



Non-Suicidal Self-Injury as a Behavioural Addiction: A Systematic Review

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Abstract

Purpose of the Review Despite the growing interest in non-suicidal self-injury (NSSI) research over the past decades, there is no comprehensive synthesis of findings on whether this behaviour should be considered an addiction. This study carries out a systematic review of theoretical and experimental studies to evaluate the empirical evidence supporting the addictive nature of NSSI.

Recent Findings In accordance with PRISMA guidelines, 36 studies were selected from a search across PubMed, Scopus, and Web of Science, covering publications from 2000 to November 2024. This review suggests that the subjective experiences of individuals who self-injure, the DSM-5 diagnostic criteria, and some relevant assessment instruments, all point to there being addictive characteristics in NSSI. These characteristics include compelling urges, altered control, and behaviour intensification. Neurobiological findings, particularly those involving the endocannabinoid and opioid systems, support the addictive-like nature, with tolerance being a key mediating factor that leads to the NSSI cyclical structure. Additionally, findings related to brain activity, connectivity, and gene expression also hint at similarities between NSSI and addictive disorders, suggesting some shared mechanisms.

Summary Existing research on NSSI emphasises its potentially addictive nature. The subjective experiences of those who self-injure together with diagnostic criteria and neurobiological findings, collectively support the conceptualization of NSSI from an addictive model. While further studies are needed to fully understand the underlying mechanisms and factors contributing to addictive patterns in NSSI, this perspective has significant implications for the prevention and treatment of NSSI.

Keywords Non-suicidal self-injury · Self-injurious behaviour · Addiction · Behavioural addiction · Craving · Control perception

Introduction

Non-suicidal self-injury (NSSI) is defined as the deliberate, intentional, and direct destruction of one's own body tissue without suicidal intent [1], resulting in repetitive,

direct, and low-lethality behaviours [2]. It is distinguished from socially accepted behaviours [3], related to healing, religious faith, or social concordance [2]. NSSI research has grown steadily since its emergence in the early 2000s [3]. However, it remains uncertain whether NSSI behaviours fit within the theoretical framework of behavioural addictions (BA).

The growing interest in NSSI is based on three main reasons. First, the high prevalence in both youth and adults, reported to be at 17.2% and 5.5%, respectively [4], with rates fluctuating between 40 and 80% among adolescents in psychiatric population [5]. Second, NSSI has been significantly associated with other health-risk behaviours, including substance use, risky sexual behaviours, and maladaptive eating habits [5]. Third, NSSI has been predictively linked to suicidal ideation and behaviours [3, 4, 6]. Additionally, its presence in non-clinical populations has highlighted the

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importance of studying NSSI an independent phenomenon rather than a nonspecific or transdiagnostic symptom [5]. In line with this, non-suicidal self-injury disorder (NSSID) was a new diagnosis proposed in the DSM-5 [7], with a need for further study [8]. Despite limited psychometric validation, NSSID has been associated with greater clinical severity in both adolescents [8, 9] and young adults [9], including more frequent NSSI, suicide attempts, higher levels of psychopathology, and lower global functioning [8]. Even though some authors argue that NSSID should be considered a precursor of psychopathology and suicidality, its significance as a diagnostic entity remains limited [10].

NSSI has been explored from various theoretical perspectives [11]; however, no consensus exists on its conceptual model [12]. Reported motivations include seeking control during periods of depersonalization [2], psychological pain release, tension reduction, and anger management [11]. Although less common, motivations such as negative affect regulation, sensation-seeking, self-punishment, or interpersonal motivations (e.g., seeking attention) have also been identified [3]. Despite this variety, NSSI primarily serves as a temporary affective regulation mechanism [3], corresponding to the affect regulation model described in previous research [1]. NSSI is considered a strategy for rapid negative affect relief [3, 5], driven by poor emotional regulation [4]. Empirical evidence indicates that intense negative emotions typically precede NSSI, leading to feelings of calmness and relief [3] that reinforce the behaviour [1]. Although elevated negative affect prior to NSSI is well-documented, evidence for a subsequent reduction in negative affect following the act remains inconclusive [13]. Thus, while NSSI is commonly conceptualised as a maladaptive coping mechanism for emotional dysregulation [14], its regulatory efficacy is uncertain.

From a behavioural theory perspective, the reinforcing nature of NSSI has been emphasised, with automatic and social contingencies identified as key maintaining factors [15]. NSSI is proposed to serve four distinct functions, classified along intrapersonal-interpersonal and positive-negative dimensions [13]. Among these, intrapersonal negative reinforcement aimed at reducing internal distress has received the most empirical evidence [13, 15], supporting the affect regulation model. Metanalytic findings indicate that intrapersonal functions are more frequently reported than interpersonal ones [16], suggesting that NSSI primarily serves to alleviate aversive intrapersonal states [13]. The reinforcement mechanisms, along with the calmness and relief after self-injury, indicates a potentially addictive component.

The reinforcement cycle is also characteristic of BA, where certain behaviours elicit short-term reward sensations that promote persistence despite negative consequences

[17]. This pattern is a key factor in the transition from seemingly habitual behaviour to addiction [18], thereby contributing to the development of BA. Individuals with such addictions exhibit loss of control, marked persistence in the addictive behaviour, and impairment in other areas of life [19]. Loss of control is characterised by an inability to resist engaging in a behaviour, despite awareness of harmful consequences [17]. This impaired control, driven by intense desire, is linked to craving, a hallmark of emotional dysregulation [20], reflecting difficulties in impulse control and in the implementation of emotional regulation strategies [21].

Despite the importance of craving in BA, consensus regarding its nature is lacking. Craving may manifest as either an appetitive or an aversive affective state [20], reinforcing the behaviours through negative reinforcement (avoiding distress) or positive reinforcement (maladaptive desire). Excessive engagement triggers biochemical processes, suggesting an indirect addictive potential [22], mediated by neurotransmitters such as dopamine, serotonin, opioids, glutamate, and norepinephrine [23]. A detailed neurobiological analysis is beyond this study's scope.

BA exhibit a chronic pattern with relapses [24]. Over time, the pleasurable effects of the habit or compulsion diminish, and it increasingly functions as a negative reinforcer, shifting from egodystonic to egosyntonic [17]. Patients with BA reported developing tolerance (defined as an increase in behaviour seeking a psychotropic effect) alongside physical and psychological withdrawal symptoms [22]. Dysphoric states, akin to withdrawal, have been commonly reported upon cessation of BA-related behaviours [24]. A similar process has been proposed for NSSI, whereby the negative emotional states preceding self-injury may resemble the aversive withdrawal symptoms experienced by drug users [25]. Additionally, it has been proposed that individuals may engage in self-injurious behaviours to avoid or mitigate withdrawal effects [26].

These findings support that NSSI shares similarities with BA, including phenomenology, reinforcement mechanisms, contingencies that sustain the behaviours, and emotion regulation functions. Prior research has suggested that NSSI could be understood as an addictive behaviour [27], linking it to challenges in impulse control [2]. A growing body of literature explores the addictive nature of NSSI and its underlying mechanisms. Some studies have explored common characteristics with substance use or BA, such as craving [12], while others have examined biological [28, 29] or phenomenological aspects [30–32]. Given the phenotypic similarities between NSSI and other BA, further investigation is necessary to assess whether NSSI can be conceptualised as an addictive behaviour. Notably, some researchers have explored the overlap among substance use disorder (SUD) and NSSI, particularly with respect to

the driving motivations, suggesting common functional or underlying mechanisms [33]. A similar approach is taken in the proposed transdiagnostic motivational model of self-damaging behaviours, which includes binge drinking, disordered eating and NSSI [34]. While the conclusions of these studies do not directly support the conceptualization of NSSI as an addiction, they both position self-injury as an emotional-regulatory mechanism, akin to the dynamics observed in BA. Additionally, evidence regarding pharmacological interventions for individuals who engage in self-harm remains inconclusive [35]. However, treatments with N-acetylcysteine, used for substance-related and BA, have demonstrated preliminary efficacy for NSSI [36], supporting its possible classification within addictive disorders. Moreover, illness severity is a significant predictor of treatment nonadherence in mood disorders [37], highlighting the necessity of accurately addressing NSSI, as it is predominantly associated with more severe psychopathological conditions. Therefore, this review aims to expand research on underexamined aspects of NSSI, contributing to a deeper understanding of the condition and providing clinically relevant insights.

