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Scars, screens, and stakes: Link between non-suicidal self-injury and problem gambling, problem gaming, and problematic internet use – A systematic review

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REVIEW ARTICLE

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ABSTRACT

Objective: Non-suicidal self-injury (NSSI) constitutes an important public health concern. Here, we systematically reviewed and synthesized existing literature to provide an up-to-date overview of associations between NSSI, problem gambling, problem gaming, and problematic internet use (PIU). *Methods:* We searched four databases through April 2025: Web of Science, Scopus, PubMed, and PsycINFO. The Joanna Briggs Institute's tool was used to assess the quality of studies. Empirical studies utilizing quantitative or qualitative methods or case studies that presented evidence on the relationships between NSSI and frequent or problematic gambling, internet use, and gaming were included. *Results:* Forty studies published between 2009 and 2025 were reviewed. Four investigated the relationship

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between NSSI and problem gambling, seven focused on problem gaming, and twenty-nine examined PIU. Cross-sectional designs and surveys were common. Findings suggest that at-risk or problem gambling was associated with NSSI in adolescents, college students, and adults. An association between PIU and NSSI appeared moderated by social support, with impulsivity representing a shared factor. Similarly, internet gaming disorder and its severity were linked to NSSI, with anxiety acting both as a mediator and moderator. Limitations entailed self-reported measures, limited generalizability, poor ability to establish causal relationships due to cross-sectional designs, and frequent use of single unvalidated questions to assess NSSI. *Conclusion:* The review provides a comprehensive overview and suggests complex relationships between NSSI and problem gambling, problem gaming, and PIU. Clinicians and future studies should focus on co-occurring disorders and identify risk factors, predictors, and moderators that influence these relationships.

KEYWORDS

problem gambling, problem gaming, problematic internet use, non-suicidal self-injury, NSSI, addictive behavior, gambling, compulsive behavior, impulsive behavior, internet addiction disorder, internet use, self-injurious behavior, suicide, technology addiction, video games

INTRODUCTION

Non-suicidal self-injury (NSSI) is defined as the deliberate destruction of one's bodily tissue without suicidal intent and for purposes not socially sanctioned (e.g., tattoo, piercing). It includes behaviors such as cutting, burning, scratching, and hitting (Nock, 2009). NSSI has become a significant public health concern. Studies show that NSSI is prevalent worldwide, with estimates ranging from 11.5 to 33.8% in developing countries (Thippaiah et al., 2020). Findings indicate that its prevalence is similar across developed and developing nations (Thippaiah et al., 2020). Lifetime prevalence in adolescents ranged from 17.1 to 38.6% across 11 European countries (Brunner et al., 2013). In most of these countries, females were more likely to engage in NSSI than males (Brunner et al., 2013). According to a recent meta-analysis by Moloney et al. (2024), female adolescents had twice the likelihood of experiencing NSSI compared to males in North America and Europe. However, this difference diminishes by early adulthood (Wilkinson et al., 2022). As high healthcare costs are related to hospitalizations and treatment of NSSI, NSSI is a noteworthy concern (Mitchell, Seah, Ting, Curtis, & Foster, 2018).

NSSI has been linked to multiple psychological disorders, including depression, anxiety, post-traumatic stress disorder, borderline personality disorder, and eating disorders (Bürger et al., 2023; Fox et al., 2015). NSSI has been strongly associated with suicidality, and they often co-occur in general and psychiatric populations. Nock et al.'s (2006) study provided foundational insight into the high rates of suicide attempts among psychiatric, self-harming adolescents: more than two-thirds (70%) reported suicide attempts, and 55% reported more than one attempt. Subsequent research has continued to confirm the strong link between NSSI and suicidality and has expanded on these findings, indicating that the co-occurrence of NSSI and suicidality remains consistently high across different populations and time periods (Grandclerc, De Labrouhe, Spodenkiewicz, Lachal, & Moro, 2016; Groschwitz et al., 2015; Klonsky, Victor, & Saffer, 2014; Voß, Hoyer, Venz, Pieper, & Beesdo-Baum, 2020).

NSSI was proposed as the basis of a new diagnostic entity (non-suicidal self-injury disorder; NSSID) in the fifth edition of the Diagnostic and Statistical Manual (DSM-5) (American Psychiatric Association, 2013) and included in Section III as a condition that needs further investigation (Glenn & Klonsky, 2013; Plener & Fegert, 2012; Zetterqvist, 2015). The argument for NSSI to be recognized as the basis for a distinct clinical diagnosis was proposed as early as the 1980s (Kahan & Pattison, 1984; Pattison & Kahan, 1983). NSSI has been primarily studied in the context of borderline personality disorder (BPD), where it is included as a diagnostic criterion. However, research has demonstrated that NSSI can occur independently of BPD and is present across different psychiatric conditions, including depression and anxiety (Glenn & Klonsky, 2013). NSSI can be observed in individuals without any psychiatric conditions (Klonsky, Oltmanns, & Turkheimer, 2003; Muehlenkamp, 2005). Another primary reason why NSSI was proposed as the basis for a distinct diagnosis involves differentiating it from suicidality, despite their frequent co-occurrence. Accurate characterization is important for research and interventions. In addition, in a clinical setting, not differentiating NSSI from attempted suicide can lead to inaccuracies (Klonsky et al., 2013). NSSI and attempted suicide differ in prevalence, frequency, methods, severity, and functions (Klonsky, 2006; Muehlenkamp, 2005). NSSI is not inherently suicidal; people who engage in NSSI may not have suicidal thoughts and attempts (Klonsky & Muehlenkamp, 2007; Nock, Joiner, Gordon, Lloyd-Richardson, & Prinstein, 2006). NSSI is a maladaptive coping mechanism often used for emotion regulation and alleviating psychological pain. In contrast, suicide attempts are driven by the desire to end one's life, and NSSI is not a less lethal form of a suicide attempt, but rather a signal of psychological distress (Butler & Malone, 2013). Therefore, even if NSSID has not been included in the DSM as a clinical disorder for now, its relevance is widely recognized, and further research efforts are strongly encouraged (Cipriano, Cella, & Cotrufo, 2017).

Some researchers argue that NSSI may be conceptualized as an addiction due to its similar characteristics (age of onset, cravings, feeling of 'relief', repetitiveness, etc.) (Blasco-Fontecilla et al., 2016; Greenberg, Zhai, Hoff, Krishnan-Sarin, & Potenza, 2021; Himelein-Wachowiak et al., 2022; Karlsson, Håkansson, & Hansson, 2023; Karlsson & Hakansson, 2023; Liu, Gao, Liang, & Liu, 2022). A common motivation underlying NSSI involves reducing negative emotions and feelings and promoting calmness and relief (Klonsky et al., 2014). Such motivations share similarities with negative reinforcement mechanisms underlying addictive disorders. Moreover, impulsivity has been linked to self-harm and suicidality (Hamza, Willoughby, & Heffer, 2015;

McHugh et al., 2019; Valenciano-Mendoza et al., 2022), and it is also a well-documented risk factor in substance-related and behavioral addictions (e.g., problem gambling, problem gaming, or problematic internet use (PIU) (Greenberg, Zhai, Hoff, Krishnan-Sarin, & Potenza, 2022; Karlsson, Broman, & Håkansson, 2019; Lee et al., 2012; Ryu et al., 2018). Gambling and gaming behaviors both show high impulsivity and reward sensitivity (Ioannidis, Hook, Wickham, Grant, & Chamberlain, 2019; Király, Koncz, Griffiths, & Demetrovics, 2023), and similarly, PIU is associated with impulsivity and sensation-seeking as well as low inhibitory control (Billieux, 2012). Gambling and gaming disorders are officially recognized as clinical conditions in the International Classification of Diseases, 11th Revision (ICD-11) (World Health Organization, 2019). Although PIU is not yet a standalone diagnosis, it has received growing empirical support due to its high prevalence and its close connection with internet-based gambling and gaming platforms (Brand et al., 2020, 2024). Alongside gambling and gaming, PIU was examined in this study given its conceptual overlap and the shared vulnerabilities it presents. There are potential risk factors and co-occurring concerns that are shared by NSSI, problem gambling, problem gaming, and PIU, including depression, anxiety, attention-deficit/hyperactivity disorder (ADHD), and suicidal behaviors (Mészáros, Győri, Horváth, Szentiványi, & Balázs, 2020), as well as dysfunctional reward processing (Case, Mattoni, & Olino, 2021; Poon, Thompson, Forbes, & Chaplin, 2018; Raiha et al., 2020). IGD and gambling disorder share similar neurobiological underpinnings, reward systems, and resemblance to substance use disorders (Weinstein, Livny, & Weizman, 2017).

