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REVIEW PAPER

UNDERSTANDING PROBLEMATIC GAMING DURING THE COVID-19 PANDEMIC IN ADOLESCENTS AND ADULTS: A SYSTEMATIC REVIEW OF THE LITERATURE

Laura Salerno, Alessandro Pepi, Maria Teresa Graffeo, Gaia Albano, Cecilia Giordano, Gianluca Lo Coco, Maria Di Blasi

Abstract

Objective: A growing body of evidence suggests that online gaming increased during the COVID-19 outbreak. This systematic review aims to summarize extant literature that reported on problematic gaming among both adolescents and adults during the pandemic and to identify available research on the bidirectional association between problematic gaming and mental health outcomes.

Method: A systematic search was carried out through PubMed, Web of Knowledge and AGRIS, Embase, Medline, PsychINFO (from January 2020 to January 2023), using keywords related to problematic gaming and mental health outcomes. Both cross-sectional and longitudinal empirical studies which used validated measures of problematic gaming and mental health outcomes during the COVID-19 pandemic were included.

Results: Twenty-five empirical articles were eligible for the current review, comprising 28,978 participants. The majority of the selected studies had cross-sectional designs. Overall, most eligible studies showed significant association between problematic gaming and negative mental health outcomes during the pandemic. Correlations were mostly found between problematic gaming, depression and anxiety.

Conclusions: Future research focusing on the relationship between problematic gaming and mental health outcomes should go beyond the considerable weaknesses due to methodological limitations of cross-sectional design, sampling and measures.

Key words: problematic gaming, COVID-19, mental health outcomes, systematic review

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Introduction

Worldwide, the COVID-19 pandemic, the resulting lockdown and restrictions implemented in its later stages had a severe impact on the individual's physical and psychological well-being (i.e., depression, anxiety, psychological distress, post-traumatic stress disorder and poor sleep quality) (Cénat et al., 2021, 2022; Robinson et al., 2022; Wu et al., 2021). In spite of the wide-ranging heterogeneity of previous meta-analytic results, younger age, female gender, low education, and low income levels were reported as the most common risk factors as regards the individual's distress (Di Blasi, Albano et al., 2021; Fancourt et al., 2021; Pieh et al., 2020). Furthermore, quarantine and shelter-in-place restrictions forced the population to stay at home more than ever before, requiring one to reconfigure one's normal everyday behavior and social life, including leisure activities. During the lockdown, internet usage and screen time for work, educational, and leisure purposes increased globally, the most frequent activities being excessive use of social networks, playing online games and watching movies (Alimoradi et al., 2022; Maraz et al., 2021; Volpe et al., 2022).

Although gaming is a healthy and enjoyable activity for the vast majority of gamers, previous literature (Billieux et al., 2015; King et al., 2019) showed that a minority of individuals may experience problematic gaming patterns. In accordance with King et al.' suggestion (2019), in this review we adopted the construct 'problematic gaming' to refer to gaming usage patterns that can put individuals at risk of a gaming disorder (GD). Otherwise, this review uses several definitions such as online gaming, gaming addiction, Internet-gaming disorder (IGD), or GD, which are related to the psychological and measurement approaches used by the scholars in this field.

Evidence from empirical research and clinical practice shows that problematic gaming is a heterogeneous activity which can potentially present certain features of the addiction model and cause negative mental health outcomes for a minority of individuals (Männikkö et al., 2020; Stevens et al., 2019). This perspective was supported by the inclusion of Internet Gaming Disorder (IGD) in the DSM-5, as a potential disorder listed within "Emerging Measures

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and Models" (Section III) (APA, 2013), and by its inclusion as a diagnosable condition labelled Gaming Disorder (GD) in the 11th revision of the International Classification of Diseases (ICD-11) (World Health Organization [WHO], 2022).

Despite online gaming often being perceived as negative, a growing body of research indicates that online gaming can benefit both physical and psychological well-being (e.g., improving cognitive skills, decision-making, mental health, and wellbeing (Halbrook et al., 2019; Reynaldo et al., 2021; Villani et al., 2018). In addition, a growing body of research supports the idea that online gaming can be conceptualized a compensative behavior that helps players both to enhance well-being (Jones et al., 2014; Villani et al., 2018) and to actively cope with stress and challenges from adverse life events (Iacovides & Mekler, 2019; Kardefelt-Winther, 2014). It has been suggested that, during the COVID-19 pandemic, which was characterized by restrictions and social isolation, online gaming and digital communication technology may have played a protective role in ameliorating the individual's well-being (Gabbiadini et al., 2020). The World Health Organization (WHO), in line with its awareness action #HealthyAtHome – Mental Health, supported the social media campaign "#PlayApartTogether", an initiative which promoted online gaming, alone or preferably in the company of friends, as a form of entertainment during the health emergency (WHO, 2022). This campaign supported the recent findings indicating that online games can have protective and even therapeutic effects on the well-being of individuals in contexts of emotional distress (Bean, 2018; Colder Carras et al., 2018). This effect seems to be related to a compensatory function linked to the ability of gaming to satisfy basic needs related to competence, autonomy, and social affiliation (Allen & Anderson, 2018; Kardefelt-Winther, 2014; Ryan et al., 2006; Snodgrass et al., 2018). This function proved to be particularly relevant in the context of social isolation due to the pandemic, where for many people social forms of online gaming mitigated loneliness and social disconnection (Nebel & Ninaus, 2022). Conversely, other studies have shown a possible negative shift towards compensatory behaviour (Ballou et al., 2022), with a positive link between increasing online gaming and feelings of loneliness or higher anxiety (Lewis et al., 2021).

Previous research supports the fact that the relationship between potentially addictive behavior, including problematic gaming, and negative mental health outcomes during the COVID-19 outbreak seemed to be stronger than in pre-pandemic times, with mixed evidence regarding the positive or negative effects of online gaming on mental health (Ballou et al., 2022; Maraz et al., 2021). Thus, a large increase in gaming during the pandemic raised the crucial question of whether online gaming had been a risk or a supportive factor for individuals' mental health during this difficult time.

Although several systematic reviews and meta-analyses investigated the relationship between problematic gaming and negative mental health outcomes before the COVID-19 pandemic (Howes et al., 2017; Männikkö et al., 2020; Sublette & Mullan, 2012), to our knowledge, only two systematic reviews were conducted to investigate the relationship between these two constructs during the COVID-19 pandemic. Pallavicini et al. (2022) conducted a systematic review regarding the consequences of video game use on individual's mental health during the pandemic. Their study identified a complex relationship between gaming and mental-health variables such as stress, anxiety, depression, and loneliness during the early stages of the COVID-19 pandemic. This study suggested that online gaming might have mitigated the stress, anxiety, depression and loneliness of teens and young adults during quarantine. However, in those at risk (especially young men), this activity could have caused a worsening of stress, anxiety, depression, loneliness and symptoms of gaming disorder (Pallavicini et al., 2022). Moreover, Han et al. (2022) conducted a further systematic review in South Korea investigating the prevalence of Internet Gaming Disorder (IGD) in children and adolescents during the COVID-19 pandemic and its effect in terms of distress. The study showed an increase in gaming time as a coping mechanism for psychological distress and social isolation. Lastly, in subjects with previous psychological problems (depression, anxiety, and ADHD), the impact of COVID-19 resulted in the emergence of Gaming Disorder (GD) (Han et al., 2022). However, there are limitations which prevent us from generalizing about these previous findings, such as the inclusion of studies adopting subjective, non-validated, measures of gaming behavior and negative mental health outcomes (e.g., open-ended questions asked respondents if and how playing video games has impacted their well-being during the COVID-19 pandemic; self-reported daily time spent on gaming). Moreover, the review by Pallavicini et al. (2022) included studies that only evaluated the relationship between gaming and mental health in the early stages (i.e., 2020) of the pandemic.