In view of these shared similarities, a systematic literature review is needed to examine whether defining attributes of BA are present in NSSI and to clarify the mechanisms reinforcing self-injurious behaviour. This need is further supported by the fact that the last review on this topic was published nearly a decade ago [38]. Given the overlap between NSSI and BA, this review aims to assess the extent to which NSSI aligns with the theoretical framework of BA.

Methods

Search Strategy

The present study was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [39]. Studies were identified through a literature search in PubMed, Web of Science and SCOPUS, covering publications from 2000 to November 2024. Only English-language articles from peer-reviewed journals were included.

The keywords were grouped into two categories, those related to NSSI and those associated with addiction. The search strategy was as follows: (“NSSI” OR “self-mutilat*” OR “self-injurious behaviour” OR “self-injurious behavior” OR “self-harm*” OR “self-injur*” OR “self-inflicted violence” OR “DSH”) AND (addiction OR “behavioural addiction” OR “Non-Substance-Related Addiction” OR addictiv*). To improve the accuracy of the search, it was

specified that the keywords must appear in the title or abstract.

Study Selection

Figure 1 illustrates the study selection process. An initial database search yielded 1,237 studies, from which 383 duplicates were removed. Two reviewers independently conducted article selection, achieving an agreement rate of 98% ($P_o = 843/854 = 0.98$). Any discrepancies were resolved through discussion between the two reviewers.

Studies were included if they met the following criteria: (1) they defined NSSI as a deliberate self-inflicted harm to the body without suicidal intent; and (2) they explicitly addressed the addictive characteristics of NSSI or (3) conceptualised NSSI as a form of addiction. No restrictions were placed on study design, and both empirical and conceptual studies were eligible for inclusion.

Articles were excluded if they did not frame NSSI within the context of addiction or if they primarily focused on the development or evaluation of interventions or treatments. Studies where self-harm was directly linked to substance use (e.g., cannabis, methamphetamine) were also excluded. In accordance with DSM-5 criteria [7], studies involving participants with psychotic disorders, intellectual disabilities, or developmental disorders were removed. Furthermore, articles were excluded if the full text was unavailable.

After applying the predefined inclusion and exclusion criteria, 43 studies were selected for full-text review. During this stage, additional exclusions were necessary, as certain studies did not fully align with the scope of the present systematic review. Specifically, 7 studies were excluded for the following reasons: (a) they investigated subclinical NSSI, (b) classified NSSI under suicidal behaviour, (c) involved samples with neurodevelopmental disabilities, or (d) focused on addictive personality traits. Notably, the exclusion of studies focusing on suicidal behaviour was not originally specified in the criteria but was applied during full-text screening to maintain the focus on NSSI as a distinct phenomenon. As a result, 36 studies were included in the final review.

All included studies were qualitatively assessed using the Appraisal Tool for Cross-Sectional Studies (AXIS tool) [40]. A meta-analysis was not conducted due to the considerable heterogeneity observed across studies in key methodological aspects, including age, sample size, assessed population and study type, among others.

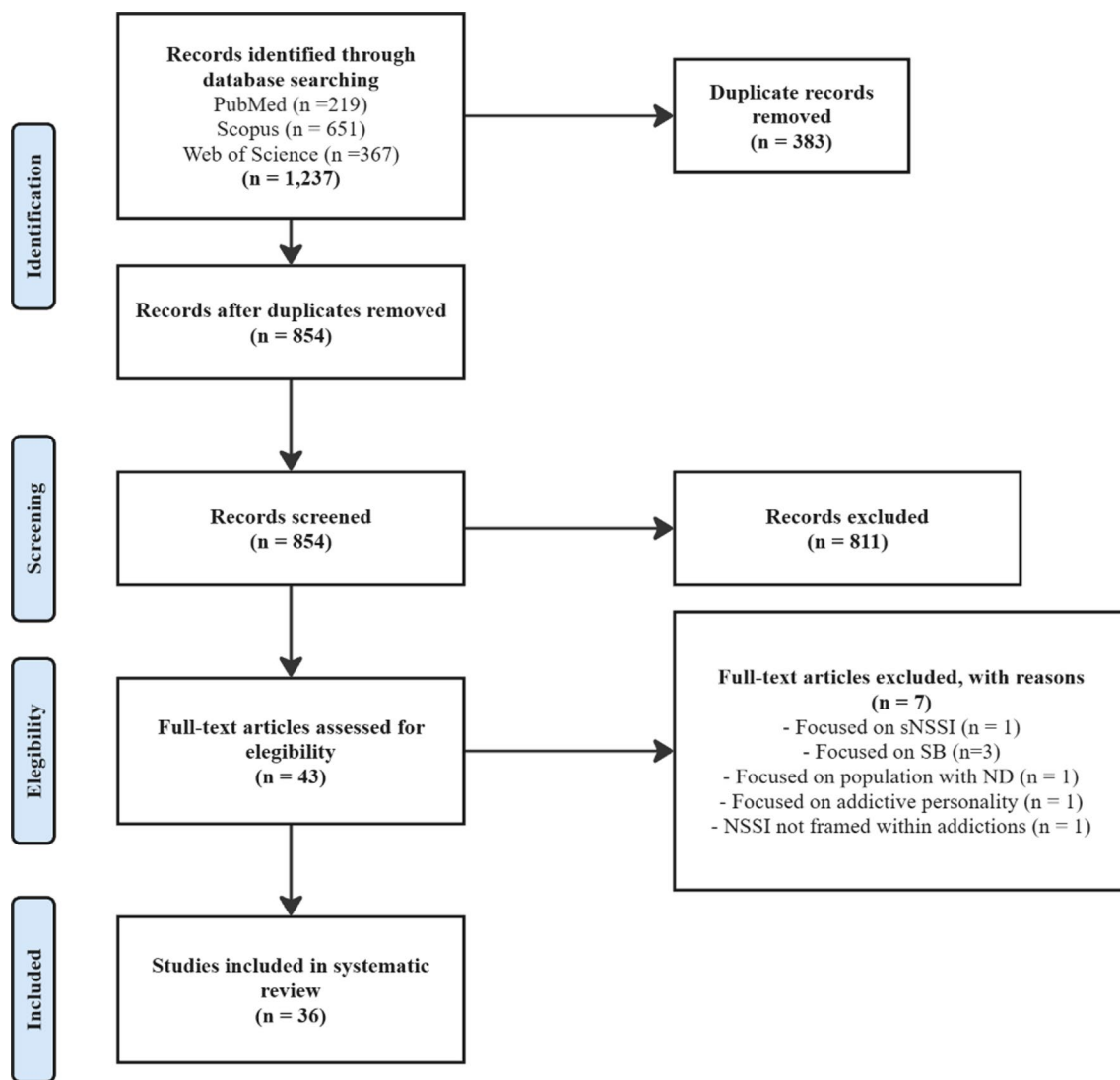


Fig. 1 PRISMA flow diagram of search results. Note: sNSSI = subthreshold NSSI; SB = suicidal behaviour; ND = neurodevelopmental disabilities

Results

This systematic review encompasses 36 publications addressing the conceptualization of NSSI within the framework of BA. Table 1 presents conceptual studies (all narrative reviews except one systematic review). Findings from empirical studies are detailed in Tables 2, 3, 4 and 5, covering four main areas: (a) subjective experiences and perspective of the those who self-injure (Table 2); (b) addictive diagnostic criteria (Table 2) and psychometric studies (Table 3); (c) factors linked to the addictive process of NSSI (Table 4); (d) neurobiological findings supporting addiction-like mechanisms (Table 5). Where relevant, theoretical contributions were incorporated into empirical sections. Each table outlines the study type, objectives, key characteristics, and main findings.

