

ORIGINAL ARTICLE

**PREVALENCE OF SLEEP PROBLEMS AMONG THOSE
WITH INTERNET GAMING DISORDER IN SINGAPORE**

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Abstract

Objectives: Internet gaming disorder (IGD) involves the excessive use of Internet games that can cause negative consequences like sleep problems, psychological distress, depression and anxiety. It is widely assumed that IGD is closely related with sleep problems, but studies on the topic are scant. Our study aims to explore the association between IGD and sleep problems. **Methods:** A total of 1085 participants, aged 13-40 years old reported playing Internet games in this self-administered, web-based survey. The instruments used for the study were socio-demographic questions, IGD Questionnaire, Life Satisfaction Scale, General Health Questionnaire-12 and Insomnia Severity Index. The cut-off point of 10 and above was used to establish the prevalence of sleep problems in this study. Logistic regression analysis was used to explore the association between socio-demographic factors, IGD and sleep problems. **Results:** The prevalence of sleep problems among those with IGD was 28.2%. Female online gamers (adjusted odds ratio, OR=0.7, 95% confidence interval (CI) = 0.5-0.9) were more likely to have sleep problems than males. Participants with secondary education (adjusted OR=1.9, 95% CI=1.2-3.0) and post-secondary education (adjusted OR=2.7, 95% CI= 1.2-6.0) were more likely to have sleep problems than those who had completed university. Participants with DSM-5 IGD were more likely to have sleep problems. Psychological distress (adjusted OR 4.8, 95% CI=3.6-6.7) and life satisfaction ($B = -3.1$, 95% CI= -4.0 to -2.2) was associated with sleep problems. **Conclusion:** Prevalence of sleep problems with IGD is higher among female gamers and is associated with increased psychological distress and decreased life satisfaction. Integrated health management is needed to promote good sleep hygiene among those diagnosed with IGD. *ASEAN Journal of Psychiatry, Vol. 17 (1): July – December 2016: XX XX.*

Keywords: Internet Gaming Disorder, Sleep Problems, Internet Survey, Psychological Distress, Education Status

Introduction

Internet gaming, also known as online gaming, is an increasingly prevalent activity among children, adolescents and adults that could influence several areas of emotional, cognitive and behavioural functioning. Online games are played on a computer network, typically on

the Internet and the individuals playing such games are known as on-line gamers or Internet gamers. Most users enjoy these games as a form of recreation whereas for some it could lead to problematic use. Research on gaming addiction dates back to 1983 [1], but these studies as well as those conducted recently have suffered from lack of comparability due

to use of non-standardized diagnostic criteria, different terminologies (online gaming addiction, problematic gaming, etc), diverse study samples and instruments as well as varying cut-offs for diagnosis. The inclusion of Internet Gaming Disorder (IGD) in the Diagnostic and Statistical Manual of Mental Disorders -5 (DSM-5) [2] is a step towards ensuring the development of standardized diagnostic criteria and instruments to evaluate the phenomenon comprehensively.

IGD is characterized by an excessive use of computers or other devices like smartphones, tablet, personal computers etc. for online gaming, to an extent that other activities of daily life are severely compromised [3]. With an estimated prevalence ranging from 1 to 10% among adolescents [3], IGD [2] is a relatively frequent phenomenon that can lead to severe functional impairment and distress. A growing number of studies indicate that IGD is associated with various negative physical [4,5] and psychological consequences like problems with sleeping [6,7], sacrificing real-life relationships, work, education [8-15] and socializing [16]. But currently there is insufficient experimental evidence about how extended internet gaming may affect sleep patterns leading to compromised daily life activities in an individual with IGD.

