

Research on the Current Situation and Prevention Mechanism of Minors' Online Game Addiction in the "Web 3.0" Era: Based on a Survey of 2,762 Minors in 54 Primary and Secondary Schools in Sichuan Province

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Abstract. In the era of "Web 3.0", despite the popularity of the Internet among minors, the problem of indulging in online games has become acute. Based on the survey data of 2762 minors from 54 primary and secondary schools in Sichuan Province, this paper systematically studies the current situation of online game addiction and focuses on the paths of minors' physical and mental development, family, school, society, and platform by using Logistic regression model. It aims to promote the construction of the system and mechanism of online game addiction prevention and provide better protection to minors. According to the analysis results, measures and suggestions are put forward, including establishing multi-party collaborative governance to prevent minors' internet addiction, enhancing the efficiency of government governance, and improving the governance ability of non-governmental subjects, thus perfecting the anti-addiction mechanism.

Keywords: "Web 3.0" era; minors; online game addiction

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1 Introduction

This article is funded for the Sichuan Normal University College Student Innovation and Entrepreneurship Training Program (Project Number: 202310636024). The article studies the current situation of online game addiction among 2762 minors in 54 primary and secondary schools in Sichuan Province, using survey data. In addition, the article also combines logistic regression models to verify and analyze the indirect effects and pathways of factors such as the physical and mental development, family, school, society, and platform of minors. Aiming to provide countermeasures and suggestions for promoting the construction of anti-addiction mechanisms in online games in the era of Web3.0.

2 Question: concerns about minors' addiction to online games in the "Web 3.0" era

In the "Web 3.0" era, the Internet penetration rate has increased rapidly. The survey shows that the Internet penetration rate among this group is almost saturated, significantly higher than the national average^[1]. According to the survey by China Internet Information Center, in 2021, the figure for online teenage game users has exceeded 200 million. Among minor netizens, playing online games has become one of the leading leisure and entertainment activities, making up 62.3%.^[2] This is because although the "Web 3.0" era brings an unprecedented sense of game experience and immersion to online minor game users, it makes minors with weak self-control more likely to indulge in online gaming, which affects their physical and mental health, and becomes the biggest victim of online games^[3].

Internet addiction refers to the apparent social and psychological damage caused by the individual's uncontrolled use of the Internet without material effects, accompanied by tolerance, compulsion, and withdrawal reactions related to the Internet^[4]. Internet addiction is not only manifested in the individual's physical and psychological dependence on the Internet^[5] but also in the cognitive conflict brought about by the contrast between the virtual world and real life^[6]. At present, Internet addiction is a common phenomenon in the group of minors. However, little attention is paid to it. Although various research teams have made some achievements, most of the studies examine the partial impact of various factors on minors^[7]. In fact, indulging in online games is affected by many factors at the same time^[8]. Online game addiction can cause serious personal, social, and professional problems^[9]. It is of significance to explore the current situation and causes of minors' addiction to online games and put forward effective countermeasures, thus promoting their healthy development^[10].

3 Empirical investigation and analysis of the current situation of minors' online game addiction in the "Web 3.0" era

3.1 Overview of empirical investigation

A total of 3170 questionnaires were sent out by the research group, and 2820 valid questionnaires were collected, with an effective rate of 88.96%, including 2762 questionnaires submitted by minors in primary and secondary schools in Sichuan Province. This survey

report mainly focuses on these 2762 respondents. The survey involved 54 schools in 11 cities and two autonomous prefectures in Sichuan Province. The cross table of the regional distribution of minors and whether they play online games(see Figure 1) shows that there is no significant difference in the proportion of using online games in different regions since they all play online games to varying degrees.

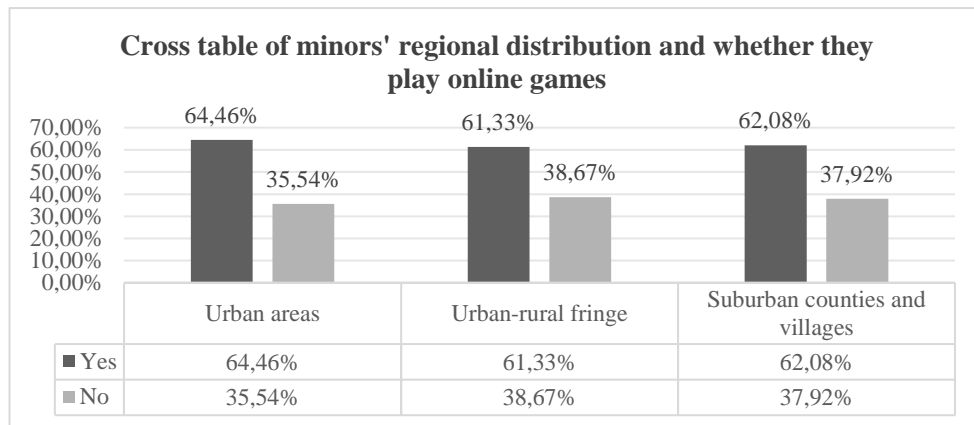


Figure 1. Cross table of regional distribution of minors and whether they play online games

