Relationship Between Non-Suicidal Self Injury and Internet Gaming Disorder in Adolescents: A Systematic Review

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Abstract

This systematic review examines the relationship between Internet Gaming Disorder (IGD) and Non-Suicidal Self-Injury (NSSI) in adolescents. Studies were selected based on criteria addressing IGD and NSSI in adolescents (age 9-18). A systematic search was conducted across multiple databases (e.g., Science Direct, Scopus, PubMed) from September 2023 to May 2024, including English and Spanish sources. The risk of bias was assessed using NHLBI's quality tools for observational and case-control studies. Five studies, involving 19 588 adolescents, were included. All studies were from East Asia. Findings indicate a positive association between IGD and NSSI, with gender differences: females had higher NSSI prevalence, while males had greater IGD frequency. Most studies were of fair or good quality. This review underscores the need for longitudinal studies and standardized assessments to better understand the IGD-NSSI relationship and guide future mental health interventions.

Keywords: non-suicidal self-injury, internet gaming disorder, adolescents, systematic review.

Relación Entre las Autolesiones No Suicidas y el Trastorno por Uso de Videojuegos en Adolescentes: Una Revisión Sistemática

Resumen

Esta revisión sistemática examina la relación entre el trastorno por uso de videojuegos (IGD) y las autolesiones no suicidas (NSSI) en adolescentes. Los estudios se seleccionaron en función de criterios relacionados con el IGD y las NSSI en adolescentes (de 9 a 18 años). Se realizó una búsqueda sistemática en múltiples bases de datos (por ejemplo, Science Direct, Scopus, PubMed) desde septiembre de 2023 hasta mayo de 2024, incluyendo fuentes en inglés y español. El riesgo de sesgo se evaluó utilizando las herramientas de calidad del NHLBI para estudios observacionales y de casos y controles. Se incluyeron cinco estudios, en los que participaron 19 588 adolescentes. Todos los estudios procedían de Asia Oriental. Los resultados indican una asociación positiva entre el IGD y la NSSI, con diferencias de género: las mujeres tenían una mayor prevalencia de NSSI, mientras que los hombres tenían una mayor frecuencia de IGD. La mayoría de los estudios eran de calidad aceptable o buena. Esta revisión subraya la necesidad de realizar estudios longitudinales y evaluaciones estandarizadas para comprender mejor la relación entre el IGD y la NSSI y orientar las futuras intervenciones en materia de salud mental.

Palabras clave: autolesiones no suicidas, trastorno por uso de videojuegos, adolescentes, revisión sistemática.

Introduction

Non-Suicidal Self-Injury (NSSI) has been widely studied long before its inclusion in the DSM-5 in 2014, where it was categorized under the section "Conditions for Further Study". When discussing NSSI, it is essential to clarify that this term refers to the intentional destruction of one's own body tissue without suicidal intent and for purposes that are not socially sanctioned (Klonsky & Muehlenkamp, 2007). According to the American Psychiatric Association (2022), the defining characteristic of NSSI is the repeated infliction of mild to moderate injuries, often painful, to one's body surface, without suicidal intent. Generally, this behavior aims to alleviate negative emotions as tension, anxiety, sadness, self-criticism, or, less frequently, to address an interpersonal difficulty. Individuals often report an immediate sense of relief during the act. Research has shown that NSSI is common among adolescents, with significant variation in prevalence across different cultural and demographic contexts.

The prevalence of NSSI varies significantly across cultural and demographic contexts. A study in the United States identified higher NSSI rates in developing countries, ranging from 11.5% to 33.8% (Mannekote et al., 2021). In Australia the prevalence among adolescents is 9.4% (Tatnell et al., 2017), while in Germany and the United States 25.6% of students reported engaging in NSSI (Plener et al., 2009). In Asia 20.5% of 3,561 adolescents experienced at least one episode of NSSI in the past six months (Liu et al., 2023). In Chile, a prevalence of 58% was found among 388 adolescents who reported self-injuring at least once (Méndez et al., 2021), representing one of the highest rates reported. In terms of gender differences, several studies indicate a higher prevalence of NSSI among females (63.7%) compared to males (36.3%) (Da Silva Bandeira et al., 2022), although some findings suggest higher rates among males in some contexts (Wang & Wang, 2023). These studies highlight that NSSI tends to occur most frequently in early adolescence, with a decline in early adulthood (Brown & Plener, 2017) and suggest that cultural factors may influence these prevalence differences.

Given the high prevalence of NSSI during adolescence, research has begun to explore potential contributing factors, including the influence of digital environments. The current adolescent population, often described as "digital natives", faces unique challenges due to extensive internet and technology use (Brown, 2006; Jeong et al., 2019; Anzak et al., 2021; Mancinelli et al., 2022). This pervasive digital engagement has led to a rise in behavioral issues, as Internet Gaming Disorder (IGD), which was classified by the DSM-5 in 2014 as an emerging mental health condition associated with excessive online gaming. The increasing prevalence of IGD and other technology-related behaviors has prompted interest in their possible links to mental health concerns, as NSSI, suggesting a relationship that warrants further investigation.