As the number of people using the internet has now surpassed 5 billion (Abdallah & Hamdan-Mansour, 2024), research on PIU, problem gambling, and problem gaming is becoming increasingly important (Fineberg et al., 2018, 2022), as these behaviors are interconnected and largely driven by internet-based platforms. Notably, gambling integrates video gaming features, and gaming incorporates some gambling elements, which, combined with the accessibility of online environments, heighten vulnerability among adolescent populations (Council of Europe Publishing, n.d.). Based on the above observations, we aimed to review and systematically synthesize the existing evidence on associations between NSSI and problem gambling, problem gaming, and PIU.

METHODS

Information sources and search strategy

The research strategy followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher, Liberati, Tetzlaff, & Altman, 2009; Page et al., 2021). No limit was set for the date of publication, and the search covered all peer-reviewed papers published up until April 2025. The protocol was registered with the PROSPERO systematic review protocol registry (https://www.crd.york.ac.uk/PROSPERO/view/CRD42024511580).

To ensure a comprehensive range of findings, we searched the following databases through April 2025: Web of Science, Scopus, PubMed, and PsychINFO. The search strategy used specific terms, clusters, and Boolean operators (See Table 1).

To cover a wide range of results, separate searches were conducted for each combination of English search terms within each database. The search was performed by considering the article title, abstract, and keywords.

Eligibility criteria

The inclusion criteria for selecting the studies were based on the following: (1) empirical studies utilizing either quantitative or qualitative methods or case studies that aimed (2) to investigate NSSI and at least one of the following phenomena: problem gambling, problem gaming, or PIU; and (3) were published in English. Studies were excluded if they were (1) systematic reviews and/or meta-analyses, (2) published in a language other than English, and (3) sources other than peer-reviewed journals or refereed book chapters (e.g., non-peer-reviewed journals, conference abstracts, corrections).

We defined a behavior as problematic if the included studies classified it as such. Various measures were used to assess this, primarily self-report tools (as detailed later).

Table 1. Search strategy for systematic review

Category	Keywords
Non-Suicidal Self-Injury (NSSI)	"nonsuicidal self-injury" OR "SIB" OR "non-suicidal self-injury" OR "nonsuicidal self-injurious" OR "non-suicidal self-injurious" OR "nonsuicidal self-harm" OR "non-suicidal self-harm" OR "NSSI" OR "deliberate self-harm" OR "DSH" OR "self-mutilation" OR "parasuicide" OR "para-suicide"
Gambling	gambl* OR "problem gambling" OR "pathological gambling" OR "betting" OR "wagering" OR "disordered gambling" OR "ludomania" OR "compulsive gambling"
Gaming	"problem* gaming" OR "gaming addiction" OR "game addiction" OR "gaming disorder" OR "internet gaming" OR "internet game" OR "online gaming" OR "online game" OR "video gaming" OR "videogaming" OR "videogame" OR "video game" OR "computer gaming" OR "computer game*" OR "excessive computer use" OR "risk* gaming" OR "pathological gaming"
Problematic Internet Use	"compuls* Internet use" OR "pathological Internet use" OR "excessive internet use" OR "problematic Internet use" OR "internet addiction" OR "problematic use of the internet"

Additionally, we verified that in all included studies, NSSI/self-harm/self-injurious behavior was defined as a behavior occurring without the intent to die or any lethal intent to differentiate it from suicidal behavior and other related concepts.

Selection process

Separate searches were conducted in each database. The preliminary search included screening titles and abstracts of identified studies. In the selection round, the full texts of the remaining papers were thoroughly reviewed and assessed for inclusion. The process of screening and selection was executed by two authors (ML and YS). Figure 1 represents the PRISMA flowchart that summarizes the identification and selection of the articles for this review. The first search yielded 485 studies. After removing the duplicates and non-English studies, 215 remained. During the initial screening, 168 papers were excluded based on titles, keywords, and abstracts. The full-text screening was conducted on 47 studies, and 7 of these records were excluded.

Quality assessment

The Joanna Briggs Institute's (JBI) critical appraisal tools were used to assess the authenticity, relevance, and results of both quantitative (Moola et al., 2019) and qualitative (Lockwood et al., 2019) studies. The assessment process involved three authors (ML, YS and PR) reviewing the articles and reaching a consensus to ensure consistent evaluation (See Table 2).

Terminology

When referring to self-harm/self-injurious behavior, we generally use the term „NSSI". However, we acknowledge that some studies use different terms including "deliberate self-harm", "self-injury", or "self-mutilation". Similarly, for the phenomenon of PIU, there are multiple other terms

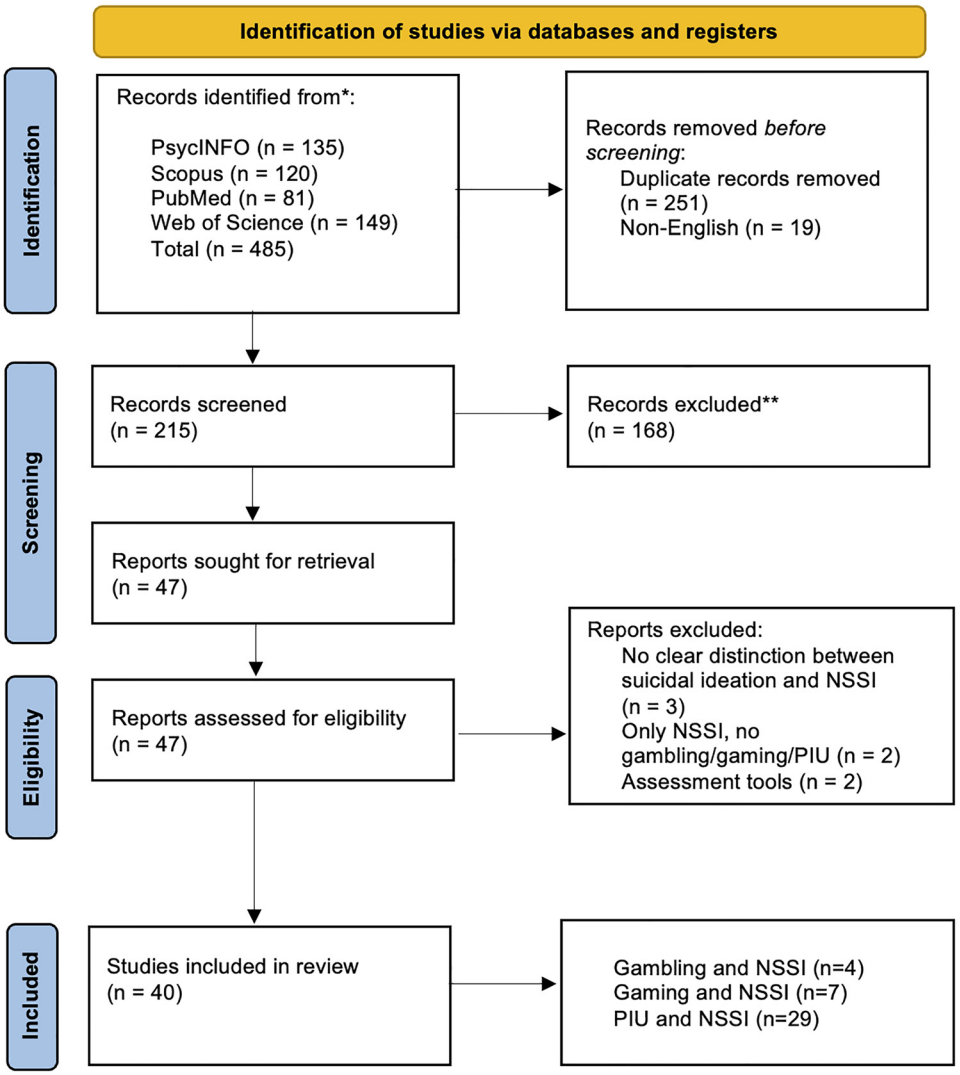

Fig. 1. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flowchart
Note. NSSI: non-suicidal self-injury; PIU: problematic internet use.

