



Internet Addiction and Online Gaming Disorder in Children and Adolescents During COVID-19 Pandemic: A Systematic Review

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The Indonesian government has enforced several social restrictions to prevent the spread of the coronavirus disease-2019 (COVID-19) virus, such as closures of in-person schools, public areas, and playgrounds as well as reduced outdoor activities. These restrictions will affect mental health of school-age children and adolescents. The internet is chosen as one of the media to keep academic activities running, but excessive internet use will increase internet addiction and online gaming disorder. This study aimed to understand the prevalence and psychological impacts of internet addiction and online gaming disorder on children and adolescents globally during the pandemic. Systematic searches were carried out on the PubMed, ProQuest, and Google Scholar search engines. All studies were assessed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2020 criteria and the Newcastle Ottawa Scale. Five studies met the criteria for assessing internet addiction and online gaming disorder cases in children and adolescents. Four studies discussed internet addiction, and one study addressed the negative impacts of online gaming on children and adolescents during the COVID-19 pandemic. There has been an increase in internet use and online gaming disruption in children and adolescents in almost all parts of Asian and Australian countries during the COVID-19 pandemic period.

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Keywords COVID-19; Mental health; Internet addiction; Adolescent behaviors; Systematic review.

INTRODUCTION

To prevent the spread of coronavirus disease-2019 (COVID-19), people have been asked to wear masks as initial protection wherever they go and to limit distance by avoiding unnecessary activities outside homes during the outbreak. Additionally, the Indonesian government has taken several steps to close several public areas, such as shopping centers, public areas, or restaurants that can accommodate large numbers of people. They have also minimized working hours to minimize the spread of the virus.¹⁻⁴

The implementation of social restriction regulations by the government has resulted in reduced direct social relations. This social restriction has been found to increase digital technology use while people are completing work at home, looking

for entertainment online, and making social contact online.⁵

Online activities can also trigger someone to play online games. When done properly, people may get the benefits from internet and online gaming which could relieve stress caused by social restrictions.^{6,7} Empirical evidence shows that, for children who are undergoing chemotherapy, online gaming acts as psychotherapy to relieve anxiety and depression. Children with emotional and behavioral problems will be able to channel their energy positively by engaging in online gaming as well. Previous studies done by experts have reported that online gaming will help improve individual's cognitive skills.^{8,9} Apart from the benefits mentioned above, excessive use of the internet and games gives negative effects on one's mental health, such as reducing sleep and lower emotional regulation. People may find it difficult to regulate their desire to continue to use the internet all the time, and thus it can disrupt learning activities and affect academic achievement at school. They often neglect time and thus perform work and school productivity poorly and even skip meals. As a result, they may experience decreased physical health and disrupted social interactions.⁶⁻⁹ Therefore, the purpose of this review article was to inform the prevalence and psychological impacts of internet addiction and online gaming disorder in children

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and adolescents across the world during the pandemic by using the systematic review method.

METHODS

This literature review utilized a systematic review method based on the provisions of Preferred Reporting Items for Systematic Review and Meta-Analysis, which is commonly referred to as PRISMA.^{10,11} This study used the latest version of PRISMA 2020.¹² Its protocols have been registered to the International Prospective Register of Systematic Reviews (PROSPERO) database with the registration number CRD42021271006. A cross-sectional study was conducted by observing the COVID-19 pandemic's impacts on increasing online gaming disorders and internet addiction cases, especially in children and adolescents. The exclusion criteria of this study are participants who were below or exceeding the stipulated age i.e., less than 10 years old or more than 24 years old. This was adjusted to the classification of young age around 10–24 years according to the World Health Organization (WHO).¹³

In addition, those with mental disorders such as autism disorder, attention disorders, hyperactivity, and post-traumatic stress disorder were excluded from this study. A systematic search for literature was carried out on July 30, 2021, using three different databases from PubMed (<https://pubmed.ncbi.nlm.nih.gov/>), ProQuest (<https://www.proquest.com/>), and Google Scholar (<https://scholar.google.com/>) with the keywords listed in Table 1. Literature included was limited to publications in the last three years from 2019 to 2021 in English. In addition, the literature also went through filtering criteria such as duplication, matching abstracts and article titles, eligibility for full-text articles, and additional data criteria, such as age of exclusion criteria and editorial letter articles. Data from each study were extracted in a standardized form. Then, study citations were compiled, and findings were analyzed. Study citations include the first author's name, publication year, and the study's title. Meanwhile, each study's char-

acteristics refer to the study's design, location, and respondents' characteristics.

