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Predictive Factors for the Persistence and Cessation of Non-suicidal Self-injury in Adolescents

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Abstract

Non-suicidal self-injury (NSSI) behavior constitutes a critical risk factor for future suicidal intent, suicidal behavior, and chronic psychological disorders. Understanding the factors that predict the continuation or cessation of NSSI behavior among adolescents can provide novel perspectives for early prevention and intervention of this behavior. Grounded in Nock' s integrated theoretical model, a review of domestic and international literature reveals that factors predictive of adolescent NSSI continuation or cessation primarily cluster within three domains: physiological mechanisms, personal traits (emotion and cognition, personality factors, etc.), and social factors (peer factors, family factors, etc.). Future research in this area should employ diversified methodological approaches and NSSI measurement techniques, expand participant populations and research domains to investigate risk and protective factors that predict the developmental trajectory of NSSI behavior, and thoroughly examine the interactive effects among these various factors.

Full Text

Predictors of Continuation and Cessation of Non-suicidal Self-injury in Adolescents

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Abstract

Non-suicidal self-injury (NSSI) represents a significant risk factor for future suicidal ideation, suicide attempts, and long-term psychological disorders. Understanding the factors that predict whether adolescents continue or discontinue NSSI can provide novel perspectives for early prevention and intervention.

Grounded in Nock' s integrated theoretical model, a review of domestic and international literature reveals that predictive factors for NSSI continuation or cessation in adolescents primarily cluster in three domains: physiological mechanisms, personal characteristics (including emotional and cognitive factors, personality traits, etc.), and social factors (such as peer and family influences). Future research should employ diverse methodological approaches and NSSI assessment techniques, expand participant populations and research domains to investigate risk and protective factors that predict the developmental trajectory of NSSI, and further explore interactions among these various factors.

Keywords: non-suicidal self-injury, interpersonal function, intrapersonal function, adolescence, predictive factors

Introduction

Non-suicidal self-injury (NSSI) refers to the deliberate, self-inflicted damage to one' s body tissue without suicidal intent and without social sanctioning (Klonsky, 2011). Common forms include scratching, cutting, hair-pulling, and hitting oneself, with cutting being the most prevalent (Halpin & Duffy, 2020). Most individuals with NSSI histories report using multiple methods of self-harm (Chartrand et al., 2016). NSSI typically begins in early adolescence (Brown & Plener, 2017), a developmental period during which it reaches peak prevalence (Nock, 2010). In community samples of adolescents, the pooled prevalence rate ranges from 17% to 23% (Brown & Plener, 2017; Donna Gillies et al., 2018), increasing to 40% to 80% in clinical samples (Klonsky & Muehlenkamp, 2007). Epidemiological surveys in China indicate that 36% to 57% of adolescents report self-injurious behaviors (江光荣 et al., 2011), with a meta-analysis revealing a 27.4% detection rate among mainland secondary school students (韩阿珠 et al., 2017). These figures demonstrate that NSSI is also highly prevalent in China, and current data suggest its incidence is rising globally (Mannekote Thippaiah et al., 2020), making it a major public health concern in numerous countries (Mummé et al., 2017) that has attracted widespread societal attention (Brown & Plener, 2017).

Beyond the immediate physical harm it causes, NSSI has been shown to increase adolescents' risk for future suicidal ideation and behaviors (Fox et al., 2017; Kiekens & Auerbach, 2018). Extensive research also documents significant associations between NSSI and various psychological disorders, including depression, anxiety, substance abuse, eating disorders, and personality disorders (Schatten et al., 2015). Additionally, researchers have confirmed a clear "contagion"effect of NSSI among adolescents (Brown & Plener, 2017; Syed et al., 2020), posing serious threats to adolescents' social development and long-term mental health (Kruzan & Whitlock, 2019). Beyond individual burden, persistent NSSI requires substantial healthcare resources and economic costs, potentially resulting in lost social productivity (Hepp et al., 2020). Therefore, identifying risk and protective factors associated with NSSI is crucial for effective intervention.

