THE ASSOCIATED FACTORS WITH INTERNET GAMING DISORDER OF CHILDREN AND ADOLESCENTS IN LOWER-MIDDLE-INCOME AND UPPER-MIDDLE-INCOME ECONOMIES: A SYSTEMATIC REVIEW

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While there is an increasing number of studies about gaming, systematic reviews of factors relating to Internet Gaming Disorder (IGD) of children and adolescents are still limited. Therefore, this review aimed to provide a synopsis of research which has described several factors associated with IGD in children and adolescents in lower-middle-income and upper-middle-income economies. We systematically reviewed the databases PUBMED, EMBASE, and Web of Science with all of the studies were conducted and published until December 2019. The extracted data included specific details about the study (authors, year, location, economic state, and study design), sample characteristics (sample size, age range, gender), the prevalence of IGD (%), related factors, and tools. Five prospective studies were identified. The results showed that the prevalence of IGD in upper-middle-income countries was significantly lower than reports from high-income countries in the world, and no selected articles described lower-middle-income countries. There were three main factor groups associated with increases and decreases in the prevalence of internet gaming disorder: psychological factors, social support, and attractive games. These findings are a step towards accurately diagnosing and preventing IGD.

Keywords: systematic review, internet gaming disorder, lower-middle-income, upper-middle-income, children, adolescents

I. INTRODUCTION

Within the past decade, researchers have examined the negative effects of internet and video game addiction. Serious gaming interventions may be effective in reducing disorder-related symptoms.¹ Internet Gaming Disorder (IGD) is associated with both functional and structural neural alterations in front-striatal and front cingulate regions.² Furthermore, it

Corresponding author: Dinh Thai Son, Institute for Preventive Medicine and Public Health, Hanoi Medical University Email: dinhthaison@hmu.edu.vn Received: 22/01/2020 Accepted: 04/03/2020 has been possible to establish a series of links between video games and attention, cognitive control, visuospatial skills, cognitive workload, and reward processing.³

Internet Gaming Disorder is a relatively new issue in the world. In 2014, D. J. Kuss and colleagues reported prevalence of IGD rates ranging from 0.8% in Italy to 26.7% in Hong Kong.⁴ And in 2017, after reviewing 50 studies, Satoko Mihara and Susumu Higuchi found that the prevalence of IGD in the total samples ranged from 0.7% to 27.5%.⁵ In 2018, Frank W Paulus and colleagues, after reviewing 252 references, reported a median IGD

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prevalence of 5.5% and a median of 2.0% for population-based in children and adolescents, respectively.⁶

Internet use and computer game playing are becoming common activities in children and adolescent populations. In America, the time spent for the recreational use of various electronic media (for example, mobile phones and computers) in children from 8 to 10 years old were about 8 hours per day; adolescents used devices more than 11 hours per day.^{7,8} Furthermore, in 2009, Guy Porter et al. figured out that 0.08% of subjects aged 14 to 19 years old had a problem with videogame use.⁹

In 2018, the World Health Organization (WHO) announced that in the 11th Revision of the International Classification of Diseases (ICD-11), gaming disorder was defined as a new addictive behavior disorder, a pattern of gaming behavior ("digital-gaming" or "videogaming") characterized by impaired control over gaming, increasing priority given to gaming over other daily activities, and continuation of gaming in spite of the occurrence of negative consequences.¹⁰ Moreover, according to the American Psychiatric Association (APA, 2013), in the fifth edition of the Diagnostic and

Statistical Manual of Mental Disorders (DSM-5), Internet Gaming Disorder was identified as a "Condition for Further Study". The DSM-5 noted that persistent and recurrent use of the Internet to engage in games, often with other players, must cause "significant impairment or distress" in several aspects of a person's life. Furthermore, Internet Gaming Disorder was announced as a mental disorder; people with this condition endanger their academic or job functioning because of the amount of time they spend playing; its consequences can more greatly affect young people and their families.¹¹

Despite the increasing number of studies about gaming, systematic reviews of factors relating to internet gaming disorder of children and adolescents in lower-middle-income and upper-middle-income economies are still limited. Therefore, this systematic review aimed to provide a synopsis of describing the several associated factors with Internet Gaming Disorder of children and adolescents in lowermiddle-income and upper-middle-income economies.

II. METHODS

1. Search strategy





To conduct this study, there were three key questions:

1- What is the prevalence of internet gaming disorder of children and adolescents in lower-

middle-income and upper-middle-income economies?

2- What measurement tools were used to assess internet gaming disorder of children and adolescents in lower-middle-income and uppermiddle-income economies?

3- What are the several associated factors with internet gaming disorder of children and adolescents in lower-middle-income and upper-middle-income economies?