IGD is acknowledged as a clinically significant issue and is included in international diagnostic and disease classification manuals. The DSM-5-TR (American Psychiatric Association,2022) introduced IGD in section 3, recognizing its unique clinical characteristics while emphasizing the necessity for further research for taxonomic purposes and noting that this diagnostic category remains under investigation. It is defined as the persistent and recurrent use of internet gaming that results in distress or impairment over a minimum period of 12 months (American Psychiatric Association, 2022). Additionally, the World Health Organization (WHO) officially recognized Gaming Disorder as a mental health disorder in the 11th revision of the International Classification of Diseases (ICD-11; World Health Organization [WHO], 2019/2021). At present, internet addiction has not yet been classified as a disorder. Starcevic (2013) indicated that internet addiction was considered for inclusion in the same category but was ultimately excluded from the official DSM-5 diagnoses; therefore,

this study will adhere to the nosological concept proposed by the APA.

Research on IGD prevalence highlights significant variability across populations. A study involving 8,067 university students from multiple Asian countries, including Singapore, Hong Kong, Macau, China, South Korea, Taiwan, and Japan, as well as a U.S. university, reported an IGD prevalence of 19%, with higher rates among males (27.9%) compared to females (11.5%) (Tang et al., 2018). Another study by the American Psychiatric Association (2012) reported a 4.7% prevalence over 12 months, showing similar distributions across Eastern and Western countries. Further research supports a link between increased gaming time and a higher likelihood of developing IGD; for instance, individuals gaming over 20 hours per week were 13.5 times more likely to develop IGD than those who played less than one hour (Severo et al., 2020).

A meta-analysis examining risk factors for developing IGD identified that excessive gaming may result from various life situations or challenges; for instance, loneliness, anger, or real-life stress may drive individuals to engage in internet gaming as a means of escape (Ropovik et al., 2023). Examining these variables more closely, IGD has been found to co-occur with several other mental health disorders and issues, as NSSI, and shared risk factors, as emotional dysregulation, have been identified (Barrocas et al., 2014; King & Delfabbro, 2016; Yang et al., 2023). Emotional regulation refers to the set of processes through which the spontaneous flow of felt emotions is redirected (Koole, 2009), and poor emotional regulation may predispose individuals to IGD (Wichstrøm et al., 2019). Moreover, emotional dysregulation may exacerbate negative mood symptoms in individuals with the disorder. Similarly, NSSI serves as an emotional regulator in response to stressors, as individuals relieve tension and/or distress through self-inflicted injuries (Nock, 2009).

A prospective study from Norway identified poor emotional regulation at age 8 as a potential predictor of greater IGD symptomatology by age 10 (Wichstrøm et al., 2019). Research suggests that NSSI is related to opioid neurotransmitters that may influence self-injurious behavior. Among their functions are "emotion regulation" and "pain suppression", indicating that self-harm can produce a pleasurable effect by stimulating the release of these neurotransmitters (Favazza, 1996). Nock's (2009) integrative theory proposes that NSSI serves as an emotional regulator in response to stress.

Based on this context, the present research aims to explore a potential relationship between NSSI and IGD through a systematic review to ensure transparency in the data analyzed, as recent studies suggest a possible link between the two disorders in adolescents (Lam et al., 2009; Strittmatter et al., 2015; Evren et al., 2020; Stevens et al., 2020; Jeong & Kim, 2021). Additionally, it is important to investigate this issue as no literature synthesis has been conducted on studies dedicated to evaluating the relationship between these disorders, despite it being an emerging and growing topic (Leino, 2024). Consequently, this systematic review seeks to answer the question: Is there a relationship between Non-Suicidal Self-Injury (NSSI) and Internet Gaming Disorder (IGD)?

Method

Eligibility criteria

For articles to be included, they had to specifically address the topics of NSSI and IGD, excluding behaviors aimed at ending life, known in the literature as self-injurious behaviors. The studies included required to have a sample with an age range covering adolescents up to 18 years, meeting the diagnostic criteria for NSSI and IGD, and to be quantitative studies exploring the relationship between these two constructs. For synthesis, studies were grouped into Observational, Longitudinal, and Case-Control categories. There were no restrictions regarding study sample size, participant sex/gender, or functionality level. Only articles written in English & Spanish were considered.

Search Strategy & Information Sources

The initial search process began in September 2023 and extended through May 2024. To increase the scope of available literature, the criteria were broadened in 2024 to include Spanish-language resources and additional databases. This comprehensive search utilized major academic and psychological databases, including multidisciplinary platforms (e.g., Science Direct, Scopus), medical and psychological sources (e.g., PubMed, APA PsycArticles, APA PsycInfo, APA PsycTherapy), and specialized psychology databases (e.g., PSYKE, PSICODOC, PePSIC).

In addition, AI-powered tools, as Connected Papers and Research Rabbit, were employed to explore related literature by inputting DOIs from selected studies, enabling efficient tracking of relevant research connections. After selecting initial articles, these AI tools facilitated a final round of screening for additional pertinent publications. The search was conducted in English and Spanish, using "Journal Article" as a consistent filter across all databases.

