Neural network to investigate gaming addiction and its impact on health effects during the COVID-19 Pandemic

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ABSTRACT

The Playing games become a serious issue and may have adverse effects on the quality of life of children. The research aims at identify in the factors and degree of influence which lead to gaming addiction and its impact on the quality of life of world children employing a comprehensive. Our method collects 2,526 children and adults' data for five significant regions globally contain schools and universities in municipal and non-municipal areas. The research also aims to investigate the effect that gaming addiction has on the quality of life of children. Structural equation test and the (NNM) were uutilized to analyze the data. The results indicate some differences between boys and girls as to what factors lead to gaming addiction. The average Root Means Square Error (RMSE) of the neural network model is relatively low (.0103 for male training data and .0113 for male examining data, while for females it was .0103 for exercising data and .0104 for examining data), But gaming addiction was found to harm the life for both genders. Discussions comprising both academic as well as practical perspectives are also presented.

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1. Introduction

After the economic bubble burst in the late 1990s, almost all Internet-related industries, except the computer game industry, online games, video games, and mobile games,experienced a recession [1]. Since then, the Internet has greatly influenced people's daily lives—through email, instant messaging, blogs, Facebook, Twitter, and many similar applications. In some cases, people have become addicted to playing online games,especially nowadays, as more have access to high-speed Internet [2].

Along with browsing and instantaneous communication with friends, parents, and others, high-speed Internet has dramatically increased the popularity of online gaming, which has become an essential part of the lives of many young people [3]. Moreover, as the popularityof online gaming continues to increase, concerns about excessive Internet usage have also increased,similar to concerns about drug or alcohol addiction. Indeed, game addicts show telltale signs of addiction by, for example, is obsessed with playing games all thetime, isolating themselves from society in order to play games, and playing games to run away from the real world pressures confronting them [4; 5]. For example, in the US, online gamers spend an average of 1-2 hours per day on their

computers, more time at video game consoles, and between 6-10 hours per week on portable video game players. Therefore,it is evident that excessive gameplay can occur on many different platforms [6].

However, it is not just online games popular with players worldwide; the offline gaming industry is also proliferating. For example, Wii Sport, with worldwide sales of 82.65 million units, is an offline game played on Wii video game consoles, and offline games Minecraftand Tetris have sold 122 million and 170 million units, respectively (as of June 2018). The largestseller of online games, on the other hand, is PUBG, with estimated sales of 27.8 million units for both mobile and tablet platforms. Other types of games on mobile and tablet platforms include arcade games (reaching 80.7 million gamers per month), adventure games (reaching 69.8 milliongamers per month), and puzzle games (reaching 54.5 million users per month). It is also interestingto note that 92 percent of mobile and tablet games are available for players to download and install for free [6].

Statistics in 2017 reveal that Thais use the Internet for an average of 6 hours and 30 minuteson work or school days and 6 hours and 48 minutes on weekends. In school or work days, 2 of these hours are spent playing online games, and in weekends it is 2 hours and 24 minutes. This is an increase of 1 hour per day or a 100 percent increase in online gaming time compared to statistics from 2008 [7]. As such, they were spending so much time playing on-line game has become a serious issu with may have adverse effects on both physical and mental health, includingfostering tendencies toward Escape and suicide and disrupting sleep patterns, resulting in insufficient rest, high blood pressure, and in some cases even death. Inthe past decade, the topic of gaming has been given more importance.

A summary of previous studies that have been conducted on gaming addiction ,precise of previous studies on gaming addiction:
1. comprised 281 university students, Cross-sectional study. Data were analyzed using descriptive statistics.[8]
2. In this case, across three universities, over a period of 30 days, data was collected using a fit model of 508 university students [9]
3. A group of 594 patientsaged 10-24 who were treated for online gameaddiction in China, A quantitative study usingquestionnaires[10]

2. Literature review

2.1. Types of games

Means to test the directing impact of stream insight in the relationship among OGA and burdensome side effects through influence balance. An aggregate of 1450 game players of the Glory of the King finished proportions of internet gaming dependence, burdensome indications, influence equilibrium, and stream insight. Results showed that OGA was emphatically connected with burdensome manifestations, and influence balance intervened that affiliation. Stream experience exacerbated the negative connections among OGA and influence balance while tempered the positive effect of effect balance on burdensome indications. This study adds to a superior comprehension of how OGA expands the danger of burdensome side effects and uncovers the clouded side of stream insight among web-based game players. As verified above, these days, games don't need to be played exclusively on a PC [12] however can likewise be played through different electronic gadgets, for example, computer game control center, cell phones, convenient game control center, and tablets [13]. [14] Classify games into four fundamental classifications: arcade games, PC games, computer game control center, and games that can be played on cell phones like telephones and tablets

Arcade games are specifically designed for single gameplay. Most of them are housed in large cabinets with coin compartments where players have to pay to play. Even though they are designed for single play, some arcade games can be played simultaneously (two or more people can play simultaneously), but they cannot be played online. Currently, arcade games are not as popular as they were in the past. However, they can still be found in in-game centers and department stores [14].

