Prevalence and Risk Factors of Internet Gaming Disorder Under the COVID-19 Pandemic Among University Students in Macao

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Abstract

Introduction: During the COVID-19 pandemic, the zero-tolerance policy implemented in Macao affected university students' life and learning styles.

Objectives: This study aimed to investigate the prevalence of internet gaming disorder (IGD) and analyze its risk factors among university students of Macao amid the COVID-19 pandemic.

Methods: Two hundred and twenty-nine university students were recruited by convenience sampling. The cross-sectional investigation was conducted using the 9-item Chinese version of the IGD Scale, the Chinese Version of the Self-Compassion Scale, and the Chinese version of the Brief Resilience Scale.

Results: The prevalence was 7.4%. Compared to Non-IGD gamers, the IGD gamers were more likely to be the older, male gender, with a longer gaming history, with more game hours per day in the last month, and with a lower self-compassion score and resilience.

Conclusion: The prevalence of IGD increased. Students who are the older, male gender, with more gaming time, low self-compassion, and low resilience, have a high possibility of IGD.

Keywords

prevalence, risk factors, internet addiction disorder, COVID-19, university students

Introduction

The internet plays an increasingly important role in modern daily life. People learn, obtain information, entertain, and communicate on the internet. The total number of Chinese internet users is 1.03 billion, of which 553.54 million are internet game users (China Internet Network Information Center, 2022). While gaming's entertaining function and social features are beneficial, problematic playing may lead to gamers' physical, psychological, and social problems. Physically, it can lead to abnormal weight gain or loss (Ornek et al., 2022), impaired sleep quality (Wong et al., 2020), and pain issues caused by poor posture (Tholl et al., 2022). Psychologically, depression and despair are always accompanied by problematic gaming (Wong et al., 2020). Socially, it hurts realistic interactions by making gamers miss opportunities, detach from reality, and neglect real-world roles (Mannikko et al., 2015).

For the past two years, during the COVID-19 pandemic, people have sometimes been restrained in isolated spaces and required to keep social distancing (Ciccarelli et al., 2022). Internet gaming appeared to be a convenient and helpful method to relieve loneliness. Playing internet games together could be a great way to connect with friends without seeing each other. Even more, university students had to attend internet courses instead of going to campus (Joshi et al., 2022; She et al., 2021). They spent

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lots of time sitting in front of computers or using smartphones which made them more accessible to internet games, potentially increasing problematic gaming (Freitas et al., 2022; Li et al., 2021).

Review of Literature

Definition of Internet Gaming Disorder

Firstly, reported in 2005 (Ng & Wiemer-Hastings, 2005), internet gaming disorder (IGD) was included in the Classification of Mental and Behavioral Disorders of the American Psychiatric Association (The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition) for future research in 2013. In the 11th Revision of the International Classification of Disease, IGD is defined as a pattern of gaming behavior characterized by impaired control over gaming, increasing priority given to gaming over other activities to the extent that gaming takes precedence over other interests, and daily activities, and continuation or escalation of gaming despite the occurrence of negative consequences. For diagnosing IGD, the behavior pattern must be of sufficient severity to result in significant impairment in personal, family, social, educational, occupational, or other important areas of functioning and would normally have been evident for at least 12 months (World Health Organization, 2013). The core symptoms of IGD are excessive use, withdrawal, tolerance, and negative repercussions, including arguments, lying, poor achievement, social isolation, and fatigue (Lecardeur, 2013).

Prevalence of IGD Among University Students

Before the pandemic, the prevalence of IGD ranged from 0.2% to 57.5% in the general population (Darvesh et al., 2020) and from 2.9% to 14.9% among university students in different regions (De Pasquale et al., 2018; Qin et al., 2020). Macao is the Special Administrative Region of China, obeying the Chinese pandemic prevention policy. Although there was no specific data for university students of Macao, the research in 2018 gave a background indicating a prevalence of 2.0% among Macao community-dwelling adults (Wu et al., 2018). The first objective of this study was to detect the current IGD prevalence of university students in Macao and to explore their internet gaming behavior under the zero-tolerance and entry & exit restriction policy.

Risk Factors of IGD

Prior studies identified some risk factors for IGD. The male gender significantly contributed to IGD occurrence, and IGD was even called an emergent health issue for men (Al Asqah et al., 2020; Borges et al., 2019; Chen et al., 2018; De Pasquale et al., 2018; Macur & Pontes, 2021; Qin et al., 2020; Rasheed et al., 2021; Severo et al., 2020). Increased gaming time was mentioned as a predisposition factor for IGD (Jeong et al., 2021; Rho et al., 2017; Severo et al., 2020). Diseases and symptoms related to IGD included functional and dysfunctional impulsivity (Rho et al., 2017), attention-deficit/hyperactivity disorder (Chen et al., 2021; Jeong et al., 2021), depression (Chen et al., 2021; Liu et al., 2022; Severo et al., 2020; Teng et al., 2020) hopelessness (Chen et al., 2021), lousy sleeping quality (Severo et al., 2020), role impairment (Borges et al., 2019), loneliness (Zeliha, 2019), and anxiety (Archana et al., 2019; Rho et al., 2017; Teng et al., 2020). The proven bidirectional relationship meant people with IGD had a high risk of developing these diseases and symptoms, and these diseases and symptoms could cause and even deteriorate IGD. Shi et al. (2020) revealed the relationship between childhood trauma with IGD. Stress, such as parental psychological control, physical/verbal abuse, and peer bullying, would increase the risk for IGD (Archana et al., 2019; Li et al., 2022; Yang et al., 2020). Low self-control was a risk factor (Macur & Pontes, 2021), while high self-control was a protective factor for IGD (Wayne et al., 2022).

There were also protective factors related to IGD. Su et al. (2018) proved that higher parental supervision and better father–child relationships were preventive factors for IGD. Chen et al. (2020) found that parents' emotional warmth, which supported self-efficacy, self-control, and autonomy, had been shown to keep adolescents from IGD. Teng et al. (2020) confirmed that peer attachments were crucial in preventing IGD in university students. Liu et al. (2022) indicated that depressive symptom was a risk factor for IGD and could be attenuated by peer support.

The above influential factors mostly came from the studies considering adolescents with high vulnerability to IGD. Little literature was found on university students, and risk factors were more emphasized than protective factors. The second objective of this study was to identify risk factors for IGD among university students of Macao, emphasizing protective factors.

