

Problematic video gaming and psychological distress among children and adolescents during the COVID-19 pandemic

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ABSTRACT

Increased internet usage, particularly in video gaming, has been observed in recent years. This scoping review aims to provide an overview of literature on psychological distress in children during the COVID-19 pandemic. The literature search followed the preferred reporting items for systematic reviews and meta-analyses guidelines. Data extraction and thematic analysis were performed to explore problematic video gaming (PVG) and its association with psychological distress. Findings revealed an increase in time spent on gaming during the pandemic, with higher severity of PVG observed in adolescents. Boys were more likely to exhibit gaming addiction symptoms than girls. A bidirectional relationship between PVG and psychological distress was found. Increased screen usage was amplified during the pandemic and persisted as a lingering concern. Educators and parents play a pivotal role in monitoring children's screen time by structuring online lessons to prevent psychological distress. Lessons drawn from the pandemic are not just retrospective but instrumental for future societal challenges.

Keywords: gaming, screen time, psychological distress, COVID-19 pandemic, children

INTRODUCTION

With the outbreak of the COVID-19 pandemic in early 2020, lockdowns and closure of non-essential services were encouraged by governments worldwide. Mental health issues such as anxiety, depression, insomnia, post-traumatic symptoms, and suicide were reported among adults during quarantine [1, 2]. The pandemic also negatively impacted children and adolescents' mental health, which the quarantine further aggravated [3, 4]. They are at a critical developmental stage where the potential long-term impact of confinement on their mental and physical health remains unknown [5].

One major concern is the increased Internet usage among children with the shift to online teaching [6]. Without the routine of going to school, children are more likely to spend time on social media use and gaming [6, 7]. Gaming, in particular, has seen a sharp rise in popularity in the past decade in children, even before the pandemic. The worldwide-pooled prevalence of gaming disorder was approximately 5% in 2017 among adolescents [8]. Following the lockdown measures, the European mobile game download broke a record

high in March 2020 [9]. Concerns were raised about the risks associated with problematic gaming, especially within a pandemic context where most "safe" activities involved using an electronic device. Children likely spent more time on video games as a coping strategy to relieve the stress elicited by the COVID-19 pandemic, further increasing their risk for problematic video gaming (PVG). A defining feature of PVG is a prolonged time spend in online gaming that interfere with social, occupational, and academic functioning. Before the pandemic, excessive gaming was already associated with social isolation, mood swings and sleep disturbance among children [10]. Confinement may have potentiated this effect. Yet, a systematic review concluded that there are very few studies on the psychological effects of confinement on children [11]. Thus, a better understanding of adverse outcomes related to PVG could provide practical implications.

Psychological distress experienced within a stressful environmental context may facilitate addictive behavior [12]. The COVID-19 pandemic created a societal context that heightens psychological distress. For individuals with PVG, the pandemic may have potentially exacerbated both addictive gaming behaviors and psychological distress [13]. However,

research on the effect of the COVID-19 pandemic on PVG and psychological distress concerns mostly the adult population [14]. Many studies have explored the issues related to PVG or to psychological distress in children, but few have examined the association between the two phenomena, specifically in the context of the COVID-19 pandemic [11, 15]. The present scoping review aims to describe existing evidence on PVG and psychological distress among school-aged youths (primary and secondary school) during the COVID-19 pandemic.

MATERIALS AND METHODS

To assess the broad scope of available literature, a scoping review was conducted to synthesize existing information on PVG and psychological distress. A scoping review is a tool to assess the scope of the overview of a body of literature as well as current knowledge gaps. Accordingly, it allows examining emerging evidence in a timely manner [16]. The preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines were followed. This rigorous approach will be operationalized in six steps, which are the identification of the research question and relevant article, the selection of relevant articles, the mapping of results, the synthesis, and the presentation of data [17].

Measures

Problematic video gaming

The definition of PVG is conceptually different across studies, and no consensus has been established regarding its diagnostic criteria. In the present study, PVG refers to prolonged time and frequency spent on gaming online and offline that exceeds the average of the study population. A defining feature is an impairment in social, occupational, and academic functioning [18]. Users become preoccupied with gaming to ease their mood. To assess the prevalence and severity of PVG, included studies used validated questionnaires. The inclusion criteria were school-aged youth who presented PVG. Studies on gambling involving monetization, betting, and chance-determined outcomes were excluded. The current study focuses solely on gaming, a skill-oriented activity performed for leisure and entertainment. Other gambling-related activities involving monetary transactions and betting remain legally restricted in some countries, therefore, are not eligible.