3.2 The current situation of minors' addiction to online games: the establishment, solution, and test of the model

Model: The behavioral characteristics of minors indulging in online games are subject to multitudinous factors. To examine the impact of various factors on minors, the research group tries to establish a measurement model. Through the establishment of a Logistic regression model and the quantitative analysis of related factors, the influence law of minors indulging in online games is revealed, and then the characteristics of minors are determined.

Chi-square test: First, the independent and dependent variables are determined based on the chi-square test. All variables are tested by chi-square test, and the independent variables with statistically significant differences between minors who are addicted to online games and those who are not addicted to online games. The results of the chi-square test are as follows:

Table 1. Chi-Square Test Results

Project	Addicted to online games (n = 239)	Not addicted to online games (n = 1467)	Chi-square value	Significance
Gender			0.268	0.605
Male	168	831		
Female	71	636		
Age			38.169	0.000
<12	33	90		
12-14	61	253		
>14	145	1124		
Place of residence			0.005	0.997

Urban area	100	645		
Urban-rural fringe	58	339		
Suburban counties and villages	81	483		
Frequency			63.673	0.000
Less than 8 times/month	42	726		
3-4 times/week	65	451		
Play almost every day.	132	290		
Time			41.628	0.000
< 1 hour	91	1014		
1-3 hours	74	381		
> 3 hours	74	72		
Recharge			5.020	0.081
< 50 yuan/month	203	1412		
50-100 yuan/month	10	28		
> 100 yuan/month	26	27		
Parents' attitudes			71.970	0.000
Strongly opposed	94	149		
Neutral	132	1261		
Strong support	13	57		

Secondly, Logistic regression is used to solve the model. SPSS26.0 software is used to perform Logistic regression analysis on the sample data. The variable entry method is a backward-stepping method, and the variables are removed from the model one by one. The Chi-square value of the model is ($P = 0.000$), and the statistical value of the model result test (Hosmer and Lemeshow Test, H-L) is ($P > 0.05$), which indicates that the model fits well, that is, the independent variable has strong explanatory power for the dependent variable.

Thirdly, this paper studies the group characteristics of minors addicted to online games. The method of backward stepwise screening is used to delete the independent variables that are not significant for the dependent variable according to the probability value of the statistic estimated by the maximum likelihood for the preliminarily established regression equation, and the significance level is given as 0.05. After several rounds of screening, the remaining four independent variables can strongly explain the dependent variable. The regression results are as follows:

Table 2. Regression Results

Independent variables	Coefficient B	Standard error	Waddell	Significance	Exp (B)
Age				0.000	
>14vs12-14	-1.525	0.266	32.799	0.000	0.218
<12vs12-14	-0.787	0.205	14.789	0.000	0.455
Frequency				0.000	
12-16 times/month vs less than 8 times/month	1.717	0.225	58.147	0.000	5.569
Play almost every day vs 12-16 times/month	0.699	0.195	11.807	0.001	1.953

Time				0.000	
1-3 hours/time vs < 1 hour/time	1.587	0.244	42.375	0.000	4.889
> 3 hours/time vs 1-3 hours/time	1.097	0.240	20.818	0.000	2.996
Parents' attitudes				0.000	
Strongly opposed vs neutral	-1.282	0.396	10.499	0.001	0.277
Strongly support vs neutral	0.337	0.374	0.809	0.369	1.400

In Logistic regression, the polytomous variables with dummy variables are in and out together, indicating that as long as one group has a statistically significant OR value relative to the reference group, all groups of the variable are included in the model. Conversely, if there is no OR, the P value represents a statistically significant difference in the overall test of the variable.