After the literature was extracted, the next step was examination regarding each available work's quality assessment with the Newcastle Ottawa Scale (NOS)¹⁴ scoring for the cross-sectional case study, which can be seen in Table 2. High quality literature that met a minimum NOS score of 7 is defined as case study literature. Any NOS score discrepancies were discussed between the authors until they reached a conclusion.

Data were synthesized based on a minimum of five different and high-quality studies with consistent findings. The data were extracted independently by the authors (PYP, IF, and ZZ). PYP registered the procedure on the PROSPERO website. All the authors did the data collection together and double peer-reviewed. PYP prepared and revised the draft manuscript, while IF and ZZ did critical revisions of the article. Final approval for the published version was granted by all authors.

RESULTS

Study selection

The database searches found seven references: PubMed (n=

Table 2. Case study quality assessment based on the Newcastle Ottawa Scale

| Study | Selection | Comparability | Results | Total |
|------------------------------------|-----------|---------------|---------|-------|
| Dong et al., ¹⁵ 2020 | ☆☆☆☆ | ☆ | ☆☆ | 8 |
| Fazeli et al., ¹⁰ 2020 | ☆☆☆☆ | ☆ | ☆☆ | 8 |
| Teng et al., ¹⁷ 2021 | ☆☆☆☆ | ☆☆ | ☆☆☆ | 10 |
| Lin, ¹⁶ 2020 | ☆☆☆☆ | ☆ | ☆☆ | 8 |
| Mulyadi et al., ¹⁸ 2020 | ☆☆☆ | ☆ | ☆☆ | 7 |

Each star represents a scale criterion point

Table 1. Keywords used in literature search

| Search engine | Keywords |
|----------------|---|
| PubMed | ((COVID-19 OR (COVID-19[Title])) OR (pandemic[Title])) OR (Sars-Cov2[Title])) OR (coronavirus[Title])) AND ((internet gaming disorder[Title]) OR (internet addiction[Title]) OR (online gaming disorder[Title]) OR (internet addiction[Title]) OR (online gaming disorder[Title]) OR (online gaming addiction[Title]) OR (game addiction[Title])) AND (((child[Title/Abstract]) OR (adolescents[Title/Abstract])) OR (adolescent[Title/Abstract])) OR (children[Title/Abstract] AND adolescents[Title/Abstract])) |
| ProQuest | ((COVID-19[Title]) OR (pandemic[Title]) OR (Sars-Cov2[Title]) OR (coronavirus[Title])) AND ((internet gaming disorder[Title]) OR (internet addiction[Title]) OR (game addiction[Title]) AND ((child[Title]) OR (adolescents[Title]) OR (children[Title]) OR (adolescent[Title]))) |
| Google Scholar | COVID-19 AND Pandemic AND Sars-Cov2 AND coronavirus AND Internet Gaming Disorder AND Internet Addiction AND Game Addiction AND child AND adolescents AND children AND adolescent |

4) and ProQuest (n=3). After removing duplicate references, only six remained. After reading the titles and abstracts, five potential studies remained. Five studies were successfully retrieved for their full text. They were selected for reading their texts in full and applying the eligibility criteria, which resulted in one study's exclusion (did not meet the age criteria). The grey literature search found 12 references from Google Scholar. After reading the titles and abstracts, only two remained. Thus, two studies were retrieved for their full text and selected for full-text reading. Applying the eligibility criteria, the authors obtained one editorial paper's exclusion. Finally, five studies were selected for qualitative analysis.^{10,15-18} The identification, selection, and exclusion processes are shown in the PRISMA diagram above (Figure 1).

