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Research Article

The Influence of Player Motivation on Problematic Online Gaming of Youth in China: A Mediation Effect of Age

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Online game playing of youth in China, especially their problematic online gaming (POG), has become one of the social issues that affects large numbers of people and their families. However, studies about the impact of player's motivation on problematic playing are sparse and lack systematic approaches. Our current study is aimed at investigating the relationship between gaming motivations and POG. This paper presents the results of a large-scale survey conducted in China with 1557 participants, of whom 1358 (87.2%) were male. A multiple regression analysis with 10 game motivations as predictors has been performed to explore which factors have effects on game addiction. It is shown that the best predictors of game addiction are the escapism motivation, followed by the competition motivation and then the advancement motivation. The mediation effect of demographic variables on the relationships between player's motivations and game addiction is further examined using the casual steps, and a significant mediating effect of age on game addiction is revealed. The POG differences across gender and age were also examined. The findings enable a better understanding of the underlying mechanics of POG and to minimize the risks and maximise the positive impact of games on society.

Keywords: China game player; online games; player motivation; problematic online gaming

1. Introduction

Video games are "interactive digital environments that engage players in goal-directed, rule-based challenges, often with immediate feedback and rewards" [1]. In 2024, China maintains its position as the largest single-country video game market in the world, with 701.6 million players contributing to a total revenue of $47 billion. Online game, a specific type of video game primarily played via the Internet or other computer networks, represented the dominant game genre in China, accounting for 95.41% of the market revenue in 2024 [2]. Especially, online games are a popular pastime among the youth population in China, which has reached 66.5%, among which the percentage of middle school students has reached 70.0% [3].

Given the increased popularity and prevalence, online games have also raised some serious debates on their negative effects on society, such as their impact on mental health, child development, and game addiction. The World Health Organization has listed gaming addiction as an addictive behavior disorder in the International Classification of Diseases in 2018 [4]. It is reported that the prevalence of video game addiction ranged from 1.0% to 26.8% worldwide [5] and 3.5% to 17% in China, depending on the varying diagnosis criteria [6], meaning that it currently affects approximately 22–109 million people in China.

The present study conducted a large survey in China with 1577 participants. A multiple regression analysis with 10 game motivations as predictors has been performed to explore which factors have effects on problematic online gaming (POG). The findings provide new insights in understanding POG of Chinese youth players whom as a group have not been paid enough attention in the past, especially, there is a strong need for better knowledge of how game playing affects the mental health and personal development of this population, given that China gamers are the largest

gaming group in the world [7]. The result of this study also contributes toward the development of new online games that are meaningful with positive impact on society.

1.1. Problematic Video Gaming. Problematic video gaming is defined as the compulsive use of video games by spending excessive time on games rather than other daily activities, leading to a significant impairment of mental health and individual development. According to the World Health Organization [4], gaming disorder is marked by impaired control over gaming, increasing priority given to gaming over other activities, and the continuation of gaming despite negative consequences. The common symptoms of problematic gaming are characterized by affective disorders (e.g., depression) and anxiety disorders (e.g., generalized anxiety and social anxiety disorder) [8, 9]. The impairments of individuals with problematic also affect various aspects of social skills, normally involving a lack of interest to communicate and an attention deficit to respond appropriately [5]. The psychological and social comorbidities have a lifelong impact on the day-to-day functioning of people who suffer from problematic gaming [4].

There is some scientific evidence that there is a resemblance between the neural mechanisms underlying drug and alcohol abuse and video game addiction [10]. Park et al. have discovered a link between excessive game play and abnormal neurobiological mechanism in the orbitofrontal cortex, striatum, and sensory regions, which are parts of the brain involved in impulse control, reward processing, and somatic representation of previous experiences [11]. Enhanced regional homogeneity (ReHo) is observed among video game addicted players in their brainstem, inferior parietal lobule, left posterior cerebellum, and left middle frontal gyrus, which are related to sensory and motor coordination [12]. It has been found that video game addiction was associated with lower absolute beta power that is correlated with the severity of impulsivity [13]. Through electroencephalogram (EEG) measurement, Duven et al. have revealed an enhanced motivational attention toward cues related to video games among addicted players, and the initial orienting toward the gaming reward is found to consume more capacity [14]. EEG technology is used to identify the unique neurophysiological characteristics of video game addiction and has shown that lower absolute beta power can be used as a potential trait marker [15]. From a psychological perspective, problematic gaming is often linked to maladaptive coping strategies, where individuals use games to regulate negative emotions (e.g., stress or loneliness) [16]. Self-determination theory (SDT) further suggests that unmet psychological needs (e.g., autonomy in restrictive environments) may drive excessive gaming [17].