Psychological distress

Psychological distress refers to emotional disturbances characterized by depressive symptoms and anxiety. A defining feature of psychological distress is exposure to a stressful event [19]. In the context of the COVID-19 pandemic, social isolation took a toll on individuals' psychological well-being. Studies presenting clinical populations were excluded. Included studies used validated questionnaires to measure the prevalence and the severity of psychological stress experienced during this time.

Literature Search

A literature search was conducted in June 2021 in the following database: Cumulative Index to Nursing and Allied

Health Literature, Excerpta Medica dataBASE, MEDLINE, PubMed, and PsychInfo. MeSH terms were used for the search (**Appendix A**). The search identified 258 records. Other sources include Campbell Collaboration Systematic Reviews and the Cochrane Database of Systematic Reviews. No record was identified through other sources. Grey literature and dissertations were excluded due to the lack of transparency and scientific rigor. The initial literature search covered between December 2019, corresponding to the first COVID-19 case detected in China, and July 2021. The search was updated in June 2022 and in April 2023. Search strategy details are found in **Appendix A**.

Eligibility criteria

Eligible articles had to have conducted primary studies during the COVID-19 pandemic among school-aged children or adolescents who presented PVG. Adults aged 18 and older and children under four were excluded because toddlers under four years of age are less likely to be attending school, and they have limited cognitive abilities to engage in prolonged gaming [20]. Clinical population presenting psychiatric conditions was also excluded, as the focus is the general population. Only qualitative, quantitative, and mixed studies were retained. Detailed criteria are found in **Appendix B**.

Study screening and selection

Figure 1 shows the flowchart illustrating the entire process of study selection. Of the 258 original records identified from the search strategy, 172 records were excluded after the screening of the title. A total of 86 abstracts were screened, and 58 were excluded due to lack of relevant results. From the remaining 28 full-text articles screened, 22 articles were excluded for non-eligibility reasons. In June 2022, another search was performed to update the literature, and two new articles were included. A total of eight studies were retained for this review. No critical appraisal of sources quality was performed as it is not a required criterion for a scoping review.

Synthesis of Results

Following the PRISMA guidelines, a data extraction grid was validated using Microsoft Excel for data extraction. Data were sorted into categories, including the study population (age and inclusion criteria), methodology (screening method, location, and focus), results, and general conclusion (main findings and recommendations) were systematically charted by two reviewers and validated by all four authors. Discrepancies were resolved through discussion.

A thematic analysis approach was applied to analyze the corpus and extract data relevant to the study's objective. Specifically, information pertaining to the screening method, prevalence, severity of PVG, and its related risk factors were extracted in the first place. Then, the relationship between PVG and psychological distress was further explored and reported.