Computer games refer to games that can be played on personal computers or notebooks, where outputs can be displayed through a monitor or television. Generally, computers are not designed for playing games, but computers, known as gaming computers, are specifically designed to play games. They are better equipped with

hardware suitable for playing games and offer more flexibility than regular computers, allowing players and game developers to modify and customize games. Computer games are designed to be played simultaneously, whether on the same computer via local area networks or online via the Internet. Moreover, since 2000, playing games through web browsers and social media has become very popular because these games are easy to play and do not need to be installed on the operating system [14].

Video game consoles are electronic gadgets intended to be associated with a TV or a screen yet contrast from PC games in that they are worked by explicit game organizations. The PlayStation game control center are fabricated by Sony, Nintendo Wii and Switch consoles by Nintendo, and the Xbox by Microsoft (a non-game-explicit organization or company). Video game consoles can be categorized into home consoles (as discussed above) and portable video game consoles. In addition, portable video game consoles, such as Nintendo's Game Boy, are small in Size, compact and lightweight, and their performance is not as robust as on a computer or home console [14].

Games on mobile phones and tablets run on the two most dominant operating systems, Android and iOS. These games have become more advanced and sophisticated, and playing games on mobile phones and tablets have become very popular. Mobile games are generally free to download with no installment costs. However, it is interesting to note that mobile games developers and game manufacturers can nonetheless generate revenue through micro-transaction systems and get real money in the form of in-game purchases [14].

2.2. Behavioral factors

One reason gamers spend their time playing games is that they can experience various social experiences within a game, such as role-playing, experiencing virtual professional careers, and enjoying membership in a virtual society. These experiences may not be available to them in the real world [15]. In addition, gamers who suffer from stress or depression use games as a means of Escapee from the real world. This is also the case with people who lack self-respect, who are more likely to become addicted to games [16; 17]. Lack of confidence and social skills makes it even easier to become addicted to Internet and games because doing so allows gamers to Escapee reality and, instead, to find happiness in the world of gaming.

[4] Found another motivation for playing games, especially online games with a large pool of players, namely, that this environment allowed players to compete and evaluate themselves within a game. Obtains of such competition come in the form of ranking and positions, leading to the increase in the players' reputation, which in turn might allow them to earn a living via game-streaming platforms or as e-sport athletes. Therefore, the following assumptions are proposed:

      A1. Self-respect sets a negative relationship towards gaming addiction
      A2. Escape sets a positive association towards gaming addiction
      A3. A competition sets a positive association towards gaming addiction.

2.3. Entertainment elements

Excessive gaming may result from the gamer being absorbed in the state of flow of the game because of the enjoyment they perceive. Games also make players want to experience the joy of finding new and different experiences inside the game [18]. Study on continuous flow and psychological motivation found a positive relationship between the state of flow and excessive gaming [19]. Therefore, this relationship suggests that continuous flow is a factor in excessive gaming.

[20] Concluded that people play games because doing so entertains them, helps pass the time, and allows them to enjoy the playfulness of games and feel relaxed because they can get away from the tensions of their daily life. [21] Found that people, especially working people and students, play games because it relaxes them. However, curiosity about new games is another factor that leads to increased gameplay. Playing games due to Curiosity about new images and sounds generated by the game heightens the stimulation of players, making them want to play the game even more. Today's games can offer gamers both entertainment and novelty, be it role-playing opportunities, the ability to virtually travel to various locations, the chance to experience novel

sounds and effects, and be virtually immersedin challenging situations. This relationship suggests that curiosity is a factor for excessive gaming[22]. Therefore, we propose the following assumption:

A4. Flow sets a positive association towards gaming addiction
A5. Playfulness sets a positive association towards gaming addiction
A6. Relaxation sets a positive association towards gaming addiction
A7. Curiosity sets a positive association towards gaming addiction.

