Evidence on Problematic Online Gaming and Social Anxiety over the Past Ten Years: a Systematic Literature Review

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Abstract

Purpose of Review The present study aimed to review the literature concerning the relationship between problematic online gaming (POG) and social anxiety, taking into account the variables implicated in this relationship. This review included studies published between 2010 and 2020 that were indexed in major databases with the following keywords: Internet gaming, disorder, addiction, problematic, social phobia, and social anxiety.
Recent Findings In recent years, scientific interest in POG has grown dramatically. Within this prolific research field, difficulties associated with social anxiety have been increasingly explored in relation to POG. Indeed, evidence showed that individuals who experience social anxiety are more exposed to the risk of developing an excessive or addictive gaming behavior.
Summary A total of 30 studies satisfied the initial inclusion criteria and were included in the present literature review. Several reviewed studies found a strong association between social anxiety and online gaming disorder. Furthermore, the relationships among social anxiety, POG, age, and psychosocial and comorbid factors were largely explored. Overall, the present review showed that socially anxious individuals might perceive online video games as safer social environments than face-to-face interactions, predisposing individuals to the POG. However, in a mutually reinforcing relationship, individuals with higher POG seem to show higher social anxiety. Therefore, despite online gaming might represent an activity able to alleviate psychopathological symptoms and/or negative emotional states, people might use online gaming to counterbalance distress or negative situations in everyday life, carrying out a maladaptive coping strategy.

Keywords Online problematic gaming · Online gaming addiction · Internet gaming · Social anxiety · Social phobia

Introduction

The social anxiety disorder (SAD), also known as social phobia, is an anxiety disorder characterized by fear in one or more social situations, leading to considerable distress, over-estimation of possible consequences of negative social evaluation, and impaired ability to face feared social situations [1, 2]. As several previous studies highlighted [3–5], socially anxious individuals might consider Internet as a safer social context than face-to-face interactions due to the lack of physical and auditory contacts, frequently developing a preference for online social interactions [6–9]. Later studies found that problematic Internet-related activities were strongly associated with individuals' social anxiety,

especially if younger [10–14]. Among the Internet-related activities, specific structural characteristics of gaming (such as design and narrative, achievements, online social interactions, and motivations) appeared particularly fascinating for individuals who attempt to escape the boredom of common life [15]. Indeed, videogames seem to help individuals to escape real life and reduce stress, problems, and isolation also through online social interactions [16–19]. In this regard, according to the *compensatory Internet use* model [20••], online videogames might offer other alternative virtual environments where highly socially anxious individuals transfer most of their social activities (such as the formation of strong friendships), alleviate their stressful life event-related negative feelings, and feel safer and more comfortable than in face-to-face socialization [21]. However, as Lo et al. [22] stated, online games reduce social anxiety only temporarily, dangerously reducing social experiences in face-to-face contexts [23]. Furthermore, several recent studies explored the association between problematic online

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gaming and social anxiety as well as depressive symptoms, self-esteem, and loneliness [24–29]. Indeed, despite online gaming might offer an alternative context in which individuals can reduce emotional distress, psychosocial problems, and isolation through online social interactions [16–19, 30], the excessive engagement in online gaming might represent a maladaptive coping strategy leading to negative outcomes [31–33].

Concerning the online gaming, in the last decade, it has been described as a social and not problematic activity for the majority of gamers [34] and concerns regarding the potential overpathologization of casual gamers have been raised [31, 33, 35, 36••, 37, 38••, 39, 40]. However, scientific research increasingly focused on problematic and potentially pathological Internet gaming [41–43]. In this regard, already in 2013, the American Psychiatric Association (APA) [44] provisionally included the Internet Gaming Disorder (IGD) in the Section III of the Diagnostic and Statistical Manual for Mental Disorders (DSM-5), as condition that requires further research to be definitely included in the manual [44], adopting the substance use diagnostic criteria (i.e., preoccupation, withdrawal, tolerance) [45, 46]. Then, only more recently, the World Health Assembly officially declared Gaming Disorder (GD) as a diagnostic category to be included in the International Classification of Diseases, 11th Revision (ICD-11) [47]. Nevertheless, a theoretical and methodological classification of the Internet gaming disorder is still lacking due to uncertainty in conceptualization, measurement, and clinical assessment [i.e., 35, 40, [48–58]. Furthermore, evidence suggested to address attention toward comorbidity factors associated with problematic gaming, since it may be present along with other pathologies [38••]. In addition to social anxiety, deficient self-regulation, negative mood, and affective disorders (e.g. anxiety and panic, distress, depression), psychosocial difficulties such as isolation, intense shyness, and consistent preference for online social interactions have been frequently associated with problematic online gaming [51, 59–67], especially among young individuals. Indeed, young people have been found typically engaged in high sensation-seeking and risky behaviors [68, 69] and they have been defined as a vulnerable population for problematic online gaming, with potential negative outcomes for their psychological, social, and physical health [61, 70].

In summary, in the past decade, the Internet gaming has dramatically grown becoming a widespread and often daily activity. However, individuals who experience social anxiety have been found more exposed to the risk of developing problematic online gaming because this online activity may help them to avoid and escape from difficulties and anxieties related to face-to-face social interactions [1, 71, 72]. A better understanding of the social anxiety-problematic online gaming relationship (and the possible related psychosocial

difficulties) might provide several practical implications, especially considering the recent evidence about the association between social isolation and problematic gaming [73, 74]. Therefore, in light of this evidence, the present study aimed at reviewing the scientific studies published in the last ten years specifically focusing on the relation between problematic online gaming and social anxiety.