Table 2. JBI critical appraisal checklist

Author(s) year	Q.1	Q.2	Q.3	Q.4	Q.5	Q.6	Q.7	Q.8	Overall
JBI Critical Appraisal Checklist for Analytical Cross-sectional Studies									
Aktepe et al. (2013)	✓	✓	?	✓	✓	✓	✓	✓	Include
Chen et al. (2023)	✓	✓	✓	✓	✓	x	✓	✓	Include
Çimen et al. (2017)	✓	✓	✓	✓	✓	✓	✓	✓	Include
Evren et al. (2020)	✓	✓	✓	✓	✓	✓	✓	✓	Include
Fan et al. (2023)	✓	✓	✓	✓	✓	✓	✓	✓	Include
Farhat et al. (2020)	✓	✓	✓	✓	✓	✓	✓	✓	Include
Gong et al. (2025)	✓	?	✓	✓	✓	✓	✓	✓	Include
Greenberg et al. (2022)	✓	✓	✓	✓	✓	✓	✓	✓	Include
Hamdan et al. (2022)	?	✓	✓	✓	✓	✓	✓	✓	Include
Kaess et al. (2014)	✓	✓	✓	✓	✓	✓	✓	✓	Include
Kim et al. (2023)	✓	✓	✓	✓	✓	x	✓	✓	Include
Kingston et al. (2011)	✓	✓	✓	✓	?	?	✓	✓	Include
Lam et al. (2009)	x	✓	✓	✓	✓	✓	✓	✓	Include
Lan et al. (2022)	✓	✓	✓	✓	✓	✓	✓	✓	Include
Leino et al. (2024)	✓	✓	✓	✓	✓	?	✓	✓	Include
Liu et al. (2017)	✓	✓	✓	✓	✓	✓	✓	✓	Include
Liu et al. (2021)	✓	✓	✓	✓	✓	✓	✓	✓	Include
Liu et al. (2023)	✓	✓	✓	✓	✓	✓	✓	✓	Include
Liu, Wei, et al. (2024)	✓	✓	✓	✓	?	x	✓	✓	Include
Lloyd et al. (2010)	✓	✓	✓	✓	✓	✓	✓	✓	Include
Lloyd et al. (2016)	✓	✓	✓	✓	✓	✓	✓	✓	Include
Lung et al. (2020)	✓	✓	✓	✓	✓	✓	✓	✓	Include
Ma et al. (2023)	✓	✓	✓	✓	✓	✓	✓	✓	Include
Mészáros et al. (2020)	✓	✓	✓	✓	✓	✓	✓	✓	Include
Muslić et al. (2023)	✓	✓	✓	✓	✓	✓	✓	✓	Include
Oktan (2015)	✓	✓	✓	✓	✓	?	✓	✓	Include
Serras et al. (2010)	✓	✓	✓	✓	✓	✓	✓	✓	Include
Tang et al. (2020)	✓	✓	?	?	✓	✓	✓	✓	Include
Tang et al. (2024)	✓	✓	✓	✓	?	x	✓	✓	Include
Twenge et al. (2020)	✓	✓	✓	✓	✓	✓	✓	✓	Include
W. Chen et al. (2024)	✓	✓	✓	✓	?	x	✓	✓	Include
Wang, Liu, Liu, and Jia (2020)	✓	?	✓	✓	✓	✓	✓	✓	Include
Wang et al. (2023)	✓	✓	✓	✓	✓	✓	✓	✓	Include
Xiong et al. (2023)	✓	✓	✓	✓	✓	✓	✓	✓	Include
Xu et al. (2023)	✓	✓	✓	✓	✓	✓	✓	✓	Include
Yang et al. (2020)	✓	✓	✓	✓	✓	✓	✓	✓	Include
Yang et al. (2023)	✓	✓	✓	✓	✓	✓	x	✓	Include
Z. Liu, Wei, et al. (2024)	✓	✓	✓	✓	✓	✓	✓	✓	Include
Zhou et al. (2022)	✓	✓	✓	✓	✓	?	✓	✓	Include
JBI Critical Appraisal Tool for Case-control Studies									
Zhu et al. (2022)	✓	?	✓	✓	✓	✓	?	✓	Include

Note. Q1.Were the criteria for inclusion in the sample clearly defined? Q2. Were the study subjects and the setting described in detail? Q3. Was the exposure measured in a valid and reliable way? Q4.Were objective, standard criteria used for measurement of the condition? Q5.Were confounding factors identified? Q6. Were strategies to deal with confounding factors stated? Q7. Were the outcomes measured in a valid and reliable way? Q.8 Was appropriate statistical analysis used?

Case control studies: Q1.Were the groups comparable other than the presence of disease in cases or the absence of disease in controls? Q2. Were cases and controls matched appropriately? Q3. Were the same criteria used for identification of cases and controls? Q4. Was exposure measured in a standard, valid and reliable way? Q5. Were confounding factors identified? Q6. Were outcomes assessed in a standard, valid and reliable way for cases and controls? Q7. Was the exposure period of interest long enough to be meaningful? Q8. Was appropriate statistical analysis used?

✓ = Yes, x = No, ? = Unclear

Overall appraisal: Include, exclude, seek further.

used in the literature, such as problematic usage of the internet (PUI). While we acknowledge that the term "PUI" has been increasingly suggested in the literature (Fineberg et al., 2025), in this paper, we primarily use "PIU", as it is used by most of the reviewed papers, while we also refer to other terminology (such as internet addiction or PUI) used by specific studies referenced.

RESULTS

Study characteristics

All included studies (n = 40) were published between 2009 and 2025. Four studies examined the relationship between problem gambling and NSSI, seven focused on problematic gaming and NSSI, and the majority (29 studies) assessed PIU and NSSI. Most (n = 22) were conducted in China, followed by Turkey and the UK (n = 4 each), the US (n = 3), and one study each were from Hungary, Croatia, Europe, Norway, Israel, Taiwan, and South Korea.

Most studies (n = 34) applied a cross-sectional design, while three cohort studies (Lung, Shu, Chiang, & Lin, 2020; Ma et al., 2023; Wang, Xu, Zhang, Wan, & Tao, 2020) were also identified. One study utilized a case-control design (Zhu et al., 2022), and two used a longitudinal design (Gong, Zhou, & Hao, 2025; Xiong et al., 2023). The survey method was primarily employed throughout the studies. Most studies (n = 32) focused on adolescents, including psychiatric inpatients and/or outpatient adolescents (n = 4) (Wang et al., 2023; Z. Liu, Wei, Yang, & Kong, 2024; Zhou et al., 2022; Zhu et al., 2022) and there were six studies (Chen et al., 2023; Evren, Evren, Dalbudak, Topcu, & Kutlu, 2020; Kingston, Clarke, Ritchie, & Remington, 2011; Leino et al., 2024; Serras, Saules, Cranford, & Eisenberg, 2010; Yang, Xin, Liu, & Böke, 2020) involving college or university students. Two studies (Lloyd et al., 2010, 2016) involved the same sample of adults with a mean (SD) age of 35.5 (11.8) years who were recruited from gambling-related websites (for the detailed study characteristics see Table 3).

