engaging in "low-severity" NSSI had worse performance than those engaging in "high-severity" NSSI. However, both NSSI groups were equivalent to controls in motor response inhibition. McCloskey et al. additionally demonstrated comparable behavioral impulsivity on several laboratory tasks among self-injuring adults, psychiatric controls, and healthy volunteers recruited from the community [10].

Yet evidence of impulsive behavior in NSSI is sometimes reported. For example, in contrast to Janis and Nock [6], Oldershaw et al. [11] found that adolescents who reported recent deliberate self-harm made more impulsive choices on a decision-making task than those without a history of deliberate self-harm. In this study, adolescents were recruited from community mental health centers and self-harm was conceptualized to include both NSSI and suicidal acts. However, these conflicting data raise an important question. What accounts for the discrepancy between self-reported and behavioral impulsivity in NSSI?

Impulsivity is a multi-faceted construct. Negative urgency, or the tendency to act rashly when experiencing negative

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emotions [12,13], is an aspect of impulsivity with intuitive and empirical relevance to NSSI [7]. For example, people who self-injure often report unpleasant mood states prior to NSSI [14], as well as improved mood and reduced negative emotional arousal after simulating or engaging in these acts [15–18]. Recent research further supports the role of negative urgency in NSSI by demonstrating that individuals who self-injure exhibit impaired response inhibition *specifically* to negative emotional stimuli [19]. In that study, participants with an NSSI history had more difficulty than control participants suppressing prepotent motor responses to images with negative emotional content, but not to those with neutral or positive content. To our knowledge, this is the first piece of evidence suggesting a response inhibition deficit in NSSI, and importantly, this deficit was observed only with negative emotional stimuli. This finding may help to explain the absence of behavioral impulsivity in previous studies that did not include emotional stimuli or mood manipulations.

If NSSI is a consequence of heightened negative urgency, negative mood might elicit other forms of behavioral impulsivity in people who self-injure. Impulsive acts reflect a failure in inhibitory control, which refers to a set of overlapping cognitive processes with putative sequential/hierarchical relationships [20,21]. The components of inhibitory control include interference control and motor response inhibition, which are considered to represent early and late stage inhibition, respectively [22]. Behavioral impulsivity tasks that rely on these processes increase in complexity and corresponding inhibitory demands from early to late stage inhibition [22].

The Stop-Signal Task (SST) [23] assesses the cancellation of an already initiated response, or motor response inhibition. Using a modified version of this task, we previously found that people with a history of NSSI had relative difficulty suppressing prepotent responses to images with negative emotional content [19]. This work raises the question of whether negative emotional context also affects early stage inhibitory control in NSSI. Thus, in the present study we sought to determine if negative mood disrupts interference control, or early stage inhibition that requires selective attention to a target while suppressing distracting stimulus characteristics [24]. To test this possibility, we administered the multi-source interference task (MSIT) [25] to individuals with and without a history of NSSI before and after a negative mood induction. The MSIT maximizes cognitive interference by combining aspects of other similar tasks (e.g., the Stroop task, the Eriksen-Flanker, and the Simon effect task) [25,26]. Action cancellation tasks such as the SST are more complex than interference control tasks, and thus thought to increase inhibitory load [22]. However, in addition to the demands inherent to the MSIT (e.g., target detection, response selection, and stimulus competition), we further enhanced cognitive interference in this study by introducing a negative mood induction. In sum, the goal of the modified SST used in our previous study was to cancel prepotent motor responses to emotional stimuli (i.e., motor response inhibition, or late stage inhibitory control); conversely, the modified MSIT procedure used in this study required participants to select a target stimulus while inhibiting interference from distractor stimuli and from negative mood (i.e., interference control, or early stage inhibitory control). Both studies examine the role of emotional inhibition to help clarify the discrepancy between self-reported and behavioral measures of impulsivity in people who self-injure.

Based on prior research indicating no general response inhibition impairment in NSSI, we expected no differences in interference control between the NSSI and healthy control groups in the absence of negative mood. However, we predicted that, following a negative mood induction, the NSSI group would exhibit reduced interference control from baseline, reflecting an increase in behavioral impulsivity consistent with previous studies indicating high negative urgency in this population. In contrast, we expected no difference in behavioral impulsivity in the healthy control group from baseline to post-induction, reflecting resilience to the effects of negative mood on interference control. Similarly, we predicted that the NSSI group would show worse interference control relative to the control group only after the negative mood induction. In line with literature reporting high trait negative emotionality in NSSI [27–29], we hypothesized that participants with an NSSI history would show more negative mood and less positive mood before and after the negative mood induction, relative to the control group. Although we expected negative mood to increase and positive mood to decrease in both groups as a consequence of the negative mood induction, we further predicted that NSSI participants would demonstrate a greater increase in negative mood and decrease in positive mood.

2. Method

2.1. Participants

Participants were 67 adults (aged 18+): 33 in the NSSI group (25 females; 8 males) and 34 healthy controls (22 females; 12 males) recruited from the community (mean age = 23.46 years; *SD* = 6.84; see Table 1 for demographic information). Potential participants were screened using an online survey. To qualify for the study, participants in the control group were required to have: a) no history of Axis I mental disorders, b) no current psychoactive medication use, and c) no history of concussions. Three participants from the control group (1 female and 2 males) reported a past suicide attempt and were thus excluded from the analyses. Those in the NSSI group reported intentional non-suicidal self-injury (e.g., cutting or burning themselves) at some point in their lifetime. Within this group, 17 (51.51%) participants reported NSSI in the past year, and eight (24.24%) also reported a past suicide attempt. A majority of participants in the NSSI group (n = 22 or 66.67%) reported a psychiatric diagnosis (see Table 2 for a complete list) and 15 participants (45.45%) were currently using psychoactive medication. All but three of these individuals were taking an antidepressant. No participants reported a history of concussions.