Study characteristics

Four of the included studies were cross-sectional studies,^{10,15-18} and one was a longitudinal study.¹⁷ A total of 7,391 participants were included in this review. They consist of 3,651 males (49.4%), 3,716 females (50.3%), and 24 people with unmentioned genders (0.3%). Participants' mean age ranged from 12.34 to 20.60 years old.^{10,15-18} The participants' countries of origin were China,¹⁵⁻¹⁷ Iran,¹⁰ Taiwan,¹⁶ Indonesia, and Australia.¹⁸

Three studies evaluated internet usage or addiction during the COVID-19 pandemic.^{15,16,18} One study evaluated online

gaming addiction only during the COVID-19 pandemic,¹⁰ while one other study compared online gaming addiction severity before and during the COVID-19 pandemic.¹⁷ Other psychological problems related to internet addiction and online gaming disorders that were evaluated included depression,^{10,15-17} anxiety,^{10,15,17,18} stress,^{10,15,17} sleep disorder,^{10,18} neuroticism, impulsivity, alexithymia,¹⁶ and quality of life.¹⁰ The summary of the research characteristics is presented in Table 3.

Individuals study results

Internet addiction prevalence

Three studies evaluated internet addiction prevalence during the COVID-19 pandemic.^{15,16,18} All three studies used a different type of instrument for assessing internet addiction, making it impossible to conduct quantitative analysis. The results on internet addiction prevalence summary is presented in Table 4.

Online gaming disorder prevalence

Two studies evaluated online gaming disorder during the COVID-19 pandemic. Both studies used the Internet Gaming Disorder Scale-Short Form (IGDS9-SF) to assess the severity of online gaming disorder.^{10,17} One study only reported participants' IGDS9-SF mean score.¹⁰ One study reported that online gaming disorder prevalence during the COVID-19