Online games, particularly massively multiplayer online games (MMOGs), which allow thousands of players to coexist in a persistent virtual world, differ significantly from conventional video games in terms of social dynamics and player experience [18]. It was found that POG manifests distinct behavioral patterns, often reinforced by social obligations within the game, such as guild participation and real-time peer expectations, which contribute to compulsive play [19]. Recent neurobiological research has identified specific neural correlates associated with POG, including hyperconnectivity between the default mode and salience networks [20], as well as accelerated gray matter reduction in hippocampal regions among adolescent users [21]. These findings highlight the presence of unique psychosocial drivers and neurobiological pathways in POG, supporting its recognition as a distinct domain of study. The *Diagnostic and Statistical Manual of Mental Disorders*, *Fifth Edition* (DSM-5), also acknowledges Internet gaming disorder as a condition warranting further research, underscoring the clinical significance of problematic engagement with online games [22].

Although numerous researchers have investigated problematic video gaming since the 1970s, the underlying mechanisms are still not well understood [23]. Especially, there have been very few studies to examine the role of player motivation in relation to POG, and the results of this study will provide knowledge about problematic gaming [9]. What they did not take into consideration is to map out the complete landscape of player motivations systemically and understand how specific motivations may contribute to the addictive behaviors of players.

1.2. Player Motivation. Video games today are designed to provide a diverse range of opportunities for players to gain entertainment, educational, and social values, such as leveling up characters through completing quests, seeking to learn new skills, collecting virtual money, and interacting with each other online. Players can also engage in different in-game behaviors and playing styles, preferences, and motivations.

Early studies regard the motivation differences of game play as the hardcore and casual players. Hardcore players are considered to have high game play skills and enjoy game progressing, challenges, and game mastery. They take game playing as a lifestyle preference and commit a considerable time and money on games, whereas casual players see game playing as another time-passing entertainment, buy and play fewer games, or only play games recommended by their hardcore friends.

Bartle's player types are another well-known and most referenced model about different player motivations in game [24]. Through observing player behavior in the early MUDs (multiuser dungeons/domains), Bartle classified players as socializers, achievers, killers, and explorers, while each type has its own motivations and play interests. For example, achievers prefer action and are world-oriented, while they derive satisfaction from constant progressing and gaining power in the game world. By contrast, socializers prefer interaction and are player-oriented and enjoy meeting and forming relationships with other players.

Yee further developed Bartle's model by introducing a questionnaire to measure players' motivations using items referred to Bartle's model and collected from players' comments [18]. Yee's study revealed 10 player motivations, which are then grouped into three overarching motivation factors: achievement (including advancement, mechanics, and competition), social (including socializing, relationship,

and teamwork), and immersion (including discovery, role-playing, customization, and escapism). As seen by Yee, each motivation factor has its own preferred usage pattern and in-game behaviors. For example, advancement motivation desires to progress rapidly, gain power, and accumulate wealth and status in the game world. Socializing motivation is aimed at helping and chatting with other players, and discovery motivation is interested in finding unknown knowledge and things. Yee's socializing and role-playing motivations are similar to Bartle's socializer type, whereas Yee's mechanics and discovery motivations overlap in the context of Bartle's explorer type. However, customization and escapism motivations have not been discussed in Bartle's model. Existing research has also verified the relationship between Yee's motivations of the player and in-game behaviors. For example, the number of hours devoted to World of Warcraft daily appeared to be strongly correlated to the advancement motive [25]. Further work of Demetrovics et al. identified seven motivational factors for online gaming that consists of social motivation, escape, competition, skill development, coping, fantasy, and recreation and developed a 27-item Motives for Online Gaming Questionnaire [26]. Fuster et al. examined the motivations of playing World of Warcraft using an online survey of 253 male Spanish players [27], which revealed four motivations: socialization, exploration, achievement, and dissociation.

A growing body of research has demonstrated a correlation between player motivations and problematic video gaming [28–30]. Early research by Xu et al. suggested that the need for relationships and escapism among game playing increases online game addiction [31]. Using five items for escapism from Yee's motivation questionnaire, Kardefelt-Winther found that escapism was a significant predictor of excessive online gaming among World of Warcraft players [32]. Similarly, Hussain et al. also selected 14 items to assess game enjoyment using Yee's player motivation questionnaire and investigated links between the enjoyment-related motivations and game addictions [33]. Through a sample of 1167 players, they found that certain enjoyment-related motivations for playing, for example, the social and competitive motivations, may put a player at a high risk of gaming addiction. However, their research narrowly focused on the 14 items of enjoyment-related motivations with North American and European participants (47.4% from the United States, 14.11% from the United Kingdom, and 6.5% from Canada). In another study conducted by Šporčić and Glavak-Tkalić, it was observed that POG was positively correlated with social, competition, coping, fantasy, and escape motives for playing online games [34].