Finally, the model results and the conclusion of the investigation are analyzed. EXP (B) is the occurrence ratio. When the probability of minors indulging in online games is small (generally considered to be less than 0.1), it can be approximately considered that the ratio of EXP (B) to the occurrence probability is very close. Therefore, in this paper, EXP (B) can be interpreted as the multiple of EXP (B) before the change of the corresponding independent variable. Based on the above analysis, this survey concludes as follows:

First, it is common for minors to use the Internet at a younger age. Through the model analysis, at the significance level of 5%, since the coefficient is negative, the variable of age passes the significance test (see Table 1). This shows that if other factors remain unchanged, there is an age difference in the behavior of minors indulging in online games. With the increase of age, their addiction decreases, which indicates that the age of minors addicted to online gaming tends to be younger. Based on the EXP (B) value, the probability of minors over 14 indulging in online games is 0.218 times that of minors between 12 and 14 years old, and the probability of minors under 12 years old indulging in online games is 0.455 times that of minors between 12 and 14, which reveals that minors aged 12-14 are most likely to indulge in online games (see Table 2).

Second, the frequency of minors playing online games is generally high. Because the coefficient is positive, with a significance level of 5%, the significance test is passed (see Table 1), indicating that the frequency of playing games affects minors' addiction to online games. With the increased frequency, the possibility of minors indulging in online games is greater. From the EXP (B) value, the probability of minors playing online games 12-16 times a month is 5.569 times less than that of minors playing 8 times a month, and the probability of minors playing online games almost every day is 1.953 times less than that of minors playing 12-16 times. It shows that the number of minors who play online games almost every day is the highest. The figure for minors who play online games less than 8 times a month is the lowest (see Table 2).

Third, the overall length of online games used by minors is on the high side. In the model analysis, with a significance level of 5%, since the coefficient is positive, the variable of the time has passed the significance test (see Table 1), which shows that the time minors spend playing online games affects their addiction to online games, that is, the more time they play

online games, the greater the addiction. From the EXP (B) value, the probability of minors playing online games for 1-3 hours each time is 4.889 times less than that of minors playing less than 1 hour, and the probability of those playing online games for more than 3 hours each time is 2.996 times than those who play online games 1-3 hours each time. That shows minors playing online games over 3 hours are most likely to get addicted (see Table 2).

Fourth, it is significant to study parents' attitudes. Through the model analysis, with a 5% significance level, the variable of parents' attitudes towards minors' playing online games passes the significance test (see Table 1), which indicates that their attitudes affect minors' willingness to play online games. From the EXP (B) value, the probability of minors who are vehemently opposed to playing games is 0.274 times that of minors who are strongly supported of playing games, and those who are strongly supported of playing games is 1.400 times that of minors whose parents are neutral about their playing (see Table 2). This indicates that when parents are supportive or neutral, minors are inclined to indulge in the Internet; minors who are supported in playing games have the highest addiction to online games.

4 Causes and prevention of minors' addiction to online games in the "Web 3.0" era

4.1 Causes of minors' addiction to online games

According to the survey data, 513 of the 1736 minors who play online games are getting addicted, and the addiction rate is about 29.55%. Among the 1026 minors who do not play online games, 256 indulge in the Internet, with the addiction rate standing at 24.95%, which shows that minors participating in the survey are more likely to get addicted to online games. Considering the current situation of education in China and the law of minors' physical and mental development, we find the following observations:

First, minors' physiological and psychological characteristics are closely related to their addiction to online games. Physiologically, they have weak self-control ability. Because of the immature prefrontal area, they cannot control impulsive behavior well, demonstrating that they cannot consciously control the behavior of indulging in the Internet.^[11] Minors' mental development is not yet sound. The existing psychological resources are insufficient to support them to resist the temptation of online games. The stage model of Internet addiction proposed by Grohol holds that the so-called Internet addiction is only a stage behavior (see Figure 2). Grohol believes all people eventually reach the third stage, but minors are not yet mature and may not have sufficient psychological resources to help them cross the first stage alone.