Recent research indicates that NSSI does not necessarily persist throughout life but may change over time. Some individuals discontinue the behavior in late adolescence or early adulthood (Plener et al., 2015), while others continue NSSI beyond adolescence with lasting negative effects (Kiekens et al., 2017). This raises important questions: Why do some individuals stop NSSI while others continue? Exploring these questions can help identify factors that promote or protect against NSSI and inform the design of effective early prevention and intervention strategies.

However, over the past decade, most domestic and international research has focused on NSSI prevalence, assessment methods, correlates, and functions (Bakken, 2021; Juan et al., 2020). While recent foreign studies have begun examining predictors of NSSI continuation and cessation through qualitative and quantitative investigations (Halpin & Duffy, 2020; Kruzan & Whitlock, 2019), relevant theoretical and practical research in China remains scarce. Given the serious and widespread nature of NSSI, this paper reviews recent studies on predictive factors for NSSI continuation or cessation among adolescents, summarizes current limitations, and proposes future research directions to provide new perspectives for domestic research and early intervention efforts.

2. Predictive Factors for Continuation and Cessation of Adolescent NSSI

Nock' s (2010) integrated theoretical model proposes that factors influencing NSSI development involve both intrapersonal and interpersonal domains. Intrapersonal risk factors may lead adolescents to cope with stress through emotional dysregulation, creating a need for NSSI, while interpersonal risk factors may weaken individuals' capacity to manage distress, triggering or exacerbating NSSI (Hamza & Willoughby, 2014; Wang et al., 2020). This model is relatively comprehensive compared to other theories, as it simultaneously considers biological, psychological, and social factors in explaining NSSI onset and development (江光荣 et al., 2011). It follows that predictive factors for NSSI continuation or cessation are unlikely to be singular but rather result from multiple interacting influences.

Following Nock' s (2010) integrated theoretical model, this review organizes predictive factors for adolescent NSSI continuation or cessation into three main categories: physiological mechanisms, personal characteristics, and social factors.

2.1 Physiological Mechanisms

Numerous studies suggest that NSSI continuation or cessation in adolescents may have neurobiological underpinnings. First, abnormal beta-endorphin levels may constitute an important physiological factor in NSSI persistence. A recent salivary assay study of 51 individuals with persistent NSSI found that beta-endorphin levels were lower among chronic self-injurers, and that engaging in

NSSI could restore beta-endorphin to normal ranges, with more severe NSSI associated with higher temporary beta-endorphin levels (Störkel et al., 2021). These findings align with previous cerebrospinal fluid studies and support the NSSI homeostasis model (Stanley et al., 2010), suggesting that adolescents may persist with NSSI to elevate beta-endorphin levels and maintain physiological balance, thereby developing long-term dependence on the behavior.

Furthermore, beta-endorphin is an endogenous opioid that releases analgesic effects and reduces pain sensitivity (Zubieta, 2001). Reduced pain sensitivity is closely linked to NSSI repetition (Koenig et al., 2016), with adolescents engaging in chronic NSSI typically showing lower pain sensitivity and higher pain thresholds (van der Venne et al., 2021), further demonstrating the connection between beta-endorphin and NSSI persistence.

In addition to beta-endorphin levels, research has shown that adolescents with repeated NSSI in the past year exhibit lower resting-state functional connectivity (RSFC) between the amygdala and frontal cortex, with this connectivity deficit appearing to be a widespread characteristic among chronic NSSI individuals (Schreinera et al., 2017). Başgöze et al.' s (2021) neuroimaging study also found a weak negative correlation between lifetime NSSI frequency and RSFC between the bilateral amygdala and prefrontal cortex (PFC). Reduced amygdala-PFC RSFC, along with abnormal activation in left and right amygdala, may contribute to chronic NSSI in adolescents. These findings suggest a strong association between amygdala-frontal RSFC and NSSI persistence, and because the amygdala is a brain structure closely related to emotion, this provides physiological evidence for emotional regulation deficits in NSSI youth (Nock, 2010).

In summary, neurobiological mechanisms that may predict adolescent NSSI continuation or cessation include beta-endorphin levels and amygdala-frontal RSFC. When these neural mechanisms are dysregulated, individuals may develop dependence on NSSI to restore homeostasis, thereby perpetuating the behavior.

