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Review

Endogenous opioids and nonsuicidal self-injury: A mechanism of affect regulation

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ABSTRACT

Nonsuicidal self-injury (NSSI), or the purposeful destruction of body tissue occurring without suicidal intent, is a perplexing behavior as it goes against the natural instinct to maximize pleasure and minimize pain. One possible reason that people engage in NSSI is to regulate affect. However, the exact mechanisms that cause NSSI to lead to reduced feelings of negative affect remain unclear. Due to its involvement in the regulation of pain and emotion, the endogenous opioid system has been proposed to mediate the affect regulation effects of NSSI. The authors review evidence from multiple literatures to support this claim. Based on the current research, it is proposed that (1) individuals who engage in NSSI have lower baseline levels of endogenous opioids, (2) NSSI releases endogenous opioids, and (3) opioids released during NSSI regulate affect. These predictions are discussed in terms of previous models and other functions of NSSI.

Contents

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1. Introduction

Nonsuicidal self-injury (NSSI), the purposeful destruction of body tissue that occurs without suicidal intent, has been of increasing interest to researchers in recent years (Klonsky, 2007; Nock, 2009, 2010). NSSI is a perplexing behavior, as it goes against the common principle of approach/maximize pleasure and avoid/minimize pain (Freud, 1929; Gray, 1982; Kahneman and Tversky, 1979; Mowrer, 1960). In an effort to understand why some individuals engage in this behavior, researchers have focused on the possible functions of NSSI. Of the proposed functions, the idea that NSSI may regulate affect has received the most theoretical and empirical attention (Klonsky, 2007; Nock and Prinstein, 2004). However, the specific mechanisms by which NSSI leads to a change in affect are still unclear. It seems intuitive to assume that the endogenous opioid system may play a role, because of its role in pain and affect regulation (Ribeiro et al., 2005). The goal of this paper is to review the potential role for the endogenous opioids system in the affect regulation function of NSSI.

2. Overview of nonsuicidal self-injury

As mentioned above, NSSI is any self-inflicted behavior, outside of what is considered culturally acceptable (e.g., tattoos, piercings), that causes injury without suicidal intent (Nock, 2010; Silverman et al., 2007). NSSI differs from other suicide-related behaviors (e.g., a suicide attempt) in that there is no intent to end one's own life. NSSI differs from risk taking behaviors (e.g., skydiving) because body damage is the intended purpose, not simply a possible byproduct of the behavior. NSSI occurs in both individuals with normal intellectual functioning and individuals with developmental disabilities (e.g., Nock and Favazza, 2009). Similar behaviors have also been found in nonhuman primates (e.g., rhesus monkeys; Tiefenbacher et al., 2003). It should be noted that our focus is on individuals with normal intellectual functioning. However, we review studies from multiple areas. Limitations to this approach are revisited in the discussion. Common methods of NSSI in individuals with normal intellectual function include: skin cutting, burning, severe scratching, and hitting (Klonsky and Olino, 2008). It is common for individuals to use more than one method (Gratz, 2001). The average age of onset for NSSI is early adolescence (Kumar et al., 2004). However, research on the typical development of NSSI and longitudinal course is limited (though see Zanarini et al., 2008).

2.1. Prevalence

The prevalence of NSSI varies by demographic characteristics. For instance, lifetime prevalence rates are higher for adolescents (14–39%; Heath et al., 2009) and college students (11–38%; Heath et al., 2008; Gratz et al., 2002) than for non-college adults (4%; Klonsky et al., 2003). Additionally, prevalence rates are higher for clinical samples than community samples (40–60% vs. 14–39%; Darche, 1990; DiClemente et al., 1991). Gender differences in NSSI have been inconsistent across studies. However, it appears that studies using adolescent samples find higher rates for girls than boys, but studies using young adult (e.g., college samples) find no gender differences (Sornberger et al., 2012).

