PREVALENCE AND FACTORS ASSOCIATED WITH GAMING ADDICTION AMONG UNDERGRADUATES IN IBADAN

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CERTIFICATION

This is to certify that Sogbesan Abdulfatah Abiodun carried out this work in the Department of Epidemiology and Medical Statistics, Faculty of Public Health, College of Medicine, University of Ibadan, Nigeria.

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DEDICATION

This dissertation is dedicated to the Almighty God, who made the project possible from the beginning to it completion.

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ABSTRACT

Gaming addiction has become of significant health concern globally among children, youths and adults. The continuous rise in the number of internet subscribers and mobile phone users has played a major role in the recent upsurge in numbers of gamers globally. The past decades have seen evolution of gaming industries, and this has significantly contributed to making the gaming market one of the biggest market in the world. Despite its growth, several health concerns such as compulsive behaviors, mental health issues and physical health problems that have been linked to gaming have raised serious concerns. The presence of gaming addiction in Nigeria universities among undergraduates has been under research, because the gaming communities in the country has always seen the fun side of game and many don't belief it could pose any serious issue. This study determined the prevalence and factors associated with gaming addiction among undergraduates in the University of Ibadan.

Using analytical cross-sectional study design and a multistage sampling technique, a sample size of 484 students were randomly selected from twenty five departments in the University of Ibadan. A pretested self-administered questionnaire was used to elucidate information on prevalence of gamming addiction, pattern of gaming, gaming tools, gaming types and factors that are associated with gaming addiction among the selected students. The data collection was completed within three weeks and analyzed. Descriptive statistics, chi-square test and logistic regression were carried out to determine the prevalence of gaming addiction and identify factors associated with gaming addiction. Level of significance set at 5% ($P < 0.05$) and confidence at 95% (C.I – 95%),

The mean age of the respondents was 20.59 (SD = 2.49) and 62.7% were males. Majority of the respondents (78.1%) reported playing games while the prevalence of gaming addiction was 15.3%.

Although, the average hours spent on gaming per week by students classified as gamers was 10 hours, a high number of the addicted gamers (81.1%) spent more than 10 hours playing games per week. Chi square analysis to determine the factors associated with gaming addiction showed that gender, marital status of parent, academic performance, time spent playing games a day, time spent playing games in a week, depression, anxiety and sleep deprivation were significantly associated with gaming addiction ($\chi 2$ [28.954], $P < 0.0001$, $\chi 2$ [6.479], $P = 0.039$, $\chi 2$ [13.705], $P = 0.001$, $\chi 2$ [121.681], $P < 0.0001$, $\chi 2$ [139.590], $P < 0.0001$, $\chi 2$ [25.349], $P < 0.0001$, $\chi 2$ [14.982], $P = 0.001$, $\chi 2$ [7.749], $P = 0.005$).

The risk of gaming addiction was significantly higher among males than females (OR 3.16 [1.02 – 9.80], $P = 0.047$). Binary logistic regression analysis also showed that marital status of parents, time spent gaming in a day and time spent playing games in a week (OR 5.9 [1.28 - 23.9], $P = 0.022$, OR 4.45 [1.87 – 10.6], $P = 0.001$ and OR 10.9 [4.33 – 27.9], $P < 0.0001$) were likely predictors of gaming addiction. Severe depression, and borderline anxiety were also significantly associated with gaming addiction (OR 4.78 [1.42 – 16.1], $P = 0.012$, OR 4.61 [1.68 – 12.7], $P = 0.003$).

The results provide information on gaming and gaming addiction among young people. Likewise, it shows the need for effective educational programmes that will create more awareness on the health issues associated with gaming addiction and preventive strategies that will help to reduce the time spent on gaming among students.

Keywords: compulsive behaviours; gaming addiction; gaming tools; mental health issues; prevalence

TABLE OF CONTENTS

Pages

CHAPTER THREE

CHAPTER FOUR

CHAPTER FIVE

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

GLOSSARY OF ABBREVIATIONS

APA - American Psychiatric Association

CGPA - Cumulative Grade Point Average

DSM-5 - Diagnostic and Statistical Manual of Mental Disorders, 5th Edition

HADS - Hospital Anxiety and Depression Scale

ICD - International Classification of Diseases

IGD - Internet Gaming Disorder

IGA - Internet Gaming Addiction

LMICs - Low and Middle Income Countries

MMORPG - Massively Multiplayer Online Role-Playing Games

PSQI - Pittsburgh Sleep Quality Index

UI - University of Ibadan

VGA - Video Game Addiction

WHO - World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Health concern associated with gaming behavior has emerged in the last two decades and these health concern include gaming disorder or addiction, psychosocial functioning and other aspect of health such as unhealthy diet, problems with eyesight or hearing, insufficient physical activity, sleep deprivation, depression and aggressive behavior (WHO, 2018). Gaming involves running of specialized applications known as electronic games or video games on game consoles like X-box and PlayStation or on personal computers (Rouse, 2016). Video game addictions are related to depression, lower academic achievement, and conduct problems (Brunborg, Mentzoni and Froyland, 2014).

The global gaming audience is approximately 2.2 billion worldwide while another source claimed that there are more than 2.5 billion active gamers (Newzoo, 2017; Narula, 2019), with global gaming market estimated to reach 180.1 billion dollars by 2021 (Newzoo, 2018). However, according to Mordor Intelligence (2020), the global gaming market figure was about 151.55 billion dollars in 2019 and is projected to reach 256.97 US Dollars in 2025. The Asia-Pacific region dominates the gaming market worldwide with China having a revenue of 40.85 billion US Dollars occupying the top spot followed by the United States with an estimated revenue of about 36.92 billion US Dollars while Japan, South Korea and Germany occupy the third, fourth and fifth spots with an estimated market revenue of 18.68 billion US Dollars, 6.56 billion US Dollars and 5.965 billion US Dollars respectively (Newzoo, 2020).

Egypt has the largest video gaming in Africa with 293 million US Dollars generated in 2018 while Nigeria rank fourth in Africa with a revenue of 122 million US Dollars (Gough, 2020). Sometimes, critical attention has been placed on gaming due to its perceived association with increased violent behaviors in children, possible negative impacts on intellectual development, and no contribution to improvement (Vaccaro and Potenza, 2019).

Gaming disorder or addiction according to World Health Organization (WHO) is defined as a pattern of gaming behavior ("digital-gaming" or "video-gaming") characterized by impaired control over gaming, increased priority given to gaming takes precedence over other interests and daily activities, and continuation or escalation of gaming despite the occurrence of negative consequences (WHO, 2018). Both online and offline gaming disorder has been added in the 11th revision of the International Classification of Disease (ICD-11) as clinically recognizable and clinically significant syndrome, when pattern of gaming behavior is of such nature and intensity that it results in marked distress or significant impairment in personal, family, social, educational or occupational function. Internet Gaming Disorder was included in the classification of mental and behavioural disorders of the American Psychiatric Association (DSM-5) in 2013 (WHO, 2018).

Lemmens, Valkenburg and Peter (2009) define video game addiction as an excessive and compulsive use of computer or video games that results in social and/or emotional problems; despite these problems, the gamer is unable to control this excessive use. Online gaming, use of social networking sites, and online pornography has been identified by epidemiological studies to be significantly associated with becoming addictive (Morrison and Gore, 2010). Internet Gaming Addiction was regarded a subtype of internet addiction (Young, 1998).

Researchers have suggested the importance of capturing symptoms of distress and interference with daily living when assessing problematic video gaming (e.g., constant preoccupation with gaming, lack of control, excessive use despite negative effects, loss of Internet (Tao *et al.,* 2010). The use of Internet and gaming at an extent that go beyond normal or usual, causing significant impairment in global functioning has been described as extreme gamming and internet use (Pontes, Kuss and Griffiths, 2015).

Male gender specifically has been found to have a positive association with gaming addiction (Wittek *et al.,* 2016). Lau *et al.*, (2018) in their study discovered that males are about five times more likely than females to have problematic video gaming problems. They also found that there is an association between problematic video gaming and poor relational problems for both males and females as well as extreme shyness majorly in males. Male undergraduates of low and middle income countries (LMICs) in Africa have an average of almost 18 hours per week of online gaming, compared with females who have close to 6 hours of online gaming per week. Also, men played video games for an average of 14 hours per week, and women for around three hours per week; which reflects that more time is spent gaming among males compared to females (Sosso and Kuss, 2018).

Gaming addiction has also been found to have a positive association with poor academic performance (Onyemaka *et al.,* 2017; Hawi, Smaha and Griffiths, 2018). A study by Weis and Cerankosky (2010) among 6-9 year old young boys found that negative effect of video game on academic performance extend to children and this effect was linked to displacement of after-school activities having significant educational value by video games which may interfere with the development of reading and writing skills in some children.

1.2 Statement of the problem

Mobile internet subscribers in Sub-Saharan Africa keep increasing, with quadrupled increase in number reported since the start of the decade (ZDNet, 2018). Nigerian communications commission (NCC) reports showed that internet users in Nigeria are about 119.5 million as at April 2019, which translates to almost half of its population both young and adults having access to the internet. This accessibility to internet makes it easy for adolescents including students to be prone to internet gaming. Similarly, the culture of playing video games is beginning to take centre stage in Nigeria among youths who when unable to afford owning a video game console are provided with opportunity of gathering at gaming centres to play video games, as well as engage in gaming competitions among themselves for less than a dollar (Vourlias, 2014).

The symptoms of the gaming addiction which is an emerging disorder includes preoccupation with gaming, withdrawal symptoms when not gaming, development of tolerance, loss of interest in other hobbies, use of gaming as an escape, and continued overuse of gaming, despite understanding the negative impact on day-to-day functioning, which are similar to symptoms of substance and gambling addiction (APA, 2013). Currently, many Nigerian teenagers and youths are becoming more addicted to playing games to the extent of finding it difficult to turn off the screen when playing video games. In fact, some Nigerian parents have complained about excessive gaming among their children who have gone on to show actions such as aggression and frightening outburst at family when told to stop gaming, loss into a virtual worlds or realms filled with strange characters from games, very noticeable negative impact on academics and poor sleeping pattern (Abulude, 2018).

Undergraduates in Nigeria make use of smartphones, tablets and computers in playing games. They have the highest number of computer gamers compared to undergraduates in other African

countries and these Nigeria gamers have an average of over 12 hours of gaming per week and therefore sleeping problems has been reported among them (Sosso and Kuss, 2018). Also, gaming addiction has a significant influence on the academic performance of male undergraduate students in Nigerian private university. The higher the video game addiction, the lower the CGPA of the male undergraduate student and vice versa (Onyemaka *et al.,* 2017). Some earlier research has shown sleeping disorder, low academic performance, depression, anxiety, social isolation, poorer mental health and cognitive function are associated with gaming addictions among undergraduate students (Sosso and Kuss, 2018; Onyemaka *et al.,* 2017; Stockdale and Coyne, 2018). Therefore, this study aim to determine the prevalence of gaming addiction and factors associated with gaming addiction among undergraduates.

