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Exploring the Influence of Internet Literacy on Game Addiction Behaviors from a Perspective of Physical and Mental Health

Abstract: - The rapid popularization of facilities such as the Internet provides a channel for users to find information and offers more game space. People can discover usable game applications online and even chat with strangers while playing games. A significant breakthrough in online games allows people to find a new place without the limitations of time and space. The growth rate of the online game market has exceeded the original expectations. One of the reasons is that the new players at the low age of primary and secondary schools have led to the continuous expansion of the online game market. Computer education courses in compulsory education are continuously being extended and expanded. Students contact the Internet and online games early. Therefore, this study used structural equation modeling (SEM) to examine the relationship between Internet literacy, game addiction behaviors, and physical and mental health. The research results show that Internet literacy positively affects game addiction behaviors, game addiction behaviors positively affect physical and mental health, and Internet literacy negatively affects physical and mental health.

Keywords: Internet literacy, online game, negative function, physical and mental health.

I. INTRODUCTION

Playing online games has become a leisure activity for some people, occupying most or even their time [25]. The rapid popularization of facilities such as the Internet allows modern people to find information and offers more game space. Today's games are different from the past. People can discover usable game applications online and even chat with strangers while playing games. A significant breakthrough in online games allows people to find a new place without the limitation of time and space [11]. A report from Unity Technologies shows that players have spent significantly more time playing games during the COVID-19 epidemic, and the daily active users of both PC and mobile games have increased considerably. Content-wise, engagement on "commuter apps" decreases while more gamers tend to rely on social gaming, which comes with functions allowing gamers to interact with other massive multiplayer. The famous game Animal Crossing: New Horizons by Nintendo is the perfect example of a pandemic era. Gamers can visit to their friends, hang out, or visit the museum without actually going out, which is changing people's social patterns. The growth rate of the online game market has exceeded the original expectations. One of the reasons is that the new players at the low age of primary and secondary schools have led to the continuous expansion of the online game market [42].

Computer education courses in compulsory education are continuously being extended and expanded. Students contact the Internet and online games early. The negative impact Internet technology has had on young people who have not been deeply involved in the world is the exchange of diverse information and the temptation of sensory stimulation. Peers compete to indulge in the virtual world, breeding all kinds of provocative behaviors and gradually forming a hotbed of crime [58]. Csikszentmihalyi [10] pointed out that when people perform certain daily activities, they will be fully immersed in the situation, concentrate, and filter out all irrelevant perceptions, entering a state of immersion accompanied by a loss of consciousness [18]. On the other hand, the stress coping theory of addictive behavior points out that when individuals face stress, using effective coping will promote health outcomes, while using ineffective coping or lack of coping skills will lead to addictive behavior [29], [59], and people who highly use emotional focus and avoidance coping will increase their likelihood of addiction [9], [59].

Internet use and the Internet itself do not cause problems, but excessive Internet use and avoidance of maintaining a healthy life are the fundamental problems that the Internet affects users [16]. People who are attached to online games will spend a lot of time playing them, become restless, easily angry, and lose interest in other activities. Online games will be used as a way to escape reality. Individuals will not obey the time limit for playing and then start to miss significant time and spend less time with their families, slowly withdrawing from normal life and

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ignoring interpersonal relationships. Life with friends, colleagues, community, and eventually self becomes unmanageable. Information education has been taking root for more than 20 years, emphasizing constructing a high-quality information education environment and integrating information technology into school curricula so that students can have a correct attitude towards information learning, understand and respect information ethics, etc. [36]. Digital learning has become popular on university campuses. College students are all Digital Natives who have lived in the world of computers and the Internet since birth. Their lives are accompanied by the applications of computers, the Internet, mobile phones, and communities [41]. Influenced by the government's active promotion of information education, their thinking and focus differ from those of the previous generation. Despite the advancement of technology, online games have brought people rich entertainment, interactivity, and sociality, but things always have two sides, and there are always pros and cons. Therefore, this study intends to examine the relationship between Internet literacy, game addiction behaviors, and physical and mental health.

II. LITERATURE REVIEW

Literacy abilities are not static but will grow with time and learning [38]. However, Internet literacy has many overlapping definitions or connotations with information literacy, technology literacy, media literacy, etc., so this study first summarizes and defines each aspect through a literature review. Online games have gradually become the leading form of entertainment for children, an unstoppable trend. But game addiction behaviors also bring many impacts to users. This study will be based on flow theory, re-deconstruct the aspects of game addiction behaviors, and understand the relationship between Internet literacy, game addiction behaviors, and physical and mental health.