Materials and Methods

The review has been conducted using *Web of Science*, *Scopus*, and *ScienceDirect* as the main research databases, entering the following keywords: internet gaming* problematic* social anxiety*/ internet gaming* disorder* social anxiety*/ internet gaming* addict* social anxiety*/ internet gaming* problematic* social phobia*/ internet gaming* disorder* social phobia*/ internet gaming* addict* social phobia. The present literature review is in compliance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) [75]. Progressive exclusion was performed by reading the abstract and, finally, the full text. The inclusion criteria for the present review were (i) studies containing quantitative empirical data, (ii) studies concerning Internet Gaming, (iii) studies published from 2010 to 2020, and (iv) studies providing a full-text article published in English. For comparison purposes, exclusion criteria were (i) studies focusing on the general Internet use, (ii) reviews, conference abstracts, letters, or editorials, and (iii) doctoral dissertations. Strong heterogeneity in reported studies' findings and statistical information lead us to adopt a systematic narrative approach to report key outcomes.

Results

A total of 784 papers were initially identified. Subsequently, 754 papers that did not meet the inclusion criteria were excluded. Thus, 30 studies that met the initial inclusion criteria were included in the present literature review (Fig. 1).

Different Perspectives on Problematic Online Gaming Research: Frameworks and Measures

Concerning the diagnostic instruments used to assess problematic video gaming (Table 1), several assessment tools based on DSM-5 diagnostic criteria for IGD and focused on traditional online gaming addiction on desktop computers have been used. More specifically, two studies administered the Gaming Addiction Scale (GAS) [76–78] and two studies adapted the GAS for mobile gaming [79, 80]. Four studies used the Internet Gaming Disorder Scale (IGDS) [28, 72, 81–83] and Starcevic et al. [84] developed a semi-structured
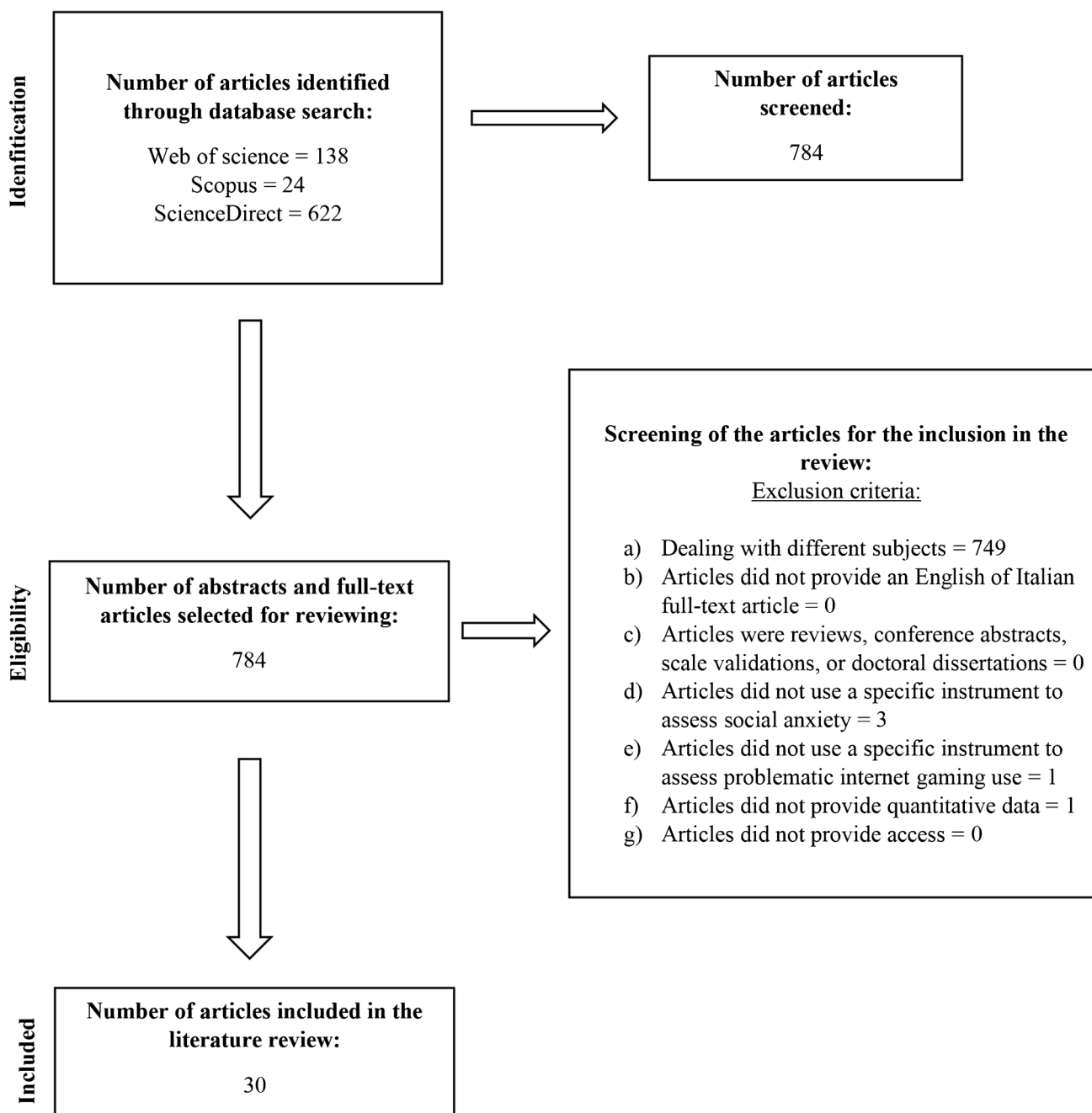
Fig. 1 Flow chart of the search strategy and selection procedure