Criteria for including studies

The following criteria were used to determine whether a study would be included in the review for purposes of estimating the associated factors with IGD of children and adolescents in lower-middle-income and upper-middle-income economies (PICOTS):¹²

P - Population: Children and adolescents in lower-middle-income and upper-middle-income economies (age ≤ 18 years old or studies that reported a mean age of ≤ 18 years old).

I - Intervention: The subjects of included studies must have been diagnosed with an internet gaming disorder by a reliable validity tool.

C - Comparison: No comparison was needed.

O - Outcome: The several associated factors with IGD.

T - Time: Any studies that were conducted and published before December 2019.

S - Study design: Quantitative and qualitative cross-sectional descriptive studies.

Moreover, some additional selection criteria were as follows:

- The studies were written in English and had full-text availability

- Published as an original paper but not as a review or case report

- Investigation of bio-psychosocial characteristics in minors with IGD

Literature search: The following search terms were entered into each database:

["children" OR "adolescents"] AND ["game" OR "gaming" OR "internet" OR "computer games" OR "video games" OR "online games" OR "internet games"] AND ["addiction" OR "problem" OR "problematic" OR "disorder" OR "problem gaming" OR "excessive" OR "associated factors" OR "prevalence"].

Databases: PUBMED, EMBASE, and Web of Science articles conducted and published before December 2019 were searched electronically. Grey literacy articles were searched. The selected studies were written in English only.

2. Data extraction

This study was conducted according to the structured Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines for systematic reviews and meta-analyses.¹³

Studies were only considered if they were quantitative and/or qualitative cross-sectional studies using ≤18 years of age as the cut-off for the follow-up of children and adolescents. The full-text articles were screened and independently selected for inclusion in this review by two independent reviewers in detail based on specific eligibility criteria. Any disagreements that arise between the reviewers at each stage of the study selection process will be resolved through discussion, or with a third reviewer.

Exclusion criteria was applied to full-text studies: studies of low-income and high-income economies, adult populations, offline games, and IGD were excluded.

The extracted data included specific details about the study (authors, year, location, economic state and study design), sample characteristics (sample size, age range, gender), the prevalence of IGD (%), related factors, measurement tools.

III. RESULTS

The PRISMA flowchart indicates 5 studies met eligibility criteria after careful screening (Figure 2). All of the results of these studies belonged to upper-middle-income economies, especially after having all selected studies focused on the Asia region (Conducted in China and Iran).



Figure 2. PRISMA flowchart for study inclusion

Our review reported 3 types of study design, which included qualitative study (1), longitudinal design (1), and cross-sectional (3). The qualitative study's purpose was to explore the Attractive Features of Active Videogames (AVGs) that affect a subject's preference through a semi-structured focus interview.14 The study which used a longitudinal design tested stage-environment fit theory empirically in problematic online game use (POGU) and reported on teacher autonomy support, basic needs satisfaction, psychological school engagement, and POGU.¹⁵ The remaining studies used a cross-sectional methodology to investigate the prevalence of computer game and video addiction as well as decision-making

intentions about online gaming and sensationseeking influence of online gaming.^{16–18}

There was a total of 2303 children and adolescents (males and females) from all five final studies, with the mean age of this sample size being 13.86 years (ranging from 9 to 17 years old), approximately with the mean age of Yu C et al. 2015 (M = 14.83, SD = 0.49, range 13.83 - 16.17 years).¹⁵ The gender ratio of males to females in this review was approximately 1.3. Some interesting points are that in Hu J et al. 2017, which recruited only male adolescents and only primary school children between 9 and 12 years old, no other study reported about gender in the Chinese studies (Lau PWC et al. 2017).^{14,16}

Authors, Year	Location	Economic state	Study design	Sample size	Age Range/Mean age	Gender (Male/ Female)	Measurement Tools
Lau PWC et al. 2017 ¹⁴	China	Upper middle income	Qualitative	22	9 and 12 years		 The interview questions (self- development)
Yu C et al. 2015 ¹⁵	China	Upper middle income	Longitudinal	356	14.83 years (SD = 0.49, range 13.83 –16.17 years)	58.99% Female (n = 210) Male (n = 146)	 (1) a 5-item questionnaire developed by Jia et al (2) Gagné's 21-item (3) Zhang et al.'s scale (4) 11 items adapted from Gentile's Pathological Video Game Use Questionnaire (5) Rosenberg Self-Esteem Scale
Hu J et al. 2017¹ ⁶	China	Upper middle income	Cross- sectional	375	Mean age = 16.02 years, SD = 0.85	Only 375 male adolescents	 (1) a short form of sensation seeking scale (2) the Barratt Impulsiveness Scale, Version 11 (3) the affect pool measure developed by Peters and Slovic (1996) (4) the Revised Chinese Internet Addiction Scale (CIAS)
Jia Wang et al. 2017 ¹⁷	China	Upper middle income	Cross- sectional	230	Mage = 11 years	Male (n = 268) Female (n = 262)	The theory of planned behavior (TPB) (1) Attitude = Lee and Tsai's (2010) three- item measure (2) Perceived behavioral control = five items adapted from Lee and Tsai (2010) and Aboelmaged and Gebba (2013)
Jamshid Ahmadi MD et al. 2014 ¹⁸	Iran	Upper middle income	Cross- sectional	1020	15-17 years	Male (n = 510) Female (n = 510)	(1) Demographic Variables Form (Self- development)(2) DSM-IV criteria