A. Internet Literacy (ITL)

Internet literacy (ITL) was a dimension of information literacy in the early days. McClure [37] believes that information literacy is a concept and the ability to solve information problems. It covers four dimensions of literacy, including traditional literacy, computer literacy, media literacy, and Internet literacy. Internet literacy is understanding the value of Internet resources and using search tools to select and process specific information. The definition of Internet literacy should incorporate new concepts and elements along with the characteristics of Internet technology and usage. Shi [49] divided Internet literacy into skills and information levels. The skill level includes using the Internet and "reading, writing, and speaking" on the computer network. In contrast, the information level consists of the degree of initiative of network users and the assessment of the importance of information.

Xu [60] proposed that computer operating skills do not equal Internet literacy but should only be part of Internet literacy. The Internet media literacy ability is divided into five categories: information evaluation ability, Internet usage ability, Internet security ability, Internet legal ability, and Internet etiquette ability. Internet literacy is defined as the ability of a person to use the Internet and to retrieve and evaluate information. A person should also understand the characteristics and impact of the Internet and be able to use it safely and ethically. Internet literacy means that in addition to a person's ability to use the Internet and retrieve and evaluate information, they should also understand the characteristics and impact of the Internet and be able to use it safely and ethically. Huang [19] believes that Internet literacy is after the user understands the need for information under the relevant regulations of the Internet and uses the computer network with a positive attitude to obtain the required information to solve work and daily life problems. The knowledge and abilities needed to solve the problem. It is believed that only by paying attention to the ability and standards to use the Internet simultaneously can one have basic Internet literacy.

Internet literacy no longer unilaterally affirms Internet usage skills and knowledge but encompasses Internet users' mentality when using the Internet and their ability to comply with social norms. Chen [7] pointed out that Internet literacy is having general Internet knowledge and understanding of the Internet's meaning, connotation, and development trends; a person can also use Internet skills to retrieve relevant knowledge after being aware of information needs. Then, evaluate and reorganize information, establish an attitude of correctly using online information, and be willing to interact and communicate with others to solve problems in personal life. Lin [30] emphasized that Internet literacy is in an Internet-based environment. In addition to having general Internet knowledge and understanding of the meaning, connotation, and development trends of the Internet, individuals can also use the Internet after being aware of information needs to retrieve relevant knowledge, evaluate and reorganize information, and use it safely and ethically to solve personal life problems.

Based on the above research results and the definition of Internet literacy, this study intends to evaluate users' Internet literacy in five dimensions: information evaluation ability, Internet usage ability, Internet security ability, Internet legal ability, and Internet etiquette ability. Internet literacy refers to an individual's ability to utilize the functions provided by the Internet and to use the Internet positively to solve problems in one's life in a safe, legal, and ethical manner without affecting one's physical and mental health.

B. Game Addiction (GMA)

Game addiction (GMA) is a particular addictive behavior characterized by excessive or compulsive online gaming that affects people's real lives [52]. The definition of GMA is still highly controversial in the medical field, and no evidence has shown that GMA should be classified as a mental disorder [21]. In 2010, the media reported that the Diagnostic and Statistical Manual of Mental Disorders (DSM) may consider GMA as a kind of mental disorder. Numerous scholars have mentioned the characteristics of GMA, which may have been spent a long time on online games. They also divided games' attractiveness and addiction factors into two groups. The first group is the addiction factor, which is characteristic of withdrawal symptoms and salience of overuse behavior; the second group is peripheral factors, that is, the strong attractiveness of the game and the characteristics related to the pathological game, including tolerance and emotional changes of the game. It was also found that more than 12% of online game addicts have the symptoms mentioned above [6].

Van Rooij et al. [53] mentioned that online game addicts have an emotional response, pointing out that online games can change individuals from negative to neutral, positive, or even more exciting. In terms of game rewards, individuals regard it as short-term high-interest rate gambling when the characters in the game obtain various rewards (treasures), character growth (upgrades), and interaction with virtual people. It is like an intermittent enhancement that continuously feels a sense of immediate feedback effect. However, the game's intensity, fun, and excitement will diminish the tolerance for the reward, and players need to spend more time betting on games and paying more attention to getting rewards. Lemmens, Valkenburg, and Gentile [26] believed that online game addicts feel eager to play online games, making the desire uncontrollable and out of control.