The qualitative assessment of the 36 articles is provided in Supplementary Table S1. All studies clearly stated their aims and provided detailed methodologies and outcome variables, ensuring internal consistency. However, sample size justification was generally lacking, despite well-defined target populations. Regarding non-responders - individuals who were invited to participate but did not complete the study- no measures were reported in any of the studies, nor was any information about them provided. Furthermore, half of the studies disclosed potential conflicts of interest, and all (when applicable) addressed ethical approval.

Subjective Perspectives on Addiction-Features of NSSI

Research on NSSI's addictive component has analysed subjective experiences of individuals through interviews and

Table 1 Characteristics of narrative and systematic review studies

Study	Study type	Study objective	NSSI definition	Main findings
Blasco-Fontecilla et al. [28]	Narrative review	Explore the underlying neurobiological and psychological mechanisms of addiction to self-injurious behaviours	-	Relief of psychological pain is associated with the release of endogenous opioids, which could produce tolerance and addiction. Desensitization and cathartic effect were related as psychological mechanisms involved in the addiction to NSSI
Sher and Stanley [29]	Narrative review	Investigate the role of endogenous opioids in SB and NSSI, exploring the biological underlying mechanisms	“Deliberate, direct destruction or alteration of body tissue without conscious suicidal intent”	Endogenous opioids participated in the expression of self-injurious behaviours. The relationship based on the partial success of opioid antagonist treatments, findings of altered pain perception, and dysregulation of opioid levels
Bunderla and Kumperščak [38]	Systematic review ($n=6$)	Assess the relationship between pain perception and NSSI, focusing on addictive characteristics and the role of the opioid system	“A behaviour characterized by causing pain to oneself with a non-lethal method and with no suicidal intent”	Pain perception was altered in NSSI, with a higher threshold and greater tolerance or resistance to pain. Emotional dysregulation was the variable most significantly associated, suggesting the use of self-injurious behaviours as a form of affect regulation
Buser and Buser [41]	Narrative review	Explore the addictive features of superficial/moderate NSSI	“Damaging of bodily tissue without suicidal intention and without social sanction”	Several indicators of addiction were relevant in NSSI, including compulsivity, loss of control, and continued use despite consequences. Some individuals experienced also tolerance
Kim et al. [45]	Narrative review	Characterise the role of the endocannabinoid system in suicidal behaviour	-	The endocannabinoid system is proposed to be involved in the pathophysiology of SB, with analgesia processes contributing to the escalation of self-harming behaviours. SB is understood as an endocannabinoid-mediated pain and reward disorder
Ducasse et al. [50]	Narrative review	Understand the daily life experiences of individuals with borderline personality disorder from the ontological theory of addiction	-	Explained borderline personality disorder from the ontological theory of addiction. Relational attachment, a central problem in borderline personality disorder, was understood as an addiction, as were various behaviours, such as NSSI
Worley [66]	Narrative review	Evaluate whether pleasure response, brain circuits and neurotransmitters play a significant role in NSSI	-	Highlights the role of pleasure responses and neurotransmitters in NSSI. The behaviour results in an activation of the opioid and dopamine system, causing a down regulation of dopamine resulting in decreased levels. This imbalance was related to addictive or craving features of NSSI

Note: NSSI = non-suicidal self-injury; SB = suicidal behaviour

qualitative examinations of social media content. Findings highlight its compulsive nature, attributed functions, the perceptions of control, and addiction-related language used to describe NSSI (Table 1).

Compulsive Nature and Craving

Individuals who engage in NSSI often conceptualise their behaviour as an addiction. Reports highlight key addictive elements such as compulsivity, loss of control, and the persistence of the behaviour despite its negative consequences [41]. The perception of NSSI as repetitive was evident in previous research [42], with data showing that most females and about half of males in the sample viewed their self-harming behaviours as repetitive. Moreover, longitudinal findings revealed that nearly half of participants reported

engaging in such behaviours more than ten times throughout their lifetime [43]. Concurrently, the compulsive and habitual quality of self-harming acts has been described as “repetitive or vicious cycles” that tended to intensify [44], associated with an increase in tolerance [31]. Tolerance and habituation developed over time [45], requiring more severe or frequent NSSI to achieve relief from negative affective states or distress [41]. Combined with negative reinforcement and increased craving, this led to escalating NSSI frequency and intensity, supporting its addictive characteristics.

Consistent with its compulsive nature, a significant majority of a sample reported daily urges to self-harm, though not always acted upon [42]. Compared to substance addictions, NSSI craving scores were lower [32], likely due to its occurrence primarily in negative affective contexts,

Table 2 Empirical studies on motivations and experiences of non-suicidal self-injury (NSSI)

Study	Study type and objective	Participants	NSSI definition	Main findings
Victor et al. [12]	Cross-sectional; comparative Compare the nature of craving in NSSI and SUD	<i>N</i> =58 Age: M=15.09 (SD=1.32) 71% F	“Intentional and direct injuring of one’s own body without suicidal intent”	Craving for NSSI occurred in the context of negative emotions, while craving for substances use appeared in a wide variety of contexts. A lower degree of craving regarding NSSI attributed to the nature of the behaviours and not to personal factors
Brown and Kimball [30]	Qualitative; semi-structured interviews Understand the meaning of self-injury from the perspective of those who self-injure	<i>N</i> =11 Age: M=23.5 (SD NR) 90% F	“The intentional harming of one’s body in order to reduce emotional pain and cope with overwhelming emotions”	Some participants described self-injury as an addiction, detailing aspects such as its progression over time and the difficulty in ending the behaviour. Self-injury was also described as a coping strategy, physical pain being easier to manage than emotional pain. NSSI was conceptualised as a source of release (81%) and a synonymous as “control” (45%)
Miller et al. [31]	Qualitative; semi-structured interviews Deepen the insights of the experience and reasons of NSSI	<i>N</i> =9 Age: M=15 (SD NR) 100% F	“Deliberately harming one’s body without any intent to end life”	The results suggest that NSSI is used to express and communicate distress, make internal pain visible, and soothe anguish by focusing on physical pain. NSSI is characterised as a “compulsive urge” that only calms down upon performing it
Pritchard et al. [32]	Qualitative; thematic analysis Explore the reasons that lead individuals to describe NSSI as addictions	423 posts from a social network related to self-injury	“Deliberate damaging of body tissue, without suicidal intent and reasons that are not culturally or socially sanctioned”	Individuals described NSSI as akin to addiction, drawing parallels with substance use. Terms such as urge, tolerance, and relapse were frequently used. Framing NSSI within addiction aims to illustrate the challenge of cessation, validate personal experiences, alert others, and its multifaceted nature
Nixon et al. [42]	Cross-sectional; correlational Explore the reasons for NSSI, examining the potential addictive properties and the role of internalised anger	<i>N</i> =42 Age: M=15.7 (SD=1.5) 86% F	“Self-injurious behaviours that are considered deliberate but without conscious suicidal intent”	NSSI was described as repetitive (88.9% females, 50% males), and characterised by daily urges (78.6%). 97.6% of sample identified three or more addictive aspects and 81% identified five or more. Addictive characteristics were linked to a higher frequency of NSSI, but not to the physical pain of self-injury. NSSI main role was affect regulation (97.6% for coping with depressive feelings) and feeling relief after doing it (92.9%). 58.3% of the sample had lived physical or sexual abuse
Harvey and Brown [44]	Qualitative; discourse analysis Explore social networks of teenagers to understand their experiences linked to health and NSSI	1.6 million words from messages. “Teenage Health Freak” (2004–2008)	-	Key words identified regarding the phenomenon of NSSI indicated that it was conceptualised as a form of addiction, over which individuals had little control. Some of the highlighted terms related to the dependency were “addiction”, “addict”, and “habit”
Zhu et al. [47]	Qualitative; semi-structured interviews Explore the motivations, experiences and perceptions of NSSI	<i>N</i> =18 Age: M=13.89 (SD=1.7) 61% F	“Deliberate infliction of harm to oneself without the intention of suicide.”	NSSI was identified as a coping mechanism for overwhelming emotions and numbness, often leading to a cyclical, potentially addictive pattern of temporary relief followed by guilt and shame. Triggers include negative self-perceptions, dysfunctional family dynamics, and academic or social pressures, exacerbated by cultural factors like high parental expectations
Davis and Lewis [48]	Qualitative; discourse analysis Examine whether NSSI has an addictive nature	500 messages related to NSSI that met BA criteria	-	NSSI presents addictive aspects related to sensations of craving, unwillingness/inability to stop the behaviour, relapse into the behaviour, shame, and a worsening of the behaviour. 17.6% of the messages referred to NSSI as a coping strategy
Luo et al. [49]	Cross-sectional; correlational Investigate the effect of addictive features on the functions of NSSI and its severity	<i>N</i> =10,501 Age: 8–12 years (M and SD NR) 50% F	“Deliberate and direct destruction of one’s body tissue without suicidal intent that mainly occurs among adolescents”	NSSI events in the previous year: 23.45% at least one and 6.64% at least five. Addictive features played a critical role in the development of repeated NSSI, both directly and indirectly influencing the relationship between NSSI functions and its severity. Addictive features also worsened the severity mainly when the function of the behaviour was related to emotion regulation and sensation seeking