In the *Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition, Text Revision* (*DSM-IV-TR*; American Psychiatric Association, 2000), the only explicit mention of NSSI is within the criteria for borderline personality disorder (BPD). This has led to a common belief that NSSI only occurs within the context of BPD. However, there are multiple lines of evidence which contradict this position. First, though NSSI is present in 70–80% of individuals with BPD (Clarkin et al., 1983), others have reported that when this symptom is controlled for, many individuals no longer met criteria (Herpertz et al., 1997). Along these lines, when individuals with BPD stop engaging in NSSI, many of them no longer meet diagnostic criteria (Favazza and Rosental, 1990). Second, NSSI is also related to other personality pathology, such as vulnerable narcissism, schizotypal, and psychopathic traits (Klonsky et al., 2003; Miller et al., 2010). Third, NSSI commonly co-occurs with a variety of Axis I disorders in the absence of BPD, including eating disorders, mood disorders, alcohol/substance use disorders, anxiety disorders, and conduct disorders (Chartrand et al., 2012; Claes et al., 2003; Deliberto and Nock, 2008; Herpertz, 1995; Jacobson et al., 2008; Nock et al., 2006; Serras et al., 2010; Stein et al., 2004; Zlotnick et al., 1999). These arguments have led some to propose that NSSI should be considered to be a distinct disorder (Favazza and Rosenthal, 1993; Muehlenkamp, 2005; Pattison and Kahan, 1983; Selby et al., 2011). In fact, the proposals for *DSM-5* include a NSSI disorder (Shaffer and Jacobson, 2009). Though further research is necessary to fully understand the relationship between NSSI and BPD, it seems clear that the two are not isomorphic. Therefore, there is likely something to gain by studying NSSI even in individuals without BPD. In this review, we focus on NSSI more generally

2.2. Functions of nonsuicidal self-injury

In an attempt to understand NSSI, theorists have proposed multiple functions for the behavior (Klonsky, 2007; Nock and Prinstein, 2004; Suyemoto, 1998). Nock and Prinstein (2004, 2005) suggested a model in which functions differ along two dimensions: reinforcement, which can be negative (i.e., the removal of an aversive stimulus) or positive (i.e., the addition of a stimulus) and contingencies, which can be intrapersonal (internal) or interpersonal (social). The combination of the two dimensions leads to four possible functions for NSSI. Intrapersonal negative reinforcement is when an individual engages in NSSI in order to end a negative emotional state. Intrapersonal positive reinforcement is when an individual engages in NSSI to end periods of prolonged numbness (i.e., "to feel something, even if it's pain"). Interpersonal negative reinforcement is when an individual engages in NSSI in order to avoid undesirable activities (e.g., chores). Interpersonal positive reinforcement is when an individual engages in NSSI in order to elicit attention or support from others. To date, much of the research has focused on intrapersonal negative reinforcement, likely due to the fact that this function is the most commonly endorsed as reasons for engaging in NSSI (Klonsky, 2009; Nock and Prinstein, 2004; Nock et al., 2009).

2.2.1. Reduction of negative affect

Multiple models have been proposed to explain the affect regulation function of NSSI (Chapman et al., 2006; Joiner, 2005; Linehan, 1993; Nock, 2009; Selby and Joiner, 2009). These theories suggest that individuals who engage in NSSI have the propensity of experience frequent NA, which is supported by research showing that individuals who engage in NSSI have higher levels of neuroticism (Baetens et al., 2011; Brown, 2008; Goldstein et al., 2009; Kamphuis et al., 2007; Maclaren and Best, 2010), emotional reactivity (Glenn et al., 2011; Nock et al., 2008), difficulty regulating emotion (Gratz and Roemer, 2008) and affective lability (Karmen et al., 2010). Furthermore, it is posited that individuals who engage in NSSI lack the skills to cope with NA, which is also supported by research (Andover et al., 2007; Fikke et al., 2011; Hasking et al., 2008; Nock and Mendes, 2008). NSSI then is thought to be a maladaptive attempt to regulate NA. In fact, multiple sources of data suggest that most individuals engage in NSSI during a state of high NA (Armey et al., 2011; Chapman and Dixon-Gordon, 2007; Kamphuis et al., 2007; Klonsky, 2009; Muehlenkamp et al., 2009; Nock et al., 2009). It is theorized that NSSI is reinforcing because if relieves NA, at least temporarily, and thus likely to occur during future periods