The present systematic review

The objective of this systematic review is to summarize extant literature that reported on problematic gaming among both adolescents and adults during the COVID-19 pandemic. Moreover, the current review aims to identify and summarize available research on the bidirectional association between problematic gaming and mental health outcomes (i.e., whether problematic gaming had a detrimental effect on individual's mental health status or, vice versa, gaming activities mitigated individual's distress during the pandemic). The current review expands on results of previous research by focusing on studies which reported validated measures of both problematic gaming and mental health outcomes, in an effort to support the standardization and the generalizability of findings in this widely-debated research and clinical field. Moreover, the present study extends previous findings on the early stages of the COVID-19 pandemic by updating the review to studies published up to the beginning of 2023.

Method

Information sources and search strategy

To identify all relevant studies on the relationship between problematic gaming and individuals' mental health outcomes during the COVID-19 pandemic, a systematic search was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines (Moher et al., 2009). The systematic search of the literature was performed on June 2022 and updated on January 2023.

The following electronic databases were used: PubMed, Web of Knowledge, and OVID (Embase, PsychINFO, AGRIS, PsychARTICLES, Medline)

and the combination of the following keywords was used: [("Gaming")] OR [("Gaming Addiction")] OR [("Internet Gaming Disorder*")] OR [("Gaming Disorder*")] OR [("Internet Gaming Addiction")] OR [("Problematic Gaming")] OR [("Dysfunctional Gaming")] OR [("Videogame Addiction")] OR [("Video-game*")] OR [("Videogame*")] OR [("Video game*")] AND [("Covid")] OR [("COVID-19")] OR [("Pandemic")] OR [("Coronavirus")] OR [("Lockdown")] OR [("Home Confinement")] OR [("Severe Acute Respiratory Syndrome")] OR [("SARS")] AND [("Psychological Distress")] OR [("Depression")] OR [("Anxiety")] OR [("Stress")] OR [("Distress")] OR [("PTSD")] OR [("Sleep Disorder")] OR [("Wellbeing")] OR [("Wellness")] OR [("Adjustment")] OR [("Mental Health")] OR [("Protective Factors")] OR [("Coping Strategies")] OR [("Social Anxiety")] OR [("Emotion Regulation")] OR [("Life Satisfaction")] OR [("Health Promotion")] OR [("Mental Illness")] OR [("Distress")] OR [("Social Discomfort")] OR [("Loneliness")].

Eligibility criteria

Studies were included in the systematic literature review based on the following inclusion criteria: they must (a) contain empirical analyses of quantitative data (i.e., randomized-controlled trial, quantitative non-randomized, quantitative descriptive); (b) included human participants (both males and females) with an age equal to, or greater than, 13 years (i.e., adolescents, young adults, and adults); and (c) use validated tools to measure problematic gaming and mental health outcomes variables (except for measures related to COVID-19 impacts). Studies were excluded if: (a) the publication was a book, conference paper, thesis, review, protocol study, presentation or grey literature; (b) the full text was not available in English; (c) the behaviour does not refer uniquely to problematic gaming (e.g., problematic internet use, total amount of screen use); (d) data were only collected before the pandemic time.

Study selection

The records identified were downloaded and merged into a single EndNote library. Duplicate articles were eliminated. Subsequently, study selection was performed in two stages according to the eligibility criteria. Firstly, four authors (L.S., A.P., G.A., and M.T.G.) screened titles and abstracts in order to identify potential eligible articles (first screening). Articles deemed ineligible by all reviewers were excluded. Secondly, the full texts of the selected articles were retrieved and independently reviewed. Ineligible articles were formally excluded. At both stages, discrepancies were resolved through group discussions with the research team.

Data collection

A data extraction table was created to synthesize the eligible studies. Data extraction from eligible papers included publication data (i.e., author, year of publication, country setting and timing of data collection), type of study (i.e., study design), sample characteristics (i.e., size, gender, and age), assessment tools for problematic gaming and mental health outcomes (with a special focus on measures related to COVID-19-related impacts), problematic gaming characteristics (i.e., time spent on gaming and prevalence), and main findings of the study. As regards participants' age and time spent on gaming, the means and SDs were extracted if not otherwise indicated.

Quality assessments

The authors L.S., A.P, and M.T.G. independently assessed all of the included studies for quality, using a modified version of the Newcastle-Ottawa Scale (Wells et al., 2000) (see **table 2**). This is an 8-item checklist and includes items such as representativeness of the sample (item 1) and sample size (item 2), whether the non-respondents/loss to follow-up rate is reported (item 3), ascertainment of the exposure (item 4), comparability/adjustment for confounding factors (item 5), assessment of the outcome (item 6), appropriateness of the statistical analyses (item 7), and follow-up (item 8). For each item, a series of response options is provided. Disagreements between authors were resolved until agreement was reached by discussion between L.S., A.P, M.T.G., and if required G.L.C., C.G. and M.D.B. A total quality score was calculated for each study by summing the scores for each item. Possible scores ranged from 0 to 9, and high scores indicated high study quality. More specifically, studies were evaluated to be of high quality if they scored seven to nine, of medium quality if they scored five or six, and of low quality if they scored equal to, or lower than, four.

Results

Study selection

The original literature search (i.e., June 2022) identified 378 papers. After removing duplicates (n = 232) and articles based on the first screening (n = 96), 50 papers were eligible for a full-text review. Thirty-two studies failed to meet the inclusion criteria; reasons for exclusion of studies are described in Supplementary materials (**table S1**). Thus, 18 papers emerged from the first search.

Moreover, 263 papers were identified through the secondary updating search (i.e., January 2023). After removing duplicates (n = 36) and articles based on the first screening (n = 188), 39 papers were eligible for full-text review. Thirty-three studies failed to meet the inclusion criteria; reasons for exclusion of studies are described in Supplementary materials (**table S1**). Thus, 6 papers emerged from the updated search.