Sleep disorders cause significant interference with normal physical, mental, social and emotional functioning. Inadequate or non-restorative sleep can markedly impair a person's quality of life [17]. While the Internet has increasingly become an important academic tool, students can experience significant academic problems because they surf irrelevant web sites, engage in chat room gossip and play interactive internet games at the cost of productive activity [18]. Engaged in these various online activities, many may stay up most or all of the night, leading to progressive lack of sleep. Students have difficulty completing homework assignments, studying for exams resulting in poor grades, academic probation and expulsion due to sleep deprivation caused by prolonged internet use [19]. Research has shown that sleep deprivation also causes fatigue, drowsy driving, contributes to weight gain due to sedentary act of prolonged computer use, loneliness, low well-being¹⁶ and can deepen

feelings of depression [20]. Sleep disturbances can also be the first step towards depression and is also a diagnostic criterion for depression [21].

A recent study examined the relationship between Internet overuse, ie. excessive computer use which interferes with daily life and sleep problem showed that the prevalence of insomnia, excessive daytime sleepiness, witnessed snoring, sleep apnea, teeth grinding, and nightmares was highest among individuals with Internet addiction [22]. A systematic review suggested that Internet gaming addiction and problematic Internet use was associated with sleep problems like subjective insomnia and poor sleep quality [15]. The scientific evidence pertaining to a linkage between Internet gaming addiction and sleep problems is not well established in the Singapore population. Thus, the aim of our study was to establish the prevalence and socio- demographic correlates of sleep problems and explore its association with psychological distress and satisfaction, among those responding to an Internet-based survey that explored the phenomenon of Internet gaming conducted in Singapore. We hypothesized that those with IGD will have a higher risk of sleep problems.

Methods

Participants

A cross sectional web based study was administered to 1251 Singapore residents aged 13-40 years of age [23]. From the total number of responses, 15 were eliminated as the data was judged to be unreliable due to duplicate entries and some of the participants were aged more than 40 (upper limit of inclusion criteria). The investigators adopted two recruitment strategies – first, through advertisement using printed flyers which were distributed to games retail stores, and secondly, through creating awareness by posting the flyer digitally on social media platforms and various gaming forums. Individuals were asked to indicate their willingness to participate through an online consent form. Verification of the IP addresses of the respondents was also done to avoid multiple responses by same respondent. Upon completing the survey, respondents were

given an inconvenience fee of SGD \$20 (equivalent to 14.94 US Dollar) in the form of a voucher²³. Participants were able to start and proceed with the online survey only after they completed the informed consent. The consent from all the research participants including children/minors was obtained online. Online informed consent was not obtained from the next of kin, caretakers or guardians on behalf of minors or children enrolled in our study. Confidentiality of the research participants was maintained as no identifiers were collected at any point of the survey.

Ethical Requirements

All study procedures and materials were approved by the relevant ethics and institutional review boards: the National Health Group (NHG) Domain Specific Review Board (DSRB) and the Institute of Mental Health (IMH) Clinical Research Committee (CRC).

Procedure

The participants were administered an online questionnaire which was designed using Questionpro, an online survey tool. The inclusion criteria comprised those residing in Singapore when the survey was conducted, aged between 13 to 40 years, able to read and understand English and current internet users. The study was largely targeted at adolescents and young adults (15 to 39 years)³² who are internet savvy and consumers of internet games. To be more inclusive, the lower age limit was set at 13 years to include those who had at least completed primary school (to ensure a better understanding of the research procedures and the survey) and the upper age limit was set at 40 years. The web survey consisted of 8 sections comprising 105 questions and on an average took 10-15 minutes to complete. The data collected was downloaded from Questionpro into SPSS data file format. Multiple linear and logistic regression analysis was used to explore the association between IGD and sleep problems.

Measurements

Socio-demographic variables such as age, gender, nationality, ethnicity, education level and employment status among the participants

playing Internet games were captured. The 9-item Internet Gaming Disorder Questionnaire [12] was used to assess IGD. The questionnaire was developed such that each item is intended to reflect a Diagnostic and Statistical Manual of Mental Disorders - 5 (DSM-5) [2] criteria for IGD in whole. Each question was answered as a Yes/ No and related to the past 12-months, with affirmative responses to any item indicative of meeting the criterion. The proposed cut-off point of 5 criteria is the threshold for a DSM-5 diagnosis of IGD. The internal consistency reliability of the scale assessed by Cronbach's alpha coefficient in this sample was 0.725.