Self-Compassion and Resilience

Self-compassion is from Buddhism, which means compassion directed inward. Neff (2003a) defined self-compassion as kindness, a sense of common humanity, and mindfulness. Self-kindness means being warm and understanding when we suffer, fail, or feel inadequate, rather than torturing ourselves with self-criticism. Common humanity indicates that the human condition is imperfect and that we are not alone in suffering and imperfection. Mindfulness involves turning toward our painful thoughts and emotions and seeing them as they are without suppression or avoidance. Given the nature of self-compassion, it may help relieve the social anxiety caused by the pandemic. Phelps et al. (2018) have demonstrated an inverse relationship between self-compassion and substance use disorder. The fact that IGD

shared similar symptoms with substance use disorder, such as preoccupation, tolerance, and withdrawal, implied that self-compassion might be a protective factor for IGD. Resilience is the capacity of a dynamic system to withstand or recover from significant challenges that threaten its stability, viability, or development (Phelps et al., 2018). Resilience is the ability to successfully cope with stress or difficult situations (Masten, 2014), and it may protect people against addictions (Krentzman, 2013). For example, resilience was positively associated with patients' health-related quality of life, and resilient patients possessed more potent abilities to rebound from frustration and tragedy (Liu et al., 2017). Furthermore, Kim et al. (2014) found that the risky user group of smartphone addiction showed a significantly lower score in resilience than the normal user group among university students. The third objective of this study was to test whether self-compassion or resilience could protect university students from IGD.

Research Question

Given the social background of the COVID-19 pandemic and targeted university students of Macao, the study aimed to (a) investigate the IGD prevalence, (b) examine whether age, gender, religious belief, living conditions, and gaming time were influential factors for IGD, and (c) explore whether the self-compassion or resilience were protective factors for IGD.

Methods

Design

This study adopted a cross-sectional and descriptive design.

Hypothesis

The hypotheses of this study were, for IGD among university students of Macao: (a) the demographic data (age, gender, religious belief, and living conditions) were influential factors; (b) the characteristics of playing games (years of playing games, gaming hours per day in the past month) were risk factors; and (c) the self-compassion and resilience were protective factors.

Sample and Settings

A convenience sampling was recruited online through institute/university and medial social platforms such as Facebook, Instagram, WeChat, gaming forum/discussion board, or by email/message invitation. The online questionnaire was set to be submitted only after all items had been answered. Including criteria were: (a) university/college students with Macao citizenship and (b) at least 12 months experience of playing internet digital/video games. Exclusion

criteria were: (a) psychological or mental disorders and (b) regular use of psychotic drugs. The minimum sampling size was 107, estimated by the statistical model to achieve the power of 0.8, α level of .05, and medium effect size of 0.15 with eight variables.

Instruments

Internet Gaming Disorder. The IGD Scale-Short-Form (Pontes & Griffiths, 2015) was the most used standardized instrument for diagnosing IGD in previous studies (Darvesh et al., 2020). This study screened the IGD by the 9-item Chinese version of the IGD Scale (Lei et al., 2020). The participants rated whether they had these symptoms over the last 12 months on a dichotomous scale (1 = yes, 2 = no). With five or more yes indicated positive in IGD. The Cronbach's α was .89, and the test–retest reliability was .84.

Self-Compassion. Self-compassion was measured by the Chinese Version of the Self-Compassion Scale (Chen et al., 2011). The scale was translated from the original 26-item English version developed by Neff (Neff, 2003b). The scale has six dimensions: self-kindness, self-judgment, common humanity, isolation, mindfulness, and overidentification. It was a 5-point Likert scale with 1 = strongly disagree and 5 = strongly agree. Dimension self-judgment, isolation, and overidentification were reversely scored. The total score ranged from 26 to 130, with a higher total score indicating greater self-compassion. The Cronbach's α was .84 overall, and the test–retest reliability was .89.

Resilience. Resilience was measured by the Chinese version of the Brief Resilience Scale (Fung, 2020). It had six items on a 5-point Likert scale, ranging from 1 = strongly disagree to 5 = strongly agree. Items 2, 4, and 6 were reversely scored. The total score ranged from 6 to 30, with a higher total score indicating better resilience. The scale showed good reliability in young adults (Cronbach's α .71).

Demographic Data

Demographic characteristics of the participants were collected as age, gender, religion, and living condition. Gaming behaviors were documented as years of playing games and hours of gaming per day in the last month.

Data Collection

The data collection was conducted from December 2021 to March 2022. The study employed a descriptive cross-sectional online survey by Google Sheets. Researchers distributed the questionnaire by (a) friends' messages/email invitations and (b) posters on Facebook, Instagram, WeChat, and online games forums/groups. On the investigation's first page, there were explanations of the survey's

objects and warrants for voluntary anonymity, and confidentiality. The survey would only start when participants clicked the box for the statement "I read through the information above and agree to participate in the research." It would take about 20 min to complete the anonymous survey.

Statistical Methods

(a) The prevalence of IGD was calculated. (b) The differences in demographic data and the scores of Self-compassion/Resilience between the IGD gamers and the Non-IGD gamers were tested with the Wilcoxon Rank-Sum test (for skewed distribution), t-test, or Chi-square test. (c) The binary logistic regression (enter method) was conducted to construct a predictive model for the IGD. IGD was set as the outcome variable, and demographic data, gaming characteristics, and self-compassion/resilience score were the possible predictors of IGD. The statistical analyses were carried out by SPSS 26.

Results

The Profile of Participants

Two hundred and thirty-six questionnaires were submitted online. Seven questionnaires were excluded because the respondents chose the same score throughout all items. Two hundred and twenty-nine questionnaires remained with a response rate of 97.03%. The basic information of the included 229 participants is listed in Table 1. The mean age was 24.42, and more than half of the sample (63.8%)

were female. Only 6.1% of the participants had religious beliefs. Most of them (89.1%) lived with families. Almost half of the participants (43.2%) had a history of playing internet gaming for more than 10 years. One hundred and forty-nine participants (65.1%) spent <2 h per day in the last month, while 12 participants (5.2%) spent more than 10 h.

The Prevalence of IGD and the Internet Gaming Behavior among Participants

The prevalence of IGD in included university students of Macao was 7.4% (95% CI [4.0, 10.8]), with 4.8% (95% CI [1.3, 8.3]) among females and 12.0% (95% CI [4.9, 19.2]) among males.

The frequency of endorsement on each item of the 9-item Chinese version of the IGD Scale is listed in Table 2. Noticeably, item 8 was answered yes by more than 50.2% of the participants, for they used internet gaming to escape negative moods. The lowest ranking was item 7, indicating that cheating behaviors caused by gaming occurred in 13 (5.7%) participants.

The Comparison Between IGD Gamers with Non-IGD Gamers

Some variables were found to have statistically significant differences between IGD and Non-IGD gamers (Table 3). Gamers who were older (Wilcoxon Rank-Sum test, $Z = -2.32$, $p = .021$), male (Chi-square test, $F = 4.05$, $p = .044$), with a long history of internet gaming (Trend Chi-square test, $Z = 9.27$, $p = .002$, $R = 0.20$, $p = .002$), and having

Table 1. Basic Information of Participants ($n = 229$).