diagnostic interview consisting of nine items corresponding to the nine criteria for IGD. Moreover, Müller et al. [85] used the Scale for the Assessment of Internet and Computer game Addiction (AICA-S) [86] and Wei et al. [15] utilized the Chen's Internet Addiction Scale (CIAS) [87]. Furthermore, Lopez-Fernandez et al. [88], Marino et al. [89], Severo et al. [90], and Wang and Cheng [91] tested the 9-item short form of IGDS (IGDS9-SF) [29]. Kircaburun et al. [92] used the 10-item Internet Gaming Disorder Test (IGDT-10) [93]. Finally, Van Rooij et al. [94] used the Compulsive Internet

Use Scale (CIUS) [95] to evaluate the adolescents' online video game addiction, and later, other studies employed the Video game Addiction Test (VAT) [43, 96–98], a modified version of CIUS referred specifically to gaming.

Four studies adapted the DSM-IV diagnostic criteria for substance dependence or pathological gambling to the online game addiction. In particular, according to previous studies [99], Hyun et al. [100] and Park et al. [101] employed 5 criteria: (i) online game playing for more than 4 h per day or 30 h per week; (ii) scores higher than 50 in the Internet

Table 1 Research articles about problematic online gaming and social anxiety in the past ten years

Study	Sample	Mean age	Online gaming instruments	Social anxiety instruments	
Colder Carras et al., 2017	N=9733	14.1 years Adolescents	VAT (van Rooij et al., 2012)	CSAS (La Greca & Lopez, 1998; La Greca & Stone, 1993; La Greca et al., 1988)	While male social gamers had no significant associations with social anxiety, females' engagement in social games reduced social anxiety, whereas non-social at-risk and extensive male gamers reported high social anxiety
Cole & Hooley, 2013	N=163	27.3 years Young adults	GPIUS (Caplan, 2002)	SIAS/SPS (Mattick & Clarke, 1998; Peters et al., 2012)	Trait anxiety and social phobia were the best predictors of problematic Internet use among online gamers. Thus, generally anxious individuals who have difficulties in social situations were more likely prone to have problematic online gaming
Gentile et al., 2011	N=3034	Grades 3–4 and Grades 7–8 Children	Pathological video games use (Gentile et al., 2009)	SPIN (Connor et al., 2000)	In a longitudinal growth model, the weekly amount of video game play significantly predicted the number of pathological gaming symptoms and that children who began with more pathological gaming symptoms demonstrated higher levels of social phobia
Hyun et al., 2015	N=263	12–45 years Adolescents, young adults, and adults	Structured Clinical Interview (Han et al., 2011; Ko et al., 2009)	SADS (Watson & Friend, 1969)	Although there were no significant results between social anxiety and online gaming addiction in the present study, social anxiety should be considered to be associated with online gaming addiction
Karaca et al., 2020	N=1174	10–15 years Children	CGASC (Horzum et al., 2008)	SASC (Demir et al., 2000)	High social anxiety was a pivotal risk factor for both problematic gaming and online gaming addiction
Kardefelt-Winther, 2014	N=702	23.6 years Adolescents, young adults, and adults	EOGS (Kardefelt-Winther 2014b)	SIAS/SPS (Mattick & Clarke, 1998; Peters et al., 2012)	Social anxiety did not predict WoW-related negative outcomes
Khalil et al., 2020	N=700	14–18 years Adolescents	IGDS (Lemmens et al., 2015)	MINI KID (Sheehan et al., 2010)	Gaming addicted adolescents showed high social anxiety

Table 1 (continued)