Moreover, when people with an addiction cannot access online games, they will feel muscular discomfort and withdrawal symptoms. Dong et al. [13] also believed that people with an addiction will continue to think about the activities and processes in the game. Because people with an addiction are ungraded by game props and character abilities in the game, they will take the initiative to maintain or rise to a new level.

Internet literacy is a multi-faceted concept. In addition to the ability to use and understand technological information tools at the application and conceptual levels, it also requires criticizing and evaluating information technology's advantages and disadvantages, capabilities, and limitations, such as judging network data. Whether it is trustworthy, the ability to understand how Internet information is produced in society and its significance, such as understanding the sources, legal implications, and social significance of Internet information [27], [28], [48]. Internet literacy improves people's critical thinking about online information, allowing players to identify game marketing strategies and psychological designs. It can effectively reduce individuals' immersion in games, better control their time allocation in games, help players identify the negative impact of games on mental health, and increase their understanding of network security. Therefore, hypothesis 1 can be inferred as follows.

H1: Internet literacy negatively affects game addiction behaviors.

C. Physical and Mental Health (PMH)

Serafini et al. [47] pointed out that a healthy person should achieve a balance of physiology, psychology, and society and be able to exert one's best potential to obtain personal growth and a productive life. Physical health refers to the self-feeling of the body's structure or physiological function. The objective evaluation is based on a diagnosis of chronic and acute diseases and the decline and limitation of physical functions; the subjective evaluation is based on the feeling of one's physical and mental condition and attitude. Regarding mental health, objective evaluation depends on whether the individual has a good mental state and social adaptability [43].

Mental health is a balanced relationship between a person's inner world and the objective environment. It is the maintenance of a good interpersonal relationship between self and others. It can not only obtain a sense of self-stability and a peaceful mind but also achieve self-fulfillment and the ability to serve and make healthy contributions to others. According to Pfefferbaum, Schonfeld, and Flynn [40], the definition of mental health refers to a state of well-adjusted life that meets the following requirements: (1) emotional stability, no long-term anxiety or psychological conflict; (2) be willing to work and demonstrate self-ability at work; (3) be able to

establish a harmonious relationship with others as well as communicate with others; (4) have a proper understanding on oneself and an attitude of self-acceptance; (5) have a proper understanding of environment, and be able to face and solve problems effectively without escaping.

Alonzi, La Torre, and Silverstein [1] pointed out the impacts of organizational stress on safety and health employees will experience heart and cardiovascular, drug and alcohol abuse, back and muscle pain, anxiety and depression, mental illnesses, infectious diseases, interpersonal conflicts, accident injuries, particular cancers (colon and rectal cancer) and so on under the working environment with high demand, low control, high effort, and low pay. Suppose employees need help to adjust or adopt effective response strategies while dealing with job stress. In that case, they will have a certain degree of negative impact on their personal, physical, and mental health.

A healthy person should achieve a dynamic balance of physiology, psychology, and society and exert one's best potential to obtain personal growth and a productive life [57]. Physical and mental health (PMH) refers to physical health, emotional stability, well-adjusted life, and social interaction [62]. Physical and mental health (PMH) means an individual needs good physical fitness. On a psychological level, the individual can adjust emotionally in daily life. At the social level, an individual has good social adaptability [61]. According to the three levels of physiology, psychology, and society, physical discomfort (PSD), depression reaction (DPR), anxiety reaction (AXR), interpersonal problems (IPP), and life adjustment problems (LAP) are identified as critical elements of physical and mental health (PMH) with negative perspectives [22], [23].

In modern society, many people use computers to complete paperwork while playing games and using social platforms simultaneously to deal with matters assigned by companies and individuals [3]. In addition, because the brain's attention must constantly switch “windows,” the brain generates stress, which induces cortisone by the stress hormone. Studies have confirmed that multitasking affects not only memory but also IQ. The doctor pointed out that the brain can only process one thing simultaneously. When forced to multitask, it also increases stress on the brain [50]. Loton et al. [33] found that Internet addicts regard online games as the most essential leisure activity, and they can spend more time in games and don't even want to eat or sleep, go to school, are out of touch with reality, and lose interest in everything. Emotionally, when individuals are forced to close online games, they will experience out-of-control situations such as screaming and emotional anger.