Table 2 (continued)

Study	Study type and objective	Participants	NSSI definition	Main findings
Himelein-Wachowiak et al. [51]	Qualitative; thematic analysis Characterise and quantify the addiction-related language used on Reddit to describe the extent to which users perceive NSSI as an addiction	500 messages from the subreddit r/self-harm	“Deliberate harming of one’s body tissue without intending to die, and for reasons that are not socially sanctioned”	86% of the participants used addiction-related language, including terms as “clean” (68%), relapse (50%) or “addiction” (30%). 76.8% of them met at least 2 of the SUD criteria adapted to NSSI, exhibiting mild (59.9%), moderate (34.9%) or severe (5.2%) “addiction”. Addictive symptoms were linked to the number of methods used and clinical severity, with participants reporting craving (67.6%), tolerance or intensification of severity (47.8%), and NSSI as a physical hazard (32.8%)
Ying et al. [58]	Cross-sectional; correlational Examine the prevalence of NSSI with addictive characteristics and their demographic and clinical variables	N=548 Age: M=15.93 (SD=2.56) 76% F	“Deliberate and self-inflicted destruction of body tissues in the absence of suicidal intent and socially sanctioned purposes”	57.5% of individuals exhibit addictive characteristics, with craving being very common. Those with addictive features were more likely to use more than one method of self-injury. Having suffered childhood abuse (physical, emotional, sexual, emotional neglect) was common. Being women was also a significant risk factor, along with low parental emotional warmth, low family support, and punitive parenting styles

Note: BA = behavioural addiction; F= female; NR: no reported; NSSI = non-suicidal self-injury; NSSID = non-suicidal self-injury disorder; SUD = substance use disorder

Table 3 Empirical studies on the psychometric properties of the Ottawa Self-Injury Inventory (OSI)

Study	Study type and objectives	Participants	NSSI definition	Main findings
Guérin-Marion et al. [43]	Perform a confirmatory factor analysis of the OSI to demonstrate reliability for assessing NSSI	N=316 Age: M=19.37 (SD=1.53) 85% F	“Intentional, self-inflicted damage of bodily tissue in the absence of suicidal intent, using methods not socially sanctioned”	The results support the psychometric properties of the OSI and confirm the 4-factor structure related to NSSI functions and 1 factor linked to its addictive aspects. Specific functions and addictive aspects of NSSI were associated with higher frequency of the behaviour, greater distress related to the urge, and increased severity
Martin et al. [52]	Examine the psychometric properties of the OSI to assess the functions and addictive components of NSSI	N=149 Age: M=19.43 (SD=1.67) 83% F	“Any purposeful, self-inflicted injury that results in tissue damage and is performed without suicidal intent and through methods that are not socially sanctioned”	The OSI showed valid and reliable psychometric properties for assessing the functions and addictive characteristics of NSSI. Five factors were identified: internal emotional regulation (21.76%), social influence (10.53%), external emotional regulation (5.98%), sensation seeking (4.38%), and addictive aspects (57.42%). Addictive aspects were linked to more frequent behaviour, feelings of relief, and a tendency to self-injure after thinking about it
Nixon et al. [54]	Conduct a confirmatory factor analysis of the OSI, in a clinical sample	N=94 Age: M=15.71 (SD=1.5) 81% F	-	Confirmatory factor analysis verified the factorial structure for NSSI functions and addictive characteristics, supporting the OSI’s validity and reliability in a clinical context. 97.6% of participants identified three or more addictive aspects and 81% identified five or more. Addictive characteristics were linked to a higher frequency of NSSI, but not to physical pain of self-injury

Note: F= female; NSSI = non-suicidal self-injury

whereas substance cravings arise in both positive and negative affective states.

Attributed Function of Self-Injurious Behaviour

Regarding the motivations described by individuals, self-injury can serve multiple functions. In one study, nearly two-thirds of individuals reported eight or more reasons for NSSI [42], with “coping with depressive feelings” being the most frequent. In terms of their experience, most reported relief after self-injury, though often accompanied by guilt and/or shame. Additionally, few engaged in NSSI for

attention, excitement or group belonging. Most participants, in contrast, reported suicide attempts within the previous six months, while many experienced daily suicidal ideation, and nearly half indicated using NSSI to stop suicidal thought or actions. Reinforcing this link, a separate study found that late-onset NSSI was associated with shorter transitions to suicide attempts [46].

NSSI primarily functions as an affect regulation, serving as a distraction strategy from emotional pain [31] and has been identified as a survival mechanism, maladaptive coping strategy, or source of relief during overwhelming negative emotions [44, 47]. In another study, most individuals

Table 4 Empirical studies on mediating variables and related aspects of non-suicidal self-injury (NSSI)