Search terms included "Non-Suicidal Self-Injury and Internet Gaming Disorder", "Non-Suicidal Self-Harm and Gaming Addiction", "Self-Harm and Gaming Disorder", "Self-Injury and Gaming Disorder", and "Conducta Autolesiva no Suicida y Trastornos por Juegos de Internet". The Boolean operator "AND" was applied to refine search outcomes. This strategy was implemented uniformly across databases to ensure a comprehensive collection of relevant studies; searches were exclusively conducted in both English and Spanish without applying additional filters.

Selection Process and Data Collection

The selection process was executed systematically in multiple phases by a team of three researchers. Initially, the databases for the scientific articles were selected and duplicate records were removed. Titles of all articles retrieved from the database search were then entered into an MS Word document, with potential articles highlighted in green and those deemed irrelevant, due to lack of alignment with study variables, highlighted in yellow. Subsequently, abstracts of initially selected titles were reviewed, followed by a full-text reading of abstracts to verify compliance with inclusion criteria. A double-review process was applied, where each of the three researchers independently cross-checked the selection of studies to ensure reliability and reduce bias. Additionally, an external reviewer oversaw the entire process to verify strict adherence to established protocols. The search process did not utilize automation tools, and the final review holds an approval letter (N°184/N°231366443/2023) from the Scientific Ethics Committee of the sponsoring university. Table 1 presents the extracted data from selected studies, including study ID, authors, year of publication, country of origin, participant details, psychometric measurement tools, gender differences in NSSI and IGD, and key outcomes.

Risk of Bias Assessment

The risk of bias was assessed using the "Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies", developed by the National Heart, Lung, and Blood Institute (NHLBI, 2021). This tool comprises 14 questions designed to evaluate the quality of research, utilizing a three-point rating system: criteria met (green), criteria not met (red), or unclear/not applicable (yellow). The assessment focuses on several critical aspects, including the clarity of the research question, the definition of the age range or population, and whether less than 50% of eligible individuals participated in the study. Inclusion and exclusion criteria were applied to ensure appropriate participant selection from the same or similar populations, alongside justification for sample size to support the ability to identify associations. Furthermore, it examines whether the exposure was measured prior to outcome assessment and whether there was an adequate duration to observe effects. The tool also evaluates whether multiple categories or levels of exposure were considered,

including the methods and instruments used for measurement, and whether exposure was assessed repeatedly throughout the study. Additionally, the reliability and validity of outcome measures are scrutinized, ensuring they are objective and accurate. Follow-up rates are reviewed to confirm participant retention remained at or below 20% loss during the study process. Finally, statistical analyses account for potential confounding factors, and the overall study quality is categorized as "Poor", "Fair", or "Good".
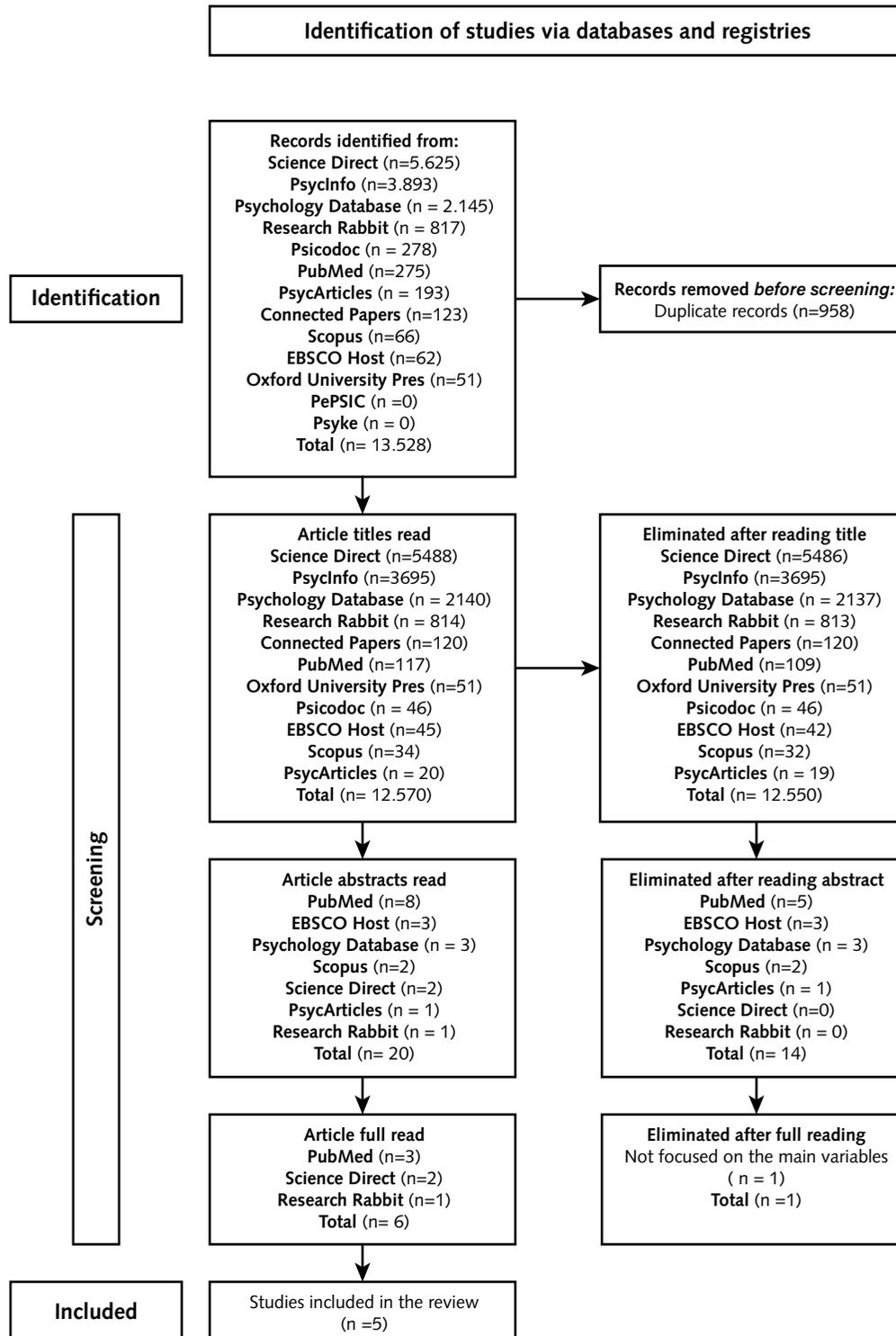
The risk of bias in case-control studies was assessed using "Quality Assessment Tool for Case-Control Studies" (NHLBI, 2021). This tool addresses essential methodological aspects, including the clarity and relevance of the research question, definition of the study population, and presence of a sample size justification. Key criteria included the selection of controls from comparable populations and timeframes, consistent application of inclusion and exclusion criteria, and reliable differentiation of cases from controls. The tool also evaluates the validity and consistency of exposure measurement, confirming that exposures preceded the onset of the case-defining condition. Blinding of exposure assessors and adjustment for confounding variables in statistical analyses were also assessed. Each study was rated as "Poor", "Fair", or "Good" based on its overall quality, following the same color-coded system applied to cross-sectional studies.