Characteristics	Category	Mean (SD) / n (%)
Age		24.42 ± 3.17
Gender	Men	83 (36.2)
	Women	146 (63.8)
Religion	No	215 (93.9)
	Yes	14 (6.1)
Living condition	Not live with family	25 (10.9)
	Live with family	204 (89.1)
How long have you played internet games?	1–3 years	62 (27.1)
	4–6 years	48 (21.0)
	7–9 years	20 (8.7)
	≥ 10 years	99 (43.2)
How many hours have you spent playing internet gaming per day in the last month?	≤2 h	149 (65.1)
	3–6 h	58 (25.3)
	7–9 h	10 (4.4)
	≥ 10 h	12 (5.2)
IGD	No	212 (92.6)
	Yes	17 (7.4)
Self-compassion		13.37 ± 1.88
Resilience		19.86 ± 3.67

Note. SD = standard deviation.

Table 2. Endorsement of Each Item in a 9-Item Chinese Version of the Internet Gaming Disorder Scale (C-IGDS-9; $n = 229$).

Items	Answer, n (%)	
	No	Yes
1. Feel preoccupied with Internet games	210 (91.7)	19 (8.3)
2. Feel irritable, anxious, or sad when trying to reduce or stop internet gaming activity	211 (92.1)	18 (7.9)
3. Spend an increasing amount of time on gaming to achieve satisfaction or pleasure	189 (82.5)	40 (17.5)
4. Systematically fail to control or cease internet games activity	203 (88.6)	26 (11.4)
5. Lost interest in previous hobbies and other entertainment activities as a result of engagement with internet games	193 (84.3)	36 (15.7)
6. Continue the internet gaming activities despite knowing it was causing problems between you and other people	197 (86.0)	32 (14.0)
7. Deceived any of your family members, therapists, or others regarding the amount of internet gaming activity	216 (94.3)	13 (5.7)
8. Use internet games to escape or relieve a negative mood temporarily	114 (49.8)	115 (50.2)
9. Jeopardized or lost an important relationship, job, or educational or career opportunity because of internet games activities	210 (91.7)	19 (8.3)

Table 3. Factors Toward Internet Gaming Disorder (IGD) Among University Students of Macao.

Variables		Non-IGD ($n = 212$)	IGD ($n = 17$)	$Z^a/\chi^2 (df)^b/Z^c/$ Pearson's R $^d/t^e$	P
Age		24.28 ± 3.09	26.24 ± 3.62	−2.32[a]	.021[*]
Gender					
	Men	73 (34.4%)	10 (58.8%)	4.05(1)[b]	.044[*]
	Women	139 (65.6%)	7 (41.2%)		
Religion					
	No	199 (93.9%)	16 (94.1%)	0.00(1)[b]	>.999
	Yes	13 (6.1%)	1 (5.9%)		
Living condition					
	Not live with family	23 (10.8%)	2 (11.8%)	0.00(1)[b]	>.999
	Live with family	189 (89.2%)	15 (88.2%)		
How long have you played internet games?					
	1–3 years	61 (28.8%)	1 (5.9%)	9.27[c]	.002[*]
	4–6 years	46 (21.7%)	2 (11.8%)	0.20[d]	.002[*]
	7–9 years	20 (9.4%)	0 (0.0%)		
	≥ 10 years	85 (40.1%)	14 (82.3%)		
How many hours have you spent playing internet gaming per day in the last month?					
	≤2 h	144 (67.9%)	5 (29.4%)	15.26[c]	.000[*]
	3–6 h	52 (24.5%)	6 (35.3%)	0.26[d]	.000[*]
	7–9 h	7 (3.3%)	3 (17.6%)		
	≥ 10 h	9 (4.2%)	3 (17.6%)		
Self-compassion		13.47 ± 1.85	12.17 ± 1.84	−2.80[a]	.005[*]
	Self-kindness	16.76 ± 3.15	16.00 ± 2.76	−1.11[a]	.268
	Self-criticism	14.85 ± 2.98	13.00 ± 2.35	−2.60[a]	.009[*]
	Common humanity	13.68 ± 2.82	13.71 ± 2.64	−0.11[a]	.915
	Isolation	11.27 ± 2.94	8.71 ± 2.85	−3.42[a]	.001[*]
	Mindfulness	13.51 ± 2.29	13.53 ± 2.65	−0.18[a]	.860
	Overidentification	10.73 ± 2.83	8.06 ± 2.75	−3.42[a]	.001[*]
Resilience		20.05 ± 3.65	17.47 ± 3.08	2.83[e]	.005[*]

[a]Wilcoxon Rank-Sum test.
[b]Chi-square test.
[c]Linear-by-linear association test.
[d]Pearson correlation test.
[e]Independent *t*-test.
[*]Significant when *p* < .05.

long hours of internet gaming per day in last month (Trend Chi-square test, $Z = 15.26$, $p = .000$, $R = 0.26$, $p = .000$), were more likely to be IGD gamers.

For the self-compassion scale, Non-IGD gamers scored higher than IGD gamers in total score (Wilcoxon Rank-Sum test, $Z = -2.80$, $p = .005$) and in the dimensions of self-judgment (Wilcoxon Rank-Sum test, $Z = -2.60$, $p = .009$), isolation (Wilcoxon Rank-Sum test, $Z = -3.42$, $p = .001$), and overidentification (Wilcoxon Rank-Sum test, $Z = -3.42$, $p = .001$). The Non-IGD gamers scored higher than IGD gamers on the resilience scale (t-test, $t = 2.83$, $p = .005$).

The Predictive Model for IGD

After adjusting for no statistical variables (religion and living conditions), the logistic regression results were summarized in Table 4. The initially included variables were age, gender, the years of internet gaming, the hours spent on gaming per day in the last month, self-compassion, and resilience. No multicollinearity was detected among all variables. The final regression model was composed of age ($p = .003$, odds ratio [OR] = 1.39, 95% CI [1.12, 1.74]), gaming hours in the last month ($p < .001$, OR = 3.93, 95% CI [1.91, 8.10]), and self-compassion ($p = .026$, OR = .63, 95% CI [.42, .95]). The regression model explained 38.8% of the variance of IGD.