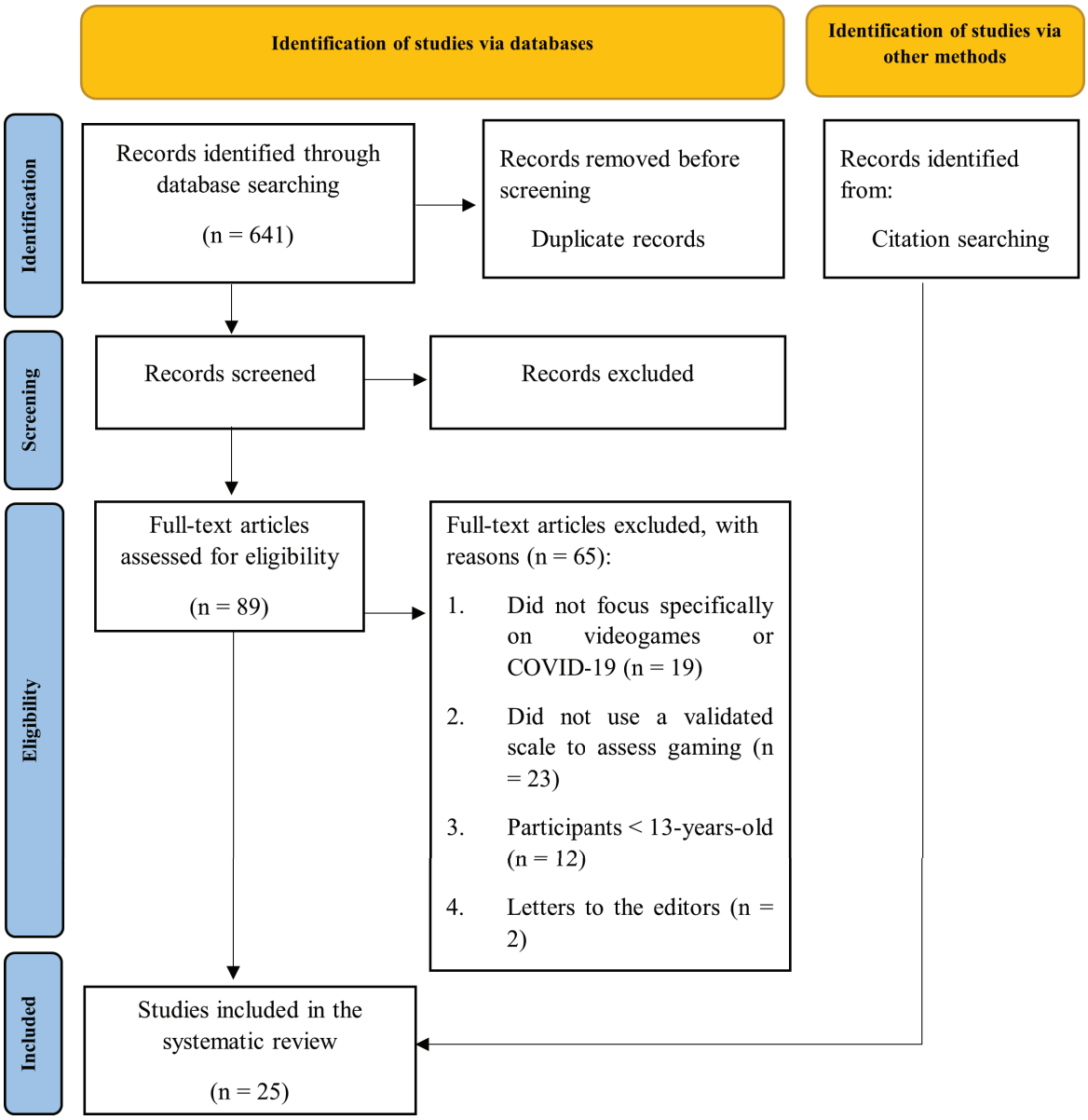
Also, a manual search was conducted by screening references from studies and citations in relevant journals. The manual search yielded one additional paper.

The final eligible papers totalled 25. A summary of the systematic review process is shown in **figure 1**.

3.2. Study characteristics

The main characteristics of the 25 studies included in the systematic review are described in **table 1**. All studies were published in peer-reviewed journals. The majority of the studies were conducted in Asia (48%, 12/25) (Balhara et al., 2020; Chang et al., 2022; Chen et al., 2022; Fazeli et al., 2020; Ismail et al., 2021; Pattanaseri et al., 2022; Shrestha et al., 2020; Teng et al., 2021; Ting & Essau, 2021; Wu et al., 2022; Yang

Figure 1. *Study selection flow diagram*



et al., 2021; Zaman et al., 2022); seven studies were conducted in Europe (28%) (Claesdotter-Knutsson et al., 2022; Cudo et al., 2022; Giardina et al., 2021; Jouhki et al., 2022; Rogier et al., 2021; Savolainen et al., 2022; Volpe et al., 2022); one study was conducted in North America (Elhai et al., 2021); one study was conducted in Australia (Kim, Nam, & Keum, 2022); and four studies (16%) included participants from various countries (Fernandes et al., 2020; Formosa et al., 2022; Hall et al., 2021; Sallie et al., 2021).

The majority of studies (76%, 19/25) had a cross-sectional design, five studies (20%) (Chen et al., 2022; Jouhki et al., 2022; Kim, Nam, & Keum, 2022; Rogier et al., 2021; Teng et al., 2021) had a longitudinal design, and one study (Wu et al., 2022) had a retrospective design.

For the majority of studies (64%, 16/25) data were collected in 2020, and five studies (20%, 5/25) collected data in 2021 and 2022 (Chen et al., 2022; Claesdotter-Knutsson et al., 2022; Jouhki et al., 2022; Kim, Nam, & Keum, 2022; Savolainen et al., 2022). Although conducted during the COVID-19 pandemic, the remaining four studies (Balhara et al., 2020; Cudo et al., 2022; Fernandes et al., 2020; Rogier et al., 2021) did not report the months or year of data collection.

Participants' characteristics

A total of 28,978 participants across the studies were involved (sample size range from 128 to 5,268 subjects). Participants were adolescents, young adults, and adults (49.5% females), with an overall mean age of 29.04 years (only calculated for 18 studies reporting participants' mean age, as seven studies reported median values or age ranges, instead of the mean value for age). More specifically, the majority of studies (56%, 14/25) (Chen et al., 2022; Cudo et al., 2022; Elhai et al., 2021; Giardina et al., 2021; Hall et al., 2021; Jouhki et al., 2022; Rogier et al., 2021; Sallie et al., 2021; Savolainen et al., 2022; Ting & Essau, 2021; Volpe et al., 2022;

Table 1. *Synthesis of relevant data collected from the studies included in the review*

Author/year	**Type of study**	Sample size (N), Gender (%), Mean age (SD)	Country and time	Time spent on gaming, M(SD)	Gaming assessment measure	Mental Health measures	COVID-19-related measures	Prevalence	**Main findings of the study**
Balhara et al. (2020)	Cross-sectional study	128 participants; 59.4% females; age: M = 19.6 (1.9)	India, during the lockdown	Increased gaming group: median = 2.5, IQR = 1.25-5 hours/day Not increased gaming group: median = 1, IQR = 0-1 hours/day	Internet Gaming Disorder Scale Short Form-9 (IGDS9-SF)	Depression (PHQ-9); Anxiety (GAD-7)	COVID-19-related stress (non-validated VAS[1] scale)	A diagnosis of IGD could be made for 14.84% participants (20% and 9.52% for "increased" and "not increased" gaming groups, respectively).	No significant association between depression/anxiety and gaming increasing. Participants with moderate-or-severe anxiety had an association with the change in gaming behavior. COVID-19-related stress was not significantly different between those who increased and did not increase gaming.
Chang et al. (2022)	Cross-sectional study	1,305 participants; 41.5% females; age: M = 15.16 (1.66)	China, June-July 2020	N.R.[2]	Internet Gaming Disorder Scale Short Form-9 (IGDS9-SF)	Depression, Anxiety, Stress (DASS-21)	N.R.[2]	Normative Gamers (30.9%), Addictive Gamers (4.1%), Occasional Gamers (42.4%), Problematic Gamers (22.7%)	Compared to "normative gamers", depression was associated with "addictive", "occasional" and "problematic" classes. Anxiety was positively associated with "problematic" class. No significant associations between stress and gaming.
Chen et al. (2022)	Longitudinal study	980 participants; 82.90% females; age: M = 34.76 (8.22)	China, November 2021 – January 2022	N.R.[2]	Internet Gaming Disorder Scale Short Form-9 (IGDS-SF9)	Psychological distress (DASS-21)	N.R.[2]	N.R.[2]	Positive association between psychological distress and problematic gaming.
Claesdotter-Knutsson et al. (2022)	Cross-sectional study	1,501 participants; 48.5% females; age groups: 16-24 (16.4%), 25-39 (30.8%), 40-59 (32.1%), ≥60 (20.7%)	Sweden, March 2021	N.R.[2]	Game Addiction Scale for Adolescents (GASA)	Psychological distress (Kessler-6 scale)	Changes in personal behavior (e.g., alcohol consumption, exercise habits).	Addicted/problem gamers (6.4%), Engaged gamers (5.8%), No problem (87.8%)	The major increase of gaming was reported in the age group of 16-39 years. Psychological distress was associated with gaming increasing in all age groups analyzed together and in 25-39-year-old age group. Increased gaming was related to drinking less alcohol and exercising less.