2.4. Social factors

In-game social interaction creates a way for players to connect and create strong relationships with each other. It also serves as a communication channel to facilitate social interaction in virtual communities, markets, and battlefields. Online games are also used as communication tools for gamers to meet and chat or message each other. Games that can facilitate good communication can promote social interaction among players [23].The fact that games can create a world of virtual reality attracts even more players because gamers are more likely to play games if their friends are also obsessed with playing games. It is interesting to note that gamers believe that games are an excellent way to have known more people, improve social skills, and create relationships with one another [24]. Thus, gamers prefer to develop relationships through gaming channels rather than real life [25].

Another critical factor is the social norm that arises when gamers acquire information from other gamers and firmly believe it. A social norm also arises when gamers adhere to the expectations of other gamers in the hope of receiving rewards or recognition and avoiding punishment. Moreover,, where as social gaming norms being established, gamers are affected via othergamers as to the number of games they ought to play [1]. For instance, in most massive multiplayer online role-playing games (MMORPG), the game has a guild system where the gamer is the association's head has the right to form a policy or group rules. This helps increase communication channels in the game and the level and game time for other gamers. In light of the above, we propose the following assumption:

A8. Social norm sets a positive association towards gaming addiction
A9. A critical mass formed a positive association towards gaming addiction
A10. Relationships develop a positive association with gaming addiction.

2.5. Gaming addiction and quality of life

Studies on quality of life in children who are addicted to games or at risk of being addictedwere assessed in the following related dimensions: physical health, learning, emotions, and socialand behavioral changes since they started playing games [26]. According to the GAME-Q quality of life index, various studies have found that excessive gameplay is harmfulin the short term; for example, gamers sleep late and miss school. However, at some point, it can also have long-term adverse effects, such as visual or other physical problems [27] and emotional fluctuations caused by games that require excessive gameplay and exposure to virtual violence [28], as well as bad academic results [16]. Therefore,we propose the following assumption:

A11. Gaming addiction sets a negative association with the Health effect.

2.6. Gender differences

In addition, past research has highlighted that male and female players have different access to games. Male players were found to have significantly higher access to games than female players, and excessive gaming, apart from being a problem among children and teenagers, is especially problematic for men [29, 30]. However, [31] argue that the differences in the number of male and women gamers have continuously decreased over time. They also report that game production companies are no longer just focusing on males but are also trying to include female players as part of their game production demographics. The current situation indicates that female players have an essential role in the gaming industry and that social networking platforms give women more access to games.

By relying on a literature review, we propose the investigator model and assumption as shown in Figure 1, comparing gaming addiction and quality of life among male and female children.
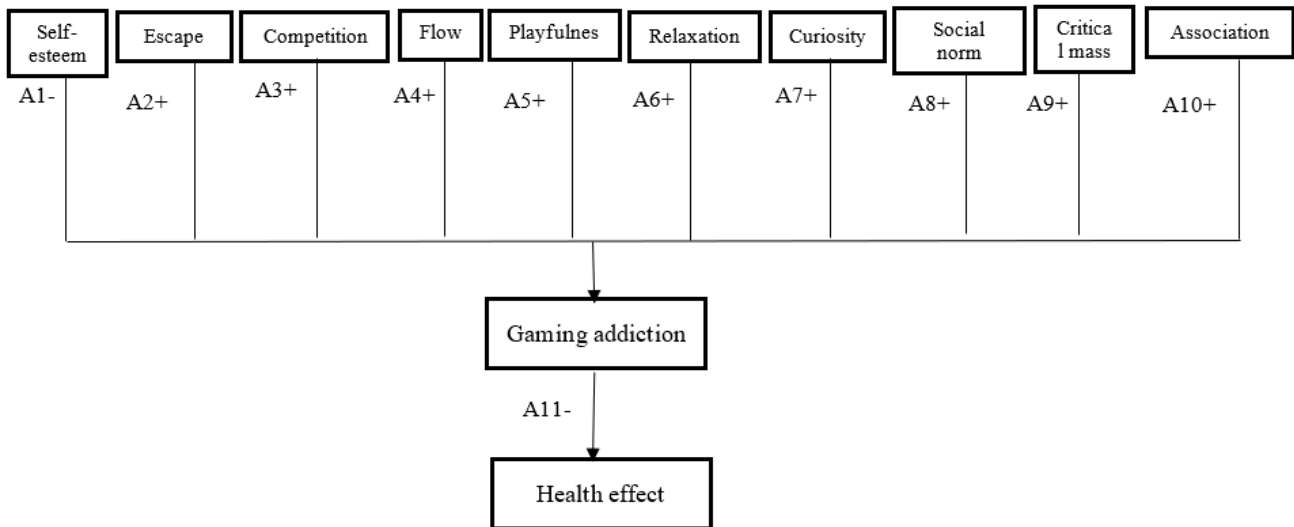