Discussion

Prevalence of IGD

In this study, the prevalence among university students of Macao was 7.4%, which was higher than 5.2% in Mexica (Borges et al., 2019), lower than 14.9% in Italy (De Pasquale et al., 2018), and comparable to 7.2% in America (Stockdale & Coyne, 2017) and 8.8% among King Saud medical university students (Al Asqah et al., 2020). Before the pandemic, an investigation from the Chinese context showed that the prevalence was 2.9% (Qin et al., 2020) and 5.5% (Shi et al., 2020) among university students. The latest prevalence in 2021 from China was 10.1% in a convenience sample of university students (Yang et al., 2021). Although the prevalence among university students in Macao was not the highest worldwide, a remarkable increase was noticed after the pandemic outbreak. Macao's first COVID-19 case was diagnosed on January 22, 2020. The government required citizens to reduce unnecessary going outside during the four waves of the pandemic and restricted congregation from time to time. The social stress caused by the pandemic may account for the increased IGD prevalence. Canale argued similar views in their survey that high-stress level was a predisposing factor to developing IGD (Canale et al., 2019). Playing internet games helped people relieve loneliness by entertaining and connecting with friends when being restricted at home. In addition, during the worst period of the pandemic, face-to-face teaching was suspended and replaced by virtual mode. University students attended lectures, discussions, and even exams on internet devices. Changes in living and learning styles made university students accustomed to sitting in front of computers or holding smartphones. Students might play games before the class, after the class, and even during the class. This study inferences that reducing face-to-face social interaction and increasing the availability of internet devices upraised the occurrence of IGD.

Considering gaming behaviors, more than half of the participants, including IGD and Non-IGD gamers, claimed they used gaming to escape or relieve negative moods. This finding was in line with Liu's result from a sample of 2,533 male university students (Liu et al., 2022). We

Table 4. Analyses of the Influential Factors for IGD ($n = 229$).

	B	SE	Wald	df	Sig.	Exp(B)	95% CI for Exp (B) Lower	Upper
Age	.33	.11	8.74	1	.003*	1.39	1.12	1.74
Gender	.72	.66	1.20	1	.273	2.06	.57	7.53
Religion	.36	1.34	.07	1	.787	1.43	.11	19.60
Living condition	−.60	.97	.38	1	.536	0.55	.08	3.66
How long have you played internet games?	.26	.35	.55	1	.458	1.29	.66	2.54
How many hours have you spent playing internet gaming per day in the last month?	1.37	.37	13.74	1	<.001**	3.93	1.91	8.10
Self-compassion	−.46	.21	4.92	1	.026*	.63	.42	.95
Resilience	−.04	.11	.16	1	.689	.96	.78	1.18
Constant	−8.17	3.73	4.81	1	.028	.00		

Note. IGD = internet gaming disorder; SE = standard error; df = degrees of freedom.
*Significant when $p < .05$.
**Significant when $p < .001$.

concluded that students used internet games more as a means than as an objective, just like Li et al. (2022) advocated IGD as a maladaptive response to stressful life events. Sixteen percentage students reported lost previous interests. These results implied to educators that identifying and relieving students' negative moods under the threat of COVID-19 and guiding new hobbies, such as doing sports at home or finding more rational methods such as reading books with families, might help prevent IGD. We found that "could not stop" was a common characteristic among participants, with 7.9% unable to stop, 17.5% needing more time for satisfaction, and 11.4% uncontrolled gaming. Educators could suggest that students avoid beginning gaming. There would be no struggles in stopping or controlling if there was no beginning. Educators also should remind students that damaged interactions with others, for example, conflict (14.0%), cheating (5.7%), and lost relationships (8.3%), should be recognized as dangerous alerts for IGD occurrence.

Different Characteristics Between IGD and Non-IGD

Demographic Data. The participants were composed of 207 undergraduates and 22 master's students. We found that the mean age of IGD was older than the Non-IGD group. This result was contrary to Wu's research, which indicated that younger age was a risk factor for IGD (Wu et al., 2018). Wu's sample was 18 to 97 years old, making the result not comparable with the current study. As no other relevant study on the age variable among adults was found, further investigation was needed. Most addictions develop in early adulthood (Macur & Pontes, 2021), so university students who are young adults should not be ignored in preventing IGD.

The prevalence of IGD was 12.0% among male university students, which was very close to the reported 11.6% among 2,533 Chinese male university students in 2022 (Liu et al., 2022). Compared to the prevalence of 4.8% among females, this study confirmed that the male gender was a risk factor for IGD, consistent with previous studies. An investigation of 7,022 Mexican university students showed the prevalence of IGD at 10.2% in males and 1.2% in females (Borges et al., 2019). Al Asqah et al. (2020) reported a prevalence of 10.1% in males and 6.3% in females among medical university students. Similar results were found in a Korean national adolescent sample showing 10.4% and 1.2% prevalence in males and females, respectively (Yu & Cho, 2016). Some reasons probably contributed to the male gender bias. De Pasquale et al. (2018) once argued that the essential characteristics of internet games, such as sports, combative, competitive, and challenging, were more attractive to male gamers. Most gaming companies target male customers. They hired male programmers to design games for men and developed promotion plans which were more attractive to male customers (Chen et al., 2018).

Macao, once a Portugal colonization, was located at the fusion frontier of eastern and western cultures, having a different religious background from Mainland China. It was estimated 84.6% of the population have religions, such as Confucianism, Buddhism, Taoism, Catholicism, Christianity, folk religion, etc. (US Department of State, 2021). Some religious rules might impede the occurrence of IGD. For example, Buddhism emphasizes the acceptance of suffering (Fraleigh, 2020), Confucianism encourages people to practice benevolence (Ding et al., 2022), Daoism assumes loneliness is a good chance to understand Dao and approach to nature (Ding et al., 2022), and Christianity advocates self-discipline (Hill, 2017). However, the results did not show a significant difference in religious beliefs between IGD with Non-IGD gamers. Fourteen participants (6.1%) had religious beliefs, which was far less than the percentage of religious people in the whole population. The low percentage of religious participants might be the reason that the religions did not show the protective effect of IGD.

One research on a sample of 1,490 adolescents argued that parental monitoring predicted a lower occurrence of IGD (Su et al., 2018), implying that participants' living conditions might affect their gaming behavior. Most Macao local university students were not allocated dormitories because the university needed to save the limited dormitories for non-Macao students. Considering our inclusion criteria of university students with Macao citizenship, 89.1% of participants lived with families. The result showed no significant differences in living conditions between IGD with Non-IGD gamers.

This study found that IGD gamers had a longer gaming history than Non-IGD gamers. We found that 82.3% of IGD gamers had more than one decade of gaming history, double the rate of Non-IGD gamers (40.1%). Astonishingly, 99 (43.2%) of the participants have been internet gamers for more than 10 years, growing gaming history accompanied by a high possibility of IGD. Educators should be on high alert that most students have begun to play internet games in their teens. More help should be given to gamers with long gaming history.