Study	Study type and objective	Participants	NSSI definition	Main findings
Buser et al. [55]	Cross-sectional; correlational Investigates the predictors of unintentionally severe harm during NSSI (impulsivity, dissociation, and addictive qualities)	<i>N</i> = 102 Age: <i>M</i> = 19.95 (<i>SD</i> = 1.85) 86% F	“Deliberate, self-inflicted damaging of a superficial or moderate amount of bodily tissue without the intent to die and outside of social sanction”	Addictive qualities of NSSI were significantly associated with unintentionally severe injury during NSSI. Impulsivity was also linked to unintentionally severe injury during NSSI, although it did not remain a significant predictor. Dissociation was not found to be related to unintentionally severe injury during NSSI
Zhu et al. [56]	Cross-sectional; comparative Analyse the factors influencing the addictive characteristics of NSSI	<i>N</i> = 168 Age (NSSI): <i>M</i> = 15.37 (<i>SD</i> 1.76) Age (controls): <i>M</i> = 14.89 (<i>SD</i> = 3.26) 84% F	“Behaviours that do not aim to end a person’s life but intentionally cause body tissue damage by themselves and are not recognised by society”	Predictors of the addictive characteristics of NSSI were being female, an only child, internet addiction, and having experienced negative parenting styles. However, only 45.24% of the case group exhibited these characteristics. NSSI was also associated with greater addiction to social media and video games
Liu et al. [57]	Longitudinal; mediation analysis Examine the role of stressful life events, emotional dysregulation, and maladaptive cognitive schemas in NSSI	<i>N</i> = 3,925 Age: <i>M</i> = 13.22 (<i>SD</i> = 0.86) 58% F	“Direct and deliberate destruction of body tissue in the absence of any observable intent to die”	Emotional dysregulation and maladaptive cognitive schemas mediated the relationship between repeated NSSI and stressful life events. Higher stress was a strong predictor of the risk of engaging in NSSI. 65.33% of participants with repeated NSSI and 32.56% with occasional NSSI reported at least one addictive aspect
Shi et al. [59]	Cross-sectional; correlational Examine the relationship between early maladaptive schemas and NSSI	<i>N</i> = 1,339 Age: <i>M</i> = 19.86 (<i>SD</i> = 1.26) 46% F	“Intentional destruction of one’s own body tissue without suicidal intent and for purposes that are not socially sanctioned”	Early maladaptive schemas were linked to NSSI history, functions, and addictive traits. The disconnection/rejection schema was associated with NSSI history. Self-sacrifice and vulnerability to harm were related to the internal emotion regulation function. The enmeshed / underdeveloped self-schema was most strongly linked to addictive features
Chen et al. [60]	Cross-sectional; mediation analysis Examine the relationship among NSSI, self-concealment and internet addiction	<i>N</i> = 573 Age: <i>M</i> = 20.10 (<i>SD</i> = 1.46) 73% F	“Suicidal behaviour that deliberately injures or destroys body tissue without committing suicide”	A positive relationship was found between self-injurious behaviours and self-concealment, with individuals engaging in NSSI more likely to adopt avoidance coping strategies. Self-concealment was positively associated with internet addiction
Zhang et al. [61]	Cross-sectional; correlational Explores the association between NSSI and mobile phone addiction	<i>N</i> = 18,723 Age: 12–13 years (<i>M</i> and <i>SD</i> NR) 65% F	“Deliberate self-harming of one’s bodily tissue with no intent of committing suicide”	A significant relationship was found between mobile phone addiction and increased odds of engaging in NSSI. The associations were significant in women participants but not in males
Liu et al. [62]	Cross-sectional; correlational Explore NSSI’s addictive mechanisms focusing on childhood maltreatment, emotional dysregulation and impulsivity	<i>N</i> = 3,915 Age: <i>M</i> = 13.21 (<i>SD</i> = 0.86) 44% F	“Direct and deliberate destruction of body tissue in the absence of any observable intent to die”	Childhood maltreatment was directly related to NSSI through emotional dysregulation, both in occasional and repeated self-injurious behaviours. Differences in the pathways involved in the association were observed, with impulsivity playing a moderating role in repeated NSSI
Greenberg et al. [63]	Cross-sectional; correlational Examine the link between problematic shopping and NSSI through impulsivity and sensation-seeking	<i>N</i> = 2,624 Age: <14 (2.5%), 14–18 (96.7%), >18 (0.7%) (<i>M</i> and <i>SD</i> NR) 66% F	“Infliction of harm to one’s own body without suicidal intent”	A relationship between self-injurious behaviours and problematic shopping was observed, mediated by impulsivity and sensation-seeking characteristics. Adolescents with problematic shopping showed higher occurrence and severity of NSSI and were more likely to present addictive aspects
Lutz et al. [64]	Cross-sectional; comparative Determine whether NSSI is driven by impulsivity or linked to compulsivity	<i>N</i> = 240 15–17 years (<i>M</i> and <i>SD</i> NR) 53% F	“Direct and deliberate damage of body tissue without suicidal intent”	Repetitive NSSI was associated with disadvantageous decision-making and increased compulsivity, but not with behavioural impulsivity. No significant associations were observed for sporadic NSSI
Saarijärvi et al. [65]	Cross-sectional; correlational Explore the associations between early maladaptive schemas with NSSI	<i>N</i> = 118 Age: <i>M</i> = 15 (<i>SD</i> NR) 73% F	“Intentional and self-caused harm to one’s own body without an aim of dying”	Early maladaptive schemas related to self-sacrifice were found to be associated with the internal emotional regulation function of NSSI. Additionally, early maladaptive schemas related to abandonment and dependence were linked to the addictive nature of NSSI. Stronger maladaptive schemas were associated with self-harming behaviours and with more severe self-harm thoughts

Note: F= female; NSSI = non-suicidal self-injury; NR: no reported

Table 5 Empirical studies on the Neurobiological aspects of non-suicidal self-injury (NSSI)

Study	Study type and objectives	Participants	NSSI definition	Main findings
Wang et al. [46]	Cross-sectional; experimental -comparative Analyse clinical profile and BE levels in NSSI cases	<i>N</i> =39 Age: <i>M</i> =14.92 (SD=1.49) 87% F	-	Individuals who met more addiction criteria exhibited higher beta-endorphins levels, though not significantly. An older age of NSSI onset was associated with a shorter transition from NSSI to suicide attempts, with no observed variation in beta-endorphins levels
Osuch et al. [67]	Cross-sectional; comparative Determine how brain function is affected in youth with NSSI	<i>N</i> =28 NSSI: age <i>M</i> =21 (SD 1.8), 23% F Control: age <i>M</i> =20 (SD=2.4), 13% F	-	Both groups of individuals (with and without NSSI) had equivalent levels of pain in response to cold stimuli. However, individuals with NSSI reported significantly greater relief during self-administration of the stimulus, an effect that was not observed during external administration
Zhou et al. [68]	Cross-sectional; experimental -comparative Explore the performance and neural reactivity of exposure to stimuli or signals related to NSSI	<i>N</i> =55 MDD: age <i>M</i> =16 (SD=1.24), 56% F MDD+NSSI: age <i>M</i> =15.17 (SD=1.30), 83% F Control: age <i>M</i> =16.11 (SD=1.91), 57.9% F	“Deliberate self-injuring behaviours that lack suicidal intent”	Significant alterations in neural reactivity were evidenced in the NSSI group when exposed to signals related to self-injury. This pattern of reactivity is characteristic of substance addiction and BA, suggesting the possible addictive nature of NSSI. This effect was not present in either the MDD group or the control group
Rodrigues et al. [69]	Cross-sectional; experimental -comparative Investigate the cognitive mechanisms involved in the desire/craving to self-injure, focusing on attentional biases	<i>N</i> =150 SH: age <i>M</i> =19.66 (SD=2.89), 70% F NA: age <i>M</i> =18.70 (SD=2.43), 92% F Control: age <i>M</i> =18.70 (SD=2.43), 80% F	“Intentional self-poisoning or injury, irrespective of the apparent purpose”	The SH group did not exhibit a statistically significant attentional bias toward self-injury related cues. However, significant avoidance of such signals was observed in the SH group compared to the control group, but not in comparison to the NA group, consistent with the ambivalent model of craving. The NA group showed less difficulty in ceasing to attend to signals related to self-injury stimuli than both the SH and control groups
Guo et al. [70]	Cross-sectional; correlational Explore the relation between NSSI and substance/behavioural addiction	<i>N</i> =48 NSSI: age <i>M</i> =16 (SD=2.5), 88% F Control: age <i>M</i> =31.6 (SD=11.3), 50% F	“Self-injurious behaviour that does not culminate in suicide and uses various methods to cause varying degrees of damage to body tissue”	A significant association between NSSI and addiction in the studied population was demonstrated. The genes SLC14A1, RPS6, and RPS3A (addiction-associated genes) were expressed differently in adolescents with self-injurious behaviours, indicating potential to be used as diagnostic markers for NSSI

Note: BA = behavioural addictions; EA = external administration; F= female; MDD = major depressive disorder; NA = negative affect; NSSI = non-suicidal self-injury; SA = self-administration; SH = self-harming

engaged in NSSI when unable to manage their emotions, finding physical pain more tolerable than emotional distress, and most described it as a reliable coping strategy that provide emotional release and even euphoria [30]. In contrast, another study found that only a small proportion perceive NSSI as a coping mechanism [48], though this may reflect the language used by participants rather than the absence of its regulatory function.

Recent studies suggest that the functions of NSSI might lead to greater severity if addictive components are present [49]. Another perspective is offered through the lens of Ontological Addiction Theory, conceptualising self-injury as an addiction to patterns of experiential avoidance and psychological pain relief [50].