2.2.1 Emotion and Cognition

The developmental maintenance theory of NSSI posits that individuals with emotion regulation deficits tend to adopt NSSI to reduce negative emotional experiences, making them more likely to initiate and maintain the behavior (Nock, 2010). Current research confirms that emotions and related cognitions significantly predict NSSI continuation or cessation in adolescents, manifesting in two primary ways.

First, adolescents' negative emotions may predict NSSI persistence. A one-year longitudinal study of 1,988 Chinese university students by 赵若兰 et al. (2019) found that depression was a significant predictor of persistent NSSI, with more severe depression increasing the risk of continuation. Conversely, adolescents with low or no depression were more likely to discontinue NSSI. These results align with Yen et al.' s (2016) findings from a U.S. clinical adolescent sample, where individuals with chronic depression (lasting over six months) were more

likely to persist with NSSI compared to those who stopped. Beyond depression, anxiety also emerges as an important predictor of NSSI continuation among adolescents already engaging in the behavior (Steine et al., 2020). Notably, anxiety and depression typically precede NSSI episodes, with adolescents often reporting reduced anxiety and depression after self-injuring (Moran et al., 2012). This pattern supports Brackman and Andover' s (2017) theoretical hypothesis that adolescents may use NSSI as an emotion regulation strategy, potentially becoming reliant on it for relief from negative affect.

Second, adolescents' beliefs about their emotion regulation capabilities and their use of adaptive strategies may facilitate NSSI cessation, whereas deficits in these areas may perpetuate the behavior. Kiekens et al. (2017) confirmed that adolescents with persistent NSSI held lower beliefs in their emotion regulation abilities, and that these negative cognitions and learned helplessness further reinforced NSSI continuation, creating a vicious cycle. Conversely, strong beliefs in one' s ability to regulate negative emotions may protect against NSSI or help discontinue it. Additionally, compared to those who stop, individuals with persistent NSSI show lower cognitive reappraisal and higher emotional suppression (Cipriano et al., 2017). Research has found that each unit decrease in cognitive reappraisal scores increases the probability of persistent NSSI by 1.16 times (Andrews et al., 2013). Correspondingly, higher emotional acceptance and impulse control appear associated with NSSI cessation. Individuals who stop NSSI demonstrate greater acceptance of their emotional responses and better impulse control compared to persistent self-injurers (Crowther et al., 2012), and they employ more adaptive emotion regulation strategies with higher levels of cognitive reappraisal (Tatnell, 2013). These findings align with Whitlock et al.' s (2015) qualitative research, where 62.6% of participants who stopped NSSI identified improved emotion regulation as the primary driver of cessation and mentioned acquiring new emotional strategies during the process.

In summary, both emotional experiences and emotion-related cognitions play crucial roles in determining whether adolescents continue or discontinue NSSI.

2.2.2 Personality Factors

Research has identified several personality factors that influence NSSI trajectories in adolescents, including borderline personality disorder, impulsive personality traits, self-esteem, and self-criticism/self-punishment (Burke et al., 2021; Kool et al., 2009; Tatnell et al., 2013). First, borderline personality disorder (BPD), characterized by unstable self-concept, interpersonal relationships, and emotion regulation alongside impulsive or self-destructive behaviors, may play an important role in predicting NSSI continuation. Researchers widely recognize NSSI as a key symptom of BPD (Brackman & Andover, 2017; Cipriano et al., 2017), and a Canadian study confirmed that lifetime NSSI frequency was significantly positively correlated with BPD features, which significantly predicted subsequent NSSI development (Glenn & Klonsky, 2011).