Results

Study Selection

Regarding the PRISMA flow diagram, a total of 13,528 articles were identified from the following databases: APA PsycArticles ($n = 193$), APA PsycInfo ($n = 3,893$), APA PsycTherapy ($n = 0$), EBSCO Host ($n = 62$), Oxford University Press ($n = 51$), PePSIC ($n = 0$), PubMed ($n = 275$), Psicodoc ($n = 278$), Psyke ($n = 0$), Psychology Database ($n = 2,145$), ScienceDirect (n = 5,625), Scopus ($n = 66$), Connected Papers ($n = 123$), and Research Rabbit ($n = 817$). After removing 958 duplicates, a total of 12,570 records were screened by title. Subsequently, articles that did not relate to the topic were excluded, with the following removals: APA PsycArticles ($n = 19$), APA PsycInfo (n = 3,695), EBSCO Host ($n = 42$), Oxford University Press ($n = 51$), PubMed ($n = 109$), Psicodoc ($n = 46$), Psychology Database ($n = 2,137$), ScienceDirect ($n = 5,486$), Scopus ($n = 32$), Connected Papers ($n = 120$), and Research Rabbit ($n = 813$), leaving a total of 12,550 articles. Next, 20 articles were reviewed for abstracts, leading to the exclusion of 14 articles. A full-text review was then conducted on the remaining 6 articles, resulting in the exclusion of 1 article for not meeting the inclusion criteria, thereby incorporating five articles into the systematic review (See Figure 1).

Figure 1

Identification of studies via databases and registries

Identification

Records identified from:
Science Direct (n=5.625)
PsycInfo (n=3.893)
Psychology Database (n = 2.145)
Research Rabbit (n = 817)
Psicodoc (n = 278)
PubMed (n=275)
PsycArticles (n = 193)
Connected Papers (n=123)
Scopus (n=66)
EBSCO Host (n=62)
Oxford University Pres (n=51)
PePSIC (n =0)
Psyke (n = 0)
Total (n= 13.528)

Records removed *before screening:*
Duplicate records (n=958)

Screening

Article titles read
Science Direct (n=5488)
PsycInfo (n=3695)
Psychology Database (n = 2140)
Research Rabbit (n = 814)
Connected Papers (n=120)
PubMed (n=117)
Oxford University Pres (n=51)
Psicodoc (n = 46)
EBSCO Host (n=45)
Scopus (n=34)
PsycArticles (n = 20)
Total (n= 12.570)

Eliminated after reading title
Science Direct (n=5486)
PsycInfo (n=3695)
Psychology Database (n = 2137)
Research Rabbit (n = 813)
Connected Papers (n=120)
PubMed (n=109)
Oxford University Pres (n=51)
Psicodoc (n = 46)
EBSCO Host (n=42)
Scopus (n=32)
PsycArticles (n = 19)
Total (n= 12.550)