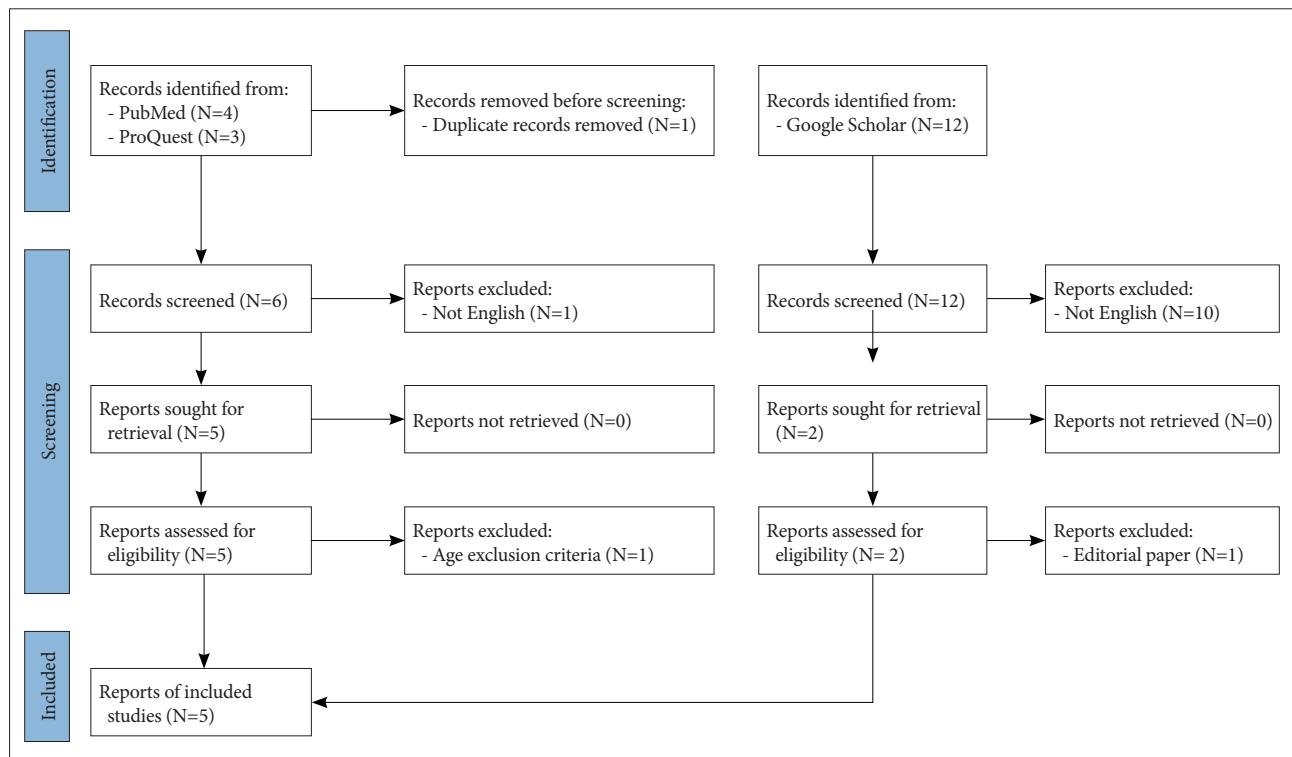


Figure 1. PRISMA diagram used in systematic literature search.

Table 3. Summary of research characteristics

| Study | Study type | Population description | Mean age (yr) | Sample size | Context/setting | Types of outcomes and instruments used | | |
|---------------------------------------|--------------------|--|-----------------|-------------------------------------|--|---|------------------------|---|
| | | | | | | Internet addiction | Online gaming disorder | Other psychological problems |
| Dong et al., ¹⁵ 2020 | Cross-sectional | School-age children and adolescents from North, East, and Middle China | 12.34 (SD=4.67) | 2,050 (1,057 male, 993 female) | During the COVID-19 pandemic in China (Feb 2020–Mar 2020) | Y-IAT | | DASS-21 |
| Fazeli et al., ¹⁰ 2020 | Cross-sectional | Adolescents aged 13–18 years from 25 high schools in Qazvin (Iran) | 15.51 (SD=2.75) | 1,512 (853 male, 659 female) | During the COVID-19 pandemic in Iran (May 2020–Aug 2020) | | IGDS9-SF | DASS-21, ISI, PedsQL-4.0 SF15 |
| Teng et al., ¹⁷ 2021 | Longitudinal study | Children and adolescents who were part of the Project of School Mental Health in Southwest China | NR | 1,778 (901 male, 877 female) | Before the COVID-19 pandemic compared with wave 3 (Oct 2019–Nov 2019) and wave 4 (Apr 2020–May 2020) | | IGDS9-SF | CES-D, STAI |
| Lin, ¹⁶ 2020 | Cross-sectional | Junior high school students from three junior high schools located in northern Taiwan | 14.66 (SD=0.86) | 1,060 (542 male, 504 female, 14 NR) | During the COVID-19 outbreak in Taiwan (Mar 2020) | CIAS | | Shortened Chinese Version of Five-Factor Inventory—Neuroticism Subscale, BIS-short form, DASS (depression only), RSES, TAS-20, CHI, SSS, VSSS |
| Mulyadi et al., ¹⁸ 2020 | Cross-sectional | University students from 21 provinces in Indonesia and Sydney, Australia | 20.6 | 991 (298 male, 683 female, 10 NR) | During the COVID-19 pandemic in Indonesia | Online questionnaires asking about internet usage activity and duration | | Anxiety scale developed by Afandi (2007), an online questionnaire asking about sleep duration during the night |

SD, standard deviation; COVID-19, coronavirus disease-2019; Y-IAT, Young's Internet Addiction Test; DASS-21, Depression, Anxiety and Stress Scale; IGDS9-SF, Internet Gaming Disorder Scale-Short Form; ISI, Insomnia Severity Index; PedsQL 4.0 SF15, Pediatric Quality of Life Inventory™ 4.0 Short Form; NR, not reported; CES-D, Center for Epidemiologic Studies Depression Scale; STAI, State-Trait Anxiety Inventory; CIAS, Chen Internet Addiction Scale; BIS, Barratt Impulsivity Scale; RSES, Rosenberg Self-Esteem Scale; TAS-20, Toronto Alexithymia Scale-20; CHI, Chinese Happiness Inventory; SSS, Social Support Scale; VSSS, Virtual Social Support Scale