The study found that IGD gamers spent more hours per day last month than Non-IGD gamers, the same as Rho's survey of 5,003 respondents showed that IGD gamers had longer weekday gaming time than Non-IGD gamers (Rho et al., 2017). Jeong et al. (2021) identified playing internet games for ≥240 min/day as an independent risk factor for IGD in a population of children and adolescents. The result was also in line with Severo's research, indicating that increased gaming time would increase the possibility of IGD (Severo et al., 2020). Although more gaming time was not destined to have IGD, it was proved to increase the likelihood. More time meant more energy, attention, and even sentimental involvement. This result indicated the importance of cutting off gaming hours. Educators should teach students if internet games were unavoided in their confined

life during the pandemic, the time-control should be carried out strictly.

Self-Compassion. Not every gamer was destined to have IGD, which indicates it did exist some protective factors for IGD. Since one symptom of IGD was continued engagement despite adverse consequences, warning gamers of harmful outcomes might not be strong enough to deter them from gaming. Previous studies confirmed that self-compassion was linked to less psychopathology in ameliorating self-criticism, shame (Atlas, 2022), and social anxiety (Blackie & Kocovski, 2018), and also linked to psychological well-being in increasing social safeness (Akin & Akin, 2015), emotional intelligence (Castilho et al., 2016), and self-determination (Buranasompob et al., 2020). The result of this study indicated that self-compassion served as a protector for IGD.

The first pair of dimensions was self-kindness/self-judgment. The self-kind person tends to treat himself tenderly and considerably, while the self-judged person inclines to blame himself. The IGD gamers scored worse in self-judgment/criticism ($p = .009$) than the Non-IGD gamers. Confronted with stress from the horrifying COVID-19 and adjustment to life and study, behaving unsuitable or making mistakes were unavoided. If a person kept criticizing himself, he was likely more susceptible to negative moods. As mentioned above, most university students use internet games to escape negative moods. So, more self-criticize, worse moods, and finally, more gaming.

The second pair was common humanity/isolation. Common humanity means the acceptance of suffering as the common fate of humanity. Knowing that he was not the only suffering one from the COVID-19 pandemic might make a person feel better. The study found that IGD gamers showed more isolation than Non-IGD gamers ($p = .001$). An isolated person was inclined to cut himself away from others, exaggerating his pains and neglecting others' pain. Although internet games might connect the gamers, the connection was unreal, without feelings exchanged aside from games, not helpful for study and interpersonal relationships. To some degree, internet gaming was a "good" way to isolate the gamer from the surrounding real life.

The third pair was mindfulness/overidentification. When life goes wrong, we often initiate problem-solving or mistake-correcting immediately, ignoring the pains we are suffering and the need to comfort ourselves. Mindfulness was not to ignore mistakes or pains but to watch with tenderness and acceptance, encourage gentleness and patience, and not allow negative feelings to overwhelm oneself (Neff, 2003a). IGD gamers in this study showed a worse status of overidentification (emphasizing suffering) and negative moods ($p = .001$) when the world was shadowed by COVID-19.

Summarily, to our knowledge, this study was the first to demonstrate that self-compassion was a protective predictor of IGD.

Resilience. This study confirmed that Non-IGD gamers showed better resilience than IGD gamers ($p = .005$), although resilience was not included as a significant protective predictor for IGD. Some studies got similar results that resilience was a protector for adults from IGD (Canale et al., 2019; Shin et al., 2019; Wu et al., 2018; Yen et al., 2019), for college students from problematic social networking site usage (Hou et al., 2017), and adolescents from internet addiction (Wisniewski et al., 2015).

Under COVID-19, the uprising ratio of IGD, along with other kinds of addiction, such as alcohol (Stockwell et al., 2021), smoking (Fucito et al., 2022), drug (Tan et al., 2021), and gambling (Bellringer et al., 2021), reflected people's intention to occupy their life with such addictions in lockdown life and to avoid suffering caused by terror from the virus. How resilience helped people to confront adversity positively might be in three steps.

Firstly, it helped people withstand suffering. Resilience was much more than optimism, and blind optimism resulted in disaster in highly adverse situations (Coutu, 2002). Resilient people faced and accepted bad circumstances, avoiding slipping into denial as a coping mechanism. The first step was to learn the knowledge of Covid-19, study the protection techniques, care for the suffering people around the world, and accept society's isolation regulations.

The famous quote, "whatever doesn't kill me makes me stronger" (Nietzsche, 1997) told the truth that despite accepting adversity, adversity had changed us to some degree. The second step was to rebound back and rise from the bottom. We may not step outside the circumstance, but we could rise from the mud of negative moods. For example, we gained emotional stability so did not need excessive internet gaming to gain entertainment or shelter.

Thirdly, the rebound was optimized after the positive adjustments developed (Daly, 2020). Gaining new interests or doing indoor sports could help to spend time, and devotion to being a volunteer could attract the person's focus from himself to others. When people could find or create meaning in lockdown life, the "empty life" did not need the IGD to occupy.

Conclusively, being restricted more, monitored more, and required more because of the pandemic, resilience, as a stress-coping competency, may help individuals respond effectively under such stress-provoking circumstances.

Strengths and Limitation

The study confirmed the increasing rate of IGD and identified the influential factors of IGD by the data from a large sample. The result of this study adopted the cross-sectional design and purposive sampling, which limited generalization to

other regions. Additionally, the data was self-reported, which made the self-report bias unavoided. Finally, although the logistic model was significant, the included variables were limited. Future studies with more comprehensive and representative samples could verify these findings. Considering the complex nature of IGD, more protective factors need to be discussed for a profound understanding of IGD.

Implications for Practice

Under the threat of COVID-19, when face-to-face interactions were reduced to a minimum, educators should guide students to communicate through the internet aside from gaming. Actions should be taken to train students to be self-compassionate and resilient in challenging situations. Individual outdoor sports were also encouraged to make students connect with the authentic world and reduce the time spent on the internet.

Conclusion

In summary, the prevalence of IGD was 7.4% among university students of Macao, which was higher than before the pandemic. University educators should pay more attention to the older, male gender, with longer gaming history, more gaming time, low self-compassion, and low resilience for their high possibility of IGD. The results highlighted that self-compassion and resilience were protective factors for the gaming disorder. Educators should train students' self-compassion and culture their resilience, which would prevent students from IGD.