Recent findings reflect the importance of considering player motivations when exploring POG. In a recent study, POG is found to be positively associated with gaming motives such as competition, escape, and socializing [35]. Gursesli et al. developed the Psychological Motivations for Playing Video Games Scale (PMPVGs), confirming that extrinsic motivations—particularly escapism and achievement—are significantly associated with increased risk of gaming disorder [36]. Similarly, it was demonstrated that players with high impulsivity and strong achievement motivations were more vulnerable to developing gaming-related problems [37]. Wong et al. revealed that gamers who were primarily driven by escapism exhibited the highest prevalence of disordered gaming behaviors [38]. Together, these studies show that player motivation plays a key role in gaming addiction, suggesting that understanding and intervention of POG should further consider motivational aspects.

Our current study is aimed at investigating the relationship between player motivations of playing and POG. The study questions we plan to investigate are (1) how POG is affected by the certain gaming motivations and (2) if the relationship between player motivations and POG is mediated by the sociodemographic factors in general (i.e., gender and age). The hypotheses were stated as follows: H1 (player motivations have an impact on POG, including playing time) and H2 (demographic variables have a mediation effect on the relationships between player's motivations and POG).

2. Methods

2.1. Study Design. We conducted a large-scale online survey among Chinese players to examine the relationship between player motivations and POG. This study used analysis of variance (ANOVA), multiple regressions, and other statistical modelling tools to examine the results of surveys.

2.2. Participants. Participants in this study were self-selected players solicited from Chinese online gamers, and they were not paid or compensated for their participation. Informed consent was obtained from all participants, and a statement was included at the beginning, informing participants under the age of 18 that they should proceed with the survey with the knowledge and supervision of their parents or legal guardians. Duplicate responses were identified and excluded by comparing IP addresses, and only the first submission from each IP address was retained for further analysis. The rate of duplicate responses was trivial, with only eight responses being excluded.

The online survey received submissions from 2318 participants, and after excluding data that was not fully completed, a total of 1557 (67.17% completion rate) respondents' data is included in the analysis.

The majority of respondents are male (87.2%), and 28.8% of the participants are studying for or have achieved bachelor's degrees. Over 37.1% are aged between 20 and 24 years, and about 24.1% are aged between 25 and 29 years. About 36.6% of participants had played online games for over 4 years, 20.4% have game play experience ranging from 2 to 3 years, and 18.4% from 3 to 4 years. The design of the study was to be demographically inclusive, and there was a concern that the self-selected group for the survey may not reflect the player population in general. Three main characteristics of the sample (gender, age, and educational background) were compared with a larger sample of 3593 Chinese players' data collected and reported in 2023 [39]. In their sample group, more than 80% (84.0%) of the computer game user group are male, and about half of them (59.1%) earned a bachelor's degree or higher, with the mean

age of 19–20 years for each group. And as reported in another survey research [8], 82.6% of their participants were male, and 32.5% were between 18 and 20 years old. It can be concluded that the participants of this survey are consistent with the characteristics of game players in general.

2.3. Measures

2.3.1. Player Motivation. In this paper, we describe our investigation on the mechanisms of how game play motivations are associated with POG. We have conducted a large online survey of POG in China. The player motivation questionnaire from Yee [17] has high reliability and validity among Chinese participants, as verified by the previous research [40]. Therefore, in this work, we have employed Yee's player motivation questionnaire to capture the player motivations as shown in Table 1. The motivation questionnaire has a total of 40 items that provide insight into 10 player motivations, which are then grouped into 3 overarching motivation factors: achievement (including advancement, mechanics, and competition), social (including socializing, relationship, and teamwork), and immersion (including discovery, role-playing, customization, and escapism). The Cronbach's alpha of Yee's motivation questionnaire in our study calculated by using the reliability analysis function of SPSS is 0.911, showing an excellent reliability.

2.3.1.1. Achievement

- Advancement (six items)

Players who scored high on advancement are driven by power, fun, and control. They tend to advance in the game as quickly as possible, such as leveling up their character, accumulating in-game resources, and acquiring rare items. They may devote a lot of time and money to improve or optimize their own character in order to gain priority to other players.

- Mechanics (four items)

Players who scored high on this motivation seek a form of play with which they can explore and understand the mechanics of game systems. For instance, they enjoy figuring out the precise numbers underlying the game mechanics and try to find the best solution for game quests through rational thought.

- Competition (four items)

Individuals who scored high on competition gain their satisfaction from complete with other real players, for example, from one-to-one duels to large 20 versus 20 battlegrounds. They value the accomplishments and enjoy the process of player versus player combat.