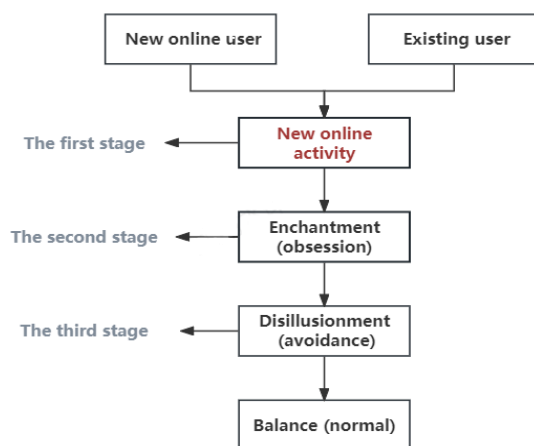


Figure 2. Stage Model of Internet Addiction

Second, minors' living environment also influence their behavior in cyberspace. According to the survey, since minors are in a rebellious period, parents' strong opposition will arouse their defiance, making them escape from reality through the Internet or become more infatuated with the Internet^[12]. The fact that the Internet is different from real life and games developed by game companies are utilitarian has led minors to choose online games. According to the ACE theory proposed by Young, Internet addiction has three characteristics: Anonymity, Convenience, and Escape. Under these three temptations, minors whose minds are not yet mature find it more challenging to resist temptation and easy to indulge in online games^[13].

4.2 The dilemma of preventing minors' addiction to online games

First, there are legal and policy gaps in the network protection and supervision of minors. Although the *Notice on Preventing Minors from Addicting to Online Games* stipulates a real-name registration system for online game users, due to the low legal rank, it has not achieved the ideal effect of preventing addiction to the Internet. The *Interim Measures for the Management of Online Games* stipulate that enterprises must prevent minors from indulging in the Internet, but the punishments against violations are single and weak. Second, the existing game anti-addiction system is facing difficulties. There are some problems in the anti-addiction system for minors, such as the nominal protection mode, the negative real-name authentication mechanism, the untimely content update, and the unsatisfactory performance of the anti-addiction system^[14].

5 Suggestions on improving the anti-addiction mechanism for minors' online games in the "Web 3.0" era

On October 24, 2023, China's State Council promulgated the *Regulations on Network Protection for Minors*. This is the first specialized comprehensive legislation on network protection for minors in China, focusing on regulating network information content and

preventing network addiction. Under the guidance of the National Press and Publication Administration, the China Audio-visual and Digital Publishing Association and the Game Industry Committee compiled and released the trial version of the group standard of *Online Game Age Tips* on December 16, 2020^[15]. According to the survey, to effectively implement the two above-mentioned documents in China, it is necessary to cultivate the soil suitable for their implementation and guide the co-governance of multiple parties.

5.1 Enhance the efficiency of government governance

First, it is vital to change the concept of governance and guide multi-governance. The government needs to change the concept of single-subject governance, guide multi-governance, develop government management and enterprise self-discipline, short-term education and long-term protection, family education and social protection, and form a new pattern of multi-governance with the government as the main body, industry associations and enterprises as supplements, and families and schools as participants. Secondly, it bears significance to strengthen law enforcement and implement normal management. Strengthening coordination among departments, fostering collaborative supervision efforts, and ensuring the timeliness and dynamism of oversight are equally crucial.

5.2 Improve the governance ability of non-governmental subjects

It is necessary to cooperation with multiple subjects is encouraged to enhance the implementation of the age-appropriate prompt system. At present, China has implemented the game age prompt system, but the system only plays a role in reminding, and there is no compulsory means. Many minors choose to ignore the prompt after seeing it, so that the original intention of the system has not been achieved, and the differences in the standard of age-appropriate prompts among app stores also indicate that the system has not been well implemented. Therefore, according to the implementation principle of “point, line, and surface”, the application of age-appropriate prompting standards can be promoted step by step:

- (1)Point: The key departments are taken as the pilot to carry out the corresponding implementation measures.
- (2)Line: In the head and large game enterprises, all products within their scope are required to implement the standard provisions.
- (3)Face: With the support of the local authorities, the key game enterprises need to carry out the corresponding training in concentrated areas.
- (4)Body: Under the consensus of the whole society, the standards should be widely promoted and fully implemented in the whole industry.

Online game enterprises need to accelerate the pace of research and development of identification technology and assist relevant departments in the unified game registration and landing platform system to jointly create a clean online game environment for minors. At the same time. In recent years, Asian countries have gradually attached importance to the development of projects and social activities to prevent primary and secondary school students from indulging in the Internet. In 2012, the Ministry of Internal Affairs and Communications of Japan launched an initiative to improve people’s information technology literacy and reduce their misuse of the Internet through lectures and training^[16]. What counts is improving

parents' network literacy and promoting the platform of parental guardianship. This enables them to actively and effectively guide and supervise minors' online game behavior and provide cheerful companionship and discipline for children.