Article abstracts read
PubMed (n=8)
EBSCO Host (n=3)
Psychology Database (n = 3)
Scopus (n=2)
Science Direct (n=2)
PsycArticles (n = 1)
Research Rabbit (n = 1)
Total (n= 20)

Eliminated after reading abstract
PubMed (n=5)
EBSCO Host (n=3)
Psychology Database (n = 3)
Scopus (n=2)
PsycArticles (n = 1)
Science Direct (n=0)
Research Rabbit (n = 0)
Total (n= 14)

Article full read
PubMed (n=3)
Science Direct (n=2)
Research Rabbit (n=1)
Total (n= 6)

Eliminated after full reading
Not focused on the main variables
(n = 1)
Total (n =1)

Included

Studies included in the review
(n =5)

Study Characteristics

Of the five studies included (Table 1), the designs encompassed three cross-sectional, one longitudinal, and one case-control study, all published between 2020 and 2023. These studies were conducted in East Asia, with four in China and one in South Korea, reflecting an exclusively Asian sample. Collectively, the studies analyzed data from 19,588 adolescents aged 9 to 18, with an initial enrollment of 24,811, which was reduced due to exclusion criteria. The gender distribution was nearly balanced, with 50.3% male and 49.7% female participants.

Validated measures were commonly used to assess IGD and NSSI across the studies, as the Adolescent Health Questionnaire (AHQ), Chinese-IGD-S, and Video Game Dependence Scale (VDG-S), while some also used author-developed measures based on World Health Organization (WHO) criteria (e.g., Jeong & Kim, 2021). The results of these studies consistently highlight the association between IGD and NSSI, although findings on gender differences and specific outcomes varied.

Gender Differences in NSSI and IGD

The studies that examined gender differences reported nuanced findings. For NSSI, Jeong and Kim (2021) observed a significantly higher 12-month prevalence among females (13.4%) compared to males (4.7%), with females showing an increased likelihood of engaging in NSSI behaviors (mOR = 2.73, 95% CI [1.87–3.99]). Similarly, Zhu et al. (2022) found a considerably higher risk for NSSI among females than males (OR = 12.50, p = 0.02). Contrastingly, Xu et al. (2023) reported a greater association between NSSI and males (B = 0.254, 95% CI [0.191–0.316], p < 0.001), indicating that gender-specific risk for NSSI might vary with age, cultural context, or assessment methods.

In terms of IGD prevalence, males consistently reported higher levels than females. Jeong and Kim (2021) found that 14.6% of males met IGD criteria, compared to 9.7% of females, while Yang et al. (2023) reported that males were significantly more likely to exhibit IGD symptoms than females (OR = 6.047, 95% CI [2.104–17.382], p < 0.001).

Outcomes of IGD and NSSI Associations

All studies, except Yang et al. (2023), identified a positive association between IGD and NSSI. For instance, Wang et al. (2020) found that adolescents who engaged in "digital media use" for two or more hours per day during weekdays had a higher likelihood of NSSI (OR = 1.81, 95% CI [1.20–2.74]). Jeong and Kim (2021) further confirmed a positive association between IGD and NSSI (mOR = 1.87, 95% CI [1.20–2.92]). Zhu et al. (2022) specifically associated higher scores on the VDG-S with an increased risk for NSSI behaviors (OR = 1.18, 95% CI [1.07–1.30], p = 0.001). Xu et al. (2023) provided additional insight by identifying anxiety as a significant moderator and partial mediator in the relationship between IGD and NSSI, with social anxiety and concentration difficulties accounting for 70.8% of this effect (B = 0.002, p < 0.001; mediation β = 0.017, 95% CI [0.01–0.02]). In contrast to the other studies, Yang et al. (2023) found no significant association between IGD and NSSI frequency, indicating that IGD alone may not directly influence NSSI behaviors without the presence of additional risk factors or mental health conditions (Mean NSSI frequency = 37.36 for IGD vs. 34.03 for non-IGD; T/Z = -1.287, p = 0.201).