1.3 Justification

Several studies have been conducted in High-income countries to determine the prevalence of gaming addiction and pattern of gaming behavior among students and adolescents (Rehbein *et al.,* 2010; Van-Rooij *et al.,* 2011; Spilkova, Chomynova and Csemy, 2017). Previous study among undergraduates in some Africa countries (Sosso and Kuss, 2018) found a significant relationship between gaming and sleeping problem. Also, a positive association between gaming addiction and low academic grades was discovered among undergraduates in Private University in Nigeria (Onyemaka *et al.,* 2017).

However, there is dearth of research in identifying other health concerns including emotional difficulties associated to gaming addiction among students in Nigeria. Their vulnerability to gaming addiction and several health issues associated with gaming addiction has been aided by the ever increasing accessibility to internet in their campuses. The study assessed the prevalence of gaming addiction, gaming types, tools, and health related factors. The result of the study will

be relevant in educating, encouraging better gaming practices and implementation of interventions to help limit excessive gaming as well as address the associated health risk factors among undergraduates.

1.4 Research questions

This study provided answers to the following research questions:

1. What is the prevalence of gaming addiction among undergraduate students?
2. What is the pattern of gaming among undergraduate students?
3. Which gaming tools and types are common among undergraduates?
4. What are the factors associated with gaming addiction among undergraduates?

1.5 Broad objective

The study aim to determine the prevalence of gaming addiction and factors associated with gaming and gaming addiction among undergraduate students.

1.6 Specific objectives

1. Determine the prevalence of gaming addiction among undergraduate students;
2. Determine the pattern of gaming among undergraduates;
3. Assess the gaming tools and types among undergraduates and
4. Identify the factors associated with gaming addiction among undergraduates

1.7 Operational definition of terms

Gaming involves running of specialized applications known as electronic games or video games on game consoles like X-box and PlayStation or on personal computers (Rouse, 2016)

Gaming disorder or addiction is defined as a pattern of gaming behavior ("digital-gaming" or "video-gaming") characterized by impaired control over gaming, increasing priority given to gaming takes precedence over other interests and daily activities and continuation or escalation of gaming despite the occurrence of negative consequences (WHO, 2018).

Video gaming is defined as playing of games on consoles such as PlayStation and X-box. (Sosso and Kuss, 2018). Online gaming is defined as playing games on Smartphones, Tablets, and Computers (Sosso and Kuss, 2018).

CHAPTER TWO

LITERATURE REVIEW

2.1 History of gaming

The origin of video games is closely connected to the evolution of computers. Despite video games having it roots in events that occurred about five decades ago in the laboratory, it wasn't until 1970s that video game exploded with creation of video game machines. (Rechsteiner, 2020). This period of it rise was referred to as 'The pre-crash' era where the first notable gaming Industry, Atari developed Pong. Pong was an arcade table tennis that became a global success with more than a million units sold during this period (Wallach, 2020). Despite the various attempts at creation of more advance console games by the new gaming industries like Sega and Nintendo, it was not until the 2000s that gaming goes online. The rise of these online games was linked to the evolution of the internet. Massively multiplayer online role-playing games (MMORPG) that are now created allow millions of gamers all around the world to play, communicate and compete with each other on the same platform (Chikhani, 2015).

In the past two decades, games became a billion dollar business, and more profit were made by the gaming industries than the music and film industries. Gamers can now play anywhere and anytime because games were developed for every type of platforms: computers, consoles, tablets and mobile phones (Rechsteiner, 2020). Mobile gaming market has massively exploded with the rise of smartphones. This has led to increase in the numbers of gaming addicts. In the current decade, video games has taken gamers deeper into the virtual world where they can almost completely get immersed in a game (Chikhani, 2015; Rechsteiner, 2020).

2.2 Prevalence of gaming addiction

The burden of gaming addiction is on the rise and different prevalence has been reported across different population and cultures in the world. In United States, gaming is prevalent mostly among children and adolescents, with an estimated 68% of 8 to 18 year-olds playing at least weekly (Gentile, 2009). Among adolescents, an estimated prevalence of online gaming addiction was found to be 2.7 % in Austria (Batthyany *et. al.,* 2009), 1.6 % in the Netherlands (Van-Rooij, 2011) and 1.16% in a nationwide survey of German adolescents (Rehbein *et al.,* 2010). Higher prevalence have been documented for Asia undergraduates, 10.3 % in China (Peng and Li, 2009) while Yu and Cho (2016) in study among South Korean adolescents in 2016 reported prevalence of 5.9%.

Kuss and Griffiths (2012) in their review of literature on internet gaming addiction reported a prevalence between 0.6% and 11.9% of gaming addiction in adolescents, while Gentile *et al.* (2011) in a two-year longitudinal study among youths found a prevalence of 7.6% to 9.9% of problematic video gaming and 84% of those who are classified as problematic video gamers during early assessment were still problematic video gamers after two years. In Chinese adult population, Wu *et al.,* (2018) reported prevalence of Internet Gaming Disorder (IGD) to be 4.3% among recent gamers and 2.0% probable IGD of the overall sample. Sosso and kuss (2018) in their study found the prevalence of gaming among undergraduates in Africa to be 83.3%. Also, African gamers showed fondness for online gaming compared to video gaming in the study with 75.71% and 24.29% of the study participants being online gamers and video gamers respectively.

2.3 Gaming tools

The major tools used in gaming across different population are Consoles (e.g. PlayStation and X-box), smartphones, Tablets, Computers and Laptops (Sosso and Kuss, 2018; Hawi, Samaha and Griffiths, 2018). Playing of games on consoles such as PlayStation and X-box is referred to as video gaming while playing games on smartphones, tablets, and computers is referred to online gaming. Video games are games that are played through the aid of an audiovisual device and which are majorly based on a story (Esposito, 2015).

Playing of games on smartphones is on the rise globally and this immense growth has been attributed to numerous advancements in technology. Also, the recent production of mobile version of many consoles and computer games by gaming industries has contributed to this massive development (Mordor Intelligence, 2020). Smartphones are favorite gaming tool among undergraduates in Africa followed by computers while console is third favorite. South Africa has the largest number of smartphone undergraduate gamers followed by Cameroon and Tunisia. Playing of computer games was dominant in Senegal and Nigeria while the largest population of Console gamers are found in Cameroon with Tunisia, Rwanda and Nigeria following respectively (Sosso and Kuss, 2018).

The use of these tools in playing of video games was proposed by Gunzburg *et al.* (1999) as one of the ways school children maintain bad posture for long duration. This could in turn increase the risk of musculoskeletal disorders especially low back pain among children while gaming compared to other activities like watching of television. Computer usage itself among adults at work has been found to be associated with the development of musculoskeletal and clinical disorders in the neck, upper back and upper extremities (NRCIM, 2001).

2.4 Gaming types

Gaming types that are common among students and adults are single player games and multiplayer games (Wu *et al.,* 2018; Sosso and Kuss, 2018). Single-player games are games made by manufacturers for only one player or games that are usually played in the single-player mode. They are also games that can be played on a single device which can be a computer system or other hand held devices that usually involve users playing against computer. Multiplayer games are games that involve mode of play of computer games and video games in which two or more players are able to play in same game at the same time, together as a team or playing against each other.

Several studies have shown that the different types of games as well as the characteristics of these games can significantly influence the progression of gaming addiction among gamers (King, Delfabbro and Griffiths 2011; Rehbein *et al.,* 2010). Muller *et al.* (2014) in a study among adolescents in seven different European countries reported that the use of every game types is associated with Internet Game Disorder (IGD) especially multiplayer games. Also, Wu *et al.* (2018) found that 70% of probable IGD gamers in Chinese adult population were involved with multiplayer games.

Massive multiplayer online role playing games (MMORPGs), a very popular gaming type usually require game user to be highly cooperative and committed because the games are so social and competitive by design and likewise run on real time giving the gamers high sense of involvement (Allison *et al.,* 2006). These gaming genres have been found to be significantly associated with self-discrepancy, negative mood, escapism and depression (Kwon, Chung and Lee, 2011; Li, Liau and Khoo, 2011)

2.5 Factors associated with gaming addiction

Loton *et al.* (2016) reported that video game addiction can be identified through psychopathological symptoms such as anxiety while Cheng (2012) revealed that gaming addiction is associated with depression, anxiety and poor academic performance among youths. Also, Lemmens, Valkenburg and Peter (2009) and Krossbakken *et al.* (2018) found an association between gaming addiction and loneliness. However, some of these previous studies showed that severe mental health issues like anxiety, loneliness and depression are risk factors of internet gaming addiction (Ko *et al.,* 2011; Spilkova, Chomynova and Csemy, 2017 and Taylor, 2017) while few studies have observed these mental health issues in the other direction as consequences of gaming addiction (Lo, Wang and Fang, 2005; Gentile *et al.,* 2011; King, Delfabbro and King, 2016). This indicates the likelihood of bidirectional relationship between gaming addiction and these mental health problems.

Other factors that has been associated with problematic gaming include marital status of parents, sleep deprivation, poor academic performance, obesity, fatigue and poor eating habit (Muller *et al.,* 2014; Hawi, Samaha and Griffiths, 2018; Onyemaka *et al.,* 2017; Turel, Romashkin and Morrison, 2016; Brunborg *et al.,* 2013; Kayhan *et al.,* 2018). Whereas, time spent playing games was found to be a major risk factor that causes gaming addiction (Gentile *et al.,* 2011). On the other hand, participants in a qualitative study among online gaming addicts reported that gaming was a form of stress relief and escape from depression (Beranuy, Carbonnell and Griffiths, 2016).

2.5.1 Socio-demographic factors

Researchers have reported gaming addiction to be more prevalent among the male gender compared to females (Wittek *et al.,* 2016 and Lau *et al.,* 2018). In a study to determine who is at

risk for problematic video gaming among Canadian children adolescents, Lau *et al.* (2018) found that males are about five times more likely than females to have problematic video gaming problems. Likewise, Muller *et al.* (2014) reported that more boys than girls in European countries are more affected by IGD.

Apart from the sex of an individual, age and marital status of parents are other risk factors for gaming addiction. Mentzoni *et al.* (2011) in their study reported that young age is associated with problematic video gaming. Internet gaming addiction decreases with increasing age. Also, adolescents from separated homes tend to be at risk of gaming addiction compared to their counterparts whose parents live together (Muller *et al.,* 2014).

2.5.2 Depression

Depression, a mental disorder that negatively affects how people feel, think or act has been linked to gaming addiction by several studies. Krossbakken *et al.,* (2018) in a cross-lagged study of developmental trajectories of gaming addiction and mental health suggested that depression was an antecedent of problem gamers and engaged gamers. Also, Pappa *et al.* (2016) found a significant relationship between Internet Gaming Addiction and internalizing symptoms such as depression. Adolescents who are able to stop excessive gaming tends to have decreased depressive symptoms (Gentile *et al.,* 2011). Similarly, adults with probable IGD at risk to psychological distress and depression than their non-IGD counterparts (Wu *et al.,* 2018). Gentile (2009) found that there is an association between study participants who are pathological gamers and some comorbid variables such as depression. This suggest the possible reciprocal relationship existing between depression and gaming addiction.