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References

Akin, U., & Akin, A. (2015). Examining the predictive role of self-compassion on sense of community in Turkish adolescents. *Social Indicators Research*, *123*(1), 29–38. https://doi.org/10.1007/s11205-014-0724-5

Al Asqah, M. I., Al Orainey, A. I., Shukr, M. A., Al Oraini, H. M., & Al Turki, Y. A. (2020). The prevalence of internet gaming disorder among medical students at King Saud University, Riyadh, Saudi Arabia. A cross-sectional study. *Saudi Medical Journal*, *41*(12), 1359–1363. https://doi.org/10.15537/smj.2020.12.05584

Archana, R., Sharma, M., Kumar, K., & Marimuthu, P. (2019). Internet gaming disorder and psychiatric symptoms in Bengaluru, India: Treatment implication for promotion of user mental health. *Indian Journal of Social Psychiatry 35*(2), 135–136. https://doi.org/10.4103/ijsp.ijsp_42_18

Atlas, M. M. (2022).Treating shame in young children with mindfulness: A bibliotherapeutic tool. Database copyright Pro Quest LLC. https://www.proquest.com/docview/2487426586?pq-origsite=primo

Bellringer, M. E., & Garrett, N. (2021). Risk factors for increased online gambling during COVID-19 lockdowns in New Zealand: A longitudinal study. *International Journal of Environmental Research and Public Health 18*(24), 12946. https://doi.org/10.3390/ijerph182412946

Blackie, R. A., & Kocovski, N. L. (2018). Examining the relationships among self-compassion, social anxiety, and post-event processing. *Psychological Reports*, *121*(4), 669–689. https://doi.org/10.1177/0033294117740138

Borges, G., Orozco, R., Benjet, C., Martínez Martínez, K. I., Contreras, E. V., Jiménez Pérez, A. L., et al. (2019). DSM-5 internet gaming disorder among a sample of Mexican first-year college students. *Journal of Behavioral Addictions 8*(4), 714–724. https://doi.org/10.1556/2006.8.2019.62

Buranasompob, P., Chantagul, N., & Santhosh, A. M. (2020). The efficacy of integrated sfbt intervention on self-compassion, self-determination, and solution-focused mindset among high school students in Bangkok, Thailand. *Scholar 12*(1), 144. https://www.proquest.com/docview/2418941189?pq-origsite=gscholar&fromopenview=true

Canale, N., Marino, C., Griffiths, M. D., Scacchi, L., Monaci, M. G., & Vieno, A. (2019). The association between problematic online gaming and perceived stress: The moderating effect of psychological resilience. *Journal of Behavioral Addictions 8*(1), 174–180. https://doi.org/10.1556/2006.8.2019.01

Castilho, P., Carvalho, S. A., Marques, S., & Pinto-Gouveia, J. (2016). Self-compassion and emotional intelligence in adolescence: A multi-group mediational study of the impact of shame memories on depressive symptoms. *Journal of Child and Family Studies 26*(3), 759–768. https://doi.org/10.1007/s10826-016-0613-4

Chen, C., Dai, S., Shi, L., Shen, Y., & Ou, J. (2021). Associations between attention-deficit/hyperactivity disorder and internet gaming disorder symptoms mediated by depressive symptoms and hopelessness among college students. *Neuropsychiatric Disease and Treatment*, *17*, 2775–2782. https://doi.org/10.2147/NDT.S325323

Chen, I., Lee, Z., Dong, X., Gamble, J. H., & Feng, H. (2020). The influence of parenting style and time management tendency on internet gaming disorder among adolescents. *International Journal of Environmental Research and Public Health*, *17*(23), 9120. https://doi.org/10.3390/ijerph17239120

Chen, J., Yan, L., & Zhou, L. (2011). Reliability and validity of Chinese version of self-compassion scale. *Chinese Journal of Clinical Psychology*, *19*(6), 734–736.

Chen, K. H., Oliffe, J. L., & Kelly, M. T. (2018). Internet gaming disorder: An emergent health issue for men. *American Journal of Men's Health*, *12*(4), 1151–1159. https://doi.org/10.1177/1557988318766950

China Internet Network Information Center (2022). The 49th statistical report on internet development in China. http://cnnic.cn/hlwfzyj/hlwxzbg/hlwtjbg/202202/P020220311493378715650.pdf.

Ciccarelli, M., Nigro, G., D'Olimpio, F., Griffiths, M. D., Sacco, M., Pizzini, B., & Cosenza, M. (2022). The associations between loneliness, anxiety, and problematic gaming behavior during the COVID-19 pandemic: The mediating role of mentalization. *Mediterranean Journal of Clinical Psychology*, *10*(1). https://doi.org/10.13129/2282-1619/mjcp-3257

Coutu, D. L. (2002). How resilience works. *Harvard Business Review*, *80*(5), 46.

Daly, L. M. (2020). Resilience: An integrated review. *Nursing Science Quarterly*, *33*(4), 330–338. https://doi.org/10.1177/0894318420943141

Darvesh, N., Radhakrishnan, A., Lachance, C. C., Nincic, V., Sharpe, J. P., Ghassemi, M., Straus, S. E., & Tricco, A. C. (2020). Exploring the prevalence of gaming disorder and internet gaming disorder: A rapid scoping review. *Systematic Reviews*, *9*(1), 68. https://doi.org/10.1186/s13643-020-01329-2

De Pasquale, C., Dinaro, C., & Sciacca, F. (2018). Relationship of internet gaming disorder with dissociative experience in Italian university students. *Annals of General Psychiatry*, *17*(1), 28. https://doi.org/10.1186/s12991-018-0198-y

Ding, X., Shang, B., & Yu, F. (2022). How to Cope with loneliness during the COVID-19 pandemic? Perspectives of Confucianism, Daoism, and Buddhism. *Religions*, *13*(11), 1085. https://doi.org/10.3390/rel13111085

Fraleigh, S. (2020). We are not solid beings: Presence in Butoh, Buddhism, and phenomenology. *Asian Theatre Journal*, *37*(2), 464–489. https://doi.org/10.1353/atj.2020.0037

Freitas, B. H. B. M., Gaíva, M. A. M., Diogo, P. M. J., & Bortolini, J. (2022). Relationship between lifestyle and self-reported smartphone addiction in adolescents in the COVID-19 pandemic: A mixed-methods study. *Journal of Pediatric Nursing*, *65*, 82–90. https://doi.org/10.1016/j.pedn.2022.03.001

Fucito, L. M., Bold, K. W., Cannon, S., Serrantino, A., Marrero, R., & O'Malley, S. S. (2022). Cigarette smoking in response to COVID-19: Examining co-morbid medical conditions and risk perceptions. *International Journal of Environmental Research and Public Health*, *19*(14), 8239. https://doi.org/10.3390/ijerph19148239

Fung, S. (2020). Validity of the brief resilience scale and brief resilient coping scale in a Chinese sample. *International Journal of Environmental Research and Public Health*, *17*(4), 1265. https://doi.org/10.3390/ijerph17041265