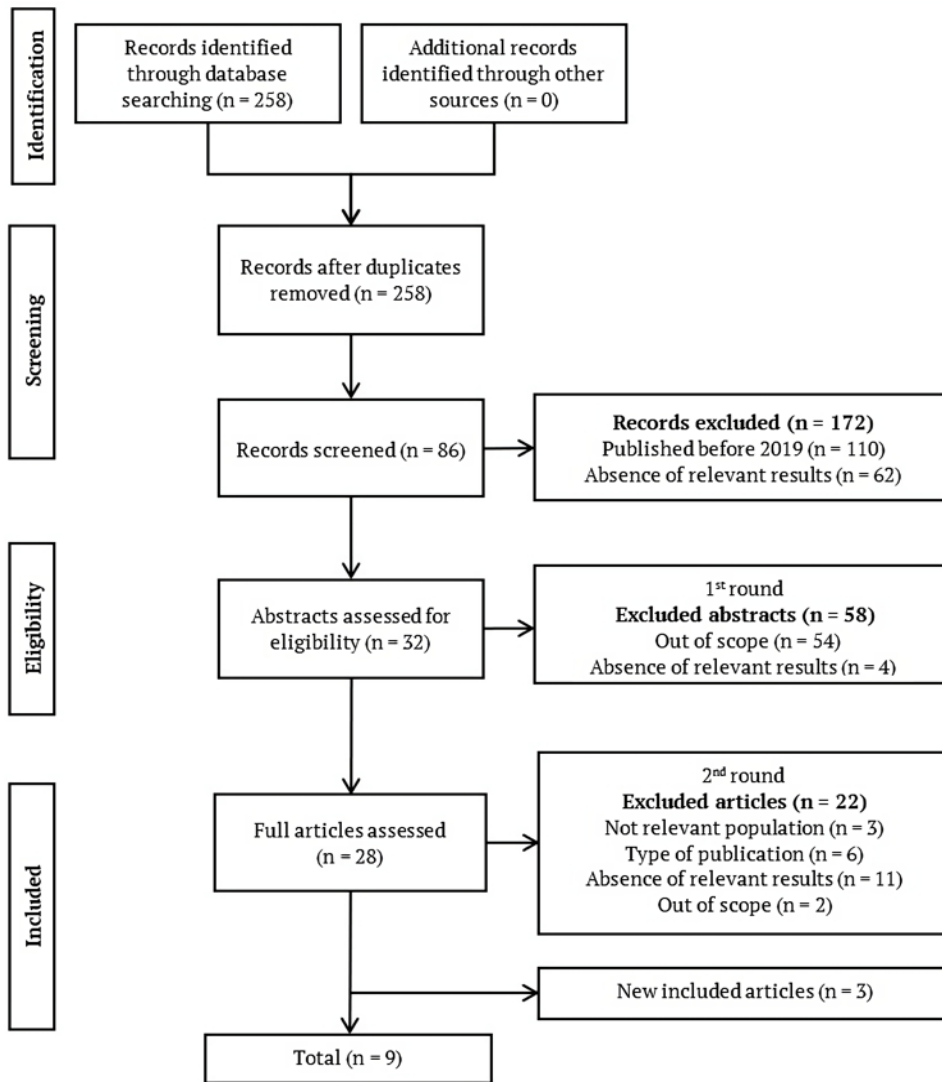


Figure 1. Flowchart of studies (Source: Authors' own elaboration)

RESULTS

Descriptive

A total of nine studies published between October 2021 and January 2022 were selected for review (Figure 1). Four (44%) had a longitudinal design, and five had a cross-sectional design. The included studies were conducted across five countries, the majority in China (n = 5). Study characteristics are summarized in Table 1.

Subjects were children aged between 6 to 18 years old. Two studies did not report age intervals [21, 22].

PVG

Five studies measured problematic gaming with the Internet gaming disorder scale short form (IGD-SF), a nine items form assessing criteria of the Internet gaming disorder defined in the DSM-5. A higher score indicates a higher level of problematic gaming [29, 30]. Two studies used parental reports of time spent on games [22, 31], and the other two

Table 1. Study characteristics of cross-sectional studies

Study	Country	Population characteristics	Methodology	Measure of gaming	Measure of psychological distress	Summary of results
[6]	China	N=575 aged 8 to 12 years old (M = 10.83, standard deviation [SD] = 0.75)	Longitudinal data collected from children in primary schools in 3 waves (November 2019 January 2020 and March 2020)	Smartphone application-based addiction scale & internet gaming disorder scale-short form	Depression, anxiety, stress scale-21 (DASS-21)	Problematic gaming explained prospective psychological distress among schoolchildren before the COVID-19 outbreak ($\chi^2 = 6940.92$, CFI = 0.938, TLI = 0.934, RMSEA = 0.079). Problematic smartphones use worsened prospective psychological distress among schoolchildren during the COVID-19 outbreak (standardized coefficient = 0.31, $p < 0.01$).