2.3.1.2. Social

- Socializing (four items)

Players who scored high on socializing enjoy chatting and making friends with other players, and they tend to help others who are in need.

- Relationship (three items)

Players who scored high on relationship are concerned with meaningful and long-term relationships with other players in the game. For instance, they may talk about personal issues in game and offer support for real-life problems.

- Teamwork (four items)

Players with high scores on this motivation display a strong desire for group membership and a high need for collaboration with others. Success in the game is seen as the result of the correct team configuration, while participation and inclusion are more important concepts.

2.3.1.3. Immersion

- Discovery (four items)

Individuals who scored high on discovery have an interest in exploring game landscapes. They were driven by finding unknown knowledge and things, such as quests, nonplayer characters (NPCs), or locations that most players do not know about.

- Role-playing (four items)

Players who scored high on role-playing seek to be in a fantasy world. They tend to try out different roles and make up stories for their game characters.

- Customization (three items)

Players who scored high on customization enjoy creating and customizing their characters. The unique style or appearance of a character is more highly valued than anything else.

- Escapism (three items)

Individuals who scored high on escapism view games as a way to escape from the problems in real life. They play games in order to avoid thinking about some of their real-life worries or stresses.

2.3.2. Problematic Gaming. To assess problematic gaming, we also use a questionnaire from Yee's research to assess POG [41], which includes seven items that allow participants to respond on a 5-point scale, as can be seen from Table 2. The total scoring on these seven items is regarded as the operationalization of POG in our research. The Cronbach's alpha of the problematic gaming questionnaire in our study was 0.823, resulting in a very good reliability.

2.3.3. Participants' Demographics and Gaming Behavior. The data collected in our survey also contained player demographic background (e.g., gender, age, and educational background) and their online gaming behaviors (e.g., daily playtime [hours], monthly income, game experience [years], and how often they pay real money for virtual items in game).

TABLE 1: Representative statements of the motivation questionnaire.

Motivation factors		Representative item	1	2	3	4	5
Achievement	Advancement	Leveling up your character as fast as possible.	○	○	○	○	○
	Mechanics	Knowing as much about the game mechanics and rules as possible.	○	○	○	○	○
	Competition	Competing with other players.	○	○	○	○	○
Social	Socializing	Getting to know other players.	○	○	○	○	○
	Relationship	How often do you talk to your online friends about your personal issues?	○	○	○	○	○
	Teamwork	Would you rather be grouped or soloing?	○	○	○	○	○
Immersion	Discovery	Exploring every map or zone in the world.	○	○	○	○	○
	Role-playing	How often do you role-play your character?	○	○	○	○	○
	Customization	How important is it to you that your character looks different from other characters?	○	○	○	○	○
	Escapism	How often do you play so you can avoid thinking about some of your real-life problems or worries?	○	○	○	○	○

TABLE 2: Seven items of POG questionnaire.

Item	1	2	3	4	5
Do you spend more time than you think you should playing the game?	○	○	○	○	○
How difficult would it be for you to limit your playing time?	○	○	○	○	○
How agitated do you get if the servers go down unexpectedly?	○	○	○	○	○
How often do your friends or family members complain about your game play behavior?	○	○	○	○	○
Has your work/school performance suffered because of your game play?	○	○	○	○	○
How much of your happiness in life currently is derived from playing the game?	○	○	○	○	○
Have your personal relationships suffered because of your game play?	○	○	○	○	○

2.4. Procedure. We designed an online survey and distributed the link of the survey through a number of player forums (e.g., Baidu Tieba, 17173 Gaming Forum, NGA Player Community, and Duowan Games Forum) and various social media channels in China such as WeChat or QQ (two most popular instant messaging software in China). The online survey included the demographics and playing behavior variables, the player motivation questionnaire, and the problematic gaming questionnaire. An Internet-posted message invited players to participate in, and the data collection took place over a period of 8 weeks. The inviting message informed all participants about the purpose of the study and provided a link to the online questionnaire. The questionnaire instructions for participants described how to fill in the questionnaire and assured that the data provided will remain anonymous and confidential.

2.5. Data Analysis. All statistical analyses were conducted using the SPSS for Windows Version 28. The scoring on the 10 motivations was calculated as reported by Yee [18], providing information about player motivation. A sum value of seven items on the problematic gaming questionnaire was created to indicate overall POG for each respondent. A multiregression was conducted to investigate the relationships between gaming motivations and POG. Three regression formulas for predicting POG, in-game item purchasing, and daily playtime were created based on the regression results. For the mediation analysis, we performed separate regression analyses for every path and estimated direct and indirect effects. Additionally, the difference across the demographic variables such as gender and age was also examined through a series of *t*-tests and one-way between-participant ANOVAs.

