

The Double Mediators of Attention Concentration and Interpersonal Self-Efficacy in Middle School Students' Internet Addiction and Overuse of Social Networks

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Abstract—To explore the relationship among attention concentration, interpersonal self-efficacy, Internet addiction and social network overuse among middle school students, a cluster sampling survey was carried out by using Yang's Internet addiction scale, mobile social network overuse scale, ADHD self-examination scale and interpersonal self-efficacy scale among middle school students in four schools in three provinces and regions in China. The results showed that: firstly, Internet addiction was positively correlated with attention concentration and social network overuse; interpersonal self-efficacy was negatively correlated with internet addiction and attention concentration; social network overuse was positively correlated with attention concentration and interpersonal self-efficacy; secondly, when interpersonal self-efficacy, attention concentration and social network overuse predict Internet addiction, interpersonal self-efficacy significantly negatively predicts Internet addiction, attention concentration significantly positively predicts Internet addiction, and social network overuse significantly positively predicts Internet addiction; thirdly, attention concentration and interpersonal self-efficacy play a dual mediating role between social network overuse and Internet addiction.

Keywords: *middle school students, social network overuse, Internet addiction, attention concentration, interpersonal self-efficacy*

I. INTRODUCTION

The "Statistical Report on the Development of the Internet in China" shows that middle school students account for the largest proportion of netizens in China, and adolescents aged 12 to 16 are the population with a high incidence of Internet addiction (Fan Wen, 2018). In recent years, the problem of adolescents' internet use has become a hot spot in society. Research on the influencing factors of

Internet addiction is endless, and Internet addiction is often linked to external factors such as family education, peer attachment, and social care. This study mainly used self-assessment questionnaires to refer to the subjective feelings of adolescents, and explored the relationship between social network overuse, attention concentration, interpersonal self-efficacy, and Internet addiction.

II. SOCIAL NETWORK OVERUSE AND INTERNET ADDICTION

A. *The relationship between social network overuse and internet addiction*

The proportion of Internet users who believe that social media can "relieve the pressure in the real life" has increased year by year, reaching 57% of the total number in 2018. This kind of behavior that relieves stress through social networks does not only happen to adults, but also quite common in adolescents.

Overuse of social networks means that, when people refer to networks specifically as social networks, and when users indulge in social networks, resulting in a series of behavioral deviations, they can be called as overuse of social networks (Yao Jingjing, 2017). There is a clear difference between it and Internet addiction: Internet addiction is defined as the impulsive control of Internet use behavior without addictive substances. It is characterized by excessive use of the Internet and causing significant social and psychological damage to individuals (Beard and Wolf, 2001). Among the methods for diagnosing Internet addiction, the Yang's Internet Addiction Questionnaire, which is relatively simple and widely accepted at present, contains 8 diagnostic signs, and a person can be diagnosed as "Internet Addiction"

when having more than 5 of the signs. The difference between social network overuse and internet addiction is that although there has been a significant bias in behavioral performance, for whatever reason, when the user ends the behavior of excessive use, there will be no strong physical discomfort and emotional fluctuations, and there is no "withdrawal response".

B. Intermediary mechanisms of social network overuse and Internet addiction

1) The intermediary effect of attention concentration:

The qualities of attention include span of attention, stability of attention, distribution of attention, and transference of attention. Stability of attention is differentiated in narrow and broad. Narrow stability refers to the time that the attention is maintained on something. Broad stability means that the specific object of attention can change constantly, but the general direction of the activity pointed to by attention is always the same. The attention concentration studied here refers to the attention concentration during the process of Internet addiction or social network overuse, which actually belongs to the narrow part of stability of attention (Liu Shan, 2015).

There is a close relationship between internet addiction and attention. Internet addiction patients have a significant bias in visual search tasks, and the internet addiction group has defects in attention orientation and it is difficult to maintain stable orientation attention for a long time. (Chen Siyu, 2019). attention concentration research often occurs in young children, elementary school students, adults, or special groups, and the influencing factors are basically related to teaching level, academic performance, and intelligence. This study used a less studied secondary school student group and further explored the relationship between attention concentration and social network overuse, internet addiction, and interpersonal self-efficacy.

2) The intermediary effect of interpersonal self-efficacy:

The self-efficacy of interpersonal communication comes from the use of self-efficacy in the process of interpersonal communication, that is, the individual's self-judgment as to whether he can complete the interpersonal activities before interpersonal communication with others. The interpersonal relationship of middle school students mainly includes three aspects: parent-child relationship, teacher-student relationship and peer relationship. This study mainly explored interpersonal relationship. It contains two layers of meanings: one is the subjective judgment of whether an individual's communication behavior can achieve the envisaged goal; the second is the individual's effectiveness expectation of whether he can successfully complete the communication activity before the communication activity (Liu Jing, 2015).