Hill, G. (2017). Enchanting self-discipline: Methodical reflexivity and the search for the supernatural in charismatic Christian testimonial practice. *Sociological Theory*, *35*(4), 288–311. https://doi.org/10.1177/0735275117740399

Hou, X., Wang, H., Guo, C., Gaskin, J., Rost, D. H., & Wang, J. (2017). Psychological resilience can help combat the effect of stress on problematic social networking site usage. *Personality and Individual Differences 109*, 61–66. https://doi.org/10.1016/j.paid.2016.12.048

Jeong, H., Yim, H. W., Lee, S., Lee, H. K., Potenza, M. N., & Lee, H. (2021). Factors associated with severity, incidence or persistence of internet gaming disorder in children and adolescents: A 2-year longitudinal study. *Addiction (Abingdon, England)*, *116*(7), 1828–1838. https://doi.org/10.1111/add.15366

Joshi, A., Sharma, K., Sigdel, D., Thapa, T., & Mehta, R. (2022). Internet gaming disorder and aggression among students on school closure during COVID-19 pandemic. *Journal of Nepal Health Research Council*, *20*(1), 41–46. https://doi.org/10.33314/jnhrc.v20i01.3737

Kim, S. M., Huh, H. J., Cho, H., Kwon, M., Choi, J. H., Ahn, H. J., Lee, S. W., & Kim, Y. J. (2014). The effect of depression, impulsivity, and resilience on smartphone addiction in university students. *Journal of Korean Neuropsychiatric Association*, *53*(4), 214–220. https://doi.org/10.4306/jknpa.2014.53.4.214

Krentzman, A. R. (2013). Review of the application of positive psychology to substance use, addiction, and recovery research. *Psychology of Addictive Behaviors: Journal of the Society of Psychologists in Addictive Behaviors*, *27*(1), 151–165. https://doi.org/10.1037/a0029897

Lecardeur, L. (2013). Psychopathologie du jeu multi-joueurs en ligne. *Annales Médico-Psychologiques, Revue Psychiatrique*, *171*(8), 579–586. https://doi.org/10.1016/j.amp.2013.06.011

Lei, W., Liu, K., Zeng, Z., Liang, X., Huang, C., Gong, K., He, W., Xiang, B., Zhang, J., Zheng, X., & Chen, J. (2020). The psychometric properties of the Chinese version internet gaming disorder scale. *Addictive Behaviors*, *106*, Article 106392. https://doi.org/10.1016/j.addbeh.2020.106392

Li, H., Gan, X., Li, X., Zhou, T., Jin, X., & Zhu, C. (2022). Diathesis stress or differential susceptibility? Testing the relationship between stressful life events, neuroticism, and internet gaming disorder among Chinese adolescents. *PLoS One*, *17*(1), Article e0263079. https://doi.org/10.1371/journal.pone.0263079. eCollection 2022

Li, Y. Y., Sun, Y., Meng, S. Q., Bao, Y. P., Cheng, J. L., Chang, X. W., et al. (2021). Internet addiction increases in the general population during COVID-19: Evidence from China. *The American Journal on Addictions*, *30*(4), 389–397. https://doi.org/10.1111/ajad.13156

Liu, F., Deng, H., Zhang, Q., Fang, Q., Liu, B., Yang, D., et al. (2022). Symptoms of internet gaming disorder among male college students in Nanchong, China. *BMC Psychiatry*, *22*(1), 142. https://doi.org/10.1186/s12888-022-03778-6

Liu, L., Xu, X., Xu, N., & Wang, L. (2017). Disease activity, resilience and health-related quality of life in Chinese patients with rheumatoid arthritis: A multi-center, cross-sectional study. *Health and Quality of Life Outcomes*, *15*(1), 149. https://doi.org/10.1186/s12955-017-0725-6

Macur, M., & Pontes, H. M. (2021). Internet gaming disorder in adolescence: Investigating profiles and associated risk factors. *BMC Public Health*, *21*(1), 1–1547. https://doi.org/10.1186/s12889-021-11394-4

Männikkö, N., Billieux, J., & Kääriäinen, M. (2015). Problematic digital gaming behavior and its relation to the psychological, social and physical health of Finnish adolescents and young adults. *Journal of Behavioral Addictions*, *4*(4), 281–288. https://doi.org/10.1556/2006.4.2015.040

Masten, A. S. (2014). Global perspectives on resilience in children and youth. *Child Development*, *85*(1), 6–20. https://doi.org/10.1111/cdev.12205

Neff, K. D. (2003a). The development and validation of a scale to measure self-compassion. *Self and Identity*, *2*(3), 223–250. https://doi.org/10.1080/15298860309027

Neff, K. D. (2003b). Self-Compassion: An alternative conceptualization of a healthy attitude toward oneself. *Self and Identity*, *2*(2), 85–101. https://doi.org/10.1080/15298860309032

Ng, B. D., & Wiemer-Hastings, P. (2005). Addiction to the internet and online gaming. Cyberpsychology & behavior: The impact of the internet. *Multimedia and Virtual Reality on Behavior and Society*, *8*(2), 110–113.

Nietzsche, F. (1997). *Twilight of the idols, or, how to philosophize with the hammer (R. Polt, Trans.).* Hackett.

Örnek, B., & Gündoğmuş, I. (2022). The effects of smartphone and internet gaming addiction on eating attitudes among university students. *Psychiatry Investigation*, *19*(1), 1–8. https://doi.org/10.30773/pi.2021.0230

Phelps, C. L., Paniagua, S. M., Willcockson, I. U., & Potter, J. S. (2018). The relationship between self-compassion and the risk for substance use disorder. *Drug and Alcohol Dependence*, *183*, 78–81. https://doi.org/10.1016/j.drugalcdep.2017.10.026

Pontes, H. M., & Griffiths, M. D. (2015). Measuring DSM-5 internet gaming disorder: Development and validation of a short psychometric scale. *Computers in Human Behavior*, *45*, 137–143. https://doi.org/10.1016/j.chb.2014.12.006

Qin, L., Cheng, L., Hu, M., Liu, Q., Tong, J., Hao, W., et al. (2020). Clarification of the cut-off score for nine-item internet gaming disorder scale-short form (IGDS9-SF) in a Chinese context. *Frontiers in Psychiatry*, *11*, 470. https://doi.org/10.3389/fpsyt.2020.00470

Rasheed, A., Ahsan, S., & Zaheer, S. (2021). Impact of internet gaming disorder on self-appraisal among university students: Moderating role of gender. *Pakistan Journal of Psychological Research 36*(3), 451–471. https://doi.org/10.33824/PJPR.2021.36.3.25