Table 1 (Continued). Study characteristics of cross-sectional studies

Study	Country	Population characteristics	Methodology	Measure of gaming	Measure of psychological distress	Summary of results
[21]	China	<i>N</i> = 1,778 50.8% adolescent	Primary and secondary school student were assessed at T1 (October to November 2019) and T2 (April to May 2020).	IGDS9-SF	Center for Epidemiologic Studies depression scale, Chinese version state-trait anxiety inventory was used to assess anxiety (STAI), Chinese version	Adolescents showed a higher severity of IGD ($t = -2.11, p = .035$) compared to pre-COVID, but not found among children ($p = .287$). Depressive symptoms were a significant predictor of videogame use ($\beta = 0.09, p < 0.001$) and IGD ($\beta = 0.14, p < .001$) from T1 to T2. Anxiety symptoms at T1 predicted IGD at T2 ($\beta = 0.15, 95\% \text{ CI } [0.09, 0.21]$) and videogame use at T2 ($\beta = 0.09, 95\% \text{ CI } [0.04, 0.14]$).
[22]	Japan	<i>N</i> = 959 (50.5% boys) grade 1 to grade 6	Students from elementary schools in Japan participated in the study in July 2020. Data were anonymously reported by parents or guardians.	Parental report of the number of hours spent on playing video games during school closure and after school reopened	Parental report of behavioral problems during school closure and after school reopened	50.3% of children showed problematic behaviors during school closure and decreased to 38.0% after schools reopened. No gender difference was found ($p = 1.00$). Children with behavioral problems watched TV and/or videos and played video games longer than children without such problems (OR 1.2, 95% CI [1.14-1.28], $p < .001$). Both the time spent watching TV/video (OR 1.1, 95% CI [1.07-1.22], $p < .001$) and playing video games (OR 1.3, 95% CI [1.20-1.40], $p < .001$) were risk factors for behavioral problems during school closure.
[23]	China	<i>N</i> = 2,863 aged 8-17 years. (<i>M</i> = 12.6, <i>SD</i> = 1.32)	Adolescent students from four primary schools and 13 secondary schools in Hong Kong completed the survey in June 2020.	Game addiction scale (GAS)	Patient health questionnaire-9 & generalized anxiety disorder-7 scale	Prevalence of excessive and pathological game addiction behaviors was 20.9% and 5.3%, with male participants more likely to report gaming addiction symptoms ($\chi^2 = 105.1, p < .001$). Children from single-parent families (OR 1.85, 95% CI [1.61-2.13], $p < .001$) are at higher risk for gaming addiction behaviors. After adjusting for age and gender, the adjusted ORs of loneliness increased to 1.23 (95% CI [1.19-1.26]) and 1.45 (95% CI [1.38-1.53]), respectively, for excessive and pathological gaming behaviors
[24]	Iran	<i>N</i> = 1,512 aged 13-18 years (<i>M</i> = 25.51, <i>SD</i> = 2.75)	High school adolescents recruited from May to August 2020 to complete an online self-report.	Internet gaming disorder scale-short form (IGDS9-SF)	Depression, anxiety, and stress scale-21 (DASS-21) & insomnia severity index (ISI)	Depression ($B = 0.22, p < .001$), anxiety ($B = 0.22, p < .001$) and stress ($B = 0.21, p < .001$) were mediators in the association between IGD and adolescent-reported quality of life. IGD directly influenced insomnia and quality of life among the participants ($B = -0.789, p < 0.001$).
[25]	Italy	<i>N</i> = 162 aged 8-10 years (<i>M</i> = 9.4, <i>SD</i> = 0.7)	Children attending school in presence prior to the recruitment (September to November 2020) completed questionnaires.	Videogame addiction scale for children (VASC)	Test of anxiety and depression (TAD) & children's anxiety meters-state (CAM-S)	Males used videogames more than females ($t = 4.06, p < .001$), declared higher self-control ($t = 3.63, p < 0.001$) and had a higher level of reinforcement mechanisms ($t = 4.36, p < 0.001$), but also of trait anxiety (TAD score; $t = -5.18, p < 0.001$).
[26]	China	<i>N</i> = 2,026 Age: <i>M</i> = 10.71, <i>SD</i> = 1.07	Participants completed cross-sectional online survey.	IGDS9-SF	DASS-21	Scores in IGD, depression, anxiety, and stress were positively and significantly correlated from moderate to high magnitude ($r = 0.36-0.80, p < 0.001$). IGD mediated the association between anxiety and increased time spent on Internet-related activities during the COVID-19 outbreak period (OR 1.8, 95% CI [1.14-1.23], $p < .001$).