Table 1. *Continued*

Cudo et al. (2022)	Cross sectional study	652 participants; 35.7% females; age: M = 28.77 (7.18)	Poland, during the COVID-19 pandemic	N.R.[2]	Internet Gaming Disorder Scale Short Form (IGDS-SF9)	Depressive symptoms (PHQ-9); loneliness (De Jong Loneliness Scale); self-control (BSCS)	N.R.[2]	N.R.[2]	Positive relationship between depressive symptoms and gaming disorders. Positive relationship between loneliness and gaming disorders only for males. Negative relationship between self-control and gaming disorders. Motives for gaming mediate the relationship between depressive symptoms/self-control and gaming disorder only for males.
Elhai et al. (2021)	Cross-sectional study	812 participants; 50.1% females; age: M = 44.45 (17.21)	United States and Canada, May 2020	N.R.[2]	GD test (GDT)	Health anxiety (SHAI)	N.R.[2]	N.R.[2]	Significant positive relationships were found between GD severity and health anxiety/perceived negative consequences of illness.
Fazeli et al. (2020)	Cross-sectional study	1,512 participants; 43.6% females; age: M = 15.51 (2.75)	Iran, May – August 2020	68.12 (±39.83) minutes/day during weekends	Internet Gaming Disorder Scale-Short Form (IGDS9-SF)	Depression, anxiety, and stress (DASS-21); Level of insomnia (ISI); Quality of life (PedsQL™ 4.0 SF15)	N.R.[2]	N.R.[2]	IGD is positively associated with depression, anxiety, stress and insomnia, and negatively related to quality of life (adolescents reports). IGD indirectly influenced insomnia and quality of life through depression and anxiety.
Fernandes et al. (2020)	Cross-sectional study	185 participants; 65.76% females; age: M = 21.59 (2.60)	Mexico, India, Indonesia, Philippines, Malaysia, UK, During the pandemic	Before COVID-19: 0.73 (6.86) hours/day; During COVID-19: 1.54 (2.13) hours/day	Game Addiction Scale (GAS)	UCLA Loneliness scale (ULS-8); Depression (K10)	N.R.[2]	N.R.[2]	Higher score on gaming addiction is associated with higher score on depression and loneliness and lower scores on sleep quality.

Table 1. *Continued*

Formosa et al. (2022)	Two cross-sectional studies	Study 1: 212 participants; 39.6% females; age: M = 28.36 (9.14) Study 2: 329 participants; 22.5% females; age: M = 27.44 (8.49)	Australia, Canada; Study 1: December 2019 – March 2020; Study 2: April-June 2020	Study 1: 15.48 (13.00) hours/week Study 2: 20.43 (14.89) hours/week	Both study 1 and 2: Addiction subscale of the Addiction-Engagement Questionnaire; Obsessive and Harmonious Passion scale.	Satisfaction with life (Satisfaction with Life scale); Subjective Vitality (Subjective vitality scale); Psychological distress (K6)	N.R.[2]	N.R.[2]	Prior to COVID-19, it seems passion for videogames influenced problematic game play but did not extend to more general well-being (satisfaction with life, vitality, psychological distress). In contrast, during COVID-19, people's passion for videogame play is able to positively influence well-being (i.e. greater vitality, reduced psychological distress), even among players who may be engaged in games in a more obsessive and rigid manner.
Giardina et al. (2021)	Cross-sectional study	664 participants; 8.7% females; age: M = 23.59 (6.27)	Italy, February – March 2020	Before COVID-19: 20.20 (16.3) hours/week; During COVID-19: 22.51 (16.50) hours/week; Overall: 21.47 (16.46) hours/week	Internet Gaming Disorder Test-10 (IGDT-10); Videogames Involvement Scale (VIS)	Depression and Anxiety (DASS-21)	N.R.[2]	N.R.[2]	Gaming for social compensation mitigated the experienced depression and anxiety during the COVID-19 pandemic, whereas maladaptive gaming patterns could constitute a vulnerability factor deserving clinical attention.
Hall et al. (2021)	Cross-sectional study	1,144 participants; 43.6% females; age: M = 31.4 (10.5)	Australia, Aotearoa New Zealand and US; April 2020	N.R.[2]	Internet Gaming Disorder Checklist (IGDC)	Contamination concern (Revised Padua-Inventory contamination subscale)	N.R.[2]	N.R.[2]	Contamination concern is associated with higher excessive gaming. People may be engaging with video games to manage their contamination concerns about the COVID-19 pandemic.
Ismail et al. (2021)	Cross-sectional study	237 participants; 69.6% females; age: Median = 21.00 (IQR = 3.0)	Malaysia, November – December 2020	N.R.[2]	Internet Gaming Disorder Scale – Short Form (IGDS9-SF)	Anxiety (DASS-21)	N.R.[2]	A diagnosis of IGD could be made for 2.5% participants.	The prevalence of IGD remained as low as the rates reported prior to the pandemic. No significant association between anxiety and IGD.

Table 1. *Continued*

Jouhki et al. (2022)	Longitudinal study	1,022 participants; 48.4% females, .03 other gender; age: M = 49.50	Finland, April 2021 – May 2022	N.R.[2]	Internet Gaming Disorder Test (IGDT)	Psychological Distress (MHI-5)	N.R.[2]	N.R.[2]	Participants experiencing psychological distress were less involved in excessive gaming.
Kim, Nam, & Keum (2022)	Longitudinal study	4,968 participants; gender N.R.; age: range = 13-14 years	Australia, 2021-2022	N.R.[2]	Internet Gaming Disorder Scale – Short Form (IGDS9-SF)	Anxiety (PROMIS-A)	N.R.[2]	15% and 16% in adolescents aged 13 and 14 years, respectively.	Higher anxiety levels were associated with higher gaming disorder 12 months later and vice versa.
Pattanaseri et al. (2022)	Cross-sectional study	224 participants; 50.5% females; age: Median = 21.02 [20.02, 21.11]	Thailand, March – October 2020	N.R.[2]	Game Addiction Screening Test (GAST)	Depression (PHQ-9)	N.R.[2]	The prevalence of game addiction was 4.5%	Game addiction was not found to be an independent risk factor for depression.
Rogier et al. (2021)	Longitudinal study	1,323 participants; 77.3% females; age: M = 35.51 (13.91)	Italy, After national lockdown	N.R.[2]	Internet Gaming Disorder Scale–Short-Form (IGDS9-SF)	Loneliness (UCLA)	N.R.[2]	N.R.[2]	Loneliness levels at T1 significantly and positively predicted gaming addiction levels at T2, controlling for gaming frequency at T1.
Sallie et al. (2021)	Cross-sectional study	1,344 participants; 24.2% females; age: M = 28.93 (12.46)	United Kingdom, United States and Other; May 2020	Before quarantine: 6.76 (13.2) hours/week; During quarantine: 9.92 (15.39) hours/week	Internet Gaming Disorder Scale-Short Form (IGDS9-SF)	Hospital Anxiety and Depression Scale (HADS)	COVID-19-related stress factors (ad-hoc questions).	N.R.[2]	Greater OG severity scores during quarantine were associated with psychological factors such as greater depression and anxiety. COVID-19_reated stress factors were associated with greater severity of OG.
Savolainen et al. (2022)	Cross-sectional study	1,530 participants; 49.41% females, 0.26% other; age: M = 46.67 (16.42)	Finland, April 2021	N.R.[2]	Internet Gaming Disorder Test (IGDT)	Mental health problems (MHI-5)	COVID-19 anxiety (adapted STAI-6).	1% of the total sample had a gaming disorder	Higher COVID-19 anxiety and incidence of mental health issues were associated with higher online gaming problems.