Second, NSSI is typically considered an impulsive or reckless behavior, and adolescents with impulsive personality traits may be more prone to act rashly when experiencing negative events, suggesting a likely connection to NSSI development (Bresin et al., 2012). Riley et al.' s (2015) longitudinal study demonstrated that lack of perseverance—a component of impulsive personality—increased the probability of persistent NSSI, with each unit increase in lack of perseverance raising the likelihood of reporting continued NSSI nine months later by 73%. This effect remained significant after controlling for NSSI history and other impulsivity traits. Individuals lacking perseverance find it more difficult to resist NSSI urges under stress or negative affect and struggle to employ effective coping strategies (Glenn & Klonsky, 2010), potentially leading to long-term NSSI dependence. However, Riley et al. (2015) did not find predictive effects for other impulsivity traits, warranting further investigation in adolescent populations.

Third, numerous foreign researchers have confirmed that enhancing self-esteem may facilitate NSSI cessation. Tatnell et al. (2013) found that adolescents who stopped NSSI reported higher self-esteem at baseline and follow-up compared to persistent self-injurers, suggesting that believing in one' s ability to cope with psychological distress or regulate negative emotional states may promote cessation. However, contrasting with this Western finding, a study with Chinese adolescents revealed that positive beliefs when facing adversity had a greater impact on reducing NSSI likelihood than self-esteem (Wang et al., 2020). This may be because negative emotions are significant risk factors for NSSI (Fox et al., 2017), and adolescents holding positive beliefs about adversity may possess cognitive resources that help them think positively to reduce negative emotions, thereby decreasing NSSI propensity. Additionally, Burke et al. (2021) found that individuals with NSSI histories showed higher levels of self-criticism and self-punishment compared to those without such histories, and NSSI history is one of the strongest predictors of future NSSI (Fox et al., 2015). These findings indirectly support the role of self-criticism/self-punishment traits in NSSI continuation, as highly self-critical adolescents may believe they deserve punishment and perceive NSSI pain as self-validation (Hooley & Fox, 2019), reinforcing the behavior by fulfilling their desire for self-punishment.

In summary, various personality factors influence NSSI continuation or cessation in adolescents. However, predictive personality traits may differ across cultural contexts, though current understanding of these differences remains limited and requires further cross-cultural investigation.

2.2.3 Functions of NSSI

The functions served by NSSI represent one of the most frequently examined variables in research on continuation and cessation predictors. Klonsky' s (2015) two-factor model proposes that NSSI serves two primary functions: intrapersonal functions (self-focused), such as emotion regulation, self-punishment, and anti-suicidality; and interpersonal functions (other-focused), such as attracting attention and group integration. Researchers generally agree that adolescents

who rely on intrapersonal functions are more likely to maintain NSSI long-term, whereas those dependent on interpersonal functions are more likely to discontinue the behavior over time, a pattern supported by substantial empirical evidence.

Social surveys indicate that intrapersonal functions like emotional release, anti-dissociation, and gaining a sense of control are primary reasons adolescents engage in NSSI (Hasking et al., 2017). Consequently, researchers suggest NSSI maintenance is strongly linked to these self-functions (Brown & Plener, 2017). Halpin et al. (2020) confirmed that endorsing intrapersonal functions was the strongest predictor of NSSI continuation, with individuals using NSSI for self-functions being nearly 20% more likely to persist even after controlling for other factors. Furthermore, studies have found that emotion regulation, self-punishment, and anti-dissociation—the most commonly endorsed functions among adolescents with moderate to severe NSSI—fall within the intrapersonal domain (Case et al., 2020; You et al., 2013). Since NSSI severity is an important predictor of maintenance (Kiekens et al., 2017), the reinforcement derived from intrapersonal functions appears to significantly impact both NSSI persistence and severity. NSSI also represents a fast life-history strategy that sacrifices long-term interests for immediate gratification (Hurst & Kavanagh, 2017), providing temporary psychological relief through negative experience regulation (Taylor et al., 2018). This fleeting sense of well-being may reinforce NSSI, leading to habit formation (Marin et al., 2020).