Table 1. Characteristics of the 5 studies included in the Systematic Review

N°	Authors	Year	Country	Participants	Measures	Gender Differences NSSI	Gender Differences IGD	Outcomes
1	Wang et al. Longitudinal*	2020	China	7.072 adolescents, 50% female. Mean age 14.59 years (SD = 1.45).	• AHQ. • Self – Harm Assessment Questions • Digital Media Use Frequency. • YSR. • Eysenck I7.	Not reported.	Not Reported.	Association between NSSI & "Digital Media Use Frequency" (Internet ≥ 2 h/day on weekdays: OR = 1.81, 95% CI = 1.20–2.74; Internet ≥ 3 h/day on weekends: OR = 1.55, 95% CI = 1.12–2.15).
2	Jeong & Kim	2021	South Korea	1.843 adolescents, 52.3% female. Ages between 12-17 years old.	• Custom questions to assess NSSI, and gaming disorder based on WHO criteria.	Females had a higher 12-month prevalence of NSSI (13.4%) than males (4.7%) (mOR 2.73, 95% CI = 1.87–3.99).	The 12-month prevalence of IGD was higher among males (14.6%) compared to females (9.7%).	Positive association of Gaming Disorder with NSSI (mOR 1.87, 95%CI = 1.20–2.92).
3	Zhu et al* Case-Control	2022	China	84 adolescents, 70.2% female. Ages between 12-18 years old.	• EMBU. • PSSS. • PSS. • BSMAS. • VDG-S. • OSIC.	Higher risk of NSSI for women compared to men (OR = 12.50 (p = 0.02).	Not Reported.	Positive association between VDG-S and NSSI characteristics (OR = 1.18, 95% CI = 1.07 – 1.30, p = 0.001).
4	Xu et al.	2023	China	10.479 adolescents, 49.5% female. Ages between 9-18 years old.	• IGDS9- SF. • RCMAS. • MASHA.	Males showed a higher association with NSSI (B = 0.254, 95% CI = 0.191–0.316, p < 0.001) compared to females.	Not Reported.	Positive association between IGD and NSSI, moderated by anxiety (B = 0.002, p < 0.001), anxiety mediating 70.8% of the effect.
5	Yang et al.	2023	China	110 adolescents, 63,6% female. Ages between 11-17 years old. Mean age 14.78 (SD = 1.87).	• Chinese-IGD-S. • ASI-S. • DSM-5 Interview -NSSI. • SAS. • SDS. • CH-UCLA-Loneliness.	Not Reported.	Males had a higher prevalence of IGD than females (OR = 6.047, 95% CI= 2.104 – 17.382, p< 0.001).	No significant association of IGD with NSSI frequency (Mean = 37.36 for IGD vs. 34.03 for non-IGD; T/Z = -1.287, P = 0.201).

* All studies are observational unless otherwise indicated. AHQ: Adolescent Health Questionnaire; ASI–S: Adolescent Self Injury– Scale; BSMAS: Bergen Social **Media Addiction Scale; CI** = Confidence Interval; **Chinese-IGD-S**: Chinese Internet Gaming Disorder Scale; **CH-UCLA Loneliness**: Chinese UCLA Loneliness Scale; SEMBU: Egna Minnen Barndoms Uppfostran; IGDS9-SF: Nine-Item Internet Gaming Disorder Scale-Short Form; MASHA: Modified Adolescent Self-Harm Scale; OSIC: Ottawa Self-Injury Inventory Chinese Revised Edition; **OR**: Odds Ratio; PSS: Perceived Stress Scale; PSSS: Perceived Social Support Scale; RCMAS: Revised Children's Manifest Anxiety Scale; SAS: Self-Rating Anxiety Scale; SDS: Self-Rating Depression Scale; VDG-S: Video Game Dependence Scale; YSR: Chinese Youth Self-Report.

Quality of Studies

Four studies were observational (Wang et al., 2021; Jeong & Kim, 2021; Xu et al., 2023; Yang et al., 2023) clearly stated their research questions and defined the study populations within each article. In most cases, the participation rate exceeded 50%, eligibility criteria were specified, and participants were recruited from the same or similar populations. Notably, Wang et al. (2020) and Yan et al. (2023) did not demonstrate statistically significant power in their sample size, in contrast to the studies by Jeong & Kim (2021), and Xu et al. (2023). Wang et al. (2020) met the criteria of measuring exposures of interest prior to assessing outcomes and included a time interval to evaluate the exposure-outcome relationship. However, the remaining studies did not meet these criteria as they were cross-sectional in nature. Regarding exposure levels, most studies lacked clear representation across different exposure levels. The independent and dependent variables were well-defined across all studies; however, exposures were not assessed over time. Bias risk was assessed by examining blinding practices to minimize potential influence from patients or evaluators on study outcomes. It is important to note that, in the first study, outcome assessors were not blinded to participants' exposure status, while the studies by Jeong & Kim (2021), Xu et al. (2023), and Yang et al. (2023) did not precisely report on blinding practices. Attrition rates following initial enrollment were reported only in Wang et al. (2020), with a loss to follow-up of 20%, whereas the other studies did not report on this aspect. Finally, confounding factors were accounted for only in the studies by Wang et al. (2020) & Jeong & Kim (2021).

According to the case-control study by Zhu et al. (2022), the research objectives were explicitly stated, and the population of adolescents with NSSI was clearly defined. The selection of controls from comparable community settings contributed to group comparability. However, the lack of a detailed justification for the sample size raises concerns about the validity of the findings. Inclusion and exclusion criteria were consistently applied, effectively distinguishing between cases and controls. While concurrent controls were utilized, the absence of random selection in their recruitment introduces potential selection bias. Investigators confirmed that exposure to risk factors preceded the onset of NSSI, although evaluators were not blinded to the case status of participants. Statistical analyses, including logistic regression to adjust for confounding variables, were employed.