Table 1. *Continued*

Shrestha et al. (2020)	Cross-sectional study	377 participants; 52.3% females; age: M = 20.85 (1.75)	Nepal, July-August 2020	95 (36.6): < 1 hour/day 104 (40.0): 1-2 hours/day 31 (11.9): 3-4 hours/day 30 (11.5): > 4 hours/day	Internet Gaming Disorder Short Form-9 (IGDS9-SF)	Depression (PHQ-9); Generalized Anxiety Disorder (GAD-7)	N.R.[2]	A diagnosis of IGD could be made for 8.5% participants	Higher depression scores and anxiety scores were significantly associated with greater scores on the IGD. Participants reported an increase in gaming behavior in order to cope with stress caused by the COVID-19 pandemic.
Teng et al. (2021)	Longitudinal study	903 participants (only adolescents are considered for the review); 49.3% females; age: N.R.	China, October 2019 – May 2020	N.R.[2]	Internet Gaming Disorder Short Form-9 (IGDS9-SF)	Depression (CES-D); Anxiety (STAI)	Perceived COVID-19 impacts on life domains (self-report questions)	N.R.[2]	Depressive and anxiety symptoms were significant predictors of video game use and internet gaming disorder. Perceived COVID-19 impacts were predictors of IGD.
Ting & Essau (2021)	Cross-sectional study	178 participants; 82% females; age: M = 22.56 (2.93)	Malaysia, September-October 2020	Before the pandemic: M = 0.95 (2.2) hours/day; During the pandemic: M = 1.33 (2.8) hours/day	Gaming Addiction Scale (GAS)	Self-regulation (SSRQ); general distress (K6)	COVID-19 related anxiety (FCV-19S);	4.5% of the participants could be defined as monothetic gamers (i.e., "pathological gaming")	Gaming was positively related to COVID-19 related anxiety and psychological distress, and negatively related to self-regulation.
Volpe et al. (2022)	Cross-sectional study	1,385 participants; 62.5% females; age : M = 32.5 (12.9)	Italy, May–September 2020	4.2 (9.8) hours/week	Internet Gaming Disorder Short Form-9 (IGDS9-SF)	Depression, anxiety, and stress (DASS-21); Social motivation and behavior (SASS)	N.R.[2]	A diagnosis of IGD could be made for 13.8% participants	COVID-related general, depressive, anxiety and stress symptomatology are negatively related to Problematic Internet gaming disorder and play a significant mediation role in the relationship between gaming and other types of problematic internet use.
Wu et al. (2022)	Retrospective study	5,268 participants; 47.4% females; age: Median = 27 (IQR = 22, 35)	China, May – August 2020	Before COVID-19: Median = 30 minutes/day (IQR = 10, 60). After the lifting of lockdowns: median 40 minutes/day (IQR = 10, 100)	Internet Gaming Disorder Short Form-9 (IGDS9-SF)	Depression, anxiety and stress (DASS-21)	N.R.[2]	A diagnosis of IGD could be made for 5% participants	Gamers with increased gaming behavior showed higher degrees of stress, anxiety, and depression than those without increased gaming behavior.

Table 1. *Continued*

Yang et al. (2021)	Cross-sectional study	177 participants; 52.5% females; Age groups: 18-25 (26.0%), 26-35 (14.1%), 36-45 (15.8%), 46-55 (10.2%), 56-65 (19.2%), >65 (11.9%), refused to answer (2.8)	China, May 2020	Pre-COVID-19: 1.81 hours/day; During COVID-19: 3.29 hours/day	9-item DSM-5 IGD symptoms checklist	Loneliness (De Jong Gierveld Loneliness Scale)	Post-traumatic stress (modified PTSD-8); Boredom (modified Multi-dimensional State Boredom Scale).	A diagnosis of IGD could be made for 9.7% participants	Boredom and emotional loneliness were significantly and positively associated with IGD symptoms. No significant relationship between PTSD and gaming. Boredom positively mediated the associations between time spent on gaming and IGD.
Zaman et al. (2022)	Cross-sectional study	618 participants; 32.5% females; age: M = 24.53 (5.02)	Pakistan, June – July 2020	N.R.[1]	Gaming addiction scale (GAS)	Sleep quality (PSQI)	N.R.[2]	Addicted Gamers (12.5%), Problem Gamers (44.3%), Engaged Gamers (5.7%), Normal Gamers (37.5%)	Participants with gaming addiction had significantly poorer subjective sleep quality, higher sleep disturbance, lesser sleep duration, and higher daytime dysfunction.

Wu et al., 2022; Yang et al., 2021; Zaman et al., 2022) involved both young adults ad adults (> 18 years); 4 studies (Chang et al., 2022; Fazeli et al., 2020; Kim, Nam, & Keum, 2022; Teng et al., 2021) involved only adolescents (13-18 years old); 4 studies (Balhara et al., 2020; Ismail et al., 2021; Pattanaseri et al., 2022; Shrestha et al., 2020) involved only young adults (18-35 years old); and 3 studies (Claesdotter-Knutsson et al., 2022; Fernandes et al., 2020; Formosa et al., 2022) involved mixed samples.

Quality Assessment

The majority of studies (44%, 11/25) were classified as "medium quality" articles (i.e., range 5-6); ten studies (40%) were classified as "low quality" articles (i.e., range 0-4); and four studies (16%) were classified as "high quality" articles (i.e., range 7-9). An overview of quality appraisal is provided in **table 2**.

Measures used to assess problematic gaming and problematic gaming characteristics

Nine measures of problematic gaming were identified across the 25 papers. Thirteen studies (Balhara et al., 2020; Chang et al., 2022; Chen et al., 2022; Cudo et al., 2022; Fazeli et al., 2020; Ismail et al., 2021; Kim, Nam, & Keum, 2022; Rogier et al., 2021; Sallie et al., 2021; Shrestha et al., 2020; Teng et al., 2021; Volpe et al., 2022; Wu et al., 2022) reported on the Internet Gaming Disorders Scale – short form (IGDS9-SF; Lemmens et al., 2015); four studies (Claesdotter-Knutsson et al., 2022; Fernandes et al., 2020; Ting & Essau, 2021; Zaman et al., 2022) reported on Game Addiction Scale (GAS; Lemmens et al., 2009); one study (Elhai et al., 2021) reported on the GD test (GDT; Pontes et al., 2021); one study (Formosa et al., 2022) reported on the Addiction subscale of the Addiction-Engagement Questionnaire (Charlton & Danforth, 2007); three studies (Giardina et al., 2021; Jouhki et al., 2022; Savolainen et al., 2022) reported on the Internet Gaming Disorder Test-10 (IGDT-10; Király et al., 2017); one study (Hall et al., 2021) reported on the Internet Gaming Disorder Checklist (IGDC; Przybylski et al., 2017); one study (Pattanaseri et al., 2022) reported on the Game Addiction Screening Test (GAST; Pornnoppadol et al., 2014); and one study (Yang et al., 2021) reported on the 9-item DSM-5 IGD symptoms checklist (APA, 2013). The study by Giardina et al. (2021) reported also on the Videogames Involvement Scale (VIS; Snodgrass et al., 2017);