The 7-item Insomnia Severity Index (ISI) [24,25] was used to assess the severity of both night time and daytime components of insomnia over the past two weeks. The ISI consists of seven domains with one item each assessing severity of sleep-onset, sleep maintenance, early morning awakening problems, sleep dissatisfaction, interference of sleep difficulties with daytime functioning, noticeability of sleep problems by others and distress caused by the sleep difficulties. Each item is scored from "0" to "4", with higher scores indicating greater insomnia severity. Scores are summed to determine a total score, which ranges from 0 to 28. Total scores are interpreted as 0-7 for no clinically significant insomnia, 8-14 for sub threshold insomnia, 15-21 for clinical insomnia (moderate severity) and 22-28 for clinical insomnia (severe) [24]. The ISI has a high internal consistency with a Cronbach's alpha of $\alpha = 0.90$ and individual items were highly correlated with scores ranged from 0.55 to 0.81 (mean 0.71). ISI has a sensitivity of 86.1% and specificity of 87.7% for detecting insomnia in a community sample [24] with a cut-off point of 10. This cut-off point was used to establish the prevalence of sleep problems in this study.

The General Health Questionnaire (GHQ-12) [26] is a self-administered screening questionnaire, aimed at detecting individuals with a diagnosable psychiatric disorder [27]. Its brevity makes it attractive for use in Internet surveys. The validity of this instrument has been demonstrated in previous studies in Singapore [28, 29]. A cut-off score of 3 and above was considered indicative of psychological distress in the study.

The Satisfaction with Life Scale (SLS) [30] is 5-item scale designed to measure global cognitive judgments of one's life satisfaction (not a measure of either positive or negative affect). Participants indicated how much they agree or disagree with each of the 5 items using a 7-point scale that ranged from 7=strongly agree to 1=strongly disagree. Higher scores indicate greater satisfaction with life.

The statistical analyses of the survey data were done using the Statistical Analysis Software (SAS) System version 9 [31]. Descriptive statistics were used to describe the prevalence of the sleep problem among online gamers and by socio-demographic characteristics. The data was summarized as mean and standard deviations for continuous variables, and as percentage and frequencies for categorical

variables. Logistic regression analyses were used for socio-demographic correlates of sleep problem and also to examine the correlation between sleep problem with IGD, psychological distress and life satisfaction. Psychological distress was also measured using univariate analysis. Significant differences were identified by P values ≤ 0.05 .

Results

Of the 1236 who participated in the study, 1085 (87.8%) reported ever playing internet games Table 1 shows the socio-demographic characteristics of the sample. The average age was 23.7 years (SD= 5.3) and the sample consisted of more males (55.5%). The prevalence of a sleep problem among online gamers was 28.2%.

Table 1. Socio-demographic characteristics of the sample

Variable		n	%
Age	Mean, SD	23.7	5.3
Sex	Female	550	44.5
	Male	686	55.5
Nationality	Singapore Citizen	1172	94.8
	Permanent Resident	64	5.2
Ethnicity	Chinese	1153	93.3
	Malay	52	4.2
	Indian	23	1.9
	Others	8	0.6
Education Level (Completed)	Primary Education	29	2.3
	Secondary	28	2.3
	'O' ⁺ / 'N' ⁺⁺ level	209	16.9
	'A' ⁺⁺⁺ level	191	15.5
	Polytechnic and other diploma	345	27.9
	University	406	32.8
Employment	ITE	28	2.3
	Student	636	51.5
	Employed	543	43.9
	Unemployed	45	3.6
Ever play Internet games	Housewife/husband	12	1.0
	Never	150	12.1
	Yes	1085	87.9

⁺GCE 'O' level – Equivalent to Grade 10/secondary education; ⁺⁺GCE 'N' level – Exams taken after 4 years of secondary education; ⁺⁺⁺GCE 'A' level – Equivalent to Grade 12/ Pre- University education; ITE - Institute of Technical Education/Vocational Education/ Post- secondary education University- Higher education

As shown in Table 2, the socio-demographic correlates of sleep problems among on-line gamers showed that males (OR=0.7) were less likely to have sleep problems than females. Those with ‘O’/ ‘N’ levels (Equivalent to Grade 10 or Cambridge O Level, equivalent to Cambridge International General Certificate of Secondary Education and the UK General Certificate of Secondary Education) (OR=1.9)

and Institute of Technical Education (ITE, equivalent to vocational education) holders (OR=2.7) were more likely to have sleep problems than University degree holders. The results also indicated that those with DSM-5 IGD were more likely (3.2 times) to have sleep problems ($p < 0.0001$).