Figure 1. Proposed study model

3. Methodology

3.1. Instrument development

For each construct in the research model, multiple items are utilized for measurement. Theseitems used in the measurement scale were adapted from previous studies, as shown below in Table2. Pre-testing was conducted among many schools and universities to check for clarity of the language and understanding of the questions.

Table 2. Source for the measurement items

S	Constructs
1	self-respect[32]
2	Escape[33][25]
3	Competition[25][34]
4	Flow[35]
5	Playfulness [23] [1]
6	Relaxation [36]
7	Curiosity[22]
8	Social norm[1]
9	Critical mass[1] [34]
10	Association[25]34]
11	Game addiction[37]
12	Quality of life[37]

3.2. Data collection

In order to gain a comprehensive understanding of gaming addiction,data collection was broken into four levels, as shown in Table 3 and explained below:

Table 3. Levels of data collection breakdown

Levels	Breakdown	
Level 1	Five regions: One province per region	
Level 2	Municipal schools	Non-municipal schools
Level 3	Grade 7	- Grade 9
Level 4	Universities	

Level 1: Data were collected from schools in the proportionate world sampling comprising all seventy-seven provinces. The province with the highest number of children aged (7-9) from each region was selected for this study.

Level 2: The schools in the provinces were then further divided into two areas: schools in the municipal and those in non-municipal areas; the proportion of sampling in municipal to non-municipal areas was 3:1.

Level 3: Data were collected from students studying in grades 7-9 (age 10–17) for schools that fall under the Office of Basic Education, Office of the Higher Education Commission, and the Office of the Private Education Commission. This age range was selected because [7] found that the age range for students who use the Internet to play games the most is below age fifteens shown in Figure 2.

Level 4: Data were collected from students studying at university age (18-23) because [38] found a suitable age range for students who use the Internet to play games shown in Figure 2.
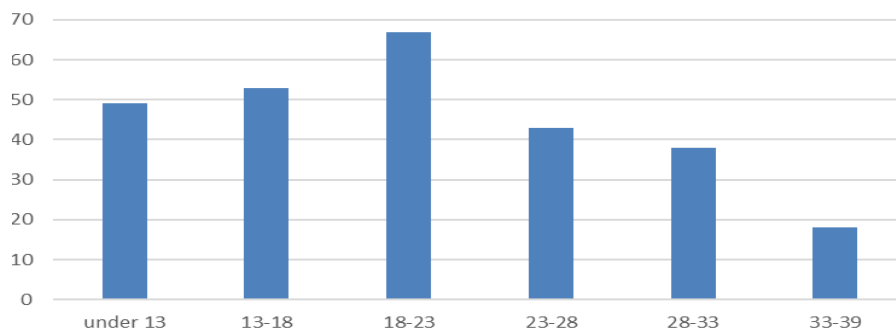

Figure 2. Online gaming percentage segmented by age groups

Focusing on students is very important because children tend to play games longer and are willing to sacrifice university and study time to play games [38]. In addition, young children are at a juncture in their lives when they can be easily tempted and develop risky behaviors that may cause problems in society [39]. In addition, [40] argued that children under fifteen were regarded high risk if they did not guide via their parents or teachers before they turn into adolescents. Once they become adolescents, their behavior and attitude are more challenging to change. The breakdown of the population and sample size is shown in Table 4.

Table 4. Population and sample size

Region	Population	Sample size		
		Total	Municipal	Non-municipal
China	33.23%	452	382	-
Malaysia	18.39%	380	287	93
United kingdom	16.24%	684	504	171
Australia	15.76%	351	240	81
Thailand	16.37%	386	253	83
	100.00%		2,526	

3.3. Result and discussion

Data are examined by uutilizing the two-step approach recommended via [41], that contains an analysis of measurement validity and the structural model to examine the adopted model and the assumption.