Table 1. Summary of studies: Personal Characteristics

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These five studies all utilized measurement tools to report such as scales, questionnaires that have been tested for reliability and validity, or self-developed questionnaires, the model of the theory of planned behavior (TPB) as well as using criteria of DSM-IV to conduct the interview. While many toolkits were utilized and there were several studies with the same objectives of investigating the associated factors with internet gaming disorder, there was no one toolkit in our systematic review study; each study used different sets of tools.

Table 2. The prevalence of Internet gaming disorder (IGD) and the associated factors in included studies

Authors, Year	The prevalence of IGD (%)	The associated factors
Lau PWC et al. 2017 ¹⁴		Attractive features of active videogames (AVGs) (Control, feedback, goal, graphics, character, color, challenge, consistency, sound, Genre, Story, Pace, Cognitive, Physical exertion, Motivation, Concentration)
Yu C et al. 2015¹⁵	5.80% and 4.78% of the participants displayed POGU in the 7th and 9th grades	Teacher and the school
Hu J et al. 2017 ¹⁶		Sensation seeking, impulsivity, and positive affective associations
Jia Wang et al. 2017 ¹⁸		Attitude, Perceived Behavioral Control (PBC), and manipulated subjective norm
Jamshid Ah- madi MD et al. 2014 ¹⁸	 (1) 13 students (1.3%) were computer games abusers (2) Computer games dependency was seen in 54 students (5.3%). 	

Prevalence of IGD: Of the studies listed, 2 studies reported the prevalence of IGD. The prevalence rates of IGD ranged from 1.3% to 5.8%. Specifically, the prevalence of IGD 5.8% and 4.78% in the 12 and 14 years old, respectively; 15-17 years: 1.3% of students were computer games abusers and computer games dependency was seen in 5.3% of students. The prevalence of anxiety and depression were significantly higher in students who were computer game abusers or dependents (p < 0.05).^{15,18}

Associated factors: The most significant

features that attract children to play were control, feedback, goal, and graphics.¹⁴ The causes of Internet addiction did not have only habitual bases, but also demographic associations (age, sex, and economic status according to income of the family) and socioeconomic aspects.¹⁸ Moreover, sensation seeking, positive affective associations with online games, and impulsivity were each significantly and positively associated with online gaming addiction in adolescents. Positive affective associations mediated the relationship between sensation seeking and online gaming addiction. Impulsivity moderated

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the relationship between positive affective associations and online gaming addiction, such that the association between positive affective association and online gaming addiction was stronger for high impulsivity adolescents compared with low impulsivity adolescents.16 Another study showed the predictive roles of attitude, Perceived Behavioral Control (PBC), and subjective norm in adolescents' decision making regarding online games. A positive attitude and high PBC toward online games increased the odds of choosing to play online games in the three situations (General learning situation, Peer support situation, Parental monitoring situation), even when playing online games led to the time cost. These results showed that manipulated subjective norms had a significant impact on adolescents' choice intention regarding playing online games.¹⁷ Besides, teacher and school engagement contributed to reductions in the rate of IGD.¹⁶

IV. DISCUSSION

Internet gaming disorder is becoming common and it can happen at the same time with other kinds of disorders. The causes of internet gaming disorder not only influenced by habitual use but also demographic and socioeconomic aspects. Gamers with this condition endanger their academics and job functioning because of gaming time. In particular, internet gaming disorder can lead to neglect of relationships, school or work-related missions, and even basic physical needs. Moreover, this condition may cause the risk of being overweight and belly fat is higher, decreasing cardiovascular Exercise.^{19–21}

The findings in this systematic review have shown that the prevalence of internet gaming disorder ranged from 1.3% to 5.8%. On the other hand, in other studies, prevalence IGD rates ranged from 0.8% in Italy to 26.7% in Hong Kong, and this ratio ranged from 0.7% to 27.5% in a study of Satoko Mihara and Susumu Higuchi.^{4,5} Moreover, the findings of Frank W Paulus reported a median IGD prevalence of 5.5% and a median of 2.0% for populationbased in children and adolescents.⁶ Therefore, the prevalence of IGD in upper-middle-income countries in our study was significantly lower than reports from high-income countries in the world.