3) Integration of two intermediary mechanisms:

This study will simultaneously examine the intermediary effect of attention concentration and interpersonal self-efficacy between social network overuse and internet addiction in junior high school students. It should be noted

that although both attention concentration and interpersonal self-efficacy are self-assessments, attention concentration is to evaluate their own behavior in reality, and interpersonal self-efficacy is to judge the social feelings in advance that they can get before interpersonal communication.

C. Research overview

As shown above, this study intended to examine the relationship between middle school students' overuse of social networks and Internet addiction, and the intermediary effect of attention concentration and interpersonal self-efficacy. This study proposes the following hypotheses: H1: Middle school students' mobile social network overuse, internet addiction, attention concentration, and interpersonal self-efficacy are significantly correlated and correlated in pairs; H2: Overuse of social networks by middle school students is significantly positively related to Internet addiction by reducing interpersonal self-efficacy; H3: Overuse of social networks and internet addiction by middle school students have significant negative predictive effects on attention concentration. Given that there has been no previous article that discusses concentration and interpersonal self-efficacy, the researchers only conduct an exploratory analysis of these contents without making assumptions.

III. OBJECTS AND METHODS

A. Objects

The research survey event lasted from March to September in 2019. Taking school as the unit, the stratified cluster sampling was carrying out. Middle school students from 4 schools in 3 provinces and regions in China have participated in this study. The total of junior high school students from Zhuhai Foreign Language School of Guangdong Province, Dahonggou Middle School of Wuwei City, and No. 8 Middle School of Wuwei City, Gansu Province were selected. A total of 300 students of Grade 7 and Grade 8 from No. 103 Middle School of Urumqi City, Xinjiang Uygur Autonomous Region were selected. A total of 741 questionnaires were issued and 712 questionnaires were valid. The efficiency of the questionnaire was 96%. The study participants included 374 male students (52.6%) and 338 female students (47.4%). The study subjects included three age groups: Grade 7, Grade 8, and Grade 9, of which 173 (24.3%) were in Grade 7 and 197 (27.7%) were in Grade 8, and 342 (48%) in the Grade 9; 281 (39.5%) in Xinjiang, 216 (30.3%) in Gansu, and 215 (30.2%) in Guangdong; 289 (39.9%) are from rural areas, and 423 (58.4%) are from the urban areas.

B. Research tools

The measurement tools used in this research include Young's Internet Addiction Form, Social Network Overuse Questionnaire, ADHD Attention Questionnaire, and Interpersonal Self-efficacy Questionnaire.

1) Young's internet addiction form:

The internet addiction form (IAT) uses the Internet Addiction Screening Scale compiled by Dr. Kimberly Young of the University of Pittsburgh in the United States. The researchers used the form with less questions. The questionnaire is divided into eight items, and the subjects are required to answer yes or no. When the test subjects reach more than five yes, they are considered to have a tendency to overuse. The more "yes" answered, the more likely they were to be judged to be social network addictions.

2) Mobile social network overuse assessment form:

The mobile social network overuse assessment form is a self-edited scale for Chinese scholars (Yao Jingjing, 2017), which is mainly divided into nine dimensions, which are social overload, privacy intrusion, work intrusion, perceived usefulness, technical pressure, perceived joy, self-efficacy, behavioral intentions, and regrets. The questionnaire used a Likert five-level scale, which was scored from "serious disagreement" to "serious consent".

3) ADHD self-examination scale:

There are 18 questions in this scale. Participants need to choose an answer for each question according to their own situation in the past 6 months. According to the frequency of the situation described in the question, the answers are divided into five levels: never, rare, sometimes, often, and frequently. The diagnostic criteria for this scale need to be in accordance with the "Fourth Edition of the Diagnostic and Statistical Manual of Mental Illness". (Liu Shan, 2015)

4) Self-efficacy in interpersonal relationships:

The interpersonal relationship self-efficacy assessment scale used in this study was the self-made questionnaire "Junior High School Students' Interpersonal Interaction Self-efficacy Questionnaire" in "Junior Middle School Students' Interpersonal Interaction Self-efficacy and Peer Social Status". The questionnaire contains 28 questions and 2 polygraph questions. It is divided into five dimensions of respect and modesty self-efficacy, sincerity and enthusiasm self-efficacy, flexible communication self-efficacy, expression and understanding of self-efficacy, interpersonal integration self-efficacy, and only answer on the Likert 5-point scale (from "no confidence at all" to "Completely confident"), scoring 1-5 points. The Krumbach a coefficient is 0.857, and the retesting reliability of a randomly selected class two weeks later is 0.862. The questionnaire also has good validity. (Liu Jing, 2015)

C. Common method test

Because this study uses the questionnaire method to measure the same batch of research subjects, there may be common method deviations, so it is necessary to first test for common method deviations. The research mainly uses statistical methods for common method deviation testing. According to previous studies, Harman's single factor test was used (Zhou Hao, Long Lirong, 2004). All original questions were used for factor analysis. The first factor extracted after exploratory factor analysis was 12.18% of the variation, which was lower than the 40% cutoff value, which indicates that the data obtained by the questionnaire method in this study were less affected by the common method bias.