In contrast, interpersonal functions significantly predict NSSI cessation in adulthood (Gelinas & Wright, 2013). Halpin et al. (2020) found that individuals using NSSI for interpersonal functions were 32% more likely to discontinue the behavior in adulthood after controlling for other variables. Interpersonal functions primarily involve using NSSI to communicate distress, punish others, or influence people (Taylor et al., 2018). Adolescence is a period of rapidly increasing social needs that may exceed adolescents' coping capacities (Halpin & Duffy, 2020), leading them to rely on NSSI' s interpersonal functions to meet these needs. However, as individuals enter adulthood, social and emotional maturity increases, relationships stabilize, and NSSI tendencies decline (Whitlock et al., 2015). Hambleton et al. (2020) reported that some individuals who relied on interpersonal functions indicated their NSSI intentions disappeared once distressing relationships ended. Thus, adolescents who engage in NSSI to maintain interpersonal relationships may do so transiently and are more likely to discontinue the behavior in the future.

Beyond these functional considerations, previous NSSI experience itself may be one of the strongest predictors of future continuation (Hamza et al., 2021; Plener et al., 2015). Research has found that individuals with persistent NSSI had higher frequencies and used more methods three years earlier (Kiekens et al., 2017). Andrews et al. (2013) conducted a longitudinal study of 1,973 Australian adolescents and found that NSSI severity significantly predicted future continuation, with adolescents using four or more methods and requiring medi-

cal attention being at greater risk for persistence, whereas those with less severe histories were more likely to stop. These findings underscore the importance of early intervention before behaviors become entrenched.

2.3 Social Factors

Current research on social factors affecting adolescent NSSI primarily examines social support, including peer support, family support, and psychological counseling support. Strong social support facilitates NSSI cessation, while lack of support may perpetuate the behavior (Kiekens et al., 2017; Mummé et al., 2017; Wang et al., 2020).

First, regarding peer support, childhood peer bullying may serve as a risk marker for current or future psychopathology, with bullying confirmed as an important risk factor for persistent NSSI (Brown & Plener, 2017). This aligns with Jutengren et al.' s (2011) findings that peer victimization may increase NSSI frequency over a one-year follow-up period compared to those who stop. Kiekens et al. (2017) also found that adolescents with persistent NSSI reported less peer support than those who discontinued. These studies suggest that lack of peer support or poor peer relationships may trigger NSSI continuation, whereas strong peer support promotes cessation.

Second, concerning family support, research indicates that family factors may exert greater influence than peer relationships on NSSI continuation or cessation (Molly et al., 2011). A supportive family system facilitates NSSI cessation, while family dysfunction may serve as a precipitating factor for continuation. Numerous studies have found that compared to individuals who stop or never engage in NSSI, persistent self-injurers report more problems with parents, perceive lower parental care, experience greater emotional distance from parents (Hamza & Willoughby, 2014), and receive significantly less social support from family members (Muehlenkamp et al., 2013). Conversely, perceived high family support is a significant predictor of NSSI cessation (Tatnell, 2013). Mummé et al. (2017) systematically reviewed previous research and proposed that family support helps individuals discontinue NSSI, with positive family relationships providing external emotional connections that enhance motivation and expectations for cessation. Wang et al. (2020) also found that higher levels of family support, parental cohesion, and parental behavioral control were significantly associated with reduced likelihood of reporting NSSI at six-month follow-up. Thus, despite adolescence being a period of emerging independence, family support remains crucial. Adolescents, though growing, typically remain under parental supervision, making positive family relationships important protective resources against NSSI, while dysfunctional family environments may increase adolescents' vulnerability and contribute to NSSI continuation.

Third, psychological counseling and treatment, as components of social support, also play important roles in facilitating NSSI cessation. A longitudinal study in Australia found that 48.1% of adolescents who stopped NSSI reported hav-

ing seen a mental health professional (Andrews et al., 2013). This aligns with Hambleton et al.' s (2020) qualitative findings that receiving professional psychological counseling or treatment was an important reason for cessation, with interviewees reporting that therapy helped them process psychological pain and trauma while providing support and attention that contributed to stopping NSSI. Halpin et al. (2020) found in a retrospective study that psychotherapy was the strongest predictor of NSSI cessation, with individuals who reported receiving psychotherapy during adolescence being approximately 40% less likely to continue the behavior. However, because this study used a cross-sectional design, confounding variables prevent causal attribution, though the meaningful role of psychological counseling in facilitating cessation cannot be denied. Research has yet to establish definitively which specific aspect of social support plays the decisive role in the cessation process.