Control Perception

NSSI has been linked with individuals' perception of control, serving to regulate emotions and maintain a sense of agency. One study found that nearly half of the participants perceived self-injury as a means of controlling stress or distressing thoughts [30], while another linked NSSI to relief, attribute to its predictability and the perceived control it offered over life circumstances [32]. This perceived sense of control extends to emotional regulation and influences on interpersonal relationships and parental actions [47]. NSSI has also been identified as an alternative to other risky behaviours [44] or a distraction from suicide [31]. Additionally, some individuals report deriving pleasure or relief from seeing their own blood, reinforcing the behaviour [32, 47].

However, while individuals may initially view these behaviours as a form of control, this perceived control contrasts with its addictive nature. What begins as self-regulation can evolve into compulsive behaviour. Experiencing NSSI as an addiction leads to a loss of perceived control, reinforced by unsuccessful attempts to refrain from self-harm [44] and distress from self-harm urges [43]. Additionally, reduced self-efficacy and diminished sense of identity appear to be associated with feelings of self-loathing, guilt and self-blame [47]. Although the addictive nature of NSSI typically results in distress and loss of control, in rare cases, some individuals may perceive self-injury as a source of pleasure due to the “power” it confers, as reported by one participant in a study [44].

Addiction-Related Language

The perception of NSSI as an addiction can be discerned from the language used by those who self-injure. An analysis of Reddit posts revealed frequent use of addiction-related terms like “clean” or “relapse”, and one-third of the posts explicitly referred to NSSI as an “addiction” [51]. Another study highlighted terms such as “time,” “duration,” “cyclical nature”, and “low mood” in the description of self-injury [44].

Characterizing NSSI as an addiction served four roles: demonstrating the difficulty of stopping (perception of lack of control, ambivalence about stopping the behaviour), legitimizing the experience (understanding NSSI as a form of relief), warning others, and illustrating its inherent complexity [32]. Furthermore, addiction-related language correlated positively with the number of NSSI addictive symptoms the variety of methods used [51].

Assessment of Addiction-Related Diagnostic Criteria

The Ottawa Self-Injury Inventory (OSI) is commonly used to assess addiction-related characteristics of NSSI, evaluating the functions, frequency and addictive-like components of self-injurious behaviours [52]. Based on the DSM-IV diagnostic criteria for substance dependence [53], the psychometric properties and validation of the OSI have been examined in three studies (Table 2).

Preliminary support for the OSI in a nonclinical sample of university students showed four factors related to NSSI functions: “internal emotional regulation”, “social influence”, “external emotional regulation”, and “sensation seeking”, explaining nearly half of the variance [52]. These factors demonstrated convergent validity with the Functional Assessment of Self-Mutilation (FASM) and specific indicators of psychological well-being [43]. Additionally, a factor linked to the addictive-like aspect of NSSI explained

the remaining variance and showed convergent validity, with higher addictive scores correlating with increased frequency, relief after self-injury, and a tendency to always self-injure after thinking about it.

The psychometric properties of the OSI in young adults corroborated the proposed factorial structure [52], with minor adjustments for both function-related and addictive-like features [43]. High scores in addictive characteristics were associated with more frequent self-injury, recent actions, and increased distress from urges to self-harm. Similarly, in a clinical adolescent sample, the factorial structure was confirmed, with high scores in addictive characteristics correlated with NSSI frequency or severity but not with physical pain [54]. Also, addictive features mediated and moderated the relationship between NSSI functions and severity, intensifying both [49].

These studies support the use of the OSI for evaluating NSSI features aligned with addiction-related constructs. An adaptation of the DSM-5 substance use diagnostic criteria (SUD) [7] has been used to operationalise these characteristics. The literature has analysed how individuals with NSSI meet these diagnostic criteria or “addictive items” (Table 1).

In a clinical sample, almost all participants identified three or more addictive items from the OSI, while most of them identified five or more [42], with the number of items identified linked to the frequency and severity of NSSI urges and behaviours. Also, components resembling SUD characteristics were associated with internalised anger, with self-injury serving as an expression of frustration or a means of relieving tension and managing depressive symptoms.

In terms of the DSM-5 adapted SUD criteria, a significant number of participants met two or more of these criteria [51], with addiction severity ranging from mild to severe, depending on the number of symptoms exhibited by the participants. Common criteria included intense cravings, tolerance or intensification of severity, and viewing NSSI as a physical hazard. It has been suggested NSSI increased severity heightens the risk of unintentional severe injury, with addictive features explaining 34% of the variance [55], while factors like dissociation and impulsivity did not significantly contribute. Other studies reported a lower proportion of NSSI cases displaying SUD-like characteristics, although internal emotion regulation remained the primary function [56]. Similar proportions were detailed in another study, where two-thirds of repeated NSSI and about one-third of occasional NSSI reported at least one addictive aspect [57].

More recently, a study of a sample meeting the DSM-5 criteria for NSSID found significant differences between those who exhibited addictive features and those who did not. Notably, demographic differences (such as age, gender, and education) were observed, alongside clinical

differences, including higher prevalence of anxiety, nicotine and alcohol use, internet addiction, alexithymia, and suicidality [58].

Factors Associated with Addiction and Their Presence in NSSI

Several factors typically linked with addictive processes are also present in NSSI. Loneliness and stressful events emerge as the most examined factors and may function as predisposing, mediating, or consequent variables (Table 3).

Loneliness and Self-Concealment

Loneliness and self-concealment, key components of addiction [30], have been linked to NSSI through individuals' subjective experience and their contribution to self-injurious behaviour.

In clinical sample, self-injurious behaviour was predominantly described as a solitary activity, with nearly 20% of participants not disclosing their actions to anyone [42]. A higher proportion was observed in another study, where half of the participants concealed their NSSI experiences [59]. Many participants also hid their self-injury from family, primarily due to shame or guilt, and from professionals out of fear of potential repercussions [48]. NSSI has also been identified as a misunderstood phenomenon, contributing to feelings of loneliness, due to others inability to understand participants' experiences [30].

A significant positive effect of self-injurious behaviours on self-concealment was identified [60], with self-concealment explaining nearly 30% of the link between NSSI and internet addiction. Additionally, NSSI has been associated with greater addiction to social media and video games [56], and shared addictive features, such as withdrawal and reinforcement, with mobile phone addiction [61]. Both NSSI and mobile phone addiction were identified as mechanisms for emotional regulation.

Stress, Trauma and Maladaptive Coping

Studies have examined the relationship between stressful events, both in childhood and adolescence, and engagement in self-injurious behaviours. Research on childhood maltreatment has found it directly associated with NSSI frequency, in repeated and occasional cases, with emotional dysregulation mediating this relationship [62]. Impulsivity moderated the mediating effect of emotional dysregulation, but only in cases of repeated NSSI. The relationship between impulsivity and NSSI has also been examined in the context of problematic shopping behaviour among adolescents, with impulsivity and sensation seeking linked to

increased NSSI occurrence and severity [63]. However, recent neurocognitive research found a non-significant association between impulsivity and NSSI [64], suggesting that impulsive behaviours may occur only during emotional dysregulation, which may not be reflected in laboratory tasks when individuals are not experiencing negative emotions.

Recent research has explored the role of stressful life events, including interpersonal relationships, academic pressure, punishment, loss, and health adaptation, in predicting NSSI frequency in adolescents [57]. These events were found to predict increased NSSI engagement, both directly and through emotional dysregulation and maladaptive cognitive schemas. Additionally, these factors were associated with behaviours exhibiting features consistent with addiction, with such relationships observed only in individuals with repeated NSSI. Recent research has explored the link between maladaptive cognitive schemas and NSSI, showing that these early beliefs are related to the history, regulatory function, and addictive-like features of NSSI [59, 65].