Study	Sample	Mean age	Online gaming instruments	Social anxiety instruments	
Kircaburun et al., 2019	N=242	18.87 years Adolescents and Young adults	IGDT-10 (Bányai et al., 2017)	SAS-A (Nelemans et al., 2017)	Social anxiety was not found as a risk factor for Internet gaming disorder
Lee & Leeson, 2016	N=626	24.80 years Young adults and adults	GPIUS (Caplan, 2002)	LSAS (Heimberg et al., 1999)	Social anxiety emerged as significant predictor of problematic Internet use and MMORPGs usage
Lehenbauer-Baum et al., 2015	N=682	23.26 years Adolescents, young adults, and adults	Engagement and addiction: WoW questionnaire (Lehenbauer-Baum et al., 2015; original version by Charlton & Danforth, 2007)	SPIN (Connor et al., 2000)	Addicted online video games users reported significantly higher score of social phobia than engaged players
Lopez-Fernandez et al., 2019	N=625	26.87 years Young adults	IGDS9-SF (Pontes & Griffiths, 2015)	SCL-27-Plus (Hardt, 2008)	The social anxiety was a significant predictor of Internet gaming disorder
Marino et al., 2020	N=543	23.9 years Young adults	IGDS9-SF (Pontes & Griffiths, 2015)	I-SPIN (Gori et al., 2013)	Social anxiety was directly and indirectly associated with problematic online gaming
Martončik & Lokša, 2016	N=161	21 years Adolescents, young adults, and adults	Game experience and game behaviors (Martončik & Lokša, 2016)	SPIN (Connor et al., 2000)	WoW players experienced less social anxiety in online world, especially in presence of and playing with known people
Müller et al., 2019	N=166	16 or older Adolescents	AICA-S (Wolfling et al., 2016)	MINI SPIN (D'El Rey et al., 2007; Weeks et al., 2007)	Patients with Internet gaming disorder showed higher level of social anxiety
Park et al., 2016	N=212	Older than 18 Young adults	Structured Clinical Interview (Han et al., 2011; Ko et al., 2009)	SADS (Watson & Friend, 1969)	The level of social anxiety was higher in the MMORPG group than in the other three groups
Phan et al., 2019	N=2400	14.81 years Adolescents	GAS (Lemmens et al., 2009)	LSAS (Heimberg et al., 1999)	Social phobia was very high in male and female populations, with a greater intensity among participants with Internet gaming disorder
Sauter et al., 2020	N=13,464	18–63 years Young adults and adults	Gaming habits (Sauter et al., 2020)	SPIN (Connor et al., 2000)	Individuals who played with known friends were less susceptible toward social anxiety
Severo et al., 2020	N=555	14–30 years Young adults	IGDS9-SF (Pontes & Griffiths, 2015)	MINI SPIN (D'El Rey et al., 2007; Weeks et al., 2007)	Social anxiety significantly and positively co-occurred with problematic online gaming

Table 1 (continued)

Study	Sample	Mean age	Online gaming instruments	Social anxiety instruments	
Sheng & Wang, 2019	N = 578 (Sample 1); N = 1501 (Sample 2)	14–21 years Adolescents	GAS for mobile games (Lemmens et al., 2009); EOGS (Kardefelt-Winther 2014b)	Child Social Anxiety Scale (Wang et al., 1999)	The results showed significant correlations between problematic online gaming and social anxiety
Sigerson et al., 2017	N = 1045	37.1 years Young adults and adults	IGDS (Lemmens et al., 2015)	SIAS/SPS (Mattick & Clarke, 1998; Peters et al., 2012)	There is a 0.37 correlation between C-IGDS and SIAS
Sioni et al., 2017	N = 394	34.3 years Adults	IGDS (Lemmens et al., 2015)	SIAS/SPS (Mattick & Clarke, 1998; Peters et al., 2012)	Participants with higher social phobia presented higher scores in identification with avatars and Internet gaming disorder symptoms
Starcevic et al., 2020	N = 100 (Sample 1); N = 100 (Sample 2)	13–38 years Adolescents and young adults	Gaming Diagnostic Interview (Starcevic et al., 2020)	SIAS/SPS (Mattick & Clarke, 1998; Peters et al., 2012)	Levels of anxiety predicted neither Internet gaming disorder nor gaming disorder. The IGD group showed higher scores in social anxiety
Subramaniam et al., 2016	N = 1251	23.7 years Adolescent, young adults, and adults	IGDS (Lemmens et al., 2015)	SPIN (Connor et al., 2000)	The participants who met criteria for Internet gaming disorder also met criteria for social anxiety
van Rooij et al., 2010	N = 4559 (Sample 1); N = 3740 (Sample 2)	13–16 years Adolescents	CIUS (Meerkerk et al., 2009)	CSAS (La Greca & Lopez, 1998; La Greca & Stone, 1993; La Greca et al., 1988	Addicted online gamers showed higher score in social anxiety compared to other online gamers
van Rooij et al., 2014	N = 8478	14.2 years Adolescents	VAT (van Rooij et al., 2012)	CSAS (La Greca & Lopez, 1998; La Greca & Stone, 1993; La Greca et al., 1988	Both male and female problematic gamers showed higher level of social anxiety
van Rooij et al., 2017b	N = 3945	12–15 years Adolescents	VAT (van Rooij et al., 2012)	CSAS (La Greca & Lopez, 1998; La Greca & Stone, 1993; La Greca et al., 1988	Self-reported problematic use of online games was associated with higher social anxiety
Vanzoelen & Caltabiano, 2016	N = 186	26–60 years Young and middle adults	GAS (Lemmens et al., 2009)	LSAS (Heimberg et al., 1999)	Socially anxious individuals showed a higher tendency to be addicted to games. Higher levels of social anxiety were predictive of online gaming addiction
Wang & Cheng, 2020	N = 544	28.8 years Young adults and adults	IGDS9-SF (Pontes & Griffiths, 2015)	SIAS-6 (Peters et al., 2012)	Problematic gaming did not explain social anxiety

Table 1 (continued)