According to the JBI critical appraisal checklist, most studies demonstrated high quality, with 19 cross-sectional studies meeting all eight criteria. Criteria not met were usually concerning confounding factors and valid and reliable measurement of the exposure.

Measures

Multiple scales and assessment methods were employed across studies. Almost half of the studies (n = 21) used commonly employed, validated inventories, such as the Deliberate Self-Harm Inventory (DSHI) (Gratz, 2001), Non-suicidal Self-injury Questionnaire (NSSIQ) (Wan, Hu, Hao, Sun, & Tao, 2011) and the Inventory of Statements About Self-injury (ISAS) (Klonsky & Glenn, 2009). Additionally, two studies incorporated clinical interviews alongside the questionnaires (Wang et al., 2023; Yang, Ma, Zhou, Ji, & Hou, 2023). In the remaining studies (n = 17), different variations of a single question, "In the past year, have you engaged in the following behaviors to deliberately harm yourself but without suicidal intent?" (Liu et al., 2021) or "Have you ever intentionally (i.e., on purpose) cut your wrists, arms, or other areas of your body or do anything else to hurt yourself (e.g., burned, bit, or severely scratched) without intending to kill yourself?" (Greenberg et al., 2022), were used to assess NSSI and its frequency. Lloyd et al. (2016) specifically tailored the question to examine gambling-related self-harm.

Concerning problem gaming, all identified studies used widely accepted measures, such as The Nine-Item Internet Gaming Disorder Scale (IGDS9-SF) Pontes and Griffiths (2014), Internet Gaming Disorder Test (IGDT-10) (Király et al., 2015), Video Game Dependence Scale (VDG-S) (Wu et al., 2022), Game Addiction Scale for Adolescents (GASA) (Lemmens, Valkenburg, & Peter, 2009) or Pathological Online Gaming Use scale (POGU) (Gentile, 2009). Gambling assessment tools also differed across studies, employing commonly used measures such as the Massachusetts Gambling Screen (MAGS) (Shaffer, LaBrie, Scanlan, & Cummings, 1994) and 10-item criteria for DSM-IV pathological gambling (American Psychiatric Association, 1994) along with assessing frequency and motivations of gambling. PIU was more commonly measured using the Young Internet Addiction Test (IAT) (Young, 1998), or short version (s-IAT) (Pawlikowski, Altstötter-Gleich, & Brand, 2012), the 26-item Chinese Internet Addiction Scale-Revised (CIAS-R) (Mak et al., 2014). These scales have been validated and are widely used. In addition, several studies utilized the duration of internet use during the day as an indicator of PIU. In one study (Greenberg et al., 2022), PIU was assessed using the Minnesota Impulsive Disorder items modified for PIU (Grant, Levine, Kim, & Potenza, 2005).

Relationship between at-risk/problem gambling and NSSI

Four cross-sectional studies using survey methodology examined the relationship between gambling of varying problem severity and NSSI. Two of these studies recruited their participants from gambling-related websites and were conducted in the UK (Lloyd et al. 2010, 2016), while the other two focused on randomly selected college (Serras et al., 2010) and high-school students from non-randomly selected public four-year and non-vocational schools in the US (Farhat et al., 2020).

According to the results, adolescents who engaged in NSSI were more likely to report at-risk/problem gambling. Notably, the association between problem-gambling severity and non-strategic gambling and gambling in casinos was stronger than with other types of gambling, with coping and pressure relief cited as primary motivations (Farhat et al., 2020). According to Serras et al. (2010), gambling was identified as a significant predictor of self-injurious behavior without suicidal intent among college students, along with depression, cigarette smoking, and substance use.

In adults, thoughts and acts of gambling-related self-harm were associated with problem gambling, gambling involvement, and parental problem gambling. The cluster of individuals engaged in casino and sports gambling exhibited

Table 3. Characteristics of the included studies

Citation	Country	Sample	NSSI assessment tool	Psychometric tool(s)	Key findings
Chen et al. (2023)	China	University students (n = 537). Mean age 20.10±1.46. 17.40% male.	NSSI scale	IAT	NSSI was positively related to internet addiction (r = 0.15, p < 0.01) Self-concealment was identified as a potential mediator.
Çimen et al. (2017)	Turkey	Adolescents (n = 555). Mean age 12.4±1.87. 43.42% male.	ISAS	Question on duration of internet usage	Significant correlation between NSSI and the duration of the internet usage on Weekdays (Linear $\chi 2$ = 18.411, p < 0.05), weekends (Linear $\chi 2$ = 5.032, p < 0.05)
Evren et al. (2020)	Turkey	University students/ Turkish gamers found on gaming forums (n = 1,010). Mean age 22. 40% male	Single question	IGDS9-SF Turkish version	Severity of IGD was associated with the presence of NSSI after controlling for depression, anxiety, and neuroticism. Participants with NSSI had higher IGDS9-SF, depression, anxiety, and neuroticism scores than those without NSSI. NSSI (B = 0.033, SE = 0.012, Wald = 8.024, p = 0.005, Exp(B) = 1.033, 95% CI [1.010, 1.057])
Aktepe et al. (2013)	Turkey	Adolescents (n = 1,645). Mean age 16.32 ± 1.08. 57.40% male.	Single question	IAS	There was a relationship between possible Internet addiction and self-injurious behavior. (B = 0.574, p < 0.001, OR = 1.78, 95% CI [1.30, 2.43]),
Fan et al. (2023)	China	Adolescents (n = 1,610). Mean age 14. 58.30% male.	Single question	CIAS-R	Significant correlations were observed between internet addiction and parameters such as non-suicidal self-injury, suicidal ideation, suicidal plans, suicidal attempts, emotional abuse, emotional neglect, physical neglect, stress, anxiety, and depression. A correlation with suicidality, non-suicidal self-injury (Cramer's V = 0.18), depression, and anxiety, was identified.
Farhat et al. (2020)	US	Adolescents (n = 2,234). Age range: 14–18 years. 41.6 % male.	Single question	MAGS	Individuals who self-injure have more permissive views towards gambling and are more likely to exhibit at-risk/ problem gambling. stronger links between problem-gambling severity and gambling in casinos (OR 4.85, 95% CI 1.94, 12.12) and non-strategic gambling (1.92, 95%CI 1.01, 3.66).
Gong et al. (2025)	China	1,249 Chinese youth (42.8% girls; Mage = 10.31 years, SD = 0.88) and parents	DSHI	POGU	Positive correlation between problematic internet game use, internalizing symptoms and nonsuicidal self-injury. Internalizing symptoms mediate the pathway from problematic internet game use to nonsuicidal self-injury.
Greenberg et al. (2022)	U.S	Adolescents (n = 2,912). 44.57% male.	Single question	Based on items from Minnesota Impulse Disorders Interview (MIDI)	The relationship between PUI factors and SIB was largely consistent across levels of impulsivity and sensation-seeking. The Dyscontrol factor, which reflects poorly controlled internet use, was associated with lifetime SIB (OR = 1.61, 95% CI [1.46, 1.78], p < 0.001), more frequent SIB (OR = 1.32, 95% CI [1.10, 1.57], p = 0.002]), and severe SIB requiring medical care, among those who self-injured. Impulsivity and sensation-seeking scores were associated with both PUI factor scores and SIB.