Also, online game addicts spend a lot of time in games, are emotionally restless, easy to get angry, and lose interest in other activities. People with an addiction disobey online game time limits, then start missing necessary time and escape from real life [20]. They begin to ignore relationships with friends, colleagues, and community, and eventually, self-life becomes unmanageable. Parrott et al. [39] mentioned that games' reward system may cause game addiction. In the virtual world created by games, game addicts can gain confidence and satisfaction, which cannot be obtained in the real world. In the field of computer literacy, the acquisition of computer knowledge is often unintentional and takes place during recreational computer use. Such instances of incidental learning are expected to increase the declarative expertise [34], [35]. Internet use provides the opportunity to have literacy-relevant experiences and decreases Internet anxiety. A low level of Internet anxiety has been conceived as a facet of Internet literacy in and of itself, and Internet anxiety was negatively related to both theoretical and practical computer knowledge [8], [44]. Therefore, this study inferred the hypothesis as follows:

H2: Game addiction behaviors positively affect physical and mental health.

H3: Internet literacy negatively affects physical and mental health.

III. METHODOLOGY

A. Research Framework

Based on the research purpose and the results of related literature discussions, this research proposed a research framework as the basis. The framework of this research is shown in Fig. 1. This study aimed to explore the influence of Internet literacy on the respondents' game addiction behaviors and physical and mental health. The questionnaire survey method was used to collect relevant data for discussion and to explore its influence on a particular construct depending on the dimension of variables. All measurement items were adapted from well-established existing scales. This study used Teicher [55] scales to operationalize the dependent variable, namely ITL. The GMA items were adapted from Turel, Serenko, and Giles [56]. The PMH items were extracted from Derogatis [12] and Ryff [46].

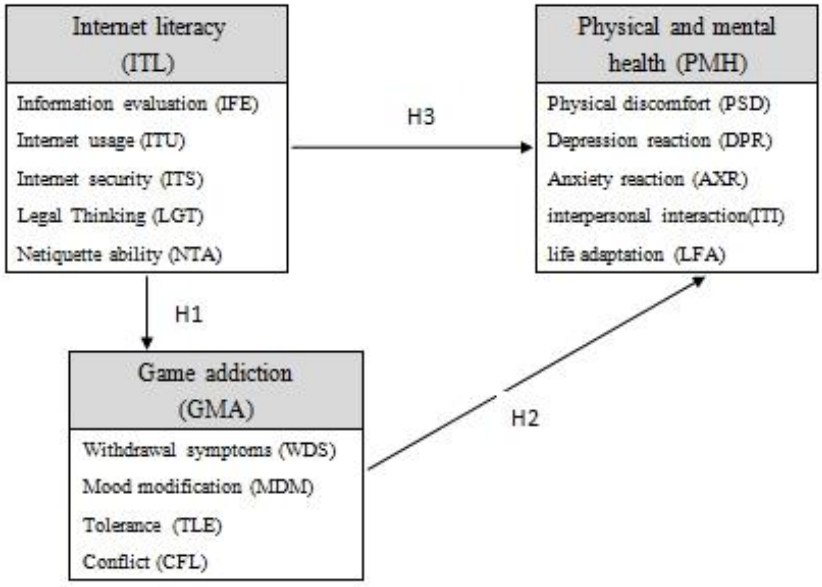

Fig. 1 Research Framework

B. Research Variables and Sampling Method

The questionnaire items of this research were divided into four parts, which were the primary information items (gender, age, education level, etc.), Internet literacy (ITL), game addiction (GMA), and physical and mental health (PMH). For 61 items, the measurement scale quantifies the scores filled in by respondents on a seven-point Likert scale. There were four age groups that belonged to the stratified sampling method. Four hundred twenty-four questionnaires were distributed in this study, and 386 were valid, with a rate of 91.04 %. In addition, in the common method variance (CMV) detection, all variables were analyzed by principal component analysis via Harman's one-factor test to process the exploratory factor analysis and assess whether there was only a single factor or a single factor occupied the majority variance. The results showed multiple factors; under the circumstances of unrotated, none of the explained variations for each factor was more than 50%. Therefore, the bias of CMV can be eliminated in this study.