2.6. Ethics. The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board of the first author's institution. Informed consent was obtained from all subjects involved in the study.

3. Results

3.1. Group Difference Analysis

3.1.1. Gender Difference. We performed an independent sample *t*-test to examine the effect of gender on POG, and as shown in Table 3, the male players scored significantly higher than the females.

Since the male sample is huge, we randomly selected a subsample of 199 male participants to match the 199 female participants and reran the independent samples *t*-test. The result revealed a statistically significant difference between male ($M = 21.67$, $SD = 5.51$) and female participants ($M = 20.13$, $SD = 5.81$) ($t = 2.28$, $df = 396$, $p = 0.007 < 0.01$). The POG score (POG^S) of males remained significantly higher than those of females and showed no meaningful difference compared to the analysis using the full male sample.

TABLE 3: Results of *t*-tests on gender differences of game addiction.

Variable	Gender	*n*	M	SD	*t*	df	*p*
Game addiction	Male	1358	21.550	5.638	3.316**	1555	0.001
	Female	199	20.125	5.808			

**$p < 0.01$.

3.1.2. Age Difference. A one-way between-participant ANOVA is used to explore the age differences on the POG, and the result was statistically significant ($F(6, 1553) = 8.23$, $p < 0.001$). As shown in Figure 1, the scoring of game addiction reached its highest at the age group of 15–19 and then decreased gradually with age, especially dropping sharply after 40 years old.

We further transformed the continuous scores of POG to the categorical variables and presented a more interpretable percentage data. The top 27% of POG^S were classified as the high POG group ($POGS \geq 25$), while the bottom 27% of POG^S scoring were classified as the low POG group ($POG^S \leq 18$). The age differences are more striking when presented with categorical data as shown in Figure 2. For example, 61.2% of players aged 15–19 were assigned as the high POG, and in contrast, only 13.3% players aged 40 or above were assigned as the low POG.

3.2. Regression Analysis. A linear multiple regression has been conducted on the POG^S with 10 motivations as predictors. We used an entry method, which forces all 10 predictor variables in to the model simultaneously. As shown in Table 4, the multiple regression is significant at $p < 0.001$ with an adjusted R^2 of 0.335, providing a good model with strong predictors.

Five motivation factors entered into the regression model and can predict 33.5% of the variance in the POG^S. The strongest predictor of POG^S is escapism ($\beta = 0.426$, $p < 0.001$), followed by competition ($\beta = 0.104$, $p < 0.001$) and then advancement ($\beta = 0.104$, $p < 0.001$). A regression formula for predicting game addiction using five motivation variables can be established as Equation (1):

$$\begin{aligned} POG^S = \sum (&7.12, 0.426 * \text{escapism}, 0.096 \\ &* \text{advancement}, 0.104 * \text{competition}, 0.077 \\ &* \text{customization}, 0.071 * \text{mechanics}). \end{aligned} \quad (1)$$

The constant of 7.12 represents the POG^S if there were no information on motivation variables.

Another linear multiple regression was performed to predict in-game item purchasing behavior with motivation factors as independent variables as shown in Table 5. The multiple regression model was significant at $p < 0.001$ with an adjusted R^2 of 0.125. The best predictors were relationship ($\beta = 0.168$, $p < 0.001$), followed by customization ($\beta = 0.166$, $p < 0.001$). A regression formula for predicting in-game item purchasing is Equation (2):

$$\begin{aligned} \text{In-game item purchasing} = \sum (&0.724, 0.168 * \text{relationship}, 0.166 \\ &* \text{customization}, 0.093 \\ &* \text{mechanics}, -0.088 * \text{discover}). \end{aligned} \quad (2)$$

We also examined the daily playtime (hours) in its relation to motivation variables through a regression analysis as can be seen from Table 6.

The regression model was significant at $p < 0.001$ with an adjusted R^2 of 0.062. However, the regression value is low, which means that only 6.2% of the variance in playing time per day can be predicted by motivation variables. A regression formula is Equation (3) (not good model, weak predictors).

$$\begin{aligned} \text{Daily playtime} = \sum (&1.541, 0.128 * \text{mechanics}, 0.142 \\ &* \text{escapism}, 0.064 * \text{advancement}, -0.087 \\ &* \text{relationship}, 0.062 * \text{competition}). \end{aligned} \quad (3)$$

3.3. Mediation Effect Analysis. The mediation effect of age on the relationships between player motivations and game addiction is examined using the casual steps. The testing involves three steps to examine the regressions between the independent variable (x), mediating variable (m), and dependent variable (y). The complete mediation effect exists when the x has no effect on the y, and the partial mediation effect exists when the x has an effect on the y. We observe a partial mediation effect of the age on the relation between the five motivations entered into the regression model and the game addiction as shown in Table 7.