(continued)

Table 3. Continued

Citation	Country	Sample	NSSI assessment tool	Psychometric tool(s)	Key findings
Hamdan et al. (2022)	Israel	Adolescents (n = 642). Mean age 14.95. 46.40% male.	DSHI youth version	IAT	More than half of the FSU immigrants and one-third of the Muslim participants indicated that they engaged in NSSI. Correlations with NSSI included being male, an immigrant/Muslim minority. severe depressive symptoms and internet addictions (OR = 1.01, p = 0.005).
Kaess et al. (2014)	Europe	Adolescents (n = 11,356). Mean age 14.9. 42.8% male.	DSHI	YDQ	SIB was nearly three times higher among maladaptive users and nearly five times higher among pathological users compared to adaptive users. PIU was an independent predictor of suicidal behaviours (0.132, p = 0.014), depression, anxiety, conduct problems and hyperactivity/inattention.
Kim et al. (2023)	South Korea	Adolescents (n = 1,694). Mean age 16.6. 63.50% male.	DSHI	IAT	Significant association between Internet addiction and suicide (p < 0.001)/NSSI (p = 0.002) risks among Korean adolescent students.
Kingston et al. (2011)	UK	University students and the general population (n = 502). Mean age 37.1 52.2% male.	DSH	IAT	Developing and validating a new composite measure of different problem behaviors, including IA and DSH (r = .21, p < .001). Potential shared underlying cause and function.
Lam et al. (2009)	China	Adolescents (n = 1,618). Age range 13–18. 45.40% male.	Questions on different types of self-harm and frequencies	IAT	Severely or moderately addicted internet users had twice the odds (OR = 2.0, 95% CI 1.1–3.7) of engaging in self-injury more than five times, compared to normal users. Those with internet addiction also had 50% higher odds (OR = 1.5, 95% CI 0.9–2.4) of self-injuring 1–5 times in the past 6 months.
Lan et al. (2022)	China	Adolescents (n = 8,446). Mean age 15.4 ± 1.8. 50.30% male.	RTSHIA	IGDT-10	Problematic online behaviors, including sexting, cyberbullying, and Internet gaming disorder, were associated with a higher risk of self-harm among adolescents. Sexting was associated with the highest self-harm scores and increased odds of identified self-harm behaviors. Cyberbullying victimization, cyberbullying perpetration, and IGD (β = 3.33 (95% CI [1.96, 4.71]).were also associated with increased self-harm risks.
Leino et al. (2024)	Norway	Norwegian Students' Health and Wellbeing Study 2022 (n = 59,544), Mean age: 26.1 years (SD = 7.3) Females: 66.5%	Single question	GASA	Problematic gaming is associated with higher NSSI risk (r = 0.051). Females had a greater risk of non-suicidal self-harm behavior than males among recreational gamers, problem gamers, and addicted gamers
Liu et al. (2017)	China	Adolescents (n = 2,479). Mean age 15.44. 39.70% male.	Questions on different types of self-harm and frequencies	CIAS	Internet addiction and internet exposure to suicidal thoughts were both significantly related to an increased risk of self-harm odds ratio 2.41 (Wald = 37.76, 95% CI [1.80, 3.22], p < 0.001).

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Table 3. Continued

Citation	Country	Sample	NSSI assessment tool	Psychometric tool(s)	Key findings
Liu et al. (2021)	China	Adolescents (n = 1,911). Mean age 16.83 ± 0.37. 46.73 % male.	Single question	CIAS-R	Internet addiction significantly predicted NSSI (β = 0.07, p = 0.020), with significant indirect effects from both offline (95% CI [−0.036, −0.004]) and online social support (95% CI [0.002, 0.024])
Liu et al. (2023)	China	Adolescents (n = 2,173). Mean age 14.66. 51% male.	Single question	CIAS-R	Problematic internet use is positively associated with suicidality and self-injurious behavior. Negative affectivity mediates the association between PIU and SIB. Social support moderates the indirect effect of negative affectivity on the association between PIU and SIB. (β = 0.255, Boot 95 % CI: 0.219–0.296) adolescents with lower social support (β = 0.228, Boot 95 % CI: 0.178–0.282)
Liu, Wei, et al. (2024)	China	Adolescents (n = 1,046), Mean age: 15.69, (SD = 1.594). Males: 57.6%	AHSH	IAT	Statistically significant positive correlation (0.476) IA has a statistically significant positive effect on NSSI (β = 0.171, CI: 0.151 to 0.190, t = 17.278)
Lloyd et al. (2010)	UK	A self-selected sample of Internet users (n = 4,125). Mean age 35.5. 79.10% male.	Information about previous self-injury	Self-report criteria for DSM-IV	Gambling-related deliberate self-harm: The multi-activity gamblers had the highest prevalence (15.0%), significantly higher than other clusters (ps < 0.001). Non-gambling-related deliberate self-harm: The multi-activity gamblers reported the highest (28.8%) prevalence (ps < 0.001).
Lloyd et al. (2016)	UK	Internet users from gambling-related websites (n = 4,125). Mean age 35.5. 79.10% male.	Single question	Self-report criteria for DSM-IV	Self-reported non-gambling related self-harm was associated with age, marital status, and problematic alcohol use. Self-reported acts of self-harm both related and unrelated to gambling were associated with drug misuse. Thoughts and acts of gambling-related self-harm were associated with problem gambling (z = 7.50, p < .0001), gambling involvement, parental problem gambling, mood disorder symptoms, unemployment, and certain gambling motivations.
Lung et al. (2020)	China	Adolescents (n = 1,457). 45.70% male.	Single question	Question on time spent online	Adolescents who spent >5 h online during days off school were at higher risk of deliberate self-harm, and perceived a lower level of happiness (β = −0.08, p = 0.002; β = 0.10, p < 0.001).
Ma et al. (2023)	China	Adolescents (n = 1,530). Mean age 12.5	C-FASM	IAT	IA was independently associated with an increased risk of NSSI at T2. Depressive symptoms mediated the association between IA and NSSI at T2, and social support moderated the indirect but not the direct effect of IA on NSSI at T2 0.113 (95% CI 0.055–0.174).

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Table 3. Continued

Citation	Country	Sample	NSSI assessment tool	Psychometric tool(s)	Key findings
Mészáros et al. (2020)	Hungary	Adolescents (n = 363). Mean age 15.12. 49.30% male.	DSHI	YDQ	PIU in itself is not a risk factor for NSSI but might become a risk factor in the presence of comorbid psychiatric disorders. There was a significant difference between 'adaptive' internet users and both 'maladaptive' and 'pathological' internet users in terms of NSSI frequency. The relationship between PIU and NSSI is mediated by all examined psychopathological factors (M.I.N.I. kid diagnoses) except for OCD, alcohol abuse and dependence, and adjustment disorder [H (2) = 10.039, $p < .05$ $p = .007$].
Muslić et al. (2023)	Croatia	Adolescents (n = 2,772). Mean age 16.	Single question	CIUS	Adolescents who were more likely to report thoughts of self-harm also scored higher on the compulsive Internet use measure ($r = 0.28$, $p < 0.001$).
Oktan (2015)	Turkey	Adolescents (n = 736). Mean age 16.83. 51.40% male.	ISAS	Problematic Internet Use Scale	Significant and positive relationship between problematic internet use, self-injurious behavior, and risk-taking behavior ($F = 86.94$, $p < 0.01$). Self-injurious behavior and risk-taking behavior were found to be significant predictors of problematic internet use, explaining 19% of the total variance. Problematic internet use varied significantly depending on self-injurious behavior, with higher scores observed in adolescents with self-injurious behavior than those without, but did not change depending on risk-taking behavior. PIU scores of adolescents with SIB are higher than adolescents without SIB
Serras et al. (2010)	US	College students across the country (n = 5,689)	Single question	Questions about gambling	Drug use, cigarette smoking, gambling (1.28 (1.07–1.52) $p < .001$), depression, sexual orientation, and undergraduate student status were associated with increased odds of engaging in SIB.
Tang et al. (2020)	China	Adolescents (n = 15,623). Mean age 15.1. 51.50% males	FASM	IAT	There is an association between internet addiction and NSSI among Chinese adolescents, stronger in females than males and in adolescents with higher levels of depression and anxiety. Possible Internet addiction: 1.75 (95% CI: 1.56–1.96) Internet addiction: 2.66 (95% CI: 2.10–3.38)
Tang et al. (2024)	Taiwan	Adolescents (n = 1,060). Mean age = 14.66, (SD = .86 years)	Single question	CIAS-R	Relationships during COVID-19: direct effect of PIU on NSSI $\beta = .23$ ($p < .001$) with depression the direct effect of PIU on NSSI decreased to $\beta = .05$ ($p = .099$) indirect effect of PIU on NSSI via depression was statistically significant ($p < .001$) through bootstrapping analysis.