IV. Data Analysis

A. Descriptive Analysis

Roscoe [45] believed that the number of participants should be between 300 and 500, which is appropriate for most studies. Therefore, potential participants will be recruited using a convenience sampling method, including mass email at different universities, circulating the recruitment posts in class, and online advertising. A total of 424 questionnaires were received, and 386 were valid, with a rate of 91.04 %. According to the valid questionnaires collected by this research, the proportion of respondents was 40.16% male and 59.84% female. The majority age group was 19-30 (75.13%), while the under 18 group was 10.62%. In terms of marriage, the majority were unmarried (93.26%). Most of the respondents have a college degree (83.68%). Also, 42.75% of participants have joined gaming communities. The time respondents spent on games was 11.66% less than 1 hour, 33.42% 1 to 3 hours, 25.39% 3 to 5 hours, and 29.53% more than 5 hours. The above mentioned is shown in Table 1.

Table 1 Sample Structure

Respondent's background	Samples		%
Gender	Male	155	40.16
	Female	231	59.84
Age	< 19	41	10.62
	19-30	290	75.13
	>30	55	14.25

Respondent's background	Samples		%
Education Level	High school	32	8.29
	College	323	83.68
	Graduate School	31	8.03
Marriage	Unmarried	360	93.26
	Married	26	6.74
Gaming Community	Yes	165	42.75
	No	221	57.25
Spend Time in Games	<1 hours	45	11.66
	1 hours-3 hours	129	33.42
	3 hours-5 hours	98	25.39
	>5 hours	114	29.53

B. Reliability and Validity Analysis

In this part of the study, Cronbach's alpha coefficient, composite reliability, and extracted variance were used to measure the internal consistency of the questionnaire. In the reliability analysis of ITL, the Cronbach's alpha coefficients of IFE, ITU, ITS, LGT, and NTA were 0.802, 0.855, 0.803, 0.836, and 0.892, respectively. The overall Cronbach's α reliability coefficient scale of ITL was 0.930. In the reliability analysis of GMA, the Cronbach's alpha coefficients of WDS, MDM, TLE, and CFL were 0.844, 0.927, 0.801, and 0.881, respectively. The overall Cronbach's α reliability coefficient scale of GMA was 0.945. In the reliability analysis of PMH, the Cronbach's alpha coefficients of PSD, DPR, AXR, ITI, and LFA were 0.855, 0.876, 0.829, 0.856, and 0.810, respectively. The overall Cronbach's α reliability coefficient scale of PMH was 0.943.

Bagozzi and Yi [4] pointed out that three evaluation criteria of convergence validity analysis are GFI (goodness-of-fit index), NFI (normed fit index), and CFI (comparative fit index). All indicators should be greater than 0.8. The RMR (root mean square residual) is lower than 0.1; the higher the CR (combined reliability) reliability, the higher the internal consistency of these indicators, of which 0.7 is an acceptable threshold [17]. AVE (extracted variation) refers to the average variation extraction greater than 0.5, which means that the construct has sufficient convergent validity [14]. From the abovementioned criteria, the ITL construct of GFI, NFI, and CFI were 0.810, 0.821, and 0.854, respectively. Each factor loading was significant, and the AVE was higher than 0.5. For the GMA construct, the GFI, NFI, and CFI were 0.858, 0.892, and 0.910, respectively, which were all higher than 0.8. And each loading factor reached a significant level. For the PMH construct, the GFI, NFI, and CFI were 0.893, 0.913, and 0.937, which were all higher than 0.8 as well as reached significant levels for each loading factor. Therefore, the constructs of this study had sufficient convergent validity. The abovementioned is shown in Table 2.

The correlation of each construct in the study was lower than its reliability, indicating discriminant reliability between constructs and discriminant validity between constructs [15]. As for comparing the dimensions with each other, when the chi-square difference between the constrained and unconstrained model was greater than 3.84, it reached a significant level. Each dimension has good discriminant validity [2], as shown in the Table 3.