For example, as shown in Figure 3, the mediation path model describes how age partially mediates the relationship between escapism and character game addiction.

Firstly, the independent variable must have an effect on the dependent variable; for example, as we can see from Figure 3, the escapism can predict the game addiction significantly ($\beta = 0.534$, $p < 0.001$). And then, the independent variable must also have an effect on the mediation variable, and as shown here, the escapism also can predict the age significantly ($\beta = -0.154$, $p < 0.001$). Finally, the mediation variable must predict the dependent variable in the regression analysis, and it can be seen from Figure 3 that the age affects the game addiction significantly ($\beta = -0.060$, $p < 0.001$). In the example above, both the escapism and the age affect the game addiction significantly, and therefore, we observed a partial mediation effect of the age on the relation between the escapism and the game addiction.

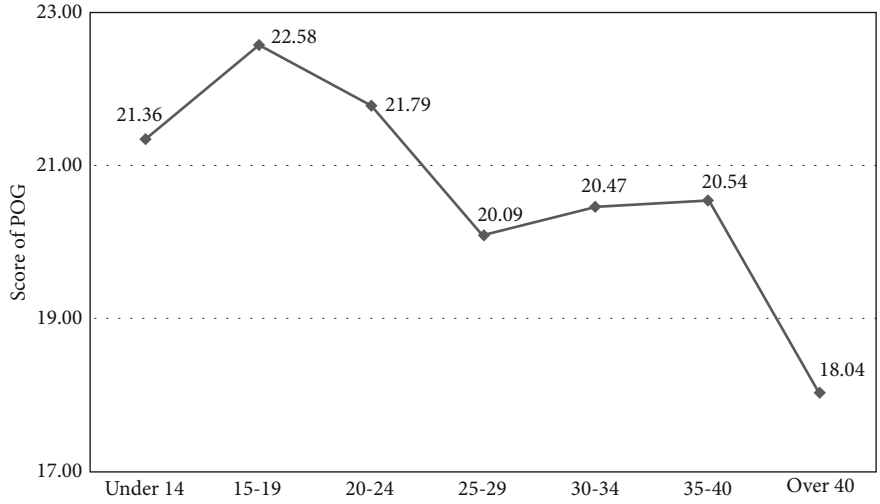

Figure 1: Age differences of POG.

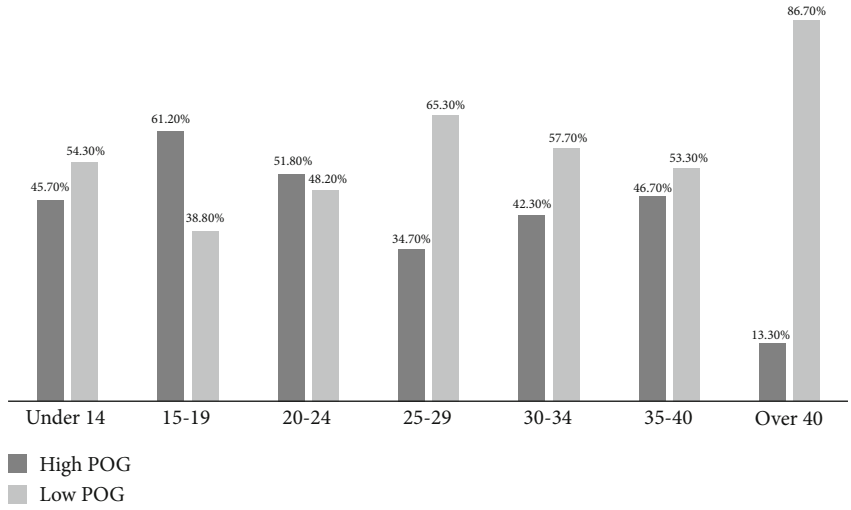

Figure 2: Age differences of high and low POG.

TABLE 4: Multiple regression on the POG^S.

Predictor variables	R	R^2	Adjusted R^2	β	F	p
Escapism	0.534	0.285	0.284	0.426	618.914	0.000
Advancement	0.561	0.315	0.314	0.096	357.460	0.000
Competition	0.571	0.327	0.325	0.104	251.040	0.000
Customization	0.577	0.333	0.331	0.077	193.717	0.000
Mechanics	0.580	0.337	0.335	0.071	157.478	0.000

The path model revealed that age mediated the relationship between specific gaming motivations and POG, consistent with developmental perspectives. Younger players exhibited higher susceptibility to escapism and competition motives, which in turn amplified their POG levels. This suggests that adolescence and early adulthood represent a vulnerable period where motivational drives (e.g., coping or achievement needs) more readily translate into problematic use. Conversely, age attenuated the link between skill development motivations and POG, reflecting older players' ability to compartmentalize learning goals from compulsive play.