2.5.3 Anxiety

Anxiety which is a normal emotion that results to amplified fear, alertness and symptoms such as increased heart rate has also been found to be associated to excessive gaming. Wu *et al.* (2018) in reported that probable internet gaming disorder respondents tend to be more at risk of moderate and above levels of anxiety. Likewise, in a study of online gaming behaviour and psychosocial well-being among Greek adolescents, a significant relationship was found between Internet Gaming Disorder and anxiety (Pappa *et al.*, 2016). Gentile *et al.* (2011) also found that stopping of excessive gaming by adolescents result in corresponding decrease of social anxiety and this findings was similar to that of Krosbakken *et al.* (2018) that observed that anxiety was a consequence of addicted gaming.

2.5.4 Academic Performance

Muller *et al.* (2014) in a study among European Adolescents in seven countries, Greece, Iceland, Netherlands, Poland, Romania and Spain found that low academic performance was evident among adolescents with IGD. Onyemaka *et al.* (2017) in study among private university student in Nigeria also found that student's low student CGPA was associated to their gaming activity. Gamers with Internet Gaming Disorder in Lebanese population were reported to have lowest school grade average and below the passing school grade average compared to other group of gamers (Hawi, Samaha and Griffiths, 2018).

2.5.5 Sleep deprivation

Sleep deprivation, a condition when individual sleep less than they require to feel awake and alert has also been reported to be associated with excessive gaming. In a study among Lebanese adolescent internet gaming addiction was found to be associated with lesser sleep. The report

revealed that respondents in the IGD group have less hours of sleep per night (5hours) compared to the casual gamers with an average 7 hours sleep per night (Hawi, Samaha and Griffiths, 2018). Even in the absence of IGD, continuous gaming have been found to be associated with decrease in the number of sleeping hours (Sosso and Kuss, 2018).

Turel, Romashkin and Morrison (2016) found that some youth and children that are addicted to video games are more at risk of sleep deprivation and other disorders that are consequently related to elevated blood pressure, low high-density lipoprotein cholesterol, high triglycerides and high insulin resistance which increases their chance of obesity and poor cardio-metabolic health.

2.5.6 Loneliness

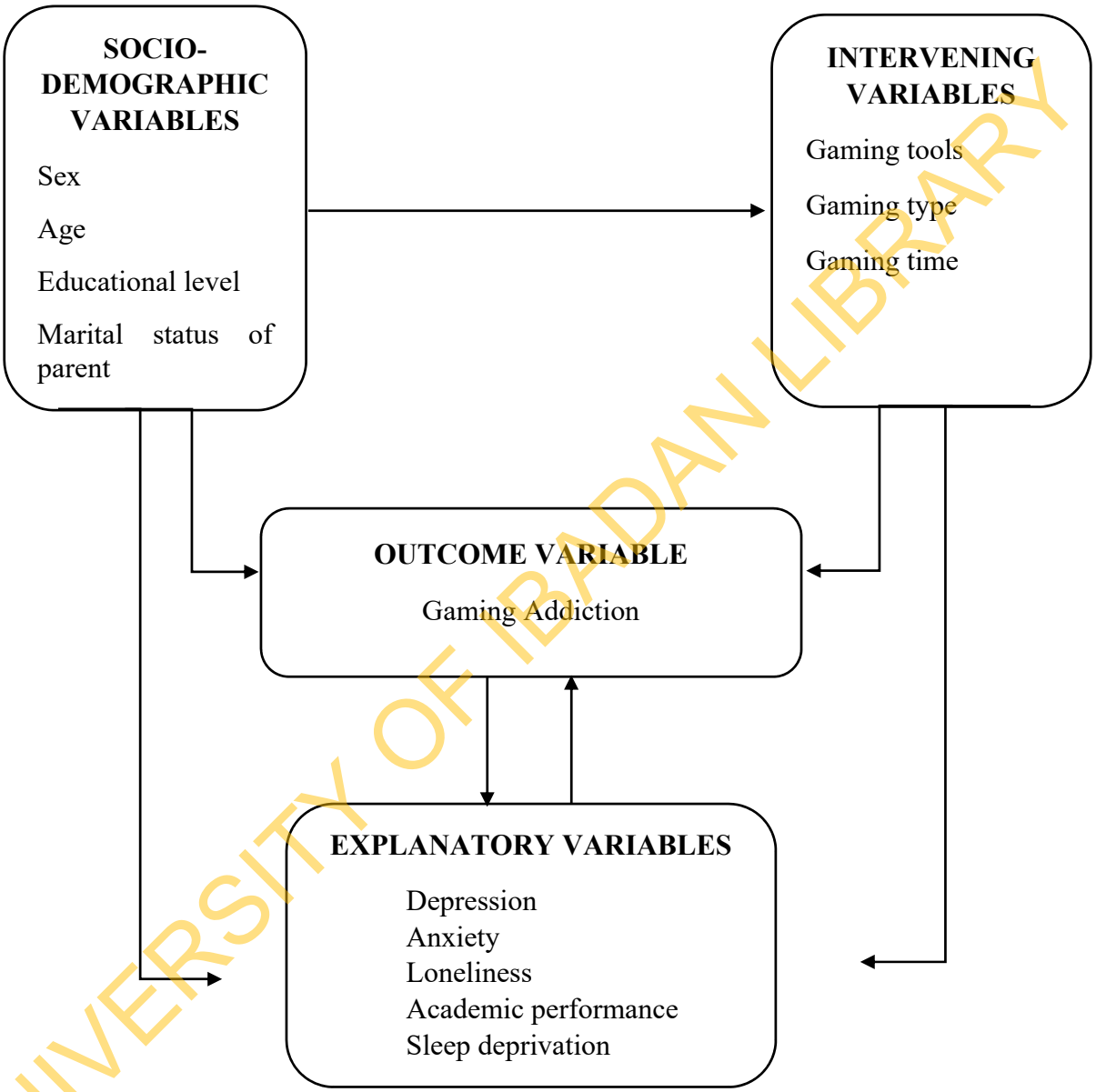
Loneliness, a feeling of isolation that makes individual to have a feeling of being alone, empty and undesirable has also been associated to excessive gaming and gaming disorder. Van Rooij *et al.* (2014) and Spilkova, Chomynova and Csemy (2017) in their study on video game and online gaming addiction respectively found that adolescents that exhibit loneliness are more likely to be addicted gamers. However, Krossbakken *et al.* (2018) findings in a cross-lagged study found that loneliness was a consequence of problem gaming, which explains the possibility of bidirectional relationship between loneliness and gaming addiction.

2.5.7 Time spent on gaming (Gaming time)

Studies have shown that duration of weekly game time to have a positive relationship with other possible behavioural symptoms of gaming addiction among gamers such as escapism and social attention (Sprong *et al.,* 2014; Buono *et al.,* 2017). Hawi, Samaha and Griffiths (2018) also in their study on internet gaming addiction among Lebanese adolescents found correlation between the

duration of time spent gaming and the risk of internet gaming disorder, although they concluded that the correlation was not a strong one.

2.6 Conceptual framework of factors associated with gaming addiction



SOURCE: Adapted from *Internet gaming disorder in Lebanon: Relationships with age, sleeping habits, and academic achievement* by Hawi, Samaha and Griffiths, 2018, and "Regular gaming behaviour and internet gaming disorder in European adolescents: results from cross-national representative survey of prevalence, predictors and psychopathological correlates," by Muller *et al.,* 2014.

CHAPTER THREE

RESEARCH METHODS

3.1 Study area

The study was conducted in the University of Ibadan, Oyo State. The University of Ibadan, UI as it is fondly called, is the oldest University in Nigeria and is located five miles from the centre of the major city of Ibadan in Western Nigeria. It was established in 1948 as the University College Ibadan, a College of the University of London in a special relationship scheme, and became a full-fledged independent University in 1962. The University which took off with academic programmes in Arts, Science and Medicine currently has academic programmes in sixteen faculties namely, Arts, Science, Basic Medical sciences, Clinical Science, Agriculture, the Social Sciences, Education, Veterinary Medicine, Pharmacy, Technology, Law, Public Health, Dentistry, Economics, Renewable Natural Resources and Environmental Design and Management. There are twelve hall of residence which provide accommodation for about 30% of the population of students in the regular studies mode. The governance of the institution is based on a committee system where every committee and boards report to council and/or the senate (UI, 2020).

3.2 Study design

An analytical cross-sectional study design was used in this study.

3.3 Study population

Participants in this study were undergraduate students in the University of Ibadan.

3.4 Inclusion/Exclusion criteria

3.4.1 Inclusion criteria

Eligibility for participating in the study was based on being an undergraduate student in any of the departments in the University of Ibadan and must be within first year to final year in the university.

3.4.2 Exclusion criteria

Undergraduates in the University of Ibadan were excluded if they did not give consent and those that were sick and therefore unavailable during the study period were also excluded.

3.5 Sample size determination

The sample size for the study was estimated using single proportion formula for finite population with 95% confidence interval.

$$n = \frac{(Z^2\ (p\ q)}{d^2}$$ (Cochran, 1977)

z = the standard score (critical value) corresponding to 95% confidence interval = 1.96

p = prevalence of gaming in African population = 83.3% (Sosso and Kuss, 2018)

d = proportion of sampling error between the sample and the population ≤ 5% (3.5% was used in order to obtain large sample size appropriate to answer the study research questions)

Sample size, $n = \frac{(1.96)^2 \times 0.833 \times 0.167}{0.035^2} = 436.25 \sim 436$

An adjustment for a minimum non response (f) of 10% among respondents was anticipated.

$$\text{Final Sample size, } N = \frac{n}{1\text{-}f}$$

$$N = \frac{436}{(1-0.1)} = 484.44 \sim 484$$

Final sample size used for this study was 484

3.6 Sampling technique

A multistage sampling technique that involves selecting faculties, departments, school levels and students was employed to select respondents. In the first stage, faculties that were in the institution were enumerated from which half were selected. Therefore, from 16 faculties in University of Ibadan, 8 faculties were randomly selected. In the second stage systematic random sampling was used to select half of the departments in the preselected faculties, therefore, twenty-five departments were selected from the university. In the third stage, number of students that were interviewed from the departments was determined using proportionate allocation. The students interviewed were selected using simple random sampling. In each department, the students were proportionally allocated by level of study, hence students from years 1 to 5 were interviewed. Respondents in each class were then selected randomly.

3.7 Study instrument

A validated self-administered questionnaire was used to collect data from the selected undergraduate students. The questionnaire was developed from existing scale of measurements of gaming addiction, and has nine diagnostic criteria for internet gaming disorder (IGD) listed in the DSM-5. Depression and anxiety were measured using the hospital anxiety and depression scale (HADS). The self-developed questions include socio-demographic variables, academic performance and gaming tools.