Regarding problematic gaming characteristics, thirteen studies (Balhara et al., 2020; Chang et al., 2022; Claesdotter-Knutsson et al., 2022; Ismail et al., 2021; Kim, Nam, & Keum, 2022; Pattanaseri et al., 2022; Savolainen et al., 2022; Shrestha et al., 2020; Ting & Essau, 2021; Volpe et al., 2022; Wu et al., 2022; Yang et al., 2021; Zaman et al., 2022) reported a prevalence of IGD, which ranged from 1% (i.e., Savolainen et al., 2022) to 16% (i.e., Kim, Nam, & Keum, 2022). Twelve studies did not report data regarding the prevalence of IGD. The mean prevalence (i.e., 10.05%), calculated from studies reporting these data and involving only adolescents (i.e., Chang et al., 2022; Kim, Nam, & Keum, 2022), appears to be higher than the one (i.e., 8.45%) calculated from studies reporting these data and involving only young adults or adults (Balhara et al., 2020; Ismail et al., 2021; Pattanaseri et al., 2022; Savolainen et al., 2022; Shrestha et al., 2020; Ting & Essau, 2021; Volpe et al., 2022; Wu et al., 2022; Yang

et al., 2021; Zaman et al., 2022).

Regarding time spent on problematic gaming, 14 out of 25 studies (Chang et al., 2022; Chen et al., 2022; Claesdotter-Knutsson et al., 2022; Cudo et al., 2022; Elhai et al., 2021; Hall et al., 2021; Ismail et al., 2021; Jouhki et al., 2022; Kim, Nam, & Keum, 2022; Pattanaseri et al., 2022; Rogier et al., 2021; Savolainen et al., 2022; Teng et al., 2021; Zaman et al., 2022) did not report participants' time spent on problematic gaming. Six studies (Fernandes et al., 2020; Formosa et al., 2022; Giardina et al., 2021; Sallie et al., 2021; Ting & Essau, 2021; Yang et al., 2021) compared participants' average time spent on problematic gaming before and during the pandemic, showing a slight increase from 1.59 hours (range 0.73-2.89 hours/day) to 2.29 (range 1.33- 3.29 hours/day). Two studies (Fazeli et al., 2020; Volpe et al., 2022) reported time spent on problematic gaming without differentiating before and during the pandemic. Lastly, three studies (Balhara et al., 2020; Shrestha et al., 2020; Wu et al., 2022) reported median and IQR values or range values, instead of the mean value for time spent on problematic gaming.

The association between problematic gaming and anxiety, depression and stress

The majority of the studies included (64%; 16/25) examined the relationship between problematic gaming and anxiety, depression, or stress (Balhara et al., 2020; Chang et al., 2022; Cudo et al., 2022; Elhai et al., 2021; Fazeli et al., 2020; Fernandes et al., 2020; Giardina et al., 2021; Hall et al., 2021; Ismail et al., 2021; Kim, Nam, & Keum, 2022; Pattanaseri et al., 2022; Sallie et al., 2021; Shrestha et al., 2020; Teng et al., 2021; Volpe et al., 2022; Wu et al., 2022).

Specifically, twelve studies (48%, 12/25) reported data on the association between problematic gaming and depression during the pandemic. Eight studies (66.7%; 8/12) (Chang et al., 2022; Cudo et al., 2022; Fazeli et al., 2020; Fernandes et al., 2020; Sallie et al., 2021; Shrestha et al., 2020; Teng et al., 2021; Wu et al., 2022) found that higher scores on problematic gaming, as well as belonging to a problematic/addictive group of gamers, were associated with higher levels of depression. Among these studies, the only longitudinal study (Teng et al., 2021) showed that depressive symptoms before the COVID-19 pandemic (i.e., October to November 2019) were a significant predictor of videogame use and internet gaming disorder during the COVID-19 pandemic (i.e., April to May 2020), but not vice versa. However, two studies (Balhara et al., 2020; Pattanaseri et al., 2022) did not report a significant association between depression and gaming, whereas one study (Volpe et al., 2022) showed a negative relationship between depressive symptoms and gaming. Finally, Giardina et al. (2021) found that gaming for social compensation mitigated the depression experienced by highly involved gamers.

Thirteen studies (52%, 13/25) examined the relationship between problematic gaming and anxiety (i.e., general anxiety, obsessive compulsive symptoms, and health anxiety). More specifically, nine studies (69.2%, 9/13) (Chang et al., 2022; Elhai et al., 2021; Fazeli et al., 2020; Hall et al., 2021; Kim, Nam, & Keum, 2022; Sallie et al., 2021; Shrestha et al., 2020; Teng et al., 2021; Wu et al., 2022) showed a positive association between higher scores on problematic gaming, as well as being in a problematic group of gamers and suffering higher anxiety. Among these studies, the two longitudinal studies (Kim, Nam, & Keum, 2022; Teng et al., 2021) noted mixed findings about the directionality of the relationship between anxiety and problematic gaming. Kim, Nam, and Keum (2022) identified a bidirectional relationship between anxiety and gaming disorder, suggesting that individuals who are experiencing high levels of anxiety may seek to manage them by playing video games, but also that gaming disorder symptoms may exacerbate anxiety levels over time. However, Teng et al. (2021) found that anxiety symptoms before the COVID-19 pandemic (i.e., October to November, 2019) were a significant predictor of videogame use and internet gaming disorder during the COVID-19 pandemic (i.e., April to May, 2020), but not *vice versa*. Two studies (Balhara et al., 2020; Ismail et al., 2021) did not find a significant association between anxiety and increased gaming activity. However, Balhara et al. (2020) found that participants reporting moderate-or-severe anxiety levels were more likely to report an increase in gaming. One study (Volpe et al., 2022) found a negative relationship between anxiety symptomatology and gaming. Lastly, Giardina et al. (2021) found a negative correlation between anxiety and gaming, but only for highly involved gamers.

Four studies (16%; 4/25) examined the relationship between gaming and stress. Two studies (Fazeli et al., 2020; Wu et al., 2022) found a positive relationship between these two variables. One study (Volpe et al., 2022) found a negative correlation between gaming and stress. One study (Chang et al., 2022) found a non-significant relationship between stress and gaming.

Global psychological distress and problematic gaming

Five studies (20%, 5/25) examined the relationship between problematic gaming and global psychological distress. Three studies (Chen et al., 2022; Claesdotter-Knutsson et al., 2022; Ting & Essau, 2021) found a positive association between psychological distress levels and gaming. Among these studies, the only longitudinal one (Chen et al., 2022) found a reciprocal relationship between psychological distress and problematic gaming. On the contrary, one study (Formosa et al., 2022) showed that people's passion for videogame playing may have reduced psychological distress during the pandemic, even among players who were more obsessively and rigidly engaged with the game. Moreover, Jouhki et al. (2022) found that participants experiencing psychological distress were less involved in excessive gaming.