3. Summary and Future Directions

This review has synthesized current research findings on predictive factors for NSSI continuation and cessation. Studies indicate that NSSI trajectories vary depending on physiological mechanisms, personal characteristics (emotions and cognition, personality factors, NSSI functions), and social factors (particularly social support). Based on the current state of the field, future NSSI research could be expanded and refined in several ways.

Regarding research methodology, first, longitudinal designs are essential for truly understanding the causes, maintenance, and cessation of NSSI and its temporal trends. However, most domestic research currently employs cross-sectional designs, leaving us with limited knowledge about the longitudinal developmental process of adolescent NSSI. A key weakness of cross-sectional approaches is that comparing differences between discontinued and persistent groups may confound extraneous variables, precluding causal inferences and limiting interpretability. Future studies should adopt longitudinal tracking methods to clarify developmental characteristics and influencing mechanisms.

Second, domestic NSSI research predominantly relies on questionnaire measures, which, while convenient for scoring, may not capture the full scope of NSSI. Structured or semi-structured interviews can provide deeper, more comprehensive understanding of NSSI experiences and life histories (Hambleton et al., 2020). However, both questionnaires and interviews depend on self-report, which may be constrained by social desirability and recall biases. Researchers have begun developing and testing experimental methods to enhance internal validity, such as measuring implicit identification with NSSI (Ammerman et al., 2018). Future research should incorporate multiple methodological approaches.

Third, NSSI often co-occurs with other psychological symptoms (e.g., depression, anxiety), yet many empirical studies fail to control for these variables or examine comorbidity.

Regarding participant populations, current NSSI research conclusions primarily

derive from adolescent samples. Although NSSI prevalence is lower in adults, the behavior remains relatively common in adult populations. A recent retrospective study indicated that even individuals aged 60 and older engage in NSSI, with significantly higher suicide risk at advanced stages compared to younger adults (Troya et al., 2019). This highlights the need for greater attention to NSSI in middle-aged and elderly populations, though empirical research on these groups remains limited, and influencing factors, motivations, and mechanisms are poorly understood.

Regarding research domains, first, beyond the social factors discussed above, substantial evidence indicates that peer "contagion" significantly influences adolescent NSSI (Brown & Plener, 2017; Heilbron & Prinstein, 2008; Prinstein et al., 2010). Specifically, even without directly observing friends' NSSI, merely perceiving or believing that peers engage in NSSI may induce adolescents to try the behavior (Hamza et al., 2021; Syed et al., 2020). Given that peer groups are adolescents' primary social context and peer relationships are developmentally salient, investigating the mechanisms linking peer influence to NSSI onset, maintenance, and cessation is critical for designing effective prevention and intervention strategies. Notably, if observing peer NSSI can produce "contagion," does observing peer cessation produce similar protective effects? Currently, no clear empirical evidence links this contagion effect to NSSI continuation or cessation, representing an important direction for future research.

Second, predictive factors for NSSI continuation or cessation among Chinese adolescents require further investigation within their cultural context. Most existing research uses foreign adolescent samples, and cultural differences may limit the generalizability of findings. For example, while foreign researchers have found self-esteem important for cessation, a study with Chinese adolescents found that positive beliefs when facing adversity—a value emphasized in Confucian culture—had greater protective effects than self-esteem (Wang et al., 2020). Future research should examine how cultural context shapes personality traits and other factors influencing NSSI. Beyond the personal characteristics discussed above, other important factors such as temperament, character, or cognitive orientation may represent fruitful avenues for investigation, potentially uncovering individual protective resources against NSSI.

Third, given the high prevalence of adolescent NSSI, the frequency of repeated behaviors, and its association with suicide, developing appropriate intervention protocols and rigorously evaluating their effectiveness through experimental and control group designs represents a crucial future direction. Additionally, current research on predictive factors for NSSI continuation or cessation has primarily examined individual effects, with less attention to interactions among factors. Future researchers should conduct in-depth investigations of how these predictive factors work in combination.

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