Table 2. Socio-demographic correlates of sleep problems among online gamers

Variable	Odds Ratio*	95% (CI)	p value
Age	1.02	(1.0,1.1)	0.33
Sex			
Male	0.73	(0.5,0.9)	0.03
Female	Reference		
Nationality			
Permanent Residents	1.66	(0.9,3.1)	0.12
Singapore citizen	Reference		
Ethnicity			
Malay	1.23	(0.6,2.5)	0.57
Indian	2.05	(0.8,5.2)	0.13
Other	1.21	(0.2,6.8)	0.83
Chinese	Reference		
Education Level (Completed)			
Primary Education	1.75	(0.7,4.5)	0.24
Secondary	1.15	(0.4,3.2)	0.79
‘O’ ⁺ / ‘N’ ⁺⁺ level	1.86	(1.2,3.0)	0.01
‘A’ ⁺⁺⁺ level	0.97	(0.6,1.6)	0.90
Polytechnic and other diploma	1.31	(0.9,1.9)	0.17
ITE	2.65	(1.2,6.0)	0.02
University	Reference		
Employment			
Student	1.19	(0.5,2.7)	0.67
Employed	0.81	(0.4,1.8)	0.61
Housewife/husband	0.38	(0.03,4.3)	0.44
Unemployed	Reference		
DSM- 5 IGD	3.18	(2.3,4.5)	<0.0001

Note: *Odds ratio was derived using multiple logistic regression analysis. CI = confidence interval

⁺GCE ‘O’ level – Equivalent to Grade 10/secondary education

⁺⁺GCE ‘N’ level – Exams taken after 4 years of secondary education

⁺⁺⁺GCE ‘A’ level – Equivalent to Grade 12/ Pre- University education

ITE - Institute of Technical Education/Vocational Education/ Post- secondary education

University-Higher education

However, gender and education showed no significant correlation to ISI severity based on

the four severity rating categories. Table 3 shows the relationship between sleep problems

and psychological distress, indicating that those with sleep problems had higher rates of psychological distress than those without sleep problems (47.2% vs 15.8%, $p < 0.001$). The results from logistic regression after adjusting for socio-demographic correlates showed that the participants with sleep problems (OR=4.8) were more likely to have psychological distress than those without sleep problems

(Table 3). The mean SLS scores, as shown in Table 3, were lower among those with sleep problems than those without sleep problems (21.5 vs 18.3, p value < 0.001). After adjusting for socio-demographic factors in multiple linear regression analysis, the relationship between sleep problems and lower satisfaction with life remained significant (B = -3.1, 95% CI -4.0 to -2.2) (Table 3).

Table 3. Correlation between Sleep Problems and Psychological Distress and Life Satisfaction

		Sleep problem							
		Yes		No		OR*	95% CI		P value
		n	%	n	%				
Psychological Distress	No	123	15.8	655	84.2	Reference			
	Yes	144	47.2	161	52.8	4.8	3.6	6.7	<0.0001
Life Satisfaction		Mean	SD	Mean	SD	Beta coefficient**	95% CI		P value
		18.3	6.4	21.6	6.9	-3.1	-4.0	-2.2	<0.0001

OR = odds ratio; CI = confidence interval, SD = standard deviation] Odds ratio* was derived using multiple logistic regression adjusting for socio-demographic characteristics whilst beta coefficient** was derived using multiple linear regression adjusting for socio-demographic characteristic

It was observed that those with IGD diagnosis were more likely to have moderate severity of

the sleep problems than without IGD diagnosis (Figure 1).