Table 4. Results on internet addiction prevalence summary

| Study | Assessment of internet addiction | Main findings on internet addiction prevalence during the COVID-19 pandemic |
|------------------------------------|---|---|
| Dong et al., ¹⁵ 2020 | Y-IAT score: ≥70=AIU 40-69=PIU ≥39=NIU | 2.68% (male, 3.50%; female, 1.81%)=AIU; 33.37% (male, 35.10%; female, 31.52%)=PIU; Age, gender, and education status were significantly different among AIU, PIU, and NIU (p<0.001) |
| Lin, ¹⁶ 2020 | CIAS score: ≥64=IA <63=non-IA | 24.4% (130 male and 125 female)=IA Age and all psychosocial risk factors were significantly different in the non-IA and IA groups (p<0.01) |
| Mulyadi et al., ¹⁸ 2020 | Duration of internet usage per day: ≥6 hrs=IA <6 hrs=non-IA | 55.6% (551 respondents)=IA Average internet usage duration per day=6.96 hrs |

COVID-19, coronavirus disease-2019; Y-IAT, Young's Internet Addiction Test; AIU, addictive internet users; PIU, problematic internet users; NIU, normal internet users; CIAS, Chen Internet Addiction Scale; IA, internet addiction

Table 5. Results of online gaming disorder prevalence

| Study | Online gaming disorder assessment | Main findings on online gaming disorder prevalence during the COVID-19 pandemic |
|-----------------------------------|---|--|
| Fazeli et al., ¹⁰ 2020 | IGDS9-SF score: no further explanation | Mean score=19.07 (SD=7.31) |
| Teng et al., ¹⁷ 2021 | IGDS9-SF: at least five questions were answered "often or very often" | A significant difference in online gaming disorder prevalence before the pandemic: 3.6% (55 boys and 9 girls) compared with during the pandemic: 5.0% (72 boys and 17 girls) (p=0.025); Higher severity of online gaming disorder symptoms in adolescents during the pandemic compared to that before the pandemic (p=0.035), but not in children (p=0.287) |

COVID-19, coronavirus disease-2019; IGDS9-SF, Internet Gaming Disorder Scale-Short Form; SD, standard deviation

Table 6. Correlation between IA or OGD with several psychological disorders during the COVID-19 pandemic summary

| Study | IA/OGD | Dep | Anx | Str | Ins | QoL/SWB | Neu | Imp | SE | Alx |
|------------------------------------|--------|-------|--------|-------|-------|---------|-----|-------|----|------|
| Dong et al., ¹⁵ 2020 | IA | Sig** | Sig**† | Sig* | | | | | | |
| Fazeli et al., ¹⁰ 2020 | OGD | Sig** | Sig** | Sig** | Sig** | Sig*** | | | | |
| Teng et al., ¹⁷ 2021 | OGD | Sig** | Sig** | | | | | | | |
| Lin, ¹⁶ 2020 | IA | NS | | | | Sig*** | NS | Sig** | NS | Sig* |
| Mulyadi et al., ¹⁸ 2020 | IA | | Sig** | | | | | | | |

*p<0.05; **p<0.01; †mild and moderate anxiety only; no significant correlation between IA and severe anxiety; ‡negative correlation. COVID-19, coronavirus disease-2019; IA, internet addiction; OGD, online gaming disorder; Dep, depression; Anx, anxiety; Str, stress; Ins, insomnia; QoL, quality of life; SWB, subjective well-being; Neu, neuroticism; Imp, impulsivity; SE, self-esteem; Alx, alexithymia; Sig, significant correlation; NS, no significant correlation

pandemic was significantly higher compared to that before the pandemic (p=0.025).¹⁷ The summary of results on online gaming disorder is presented in Table 5.