Study	Sample	Mean age	Online gaming instruments	Social anxiety instruments	
Wang et al., 2019	N = 600	15 years Adolescents	GAS for mobile games (Lemmens et al., 2009)	CSAS (La Greca & Lopez, 1998; La Greca & Stone, 1993; La Greca et al., 1988)	Problematic gamers, especially males, scored significantly higher in social anxiety compared with no problematic peers
Wei et al., 2012	N = 722	21.08 years Adolescents and young adults	CIAS (Chen et al. 2003)	SPIN (Connor et al., 2000)	Socially anxious individuals might use games as an escape mechanism, avoiding face-to-face contact but significantly increasing online relationships

Addiction Scale score [102]; (iii) irritability, anxiety, and aggressive behaviors when forced to stop online gaming; (iv) impaired behaviors or distress, economic problems, or maladaptive patterns of regular life due to excessive online gaming; and (v) altered diurnal rhythms and consequent outcomes in life patterns (i.e., online gaming at night and sleeping during the day, irregular meals, failure in personal hygiene, school truancy, or loss of job). Moreover, Karaca et al. [103] utilized the Computer Game Addiction Scale for Children (CGASC) [104]. Finally, following Gentile [105], Gentile et al. [106] evaluated the pathological video game use.

According to the cognitive behavioral model of problematic Internet use [6, 107, 108], Cole and Hooley [10] and Lee and Leeson [1] tested the Generalized Problematic Internet Use Scale (GPIUS) [107] on MMOs and MMORPGs players, respectively.

In an alternative conceptualization termed *compensatory internet use*, Kardefelt-Winther [20••, 109] problematized the common research methodology in studies on excessive internet use developing the Excessive Online Gaming Scale (EOGS) [109]. As well, Sheng and Wang [79] employed the EOGS.

Three studies developed ad hoc measures to explore gaming habits [110], game experience and game behaviors [71], and engagement and addiction to World of Warcraft [111, 112].

Measures of Social Phobia and Social Anxiety

Concerning the social phobia and social anxiety, the most employed self-report measure was the Social Phobia Inventory (SPIN) [15, 71, 83, 106, 110, 111, 113] and two studies used the SPIN short form (MINI SPIN) [85, 90, 114, 115] to evaluate the social phobic symptoms such as social situations fear, avoidance of social situations or performances, and physiological discomfort in social contexts. Marino et al. [89] used the Italian version of the Social Phobia Inventory (I-SPIN) [116]. Five studies used the Social Anxiety Scale for children (CSAS) [43, 80, 94, 97, 98, 117–119] aiming to explore how children deal with social avoidance and distress in new and known situations. Six studies [10, 72, 82, 84, 91, 109] utilized the Social Interaction Anxiety Scale and Social Phobia Scale measures (SIAS/SPS) or its short form [120, 121], and two companion scales aimed at measuring two related facets of social fears/anxiety. Furthermore, three studies utilized the Liebowitz Social Anxiety Scale (LSAS) [1, 77, 78, 122] to assess social anxiety disorder and two Korean studies [100, 101] employed the Social Avoidance and Distress Scale (SADS) [123] to explore the fear of negative evaluation by others and the tendency to avoid social situations due to distress in the presence of others. Karaca et al. [103] and Sheng and Wang [79] used two

different measures for children: the Social Anxiety Scale for Children (SASC) [124] and the Child Social Anxiety Scale [125], respectively. Finally, Kircaburun et al. [92] utilized the Social Anxiety Scale for adolescents short form (SAS-A) [126], Lopez-Fernandez et al. [88] the social phobia items of the Symptom Checklist-27-Plus (SCL-27-Plus) [127], and Khalil et al. [81] employed the Social Anxiety subscale of the MINI International Neuropsychiatry Interview for children and adolescents (MINI KID) [128].

Problematic Online Gaming and Social Anxiety

Several reviewed studies found a strong association between social anxiety and problematic online gaming [1, 15, 43, 71, 72, 77–85, 88–90, 94, 97, 98, 100, 101, 103, 106, 110, 111] among both young and adult individuals. More specifically, some studies highlighted significant differences between at-risk/problematic online gamers and no problematic/engaged video games users [43, 77, 81, 83, 85, 94, 100, 101, 111]. Indeed, problematic users, especially males [80], scored significantly higher in social anxiety compared with no problematic peers. Colder Carras et al. [97] used the latent class analysis to identify distinct classes of gamers (normative, problematic, at-risk, social at-risk, extensive, and social engaged gamers) and explored the association between social and non-social video gaming and social anxiety in both male and female adolescents. Interestingly, they found that while male social gamers had no significant associations with social anxiety, females' engagement in social games reduced social anxiety, whereas non-social at-risk and extensive male gamers reported high social anxiety. Recently, Starcevic et al. [84] compared IGD patient group and general gamer group highlighting that patient group reported significantly higher social anxiety compared to general gamers. Finally, findings suggested that individuals with high level of social phobia spent more hours and played online video games during the weekends more than participants with lower social phobia [15].

Some correlational studies reported significant positive co-occurrence between social anxiety and problematic online gaming [79, 81, 82, 90, 98]. Kardefelt-Winther [109] suggested that social anxiety might be correlated with problematic video game use and that excessive use might be more usefully framed and considered as a coping strategy instead of as a compulsive behavior. Accordingly, Wei et al. [15] stated that socially anxious individuals might use games as an escape mechanism, avoiding face-to-face contact but significantly increasing online relationships.