Note. CI: Confidence interval; CFI: Comparative fit index; TLI: Tucker-Lewis index; & RMSEA: Root mean square error of approximation

Table 1 (Continued). Study characteristics of cross-sectional studies

Study	Country	Population characteristics	Methodology	Measure of gaming	Measure of psychological distress	Summary of results
[27]	Sweden	<i>N</i> = 1,232 (82.5% female) 13-18 years. (<i>M</i> = 16.35, <i>SD</i> = 0.50)	Adolescent attending high school recruited to complete an online survey from June to August 2020.	Self-reported number of hours spent playing video games	Self-reported psychological well-being due to game playing	Increase in gaming and social media use was reported, which was associated with negative consequences and perceived well-being. A majority of female (62%) adolescents reported that they used social media more than they felt comfortable with. Girls were more negatively affected across measures.
[28]	China	<i>N</i> = 535 Age: <i>M</i> = 10.32, <i>SD</i> = 0.84	Self-report measures collected from primary school students before (November 2019) and after (March 2020) the outbreak of COVID-19.	Internet gaming disorder scale-short form (IGDS9-SF)	DASS-21	Schoolchildren spent significantly more time on the smartphone (increased 1.02 h daily, <i>p</i> < 0.001) and social media (increased 0.73 h daily; <i>p</i> < 0.001) but not gaming (increased 0.14 h daily, <i>p</i> = 0.07) during the school suspension. The association between problematic use of social media and psychological distress was stronger during the school suspension than at the baseline (β = 0.451, <i>p</i> < 0.001).

Note. CI: Confidence interval; CFI: Comparative fit index; TLI: Tucker-Lewis index; & RMSEA: Root mean square error of approximation

studies used the game addiction scale (GAS) [23] or videogame addiction scale for children (VASC) [25]. The GAS was conceptually based on the seven diagnostic criteria for pathological gambling reported in the DSM-IV, and it is now used to screen addictive game use with seven items [32]. The VASC is comprised of a 21-item questionnaire designed for children under 12 years old [33, 34].

Cross-sectional [22] and longitudinal studies [21] reported increased time spent on video games during the COVID-19 pandemic. In terms of prevalence, 20.9% and 5.3% of game players exhibited excessive and pathological game addiction [23]. The severity of the Internet game disorder (IGD), measured by the IGDS9-SF, has increased significantly during the pandemic in adolescents only [21].

Psychological Distress

The most common assessment of psychological distress was the depression, anxiety, and stress scale-21 (DASS-21) (*n* = 4). A higher score indicates greater depression and anxiety symptoms. Scores on the generalized anxiety disorder scale-7 (*n* = 2), test of anxiety and depression (*n* = 1), Center for Epidemiologic Studies depression scale (*n*=1), and insomnia severity index (*n* = 1) were also reported. One study used parental reports of children's behavioral problems during and after school closure [22].

Longitudinal studies reported significantly higher psychological distress measured by the DASS-21 at the outbreak of the pandemic (March 2020) than in the periods preceding the outbreak in mainland China (October to November 2019 and January 2020) [6]. In another longitudinal study, Teng and colleagues suggest that depressive and anxiety symptoms measured before and during the pandemic are positively correlated. However, only anxiety symptoms among adolescents were found to be statistically different between the two times measures [21].

Individual and Contextual Risk Factors

Mixed results were found with regard to gender differences. Two studies noted that boys are more likely to report gaming addiction symptoms and spend more time on gaming than girls [24, 25], whereas another study found no gender difference [22]. Males had a higher level of reinforcement mechanism and scored higher on the test of anxiety and depression than females [25]. Loneliness was associated with gaming addiction behaviors [23].

Other risk factors of PVG were low socioeconomic status (SES), single-parent households, less parental support, and less supervision [23]. High SES was indicated by more e-learning devices and satisfactory Internet access. The magnitude of these associations was higher among younger children. Higher perceived parental supervision was found to be a significant protective factor of PVG among males only.

Association Between PVG and Psychological Distress

The mean depression score on the patient health questionnaire-9 was statistically different across groups of no gaming (mean [*M*] = 5.52), leisure (*M* = 4.75), excessive (*M* = 6.73), and pathological gaming (*M* = 8.63), with pathological gamers presenting more depressive symptoms during the pandemic. The generalized anxiety disorder scale and loneliness score showed similar results. Pathological gamers scored higher on depression, anxiety, and loneliness [23].