Other psychological disorders related to internet addiction and online gaming disorder during the COVID-19 pandemic

All studies also assessed correlation between internet addiction or online gaming disorder with several psychological disorders during the COVID-19 pandemic. This summary is presented in Table 6.

DISCUSSION

Online gaming disorder and internet addiction

According to Diagnostic and Statistical Manual of Mental Disorders, fifth edition, internet gaming disorder may be diagnosed if five (or more) of the following nine criteria are fulfilled: 1) preoccupation with online/offline gaming; 2) unpleasant symptoms experienced when gaming is taken away; 3) need to spend increasing amounts of time engaged in gaming; 4) unsuccessful attempts to control participation in games; 5) loss of interest in previous hobbies and entertainment be-

cause of and apart from games; 6) continued excessive game use despite knowledge of psychosocial problems; 7) deceiving family members, therapists, or others regarding the amount of gaming; 8) use of games to escape or relieve negative moods; and 9) jeopardising or losing a significant relationship, job, education, or career opportunity because of game participation.¹⁹

Those with internet addiction will experience problems such as losing control and inability to reduce the time spent playing, followed by problems in real life. These are some criteria for identifying internet addiction. There are six dimensions described in defining online gaming addiction: preoccupation, overuse, immersion, social isolation, interpersonal conflicts, and withdrawal. Gaming induces compulsive behavior, meaning the player increases their gaming intensity to obtain gratification. If the feelings are not satisfied, the inner tension may increase and turn into aggressive behavior. Under these conditions, they could ignore their usual obligations and social interactions.²⁰

Addicted adolescents prefer using the internet to gain the needed social relationships and support whilst going through difficult times in their lives. This also occurs in children. Boys are generally more experienced in programming and computer games than girls.²¹

The prevalence of internet addiction and online gaming disorder during the COVID-19 pandemic

The internet has become important in people's daily lives, but prolonged daily use can have a detrimental effect on an individual's physical and mental well-being. As soon as COVID-19 spread to all parts of the world and government lockdowns were imposed, many individuals had more free time to spend at home. This excessive free time is likely to have sparked boredom among many internet users, and its overuse during the pandemic will further facilitate problematic internet usage behavior. This has a significant impact on mental health of internet users, especially children and adolescents.²²⁻²⁵

The results indicated that adolescents increased their social media contact in different parts of the world. Most of them reported using social media (Instagram, Snapchat, and TikTok) to stay in touch with their peers. A sample of studies conducted on children aged 6 and 9 years found 1.67% had an internet addiction, and 28.10% used the internet excessively.¹⁵ Internet addiction, like online gaming disorders and pathological gambling, is a kind of addictive behavior without a psychoactive substance generally developed gradually. It is characterized by changes ranging from pleasure, loss of control over loved ones to obsession about the internet use. Gender is an important factor in the occurrence of internet addiction.^{15,26,27} The proportion of men who experience internet addiction is higher than that of women. Dong et al.¹⁵ found

that boys using the internet prefer large multiplayer games and violent games. In contrast, women are mostly more focused on playing online games just to pass the time while still socializing with the outside world during the pandemic, chatting, and shopping online. In terms of internet use duration, women spent less time playing online games and spent less time in front of online screens. This may be since girls are better at self-control in managing emotions both physically and psychologically to reduce pathological internet use.^{19,20}

The frequency of electronic device use after midnight and electronic product addiction self-scores showed an increase during the pandemic in all groups.²⁸ Risk factors, such as increased family stress experienced by children will potentially increase the hours that a person spends using digital media in the future. Other risk factors include social isolation, school closings, unemployment, and an increase in child maltreatment incidence in their family.^{15,29}