The study conducted construct reliability and validity tests, using Cronbach's alpha to test the scales' reliability. Cronbach's alphas for both genders were above the recommended threshold value of 0.70, indicating that the scales were reliable [42, 43]. Following this, confirmatory factor analysis is acted. The factor loadings were above 0.50, as suggested by [43], and the ones below 0.5 were removed because of low factor loading. Composite reliabilities (CR) and average variance extracted (AVE) Each construct (except male self-respect and game addiction for both males and females) wasabove the recommended value of 0.5, suggesting good convergent validity [44]. Table 6 summarizes the confirmatory factor analysis CFA. Furthermore, the square root ofthe AVE and its correlation with other constructs were compared to test for discriminant validity.The results in Table 5 and Table 6 demonstrate that the square root of the AVEs for almostall constructs is greater than the correlations between the constructs, thereby suggesting good discriminant validity [44].

Table 5. Correlation coefficient matrix and the square root of AVEs (Male)

	1	2	3	4	5	6	7	8	9	10	11	12
1 Self-respect	**0.14**											
2 Escape	-0.112	**0.680**										
3 Competition	0.030	0.540	**0.501**									
4 Flow	-0.049	0.524	0.672	**0.639**								
5 Playfulness	0.083	0.332	0.504	0.558	**0.542**							
6 Relaxation	0.030	0.449	0.484	0.523	0.573	**0.704**						
7 Curiosity	0.077	0.430	0.562	0.596	0.534	0.652	**0.546**					
8 Social norm	-0.070	0.415	0.417	0.358	0.256	0.298	0.345	**0.602**				
9 Critical mass	0.089	0.399	0.557	0.494	0.553	0.461	0.497	0.391	**0.677**			
10 Association	0.010	0.450	0.492	0.502	0.505	0.546	0.635	0.358	0.462	**0.678**		
11 Gaming addiction	-0.170	0.309	0.400	0.378	0.301	0.268	0.267	0.229	0.342	0.295	**0.669**	
12 Health effect	0.279	-0.110	-0.090	-0.143	-0.043	-0.061	-0.068	-0.043	-0.081	-0.073	-0.232	**0.507**

Table 6. Correlation coefficient matrix and the square root of AVEs (Female)

	1	2	3	4	5	6	7	8	9	10	11	12
1 self-respect	**0.549**											
2 Escape	-0.231	**0.652**										
3 Competition	-0.137	0.661	**0.621**									
4 Flow	-0.126	0.683	0.699	**0.624**								
5 Playfulness	0.016	0.473	0.552	0.587	**0.699**							
6 Relaxation	-0.099	0.553	0.552	0.604	0.600	**0.670**						
7 Curiosity	-0.038	0.532	0.600	0.623	0.616	0.709	**0.707**					
8 Social norm	-0.129	0.440	0.459	0.352	0.282	0.375	0.370	**0.626**				
9 Critical mass	-0.073	0.480	0.580	0.531	0.524	0.448	0.480	0.494	**0.849**			
10 Association	-0.064	0.538	0.558	0.586	0.529	0.637	0.698	0.412	0.473	**0.670**		
11 Gaming addiction	-0.223	0.404	0.393	0.445	0.424	0.352	0.314	0.215	0.375	0.296	**0.475**	
12 Health effect	0.250	-0.203	-0.134	-0.173	-0.115	-0.113	-0.125	-0.111	-0.149	-0.061	-0.261	**0.622**

4. Testing results

Structural equation modeling (SEM) was run using the R language to test the way and assumption propose in the research sample. SEM was preferred over traditional statistical tools like linear regression or ANOVA because SEM can simultaneously test the relationship between multiple dependent variables and independent [41]. Table 7 shows the fit indices. Although the fit values do not exceed the threshold value of 0.9, they are still above 0.85, which still meets the requirement suggested by [45] and[46], while the RMSEA value is less than 0.6, also indicating a good fit. Figures 3 and 4 show the direction as well as significance and the strength of the way coefficients. Only a significant ways are shown in the two figures.