All longitudinal studies reported an association between PVG and psychological distress during the COVID-19 pandemic. There was a bidirectional relationship between the two measures. Pre-pandemic depressive and anxiety symptoms positively predicted IGD and video game use during the pandemic [21]. Inversely, cross-sectional studies found that increased time spent on gaming during the first wave of the pandemic negatively impacted well-being [22, 27]. In terms of gender difference, adolescent boys were less affected by the negative consequences of gaming and social media use [27].

DISCUSSION

School closure due to the COVID-19 pandemic has limited children's outdoor activities. They might be more engaged in video gaming as a coping strategy. The aim of the study was to provide a review of the literature on PVG and psychological distress among school-aged children.

The first finding is the amount of time spent playing games has increased among children and adolescents during the COVID-19 pandemic. Mandatory lockdown limited their usual social activities, such as going to the park or playing an outdoor sport. Gaming could be used as a coping mechanism to deal with pandemic-related stress and to maintain a connection with their peers [23]. Only adolescents in middle school exhibited higher severity of PVG, possibly because younger children received more parental supervision, whereas adolescents had a higher level of independence in their routine [23]. In accordance with the literature on gaming, the prevalence of PVG was higher during adolescence [35]. It is plausible that games designed for older adolescents are generally more complex, immersive, and engaging, which increases the potential for gaming-related problems. Combined with increased autonomy, less parental supervision and support for this age group, these factors may have led adolescents to spend more time gaming as a coping mechanism, thereby escalating the risk of developing PVG.

In terms of individual risk factors, gender differences in PVG were also reported. Boys spent more time on games and exhibited more addiction symptoms than girls [25]. It could be argued that the competitive aspects of online games tend to appeal more to men than women. Competitiveness is a masculine trait in many cultures, while it is not a typical social expectation for females [36]. For this reason, game designers tend to target males as the primary users of competitive and adventurous video games. Yet, we should not overlook the possibility that male children play games to socialize with friends, whereas female children spend more time online on other platforms than gaming [37]. Parents could implement tools for moderation, such as setting gaming limits and introduce off screen activities for boys who display problematic gaming behavior. We speculate that girls use social media to mitigate the stress associated with the pandemic and to socialize. Additionally, our findings confirmed the positive association between loneliness and PVG that was suggested by other comparable studies [38, 39]. There seems to be a reciprocal relationship between loneliness and gaming. Although engaging in online gaming may provide temporary relief from social isolation due to quarantine, excessive gaming replaced face-to-face social interactions, thus leading to increased loneliness [39].

Contextually, family structure and SES status play an important role in gaming behavior. Children from single-parent families, lower SES, and unemployed fathers had higher risks of developing PVG [23]. These children might have less access to other leisure activities and have less parental monitoring. Children from higher SES might engage in other activities that do not necessitate a screen, such as participation in sports or arts. Children from single-parent families with less parental involvement in their daily routine

may be more vulnerable to excessive gaming. Another possible explanation is that single-parent families have fewer resources to support children's other leisure activities [40]. A systematic review conducted by Schneider, King and Delfabbro reported that a poorer parent-child relationship is associated with increased problem gaming. Longitudinal evidence further indicate that paternal bond was a protective factor against PVG. Prevention and intervention approaches should therefore recognize and consider the dysfunctional family dynamics [40]. Due to the small number of included studies, no other individual or contextual risk factors were identified.

Another finding was the bidirectional relationship between PVG and psychological well-being. We speculate that those with pre-existing depressive symptoms are more likely to develop PVG within a stressful environment to cope with the stress, lending support to the interaction-person-affection-cognition-execution (I-PACE) model of addictive behavior. This model posits that psychological distress experienced within a stressful environmental context may facilitate addictive behavior [12]. The COVID-19 pandemic created a societal context that heightens psychological distress. For individuals with PVG, the pandemic may have potentially exacerbated addictive gaming. Consequently, excessive gaming reduces time spent in other significant areas of life and bonding with family. In the context of the pandemic, PVG could, to some extent, further limit healthy behavior of this age group, such as enough sleeping, meeting friends and physical exercise. Gaming is not inherently harmful, but some people develop PVG as maladaptive coping behavior to the distress experienced during the pandemic. They enter a vicious cycle as social withdrawal due to gaming further exacerbates psychological distress. Consistent with the findings in [27], gaming during the lockdown negatively affected healthy behavior that promotes psychological well-being [27].