COVID-19-related psychological impacts and problematic gaming

Special attention was paid to studies that specifically evaluated the relationship between problematic gaming and COVID-19-related psychological impacts. Given the wide variety of measures used to evaluate COVID-19-related psychological impacts, non-validated measures were also considered. More specifically, five studies (20%, 5/25; Balhara et al., 2020; Sallie et al., 2021; Savolainen et al., 2022; Ting & Essau, 2021; Yang et al., 2021) used measures on COVID-19-related psychological impact (i.e., COVID-19- related stress, COVID-19-related anxiety, COVID-19-related post-traumatic stress, and COVID-19-related boredom). No significant association was found between problematic gaming and COVID-19-related stress (Balhara et al., 2020) as well as COVID-19-related post-traumatic

Table 2. *Assessment of study quality*

Authors, date	Representativeness of the sample	Sample size	Non-respondents/ Loss to follow up	Ascertainment of the exposure	Confounders	Assessment of the outcome	Statistical analyses	Follow up	Total score	Quality
Balhara et al. (2020)	0	0	0	1	2	1	1	0	5	medium
Chang et al. (2020)	0	0	0	1	1	1	1	0	4	low
Chen et al. (2022)	1	0	1	1	2	1	1	1	8	high
Claesdotter-Knutsson et al. (2022)	1	0	0	1	2	1	1	0	6	medium
Cudo et al. (2022)	0	0	0	1	2	1	1	0	5	medium
Elhai et al. (2021)	0	0	0	1	1	1	1	0	4	low
Fazeli et al. (2020)	0	0	1	1	2	1	1	0	6	medium
Fernandes et al. (2020)	0	0	0	1	1	1	1	0	4	low
Formosa et al. (2022)	0	0	0	1	0	1	1	0	3	low
Giardina et al. (2021)	0	0	0	1	2	1	1	0	5	medium
Hall et al. (2021)	0	0	0	1	0	1	1	0	3	low
Ismail et al. (2021)	1	0	1	1	2	1	1	0	7	high
Jouhki et al. (2022)	1	0	1	1	2	1	1	1	8	high
Kim, Nam & Keum (2022)	0	0	0	1	0	1	1	1	4	low
Pattanaseri et al. (2022)	0	0	0	1	2	1	1	0	5	medium
Rogier et al. (2021)	0	0	0	1	0	1	1	1	4	low
Sallie et al. (2021)	0	0	0	1	2	1	1	0	5	medium
Savolainen et al. (2022)	0	0	0	1	0	1	1	0	3	low
Shrestha et al. (2020)	0	1	1	1	0	1	1	0	5	medium
Teng et al. (2021)	1	1	1	1	2	1	1	1	9	high
Ting & Essau (2021)	0	0	0	1	0	1	1	0	3	low
Volpe et al. (2022)	0	0	0	1	0	1	1	0	3	low
Wu et al. (2022)	0	0	0	1	2	1	1	1	6	medium
Yang et al. (2021)	1	0	0	1	2	1	1	0	6	medium
Zaman et al. (2022)	0	1	0	1	2	1	1	0	6	medium

stress (Yang et al., 2021). Four studies found a positive association between greater problematic gaming and COVID-19-related anxiety (Savolainen et al., 2022; Ting & Essau, 2021), COVID-19-related stress factors (Sallie et al., 2021), and COVID-19-related boredom (Yang et al., 2021).

Moreover, two studies (Claesdotter-Knutsson et al., 2022; Teng et al., 2021) specifically evaluated the relationship between problematic gaming and changes in lifestyle habits. Claesdotter-Knutsson et al. (2022)

showed that increased gaming was related to drinking less alcohol and exercising less. Teng et al. (2021) showed that perceived COVID-19 impacts (i.e., study activities, sleep quality, lifestyle habits [e.g., eating habits, physical exercise, and entertainment], social activities, and family relationships) were predictors of IGD.

Other psychological variables and problematic gaming

Other studies examined the relationship between problematic gaming and other psychological variables, such as insomnia and sleep quality, quality of life, loneliness, satisfaction with life, subjective vitality, and self-control.

Three studies (Fazeli et al., 2020; Fernandes et al., 2020; Zaman et al., 2022) found a positive relationship between internet gaming disorder or gaming addiction and poor sleep quality or insomnia.

Four studies (Cudo et al., 2022; Fernandes et al., 2020; Rogier et al., 2021; Yang et al., 2021) found that higher scores on problematic gaming were associated with higher scores on loneliness. More specifically, the longitudinal study by Rogier et al. (2021) showed that loneliness levels at T1 (i.e., at the beginning of the national lockdown) significantly and positively predicted IGD at T2 (i.e., three days before the end of the national lockdown).

Fazeli et al. (2020) found a negative relationship between IGD and quality of life.

Moreover, Formosa et al. (2022) showed that during the COVID-19 pandemic, people's passion for playing videogame was related to greater vitality, even among players who may be engaged more obsessively and rigorously in games.

Finally, Cudo et al. (2022) found a negative relationship between self-control and GD.

4. Discussion

The present systematic review examines the relationship between problematic gaming and mental health outcomes during the COVID-19 pandemic in different age groups, i.e. adolescents, young adults and adults, with a focus on studies which reported validated measures of both problematic gaming and mental health outcomes. A final number of twenty-five papers that reported quantitative and validated measures of the examined variables were included in this review.

Our results showed that the prevalence rate of problematic gaming during the pandemic varies across studies (K=13; 17,896 participants), ranging from 1% (Savolainen et al., 2022) to 16% (Kim, Nam, & Keum, 2022). Our findings are in line with those reported in a previous review (Howes et al., 2017) which reported a range, for gaming disorder, varying from 4.1% to 19.1% during the early stages of the pandemic. Also, in this study, the mean prevalence of IGD among adolescents appears to be higher than the one among young adults or adults. As reported in other studies, younger people appeared at greater risk of unhealthy behaviour and experiencing negative mood swings during this time, due to a maladaptive use of emotion regulation strategies, such as cognitive reappraisal (Cardi et al., 2021).

However, further studies are needed to meta-analytically examine the prevalence of problematic gaming during the COVID-19 outbreak, taking into account some factors which may help to clarify the broad variability in problematic gaming reported in the selected studies, such as: conceptual heterogeneity and non-representative samples (Kircaburun et al., 2020), screening tools (i.e., some measures may overestimate prevalence rates of IGD; Király et al., 2022; Kircaburun et al., 2020; Stevens et al., 2021), participants' age (i.e., adolescent samples tended to report estimates of a prevalently higher gaming disorder; Stevens et al., 2021), gender (i.e., gaming disorder prevalence rates were found to be 2.5 times higher for males than females; Stevens et al., 2021), and country (e.g., a meta-analysis of prevalence estimates of gaming disorder in Southeast Asia reported an estimate of 10.1%; CI = [7.3, 13.8]; Chia et al., 2020). Only studies that assessed problematic gaming using validated measures were included in this review; the strength of this criterion was related to ensuring reliability and validity through robust and replicable data, especially for these newly-emerging areas of research.