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Table 3. Continued

Citation	Country	Sample	NSSI assessment tool	Psychometric tool(s)	Key findings
Twenge et al. (2020)	UK	Adolescents (n = 11,427). Mean age 13.77. 50% male.	Single question	Question	Social media and Internet use of 5 + h (vs. < 1 h) were significantly associated with self-harm behavior (aRRR's = 1.86, 1.73).
W. Chen et al. (2024)	China	Adolescents (n = 4,487), Mean age; 16. SD 1.75.	NSSIQ	s-IAT	Internet addiction has been identified as a significant predictor of NSSI. Resilience is found to be a protective predictor of NSSI.
Wang, Liu, et al. (2020)	China	Adolescents (n = 7,072). Mean age 14.59. 50% male	Single question	Question	Daily internet use was associated with an increased risk of recurrent self-harm. Daily internet use ≥2 h on weekdays (OR = 1.81, 95%CI = 1.20–2.74) and ≥3 h at the weekend (OR = 1.55, 95%CI = 1.12–2.15),
Wang et al. (2023)	China	Outpatient adolescents (n = 548). Mean age 15.9. 23.70% male.	Clinical interviews OSI	CIAS-R	Subjects with addictive NSSI had a higher lifetime prevalence of nicotine and alcohol use, a higher prevalence of current internet addiction χ^2 (1) = 7.717, p = 0.006, suicidality, and alexithymia, and were more likely to have physical abuse/neglect, emotional abuse, and sexual abuse than NSSI subjects without addictive features.
Xiong et al. (2023)	China	Adolescents (n = 6,092). Mean age 10.32. 51% male.	DSHI-9 Items	IAT	Bidirectional associations between PIU and LS, LS and DSH, and LS, PIU, and DSH strongly predicted themselves. Female adolescents had lower LS and more DSH behaviors, while male adolescents had worse PIU (T1 0.35 (p < 0.001) T2 0.17 (p < 0.001), T3 0.12 (p < 0.001).
Xu et al. (2023)	China	Adolescents (n = 10,479). 50.50% male.	MASHA	IGDS9-SF	Anxiety moderated the problematic internet gaming-NSSI relationship [B = 0.002, SE = 0.000, p < 0.001] and partially mediated it [B = 0.017, SE = 0.001, 95% CI 0.014–0.021].
Yang et al. (2020)	China	Middle school/ university students (n = 2,018). Mean age 17.8.	NSSI-AT	EHOBA	social software use positively predicted NSSI in males (EXP(β) = 0.786, p < 0.05), females EXP(β) = 0.993, p < 0.001)
Yang et al. (2023)	China	Adolescents with NSSI (n = 110). 40.90% male.	The Adolescent Self-Injury Scale unstructured case-by-case interview.	C-IGDS	Internet gaming addiction was prevalent among children and adolescents with NSSI (45).
Z. Liu, Wei, et al. (2024)	China	Adolescents with depressive disorder (n = 302) Mean age: 15.1. SD = 1.8.	DSM-5	IAT	IAT (OR = 1.03, p < 0.01, 95% CI: 1.01–1.05) contributed independently to the emergence of NSSI behaviors in adolescents with depression
Zhou et al. (2022)	China	Adolescents (n = 157 (psychiatric inpatients and outpatients)) Mean age 15.4 ± 1.8. 27.40% male.	ANBFAS	IAT	Current GAD and NSSI were positively correlated to IA (B = 0.03, SE = 0.01, Wald = 7.3, p = .01) (OR = 1.03, 95% CI [1.01, 1.05]).

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Table 3. Continued

Citation	Country	Sample	NSSI assessment tool	Psychometric tool(s)	Key findings
Zhu et al. (2022)	China	Adolescents (n = 168); (n = 84 with NSSI and 84 without). Mean age; patients 15.37/ controls 14.89. 29.8% NSSI.	OSIC	VDG-S	Female, only child, internet addiction VDG-S (B = 0.16 SE = 0.05, Wald = 10.56, p = .001). (OR = 1.18, 95% CI [1.07, 1.30]), and negative parenting styles were predictors of NSSI behavioral addiction characteristics in adolescents.

Note: RTSHIA = Risk-taking and Self-harm Inventory for Adolescents (Vrouva et al., 2010), HBICA = Health-risk Behavior Inventory (Wang et al., 2012), OSIC = Ottawa Self Inventory Chinese revised edition (Zhang et al., 2015), NSSI-AT = Non-suicidal Self-injury Assessment tool (Whitlock & Purington, Cornell Research Program on Self-Injury and Recovery), DSHI = Deliberate Self-harm Inventory (Gratz, 2001), DSHI-9 = Deliberate Self-Harm Inventory Nine-Item Version -Adapted (Lundh et al., 2007), DSHI-Y =Deliberate Self-Harm Inventory - Youth Version (Gratz et al., 2012), NSSI scale (You et al., 2013), ANBFAS = Adolescent Non-Suicidal Self-Injury Behavior Function Assessment Scale (Feng & Jiang, 2009), YRBS = Youth Risk Behavior Survey (Brener et al., 2002), FASM = Functional Assessment of Self-mutilation (Qu et al., 2022), ISAS = Inventory of Statements About Self-injury (Klonsky & Glenn, 2009), NSSIQ-Non-suicidal Self-injury Questionnaire (Wan et al., 2011), AHSH = Adolescent Self-Harm Scale (Zheng, 2006), MASHA = Modified adolescent self-harm scale (Feng, 2008), MAGS = Massachusetts Gambling Screen (Shaffer et al., 1994), IGDS9-SF = Internet Gaming Disorder Scale-Short form (Pontes & Griffiths, 2014), IGDT-10 = Ten-item Internet Gaming Disorder Test (Király et al., 2015), GASA = Game Addiction Scale for Adolescents (Lemmens et al., 2009), VDG-S=Video Game Dependence Scale (Wu et al., 2022), C-IGDS = Chinese Internet Gaming Addiction Scale (Ma & Dai, 2011), POGU = Pathological Online Gaming Use scale (Gentile, 2009; Zhao et al., 2020), MIDI = Minnesota Impulse Disorders Interview (Grant et al., 2005), EHOBA = Emotional Health Online Behavior Assessment (De Riggi et al., 2018), YDQ = Young Diagnostic Questionnaire for Internet Addiction (Young, 1998), CIAS = Chen Internet Addiction Scale (Chen et al., 2003), IAT = Internet Addiction Test (Young, 1998), s-IAT = short Internet Addiction Scale (Pawlikowski et al., 2012), IAS = Internet Addiction Scale (Nichols & Nicki, 2004), CIAS-R = Chen Internet Addiction Scale-Revised (Mak et al., 2014), CIUS = Compulsive Internet Use Scale (Meerkerk et al., 2009), Problematic Internet Use Scale (Ceyhan et al., 2007), ICD = The International Classification of Diseases, SIB = Self-injurious behavior. LS = life satisfaction, GAD-Generalized Anxiety Disorder.

a higher occurrence of gambling-related self-harm. A gender-related difference was also observed; namely, among females, the sports-betting cluster had a higher prevalence of gambling-related self-harm (Lloyd et al., 2010). In addition, gambling-related thoughts of self-harm were associated with coping and monetary motivations and negatively associated with gambling for enjoyment (Lloyd et al., 2016).

Relationship between problem gaming and NSSI

Seven studies, five conducted in China, one in Turkey, and one in Norway, assessed the relationship between NSSI and problem gaming. Studies conducted in China included a large population of adolescents, except for one study, which had a relatively small sample of adolescents with NSSI (Zhu et al., 2022). The majority used cross-sectional designs, with one longitudinal (Gong et al., 2025) and one case-control (Zhu et al., 2022).

