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Short Communication

Emotional reactivity in nonsuicidal self-injury: Divergence between self-report and startle measures

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ABSTRACT

The current study examined emotional reactivity in nonsuicidal self-injurers and noninjuring controls using self-report (the Emotional Reactivity Scale: ERS) and psychophysiological measures (the startle reflex was measured during and after the presentation of IAPS images). Self-injurers reported greater emotional reactivity on the ERS, but did not exhibit differences in startle modulation during or after picture viewing compared to controls. Results suggest a divergence between self-report and psychophysiological measures of emotion in NSSI.

1. Introduction

Nonsuicidal self-injury (NSSI; e.g., skin-cutting and burning) refers to the deliberate injury of body tissue without suicidal intent (Klonsky and Glenn, 2009; Whitlock et al., 2006). NSSI has become a significant public health problem occurring in up to 14–15% of adolescents (Ross and Heath, 2002) and 17% of college students (Whitlock et al., 2006). Although NSSI can serve multiple purposes, it most often functions to reduce negative emotional experience (Klonsky, 2007): intense negative emotional states appear to precede engagement in NSSI (Nock et al., 2009), and decreases in negative affect following NSSI predict lifetime frequency of the behavior (Klonsky, 2007). Given that NSSI most often serves an emotion regulation function, it is not surprising that individuals who self-injure report more frequent and intense emotions (Klonsky et al., 2003; Nock et al., 2008), and greater difficulty dealing with unpleasant emotions (Gratz and Roemer, 2008; Heath et al., 2008; Nock, 2009).

Despite the mounting evidence of heightened negative emotionality in NSSI, most studies have not assessed physiological measures sensitive to emotion, or the convergence between multiple measures of emotion in NSSI. One study found that self-injurers are characterized by increased skin conductance compared to noninjurers during stressful tasks (Nock and Mendes, 2008). However, skin conductance measures arousal but does not distinguish between pleasant and unpleasant emotional states. Given the prominent role of negative emotionality in NSSI, this work might be supplemented by biological markers of emotional processing that are sensitive to negative valence.

In addition, it is important to consider how an emotional response may vary over time. Davidson (1998) articulated multiple aspects of emotional responding (i.e., affective chronometry) which could be abnormal among individuals who engage in NSSI. Specifically, the current study focuses on the possibility that individuals who engage in NSSI may differ in terms of reactivity (i.e., the magnitude of response to an emotional stimulus) and/or delayed recovery (i.e., less reduction in reactivity following an emotional challenge). Understanding whether individuals who engage in NSSI are characterized by heightened reactivity or delayed recovery, or both, may help explain the intense negative emotionality reported by those who self-injure.

The current study evaluated these aspects of affective chronometry in NSSI using a multimethod approach. First, we utilized a self-report instrument that assesses multiple aspects of emotionality: the Emotional Reactivity Scale (ERS; Nock et al., 2008). The ERS is a validated self-report measure of emotional reactivity that has been found to mediate the relationship between psychopathology and self-injurious thoughts and behaviors (Nock et al., 2008).

Second, we examined emotionality in NSSI using a psychophysiological measure that is sensitive to emotional valence, and has been used extensively to measure emotional processing in relation to psychopathologies characterized by negative emotionality (see reviews: Grillon and Baas, 2003; Vaidyanathan et al., 2009): the defensive startle reflex. In humans, the startle reflex is most often measured by the

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eyeblink response, an initial and rapid protective behavior. The startle reflex is largest when individuals are viewing unpleasant stimuli and smallest when viewing pleasant stimuli (Bradley et al., 1990; Vrana et al., 1988).

Moreover, studies have assessed startle responding both during and after picture presentation (i.e., in the postpicture period). Although some studies suggest little to no affective modulation of startle following picture offset (Bradley et al., 1993; Dichter et al., 2002), Schupp et al. (1997) found a significant, yet weaker, affective modulation pattern after picture offset (also see Dillon and LaBar, 2005). Jackson et al. (2003) suggest that less startle potentiation after aversive picture offset may indicate greater emotional recovery and automatic return to baseline.

The current study utilized a multimethod approach to study emotional reactivity in NSSI, including a self-report instrument of emotional reactivity and a startle paradigm, similar to Jackson et al. (2003; also see Larson et al., 2007), to examine defensive reactivity during and after picture viewing. A young adult sample is particularly relevant because rates of NSSI are disproportionately high in this population (Whitlock et al., 2006). Based on existing research indicating increased negative emotionality in NSSI (Gratz and Roemer, 2008; Heath et al., 2008; Nock and Mendes, 2008), we hypothesized that self-injurers would report greater emotional reactivity on the ERS and would exhibit greater emotional reactivity during unpleasant picture viewing, and would maintain this greater startle potentiation in the postpicture period compared to controls.

2. Methods

2.1. Participants

Participants were 78 young adults from a college population: 41 self-injurers (73.2% female; *M* age = 19.98 years, *SD* = 1.99; 51.2% Caucasian) and 37 noninjuring controls (62.2% female; *M* age = 19.56 years, *SD* = 1.69; 56.8% Caucasian). The self-injuring sample was recruited from a larger study on NSSI (for initial recruitment, demographic, and clinical details, see Glenn and Klonsky, 2010). Approximately 63% of the self-injuring sample engaged in some form of NSSI during the previous 12 months, and half had engaged in two or more NSSI methods. The most common behaviors (assessed with the ISAS; see Self-report measures section) were banging/hitting self (performed by 46.9% of the sample, *M* frequency = 18.67, *SD* = 38.28, *Range* 1 to 150), and cutting (performed by 43.8% of the sample, *M* frequency = 12.36, *SD* = 15.87, *Range* 1 to 59). The most common NSSI functions were affect regulation (endorsed by 95.1% of self-injurers, *M* = 1.85, *SD* = .85), interpersonal boundaries (endorsed by 92.7%, *M* = 2.05, *SD* = 1.24), and self-punishment (endorsed by 90.2%, *M* = 2.49, *SD* = 1.27).

