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# How does self-injury feel? Examining automatic positive reinforcement in adolescent self-injurers with experience sampling

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## ABSTRACT

One of the most frequently reported, yet understudied, motivations for non-suicidal self-injury (NSSI) involves automatic positive reinforcement (APR), wherein sensations arising from NSSI reinforce and promote the behavior. The current study used experience sampling methodology with a clinical sample of self-injuring adolescents ( $N=30$ ) over a 2-week period during which the adolescents reported NSSI behaviors, and rated if an APR motivation was present, and if so whether that motivation pertained to feeling “pain,” “stimulation,” or “satisfaction.” Over 50% of the sample reported at least one instance of NSSI for APR reasons. No significant differences were found on demographic factors or psychiatric comorbidity for those with and without an APR motivation. However, those with an APR motivation reported elevated NSSI thoughts, longer duration of those thoughts, and more NSSI behaviors. They also reported more alcohol use thoughts, alcohol use, impulsive spending, and binge eating. The most commonly reported sensation following NSSI for APR was “satisfaction.” However those endorsing feeling pain reported the most NSSI behaviors. These findings provide new information about the APR motivations for NSSI and shed light on the different sensations felt.

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## 1. Introduction

The most commonly reported motivation for non-suicidal self-injury (NSSI) is an attempt to reduce or escape from negative emotions and/or thoughts (ANR; Nock and Prinstein, 2004, 2005; Klonsky, 2007). However, a less common but frequently reported motivation for NSSI pertains to automatic positive reinforcement (APR; Nock and Prinstein, 2004), wherein NSSI is used to elicit feelings or sensations that ultimately reinforce and promote the behavior. Despite being a common motivation or function of NSSI, APR motivations have not been well studied in the context of self-injury. Furthermore, although existing studies indicate that APR is often reported as a motivation for NSSI, the percentage of those endorsing this motivation as one of the functions of NSSI varies from study to study. One found that 62% of an adolescent sample endorsed NSSI to “elicit feelings” (Nixon et al., 2002), 92% of an adult sample of women with a history of NSSI endorsed feeling generation as a motivation (Turner et al., 2012), and an epidemiologic study found that up to 36% of self-injurers reported engaging in NSSI “to feel something because you were feeling numb or empty” (Klonsky, 2011). Furthermore, in another adolescent sample

approximately 23.5% reported engaging in NSSI “to feel relaxed,” while 34% reported using NSSI “to feel something, even if it was pain” (Nock and Prinstein, 2004). Thus, research has yet to clearly establish the rate at which self-injurers report APR motivations.

Difficulty with establishing rates of APR motivations for NSSI may be in part because the descriptions of APR motivations are inconsistent from study to study. As an example, reports on the specific sensation of pain during NSSI are mixed. It is well documented that many self-injurers report pain analgesia during self-injury (Russ et al., 1992; Schmahl et al., 2006), yet there is also evidence that pain might act in some way as an APR function for some self-injurers (Bresin and Gordon, in press; Gordon et al., 2010). One study of adolescent self-injurers found that although many reported feeling no pain during self-injury, over half reported feeling a least some to severe pain (Nock et al., 2006). Thus, it is difficult to determine “what” exactly is being felt during NSSI engaged in for APR reasons, which makes understanding this motivation for NSSI even more complicated.

Perhaps one way to advance the understanding of APR motivations for NSSI may be to recognize that NSSI for APR may elicit different sensations in different people, depending on a variety of factors. Previous studies have examined NSSI to feel “something” with the general assumption that what they are attempting to feel is the same in most cases (e.g., pain). However, there is some evidence that NSSI for APR motivation may at times involve

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sensation seeking, where NSSI is engaged in, in order to generate feelings of excitement or exhilaration in a similar manner as other risky behaviors such as skydiving (Nixon et al., 2002; Osuch et al., 1999; Klonsky, 2007). In line with this possibility, one study of adolescents found that close to 10% of those who engaged in NSSI reported doing so because they thought it would be “fun” (Laye-Gindhu and Schonert-Reichl, 2005) and another study reported that a similar percentage engaged in NSSI for “excitement” (Nixon et al., 2002). Although many self-injurers may be attempting to feel pain at times with NSSI, different people or different NSSI scenarios may involve attempts to elicit other sensations. Thus, in the present study, we define APR in the case of NSSI as an instance of NSSI that was engaged in specifically to “feel” a sensation, such as to feel stimulation, satisfaction, or pain. This is in contrast to engaging in NSSI to escape or remove an unpleasant thought or feeling, instances that would be classified as ANR. This definition of APR is consistent with empirical evidence that motivations such as trying to “feel relaxed” or “trying to feel something, even if it was pain” tend to load onto the same factor (Nock and Prinstein, 2004), suggesting there may be positive reinforcement taking place, regardless of the specific sensation being reported (e.g. pain vs relaxation).