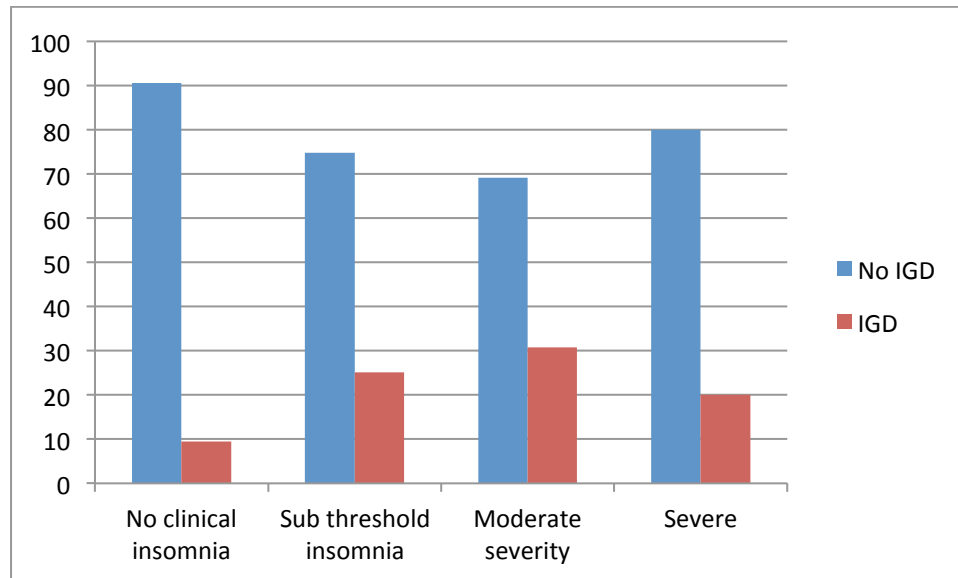


Figure 1. Significant relationship between DSM-5's Internet Gaming Disorder (IGD) diagnosis and severity of sleep problem: severity of sleep on x- axis and IGD diagnosis on y-axis

Discussion

The prevalence of sleep problems established by our study among internet gamers in Singapore was 28.2%. The significant risk factors for sleep problems were female gender, those with secondary (GCE 'O', 'N' Levels), pre-university (GCE 'A' levels), post-secondary (ITE, Junior college, Polytechnic) education and those with DSM-5 IGD. It was also observed that internet gamers with sleep problems had higher rates of psychological distress and had lower satisfaction.

Many previous studies [7,32] provide evidence that internet gaming causes clinically significant sleep disruption. According to Buysse et al's study (2006) [33] sleep efficiency is reduced to below 85 % (the established clinical cut-off used to indicate sleep disruption) due to prolonged internet gaming. Another study suggests that internet gaming or video-gaming activity causes sleep disruption by delaying bed time, and causing clinically significant reduction in sleep time [9]. The findings of our study appear to support previous research as those with IGD tend to spend significantly more time gaming than those without IGD [23] and thus, are more likely to experience sleep problems as is the case in our sample.

The adverse effects of sleep problems are multifaceted. One study suggests that sleep problems play a key role in the pathophysiology of type 2 diabetes, hypertension, dyslipidaemia and premature aging [34], and may be a causative factor for a wide range of health problems such as cardiovascular diseases, obesity, depression, anxiety, fatigue and cognitive impairment [35, 36]. Dewald et al's study (2010) [37] inferred that IGD may produce cognitive deficits associated with chronic sleep reduction. Thus, while internet gaming may not be a direct cause of these health issues, it may exacerbate these issues by increasing the risk of sleep problems in gamers.

The finding of this present study that females are at higher risk of suffering from sleep problems is consistent with those from others [38 – 40]. A study [41] reported that women are usually 1.4 times more likely to have sleep problems than men which could be due to

women being more vulnerable to depression, anxiety and psychological distress. While other studies showed that female on-line gamers had shorter duration of on-line gaming, they tend to have more severe somatic, pain and anxiety symptoms as compared to male players [7, 30]. The results from various studies [7,14,23,30] indicate that females tend to engage in on-line gaming to cope with depression, somatic symptoms, anxiety for which they increase amount of time spent gaming. This behaviour disturbs healthy sleep habits and accelerates the development of sleep problems [23].

