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Brief report

Low physiological arousal and high impulsivity as predictors of self-injurious thoughts and behaviors among adolescents

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ABSTRACT

Self-injurious thoughts and behaviors are used to escape or regulate aversive physiological states during stress. Low sympathetic nervous system arousal during stress has been shown to confer risk. This risk may be exacerbated by trait impulsivity; adolescents high in impulsivity are more likely to rashly use maladaptive regulation strategies. We examined this relationship longitudinally in a sample of adolescents ages 10 to 14 (55.4% female) from the United States. Consistent with our hypothesis, low arousal during stress and high trait impulsivity interacted to predict the use of self-injurious thoughts and behaviors over a six-month period. This study extends and clarifies previous research findings regarding the relationship between physiological arousal and self-injurious thoughts and behaviors.

Self-injurious thoughts and behaviors refer to "directly and deliberately" injuring oneself and includes suicidal ideation, suicide attempts, suicidal gestures, nonsuicidal self-injury and thoughts about self-injury (Nock & Favazza, 2009, p. 10). Among adolescents, these thoughts and behaviors are major mental health problems with twelve-month prevalence rates ranging from 11.7 to 26.0% for suicidal ideation, 1.8–8.4% for suicide attempts (Nock et al., 2008), and 7.5% for nonsuicidal self-injury (Hilt, Nock, Lloyd-Richardson, & Prinstein, 2008). These thoughts and behaviors tend to onset during adolescence, a time when youth experience an increase in stress and emotional reactivity (Romeo, 2010), and occur at higher rates compared to children and adults (Nock et al., 2008). Self-injurious thoughts and behaviors are associated with negative outcomes, including distress (Klonsky, 2007), common mental health problems, such as depression and anxiety, (Andover, Pepper, Ryabchenko, Orrico, & Gibb, 2005; Klonsky, Oltmanns, & Turkheimer, 2003), and increased risk for suicide (Jacobson & Gould, 2007; Klonsky, May, & Glenn, 2013). Although there are important distinctions between forms of self-injurious thoughts and behaviors (Nock & Favazza, 2009), literature suggests these thoughts and behaviors are closely related and display common vulnerabilities and outcomes (Nock & Kessler, 2006; Reinherz, Tanner, Berger, Beardslee, & Fitzmaurice, 2006). Further, these behaviors often co-occur and the rate of engaging in any one form remains low (Nock et al., 2008); thus, studying these behaviors and thoughts together is appropriate to understand onset and trajectory.

A predominant theory suggests self-injurious thoughts and behaviors are maladaptive strategies used to regulate emotional states and corresponding physiological arousal when individuals lack or fail to utilize adaptive regulation strategies (Nock & Prinstein, 2004; 2005). This includes the up-regulation and down-regulation of aversive arousal states. Individuals experiencing high physiological arousal to stressors may engage in self-injurious thoughts and behaviors as a means of alleviating physiological responses associated with emotional distress (Nock & Mendes, 2008), whereas others experiencing low physiological arousal may engage in such thoughts and behaviors to up-regulate low arousal and generate stimulation (Klonsky, 2007; Selby, Nock, & Kranzler, 2014). Previous research has generally focused on the down-regulation of high physiological arousal and negative affective states (Anestis,

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Kleiman, Lavendar, Tull, & Gratz, 2014; Nock & Mendes, 2008); however, research among adults indicates that lower physiological arousal during stress is associated with suicide attempts and threats (Spiegel, 1969) and suicidal ideation (Thorell, 2009; Thorell et al., 2013). Less research exists among adolescents and past studies have yielded mixed significant and non-significant findings regarding the relationship between low physiological arousal and self-injurious thoughts and behaviors (Crowell et al., 2005, 2012).

Low physiological arousal is described as a subjectively aversive physiological state (Raine, 2002). Low arousal is associated with emotions including boredom, sadness, numbness, and emptiness. Studies of adolescents and adults indicate that low arousal emotions decrease following some types of self-injury (Claes, Klonsky, Muehlenkamp, Kuppens, & Vandereycken, 2010; Klonsky, 2009; Lloyd-Richardson, Perrine, Dierker, & Kelley, 2007). Furthermore, emotions and sensations such as relief, stimulation, or satisfaction increase following self-injury, suggesting that affective change reinforces engagement in self-injury (Claes et al., 2010; Klonsky, 2009; Selby et al., 2014). Youth with low physiological arousal are more likely to seek out stimulation to reduce the unpleasant nature of a low-arousal state (Raine, 2002). During stressful situations, youth may attempt to alter their low arousal by engaging in self-injurious thoughts or behaviors. Research has suggested that physiological arousal is a relatively stable trait, with stability achieved around age 7 (El-Sheikh, 2007). In order to understand the risk associated with low arousal, it is necessary to use a longitudinal design, which yields a more rigorous test current physiological functioning and engagement in self-injurious thoughts and behaviors. Given the mixed findings of previous research, low arousal alone may not be a sufficient predictor of self-injurious thoughts and behaviors among adolescents.