Table7. Measures of the model fit

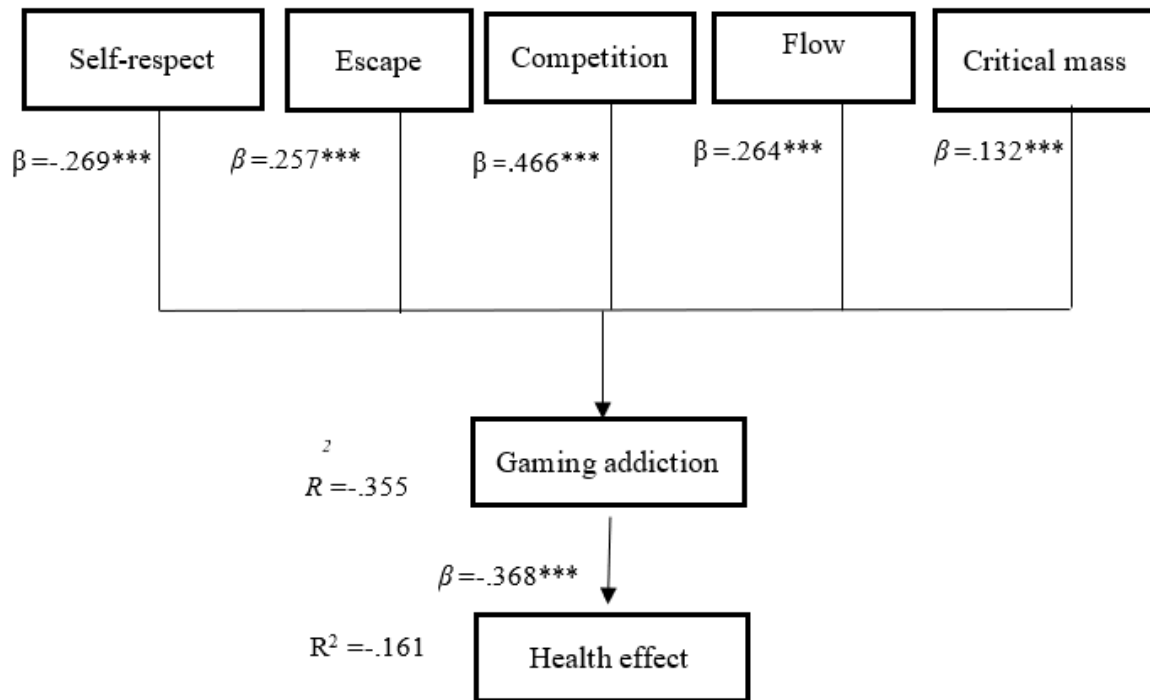| Model	NFI	GFI	IFI	CFI	RMSEA
Male	.880	.876	.877	.886	.050
Female	.800	.842	.868	.827	.054

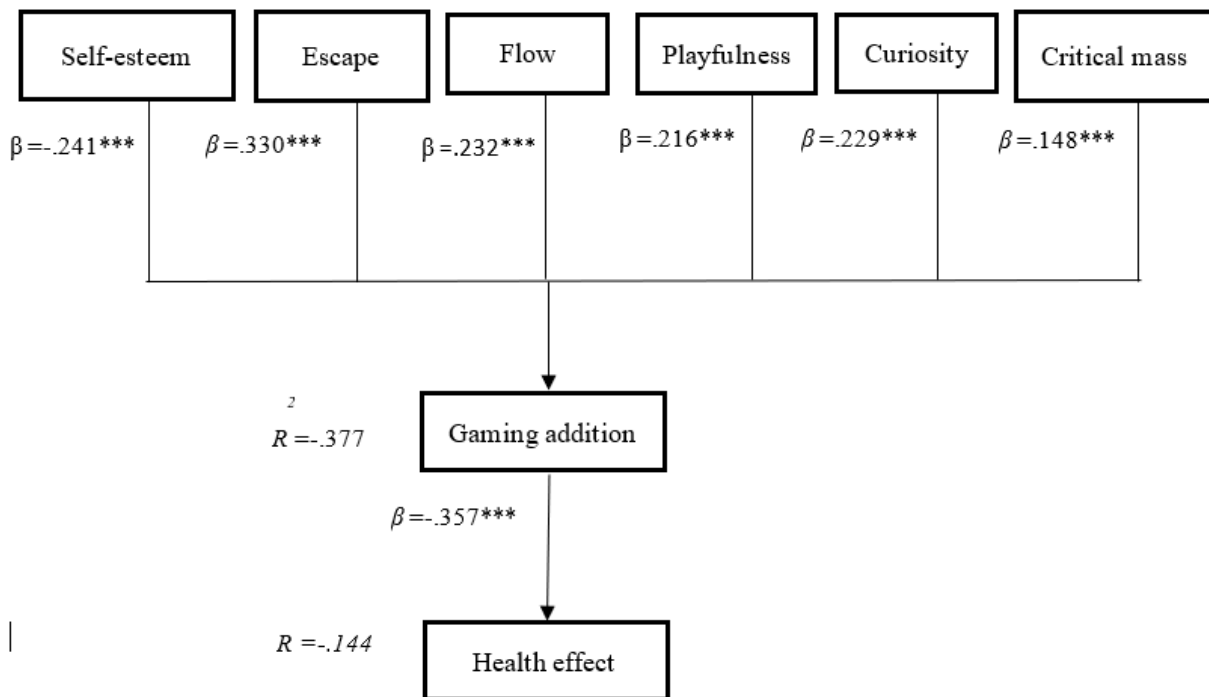Figure 3. Path diagram and assumption testing results (Male)