Further, an intercorrelation between PVG, insomnia, depression, and quality of life was found among adolescents. It is possible that gaming served initially as a coping strategy for boredom, and such behavior is maintained through reinforcement mechanisms. But over time, they might increasingly rely on it and withdraw from the real world, which can cause significant psychological distress when attempting to disengage from gaming later on [24]. Gentile and colleagues concluded that the relationship between variables is reciprocal, as mental health disorders tend to show comorbidity [41].

CONCLUSION

The scientific literature has extensively discussed both the positive and negative effects of video games on youth development. Within the challenging context of the COVID-19 pandemic, gaming provided respite from the stress and allowed online social interaction. However, excessive gaming within this stressful period could lead to a maladaptive coping strategy and potentially affect school-aged children's psychological well-being. The current scoping review confirmed the increase in time spent on gaming during COVID-19 and its associated negative outcomes. While playing games allows children to stay connected with their

peers, finding the balance between leisure time and uncontrolled excessive gaming is paramount. Although COVID-19 may be in the rear-view, the implications of the behavioral adaptations during the pandemic are still prevalent.

Lastly, it is worth mentioning that historical patterns tend to repeat. About a century ago, the outbreak of the Spanish Flu pandemic also had adverse effect on children and adolescent's mental health. Although gaming became increasingly popular in recent years, both pandemics were characterized by reduced social contact, restrictive measure and disruption of daily routine that led to the adoption of unhealthy behaviors [42]. Long-term effects of the Spanish flu on children are well-documented, including lower academic achievement and high morbidity in later life [43]. Pandemics, beyond their immediate health threats, have significant and lasting impacts on the mental health and development of the youth. As Hedderson and colleagues reported, the increase in screen time remain elevated more than one year following the end of pandemic-related restrictions [44]. Parents and educators should propose a variety of structured activities for children outside school. By learning from these historical repetitions, we can forge a path that is not only reactive but also proactive, mitigating the impacts of future pandemics on the psychological well-being of the youth and the broader population.

Strengths and Limitations

Our study fills an important gap in knowledge through its focus on the association between PVG and psychological distress among children. Another key strength is the distinction between gaming and other type of screen-related activities. Gaming and screen time are often difficult to separate as they both involve the use of similar devices. However, included studies specifically assessed time spent on gaming by consulting different sources, including parental reports, self-report, and screening questionnaires.

The present review also has several shortcomings. First, terms used to describe PVG were heterogeneous across studies, including problematic gaming, pathological gaming, and Internet gaming disorder. The lack of consensus regarding the conceptualization of PVG and its inclusion as a mental health disorder could account for the disparities in the results. Second, the COVID-19 pandemic has affected all significant areas of life. It is possible that psychological distress experienced is unrelated to gaming, but other stressors are not measured in these studies. Further, the present study cannot establish a causal relationship between PVG and psychological distress. Third, because of the large variability in study characteristics, the reliability of the pooled estimate might be compromised. Along the same line, generalizability could be limited because the majority of included studies were carried out in China. Lastly, no appraisal of sources quality was performed. The results should be interpreted with caution.

Implications and Futures Directions

Notwithstanding these limitations, our findings present preventative implications. Our study suggests that PVG is not uncommon in children, particularly among boys, and it increases within a stressful environment. The long-term effect of increased screen time on mental health needs to be

determined in future research. The world transitions into a post-COVID era, but remote learning became the norm nowadays in many countries [12]. While technology is a crucial tool for learning, it's also essential to encourage students to spend time away from screens, engaging in physical activity and face-to-face social interactions. Alternative non digital leisure activities such as reading, board games, and regular exercise must be prioritized. Less screen time and frequent physical activity has been shown to lower the risks of mental health symptoms among adolescent [12]. The World Health Organization recommends creating a balance between online and offline activities by setting clear rules about screen time. Parents should guide children to avoid excessive time spent online and encourage regular breaks from screens to engage in physical activity [13-15]. Also, adaptive coping strategies that help navigate the challenges encountered during a difficult time should be promoted [16].

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Declaration of interest: No conflict of interest is declared by the authors.

