

## Pain Regulation in Nonsuicidal Self-injury

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Non-suicidal self-injury (NSSI), a new disorder included in the “conditions for further study” section of the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders [1], refers to a deliberate behavior that directly damages one’s own body tissue without suicidal intention [2]. This behavior has become a major public health concern among adolescents, affecting about 18% of community adolescents all over the world [3].

This high prevalence of NSSI may make people wonder why so many adolescents engage in this behavior. We may think that NSSI must cause physical pain. It is against the innate and evolutionary drive of self-preservation. However, although getting involved hurting oneself, as many as 80% of adolescent self-injurers reported little or no pain while engaging in the act [4]. Laboratorial studies using various NSSI proxies (e.g., cold, heat, electric shock) also provided supports for the diminished pain perception in individuals with NSSI [5,6]. Regarding the mechanism underlying the relationship between diminished pain perception and NSSI, studies suggested that emotion dysregulation and self-invalidation may act as potential mediators [7,8].

Apart from the abnormal physical pain perception, the engagement in NSSI also involves social pain dysregulation. Social pain is associated with actual or potential damage to one’s sense of social connection or social value and is often described by the language of physical pain (such as broken hearts, or hurt feeling) across a variety of cultures [9,10].

Interpersonal disturbances, particularly in the family context, may influence the development of NSSI in adolescence [11]. It is suggested that the overall quality of attachment with parents in childhood, injury in parent–child bonds, and experiences of separation and loss may contribute to later NSSI [11-13]. Additionally, maternal emotional neglect (e.g., lack of maternal care), paternal insecure attachment, lack of intimacy within the parent-child relationship, and family invalidation were reported to be associated with NSSI [12,14-16]. In short, when there are problems in parent-child relationships, which are the most important social connections, individuals may suffer social pain, which may then lead to the engagement in NSSI.

Non-suicidal self-injury is not the privilege of humans. Other animals may also engage in NSSI. It is thus meaningful to explore this phenomenon in non-human primates, even in other mammals [17]. Approximately 10% of animals under individual caging (i.e. social isolation) engage in NSSI [18]. Isolated animals, both with and without abnormal rearing, may exhibit NSSI. Besides, the duration of isolation, and the beginning age of isolation may play a key role in determining the extent of risk for later developing NSSI [19].

Previous research suggests that both physical pain and social pain dysregulations may be involved in NSSI. In fact, considerable evidence has been showing that social pain shares parts of the same phenomenological, neurological, and psychological systems with physical pain [10,20]. We thus speculate that one important function of NSSI may be social pain regulation, by means of inflicting physical pain on the body. Several studies have provided preliminary evidence for this speculation, such that acute physical pain (NSSI-proxy) was found to lead to emotional benefits [2,21,22]. Additionally, only under conditions of interpersonal distress did heightened physical pain tolerance among self-injurers occur [23]. Therefore, although most past studies focused on the emotion regulation function of NSSI [24,25], we suggest future research to consider pain regulation as an important mechanism underlying the engagement in NSSI.

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