Several studies explored the predictive effect of social anxiety on problematic online gaming, highlighting that gamers affected by social phobic symptoms were more prone to be engaged in virtual reality of online games, likely to avoid face-to-face social distress [1, 15, 72, 78, 88, 89].

Accordingly, Cole and Hooley [10] identified trait anxiety and social phobia as best predictors of problematic Internet use among online gamers, suggesting that generally anxious individuals who have difficulties in social situations are the people most likely to have problems online gaming. Similarly, Karaca et al. [103] reported that high social anxiety was a pivotal risk factor for both problematic gaming and online gaming addiction. On the contrary, only Kircaburun et al. [92] failed to identify social anxiety as a risk factor for IGD.

Inversely, two studies tested the predictive role of problematic online gaming on social anxiety [80, 106]. In a longitudinal growth model, Gentile et al. [106] found that the weekly amount of video game play significantly predicted the number of pathological gaming symptoms and that children who began with more pathological gaming symptoms demonstrated higher levels of social phobia. Similarly, the recent Wang et al.'s [80] findings reported that males addicted to mobile games tended to suffer more social anxiety. In addition, Wang and Cheng [91] found that gaming disorder measure did not explain a significant proportion of social anxiety. In a study focused on the MMORPG World of Warcraft (WoW), Martončik and Lokša [71] found that WoW players experienced less social anxiety in online world, especially in presence of and playing with known people. Similarly, Sauter et al. [110] found that individuals who played with known friends were less susceptible toward social anxiety. In Kardefelt-Winther's [109] study, social anxiety did not predict WoW-related negative outcomes.

Problematic Online Gaming, Social Anxiety, and the Associated Factors

Three main orders of factors have been found to be associated with problematic online gaming and social anxiety: online gaming-related variables, psychosocial factors, and comorbid symptoms.

Concerning the online gaming-related variables, some studies reported a significant relationship between problematic online gaming and time spent video gaming [1, 43, 79, 82, 94, 103]. More specifically, findings stated that an increase in young individuals' online gaming time raised the risk of addiction [90, 103], which in turn might gradually increase the time spent on video gaming [103]. On the contrary, according to Kardefelt-Winther [109], Lee and Leeson [1] showed that time spent playing was not indicative of problematic MMORPG usage. Other studies explored the motivations for online gaming using the Online Game Motivation Scale [129]. In this regard, assuming a compensatory view on MMO play, Kardefelt-Winther [109] evaluated the predictive effect of escapism, achievement, and social interactions motives underlying WoW-related negative outcomes and found that only escapism and achievement

had significant effect. Furthermore, entering motivations in the regression model, the social anxiety lost the significant predictive effect on negative outcomes related to WoW play. Lehenbauer-Baum et al. [111] compared addicted and engaged players and showed that addicted gamers displayed higher achievement and immersion scores than engaged gamers. In a recent study focused on female gamers [88], the achievement and social motivations were detected as unique predictors of IGD, as well as strictly related to the identification with the avatar when playing videogames. Furthermore, Marino et al. [89] highlighted that social anxiety was directly associated with four escape, coping, fantasy, and recreation motives, but only escapism mediated the relationship between social anxiety and IGD. Finally, Sioni et al. [72] found that higher level of social phobia promoted stronger identification with gamers' own avatar, which in turn exacerbated IGD symptoms.

The second order of factors refers to the psychosocial factors, including personality characteristics as well as social and family variables. More specifically, among the internal and personality factors, loneliness has been frequently explored [43, 71, 79, 80, 92, 94, 98, 109]. A strong association between loneliness, social anxiety, and problematic online gaming has been confirmed [43, 79, 80, 94, 98, 109]. Kardefelt-Winther [109] and Kircaburun et al. [92] failed to identify the predictive effect of loneliness on problematic online gaming, whereas this latter emerged as a pivotal predictive factor of loneliness in the Wang et al.'s [80] study. Martončik and Lokša [71] indicated that online gamers might experience less loneliness and social discomfort in virtual contexts. Other several psychosocial factors have been explored, such as perceived quality of life and life satisfaction [77, 83, 98, 110, 111], loneliness, stress [109], impulsivity [100, 101, 106], metacognitions [89], self-esteem [43, 92, 94, 98, 100, 101], the true self [1], and personality traits [10, 111]. Among the social variables, perceived social support [1], friendship quality [97], and social competence and skills [106] have been explored. Furthermore, the quality of parent–child relationship has been considered [100, 101, 106]. Also, cognitive factors have been explored [100, 101].