Data sharing statement: Data supporting the findings and conclusions are available upon request from corresponding author.

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APPENDIX A: SEARCH STRATEGY

Table A1. Search strategy

No Strategy	
1	("psychological distress" OR depression OR "mental health" OR "mental disorder*" OR "mental illness" OR "emotional distress" OR "irritable mood" OR "sadness" OR "unhappiness" OR "Anhedonia*" OR "cognitive manifestation*" OR "cognitive symptoms" OR "neurobehavioral manifestation*" OR "anger*" OR "Emotion*" OR "boredom" OR "mood disorder*" OR "Emotion*" OR "Psychological" OR "behavior*" OR "fatigue" OR "signs and Symptoms").ti,ab.
2	Psychological Distress/ or Depression/ or Mental Health/ or Mental disorder/ or Mental Illness/ or emotional distress/ or Irritable mood/ or Sadness/ or Unhappiness/ or Anhedonia/ or Cognitive manifestation/ or Cognitive symptoms/ or Neurobehavioral manifestation/ or Anger/ or Emotion/ or Boredom/ or Mood disorders/ or Emotional/ or Mood/ or Stress/ or Psychological/ or Nervousness/ or Coping/ or Behavior/ or Adaptation/ or Psychological Adaptation/ or Behavioral Symptoms/ or Fatigue/ or Mental/ or Lassitude
3	1 or 2
4	("Addicti* disorder*" OR "Addictive" OR "Internet gaming disorder" OR "video game" OR "game" OR "Internet" OR "Web" OR "Cyberspace").ti,ab.
5	Addictive disorder/ or Gaming disorder/ or Gaming disorder/ or Internet/ or Game/ or Video/ or Computer Games/ or Computer game/ or Online game/ or Internet game/ or Web/ or Cyberspace
6	4 or 5
7	("school-aged child" OR "children" OR "kids" OR "primary").ti,ab.
8	Child, Preschool/ or Children/ or minors/ or Kids/ or Primary school/ or Primary schools
9	7 or 8
10	("youth" OR "adolescent" OR "teen*" OR "student" OR "school").ti,ab.
11	Youth/ or Adolescent/ or Teen/ or Secondary school/ or Secondary schools
12	10 or 11
13	("COVID 19" OR " COVID19" OR "COVID 19 Virus Disease" OR "COVID-19 Virus Disease" OR SARS-CoV-2" OR "2019-nCov Infection" OR "Coronavirus Disease-19" OR "Pandemic" OR 'Respiratory Tract Infection" OR "Pneumonia" OR "Vir*").ti,ab.
14	COVID 19/ or COVID19/ or SARS-CoV-s/ or Coronavirus
15	13 or 14
16	3 and 6 and 9 and 12 and 15 + 2019-2021

APPENDIX B: INCLUSION AND EXCLUSION CRITERIA

Table B1. Inclusion and exclusion criteria of scientific studies according to PICOT

	Inclusion Criteria	Exclusion Criteria
Population (P)	School-aged children (primary and secondary) <ul style="list-style-type: none"> • 5 to 17 years old • Showing psychological distress and online or off-line gaming problems 	Children aged 0 to 4 years Adults aged 18 and above Children with diagnosed psychiatric problems (e.g., ADHD, Tourette syndrome, etc.) Children and adolescents in foster care or under youth protection Children requiring isolation during COVID-19 due to specific medical conditions (immunosuppressed, cystic fibrosis, etc.)
Intervention (I)	Primary or secondary prevention models Interventions model (front and second line) Structural elements such as <ul style="list-style-type: none"> • Care team (doctors or care professionals involved) • Clinics/facilities (walk-in, family medicine clinics, community care, CLSC, CRD, etc.) Process elements such as: <ul style="list-style-type: none"> • Sensibilization/information • Intervention plans 	Tertiary care (psychiatric hospital)
Comparison (C)	Compare to no intervention or no management	Intervention in medical settings
Outcomes (O)	Psychological distress Online and offline problematic gaming Secondary outcomes such as <ul style="list-style-type: none"> • Family, social and contextual factors 	Traditional gambling games (poker, roulette, and blackjack)
Types of Publication (T)	Primary studies Systematic reviews with or without meta-analysis	Conference abstracts, case reports, editorials, and letters to the editor/comments