Findings suggest that the relationship between NSSI and gaming is a concern across different cultural backgrounds. In students and gamers, the severity of internet gaming disorder (IGD) symptoms was linked to the presence of NSSI, with findings persisting after controlling for depression, anxiety, and neuroticism (Evren et al., 2020). Similarly, in adolescents, IGD and problematic gaming were linked to an increased likelihood of self-harm (Lan, Pan, & Lin, 2022), with anxiety serving as both a mediator and moderator in this relationship (Xu et al., 2023). Additional risk factors identified in adolescents included being female, being an only child, having video game addiction, and experiencing negative parenting styles, all of which predicted behavioral addiction characteristics related to NSSI (Zhu et al., 2022). Within an inpatient child and adolescent population with NSSI, 40.9% also reported internet gaming addiction (Yang et al., 2023). Problem gaming was linked to higher risks of NSSI and suicidality, with sex differences: likelihood increased progressively for females, while males showed elevated likelihood even at lower gaming levels (Leino et al., 2024). A recent longitudinal study showed no direct link between problematic gaming and NSSI, but internalizing symptoms fully mediated the path from gaming to NSSI (Gong et al., 2025).

Relationship between PIU and NSSI

Most studies (n = 15) investigating relationships between NSSI and PIU/internet addiction included adolescents and were conducted in China. Apart from two longitudinal studies, all applied cross-sectional designs. Overall, findings consistently show a robust link between PIU and NSSI across different cultural contexts.

In adolescents, there was a strong association between internet addiction and self-harm (Chen et al., 2023; Greenberg et al., 2022; Hamdan et al., 2022; Fan et al., 2023; H. Liu et al., 2017; Kim et al., 2023; Liu et al., 2021; Liu, Wei, et al., 2024; Lam, Peng, Mai, & Jin, 2009; Ma et al., 2023; Muslić, Rukavina, Markelić, & Milanović, 2023; Oktan et al., 2015; Tang et al., 2020; Tang et al., 2024; Twenge et al., 2020; Xu et al., 2023; Yang et al., 2023; Z. Liu, Wei, et al., 2024).

The machine learning algorithm implicated internet addiction as a statistical predictor of NSSI (Chen, Gao, & Xiao, 2024). Internet use frequency was a potential risk factor for NSSI and suicidal ideation (Yang et al., 2020). More time spent using the internet on weekends and weekdays was associated with a higher likelihood of NSSI (Çimen, Çoşkun, & Etiler, 2017; Lung et al., 2020; Wang, Xu, et al., 2020). Scores on the compulsive internet use scale were positively linked to self-harm thoughts (Muslić et al., 2023).

Higher co-occurrence of internet addiction, nicotine, and alcohol use was found among adolescent outpatients with NSSI reporting current suicidality (meaning they reported suicidal thoughts and behaviors at the time of the study) (Wang et al., 2023). Moreover, a total score of NSSI and diagnosis of generalized anxiety disorder were independent predictors of moderate and severe internet addiction (Zhou et al., 2022).

Potential risks of internet addiction and self-harm behaviors were associated (Aktepe, Dundar, Soyöz, & Sonmez, 2013) and a positive association was found between PIU, NSSI, and risk-taking behaviors (Oktan, 2015).

Several studies explored mediators and moderators in this relationship. Negative affectivity mediated the association between PIU and NSSI, while social support acted as a moderator (Liu, Jia, Kamper-DeMarco, & Fu, 2023). Online and offline social support were significantly associated with both internet addiction and NSSI. Specifically, there was a significant negative relationship between offline social support and both NSSI and internet addiction, while online social support was positively associated with internet addiction and NSSI (Liu et al., 2021).

Loneliness and self-concealment emerged as mediators (Chen et al., 2023; Tang et al., 2024). In a longitudinal study, social support reduced depressive symptoms and thus moderated the indirect link between internet addiction and NSSI (Ma et al., 2023). Cognitive reappraisal was also shown to buffer the impact of loneliness on NSSI (Tang et al., 2024).

Life satisfaction, PIU, and self-harm appeared to be related bidirectionally (Xiong et al., 2023). Adolescents who suffered more severe self-harm behaviors were more likely to exhibit PIU, and those who had previously engaged in self-harm were more likely to repeat engagement in self-harm (Xiong et al., 2023). Impulsivity appeared to be a common underlying factor in the association between PIU and self-injurious behavior (Greenberg et al., 2022).

Two studies suggested that PIU itself may not be a risk factor for NSSI unless other psychopathological factors are present, such as depression (Mészáros et al., 2020; Tang et al., 2024). Supporting this, studies conducted during the COVID-19 pandemic indicate nuanced results; one study (Tang et al., 2024) suggested that depression may mediate the link between excessive internet use and NSSI. However, another study focusing on depressed adolescents found that those who engaged in NSSI had notably higher levels of internet addiction than their counterparts who did not (Z. Liu, Wei, et al., 2024).

Another observation was a significant difference in self-harming behavior frequency among groups with maladaptive, adaptive, and pathological internet use (Kaess et al., 2014; Mészáros et al., 2020). The prevalence of self-injurious behavior was approximately three times higher in people with maladaptive use and nearly five times higher in those with pathological use compared to those with adaptive use (Kaess et al., 2014).

DISCUSSION

In this manuscript, we reviewed the literature on relationships between NSSI and problem gambling, problem gaming, and PIU. Our first finding is that PIU has been the most extensively studied phenomenon in relation to NSSI. The results align with a recently conducted meta-analysis in China, linking PIU to NSSI in Chinese adolescents (Jin et al., 2023). Specifically, adolescents with PIU were two times more likely to engage in NSSI (Fan, Liu, Zeng, Conrad, & Tang, 2021). Regarding the relationship between gaming and NSSI, only seven studies were identified, and the area of gambling is even more under-researched, with only four studies. This highlights a significant gap in understanding relationships between NSSI and gaming and gambling, and these require further investigation. More than half of the studies (23 out of 40) were conducted in China, and only ten other countries reported any results, showing a geographical limitation of this research direction. Considering cultural differences both in terms of behavioral addictions and NSSI, we identify this result as a significant gap calling for more and culturally diverse research.

Theoretical frameworks help contextualize the findings. According to Klonsky (2006), self-injury has two main functions: interpersonal and intrapersonal. Interpersonal encompasses self-regulation, and intrapersonal is more about connection and seeking attention/social support. However, the most central function has been proposed to be immediate emotional regulation (Nock, 2009). NSSI, like established behavioral addictions, is repetitive and may become entrenched over time as it is self-reinforcing. According to the four-function model, NSSI is maintained by negative and positive self-reinforcements (M. K. Nock & Prinstein, 2004). Our findings align with these theories, indicating that both emotion regulation (intrapersonal) and seeking social support (interpersonal) aspects are associated with NSSI, as well as problem gaming, problem gambling, and PIU. Additionally, we identified underlying shared reinforcement mechanisms that may contribute to these associations. These behaviors might reinforce each other over time, creating a maladaptive coping cycle. Adolescents with internet addiction might use self-injury as a coping mechanism to alleviate emotional distress caused by feelings of loneliness or frustration associated with excessive internet use (Liu, Wei, et al., 2024). Furthermore, individuals who cope with negative emotions through problem gaming may experience intensified internalized symptoms of anxiety and depression, which they might then attempt to manage through NSSI (Gong et al., 2025).

It is important to discuss the role of social support. Having strong offline social support (close relationships with

friends and family), even when struggling with internet addiction, can be a protective factor against NSSI (Liu et al., 2021), but if adolescents are not receiving sufficient support from their loved ones, they may turn to the internet for online social support, which may provide them with feelings of emotional connectedness. Such support can be beneficial; however, relying solely on online support may increase vulnerability to NSSI or exposure to self-harm behaviors. As a result, they may be more prone to engage in NSSI for attention-seeking (Nock, 2009). Internet addiction has been linked to NSSI indirectly through loneliness. Adolescents with internet addiction may be more likely to experience feelings of loneliness due to decreased face-to-face interactions and limited real-life social support (Liu, Wei, et al., 2024) Research suggests that internet exposure to NSSI content increases the frequency of the behavior, and it is currently easy to access resources, groups, and content regarding NSSI (Lewis & Arbuthnott, 2013).