Research by Mulyadi et al.¹⁸ in Indonesia found that internet activity is dominantly carried out on WhatsApp, followed by Instagram, Twitter, and Facebook. In contrast, the internet access in the United States and Italy is more dominant in online gaming during the pandemic at 75% and 70%, respectively. In addition, addictive behaviors such as playing video games, watching TV series, using social media, or accessing the internet are often exhibited by individuals to reduce their stress and anxiety during the pandemic. Internet use, especially video gameplay, has increased sharply in the pandemic period as players are required to stay at home. Among the many addictive behaviors that have emerged, internet addiction (especially social media use) is the most common in several studies that have been conducted.^{16-18,30}

From several research studies that have been conducted, problematic internet usage has been found to be more common in small families than in large families; this supports the theory that small families are more at risk of experiencing loneliness. This feeling is also correlated and has contributed to an increase in internet overuse. In addition, these studies have also revealed that unmarried individuals are more prone to experiencing internet use disorders than those who are married.^{13,16,17,31} This may occur because individuals who are separated from their families and/or not with their current partners will use the internet to address their need for interpersonal action, as well as to build social networks and support virtually, thereby increasing their internet usage.^{6,32} The findings also show that excessive internet use incidence is higher among smokers, implying that smoking is significantly associated with internet overuse. A previous study examining internet addiction among adolescents reported that smoking significantly increased social stress and anxiety, which can play a contributing role to internet addiction.^{14,23}

Several studies suggest that individual fear of COVID-19 and a prolonged quarantine period may have led people to experience depression and anxiety symptoms coupled with increased confirmed or suspected COVID-19 cases in household clusters. Those with obsessive-compulsive personality disorder, sensitive interpersonal qualities, a history of somatization disorder, and psychotic tendencies will be at greater risk of occurrence.^{6,20,33} Obsessive-compulsive tendencies are more likely to occur in people with internet addiction. Online recreational activities are often chosen as a mechanism for dealing with anxiety and reducing stressful moods. However, overuse will exacerbate feelings of anxiety and depression, reinforce the urge to continue using the internet, and develop these maladaptive results. Social media and online gaming are the two most prevalent types of internet addiction, especially in this pandemic era.^{26,28}

A study conducted by Teng et al.¹⁷ showed that videogame use and online gaming disorder among adolescents increased significantly during the COVID-19 pandemic. Children with pathological and excessive gaming behavior are more likely to be depressed, anxious, and lonely. Feeling depressed can reduce motivation to socialize and reduce motivation to play games in both males and females. Female respondents were more likely to report feeling lonely than male respondents, while those who tended to overplay and were pathological reported feeling lonelier.¹⁷ Loneliness is positively associated with gameplay addiction adjusted for socio-demographic characteristics, but that the association is negative when associated with depression and anxiety.^{17,18}

Increased video gameplay can be conceptualized as a coping mechanism that helps children and adolescents cope with the mental health burdens associated with the COVID-19 pandemic. According to a recent study on youth mental health, children and adolescents are prone to psychiatric disorders that have the potential to make them more prone to online gameplay disruption.^{6,13,16,32} There are several developmental and parental factors at play, such as the state of adolescence. It is known that adolescence is associated with an increased risk of developing various emotional and behavioral problems, making it a vulnerable period for addiction disorders to manifest due to negative coping strategies that lead to uncontrolled online gaming disorders. In terms of parental factors, it is possible that children receive more parental supervision during the pandemic because they are generally more inclined to obey their parents.^{6,7,34,35}

As a result, children may have a lower risk of experiencing disruption in playing online games when compared to youth groups due to mediation, monitoring, and parental supervision. Online gameplay disorders can develop as a dysfunctional compensatory mechanism and result from poorer psy-

chological health during pandemic periods.^{15,36} Stress associated with the COVID-19 pandemic can also trigger negative cognitive effects influenced by predisposing variables (e.g., depression and anxiety symptoms). Greater COVID-19 impacts could potentially lead to greater online gaming impacts.^{15,31,34} Boys are more likely to play video games and experience disruption as playing online games. Depression, anxiety, and stress serve as powerful mediators between online gaming disruption, insomnia, and quality of life among adolescents during the COVID-19 pandemic.^{10,17,30}