The questionnaire had seven sections

- Section A: Socio-demographic characteristics of respondents
- Section B: Measures of anxiety among respondents
- Section C: Measures of depression among respondents
- Section D: Measures of loneliness among respondents
- Section E: Measures of sleep deprivation among respondents
- Section F: Assessing the gaming tools and gaming types of respondents
- Section G: Gaming characteristics of respondents

Questions socio-demographic characteristics

The questionnaire to assess socio-demographics contained questions on sex, age, religion, ethnicity, religion, faculty, department, education class level and marital status of parents.

Questions on anxiety and depression

The questionnaire to assess anxiety and depression was developed from the existing measurement of the Hospital Anxiety and Depression Scale, HADS. The HADS-A is a seven question self-report measure of anxiety and HADS-D is a seven question self-report measure of Depression. It is a 4-point scale for each item with scores ranging from 0 to 21. Participants that score from 0 to 7 were regarded as normal (no anxiety symptom and not depressed), those that score between the range of 8 to 10 were classified as borderline anxiety or depressed (partial anxiety or partially depressed) and participants that score between the range of 11 to 21 were classified as being a case for severe anxiety and depression (Zigmond and Snaith, 1983). The review of the HADS by Bjelland *et al.,* 2002 found that HADS performed very well in assessment of severity and cases of anxiety disorders and depression in somatic, and psychiatric cases and in primary care patients and the general population. That is, its validity and usefulness is beyond the hospital practice for which it

was first design. The Cronbach alpha reliability coefficient of 0.74 and 0.70 was recorded for HADS-A and HADS-D respectively. Sample items included: ***"I feel tensed or wound up" and "I have lost interest in my appearance."***

Questions on loneliness

The questionnaire to assess loneliness was developed from the UCLA 3 item Loneliness Scale, a version created in 2004. The scale consist of 3 questions that measures three dimensions of loneliness which are relational connectedness, social connectedness and self-perceived isolation. Respondents who score 3 to 5 were classified as "not lonely" and respondents with the score 6 to 9 as "lonely" (UCLA Loneliness Scale, 2004). The participants answered: *Hardly ever, some of the time or often* to the three questions. The UCLA Loneliness scale was used in previous studies by Eren and Ozlem (2018) on computer game addiction and loneliness among Iranian children. Similarly, the scale was used by Pontes *et al.* (2019) in their study on Measurement and Conceptuslization of Gaming Disorder According to the World Health Organization Framework: the Development of the Gaming Disorder Test. The Cronbach alpha reliability coefficient recorded was 0.77. Sample items included: ***"How often do you feel you lack companionship" and "How often do you feel left out."***

Questions on sleep deprivation

The questionnaire to assess sleep deprivation was developed from the Pittsburgh Sleep Quality Index (PSQI). It differentiates "poor" from "good" sleep by measuring seven domains, it is a 4 point scale that is scored between 0 and 3. Negative extreme on the Likert Scale is reflected by 3. The Cronbach alpha reliability coefficient of 0.75 was recorded. Sample items included: ***"Usual bed time" and "Hours of sleep per night."***

Questions on gaming characteristics

The questionnaire to assess gaming addiction or disorder was developed from existing scale of measurements of gaming addiction, the Internet Gaming Disorder Scale (Lemmens *et al.,* 2015). DSM-5 lists nine IGD criteria reflecting the following symptoms: Preoccupation, tolerance, withdrawal, deception, escape, continuing despite problems, loss of control, giving up other activities, and negative consequences (American Psychiatric Association [APA], 2013). The IGD scale is a nine question self-report measure of addiction that includes criteria described in the DSM-V, including preoccupation, tolerance, withdrawal, persistence, escape, deception, displacement, and conflict regarding video game use.

Participants answered yes or no to the nine questions in regards to their gaming behavior in the last 12 months. Participants who respond yes to five or more items were classified as addicts or said to have disorder. The Cronbach alpha reliability coefficient of 0.70 was recorded. Sample items included: ***"Have you made unsuccessful attempts to control your participation in gaming activity" and "Do you play games to escape or relieve a negative mood"***

3.8 Study variables

The dependent variable was gaming addiction and it was determined by using the existing scale of measurements of gaming addiction, the Internet Gaming Disorder (IGD) Scale (Lemmens et al., 2015). The scale is a nine question self-report measure of addiction that includes criteria described in the DSM-V as characteristics exhibited by addicted gamers. These criteria include: preoccupation, tolerance, withdrawal, persistence, escape, deception, displacement, and conflict regarding video game use.

The respondents answered yes or no to the nine questions in regards to their gaming behavior in the last 12 months. Those who responded "*Yes"* to five or more items were classified as addicts or said to have gaming disorder while those who respond "Yes" to four items or less and those who respond "NO" to all the items are classified as non-addicted gamers.

The independent variables are: age, sex, marital status of parents, educational level, ethnicity, gaming tools (such as consoles; PlayStation and X-box, smartphones, tablets, computers or laptops), gaming types (which are multiplayer and single player games), depression, anxiety, loneliness, academic performance and sleep deprivation. In the current study, academic performance was categorized by using the Nigerian grading system; first-class and second class upper students were classified as having good academic performance, second class lower students were classified as having average academic performance while third class students and those with pass were classified as having poor academic performance. These independent variables were adopted from reviews of several literatures on gaming addiction.

3.9 Validity of instrument

The validity of the instruments was ensured through extensive review of relevant pieces of literatures. Content validation was done by ensuring that each item in the instrument measures what it sets out to measure. Also, construct validity was carried out to ascertain that the variables in conceptual framework are well represented in the instrument.

3.10 Reliability of instrument

Pre-test of the instrument was conducted in order to establish the reliability of the study instrument. The pre-test of this study instrument was conducted among 10 percent of the study sample size at the Lead City University, a private university in Ibadan metropolis that has similar socio-

demographic characteristics and settings as the current study area. Also, the private university being the only university in the city with close proximity to the study area makes it the most suitable. The pre-tested questionnaire was retrieved and subjected to Cronbach alpha analysis to get reliability co-efficient of 0.7 and above before data collection.

3.11 Data collection procedure

Three research assistants helped with the administration of the questionnaire throughout the duration of the data collection. They were properly trained so they can understand the scope and purpose of the study, confidentiality of information, right of participants, informed consent and technique for the collection. The research assistants were colleagues in the Department of Epidemiology and Medical Statistics.

Data were collected primarily from undergraduates of age 16 years and above from the university. Data was collected using the pre-tested self-administered, semi structured questionnaire with context to the objectives of the study. The collection was completed within three (3) weeks of its commencement.

3.12 Data management and analysis

Each questionnaire was assigned a serial number in order to ensure easy identification and entry. The collected data were checked for its completeness, coded using a developed coding guide and entered into the SPSS version 20 statistical software for analysis. Data cleaning was performed to check for frequencies, accuracy, consistencies, missing values and variables.

Descriptive statistics such as frequencies, proportion and summary statistics (mean and standard deviation) were used to elucidate information on the Socio-demographic characteristics, pattern of

gaming, prevalence of gaming addiction and gaming characteristics of respondents. The association between various factors and gaming addiction was examined using Chi-square test analysis while binary logistic regression analysis was carried out to identify the predictors of gaming addiction.

3.13 Data analysis matrix

S/N	Specific objectives	Dependent variables	Independent variables	Tools for data analysis
1	Determining pattern of gaming among under graduate students	Gaming pattern		Mean, proportion and percentages
2	Determining the prevalence of gaming addiction among undergraduate students	Gaming addiction		Proportion and percentages
3	Assessing the gaming types and tools among undergraduate		Gaming tools such as smartphones, tablets, consoles, computer or laptops	Proportion and percentage
4	Identifying the factors associated with gaming addiction among undergraduates	Gaming addiction	Socio-demographics Depression Anxiety Loneliness Academic performance Sleep deprivation	Chi-square and binary logistic regression

3.14 Ethical considerations

Ethical approval was obtained from the Oyo State Ministry of Health Ethical Review Committee before the commencement of the study (Ref. No: AD 13/479/1595[A]). Written informed consent was also obtained from the respondents after giving detailed information about the study.

Confidentiality: In order to guarantee respondents of confidentiality of the information that was obtained, the names and phone numbers or addresses of respondents were not requested, only identification number were assigned to the questionnaire for proper recording.

Beneficence: The outcome of the research is of benefit not only to the researcher but also to the respondents on the negative effect of excessive gaming.

Non-maleficence: The research was not invasive in nature as collection of invasive materials was not required. Hence, the safety of the participants was guaranteed.

Voluntariness: The respondents had the full detail concerning the research before they took part in it and they were aware of their full rights to withdraw at any stage of the study.

Inducements: No fee was paid to any of the respondents to be part of the study.

CHAPTER FOUR

RESULTS

4.1 Socio-demographic characteristics of the sample

A total of 483 respondents were enrolled from various departments of the institution. The mean age of respondents was 20.59 years (SD=2.49). Majority were aged between 20 and 23 years (50.3%) and 62.7% of the respondents were male; 76.6% reported that their parents are living together while 35.6% were first year students. More than three quarter 80.1% of the respondents belong to the Yoruba ethnic group while 50.9% had academic grade of second class upper (Table 4.1).

4.2 Prevalence of gaming addiction and pattern of gaming among respondents

According to the Internet Gaming Disorder Scale by Lemmens *et al.* (2015) that include the criteria for gaming addiction described in DSM-5, the prevalence of gaming addiction among the respondents was 15.3% with more males meeting the criteria compared to females (Figure 4.1). Majority of the gamers (66.6%) agreed that they think about their previous gaming activity or anticipate playing their next game compared to those that do not, 57.3% played games to escape negative mood compared to those that do not, while very few (16.4%) of the respondents agreed to jeopardizing or losing significant relationship, job or career opportunity due to participation in gaming.

The percentage of the respondents that were gamers was 78.1% (377) with higher percentage 66.8% of gamers being male compared to female. Among the gamers, 50.7% were respondents between age group 20-23 while 77.2% of the gamers reported that their parents were living

together. First year students (34.7%) play more games compared to others with fifth year students (3.7%) being the least gamers (Table 4.2b).

Of the addicted gamers, 93.2% were boys, 51.4% were between 20-23 age group; 68.9% reported that their parents were living together while 33.8% and 32.4% were first year and second year students (Table 4.2b).

4.3 Gaming characteristics of the respondents

Among the gamers, the most commonly used gaming tools were smartphones (91.8%) and the least used were tablets (32.6%). Single player games (79.6%) was the most common gaming type among the gamers (Table 4.3a). However, 43% of the gamers played single player games only while 36% played both single player and multiplayer games (Figure 4.2).

Majority of the gamers (60.2%) started playing games in primary school while few (8.8%) started playing games after secondary school. Of the total sample of gamers 84.4% and 79.8% play games during holidays and weekend respectively; 76.1% play games less than 2 hours a day while 26.7% play games more than 10 hours a week. On average, gamers play games for 2 hours and 10 hours in a day and week respectively (Table 4.3a).