Sexual abuse emerged as a significant stressor in NSSI literature. In a study, over half of individuals who self-harmed to manage dissociative states had histories of sexual or physical abuse, with this pattern observed exclusively among females [42]. Although causality is not established, individuals exhibiting addictive-like NSSI characteristics report higher levels of childhood abuse and emotional neglect compared to those without such features [58]. Additionally, lower parental emotional warmth, reduced family support, and higher punitive or disciplinary parenting styles [56]. Qualitative research further suggests that dysfunctional family environments, including verbal abuse and emotional neglect, contribute to the development of self-destructive behaviours [47].

Addiction-Linked Neurobiology in the Context of NSSI

Recent studies have sought to elucidate crucial neurobiological or genetic factors implicated in the onset and perpetuation of NSSI, with a particular focus on features resembling addiction (Table 4). In terms of neurobiology, particular attention has been directed towards the endocannabinoid and opioid systems.

NSSI has been conceptualised as an endocannabinoid-mediated pain and reward disorder, with dysfunctions in the endocannabinoid system explaining the analgesic effects of self-injury, which reinforces and maintain NSSI as seen in addictive processes [45]. In parallel, pain alleviation has also been linked with the opioid system [28], with the release of endogenous opioids (beta-endorphins and met-enkephalins) during NSSI potentially creating a cathartic effect that reinforces the behaviour and leads to tolerance and persistent

urges. In line with that, elevated beta-endorphins serum levels have been observed in adolescents, particularly among those exhibiting more addictive-like characteristics [46]. Additionally, a baseline opioid deficit may explain the vulnerability to engage in maladaptive coping strategies and the increased pain tolerance in individuals with chronic NSSI [45].

Other studies have also explored the implication of the opioid system in NSSI, emphasizing the role of endogenous opioids in its pathogenesis. Key evidence included: (a) partial success of treatment with opioid antagonists, (b) altered pain sensitivity during NSSI episodes, modulated by the opioid system, and (c) altered levels of endogenous opioids in individuals who self-injure. Findings suggest an opioid deficit, particularly in beta-endorphins and met-enkephalins (both linked to pain perception), potentially mediated by severe childhood trauma or chronic stress [29, 66].

Regarding pain perception, individuals with NSSI exhibited higher pain thresholds and pain tolerance, associated with emotional dysregulation, neuroticism, self-criticism, and prior painful experiences [38]. Factors such as dissociation, hopelessness, and locus of control were also considered but did not correlate with pain perception measures. In a separate study, cold pain sensitivity showed no significant differences between individuals with and without NSSI [67], as assessed via BOLD (Blood Oxygenation Level-Dependent) signals. Similarly, no group differences emerged when painful stimuli were externally applied. However, self-administered stimuli elicited greater relief among individuals with NSSI, who also exhibited increased activation in brain regions, such as the right brainstem, superior temporal gyrus, and amygdala, and reduced activity in parietal and occipital lobes compared to control group. Reduced connectivity was also found between the orbitofrontal and the anterior cingulate cortex. In adolescents, altered neural reactivity to NSSI-related stimuli was observed [68], with longer reaction times to salient versus neutral, suggesting an attentional bias. Accuracy measures, however, showed no significant differences.

Recent research using a dot probe task revealed that while all the participants were initially oriented towards the stimuli, those with a history of self-injury demonstrated avoidance behaviours towards NSSI-related cues [69]. Moreover, those who perceived these cues as “reassuring” exhibited greater avoidance tendencies, whereas those rating them as “pleasant” displayed enhanced sustained attention. These findings suggest nuanced cognitive responses to NSSI-related stimuli, implicating attentional biases in NSSI. Additionally, a probabilistic reversal task showed increased perseverative errors in individuals with NSSI, indicating compulsive response patterns and supporting a compulsivity-based aetiology for repetitive NSSI [64].

Lastly, studies have found positive correlations between NSSI and both substance-related and BA, particularly mobile phone addiction [70]. Individuals with mobile phone addiction showed increased likelihood of engaging in NSSI [61]. Additionally, genetic analysis revealed higher differential expression of three genes associated with alcohol addiction (SLC14A1, RPS6, and RPS3AY) in individuals who self-injure [70].

Discussion

Findings from this review highlight notable parallels between NSSI and BA across subjective experiences, diagnostic criteria, and neurobiological mechanisms. These results support the presence of addictive components in NSSI and its conceptualisation as a BA.

Addiction-Related Patterns of Subjective Experience in NSSI

Subjective experiences are crucial in conceptualising NSSI as a BA. BA involve impaired control, with compelling urges and difficulty resisting them, akin to the recurrent distressing urges reported by individuals with NSSI [17, 42, 48]. This has been linked to withdrawal-like symptoms, drawing a parallel with addictive processes. NSSI is described as habitual and escalating over time, forming a vicious cycle that persists despite individuals’ efforts to refrain and the occurrence of negative consequences [31, 41, 44]. This cyclical and reinforcement parallels patterns observed in substance and BA [24, 33, 71], mirroring the development of tolerance seen in addictions, where increased engagement is required to achieve the desired effect [22]. Moreover, as NSSI escalates, it may result in severe accidental injuries, highlighting the addictive features and associated loss of control. NSSI has been linked to challenges in impulse control [21, 41], a feature common in BA; however, some studies found no significant association between neurocognitive measures of impulsivity and NSSI presence [64] or severity [55].

The function NSSI serves further supports its conceptualization as an addiction. Addictive behaviours often occur in contexts of emotional dysregulation, which also hinder cessation [21], while similarly, emotional dysregulation is strongly linked to the aetiology, onset, maintenance, frequency and severity [57, 62]. Affect regulation is a primary intrapersonal function of NSSI [16] with the behaviour often used as a maladaptive coping strategy to manage emotional pain and depressive states employed to alleviate depressive feelings [30, 31, 42, 44, 47], though it is not always effective [13]. When effective, NSSI may serve as a negative

reinforcer by alleviating emotional discomfort, thus reinforcing the behaviour, akin to mechanisms seen in addictive behaviours. Although affect regulation is the predominant motive for NSSI, a minority report experiencing pleasure or euphoria during the act [32, 44]. This discrepancy may reflect the dual nature of craving in BA (aversive or appetitive), with NSSI primarily triggered by negative emotional states [12]. Although this highlights some differences, it does not preclude its conceptualisation as an addiction. The transition from a behaviour initially experienced to one driven by negative reinforcement, becoming increasingly egodystonic, is observed in both NSSI and other addictions [17].

Perceptions of control in NSSI also align with patterns observed in addictions. While some view self-injury as a means to manage emotions or stress [30, 32, 47], others report a diminished sense of agency when conceptualising it as an addiction, which may increase dependence [44] and negative self-perceptions [47]. These perspectives suggest an initial sense of control that shifts toward perceived loss of control and increased dependence, mirroring the trajectory seen in addiction. This shift is further influenced by addiction-related language, which reflects how individuals conceptualise NSSI [32, 51], shapes their identity [44], and correlates with the presence of addictive symptoms, thereby underscoring the connection between NSSI and addictions [51].

Also, NSSI is often described as a solitary, non-shared activity [30, 42, 48, 59], frequently influenced by feelings of being misunderstood, which aligns with components of addiction [30] such as loneliness and self-concealment. The association between NSSI and internet addiction [60], social media and video gaming addictions [56], further highlights similar behavioural patterns. Additionally, dysfunctional family environments [47] and stressful life events, both in early childhood [62] and/or adolescence [57], have been identified as risk factors in NSSI and other BA or problematic behaviours [57].

These findings, including the compulsive or impulsive nature of NSSI, its function, and the element of perceived control, strongly suggest that NSSI aligns with BA. Moreover, patterns of compulsive engagement, failed attempts to refrain, and continued behaviour despite harm further align NSSI with core features of addictive disorders. The solitary nature of NSSI, the language used to describe it, and its association with stress, trauma, and maladaptive coping further reinforce its connection with BA.