Figure 4. Path diagram and assumption testing results (Female)

5. Discussion

This study aims to investigate the factors and the degree of influence that lead to gaming addiction among the world and its effect on their quality of life. A comprehensive model that covers behavioral, entertainment, social, and quality of life factors were proposed. Findings provide evidence to answer the research questions proposed

and show that gaming addiction is influenced by several factors that differ by gender. Aabstract of the assumption testing are presented in Table 8.

Table 8. Aabstract of assumption tests

Summary of assumption testing	Path coefficients	Results Male	Path coefficients	Results Female
A1:SE-GA	β=-.269***	Supported	β =-.241***	Supported
A2: ES – GA	β =.257**	Supported	β =.330***	Supported
A3: COM – GA	β =.466***	Supported	-	Not supported
A4: FL – GA	β =.264***	Supported	β =.232***	Supported
A5: PLA – GA	-	Not supported	β =.216***	Supported
A6: RX – GA	-	Not supported	-	Not supported
A7: CU – GA	-	Not supported	β =.229***	Supported
A8: SN – GA	-	Not supported	-	Not supported
A9: CM – GA	β =.132**	Supported	β =.148***	Supported
A10: RE – GA	-	Not supported	-	Not supported
A11: GA – QL	β =-.368***	Supported	β =-.357***	Supported

As shown in the table, six out of the eleven assumptions for males and seven out of eleven assumptions for females were supported. We can see that there are some similarities betweenthe two genders. For both genders, self-respect had an antagonistic relationship towards gaming addiction, which is consistent with the findings of [47] and [17]. Therefore, it can be concluded that children who lack confidence, have a negative attitude towards themselves, and have low self-respect are more likely to be addicted to games. Escapehad a positive relationship for both males and females, consistent with the findings of. This means that children being stressed and have troubles in their day-to-day life find it necessary to run away from these problems by playing games. By doing so, they can forget or lower their stress and detach themselves from their problems. There is also a positive relation amidst competition and gaming addictions for males, but this was not supported for females. Therefore, it can be concluded that males play games because they have a strongcompetitive nature and want to prove to others that they are the most skillful and the fastest at thegames they play, which gives them a sense of satisfaction.

Consistent with the findings of [19], for both genders, the flow had a positiverelationship towards gaming addiction. This might be because once gamers start playing, they become fully immersed in the game and lose track of time. While There is also a positive relation amidstplayfulness and gaming addiction for females, this was not the case for males. Perhaps females play games because they simply believe that it is fun to do so. Inconsistent with the findings of [21], for both genders, relaxation did not show a positive relationship with gaming addiction. This means that children do not play games because they wantto relax, feel refreshed, or enjoy a sense of calm after playing games. There is also a positive relation amidstcuriosity and gaming addiction for females, but this was not found to be true formales. This could be because females are more satisfied playing games when doing so can satisfytheir curiosity and feel that games can surprise them in a good way.

Inconsistent with the findings of [1], for neither gender did social norms show a positive relationship with gaming addiction. This is surprising because Tha iland is the highly collectiv country according to [48] cultural dimensions. This shows that individual is exceptionally given to family, more distant family, and companions and are engaged with broadened connections, and that implies that they are enormously affected by their social environmental factors and worth the assessments of others. Nonetheless, this study shows that those youngsters

are not affected by the assessments of family or companions and don't mess around to look for their endorsement.They are, however,influenced by critical mass as this had a positive relationship with gaming addiction for both genders. This is not surprising as the most popular games children play in this study are not single- but rather multiplayer games and require a critical mass for playing to be enjoyable. Thesegames require continued coordination among players, so playing games in groups or having a largecritical mass is deemed important for the game's success. Surprisingly, inconsistent with the findings of [24] and [25], for neithergender did such relationships show a positive relationship with gaming addiction. This means thatyoung gamers do not play games because they want to spend time with others online necessarily and create personal relationships, implying that they still prefer the "offline," natural world method of creating and maintaining relationships. Finally, a negative relationship was found between gaming addiction and quality of life. This indicates that excessive gaming hurts physical health and mood as well as behavior. Youngsters' academic performance in school also tends to decline in their relationships with their family and friends.