Certain social factors further elevate risk. Being an only child was also a predictor of NSSI (Zhu et al., 2022), which again suggests the importance of social support. Adolescents without siblings were more prone to engaging in NSSI (Wang, Xu, et al., 2020; Xu et al., 2019). Extensive research on social support shows its importance in preventing and recovering from both substance use disorders (SUDs) (Bond, Kaskutas, & Weisner, 2003; Lookatch, Wimberly, & McKay, 2019) and behavioral addictions (Penfold & Ogden, 2023; Petry & Weiss, 2009; Räsänen, Lintonen, Tolvanen, & Konu, 2016). Strong social support may also be a protective factor against developing internet addiction (Lu, Zhang, & Zhang, 2023), gambling-related problems (Bickl et al., 2023), and problem gaming (Tham, Ellithorpe, & Meshi, 2020).

Longitudinal studies add further insight. A prospective three-wave longitudinal study included in this review showed that PIU tends to worsen over time, and NSSI showed a minor increase and remained stable. Deliberate self-harm statistically predicted PIU over time, but a predictive link in the opposite direction could not be established. Life satisfaction and NSSI showed a negative association. Moreover, adolescents who had already engaged in NSSI or experienced PIU had higher likelihood of developing these behaviors more severely subsequently (Xiong et al., 2023). These findings suggest that these behaviors may escalate over time and reinforce each other.

In a large, representative sample from 11 European countries ($N = 11,356$), PIU was prevalent and significantly correlated: 13.4% of the participants used the internet maladaptively, and 4.2% pathologically. NSSI prevalence was 4.5 % among those with adaptive use, 12.2 % among those with maladaptive use, and 22.2 % among those with pathological use. This relationship varied by sex and country, suggesting underlying socio-cultural dynamics. The authors suggest that addressing PIU in adolescents at an early stage could contribute to improved psychological well-being and a reduction in suicidal behaviors at both clinical and public health levels (Kaess et al., 2014). Furthermore, addressing loneliness and improving coping skills, especially cognitive reappraisal, could be potential intervention strategies for adolescents dealing with both internet addiction and NSSI. Cognitive reappraisal may be a buffer to the impact of internet addiction on loneliness and as a result reduce the likelihood of NSSI (Liu, Wei, et al., 2024).

An interesting observation is that people who gamble mainly for monetary reasons have a higher occurrence of self-harm thoughts, suggesting that loss of money may, in part, motivate self-harm. This relationship may be particularly relevant for people who gamble frequently (Lloyd et al., 2016), as gambling intensity has been associated with financial losses (Mathews & Volberg, 2012). Moreover, adults who engage in multiple forms of gambling (sports betting, casino) as opposed to a single form (lottery) are more likely to engage in NSSI (Lloyd et al., 2010).

Gambling, gaming, and PIU are also related to depression and anxiety. People might engage in NSSI because they use it as a coping mechanism, to manage their negative emotions and to alleviate pressure. Guilt and shame can also promote engagement in NSSI (Sheehy et al., 2019). On the other hand, NSSI may increase IGD, PIU, and problem gambling, as people who engage in NSSI may use these behaviors as coping strategies or to escape from negative emotions or as distractions. In addition, with time, the threshold of the pleasure derived from NSSI may increase. In such processes, intensity and frequency may increase to reach the same feelings of relief, in manners similar to tolerance in addictions. NSSI has been linked to both substance and behavioral addictions (Guo et al., 2023). The National Institute on Drug Abuse (NIDA) compared NSSI to addictions, and some diagnostic criteria for SUDs may be applicable to NSSI. In accordance, the language used by people who struggle with NSSI often mirrors that used by people when talking about SUDs and may include terms like craving and relapse among others. NSSI is frequently experienced as highly stigmatized and private, which can further hinder help-seeking and access to support (Knopf, 2022). Considering the severity of NSSI, its prevalence and outcomes, action is required. It is established that NSSI can be a precursor of suicidal ideation and suicide attempts (Hamza, Stewart, & Willoughby, 2012).

Several demographic and cultural factors also shape NSSI vulnerability. According to Hamdan, Apter, and Levi-Belz (2022), in Israeli adolescents, along with internet addiction, stronger relationships with NSSI were found in males and those of immigrant/Muslim minority status. Self-injurious behavior is particularly common in students who represent sexual minorities and identify as gay, lesbian, transgender, or queer (Serras et al., 2010) and among White as compared to non-White individuals (Klonsky et al., 2014). White students showed higher prevalence, frequency, and versatility of NSSI, in addition to increased positive emotions after engaging in NSSI behavior compared to Asian students (Turner, Arya, & Chapman, 2014). Females who are only children and experience negative parenting styles also appear at elevated risk (Yang et al., 2020). Considering that behavioral addictions are represented by different sociodemographic profiles (especially considering sex and gender), related studies/analyses are warranted. For example,

higher problem gaming levels were linked to increased non-suicidal self-harm ideation/behavior and suicidal ideation in females, but not males (Leino et al., 2024).

The cultural context is especially relevant. Of the 40 studies included in our review, 23 were from China. It is important to consider the socio-cultural context. Based on interviews with mental health professionals in a school setting, Chen et al. (2021) identified several key contributing factors. One such factor was sex-biased discrimination, where girls often face more pressure and are less desired in the family, making NSSI a coping strategy. Another significant factor was the high academic expectations, a deeply rooted value in Chinese culture. Additionally, overly controlling parenting styles, physical punishment, and the cultural tendency to suppress emotions to appear tough contribute to higher rates of NSSI. Internet use was also identified as an influential factor, as children can easily access a wealth of information online. Moreover, stigma, lack of psychoeducation, and general ignorance are important factors that must be considered. In comparison, in Western cultures, where individual expression is emphasized, self-injurious behavior is more often used for emotion dysregulation (Wolff et al., 2019) rather than due to social or cultural pressure.

Despite increasing attention, our preliminary search revealed that there is no clear distinction between NSSI and suicidality in many studies, often conflating the two despite the conceptual and clinical distinction. Such inconsistencies in terminology complicate comparisons across studies and can lead to ineffective intervention strategies (Turner, Austin, & Chapman, 2014). Furthermore, this inconsistency can distort estimates of frequency, severity, and prevalence. This highlights the need for a unified language and standardized assessment tools. The ongoing debate surrounding the inclusion of NSSI as a distinct diagnostic entity in the DSM-5 is both timely and significant. It should help researchers and clinicians have widely accepted criteria, which, as a result, should lead to more effective studies and clearer communication.

Limitations related to the characteristics of the available studies should also be acknowledged. Most studies used cross-sectional designs; thus, causal inferences cannot be made. Most studies relied on self-report measures that have potential biases. Several studies used single unvalidated questions to assess NSSI, or utilized time spent online as an indicator of PIU, which is insufficient, given the internet's broad use in multiple life domains. However, in some cases, it was the only available indicator, which can reduce reliability and rigor. In addition, most included studies focused on adolescents, with only two papers involving adult samples.

In conclusion, this systematic review highlights an association between NSSI, problem gambling, problem gaming, and PIU. These behaviors may share underlying mechanisms such as impulsivity, emotion dysregulation, and maladaptive coping strategies. However, the nature and strength of these relationships require further investigation. The complex association between NSSI and problem gambling, problem gaming, and problematic internet use remains largely underexplored (especially in the context of problem gambling and problem gaming). Cross-sectional designs, self-reported measures, and cultural concentration limit the generalizability of the current findings or establishing causal relationships. Longitudinal studies are needed to examine the complex relationships between mechanisms underlying NSSI and problematic/addictive behaviors. Research should also focus on diverse populations with respect to culture, sex/gender, sexual orientation, and other demographic factors.

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