The popular gaming tool among the addicted gamers were smartphones and computers or laptops with 85.1% of total sample of addicted gamers and 79.7% of the total sample of addicted gamers respectively while single player games with 78.4% of the total sample of addicted gamers is the most common gaming type (Table 4.3b). 34% of the addicted gamers played single player games only while 22% and 44% played multiplayer games only and both types of games respectively (Figure 4.3).

Table 4.1: Respondents socio-demographic characteristics (N=483)

Characteristics	Frequency	Percentages (%)
Gender		
Male	303	62.7
Female	180	37.3
Age group		
16-19	177	36.6
20-23	243	50.3
>24	63	13.0
Marital status of Parents		
Married/living together	370	76.6
Separated/divorced	87	18.0
Widowed	26	5.4
Education		
First year	172	35.6
Second year	154	31.9
Third year	71	14.7
Fourth year	71	14.7
Fifth year	15	3.1
Ethnicity		
Yoruba	387	80.1
Igbo	56	11.6
Hausa	4	0.8
Others	36	7.5
Academic grade		
1st class	115	23.8
2nd class upper	246	50.9
2nd class lower	101	20.9
3rd class	15	3.1
Pass	6	1.2

Mean age of respondents = 20.59 (SD=2.49)

Table 4.2a: Respondents' responses to each item of DSM-5 gaming addiction criteria, (N= 377)

Items	No (%)	Yes (%)
Think about your previous gaming activity or anticipate playing the next game	126 (33.4)	251 (66.6)
Feel irritable, anxious, or sore when you try to reduce or drop your gaming activity	281 (74.5)	96 (25.5)
Spend increasing amounts of time on gaming to achieve satisfaction	216 (57.3)	161 (42.7)
Made unsuccessful attempts to control participation in gaming activity	265 (70.3)	112 (29.7)
Lost interests in previous hobbies and entertainment as a result of your engagement with games	282 (74.8)	95 (25.2)
Continued your gaming activity despite knowledge of causing problems between you and other people	262 (69.5)	115 (30.5)
Deceived others regarding the amount of your gaming activity	280 (74.3)	97 (25.7)
Play games to escape or relieve a negative mood	161 (42.7)	216 (57.3)
Jeopardized or lost a significant relationship, job, or educational or career opportunity because of participation in gaming activity	315 (83.6)	62 (16.4)

Table 4.2b: Pattern of gaming among respondents (N=483)

Variables	Gamers	Non-gamers	Addicted Gamers	Non addicted Gamers
	n (%)	n (%)	n (%)	n (%)
Gender				
Male	252 (66.8)	51 (48.1)	69 (93.2)	183 (60.4)
Female	125 (33.2)	55 (51.9)	5 (6.8)	120 (39.6)
Age groups				
16-19	134 (35.5)	43 (40.6)	25 (33.8)	109 (36.0)
20-23	191 (50.7)	52 (49.1)	38 (51.4)	153 (50.5)
>24	52 (13.8)	11 (10.4)	11 (14.9)	41 (13.5)
Marital status of parents				
Living together	291 (77.2)	79 (74.5)	51 (68.9)	240 (79.2)
Separated/divorced	66 (17.5)	21 (19.8)	15 (20.3)	51 (16.8)
Widowed	20 (5.3)	6 (5.7)	8 (10.8)	12 (4.0)
Education				
First year	131 (34.7)	41 (38.7)	25 (33.8)	106 (35.0)
Second year	122 (32.4)	32 (30.2)	24 (32.4)	98 (32.3)
Third year	50 (13.3)	21 (19.8)	12 (16.2)	38 (12.5)
Fourth year	60 (15.9)	11 (10.4)	12 (16.2)	48 (15.8)
Fifth year	14 (3.7)	1 (0.9)	1 (1.4)	13 (4.3)
TOTAL	**377 (78.1)**	**106 (21.9)**	**74 (15.3)**	**303 (62.7)**

Table 4.3a: Respondents gaming characteristics (N=377)

Characteristics	Frequency	Percentage (%)
Gaming tools		
Consoles (PlayStation or X-box)	161	42.7
Computers or Laptops	239	63.4
Smartphones	346	91.8
Tablets	123	32.6
Gaming types		
Single player games	300	79.6
Multiplayer games	214	56.8
When did you start playing games?		
Primary School	227	60.2
Secondary school	117	31.0
After Secondary School	33	8.8
Game time/days		
Weekdays	276	73.2
Weekends	301	79.8
Holidays	318	84.4
Hours of playing games in a day		
≤ 2 hours	286	76.1
> 2 hours	90	23.9
Hours of playing games in a week		
≤ 10 hours	275	73.7
>10 hours	100	26.7

Mean time spent gaming in a day and week = 1.80 (SD = 1.62) & 9.57 (SD = 11.55) respectively.

Table 4.3b: Gaming tools and types among addicted gamers

Characteristics	Non-addicted gamers (N=303) n (%)	Addicted gamers (N=74) n (%)
Gaming tools		
Consoles (PlayStation and X-box)	113 (37.3)	48 (64.9)
Smartphones	283 (93.4)	63 (85.1)
Computers or laptops	180 (59.4)	59 (79.7)
Tablets	90 (29.7)	33 (44.6)
Gaming types		
Single player games	242 (79.9)	58 (78.4)
Multiplayer games	165 (54.5)	49 (66.2)