An artificial neural network (ANN) has been a lively rang of paper [52-53]. This study also combined SEM and neural network analysis, one of the most important techniques used in artificial intelligence. The advantage of using (ANN) test is that unlike multiple regression analys and SEM, which can only detectlinear relationships, it can detect non-linear relationships [49]. In addition, according to [50], ANNs can learn both complex- linear and nonlinear relationships admits predictor, are more robust, and provide more complex accuracy with predictions [51]. This study uses multilayer perception (MLP)with nine independent variables—self-respect, Escape, competition, flow, entertainment, relaxation, curiosity, social norm, critical mass—and relationships as the input layer, while gamingaddiction was used as the output layer. The study used 10-fold cross-validations, in which 90% of a info was used for training the networks, and the other 10% used for testing. The root means square error (RMSE) for all the training and the test of info groups was set at ten (NN) to generate a predictive accuracy of a sample [49]. The RMSE values for all the train and testand the average and standard deviation for both genders are shown in Table 9. The average RMSE of the (NN) sample is relatively low (.0103 for male train info and .0113 for male test info, while for females it was .0103 for training info and .0104 for test info), suggesting that it is quite an accurate prediction [49].

Table 9. RMSE values for the neural networks

| Neural networks | RMSE | | | |
| | Male | | Female | |
	Training	Testing	Training	Testing
ANN1	.0108	.0105	.0104	.0101
ANN2	.0106	.0114	.0101	.0106
ANN3	.0104	.0102	.0103	.0103
ANN4	.0104	.0109	.0103	.0113
ANN5	.0101	.0108	.0101	.0097
ANN6	.0107	.0117	.0097	.0101
ANN7	.0104	.0120	.0106	.0108
ANN8	.0102	.0120	.0103	.0105
ANN9	.0100	.0114	.0101	.0110
ANN10	.0097	.0117	.0106	.0098
Mean	**.0103**	**.0113**	**.0103**	**.0104**
SD	**.0003**	**.0006**	**.0002**	**.0005**

Table 10 presents the results of the sensitivity analysis, which show the normalized important as the proportion of the important of each of the predictors to the values that has the highest importance. [49].

Table 10. Normalized variable importance

Predictors	Normalized Importance	
	Male	Female
Self-respect	100.00%	100.00%
Escape	43.53%	28.37%
Competition	93.82%	n.s
Flow	54.14%	67.68%
Playfulness	n.s.	86.83%
Curiosity	n.s.	14.42%
Critical mass	77.81%	51.11%

As shown in Table 10, based on the (NNA), self-respect and competition are the most important predictors for male gaming addiction, whereas Escape and self-respect are the most important predictors for females. One limitation of (NNA) is that it does not identify the direction of the relationship of both the predictor and the outcome. However, this limitation has already been addressed by SEM [49].

6. Conclusion

Our study provides both academic and managerial implications. In terms of theoretical implications, we propose a comprehensive framework that covers the behavioral and entertainment factors and social factors. Other researchers can perhaps use this as a guideline to research a similar context in their own countries; we have also found both contradictions and consistencies with previous studies on gaming addiction and have extended our perspective to measure how such addiction impacts young people's quality of life. We use neural network analysis in addition to the traditional approach of using SEM. In terms of practical contributions, solid empirical evidence indicates which factors lead to gaming addiction and how they affect the quality of life of the world's youngsters. This could be necessary for fathers and mothers to know or to understand why their children become addicted to games and how this affects them. This is also important for schools and teachers so that they too can better understand the behavior of their students. In doing so, both parents and teachers can devise mechanisms that curb excessive gaming behaviors. It is also essential for policymakers to devise national policies that restrict excessive gaming, similar to what governments in Australia, China, United Kingdom, and Malaysia have done.

However, meticulous respect being paid in the literature review process and design and carry out the fieldwork, this paper does have some limitation. First, this research was study results might be applicable in different countries with different cultures and settings. Secondly, the data were collected at 1 (po) in time (cross sectional). selecting data uutilizing the longitudinal approach would give different results. Thirdly, although the proposed framework was comprehensive, it might have left out other factors that might better explain the factors that lead to gaming addiction. Further research could explore other factors that lead to gaming addiction.

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