Discussion

This systematic review aimed to examine the relationship between Internet Gaming Disorder (IGD) and Non-Suicidal Self-Injury (NSSI) in adolescents. The primary findings suggest a significant association between NSSI and IGD (Wang et al., 2020; Jeong & Kim, 2021; Zhu et al., 2022; Xu et al., 2023). A notable trend was observed with higher reports of NSSI behaviors among female adolescents (Jeong & Kim, 2021; Zhu et al., 2022) compared to males, although one study (Xu et al., 2023) reported greater male involvement. In contrast, IGD prevalence appears higher among males (Yang et al., 2023). An interesting outcome from Wang et al. (2020) indicates that excessive internet or mobile phone use may be a major risk factor for self-harm. Similarly, Mészáros et al. (2020) found that pathological internet use in adolescents led to a 63.6% increased likelihood of NSSI, while Fan et al. (2023) reported a 12.8% prevalence of "internet addiction" that was significantly associated with NSSI. Lan et al. (2022) further demonstrated that individuals with IGD are more likely to engage in self-injury, though they did not specify whether injuries were non-suicidal. In summary, lifetime NSSI is associated with the severity of IGD symptoms, and gaming-related issues are linked to a higher risk of NSSI (Evren et al., 2020; Leino et al., 2024). Consistent with these findings, evidence indicates that the IGD–NSSI association is moderated by anxiety, with 70% effect size noted for this moderator. Moderators are useful in identifying

specific situations in which a risk factor might increase the likelihood of self-injury among adolescents. Meanwhile, mediators help to explain the underlying psychological factors that connect IGD and NSSI, shedding light on why and how this relationship occurs (Valencia-Agudo et al., 2018).

Regarding NSSI prevalence between genders (Jeong & Kim, 2021; Zhu et al., 2022; Xu et al., 2023), findings show that female adolescents report higher NSSI behaviors than male counterparts (Jeong & Kim, 2021; Zhu et al., 2022), with only one study (Xu et al., 2023) finding higher NSSI recurrence among males. A recent meta-analysis exploring sex differences in global NSSI prevalence aligns with these findings, revealing a predominance of NSSI in female adolescents across North America and Europe, with rates consistent across regions. In contrast, male adolescents showed higher NSSI rates than females, particularly in Asia, where the trend is notably pronounced (Moloney et al., 2024). This is especially relevant, as all studies included in this review sample were conducted in Asia, with only Xu et al. (2023) identifying a stronger association between NSSI and male adolescents. This gender disparity in NSSI prevalence may be partially explained by psychological and sociocultural factors; studies indicate that higher levels of psychological distress in female adolescents are linked to increased NSSI behaviors (Wilkinson et al., 2022; Lutz et al., 2023). Conversely, NSSI in males often manifests in behaviors like wall-punching, which are less likely to be recognized as NSSI and may be perceived as aggression (Curtis & Terry, 2024). This distinction suggests a need for gender-sensitive approaches in NSSI assessment and intervention, especially in regions like Asia where male NSSI rates are significant.

As for IGD differences between males and females, only two studies in this review (Jeong & Kim, 2021; Yang et al., 2023) reported gender-specific findings, with males exhibiting higher IGD scores. Lan et al. (2022) indicated that IGD is also a significant self-injury risk factor among both males and females. Marraudino et al. (2022) argue

that there is insufficient research to clarify why IGD risk is higher among males, as clear evidence is still lacking. One possible explanation is that male adolescents may engage more intensively in online gaming, whereas females more commonly use social media platforms, as noted by Dufour et al. (2016). Likewise, findings by Desai et al. (2010) show that male adolescents reported gaming over 20 hours per week, while females reported fewer than 7 hours. It is notable to compare these findings with those from Wang et al. (2020), who reported that gaming for more than three hours a day may increase the likelihood of developing NSSI. Furthermore, Stevens et al. (2021) found the global prevalence of IGD to be approximately 3.05%, which adjusted to 1.96% in studies with more rigorous sampling and varied depending on the screening tool used. Studies with smaller sample sizes or those focusing on adolescents reported higher prevalence rates, with IGD being approximately 2.5 times more common among males than females. Moreover, studies conducted after 2013, particularly in Asia, reported higher prevalence rates compared to Europe, suggesting possible regional trends. According to Mestre-Bach et al. (2022), Asia appears to be at the forefront of IGD assessment advancement, including new validations and adaptations, with China and Korea leading in the number of studies, highlighting the issue's regional significance.

The studies included in this review exhibit bias risks that may impact the reliability of their findings. Cross-sectional designs in most studies (Wang et al., 2021; Jeong & Kim, 2021; Xu et al., 2023; Yang et al., 2023) hinder causal inference by measuring exposures and outcomes simultaneously. Limited sample sizes in Wang et al. (2020) and Yang et al. (2023) weaken statistical power, and lack of blinding in Wang et al. (2020), with minimal reporting on blinding practices in other studies, raises measurement bias concerns. Additionally, Zhu et al. (2022) did not justify sample size, risking selection bias. Only Wang et al. (2020) and Jeong & Kim (2021) controlled for confounders,

suggesting unaccounted confounding effects may influence the other studies.