Impulsivity may exacerbate the relation between low arousal and self-injurious thoughts and behaviors. Broadly, impulsivity refers to a tendency to engage in behaviors without planning and thought for risks or consequences (Whiteside & Lynam, 2001). During adolescence, a rise in risk-taking or novelty-seeking behaviors emerges (Harden, Quinn, & Tucker-Drob, 2012); this increase may be especially salient for adolescents high in trait impulsivity, who develop self-regulation strategies more slowly (Shaw et al., 2011). Youth low in trait impulsivity may use more adaptive emotion regulation strategies to manage stress without reliance on self-injurious thoughts and behaviors. Conversely, youth high in trait impulsivity may be unable to think through the long-term consequences of self-injury or suicide (Crowell et al., 2005; Klonsky, 2007) and use self-injurious thoughts and behaviors as an immediate way to alter their arousal and create sensation. Trait impulsivity has been shown to prospectively predict engagement in self-injury (Claes et al., 2015; Glenn & Klonsky, 2010).

In the current study, we examined the joint influence of arousal and impulsivity as predictors of engagement in self-injurious thoughts and behaviors among adolescents over a six-month period. We hypothesized that impulsivity would moderate the effect of arousal on self-injurious thoughts and behaviors, such that youth with low arousal to a stressor and high trait impulsivity would be most likely to prospectively engage in self-injurious thoughts and behaviors.

1. Method

Participants were 121 (55.40% female) adolescents recruited from middle schools in the Pacific Northwest of the United States (M_{age} = 12.86, SD = 0.85). Participants were recruited during a school-based screening and invited to complete laboratory visits if the child was below the clinical cutoff for depressive symptoms on the Children's Depression Inventory-2 (CDI-2; Kovacs, 2010) and if both child and parent were fluent in English. During the baseline assessment (T1), adolescents and parents completed questionnaires and were interviewed by trained researchers to assess the adolescent's lifetime history of self-injurious thoughts and behaviors. Adolescents completed a stressor paradigm consisting of baseline, stressor, and recovery periods. During the stressor, participants were asked to complete an anagram task in which 50% of the anagrams were unsolvable (Wielgus, Aldrich, Mezulis, & Crowell, 2016). Arousal during stress was measured via electrodermal responding. Following the baseline visit, youth and parents completed a follow-up visit six months later (T2), during which adolescents' self-injurious engagement over the course of the six months was assessed.

1.1. Measures

1.1.1. Self-injurious thoughts and behaviors

Self-injurious thoughts and behaviors were assessed by pooling multiple data sources including self-report, parent-report, and semi-structured interviews. The baseline engagement score represented the youth's lifetime history of self-injurious thoughts and behaviors. Participants were identified as having engaged in self-injurious thoughts and behaviors if they endorsed at least one item pertaining to suicidality or self-harm on the CDI-2 (i.e., “I want to kill myself”) or Youth Self-Report (YSR; Achenbach, 2001; i.e., “I deliberately try to hurt or kill myself”). Adolescents and their parents completed the Kiddie Schedule of Affective Disorders and Schizophrenia for School-Age children, Present and Lifetime version (K-SADS-PL; Kaufman, Birmaher, Brent, Rao, & Ryan, 1996). Participants were identified as having engaged in self-injurious thoughts and behaviors if they or their parent endorsed questions regarding suicidal ideation, suicide attempts/gestures/threats, and self-injury. At T2, youth were identified through the same methods, however the YSR was not administered.

1.1.2. Sympathetic nervous system arousal

Sympathetic nervous system arousal was assessed during the stressor paradigm through electrodermal responding, as the eccrine sweat glands are enervated by the cholinergic fibers of the sympathetic nervous system during stressful or threatening situations (Beauchaine, 2001; Fowles, 1986). Electrodermal responding data were measured continuously using Biopac MP150 Data Acquisition Unit (Goleta, CA) and sampled at 15.625 Hz with a gain of 5 μmhos and a low-pass filter of 10 Hz with the AcqKnowledge software