In terms of measurement tools, although these studies utilized heterogeneous toolkits, they had similar objectives to predicting the condition of IGD. These toolkits can be applied for the screening, diagnosis, and treatment of IGD. Differences can be explained by the diversity in culture, the differences in socioeconomic status among upper-middleincome countries and differences in the various specific objectives.

Based on the results of the present study, we divided factors influencing IGD into three main groups: psychological factors (a positive attitude and high perceived behavioral control (PBC), sensation seeking, impulsivity); social support (peer support, parental monitoring, the positive support from teachers and schools); and attractive games (positive affective associations with online games, attractive features of active videogames). Two factors that were found to possibly protect against IGD were the support of parents, teachers and schools. Reviewing the scientific literature, the evidence of factors that increase and decrease internet gaming disorder shown clearly that one of the main factors influencing internet gaming disorder is that the participants spend more time participating in internet gaming. Especially, according to Jia Wang et al. 2017, adolescents with a positive attitude and high PBC toward

online gaming were more likely to choose to spend time on internet gaming.¹⁷ These results were similar to previous research suggesting that attitude and PBC influence participants' continued intention to play online gaming.22,23 Moreover, peer support positively predicted online game intentions and behaviors, which were consistent with previous studies.24,25 Gamers with IGD tended to start playing Internet games at a relatively early age and individuals were members of peer groups, who frequently communicated and interacted, such as close friends. In this way, the actions and opinions of each peer group member will affect other individuals, even having a positive effect on other members. Higher sensation seeking and impulsivity are important psychological factors affecting addiction. These factors were each significantly and positively associated with internet gaming disorder and more detail was gaming addiction in adolescents. Positive affective associations as an intermediary factor between sensation seeking and online gaming addiction. Impulsivity has been reported as a risk factor in a higher tendency to relapse into problematic behavior.26 This shows that impulsive gamers may need a special treatment that is more focused on the prevention of relapse and the reinstatement of the problematic behavior. Furthermore, In Lau PWC et al. 2017, attractive features of active videogames (AVGs) led children to be attracted, immersed, thereby leading to spending more time playing games and more likely to increase the prevalence of internet gaming disorder, because it satisfies their basic psychological needs. Specifically, the Chinese children in this review rated control as the most important feature because of that they valued a sense of freedom and the mastery of their body parts when playing AVGs. Feedback, goal, and graphics are the next most

attractive features for children to play AVGs. In contrast to other previous studies in Western nations, children valued immersion the most, followed by challenge, feedback, control, and interactivity.¹⁴

On the other hand, according to Jia Wang et al. 2017, parental monitoring was a useful strategy to control or limit internet gaming disorder in adolescents, which led significantly decreased participate in to playing online games of gamers, which was suggested in the study of Weigle and Reid, 2014.17,27 On the other hand, a high level of parental monitoring might prevent children from satisfying their basic psychological needs (e.g., autonomy, competence, and relatedness), which inferred to negative consequences such as parent-child conflict.²⁸ We therefore suggest that parents should discuss the content of video games and/or co-playing with their child to better understand their thinking and needs in decision-making. In this way, parents can use this time to minimize the negative effects of online gaming, instead of making conflict due to strict control. Moreover, the positive support from teachers and schools has helped satisfy the basic psychological needs satisfaction of adolescents, leading to reduce the prevalence of internet gaming disorder of subjects because they feel cared for and understood, which help to increase motivation to learn and participate in activities at school.15

There are several limitations in our current study. First, data were collected only in English and did not have grey literature research, this might have excluded some key studies. Second, we did not conduct a meta-analysis because of the different measurement approaches to main outcomes across five inclusion studies.

V. CONCLUSION

In summation, the prevalence of IGD in

upper-middle-income countries in our study was significantly lower than such from high-income countries in the world, and no articles related to lower-middle-income countries met selection criteria. Secondly, these five included studies utilized heterogeneous toolkits. Lastly, factors increasing and decreasing internet gaming disorder were divided into three main groups: psychological factors (a positive attitude and high perceived behavioral control (PBC), sensation seeking, impulsivity); social support (peer support, parental monitoring, the positive support from teachers and schools); and attractive games (positive affective associations with online games, attractive features of active videogames). Accordingly, based on these risk factors via a valuable contribution of this study, diverse approaches are needed early on to prevent internet gaming disorder among children and adolescents. In the future, more studies about internet gaming disorder, especially in children, should be conducted.

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