With the exception of two studies (Ismail et al., 2021; Savolainen et al., 2022), the prevalence data seem to be higher than those reported in recent meta-analyses (Kim, Son et al., 2022; Stevens et al., 2021), which included studies conducted before the COVID-19 pandemic, showing a rate of 3.05% (CI: [2.38, 3.91]) and 3.3% (CI: [2.6–4.0]), respectively. Unfortunately, only six studies in the present systematic review compared participants' time spent on gaming before and during the pandemic, showing a small increase. This finding is in line with previous studies which reported an increase in time spent playing during key points of the COVID-19 pandemic (Vuorre et al., 2021), and for specific types of games (e.g., multiplayer games, which allow one to play together with friends; Vuorre et al., 2021). A recent review examining whether problematic gaming increased during COVID-19 confinement (Oceja et al., 2023) reported inconclusive results about the negative impact of confinement on video game addiction, as only a few studies used validated instruments to compare pre-pandemic and during-confinement levels of problematic gaming. On the other hand, the literature related to COVID-19 has demonstrated, as restrictive measures, (due to the containment of the pandemic) strengthened negative psychological effects in the general and clinical population, along with heightened symptoms of anxiety, depression, post-traumatic stress disorder, and stress, together with a general tendency to experience risky health behaviour, such as disrupted sleeping, dysfunctional eating and an increase in substance abuse (Kaiser Family Foundation, 2020). The literature also showed a negative impact of COVID-19 on wellbeing for a more vulnerable subgroup of the general population, comprising women, young people, those with a lower income, and subjects with problematic health conditions (Frank et al., 2020; Shevlin et al., 2020; Xiong et al., 2020). Regarding problematic gaming, these findings call for future studies addressing changes in problematic gaming with longitudinal cohort studies, which rely on large representative samples. Moreover, it is difficult to come to firm conclusions because the majority of studies were conducted in the early phases of the pandemic when people faced high levels of COVID-19 related stress and social restrictions (Di Blasi, Gullo et al., 2021; Lo Coco et al., 2021). Given that second waves of the pandemic were undergone in many countries during 2021, with variously implemented restrictions for social life, it will be important to continue to monitor problematic gaming through the different phases of the pandemic.

The results of the current study highlight the link between problematic gaming and depression or anxiety

symptoms during the pandemic. These findings can be interpreted as referring to the I-PACE model (Brand et al., 2019), which suggests that playing video games may be a dysfunctional way to cope with negative emotions. In a previous review, Pallavicini et al. (2022) found that during the early stay-at-home period following the COVID-19 outbreak, video games had been helpful in mitigating stress, anxiety and depression. Relatedly, the results of a cross-sectional between-group study (Giardina et al., 2021) comparing two independent groups of online gamers, before and during the COVID-19-related lockdown, suggested that gaming for social compensation mitigated emotional distress (i.e., depression and anxiety) during self-isolation. Thus, in accordance with the Self-Determination Theory (Deci & Ryan, 1985; Ryan & Deci, 2000), some scholars suggested that during the COVID-19 pandemic, people often engaged in gaming in order to fulfil basic psychological needs (e.g., autonomy, relatedness; Ballou et al., 2022). Although gaming activities may have been useful to mitigate emotional distress during the pandemic, the current findings suggest that problematic gaming or IGD were intertwined with depressive and anxiety symptoms. Nonetheless, the finding that younger people reported higher levels of psychological distress is confirmed by the results from other studies investigating the impact of COVID-19 on wellbeing throughout one's lifetime (Rodriguez et al., 2019; Vahia et al., 2020).

However, it is difficult to come to firm conclusions given that the majority of studies adopted a cross-sectional design and we are unaware whether pre-existing mental health symptoms improved the likelihood of reporting problematic gaming during the pandemic or vice versa. The few longitudinal studies which examined the link between problematic gaming and mental health outcomes before and during the pandemic reported mixed results. This mixed evidence might be explained by exploring further the possible moderators with a large number of studies (e.g., early vs. subsequent stages of the pandemic, social vs. solitary games, harmonious vs. obsessive engagement; Koban et al., 2022). It has been suggested (Ballou et al., 2022) that future research needs to explore whether the compensatory use of gaming may negatively or positively affect well-being, depending on situational and personal moderators and that the relationship between compensatory gaming and mental health may be different if gaming is associated with more adaptive (harmonious) or maladaptive (obsessive) reasons for gaming. The review by Pallavicini et al. (2022) suggested that some types of players (i.e., problematic gamers or individuals with avoidant coping styles) may be more at risk of distress when facing a difficult time such as the threat of pandemic. Our results suggest that problematic gaming during the pandemic was linked to anxiety and depression symptoms, whereas its relations with other facets of psychological distress is mixed. For example, our results based on the relationship between stress and problematic gaming were inconclusive, considering that this link was only evaluated, with mixed findings, by four out of the 25 studies. Two studies (Fazeli et al., 2020; Wu et al., 2022) found a positive relationship between these variables, one study (Volpe et al., 2022) found a negative correlation, and one study (Chang et al., 2022) found a non-significant relationship. Our results about the relationship between problematic gaming and all-round psychological distress as well as COVID-19-related psychological impacts are still inconclusive. This mixed evidence could be due either to the use of different assessment tools (e.g., IGDS9-SF for problematic gaming and DASS-21 for stress) or to the period of the pandemic (from May to July/August/September 2020). Additionally, a limitation in the studies included is that the COVID-19 containment measures were not fully described and thus, participants may have been under different types of social restrictions around the world.

Finally, a few studies supported a negative impact of problematic gaming on poor sleep quality (n = 3; Fazeli et al., 2020; Fernandes et al., 2020; Zaman et al., 2022), loneliness (n = 4; Cudo et al., 2022; Fernandes et al., 2020; Rogier et al., 2021; Yang et al., 2021), quality of life (n = 1; Fazeli et al., 2020), and self-control (n = 1; Cudo et al., 2022), suggesting that individuals with IGD had problems in several areas of personal distress during the pandemic; this set of results seems to be confirmed by the evidence from of the existing literature reported above.

Limitations of the study and clinical implications

The present study has some limitations. Firstly, most of the studies included in the present systematic review were cross-sectional, lacking the ability to determine causal relationships between the variables. More longitudinal studies are needed to understand how the COVID-19 pandemic and related restrictions have impacted problematic gaming. Secondly, the studies that specifically evaluated the COVID-19-related psychological impacts presented elevated heterogeneity in the measures and often used non-validated tools. Thirdly, all of the studies included in this systematic review used online surveys to collect data, which may have caused selection bias in sampling by overrating the estimations of problematic gaming users and excluding gamers who could not use the internet. Validated measurement of variables and broader and more representative samples are needed for producing valid and reproducible results.

This paper examines a relatively consistent body of knowledge from different countries, thus contributing to a more comprehensive and broader understanding of how problematic gaming appeared to be linked to potential negative mental health outcomes during the COVID-19 pandemic in different economic, social and cultural contexts. That is to say that the summary of findings can inform and inspire future research and policy strategies to mitigate the development of problematic gaming as a maladaptive coping response to stressful situations such as pandemics. Thus, appropriate preventive programs to reduce the development and maintenance of problematic gaming during the COVID-19 pandemic and similar crises are highly recommended. Furthermore, the provision of online assessment and treatment of problematic gaming during the pandemic, in addition to more traditional face-to-face treatments, could allow services to reach more vulnerable users and respond more effectively to subsequent pandemics in the future.

Conclusions

The potential benefits or negative effects of gaming on individuals' mental health outcomes during crises and adverse life circumstances (such as the COVID-19 pandemic) may not be universal. This review demonstrated a significant association between problematic gaming and negative mental health outcomes during the pandemic. Specifically,

among the included studies examining the link between problematic gaming and mental health outcomes during the pandemic, a positive relationship was found between negative mental health outcomes and problematic gaming, which seemed greater with regard to depressive and anxiety symptoms. These sets of results seem to be in line with the assumptions that the adoption of unhelpful behaviour to cope with psychological distress (as a maladaptive strategy) contributes, over time, to increasing risky behaviour and psychological distress (Folkman & Lazarus, 1980; Pearlin et al., 2005).

Further monitoring of changes in the prevalence of problematic gaming and its association with mental health outcomes will be of importance, given the enduring negative consequences of the pandemic on mental states. Future studies on this topic are needed to evaluate the moderating role of variables such as types of video games, types of gamers, motives for playing, and socio-cultural context. Also, a focus on the sense of loneliness experienced during home confinement among adolescents and young adults could be further investigated considering that social isolation can be read as a trigger for an increase in unhealthy/problematic behaviour.

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