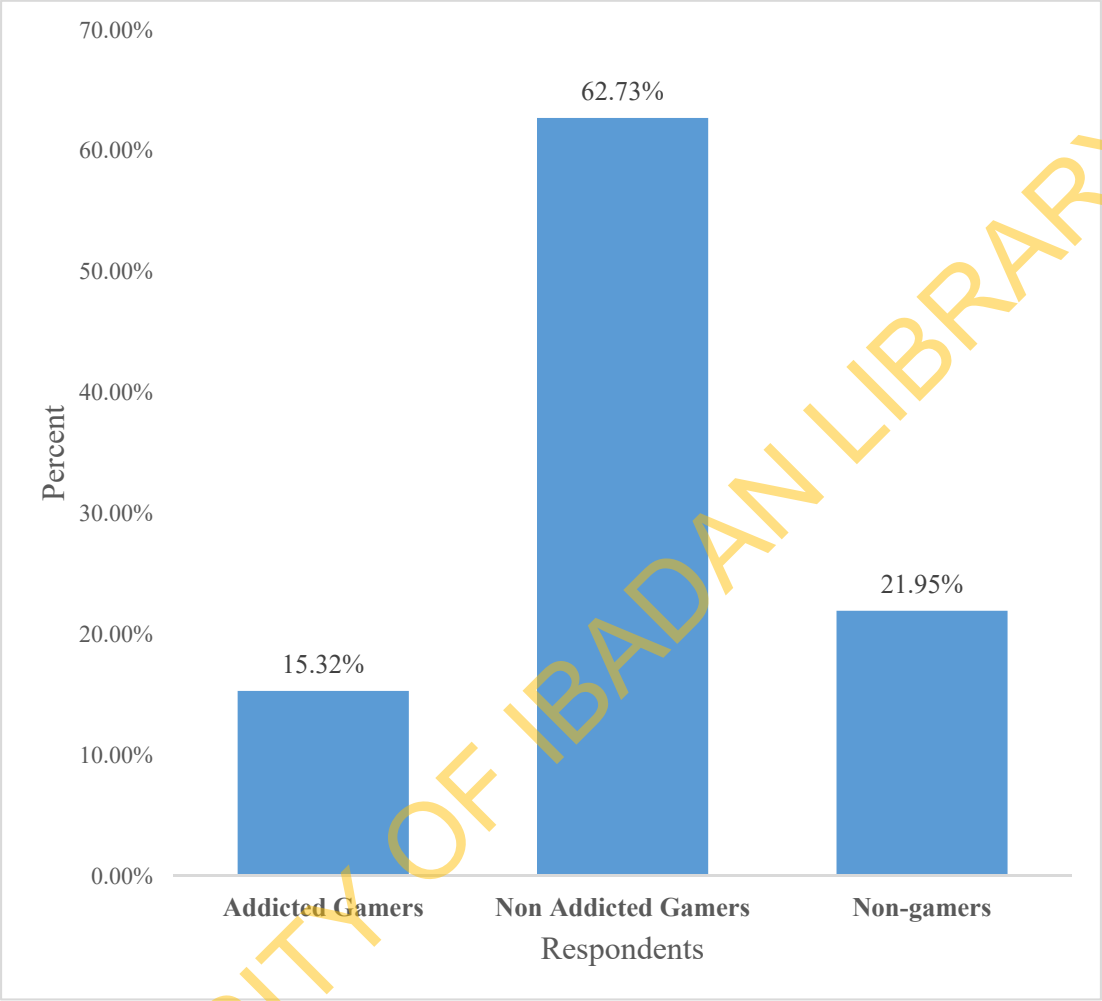


Figure 4.1: Prevalence of gaming addiction among respondents

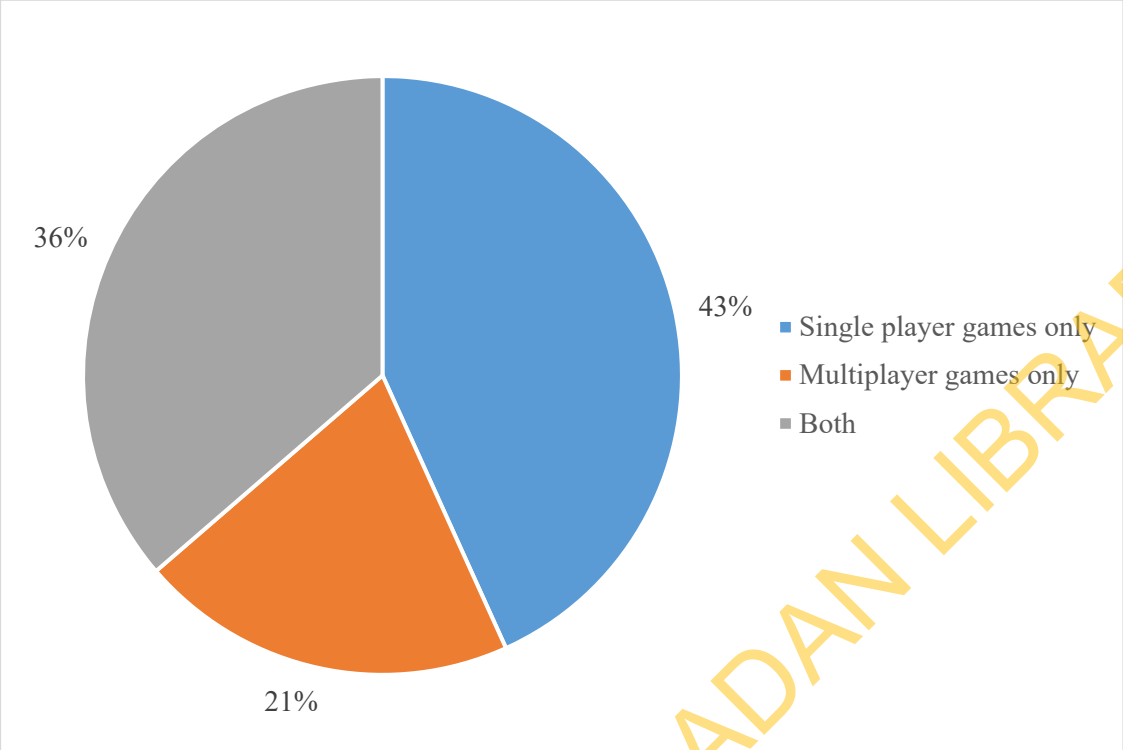


Figure 4.2: Gaming types among respondents

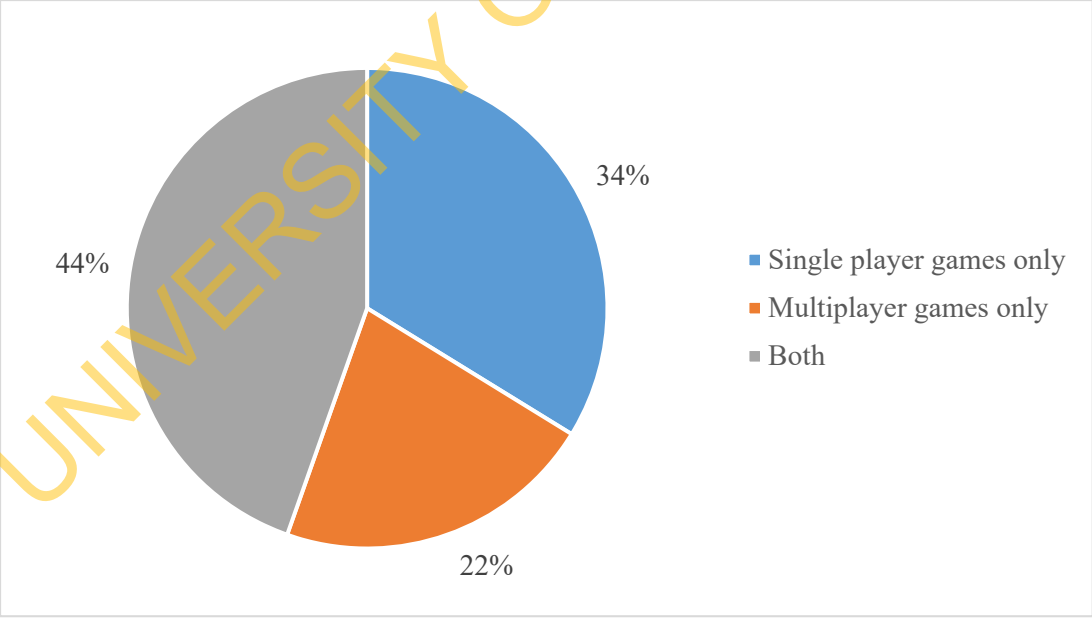


Figure 4.3: Gaming types among addicted gamers

4.4 Factors associated with gaming addiction

Table 4.4a showed the association between gaming addiction and different variables. Chi square analysis showed that gender, marital status of parent, academic performance, time spent playing games a day, time spent playing games in a week, depression, anxiety and sleep deprivation were significantly associated with gaming addiction (χ^2 [28.954], P < 0.0001, χ^2 [6.479], P = 0.039, χ^2 [13.705], P = 0.001, χ^2 [121.681], P < 0.0001, χ^2 [139.590], P < 0.0001, χ^2 [25.349], P < 0.0001, χ^2 [14.982], P = 0.001, χ^2 [7.749], P = 0.005).

Using binary logistic regression (Table 4.4b) to determine the predictors of gaming addiction, respondents whose parents were widowed, play games greater than 2 hours a day and those with a gaming time greater than 10 hours a week were significantly more likely to be addicted gamers (OR 5.9 [1.28 - 23.9], P = 0.022, OR 4.45 [1.87 – 10.6], P = 0.001 and OR 10.9 [4.33 – 27.9], P < 0.0001). Gaming addiction was three times more likely among the male university students compared to the female students (OR 3.16 [1.02 – 9.80], P = 0.047) and addicted gamers were likely to be depressed (OR 4.78 [1.42 – 16.1], P = 0.012). Also, borderline anxiety was significantly associated with gaming addition (OR 4.61 [1.68 – 12.7], P = 0.003).

4.5 Respondents perceived effects of continuous prolonged gaming

Finger hurts (57.3%) and neck discomfort (50.9%) are the most reported perceived effect of continuous prolonged gaming while 2.9% reported others (Table 4.5a).

Chi square analysis showed that shoulder discomfort, neck discomfort, back discomfort, headache, eye pain, fingers hurt were all associated with Gaming addiction (P < 0.05). Gamers with shoulder discomforts tend to be addicted gamers (59.5% versus for no shoulder discomfort), gamers with neck discomfort (66.2% versus 33.8%) compared to those with no neck discomfort tend to be

addicted gamers, back discomfort (58.1% versus 41.9%) compared to those with no back discomfort. Also, those gamers with reported eye pain (60.8% versus 39.2%) were more addicted compared to those with no eye pain and those with fingers hurt (70.3% versus 29.7%) compared to those with no fingers hurt (Table 4.5b).

Table 4.4a: Factors associated with gaming addiction (N = 377)

Characteristics	Gaming Addiction		
	Non-addicted Gamers N (%)	Addicted Gamers N (%)	χ^2 (P-value)
Gender			
Male	183 (60.4)	69 (93.2)	28.954
Female	120 (39.6)	5 (6.8)	(*P < 0.0001)
Age groups			
16-19	109 (36.0)	25 (33.8)	
20-23	153 (50.5)	38 (51.4)	0.166
>24	41 (13.5)	11 (14.9)	(P = 0.921)
Education			
First year	106 (35.0)	25 (33.8)	
Second year	98 (32.3)	24 (32.4)	
Third year	38 (12.5)	12 (16.2)	
Fourth year	48 (15.8)	12 (16.2)	2.019
Fifth year	13 (4.3)	1 (1.4)	(P = 0.732)
Marital Status of parent			
Living together	240 (79.2)	51 (68.9)	
Separated/divorced	51 (16.8)	15 (20.3)	6.479
Widowed	12 (4.0)	8 (10.8)	(*P = 0.039)
Academic performance			
Good	237 (78.2)	44 (50.5)	
Average	58 (19.1)	23 (31.3)	13.705
Poor	8 (2.6)	7 (9.5)	(*P = 0.001)
Time spent playing games in a day			
≤ 2 hours	266 (88.1)	20 (27.0)	121.681
>2 hours	36 (11.9)	54 (73.0)	(*P = 0.000)
Time spent playing games in a week			
≤ 10 hours	261 (86.7)	14 (18.9)	139.590
>10 hours	40 (13.3)	60 (81.1)	(*P < 0.0001)
Depression			
Not depressed	247 (81.5)	40 (54.1)	
Borderline depression	40 (13.2)	22 (29.7)	25.349
Severe depression	16 (5.3)	12 (16.2)	(*P < 0.0001)
Anxiety			
No Anxiety	189 (62.4)	28 (37.8)	
Borderline Anxiety	57 (18.8)	21 (28.4)	14.982
Severe Anxiety	57 (18.8)	25 (33.8)	(*P = 0.001)
Loneliness			
Not lonely	169 (55.8)	36 (48.6)	1.218
Lonely	134 (44.2)	38 (51.4)	(P = 0.270)
Sleep deprivation			
Not sleep deprived	84 (27.7)	9 (12.2)	7.749
Sleep deprived	219 (72.3)	65 (87.8)	(*P = 0.005)

*Significant p-value

Table 4.4b: Logistic regression analysis predicting gaming addiction among respondents

Characteristics	Odds Ratio	O.R 95% C.I.	P-value
Gender			
Female	1.000		
Male	3.156	1.017 – 9.795	0.047*
Marital status of Parent			
Living together	1.000		
Separated/divorced	1.691	0.678 – 4.219	0.260
Widowed	5.948	1.279 – 23.917	0.022*
Academic Performance			
Good	1.000		
Average	1.610	0.696 – 3.723	0.265
Poor	0.891	0.203 – 3.912	0.878
Time spent playing games in a day			
≤ 2 hours	1.000		
>2 hours	4.447	1.868 – 10.586	0.001*
Time spent playing games in a week			
≤ 10 hours	1.000		
>10 hours	10.993	4.332 – 27.897	< 0.0001*
Depression			
Not depressed	1.000		
Borderline depression	1.750	0.697 – 4.393	0.233
Severe depression	4.776	1.419 – 16.069	0.012*
Anxiety			
No Anxiety	1.000		
Moderate anxiety	4.608	1.675 – 12.680	0.003*
Severe anxiety	2.205	0.894 – 5.435	0.086
Sleep deprivation			
Not sleep deprived			
Sleep deprived	1.690	0.656 – 4.354	0.277

*Significant p-value

Table 4.5a: Respondents perceived effects of continuous prolonged gaming (N = 377)

Characteristics	Frequency	Percentage (%)
Shoulder discomfort	156	41.4
Neck discomfort	192	50.9
Back discomfort	177	46.9
Headache	132	35.0
Eye pain	149	39.5
Fingers hurt	216	57.3
Others (aggressiveness, abusive behavior, chest pain, hazy mind, hunger, leg pain, waist pain)	11	2.9

Table 4.5b: Respondents perceived effect of continuous gaming by gaming addiction (N = 377)

Characteristics	Game Addiction		χ^2
	Non-addicted Gamers (%)	Addicted Gamers (%)	P-value
Shoulder discomfort			
No	191 (63)	30 (40.5)	12.408
Yes	112 (37.0)	44 (59.5)	(*P < 0.0001)
Neck discomfort			
No	157 (51.8)	25 (33.8)	7.744
Yes	146 (48.2)	49 (66.2)	(*P = 0.005)
Back discomfort			
No	169 (55.8)	31 (41.9)	4.603
Yes	134 (44.2)	43 (58.1)	(*P = 0.032)
Headache			
No	219 (72.3)	26 (35.1)	36.059
Yes	84 (27.7)	48 (64.9)	(*P < 0.0001)
Eye Pain			
No	199 (65.7)	29 (39.2)	17.457
Yes	104 (34.3)	45 (60.8)	(*P < 0.0001)
Fingers hurt			
No	139 (45.9)	22 (29.7)	6.336
Yes	164 (54.1)	52 (70.3)	(*P = 0.012)

*Significant P-value

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion

This study reported the prevalence and described the factors that are associated with gaming addiction, the gaming tools and types among undergraduate students in the University of Ibadan. Though prevalence of gaming addiction were reported to be generally low across various countries of the world, this study showed a high prevalence of gaming addiction.