4. Discussion

Our research is probably among the pioneering research endeavors to investigate how player motivations play a role in explaining POG, in particular among Chinese adolescents. It is shown that the best predictors of problematic

TABLE 5: Multiple regression on in-game item purchasing.

Predictor variables	R	R^2	Adjusted R^2	β	F	p
Relationship	0.266	0.071	0.070	0.168	117.293	0.000
Customization	0.321	0.103	0.102	0.166	88.538	0.000
Escapism	0.345	0.119	0.117	0.142	69.210	0.000
Mechanics	0.351	0.123	0.121	0.093	54.140	0.000
Discovery	0.358	0.128	0.125	−0.088	45.209	0.000

TABLE 6: Multiple regression on daily playtime.

Predictor variables	R	R^2	Adjusted R^2	β	F	p
Mechanics	0.178	0.032	0.031	0.128	50.266	0.000
Escapism	0.227	0.052	0.050	0.142	42.013	0.000
Advancement	0.236	0.056	0.054	0.064	30.168	0.000
Relationship	0.244	0.060	0.057	−0.087	24.355	0.000
Competition	0.250	0.062	0.059	0.062	20.428	0.000

TABLE 7: Mediation effect of age.

Predictor	Dependent variable	β	Mediation effect
Escapism	Game addiction	0.534**	Partial
	Age	−0.145**	
Advancement	Game addiction	0.310**	Partial
	Age	−0.104**	
Competition	Game addiction	0.366*	Partial
	Age	−0.132**	
Customization	Game addiction	0.320*	Partial
	Age	−0.172**	

*$p < 0.05$.
**$p < 0.01$.

gaming are the motivations of the escapism, followed by the competition and then the advancement. The mediation effect of demographic variables on the relationships between player's motivations and game addiction is further examined using the casual steps, and a significant mediating effect of age on problematic gaming is revealed. The results enable us to better understand the underlying mechanism that makes a game addictive and develop effective interventions for people that suffer from problem online game playing.

It was revealed that male players scored higher on game addiction than female players significantly. This finding is in line with previous statements that male players spent more time on gaming than female players, and the majority of individuals reported having a gaming addiction are male [42, 43]. For example, Rehbein et al. described a high gender gap in a large German adolescent sample with males playing video games for 162 min, whereas females play for 27 min per day [44]. However, it should be pointed out that the gender imbalance in our sample, with male-dominated participants, may skew results by overestimating game POG among male players. The score of game addiction decreases steadily with an individual's age, while the highest game addiction score is observed among youth aged 15–19. The findings show the effect of age on POG, which accords with previous results that younger age is negatively related to video game addiction and gaming time is lower in the population of higher age [45].

The regression analysis results suggested that we can infer a player's game POG statistically using playing motivations in the game world. The escapism motivation is revealed to be the best predictor of game addiction. Individuals who escape from their real-life problems are most likely to commit a considerable amount of time on game playing and develop game addiction. We also demonstrated that the motivations of advancement and competition can predict game addiction. The customization and mechanics motivations are also associated with game addiction but are found to be two weaker predictors of problematic usage. Theoretical implications arising from the findings suggest that the primary cause of POG lies in real-life problems rather than the mechanics of the game. This is consistent with the results of Yee's study on player motivation and

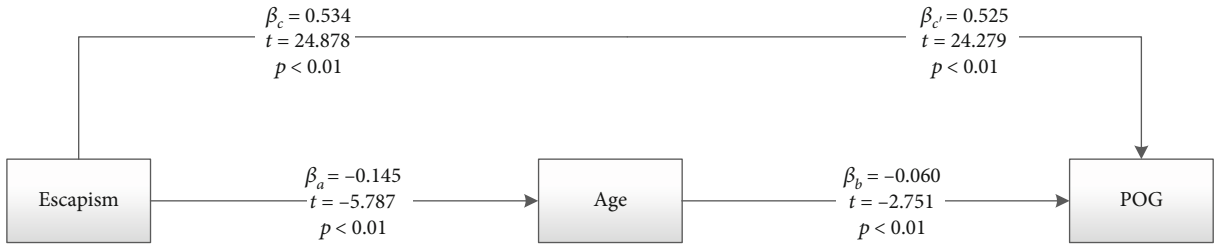

Figure 3: Path model for the mediation effect of age.