Rho, M. J., Lee, H., Lee, T., Cho, H., Jung, D. J., Kim, D., & Choi, I. Y. (2017). Risk factors for internet gaming disorder: Psychological factors and internet gaming characteristics. *International Journal of Environmental Research and Public Health*, *15*(1), 40. https://doi.org/10.3390/ijerph15010040

Severo, R. B., Soares, J. M., Affonso, J. P., Giusti, D. A., de Souza Junior, A. A., de Figueiredo, V. L., Pinheiro, K. A., & Pontes, H. M. (2020). Prevalence and risk factors for internet gaming disorder. *Brazilian Journal of Psychiatry*, *42*(5), 532–535. https://doi.org/10.1590/1516-4446-2019-0760

She, R., Wong, K., Lin, J., Leung, K., Zhang, Y., & Yang, X. (2021). How COVID-19 stress related to schooling and online learning affects adolescent depression and internet gaming disorder: Testing conservation of resources theory with sex difference. *Journal of Behavioral Addictions*, *10*(4), 953–966. https://doi.org/10.1556/2006.2021.00069

Shi, L., Wang, Y., Yu, H., Wilson, A., Cook, S., Duan, Z., Peng, K., Hu, Z., Ou, J., Duan, S., Yang, Y., Ge, J., Wang, H., Chen, L.,

Zhao, K., & Chen, R. (2020). The relationship between childhood trauma and Internet gaming disorder among college students: A structural equation model. *Journal of Behavioral Addictions*, *9*(1), 175–180. https://doi.org/10.1556/2006.2020.00002

Shin, D., Choi, A. R., Lee, J., Chung, S. J., Kim, B., Park, M., Jung, M. H., Kim, D. J., & Choi, J. (2019). The mediating effects of affect on associations between impulsivity or resilience and internet gaming disorder. *Journal of Clinical Medicine*, *8*(8), 1102. https://doi.org/10.3390/jcm8081102

Stockdale, L., & Coyne, S. (2017). Video game addiction in emerging adulthood: Cross-sectional evidence of pathology in video game addicts as compared to matched healthy controls. *Journal of Affective Disorders*, *225*, 265–272. https://doi.org/10.1016/j.jad.2017.08.045

Stockwell, T., Andreasson, S., Cherpitel, C., Chikritzhs, T., Dangardt, F., Holder, H., Naimi, T., & Sherk, A. (2021). The burden of alcohol on health care during COVID-19. *Drug & Alcohol Review*, *40*(1), 3–7. https://doi.org/10.1111/dar.13143

Su, B., Yu, C., Zhang, W., Su, Q., Zhu, J., & Jiang, Y. (2018). Father–child longitudinal relationship: Parental monitoring and internet gaming disorder in Chinese adolescents. *Frontiers in Psychology*, *9*, 95. https://doi.org/10.3389/fpsyg.2018.00095

Tan, H. T., Chai, B. C., & Lui, Y. S. (2021). Effects of COVID-19 on substance use in Singapore. *Substance Abuse: Research & Treatment 15*, 11782218211030533. https://doi.org/10.1177/11782218211030533. eCollection 2021.

Teng, Z., Griffiths, M. D., Nie, Q., Xiang, G., & Guo, C. (2020). Parent–adolescent attachment and peer attachment associated with internet gaming disorder: A longitudinal study of first-year undergraduate students. *Journal of Behavioral Addictions*, *9*(1), 116–128. https://doi.org/10.1556/2006.2020.00011

Tholl, C., Bickmann, P., Wechsler, K., Froböse, I., & Grieben, C. (2022). Musculoskeletal disorders in video gamers – a systematic review. *BMC Musculoskeletal Disorders*, *23*(1), 1–678. https://doi.org/10.1186/s12891-022-05614-0

US Department of State (2021). 2021 report on international religious freedom: China-Macao. https://www.state.gov/reports/2021-report-on-international-religious-freedom/china/macau/

Wayne, A. W., Parkes, S., & Sweller, N. (2022). Internet gaming disorder: Evidence for a risk and resilience approach. *International Journal of Environmental Research and Public Health*, *19*(9), 5587. https://doi.org/10.3390/ijerph19095587

Wisniewski, P., Jia, H., Wang, N., Zheng, S., Xu, H., Rosson, M. B., & Carroll, J. (2015). Resilience mitigates the negative effects of adolescent internet addiction and online risk exposure. In *CHI'15: Proceedings of the 33rd annual ACM conference on human factors in computing systems* (pp. 4029–4038). Association for Computing Machinery.

Wong, H., Mo, H., Potenza, M., Chan, M., Lau, W., Chui, T., & Lin, C. (2020). Relationships between severity of internet gaming disorder, severity of problematic social media use, sleep quality and psychological distress. *International Journal of Environmental Research and Public Health*, *17*(6), 1879. https://doi.org/10.3390/ijerph17061879

World Health Organization (2013). 6C51 Gaming disorder. https://icd.who.int/browse11/l-m/en#/http%3a%2f%2fid.who.int%2ficd%2fentity%2f1448597234

Wu, A. M. S., Chen, J. H., Tong, K., Yu, S., & Lau, J. T. F. (2018). Prevalence and associated factors of internet gaming disorder

among community dwelling adults in Macao, China. *Journal of Behavioral Addictions*, *7*(1), 62–69. https://doi.org/10.1556/2006.7.2018.12

Yang, X., Jiang, X., Mo, P. K., Cai, Y., Ma, L., & Lau, J. T. (2020). Prevalence and interpersonal correlates of internet gaming disorders among Chinese adolescents. *International Journal of Environmental Research and Public Health*, *17*(2), 579. https://doi.org/10.3390/ijerph17020579

Yang, X., Wong, K. M., She, R., Zhao, C., Ding, N., Xu, H., Tu, X., Lai, X., & Zhang, G. (2021). Relationship between illness representations and symptoms of internet gaming disorder among young people: Cross-lagged model. *JMIR Serious Games*, *9*(4), e28117. https://doi.org/10.2196/28117

Yen, J., Lin, H., Chou, W., Liu, T., & Ko, C. (2019). Associations among resilience, stress, depression, and internet gaming disorder in young adults. *International Journal of Environmental Research and Public Health*, *16*(17), 3181. https://doi.org/10.3390/ijerph16173181

Yu, H. s., & Cho, J. (2016). Prevalence of internet gaming disorder among Korean adolescents and associations with non-psychotic psychological symptoms, and physical aggression. *American Journal of Health Behavior*, *40*(6), 705–716. https://doi.org/10.5993/AJHB.40.6.3

Zeliha, T. (2019). Internet addiction and loneliness as predictors of internet gaming disorder in adolescents. *Educational Research and Reviews*, *14*(13), 465–473. https://doi.org/10.5897/ERR2019.3768