Based on the findings from the current study, the following discussion will give more details on these themes: (a) the prevalence of gaming addiction among undergraduates; (b) assessing the gaming tools and types among undergraduates; and (c) factors associated with gaming addiction among undergraduates.

5.1.1 Prevalence of gaming addiction among undergraduates

This is the first study in a Nigeria Public University setting that examine the prevalence of gaming addiction. Previous studies published on gaming addiction in African setting and Nigeria Private University setting (Sosso and Kuss 2018; Onyemaka *et al.* (2017) respectively only describe the percentage of gamers in those population while Okika and Nwakasi (2016) investigated parent awareness of violent video game screen time and its effects among their children.

This study revealed a high prevalence of gaming addiction. This finding is similar to the prevalence documented among undergraduates in China (Peng and Li, 2009), prevalence reported in a longitudinal study among youths in Singapore (Gentile *et al.,* 2011), as well as the documented prevalence in the review of literature on internet gaming addiction by Kuss and Grifiths (2012). The reason for the high prevalence of gaming in our study compared to some previous study can be attributed to high acquisition of computers or laptops and smartphones among these

undergraduates as over 60% of the undergraduates that played games have computers or laptops and smartphones respectively. There is high usage of computers or laptops in gaming among Nigeria undergraduates compared to other undergraduates in other African population (Sosso and Kuss, 2018).

5.1.2 Assessing the gaming tools and types among undergraduates

There were more online gamers than video gamers in our study. Majority of the undergraduates reported playing games on their smartphones and computers or laptops more than playing on consoles (PlayStation and X-box) or tablets. Similar trend was observed among the addicted gamers who play more games on their smartphones and computers or laptops compared to other means of gaming. The most likely reason for this observation has been attributed to high emergence of mobile phones and computers usage among undergraduates which has formed a very important part of students daily life as highlighted by Adenya and Onyeyinka-Oyelaran (2002); Park (2005) and Cheung (2008). This report is very similar to the findings of Hawi, Samaha and Griffiths (2018); Soso and Kuss (2018) among internet gaming disorder group of Lebanese adolescents and student gamers in Africa respectively. Also, less use of consoles could be attributed to the cost of purchase of the gadgets or payment to use the tools at gaming centres (Vourlias, 2014). Video gaming is not mobile like online gaming that takes place anywhere the gamer is.

In contrast to previous studies (Porter, 2010; Muller, 2014; Haagsma, Pieterse and Peters, 2012; Wu *et al.,* 2018) where the common gaming types among addicted gamers was the multiplayer gaming genre, the results of present study indicate that that the single gaming type was the major gaming genres among undergraduates that are gamers as well as the addicted gamers. The possible reason could be as result of the high emergence and usage of mobile phones (Adenya and

Onyeyinka-Oyelaran, 2002) or because smartphones is the most favorite gaming tool in Africa (Sosso and Kuss, 2018) which could support game play by a single player more than multiplayers.

5.1.3 Factors associated with gaming addiction among undergraduates

The current study found gender, marital status of parents, academic performance, time spent playing games in a day, time spent playing games in a week, depression, anxiety and sleep deprivation to be related to gaming addiction while age, loneliness and education class level were not related. However, these association were no longer significant for academic performance and sleep deprivation on logistic regression. Hence the present study suggest that gender, gamers whose parent are widowed, average hours of gaming in a day and week, severe depression and moderate anxiety to be significantly associated to gaming addiction.

Also, we found that males are three times more likely to be addicted gamers than females similar to the findings of Wittek et al. (2016) and Lau et al. (2018). The fact that the reward and addiction region of the brain, the mesocorticolimbic center becomes activated in male young adults compared to females during video game play also explains why males are more addicted to gaming and spend more time playing games than females (Hoeft *et al.,* 2008).

Contrary to existing literature and expectation of association between gaming addiction and age (Muller *et al.,* 2014; Rehbein *et al.,* 2016), this study showed that there was no significant association between gaming addiction and age. The most likely reason for this observation is that data obtained showed there were similarities across each age group with regards to percentage of gamers as well as percentage of addicted gamers and there was no noticeable change at all in the trend at any point in time. However, this observation aligns with Witek *et al.* (2016) argument that "gaming is a relatively new phenomenon hence cohort-effects may be at play. As younger video gaming generation grows gaming will probably be more uniformly distributed across age

groups". The respondents' narrow age gaps could also explain why every students in different age groups generally showed same tendencies to play games and also share similar prevalence of gaming addiction. Similar trend was observed in the insignificant relationship between gaming addiction and education class levels in which students belong; current data attributed this observation to the fact that games are played almost equally among students regardless of their class levels.

Our study showed that marital status of parents influences tendencies of undergraduates to be addicted gamers; students whose parents are no longer together as result of either one of them being widowed were found to be five times more likely to be addicted gamers compared to their colleague whose parents are living together. This observation is similar to the findings of Muller *et al.* (2014) and Rehbein and Baier (2013) who found a significant association between problematic gaming and family factors; they reported that adolescents from single-parent were more at risk of being addicted gamers than the ones from two-parents. The possible explanation for this findings could be that the undergraduate addicted gamers whose parents are widowed are likely to receive less quality parenting (Kim and Kim, 2015).

Previous studies have found association between low academic performance and gaming addiction (Gentile, 2009; Muller *et al.*, 2014; Onyemaka *et al.,* 2017; Hawi, Samaha and Griffiths, 2018), but the results of this present study does not suggest any relationship between gaming addiction and low academic performance. This could be because the current study adopted self-reported or self-rated academic grades which might not give a true picture of the students' true performance.

Our study found that time spent in playing games is significant in developing addictive gaming behavior among undergraduates. Students that played games for more than an average of 2 hours per day and those that played gamed for more than an average of 10 hours per week were found to

be likely addicted gamers. Time spent in playing games has been found to be a significant risk factor in the development of gaming addiction or to have positive association with behavioral symptoms of gaming addiction (Gentile *et al.,* 2011; Sprong *et al.,* 2014).

Several studies have revealed contrasting evidences about association between gaming addiction and depression as well anxiety. Wan and Chiou (2006), Stockdale and Coyne (2018) and Wu *et al.* (2018) found a positive relationship while Lau *et al.* (2018) indicate that internalizing symptoms like depressive symptoms and anxiety were not significantly related with gaming addiction. However, the results of the present study suggest that students that have severe depression and borderline anxiety are more likely to be addicted gamers. In contrast to previous studies (Krossbakken *et al.,* 2018; Wang, Sheng and Wang, 2019) loneliness was not significantly associated with gaming addiction.

Unlike previous studies (Rehbein *et al.,* 2010; Hawi, Samaha and Griffitths, 2018) that indicate relationship between sleep problems to be significantly related with gaming addiction, this study suggest no significant association between sleep deprivation and gaming addiction. The possible explanation is that sleep problems could related to stimulant use among university students (Lohsoonthorn *et al.,* 2013) or as result of preference for eveningness among university students for alertness and activity (Lehnkering and Siegmund, 2007)

While the data obtained provide valuable insights about the likely existence of gaming addiction among undergraduates in Nigeria public university, the study was not without several limitations. One shortcoming of the current study is that it adopted cross-sectional design, which prevent drawing of inferences on the causal relationship between variables. More longitudinal studies are needed in order to conclude if the observed factors are causes or consequence of gaming addition.

The study did not explore the possibility of establishing an association between the type of gaming genres or gaming tools popular among students and the development of gaming addiction. Another limitation was student self-reported academic grade which could be over or under representation of their academic performance.

5.2 Conclusion

Gaming has become a popular practice among both male and female students in the university. The development of compulsive gaming behaviors among some undergraduates has therefore resulted to the evolvement of gaming addiction. Recent advancement in technology which has brought about ease in possession of different electronic gadgets like laptops, smartphones and tablets has contributed massively to it evolution. These electronic devices which are meant to support academic activities on campus are being used as gaming tools by these students.

The present study revealed that majority of the male and female students are gamers. Also, a high prevalence of gaming addiction was recorded among the students. The study also showed that the smartphones and laptops are the major tools used in gaming by both gamers and the addicted gamers. A high number of the students will rather engage in a single player game than multiplayer games. Furthermore, the study revealed that addicted gamers played games for more than the average 10 hours used in gaming by students in a week.

The current study also suggested that the following factors: gender, marital status of parents, time spent gaming, depression and anxiety are associated with gaming addiction. These factors provide insights on gaming addiction in Nigeria public university and could help in the identification of students that are at risk of developing this addiction and therefore guide the best preventive approaches.

5.3 Recommendations

In view of the study findings, the following recommendations were made:

1. University authorities should take a more proactive approach in other to prevent the negative effect of gaming addiction by educating students especially the males on gaming addiction and creating awareness on the possible health concerns as well as symptoms that are associated with it.
2. Activities that will assist students in having a better sense of self should be introduced and encouraged in universities so as prevent attachment of students to gaming as a form of escape from negative moods.
3. Gaming spots in universities should be strictly monitored by university authorities. These university gaming centres should not be given free will to operate at all time of the day in order to reduce time spent on gaming by students.
4. Similarly, there is need by relevant public health stakeholders not just to create awareness among students but also the parents. This will help to ensure good monitoring of students especially when they are on holidays.

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APPENDIX A

INFORMED CONSENT

Dear Respondent,

I am a postgraduate student at the Department of Epidemiology and Medical Statistics, Faculty of Public Health, College of Medicine, University of Ibadan, Ibadan, Nigeria. The purpose of this study is to gather information about the **PREVALENCE AND FACTORS ASSOCIATED WITH GAMING ADDICTION AMONG UNDERGRADUATES HERE IN IBADAN**. Please note that your participation in this study is entirely voluntary as you can decide to stop at any time without any consequence. Each questionnaire has been constructed in such a way that it will conceal your identity. All information that would be collected during this study will be treated with the utmost confidentiality and used strictly for research purpose only.

Your participation in this study is important as it would help to understand prevalence of gaming and gaming addiction and factors associated with gaming addiction among undergraduates, help educate, encourage better gaming practices among undergraduates as well as provision of vital information needed by health policymakers to take necessary action. Please also note that there are no right or wrong answers to the questions asked or the statements made and I seek truthful response to the question. The survey will take at most about 20-25 minutes of your time.

Thank you for cooperating.

I have read and understand the consent form and voluntarily agree/disagree to participate in the study by checking the appropriate box below:

1. Agree [ ] 2. Disagree [ ]

_____ _____ _____

Signature Date Witness

APPENDIX B

QUESTIONNAIRE

PREVALENCE AND FACTORS ASSOCIATED WITH GAMING ADDICTION AMONG UNDERGRADUATES IN IBADAN

My name is SOGBESAN ABIODUN, a postgraduate of the Department of Epidemiology and Medical Statistics, Faculty of Public Health, College of Medicine, University of Ibadan, Ibadan, Nigeria. I am researching the prevalence of gaming and gaming addiction and factors associated with gaming addiction among undergraduates here in Ibadan. This study will help educate, encourage better gaming practices among undergraduates and provide vital information on the need for health policies. I seek truthful response to the question. The survey will take at most about 20 minutes of your time. Any information collected from you during the process will be kept confidential and will be used strictly for research purposes only.