POG [18], and the latest research also pointed out that escapism and avoidance motives of playing represent both a predictor of POG [28]. Other researchers indicated that issues in real life such as parent-adolescent conflict or conflictive family relations have an impact on game addiction [46]. It is pointed out that adolescents tend to play video games to forget about unpleasant things, reduce tension, and improve mood [47]. The present findings provide empirical support for key psychological frameworks explaining POG. Most significantly, the results align with SDT, as they demonstrate that adolescents who experience autonomy frustration in real-life contexts are more likely to develop POG behaviors. Ryan et al. explain how unmet basic psychological needs for autonomy, competence, and relatedness in real-world settings may drive excessive gaming as a substitute source of fulfillment [17]. Furthermore, the observed pattern of using games for mood regulation and escapism directly corresponds with maladaptive coping strategies [16], which suggest that individuals may engage in video gaming as a means of regulating negative emotions in real life. The findings indicate that the main factor contributing to POG is underlying real-world challenges, highlighting significant implications for policymakers and educators. Aside from video games being labeled as addictive, the research underscores the necessity of addressing pre-existing real-life issues faced by problematic gamers, such as unfavorable surroundings, learning disabilities, or turbulent family dynamics. Previous research suggested that a range of rewards and advancements offered in video games may lead to problem video game playing, which requires the player to respond rapidly and with few postreinforcement pauses [48]. And this might be one reason why male players have the higher engagement in online gaming, since males are more driven by strength, fight, and achievement [49, 50], while females, in contrast, show more willingness to help, care, and empathize with others [51]. A recent review research on player motivation concluded that male players are more oriented to play to compete with others, while female players seemed to use games for relationship and social reasons [30]. For game designers and developers, the research findings suggest the importance of incorporating specific design strategies to encourage responsible gaming behavior and reduce the potential for addiction. These strategies could include implementing balanced reward systems that are not overly compelling, utilizing time-limited mechanics, and integrating built-in player community systems that offer support for real-life challenges.

The real money spent for purchasing in-game items, for example, weapons, pets, and character customisations, is a main indicator of devotion to the game for today's free-to-play model. It is shown that the best predictor for consumption in the game is relationship motivation, which means that increases in the scores of relationship correspond to more real money spent for virtual items contained in the online game. The best predictor for daily playtime is the mechanics followed by the escapism. It is the motivation to understand the underlying game mechanics that would end up in gaming of significant duration. Previous research maintained that purchase behavior could be due to the fulfillment of social needs enabled by the game, and virtual items enable the player to build lasting friendships [52]. Apart from relationship, other significant predictors include customization, mechanics, discovery, and escapism. As noted by other researchers, there is a link between the virtual item purchases with real money and motivations of playing for self-expression and advancement [53].

One limitation of our research is that the sample is probably biased by recruiting game players only from China. To increase the generalization, it would be valuable to expand the study to other populations and do a cross-cultural comparison with a more diverse sample. Furthermore, the male-dominated sample, with 87.2% of participants identifying as male, may affect the generalizability of our results, especially concerning female gamers, whose gaming behaviors may vary. Another limitation may be that we just investigate the effect of the player's motivations. It is possible that other variables, such as game mechanics, may be even more predictive of POG. Therefore, it is essential to examine how certain game features and mechanics impact addictive behaviors in the games. And the cross-sectional nature of the research design also constrains our ability to draw causal inferences. A longitudinal study is suggested to explore further factors influencing POG and establish causal relationships with greater confidence. Additionally, the current research relied on self-reported survey data, a well-established methodology, but may introduce response bias. Participants who chose to respond may differ from nonrespondents, potentially introducing a self-selection bias by attracting highly engaged or problematic players. To address this limitation, future studies could examine a more representative sample and integrate new emerging technologies such as data mining to track player actions and machine learning for enhanced data analysis, providing new insights into the studied phenomenon.

5. Conclusions

In conclusion, as online games become an ever-increasing aspect of daily life, we have a responsibility to create games that are beneficial to both mind and body, while reducing or even eliminating harmful effects. Due to the large number of people with online game addiction and the significant impairment, there is an increased demand for a deep understanding of the mechanisms underlying it. Especially, there is a tremendous importance to help reduce anxiety, social phobia, and depression associated with excessive game play among youth. A meaningful finding in this study is that the escapism motivation is significantly associated with gaming addiction in youth. This is in contrast with the dominant view that game content and mechanics themselves mainly cause addiction and problematic usage. The results may highlight the importance of intervention for real-life problems of game addiction in youth. It provides new insight on specific player motivations in game addictions. We found that age has a significant effect on the link between problem gaming and player motivations, and problem gaming is considerably high among youth. This provides valuable information for us to understand the problematic player group as accurately as possible and support the development of effective intervention. Especially, the findings prove the strong need to have greater control over the observed effect that young players react to online games and harness the potential of online games to influence their development. This finding allows us to better understand the possible effects of online game play and increase games' potential for positive impact on society. Further research is needed to understand the underlying mechanisms of game addiction and develop a highly effective treatment option for this population.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare no conflicts of interest.

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