The results of a study conducted by Lin¹⁹ had varied internet addiction prevalence rates among high school students in Taiwan. There was a relationship between young age and the highest internet addiction cases related to the COVID-19 pandemic.¹⁶ Various psychological impacts and stress due to the COVID-19 outbreak can make it easier for students to experience internet addiction, this high prevalence calls for attention from mental health organizations and educational institutions to develop intervention strategies.¹⁶

Psychological influence on internet addiction prevalence among adolescents

Based on previous studies, individuals who experience more intrapersonal conflict have a higher risk of excessive internet use. Reduced close social relationships due to social isolation can increase risk of spending more time on the internet. They may experience difficulties with their social relationships due to the COVID-19 pandemic.^{13,23}

The WHO also states that social isolation and self-quarantine activities can affect individuals' activities, daily routines, and livelihoods. This can result in increased feelings of loneliness, anxiety, depression, insomnia, excessive alcohol and drug use, and the onset of suicidal ideas.^{18,37}

Impulsivity has the greatest influence on internet addiction occurrence. This is because individuals are more likely to dislike long-term benefits when compared to getting instant gratification on the internet, increasing the likelihood of an addiction developing. Individuals who are addicted to the internet are more likely to ignore their tasks suddenly.^{16,24} Individual well-being is defined as a cognitive and emotional evaluation of life, such as a sense of peace, happiness, life satisfaction, and need fulfillment. High virtual social support and low-functioning independent family life have contributed to the internet addiction incidence prediction.¹⁶ With social isolation, students will increase their internet use to get information about COVID-19. As a result, they may rely on their online friends when they need. However, that hope will often fail and lead to internet addiction. Conversely, low-functioning family life increases the risk of internet addiction during the COVID-19 pandemic.^{10,16} Family function is an important in-

indicator of how family members interact and understand each other. Having a poor-functioning family during a pandemic will increase adolescent students' chances of increased internet use to reduce stress. Internet addiction may be a behavioral symptom reflecting poor-functioning families among adolescent students during the pandemic.³⁸⁻⁴⁰

CONCLUSION

There has been an increase in internet use and online gaming disruption in children and adolescents in almost all parts of Asian and Australian countries during the COVID-19 pandemic period. This occurs due to stress, anxiety, loneliness, and depression, mostly during the lockdown period. For the most part, children and adolescents will use coping strategies to play games or spend most of their time on the internet to deal with negative feelings that arise during the pandemic. Parents, therefore, need to monitor the amount of time children spend in online games and the internet. Parents need to educate their children on managing their online activities, including game play. They must also monitor and guide their children to take advantage of several different activities and/or adaptive coping strategies to face the challenges during the COVID-19 pandemic.

Limitations

Currently, few published research reports examine impacts of internet addiction and internet gaming disorder on children and adolescents during the COVID-19 period. This study provides information about the prevalence associated with psychological impacts, such as depression and anxiety. This should be helpful for concerned authorities to plan and adopt appropriate interventions to overcome the negative psychological impacts to ensure sound mental health, especially for those in quarantine.

This study had several limitations. Firstly, it is based on data collected from several search engines at a single time; thus, these data may differ when accessed at another time, potentially leaving some significant differences from the data obtained for this study. Secondly, only the data collected from search engines were used, and the data mostly came from Asian countries. In other words, it might not represent data form across the world. Thirdly, most of the data only showed internet addiction and internet gaming disorder prevalence followed by depression and anxiety disorders. They did not feature any psychological factors extensively. Future research should consider exploring this aspect. Prospective studies on the impacts of internet addiction and internet gaming disorder during COVID-19 are required. Finally, it may be difficult to generalize these results as this study only uses relatively

small data of patients with internet addiction and internet gaming disorder.

Availability of Data and Material

All data generated or analyzed during the study are included in this published article.

Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

Author Contributions

Conceptualization: Patria Yudha Putra, Izzatul Fithriyah. Formal analysis: Patria Yudha Putra. Investigation: Patria Yudha Putra, Izzatul Fithriyah. Methodology: all authors. Validation: all authors. Writing—original draft: Patria Yudha Putra. Writing—review & editing: all authors.

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