Finally, concerning the comorbid symptoms, the association among depression, anxiety, social anxiety, and problematic online gaming has been the most explored [10, 15, 43, 77–82, 84, 85, 88, 90–92, 94, 97, 98, 100, 101, 106, 110, 111]. In particular, depression symptoms as well as social anxiety have been found positively co-occurred with problematic online gaming [15, 79, 82] and problematic or addicted online gamers showed higher level of depression than engaged or non-problematic gamers [43, 85, 90, 94, 111], especially female gamers [77] and arcades games, sports online games, and casual games players [101]. Furthermore, depression has been reported also as a pivotal risk and predictive factor of problematic online gaming

[15, 78, 92, 97, 98, 100], whereas, inversely, Gentile et al. [106] and Wang et al. [80] found that young individuals who became pathological gamers ended up with increased levels of depression, anxiety, loneliness, and social phobia. Wang and Cheng [91] found that gaming disorder measure did not explain a significant proportion of depression. Finally, only in two studies [84, 88], the depressive symptoms did not emerge as a predictor of problematic online gaming. According to Gentile et al. [106], also Müller et al. [85] found a strict relationship between problematic online gaming and anxiety and other studies showed the predictive role of anxious symptoms on problematic online gaming [10, 100]. Only Starcevic et al. [84] did not found confirmed this predictive role and Sauter et al. [110] found that gaming habits significantly predicted generalized anxiety but with negligible practical relevance. Finally, other studies explored comorbid symptoms including obsessive–compulsive disorder [84], ADHD [84, 100, 101], sleep quality and suicidal ideation [90], psychoactive substance use [43], Internet addiction [81, 84], problematic social media use [81, 89], and mobile phone addiction [79].

Problematic Online Gaming and Social Anxiety at Different Ages

Among the reviewed studies, some age-related differences emerged in the relationship between social anxiety and problematic online gaming, showing mixed findings. Only two studies focused on children's problematic online gaming [103, 106]. More specifically, Karaka et al. [103] identified older age as a risk factor for online gaming addiction and Gentile et al. [106] confirmed that children with lower social competence and greater impulsivity showed increased pathological gaming symptoms, which in turn, over time, lead to higher levels of depression, anxiety, and social phobia. Several studies focused on adolescent samples. Phan et al. [77] highlighted that the incidence of IGD symptoms was similar before and after the age of 15 among both male and female adolescents, whereas Khalil et al. [81] found that gaming addicted adolescents had statistically significantly higher age and male sex. Other studies did not discuss their findings according to the adolescent age [43, 80, 94, 97, 98]. Six studies involved samples composed by adolescents and young adults. More specifically, Müller et al. [85] found that late adolescents sought treatment for online gaming more than for other Internet-based activities, whereas Kircaburun et al. [92], Severo et al. [90], and Wei et al. [15] reported that age was not significantly associated with Internet Gaming Disorder. Differently, Sheng and Wang [79] and Starcevic et al. [84] did not discuss the role of age in the problematic online gaming. Furthermore, some studies focused their research on emerging adult samples [10, 88, 101], but only two studies discussed their findings according to age,

showing that there were no differences between problematic and non-problematic online gamers [10] and among different kind of games players, respectively [101]. Seven studies involved young adult and adult participants. Vanzoelen and Caltabiano [78] found that, as age increased, levels of social anxiety, behavioral inhibition, depression, and gaming addiction decreased, Sigerson et al. [82] tested and confirmed the strict measurement invariance of IGD scale for age, whereas in Sioni et al.'s study [72], age was not a significant factor. Similarly, Marino et al. [89] highlighted that age was not significantly associated with IGD. Lee and Leeson [1], Sauter et al. [110], and Wang and Cheng [91] did not explore age-based differences in association with problematic online gaming. Finally, other studies focused on a large range of age, including adolescents, young adults, and adults. In particular, despite findings did not highlight significant age-related differences between problematic and non-problematic gamers [100, 111] and 109 found that age was not significantly associated with online gaming-related negative outcomes, Subramaniam et al. [83] reported that increasing age was a significant risk factor for IGD. Martončik and Lokša [71] did not discuss their findings according to age.

Discussion

The present study reviewed the scientific literature published in the last ten years exploring the relationship between problematic online gaming, social anxiety, and other variables potentially implicated in this relationship. First, a large number of conceptual, theoretical, and/or methodological mixed approaches about problematic online gaming have been confirmed, thus showing the heterogeneity of conceptual and psychometric properties of the assessment tools largely used to measure problematic online gaming. According to recent findings by King et al. [38••], the IGD criteria have been found as privileged by the largest part of the studies [15, 72, 77–80, 82–85, 88, 90, 92, 100, 101, 103, 106], but other studies assumed different perspectives [1, 10, 43, 60, 71, 79, 94, 97, 98, 109, 111]. Concerning the frequency of use of online games, despite several reviewed studies reported a significant relationship between problematic online gaming and time spent video gaming [1, 43, 79, 82, 90, 94, 103], according to Kardefelt-Winther [109] and Lee and Leeson [1], the playing time variable should be used as a screening, rather than a diagnostic tool. Furthermore, mixed findings emerged concerning the relationship between age and problematic online gaming. As previous studies highlighted [49, 70, 78, 130, 131], the problematic online gaming has been found consistently associated with gamers' younger age. On the contrary, among the reviewed studies, several studies found no significant age-related differences among

problematic online (and offline) gamers [10, 15, 77, 82, 90, 92, 100, 101, 109, 111] and other studies showed that, as age increased, levels of problematic online gaming also increased [83, 85, 103]. Likely, according to Kardefelt-Winther [109], online gaming is increasingly becoming common across the age groups, and therefore also the correlated risks. Further research on this issue is needed.

Overall, despite the several different frameworks concerning the problematic online gaming, the association between problematic online gaming and social anxiety has been largely confirmed [1, 15, 43, 71, 72, 77–80, 82–85, 88, 90, 94, 97, 98, 100, 101, 103, 106, 111].