Serial Number……

SECTION A: SOCIO-DEMOGRAPHICS

SN	QUESTIONS	RESPONSES
1	AGE IN YEARS	.....
2	SEX	A). MALE B). FEMALE
3	FACULTY	……
4	DEPARTMENT	…….
5	ETHNICITY	( ) YORUBA ( ) IGBO ( ) HAUSA ( ) OTHERS……
6	EDUCATIONAL LEVEL	( ) 1st year ( ) 2nd year ( ) 3rd year ( ) 4th year ( ) others _____
7	MARITAL STATUS OF PARENT	( ) LIVING TOGETHER ( ) SEPARATED ( ) OTHERS……..
8	ACADEMIC GRADE	( ) 1st class ( ) 2nd class upper ( ) 2nd class lower ( )3rd class ( ) Pass

SECTION B: MEASURES OF ANXIETY

Tick the box beside the reply that is closest to how you have been feeling in the past week. Don't take too long over your replies.

9	Do you feel tense or wound up?	( ) Most of the time ( ) A lot of the time ( ) Occasionally ( ) Not at all
10	Do you get a sort of frightened feeling as if something awful is about to happen?	( ) Very definitely and quite badly ( ) Yes but not too badly ( ) A little but it doesn't worry me ( ) Not at all
11	Do you get worrying thoughts go through your mind?	( ) A great deal of the time ( ) A lot of the time ( ) From time to time but not too often ( ) only occasionally
12	Can you sit at ease and feel relaxed?	( ) Definitely ( ) Usually ( ) Not often ( ) Not at all
13	Do you get a sort of frightened feeling like butterflies in the stomach?	( ) Not at all ( ) Occasionally ( ) Quite often ( ) Very often
14	Do you feel restless as you have to be on the move?	( ) Very much indeed ( ) Quite a lot ( ) Not very much ( ) Not at all
15	Do you get sudden feeling of panic?	( ) Very much indeed ( ) Quite often ( ) Not very often ( ) Not at all

SECTION C: MEASURES OF DEPRESSION

Tick the box beside the reply that is closest to how you have been feeling in the past week. Don't take too long over your replies.

16	Do you still enjoy the things you used to enjoy?	( ) Definitely as much ( ) Not quite so much ( ) Only a little ( ) Hardly at all
17	Can you laugh and see the funny side of things?	( ) As much as I always could ( ) Not quite so much now ( ) Definitely not so much now ( ) Not at all

18	Do you feel Cheerful?	( ) Not at all ( ) Not often ( ) Sometimes ( ) Most of the times
19	Do you feel as if you're slowed down?	( ) Nearly all the time ( ) Very often ( ) Sometimes ( ) Not at all
20	Have you lost interest in your appearance?	( ) Definitely ( ) I don't take as much care as I should ( ) I may not take quite as much ( ) I take just as much care as ever
21	Do you look forward with enjoyment to things?	( ) As much as I ever did ( ) Rather less than I used to ( ) Definitely less than I used ( ) Hardly at all
22	Can you enjoy a good book or radio or TV program?	( ) Often ( ) Sometimes ( ) Not often ( ) Very Seldom

SECTION D: MEASURES OF LONELINESS

Tick appropriately the boxes of best response

SN	QUESTIONS	Hardly ever	Some of the time	Often
23	How often do you feel that you lack companionship?			
24	How often do you feel left out?			
25	How often do you feel isolated from others?			

SECTION E: MEASURES OF SLEEP DEPRIVATION

The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions

26. During the past month, when have you usually gone to bed?

USUAL BED TIME……

27. During the past month, how long (in minutes) has it taken you to fall asleep each night?

NUMBER OF MINUTES TO FALL ASLEEP……

28. During the past month, when have you usually gotten up in the morning?

USUAL GETTING UP TIME……

29. During the past month, how many hours of actual sleep do you get at night?

HOURS OF SLEEP PER NIGHT……

For each of the following questions, tick the one best response. Please answer all questions.

30	During the past month, how often have you had trouble sleeping because you…	NOT DURING THE PAST MONTH	LESS THAN ONCE A WEEK	ONCE OR TWICE A WEEK	THREE OR MORE TIMES A WEEK
A	…cannot get to sleep within 30 minutes				
B	… wake up in the middle of the night or early morning				
C	…have to get up to use the bathroom				
D	…cannot breathe comfortably				
E	…cough or snore loudly				
F	…feel too cold				
G	…feel too hot				
H	…have bad dreams				
I	…have pain				
J	Other reason(s), please describe ---------- How often during the past month have you had trouble sleeping because of this?				

31	During the past month, how often have you taken medicine (prescribed or 'over the counter') to help you sleep?				
32	During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?				
		Not a problem at all	Only a very slight problem	Somewhat of a problem	A very big problem
33	During the past month, how much of a problem has it been for you to keep up enthusiasm to get things done?				
		Very good	Fairly good	Fairly bad	Very bad
34	During the past month, how would you rate your sleep quality				

INSTRUCTION: ONLY THOSE WHO PLAY GAMES, SHOULD CONTINUE WITH THE NEXT SECTIONS OF THIS QUESTIONNAIRE

SECTION F: ASSESSING THE GAMING TOOLS AND TYPES

Tick appropriately as many options that applies to your gaming activities

35. Which of the following device do you use in gaming? Tick as appropriate

	DEVICES	YES	NO
A	Consoles e.g. PlayStation or X-box		
B	Smartphones		
C	Computers or Laptop		
D	Tablets		

36. What is your favorite gaming type?

	GAMING TYPE	YES	NO
A	Single player games		
B	Multiplayer games		

SECTION G: GAMING CHARACTERISTICS

37. When did you start playing game?

( ) Primary school ( ) Secondary school ( ) after Secondary school

38. What time or days do you play games?

	GAME TIME/DAY	YES	NO
A	Weekdays		
B	Weekends		
C	Holidays		

39. How many hours do you spent playing games in a day? .....

40. How many hours do you spent playing games in a week? …….

Tick YES or NO based on your gaming activity for the last 12 months

	GAMING ACTIVITIES	YES	NO
41	Do you think about previous gaming activity or anticipate playing the next game?		
42	Do you feel irritable, anxious, or sad when you try to either reduce or drop your gaming activity?		
43	Do you spend increasing amounts of time on gaming to achieve satisfaction?		

44	Have you made unsuccessful attempts to control your participation in gaming activity?		
45	Have you lost interests in previous hobbies and entertainment as result of your engagement with games?		
46	Have you continued your gaming activity despite knowledge of causing problems?		
47	Have you deceived others regarding the amount of your gaming activity?		
48	Do you play games to escape or relieve a negative mood?		
49	Have you jeopardized or lost a significant relationship, job, or educational or career opportunity because of participation in gaming activity?		

50. Which of the following have you experienced as a result of your continuous prolonged gaming?

	EFFECTS	YES	NO
A	Shoulder discomfort		
B	Neck discomfort		
C	Back discomfort		
D	Headache		
E	Eye pain		
F	Finger pain		
Other Effects, please describe_____			

APPENDIX C

RAW SCORES OF SCALE OF MEASUREMENTS

Depression Scale (N = 483)

Items	N (%)	N (%)	N (%)	N (%)
1. I still enjoy things I used to enjoy	Definitely as much 234 (48.4)	Not quite so much 181 (37.5)	Only a little 40 (8.3)	Hardly at all 28 (5.8)
2. I can laugh and see the funny side of things	As much as I always could 349 (72.3)	Not quite so much now 80 (16.6)	Definitely not so much 42 (8.7)	Not at all 12 (2.5)
3. I feel cheerful	Most of the times 278 (57.6)	Sometimes 122 (25.3)	Not often 63 (13.0)	Not at all 20 (4.1)
4. I feel as if I am slowed down	Not at all 125 (25.9)	Sometimes 243 (50.3)	Very often 83 (17.2)	Nearly all the time 32 (6.6)
5. I have lost interest in my appearance	I take just as much care as ever 218 (45.1)	I may not take quite as much care 126 (26.1)	I don't take as much care as I should 98 (20.3)	Definitely 41 (8.5)
6. I look forward with enjoyment to things	As much as I ever did 276 (57.1)	Rather less than I used to 120 (24.8)	Definitely less than I used to 65 (13.5)	Hardly at all 22 (4.6)
7. I can enjoy a good book or radio or TV program	Often 257 (53.2)	Sometimes 169 (35.0)	Not often 33 (6.8)	Very seldom 24 (5.0)

Anxiety Scale (N = 483)

Items	N (%)	N (%)	N (%)	N (%)
1. I feel tensed or Wound up	Not at all	Occasionally	A lot of the time	Most of the time
	125 (25.9)	254 (52.6)	55 (11.4)	49 (10.1)
2. I get sort of frightened feeling as if something awful is about to happen	Not at all	A little, but it doesn't worry me	Yes, but not too badly	Very definitely and quite badly
	135 (27.9)	172 (35.6)	136 (28.2)	40 (8.3)
3. Worrying thoughts go through my mind	Only occasionally	From time to time but not too often	A lot of time	A great deal of the time
	183 (37.9)	149 (30.8)	83 (17.2)	68 (14.1)
4. I can sit at ease and feel relaxed	Definitely	Usually	Not often	Not at all
	267 (55.3)	126 (26.1)	72 (14.9)	18 (3.7)
5. I get a sort of frightened feeling like butterflies in the stomach	Not at all	Occasionally	Quite often	Very often
	227 (47.0)	185 (38.3)	52 (10.8)	19 (3.9)
6. I feel restless as I have to be on the move	Not at all	Not very much	Quite a lot	Very much indeed
	133 (27.5)	201 (41.6)	94 (19.5)	55 (11.4)
7. I get sudden feeling of panic	Not at all	Not very often	Quite often	Very often indeed
	164 (34.0)	187 (38.7)	100 (20.7)	32 (6.6)

Loneliness Scale (N = 483)

Items	N (%)	N (%)	N (%)
	Hardly ever	**some of the time**	**Often**
1. How often do you feel like you lack Companionship	190 (39.3)	233 (48.2)	60 (12.4)
2. How often do you feel left out	190 (39.3)	231 (47.8)	62 (12.8)
3. How often do you feel isolated from others	205 (42.4)	213 (44.1)	65 (13.5)

The Pittsburgh Sleep Quality Index (PSQI): component and global scores

Component	Mean	± SD	N
1. Subjective sleep quality	0.81	0.77	483
2. Sleep latency	0.79	0.83	483
3. Sleep duration	1.75	0.87	483
4. Habitual sleep efficiency	0.51	0.87	483
5. Sleep disturbances	1.19	0.57	480
6. Use of sleep medication	0.31	0.69	483
7. Daytime dysfunction	0.83	0.76	483
PSQI global score	6.18	2.90	483