The potential distinctions between NSSI for APR motivation, as opposed to NSSI for ANR motivations, are also highlighted in the various theoretical models attempting to explain NSSI functions. Some functional models of NSSI have suggested that it might be used to interfere with dissociative episodes, where the pain or sight of blood in NSSI would “shock” the individual out of a dissociative episode (Gunderson, 1984). Similarly, there are findings that suggest that the sight of blood is a reinforcing aspect of NSSI (Glenn and Klonsky, 2010; Selby and Joiner, 2009), and many self-injurers report that seeing blood during NSSI makes them “feel real” and helps them “focus.” However, most affect regulation models of NSSI do not distinguish between aversive and pleasant sensations felt in the process of self-injury and are still limited in their attempts to understand why NSSI is selected over other behaviors as a specific method for emotion regulation.

Another model of NSSI, which may be particularly relevant to understanding sensation seeking or other APR motivations for self-injury, is the opioid hypothesis model (Chapman et al., 2006; Sher and Stanley, 2008). In this view, NSSI may be used to elicit endogenous opioids through deliberate tissue damage, and the release of these opioids may result in pain analgesia and act in some ways like a natural drug that results in feelings of euphoria. The opioid generation model is supported by some findings that self-injurers had significantly lower levels of cerebrospinal fluid levels of  $\beta$ -endorphins and met-enkephalin compared to those who did not engage in NSSI (Stanley et al., 2010). However, potential positive APR motivations that might be consistent with the opioid hypothesis of NSSI have not been well examined in relation to other APR sensation motivations, such as feelings of pain.

Finally, although a number of studies have identified multiple APR motivations for NSSI, few studies have examined these motivations in multivariate analyses predicting NSSI frequency. Such analyses may provide more insight into the shared variance between differing APR motivations, potentially highlighting if certain APR motivations are more salient predictors of NSSI frequency than others (e.g., is feeling satisfaction a stronger motivator for NSSI than feeling pain is?). At present, there is little information regarding whether one APR motivation is a more salient predictor of NSSI relative to others, suggesting that further exploration of this issue is needed.

### 1.1. Current study

One important methodological note with previous studies examining APR motivations for NSSI is that most have examined

NSSI using retrospective self-report methods during laboratory assessments, which leaves the report of motivations for self-injury potentially biased by poor recall. One way to diminish the impact of recall bias is through the use of experience sampling, which involves daily assessment over multiple days, allowing participants to report experiences in their natural settings as they occur. Using experience sampling, a more accurate depiction of APR motivations and sensations can be captured, as well as potential associations with frequency of actual NSSI behavior and thoughts.

In the present study, we examined experience sampling data from a group of adolescent self-injurers who were monitored over a period of two-weeks and reported NSSI events as they occurred. Using these data we compared those who reported at least one instance of NSSI for APR motivations during monitoring to adolescents who did not on multiple demographic and psychiatric indices. We also examined group differences in total frequency of NSSI thoughts and behaviors, as well as thoughts about and actual reports of other dysregulated behaviors (e.g. binge eating, alcohol use). To our knowledge, this is the first study to conduct such analyses. Furthermore, in the present study we also examined potential differences between different APR motivations for and sensations felt during NSSI, specifically pain, stimulation, and satisfaction. A better understanding of these specific sensations in the role of NSSI may refine our understanding of what competing sensations are at play in NSSI. In addition to these primary analyses, we also conducted two exploratory multivariate analyses using each of the APR motivations assessed as predictors of total NSSI frequency. The first multivariate analysis examined the specific sensations the participant was attempting to feel, the second examined what sensations were actually felt as a result of NSSI. These analyses allowed for the determination if some APR motivations were more salient predictors of NSSI behavior than others. Finally, examining NSSI in adolescents represents a major advantage for understanding APR motivations, as motivation for and experience of sensations may change over time and following development into an adult, potentially due to factors such as habituation to NSSI sensations (Van Orden, et al., 2010). Thus, fewer confounding factors may be present in an adolescent as compared to an adult sample.

## 2. Methods

### 2.1. Participants

This study examined data from 30 adolescents with clinically significant NSSI (ages ranged from 12 to 19 years,  $M = 17.3$ ,  $S.D. = 1.9$ ), who completed an experience sampling study on the characteristics of self-injurious thoughts and behaviors (Nock et al., 2009). Participants for this study were recruited from the surrounding community of a northeastern university by contacting local treatment centers. Participants were included into the study if they endorsed both of the following criteria: (1) presence of NSSI thoughts in the past 2 weeks and (2) had access to a computer. There were no exclusion criteria. All participants and their parents completed informed consent and assent to participate in the study, and the study was approved by the university IRB board. The sample was 86.7% female, 86.7% European American, 6.7% Hispanic, and 6.7% other race/ethnicity.

### 2.2. Procedures

Participants first completed a baseline diagnostic interview for history of self-injurious thoughts and behaviors and a psychiatric interview, and then they were trained on the experience sampling protocol. All were provided with personal digital assistants (PDAs) and were trained on how to use the equipment. Participants then engaged in a 14-day assessment protocol, during which the PDAs were programmed to signal participants to complete the experience sampling assessment. Signals alerted participants two times each day, one at midday and the other at end-of-day. Participants were also instructed to complete event-contingent recordings where they initiated a PDA entry whenever they experienced a “self-destructive” thought or behavior. Data from PDAs were uploaded onto a secure server each evening. Participants were compensated upon returning to the lab at

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