Previous research suggested that socially anxious individuals might perceive the Internet as a safer social environment than face-to-face interactions [3–6, 8], often developing a preference for online socialization [9, 132–135]. Subsequently, this psychosocial vulnerability [108] might predispose individuals to the online gaming. In this regard, the literature of the last ten years largely showed that individuals with a serious tendency for problematic or addicted online gaming reported significantly higher social anxiety levels than non-problematic or engaged gamers [43, 77, 80, 83–85, 94, 97, 100, 101, 111]. Furthermore, in a possible bidirectional relationship [136], problematic online gaming and levels of social anxiety might mutually affect and reinforce each other. Indeed, as Lo et al. [22] found that the amount of social anxiety might increase when individuals spent more time playing online games, Wang et al. [80] and the longitudinal findings of Gentile et al. [106] showed the predictive role of the problematic (mobile) online gaming on social anxiety, especially among younger individuals. Nevertheless, overall, social anxious symptoms emerged as a pivotal risk and predictive factor of problematic online gaming [1, 10, 15, 72, 78, 88, 103]. In this regard, online gamers who suffer from social phobic symptoms appeared more likely to indulge in the virtual reality and more prone to develop a problematic online gaming, likely to avoid real life face-to-face social distress [73]. Therefore, the mutual predictive effect of social anxiety and problematic online gaming has been largely explored and frequently found in both young and adult individuals.

Several studies have defined social anxiety, depressive symptoms, self-esteem, and loneliness as strongly interrelated constructs [137] that have been extensively treated as risk factors for or of problematic Internet-related activities [7, 9, 22, 138–141]. More specifically, in addition to social anxiety, the problematic online gaming has been explored in association with depression, self-esteem, and loneliness [24–28, 131]. Similarly, the reviewed studies confirmed a strong association and a mutual relationship between these psychosocial and comorbid factors (especially depression and loneliness) and problematic online gaming [15, 43, 78–80, 94, 97, 98, 100, 106]. Furthermore, interestingly,

Martončik & Lokša [71] reported a reduction of social anxiety and loneliness among the WoW gamers, suggesting that likely online players who do not feel accepted in offline world might turn to the video games' worlds where they might perceive less threat to their social status. These controversial findings seem to reflect the complexity of the relationship between problematic online gaming and psychosocial/comorbidity issues [94]. Overall, the problematic online gaming might be defined as a complex psychological health condition which involves a feature of everyday life activities with potential negative outcomes. Indeed, although online gaming might offer an alternative context in which individuals can experiment personal social competences, reducing stress, problems, and isolation through online social interactions [16–19, 30], it might concurrently limit social experiences in face-to-face contexts when the online life starts to overshadow the offline one [23, 80, 94, 106]. Consequently, following the theoretical work of Caplan [7], some gamers might find refuge in online games with decreasing depressive symptoms, social anxiety, and loneliness, whereas, in other gamers' experiences, these correlates might increase, ensuring online socialization but failing in providing the needed face-to-face interactions.

Finally, in a *compensatory Internet use* model [20••, 98] by which addictive Internet-related activities might represent coping mechanisms to alleviate psychopathological symptoms and/or negative emotional states, people might use online gaming to counterbalance distress or negative situations in everyday life, carrying out a maladaptive coping strategy [31–33]. In this regard, according to the Yee's [129] construct of motivations to play, the escapism has been identified as motivation to play that strongly predicts problematic gaming [16, 31, 32, 142–144], especially in interaction with negative affects [111, 143, 145–148]. Overall, in line with previous studies [36••, 37, 74, 112], a new conceptualization of problematic online gaming and its related screening and assessment tools distinguishing between high engagement and pathological involvement in online videogames appear crucial.

Limitations and Conclusions

The results of the present review should be considered in view of the examined studies' limitations. Firstly, the cross-sectional nature of the data limits the formal test of causality between social anxiety and problematic online gaming; thus, more longitudinal studies are needed to clarify the direction of their relationship. Secondly, studies largely used self-report methods which might be influenced by well-known bias, such as the lack of answer accuracy and social desirability. Furthermore, future studies should evaluate the relationship between social anxiety and problematic online gaming in interactions with other variables, contributing to the research field concerning the protective and predictive factors of problematic videogames use. Finally, the problematic online gaming among female users and gender-related differences in gaming habits are still understudied issues. However, the specific limitations of the present review should be considered. Firstly, the problematic online gaming research field is extremely prolific and largely explored and only studies published within the last ten years have been included in the present study. Consequently, this review might have excluded some relevant studies published more than ten years ago. Secondly, due to the electronic search of the studies, some not non-indexed papers into in the involved databases might have been missed. Finally, this review was based on English-language studies which excluded a significant proportion of the literature (especially East Asian).

Despite the limitations, the present review examined the literature of the last ten years concerning the association between problematic online gaming and social anxiety. According to King et al. [38••], studies on gaming behavior should include measures of comorbidity, thus addressing questions regarding the presence of other mental disorders. The current review of the literature confirmed a strong relationship among online gaming disorder and other psychosocial and comorbid factors, especially social anxiety, depression, and loneliness, thus reinforcing that great attention should be paid to the problematic or excessive online gaming as a maladaptive coping strategy for the psychopathological symptoms and/or negative emotional states regulation.

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