Table 2 Reliability and convergent validity

Construct	MLE		Composite reliability	AVE	Cronbach's α	Avg
	Loading	Error				
Internet Literacy (ITL)			0.9499	0.7940	0.930	4.902
Information Evaluation (IFE)	0.869***	0.095			0.802	4.747
Internet Usage (ITU)	0.908***	0.071			0.855	4.841
Internet Security (ITS)	0.865***	0.142			0.803	5.011

Legal Thinking (LGT)	0.647***	0.235		0.836	4.789
Netiquette Ability (NTA)	0.693***	0.294		0.892	5.121
Note: GFI = 0.810, AGFI=0.767, RMR = 0.069, NFI = 0.821, CFI = 0.854, ***p < 0.001.					
Game Addition (GMA)		0.9305	0.7704	0.945	3.399
Withdrawal symptoms (WDS)	0.881***	0.198		0.844	3.479
Mood modification (MDM)	0.816***	0.340		0.927	3.082
Tolerance (TLE)	0.887***	0.200		0.801	3.248
Conflict (CFL)	0.919***	0.178		0.881	3.785
Note: GFI = 0.858, AGFI=0.801, RMR = 0.102, NFI = 0.892, CFI = 0.910, ***p < 0.001.					
Physical and Mental Health (PMH)		0.9359	0.7469	0.943	3.484
Physical Discomfort (PSD)	0.859***	0.282		0.855	3.718
Depression Reaction (DPR)	0.905***	0.210		0.876	3.430
Anxiety Reaction (AXR)	0.975***	0.060		0.829	3.540
Interpersonal Interaction (ITI)	0.799***	0.447		0.856	3.382
Life Adaptation (LFA)	0.719***	0.242		0.810	3.351
Note: GFI = 0.893, AGFI=0.856, RMR = 0.087, NFI = 0.913, CFI = 0.937, ***p < 0.001					

Table 3 Discriminative validity analysis of each dimension

Internet Literacy (ITL)		χ^2	d.f	$\triangle\chi^2$
Unconstrained model		887.3	220	—
Information Evaluation (IFE)	Internet Usage (ITU)	938.9	221	51.6
Information Evaluation (IFE)	Internet Security (ITS)	977.7	221	90.4
Information Evaluation (IFE)	Legal Thinking (LGT)	973.6	221	86.3
Information Evaluation (IFE)	Netiquette Ability (NTA)	979.2	221	91.9
Internet Usage (ITU)	Internet Security (ITS)	965.7	221	78.4
Internet Usage (ITU)	Legal Thinking (LGT)	982.8	221	95.5
Internet Usage (ITU)	Netiquette Ability (NTA)	974.1	221	86.8
Internet Security (ITS)	Legal Thinking (LGT)	980.5	221	93.2
Internet Security (ITS)	Netiquette Ability (NTA)	990.2	221	102.9
Legal Thinking (LGT)	Netiquette Ability (NTA)	941.5	221	54.2
Game addition (GMA)		χ^2	d.f	$\triangle\chi^2$
Unconstrained model		444.1	84	—
Withdrawal symptoms (WDS)	Mood modification (MDM)	474.7	85	30.6
Withdrawal symptoms (WDS)	Tolerance (TLE)	485.4	85	41.3
Withdrawal symptoms (WDS)	Conflict (CFL)	485.6	85	41.5
Mood modification (MDM)	Tolerance (TLE)	489.5	85	45.4
Mood modification (MDM)	Conflict (CFL)	479.5	85	35.4

Tolerance (TLE)	Conflict (CFL)	473.1	85	29.0

Table 3 Discriminative validity analysis of each dimension (Continued)

Internet Literacy (ITL)		χ^2	d.f	$\triangle\chi^2$
Physical and Mental Health (PMH)		χ^2	d.f	$\triangle\chi^2$
Unconstrained model		360.6	109	—
Physical Discomfort (PSD)	Depression Reaction (DPR)	413.5	110	52.9
Physical Discomfort (PSD)	Anxiety Reaction (AXR)	417.3	110	56.7
Physical Discomfort (PSD)	Interpersonal Interaction (ITI)	438.5	110	77.9
Physical Discomfort (PSD)	Life Adaptation (LFA)	423.2	110	62.6
Depression Reaction (DPR)	Anxiety Reaction (AXR)	397.9	110	37.3
Depression Reaction (DPR)	Interpersonal Interaction (ITI)	419.1	110	58.5
Depression Reaction (DPR)	Life Adaptation (LFA)	420.5	110	59.9
Anxiety Reaction (AXR)	Interpersonal Interaction (ITI)	426.5	110	65.9
Anxiety Reaction (AXR)	Life Adaptation (LFA)	417.2	110	56.6
Interpersonal Interaction (ITI)	Life Adaptation (LFA)	421.2	110	60.6

C. Structure Equation Model

According to Hair et al. [17], this study evaluates the model's fit and observes the data into three indicators: Absolute Fit Measures, Incremental Fit Measures, and Parsimonious Fit Measures. The absolute fit measures of the overall theoretical model in this study were χ^2=313.0, GFI=0.895, RMR=0.060, RMSEA=0.092, AGFI=0.852. Also, RMR and RMSEA achieved acceptable standards, and the chi-square value reached a significant level. The measure of incremental fit was NFI=0.902 and CFI=0.923, which were acceptable standards. Therefore, the overall theoretical model of this study has a great model fit. The SEM path is shown in Fig. 2.