In this cross-sectional study, education level was one of the risk factors identified. Majority (51%) of the participants were students belonging to younger age group. We observed that gamers who had only completed basic levels (secondary, pre-university, post-secondary) of education were at higher risk of having sleep problems than those with higher education. This result may be ascribed to the fact that as the gamers belong to younger age group their education levels are also lower levels, corresponding to their age. The extant literature is conflicting: a study [42] suggests that sleep problems are more common among those who have completed basic education while other studies [40,41,43] indicate that those with higher education level are at greater risk of sleep problem. A study [44] suggests that on-line gaming addiction is one of the challenges to good sleep hygiene among students. But to date, research exploring the pattern between sleep problems, IGD and education level is sparse and has not been consistent.

Our results showed a significant association between IGD and sleep problems, supporting our hypothesis. This finding is consistent with the findings of Achab et al. (2011) [45] who reported that those with IGD had higher rates of sleep problems, irritability and low mood. A study [46] reported that on-line gamers had a tendency to play continuously for long hours, causing loss of sleep and other negative consequences such as academic failure, health problems and problems with inter-personal relationships.

The current study also demonstrated an association between IGD and psychological

distress and life satisfaction. Psychological distress as measured by GHQ-12, was higher among those diagnosed with IGD and sleep problems. These findings were similar to Wenzel et al.'s study (2009) [47] which showed a higher prevalence of sleep problems and negative consequences such as depression, anxiety, suicide ideations among adult gamers. Systematic reviews [48,49] have indicated that sleep problems are a major risk factor for development of depression and anxiety disorders.

Life satisfaction as measured by Satisfaction with Life Scale revealed that the mean satisfaction score was significantly lower among those diagnosed with IGD and sleep problems. A study postulated that lower satisfaction with daily life is associated with a greater severity of Internet gaming addiction [50] while another [51] showed a significant negative relationship between life satisfaction and problematic game use. The data reported by a number of studies [52,53] suggests significant negative correlation between satisfaction with life and sleep.

Strengths and limitations

There are a few limitations in our study. As we used the snowballing method or convenience sampling, the participants in our sample pool may share general similarities in socio-demographic backgrounds [23] and thus the study may not be representative of Singapore's population of gamers. The sample was self-selected, which might affect generalizability of the findings. Being a self-administered on-line survey, clinical validation through clinician's assessment was impossible. However, other studies that used such self-administered on-line questionnaires have reported this method as acceptable [14]. There is also the possibility of respondents giving socially acceptable answers but the assurance of data anonymity and use of on-line administration as compared to a face-to-face interview make this less likely. Results of a previous study showed that self-diagnosis correlates with standardized measures of addiction, and that individual's perception of problems can be relatively accurate [54].

To the best of our knowledge, this is the first study to investigate sleep problems among

those diagnosed with IGD and its association with psychological distress and life satisfaction. The study sample size is large, and collection of good-quality data ensures the reliability to the findings. Implications for treatment would suggest that sleep hygiene must be encouraged in those seeking treatments for IGD and also the clinicians treating those with sleep problems may also need to consider whether excessive gaming is aggravating their patients' sleep problems.

Conclusion

The present study found that those with IGD and sleep problems had higher incidence of negative consequences like psychological distress and lower life satisfaction. The presence and extent of on-line gaming should also be part of the assessment for any patient presenting with depression or anxiety. These findings would also be helpful while devising future strategies to address the problem as well as improve psychological and social well-being among those with IGD. Future studies that include additional face-to-face interviewing, and clinical diagnosis are required to further validate these findings.

Acknowledgments

The study was supported by funding from National Medical Research Council (NMRC) Centre Grant.

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Received: 3 May 2016

Accepted: 4 November 2016