Addiction-Related Diagnostic Criteria in NSSI

An additional argument supporting the view of NSSI as an addiction draws on diagnostic criteria adapted from

substance addiction categories found in both the DSM-IV [53] and DSM-5 [7].

Studies using the OSI to assess addictive characteristics have consistently supported NSSI's potential to be considered as a form of addiction. Initial findings identified a specific factor linked to NSSI's addictive component, demonstrating high explained variance and convergent validity [52]. Subsequent studies corroborated this model in adolescents [54] and young adults [43], highlighting NSSI's addictive features in relation to behaviour frequency, severity [49, 52, 54], relief [52], recency, and the distress caused by the urge [43]. Additionally, the moderation and mediation roles of addictive features between NSSI's functions and severity underscore their significance [49]. In summary, psychometric validation studies of the OSI support conceptualising NSSI as an addictive behaviour with reinforcing patterns resembling those in other addictions.

The findings from studies using the OSI or the adaptation of DSM-5 criteria further support the potential addictive nature of NSSI. The number of addictive components is correlated with the frequency and severity of self-injury, with symptoms like the intense urge to self-injure and perceiving it as a physical hazard reinforcing this association. Although one study found a low proportion of cases exhibiting addictive features, NSSI still functioned as a mechanism for emotional regulation [56]. A study assessing addictive characteristics in individuals with NSSID found a high prevalence of such features, further supporting the link between NSSI and BA [58]. Additionally, variations in age, gender, education, and the presence of other mental disorders and addictions underscore the complexity of the phenomenon, highlighting the need for further research.

Overall, findings based on diagnostic criteria indicate that many individuals exhibit addictive characteristics related to NSSI, underscoring the need for a comprehensive approach that addresses both its emotional and addictive components.

Addictive-Like Neurobiological Aspects of NSSI

Recent research has compiled neurobiological and genetic evidence supporting the similarities between NSSI and conventional addictions.

The involvement of endogenous opioids in the pathogenesis of NSSI suggests an addictive component, with self-injury alleviating discomfort via the opioid system, similar to substance addictions, which facilitates the maintenance of the behaviour [29, 45, 66]. Changes in pain perception, mediated by opioids, may also play a role in the addictive nature of NSSI [29, 38]. Although no significant differences in pain perception were found, a regulatory function of self-injury was suggested by differences in perceived relief when painful stimulus were self-administered [67].

Moreover, differences in brain activation and connectivity related to emotional processing and response inhibition suggest impulse control difficulties, akin to those in addictions. Finally, genetic similarities have been identified, providing objective support for conceptualising NSSI as an addiction.

While the current evidence on the neurobiological basis of NSSI pathogenesis is preliminary, it points to potential overlap in the neurobiological mechanisms involving the opioid and endocannabinoid systems. Further research is needed to clarify these underlying mechanisms and their roles in the development and maintenance of NSSI, as well as to assess its classification within BA.

Limitations and Future Research

Our review is not exempt of limitations. First, a limitation in many included studies is the reliance on self-reported data from interviews and psychometric assessments, which, while valuable, are subjective in nature. Neurobiological and neurocognitive findings, however, offer more objective evidence. Second, cognitive biases associated with maladaptive cognitive schemas may affect the reliability of self-reports. The subjective nature of emotional dysregulation and trauma exposure also complicates external assessment. Finally, despite the objective intent of neurobiological studies, caution is needed when drawing definitive conclusions, as this field remains in early its stages.

Another limitation arises from the use of OSI to define NSSI, as it implicitly suggests an addictive nature by assessing “addictive features” such as compulsiveness, craving, and loss of control. However, the OSI was not designed to diagnose an addictive disorder but to explore elements relevant to NSSI, including addiction criteria, without implying that NSSI is an addictive disorder. Rather, it serves as a tool for evaluating these characteristics and advancing the nosological understanding of NSSI, potentially identifying its variants or subgroups.

Lastly, several studies in this review had modest sample sizes or limited number of studies, which increase the risk of bias and reduce generalizability. The predominance of female participants and the lack of exploration into gender-specific differences further limit the applicability of findings across sexes. Additionally, the variability in NSSI definitions, participant demographics, and methodological discrepancies complicate result synthesis and inter-study comparisons. The cross-sectional design of many studies also precludes causal inferences, underscoring the need for longitudinal research. Potential biases in study selection, results interpretation, and publication bias may also affect the accuracy of the conclusions. Despite these limitations,

this review provides valuable contributions to the literature, supporting the conceptualization of NSSI as a BA.

This review suggests several directions for future research into the conceptualisation of NSSI as an addiction. First, further empirical investigations are needed to explore why some individuals exhibit addictive traits while others do not. Second, research should consider factors such as life history, personality traits, and cognitive aspects like attentional biases and maladaptive schemas. Third, investigating underlying biological factors, including molecular, anatomical and functional aspects, is crucial. Fourth, distinguishing NSSI’s addictive characteristics from those of substance use disorders is essential for developing specific assessment tools. Finally, research into addiction-related treatments for NSSI is warranted to clarify its nosology and enhance clinical interventions.

Conclusions

This systematic review provides substantial evidence supporting the conceptualization of NSSI as a behavioural addiction, evaluated through subjective experiences, diagnostic criteria, and neurobiological findings. Individuals with NSSI exhibit analogous patterns to those seen in addictive behaviours, including compulsive urges, loss of control, persistence of the behaviour, and concern over the behaviour. Despite the distress caused, NSSI is often maintained to cope with negative emotional states, indicating a negative reinforcement mechanism. Over time, addiction-related features contribute to tolerance development, driven by biochemical processes that exacerbate the intensity and frequency of the behaviour, and maintain the cyclical structure typical of addictive disorders.

Emotional dysregulation plays a key role in the aetiology, maintenance and clinical presentation (frequency and severity) of NSSI, resembling patterns seen in other addictions. Factors such as loneliness and self-concealment further support its addictive nature. Similarities with other behavioural addictions, such as internet addiction, suggest shared underlying mechanisms that support the addiction model. Valid diagnostic criteria and assessment tools for addiction reinforce the addictive component of NSSI, while neurobiological findings indicate the involvement of the reward system, along with the endocannabinoid and opioid systems. Although the exact mechanisms of repeated NSSI remain unclear, biochemical and neural similarities to addiction processes suggest the need for treatment strategies targeting dysregulation in these systems, including opioid antagonists.

While current evidence may not definitively classify NSSI as a behavioural addiction, it strongly suggests the

potential for such classification in the future. Some individuals with NSSI may benefit from treatments incorporating evidence-based elements from addiction treatment programs. However, conceptualising NSSI as an addiction alone does not fully capture its complexity, highlighting the need for a multidimensional understanding that includes emotional, compulsive, impulsive, and potentially addictive components. In conclusion, combining addiction frameworks with a multidimensional approach could significantly improve intervention strategies and deepen the understanding of NSSI in both research and clinical practice.

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- 62. Liu J, Gao Y, Liang C, Liu X. The potential addictive mechanism involved in repetitive nonsuicidal self-injury: The roles of emotion dysregulation and impulsivity in adolescents. *J Behav Addict*. 2022;11:953–62. <https://doi.org/10.1556/2006.2022.00077>. This study examined repetitive NSSI in a large adolescent sample, substantiating the addictive conceptualization of NSSI and highlighting the clinical relevance of emotional and behavioural dysregulation in maintaining the behaviour.
- 70. Guo Z, Liu Y, Wang C, Li S, Yu L, Wu W, et al. Exploring the association of addiction-related genetic factors with non-suicidal self-injury in adolescents. *Front Psychiatry*. 2023;14. <https://doi.org/10.3389/fpsy.2023.1126615>. This study provides compelling molecular evidence linking addiction-related genes to NSSI by identifying differential genetic expression in adolescents with NSSI.

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Data Availability No datasets were generated or analysed during the current study.

Declarations

Human and Animal Rights and Informed Consent No animal or human subjects by the authors were used in this study.

Competing Interests The authors declare no competing interests.

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