In line with these considerations, it is worth noting that all studies employed self-report measures (Wang et al., 2020; Jeong & Kim, 2021; Zhu et al., 2022; Xu et al., 2023; Yang et al., 2023), which could introduce bias due to social desirability tendencies, where participants may distort responses to align with perceived social norms (Ellington et al., 2001, cited in Del Valle & Zamora, 2021). Additionally, Jeong & Kim (2021) utilized a single closed-ended question to assess NSSI and relied on questions based on the WHO criteria for gaming disorder assessment, which also limits the validity of findings, underscoring the need for reliable and valid instruments in these measurements. Furthermore, throughout this review process, we identified a lack of consensus in the conceptualization of NSSI, as the terms "self-injurious behavior" and "self-harm" are often used interchangeably, even though these terms combine self-injury with suicidal components. For instance, Yang et al. (2023) conflated these terms in the measures description, which led us to expand our search from exclusively NSSI to include self-harm terminology. Addressing this inconsistency is crucial for establishing a common clinical language to support transparent reporting in future research. Qu et al. (2023) highlight that the absence of standardized NSSI methods in China limits a comprehensive understanding of NSSI, potentially hindering effective prevention and intervention efforts. Thus, terminological and taxonomical criteria must be clarified to accurately identify studies specifically targeting IGD and NSSI.

To advance understanding in this area, future research would benefit from longitudinal studies to explore underlying mechanisms and etiologies of IGD and NSSI, as well as incorporating considerations for the identified biases, as ensuring adequately powered sample sizes and using longitudinal designs to clarify temporal relationships between these conditions. Standardizing blinding practices and controlling for confounders would further

improve the objectivity and accuracy of findings, reducing observation and response biases. Finally, this review highlights the methodological rigor of the included studies, with an average sample size of 3,918 adolescents and large samples in at least three studies (Wang et al., 2020; Jeong & Kim, 2021; Xu et al., 2023). Furthermore, in line with Xu et al.'s (2023) finding that anxiety serves as a significant moderator between IGD and NSSI, we encourage future research to consider the variable of irritability, as proposed by Stringaris et al. (2018), as a potential moderator in the relationship between these conditions. This line of inquiry is supported by studies as those by Li et al. (2023) and Akbaş & Kilinç (2024), which underscore anger as an emotion closely linked to irritability. Stringaris et al. (2018) define irritability as an "increased proneness to anger relative to peers of the same developmental level", a symptom observed in various psychiatric disorders, including generalized anxiety disorder, depression, and post-traumatic stress disorder (PTSD). We believe that studying irritability as a moderator in IGD and NSSI, similar to anxiety, could reveal valuable insights, particularly among adolescents, where this trait may contribute to the development of core psychiatric disorders.

This review has several limitations. First, the studies included were exclusively conducted in East Asia, limiting the generalizability of findings to other cultural contexts. Additionally, most studies used cross-sectional designs, which constrained our ability to draw causal inferences between IGD and NSSI. The reliance on self-report measures introduces potential biases, such as social desirability, which may affect the accuracy of the results. Variability in IGD and NSSI measurement tools further complicates comparisons across studies. Moreover, the exploration of moderators, while insightful, remains limited to factors as anxiety, leaving other potential moderators and mediators underexplored. Future research should address these limitations to enhance our understanding

of the IGD-NSSI relationship across populations and study designs.

This review provides important contributions to our knowledge, this is the first systematic review to examine the relationship between IGD and NSSI. By consolidating evidence of their association, our study highlights the need for mental health professionals to assess both conditions, particularly in at-risk youth. The findings on gender differences suggest that tailored interventions may better address the unique risk profiles of male and female adolescents. Additionally, identifying psychological factors, as anxiety, as moderators offers insight into the emotional dimensions that link IGD and NSSI, indicating new avenues for targeted therapies. Although limited to an Asian sample, our review sheds light on cultural aspects that may shape the IGD-NSSI relationship, encouraging future research in diverse cultural contexts. The review highlights the confusion in nomenclature that still exists between the concepts of self-injury, between suicidal and non-suicidal, an element that must be treated with caution in the clinical and academic environment. Finally, the need for longitudinal studies is evident; understanding the long-term interactions between IGD and NSSI is essential for developing preventive and therapeutic interventions that can effectively reduce the risk of these behaviors over time.

Conclusion

This systematic review identifies a significant association between Internet Gaming Disorder (IGD) and Non-Suicidal Self-Injury (NSSI) among adolescents, demonstrating an elevated risk of self-injurious behavior in adolescents with IGD, particularly where anxiety acts as a moderating factor, amplifying this risk. These findings underscore the critical need for clinicians to assess both conditions in vulnerable youth populations, incorporating considerations of cultural and gender-specific influences. Given the limitation of existing studies to East Asian contexts, future research should explore this relationship across diverse cultural backgrounds to enhance generalizability. Furthermore, longitudinal studies are essential to elucidate the mechanisms underlying this association, thereby informing the development of more effective, culturally sensitive preventive and therapeutic interventions.

Additional information

Registration and Protocol

Financing

Conflict of Interest

The authors have no conflict of interest to declare.

Acknowledgments

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