The factor loadings of each aspect of ITL were most significant in ITU (λ=0.849), followed by IFE (λ=0.775), ITS (λ=0.760), NTA (λ=0.636) and LGT (λ=0.569). It shows that to improve Internet literacy, we should focus on Internet legal and etiquette abilities, including anonymity, training in legal and Internet standards, identification and criticism of false information, etc. Among the factor loading of GMA, TLE (λ=0.878) was the most significant, followed by CFL (λ=0.810), MDM (λ=0.809), and WDS (λ=0.807). It showed that perhaps due to habits during the epidemic, the game's reward mechanism, or the new game social model, gamers' gaming time has become longer, and the frequency and stimulation intensity of their video games are increasing. For the factor loading of PMH, AXR was the most significant (λ=0.894), followed by DPR (λ=0.855), PSD (λ=0.799), ITI (λ=0.740), and LFA (0.698), which showed that although gamers turn to the virtual world to seek Happiness and a sense of accomplishment, they may still be overly sensitive to anxiety and depression due to game interruption and game socialization, which is also reflected in individual physical discomfort, interpersonal relationship tension and life adjustment.

From the analysis results of the structural equation model, this study examines the relationship between Internet literacy (ITL), game addiction (GMA), and physical and mental health (PMH). The results are interesting but different from what we previously hypothesized based on the literature. It was initially expected that Internet literacy (ITL) would negatively affect game addiction (GMA), but Internet literacy (ITL) actually increased the risk of game addiction (GMA), although only **= $p<0.01$. This may be the result of players having excellent abilities in ITU (λ=0.849) and IFE (λ=0.775) but insufficient training in NTA (λ=0.636) and LGT (λ=0.569). Research also shows that game addiction can produce unhealthy physical and mental outcomes, while Internet literacy (ITL) negatively affects physical and mental health, although only *= $p<0.05$. This also reminds us of the balanced view of educational literacy. In the future, educational literacy must simultaneously improve ITU, IFE, ITS, NTA, and LGT levels.

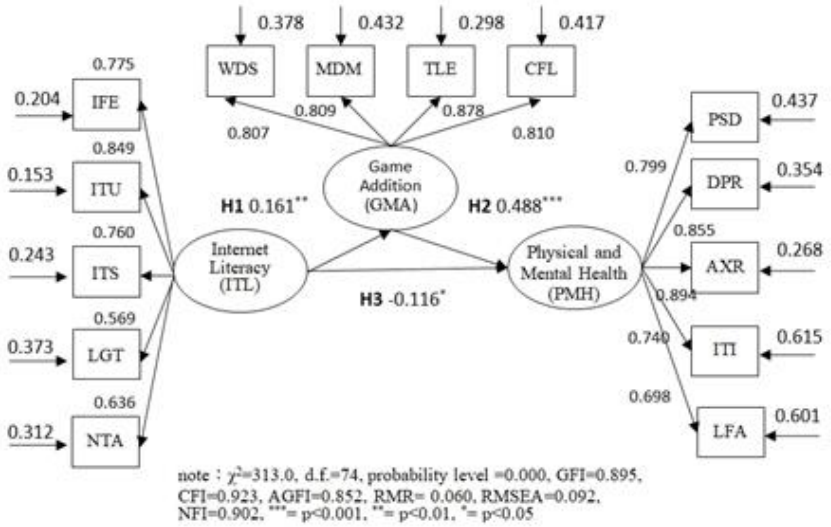

Fig. 2 SEM path

V. CONCLUSION AND IMPLICATION

Based on the statistical analysis results, the item scales of ITL showed that NTA got the highest scores (5.121), which reveals NTA still needs to be able to internalize the power of the respondent's ITL. As for the item scales of GMA, the MDM had the lowest score (3.082), reflecting that the respondents would not change their emotions by playing online games. Regarding the PMH scales, PSD had the highest score (3.718), reflecting that the respondents had a high perception of physical discomfort; psychological harm was far more serious than physical harm. Besides, the empirical results of this study were supported, except for H1, which has changed from negative to positive effects, as described in Table 4.