6 Conclusion

In the era of "Web 3.0", with the rapid development of mobile Internet, the development of online games has been advancing all the way. From the perspective of the "Web 3.0" era, we investigate the basic situation of online games among minors, make a multi-dimensional analysis of the behavior and psychological characteristics of minors and the causes of addiction. The causes of minors' addiction to online games mainly include: minors' physiological and psychological characteristics are closely related to their addiction to online games, and their living environment also has a profound impact on their behavior in cyberspace. The challenges include legal and policy gaps in safeguarding and supervising minors' online gaming activities, as well as operational difficulties faced by the existing anti-indulgence systems. From the perspectives of government, industry, technology, school, and family, we put forward countermeasures and suggestions for relevant legislatures, government departments, online game operators, and related personnel to better assume the responsibility of protecting minors and prevent them from indulging in online games, such as enhancing the efficiency of government governance and improving the governance ability of non-governmental subjects.

In the "Web 3.0" era, with the help of the efforts from all sectors of society and the use of appropriate technical means, we hope to establish a multi-party co-governance system, implement the Regulations on Network Protection for Minors, promote the implementation and improvement of the anti-addiction system for minors' online games, and bring the prevention mechanism into an unprecedented stage of development, thus promoting the all-round development of minor's physical and mental health.

References

- [1] China Internet Network Information Center (CNNIC): 51st Statistical Report on Internet Development in China, [HTTPS://www.cnnic.net.cn / NMediaFile / 2023 / 0322 / MAIN16794576367190GBA2HA1KQ.pdf](https://www.cnnic.net.cn/NMediaFile/2023/0322/MAIN16794576367190GBA2HA1KQ.pdf). [2023.11]
- [2] Ministry of Youth Rights and Interests of the Central Committee of the Communist Youth League, China Internet Network Information Center, Research Report on Internet Use by Minors in China in 2021, November 2022, p. 26.
- [3] Research Group of China Youth and Children Research Center, Investigation and Research on Internet Addiction of Minors and Countermeasures, 6 China Youth Research, 5-29 (2010).
- [4] Kimberly S.Young, "Internet Addiction: The Emergence of a New Clinical Disorder," Cyber Psychology & Behavior, Vol.1, No.3, 1998, pp.237-244.
- [5] R.A.Davis,"A Cognitive-Behavioral Model of Pathological Internet Use,"Computers in Human Behavior,Vol.17,No.2,2001, pp.187-195.
- [6] Kimberly S.Young,"Psychology of Computer Use:XI.Addictive Use of the Internet:A Case That Breaks the Stereotype,"Psychological Reports,Vol.79,No.3,1996,pp.899-902.

- [7] Li J. Y., Li Y. G., The Legal Dimension of Youth Online Game Governance in China, Contemporary Communication, No.4, 2015, pp. 54-57.
- [8] Zhang L. Y., Gao Y. T., Research on the Improvement Path of Online Game Legal Regulation System, Guangxi Social Sciences, No.10, 2016, pp. 110-113.
- [9] Sachdeva A., Verma R. Internet gaming addiction: A technological hazard[J]International Journal of High Risk Behaviors and Addiction Kowsar Medical Institute, 2015, 4(4):e26359
- [10] Iresearch Series Research Report, White Paper on the Protection of Minors in China's Gaming Field 2020, <https://report.iresearch.cn/report/202101/3727.shtml>. [2023.6]
- [11] Xi W., Hu Y.Z., Research status and prospect of adolescent online game addiction, Psychotechnics, No.28(1), 2022, pp. 3-19.
- [12] Liu Y., Research on the Construction of Evaluation Index System for Minors' Anti-addiction System on Network Platform, Journal of Southwest University for Nationalities (Humanities and Social Sciences Edition), No.11, 2022, pp. 156-162.
- [13] Liu Y. N., Empirical Research and Coping Mechanism of Teenagers' Addiction to Online Games and Crime, Journal of Shandong University (Philosophy and Social Sciences Edition), No.3, 2020, pp. 9-21.
- [14] Cheng S. H., Liu Y. J., Foreign Models and References for Preventing Primary and Secondary School Students from Being Addicted to the Internet, People's Education, No.10, 2019, pp. 75-79.
- [15] Game Working Committee of China Audio-visual and Digital Publishing Association: <http://www.cgigc.com.cn/details.html?id=eaba10e1-0407-4afd-aeb5-9ca4d80338ad&tp=news> of the Group Standard (Trial Version) of "Online Game Age Tips". [2023.5]
- [16] Young-Sam Koh. The Korean National Policy for Internet Addiction[J]. Springer International Publishing Switzerland, 2015-02-15.