2.2. Stimuli and presentation

Participants viewed 54 images (18 unpleasant, 18 neutral, and 18 pleasant) from the International Affective Picture System (IAPS; Lang et al., 2005).[1] IAPS images were randomly presented for 8 s, in color on a 19-inch monitor set to a resolution of 1024 × 768 pixels, using PSYLAB 8 software (Contact Precision Instruments; Cambridge, MA). Stimuli viewing distance was 25 in. and each stimulus occupied approximately 27° of visual angle vertically and 33° of visual angle horizontally. Auditory startle probes, consisting of 50 ms, 105 dB bursts of white noise with near instantaneous rise time, were presented binaurally through headphones. Startle probes were produced with a noise/tone generator (Contact Precision Instruments; Cambridge, MA).

2.3. Self-report measures

The frequency and functions of nonsuicidal self-injury (NSSI) were measured using the Inventory of Statements about Self-Injury (ISAS), a reliable and valid measure of NSSI (Klonsky and Glenn, 2009; Klonsky and Olino, 2008). The ISAS measures the frequency of 12 NSSI behaviors (e.g., cutting and burning), as well as 13 functions of NSSI (e.g., affect regulation and peer bonding). In addition, a brief structured interview was used to confirm a history of NSSI.

Self-reported emotional reactivity was measured using the Emotional Reactivity Scale (ERS; Nock et al., 2008), which contains 21 items that assess three areas of emotional reactivity: emotional *sensitivity* (e.g., "I tend to get emotional very easily"; 8 items: total scale 0–32), emotional *arousal/intensity* (e.g., "I experience emotions very strongly"; 10 items: total scale 0–40), and emotional *persistence* (e.g., "When I am angry/upset, it takes me longer than most people to calm down"; 3 items: total scale 0–12).

Participants provided valence and arousal ratings of the IAPS pictures, after the startle task, using the Self-Assessment Manikin (SAM; Lang, 1980): (a) valence — rated from 1 = *extremely pleasant* to 9 = *extremely unpleasant*, and (b) arousal — rated from 1 = *extremely aroused* to 9 = *extremely calm.*

2.4. Procedure

All participants were tested individually in a sound-attenuated enclosure. An initial 4-trial habituation phase was used to reduce extreme startle responses from the first few trials. During the actual experiment, startle probes were presented randomly either during (6 pleasant, 6 neutral, and 6 unpleasant) or after (6 pleasant, 6 neutral, and 6 unpleasant) picture presentation; to decrease startle predictability, no startle probes were presented on the other 18 trials. Intertrial intervals ranged from 12 to 14 s; there were no specific instructions for the intertrial intervals.

Startle probes during picture presentation (used to quantify reactivity) were presented randomly between 4 and 6 s after picture onset in order to approximate peak startle magnitude based on work by Bradley et al. (1993). Based on previous studies, startle probes were presented randomly between 4 and 6 s after picture offset to measure recovery (Bradley et al., 1993; Dillon and LaBar, 2005; Schupp et al., 1997). IAPS images were grouped into 6 blocks of 9 images, so that each block included 3 images from each picture category and from each startle timing category. Following the startle task, participants completed the self-report measures.

2.5. Physiological data recording, reduction, and analysis

Startle-elicited EMG activity was recorded using a PSYLAB Stand Alone Monitor (SAM) Unit and an attached BioAmplifier system (Contact Precision Instruments; Cambridge, MA). Consistent with startle guidelines (see Blumenthal et al., 2005), two electrodes, 4 mm diameter Ag–AgCl filled with electrode gel (TD-40; Mansfield R & D), were positioned beneath the left eye over the orbicularis oculi muscle approximately 25 mm apart. A third electrode was placed on the forehead to serve as an isolated ground. EMG activity was sampled at 1000 Hz and filtered between 30 and 500 Hz. EMG responses were rectified in a window 200 ms wide, beginning 50 ms before the onset of the startle probe. To smooth out sharp peaks, a 6-point running average was applied to the rectified data. Startle amplitude was expressed as the difference between the average of the EMG data in the 50 ms window prior to the startle probe and the maximum in the 150 ms post-probe window. Data for each participant was then examined on each trial. Trials where the baseline included excessive

[1] The following images were selected from the International Affective Picture System (IAPS; Lang et al., 2005): pleasant — 1463, 1710, 1811, 2070, 2080, 2092, 2165, 2311, 2340, 4180, 4460, 4651, 4659, 4660, 4669, 4810, 7325, and 8461; neutral — 2320, 2570, 2580, 2870, 5390, 5410, 5532, 5534, 5731, 7009, 7010, 7025, 7041, 7140, 7175, 7224, 7235, and 7550; and unpleasant — 1050, 1300, 3261, 3500, 3530, 6230, 6250, 6313, 6510, 6560, 6571, 9250, 9253, 9400, 9405, 9410, 9420, and 9433.