Table 4 Path coefficient and hypothesis

Constructive relationship	Path coefficient	Hypothesis	Result
ITL → GMA	0.161^{**}	H1	supported
GMA → PMH	0.488^{***}	H2	supported
ITL →PMH	-0.116^{*}	H3	supported

Note: ***= p<0.001, **= p<0.01, *= p<0.05

In recent years, social media, online forums, shopping websites, gaming platforms, etc., have become a part of people's lives. The convenient Internet environment provides a channel for the public to socialize, seek information, entertain, and learn, but it also relatively increases the chance of encountering risks. Many cyberbullying incidents have attracted social attention, while online fraud incidents and information security issues are also emerging one after another. On the one hand, the Internet environment may become a hotbed for Internet crimes. However, it is still an important field for cultivating Internet skills and literacy. It cannot be denied that Internet literacy is not just a tool to avoid negative Internet experiences. For digital natives, Internet literacy can help them solve fundamental life problems and maintain life functions (such as online shopping and online dating), improve knowledge, develop skills, and effectively expand their network. Although the Taiwanese education authorities are committed to producing teaching materials, setting up websites, conducting studies, and promoting publicity, we understand there is still much room to implement Internet literacy education.

Those dimensions of Internet literacy only focus on Information Evaluation (IFE), Internet Usage (ITU), Internet Security (ITS), Legal Thinking (LGT), and Netiquette Ability (NTA) as the primary research axes, but fail to focus on publishing and publishing, creativity, and other important aspects of Internet literacy are discussed [32]. Previous literature has not focused on Internet literacy related to creation and publishing. Other aspects, such as Internet communication skills, the ability to monitor Internet information content, Internet ethics, etc., are also included [31]. This direction can also be worked towards in structuring the Internet literacy scale. Empirical findings indicate that Internet literacy (ITL) will increase the risk of game addiction (GMA), although Internet literacy (ITL) will slow down the impact on physical and mental health. The results may be that NTA (λ=0.636)

and LGT (λ=0.569) cannot Internalize the interviewee's Internet literacy or other abilities that must be used to reflect Internet literacy. It should be noted that empirical data do not support the above inference, and extended research can be conducted on the above points in the future.

Game addiction refers to online games providing a kind of wonderful feeling like the real world, and users feel good and immersed in it [51]. This study confirms that game addiction can cause physical and mental health. Previous studies have found that in the process of forming an addiction, online game addicts will initially produce psychological and physiological orgasmic substances, strong desires, and cravings and then repeatedly experience tolerance, withdrawal, dependence syndrome, and other phenomena. It may result in addictive behavior evolving into a habitual response to the necessity that ultimately results in real life being hindered by online games [5].

Many people utilize various leisure activities to deal with stress [24], including using the Internet, which is easily and quickly accessible. People are more likely to develop Internet addiction when met with unsatisfactory experiences in their daily lives and when they fail to try other coping methods. Online games account for a large portion of Internet use. Moreover, different personality factors are related to the tendency of Internet game addiction [54]. Therefore, people who are addicted to games still have to face the natural working environment while being addicted to games. Game players must be able to judge the gaming environment and behavior with self-efficacy to reduce the time they spend addicted to games. In terms of Internet literacy education, in the future, the levels of ITU, IFE, ITS, NTA, and LGT of game players should be simultaneously improved so that the digital generation can face the real and virtual world in a positive and balanced way.

VI. Limitations and Recommendations

Due to the time limit of this research, random sampling of questionnaires and literature analysis was mainly used, and secondary data were collected from website materials, books, e-books, and related reports, which may be insufficient. Future research can strengthen data collection and differentiate different levels, such as categorizing game community (role-playing, simulation, shooting, and so on) and the attributes of the community members (occupation, position, hobby, and so forth). It is suggested that follow-up researchers can conduct long-term research and use questionnaire-stratified sampling to further understand the relationship between variables. Since this study explores the relationship between Internet literacy, game addiction behaviors, and physical and mental health, many aspects are still worthy of further study and discussion. Also, the proportion of subjects mainly was 19-30 years old in the subjects of this study. However, conducting a comparative analysis between different age groups in the follow-up study may be necessary.

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