D. Statistical analysis

SPSS 21.0 software was used to perform Pearson correlation analysis and hierarchical regression analysis, and non-parametric percentile Bootstrap method was used to conduct model construction and mediation effect analysis. This method is based on the original sample (the sample size is n), and the repeated sampling with replacement is performed under the condition that the probability of each observation unit being drawn each time is equal (both 1 / n) to obtain a sample size. For the Bootstrap sample of n, it establishes an estimate of the indirect effect and sort it to obtain sequence C. Using the percentile value in sequence C as the upper and lower confidence limits of the confidence interval, it constructs the confidence interval for the intermediate effect. If the confidence interval does not include 0, it indicates that the intermediary effect exists, and if the confidence interval includes 0, it indicates that the intermediary effect does not exist.

IV. RESEARCH RESULTS

A. Correlation analysis between variables

The mean, standard deviation and correlation matrix of each variable are shown in "Table I". The results found that Internet addiction was significantly positively correlated with attention concentration and social network overuse; interpersonal self-efficacy was significantly negatively correlated with Internet addiction and attention concentration; overuse of social networks was significantly positively correlated with attention concentration and interpersonal self-efficacy.

TABLE I. CORRELATION ANALYSIS BETWEEN DESCRIPTIVE STATISTICAL RESULTS AND VARIABLES

Variables	M	SD	1	2	3	4
1. Internet addiction	2.45	2.08	1			
2. Attention concentration	2.59	0.72	0.206***	1		
3. Interpersonal self-efficacy	3.42	0.62	-0.108***	-0.156***	1	
4. Overuse	2.97	0.52	0.223***	0.289***	0.223***	1

^a. Note: *p<0.05; **p<0.01; ***p<0.001, similarly hereinafter.

B. Analysis of chain mediation effect of attention concentration and interpersonal self-efficacy

The results of multicollinearity found that the variance expansion factor values of all predictors were between 1.114-1.186, all less than 5, and the tolerances were between 0.843 and 0.898, all greater than 0.1. Therefore, there is no multicollinearity problem in this study. The SPSS macro program PROCESS compiled by Hayes (2013) was used. The Model number was set to 6, and the sampling was repeated 5000 times to calculate the 95% confidence interval. If the 95% confidence interval does not include 0, it indicates that the effect is significant to test the chain-mediating effect of attention concentration and interpersonal self-efficacy between social network overuse and Internet addiction.

Regression analysis (as shown in "Table II") shows that social network overuse significantly predicts attention

concentration ($\beta = 0.289, p < 0.001$); attention concentration when attention concentration and social network overuse simultaneously predict interpersonal self-efficacy, attention concentration significantly predicts interpersonal self-efficacy ($\beta = 0.292, p < 0.001$), and social network overuse significantly negatively predicts interpersonal communication self-efficacy ($\beta = -0.240, p < 0.001$); when interpersonal self-efficacy, attention concentration, and social network overuse simultaneously predict Internet addiction, interpersonal self-efficacy significantly predicts Internet addiction ($\beta = -0.138, p < 0.001$), and attention concentration is significantly positive predicting Internet addiction ($\beta = 0.120, p < 0.01$), and overuse of social networks significantly predicts Internet addiction ($\beta = 0.220, p < 0.001$).

TABLE II. REGRESSION ANALYSIS OF VARIABLE RELATIONSHIPS IN THE MODEL

Regression equation		Overall fit index			Significance of regression coefficient	
Result variables	Predictive variables	R	R ²	F	β	t
Attention concentration	Overuse of social network	0.289	0.083	64.349***	0.289	8.022***
Interpersonal communication Self-efficacy	Attention concentration	0.320	0.102	40.306***	0.292	7.842***
	Overuse of social network				-0.240	-6.449***
Internet addiction	Interpersonal communication Self-efficacy	0.298	0.089	22.977***	-0.138	-3.638***
	attention concentration				0.120	3.121**
	Overuse of social network				0.220	5.626***

^a. Note: Each variable in the model is brought into the regression equation after normalization.

Analysis of the mediating effect (as shown in "Table III" and "Fig. 1") shows that attention concentration and interpersonal self-efficacy play a intermediary effect between social network overuse and Internet addiction. Specifically, the intermediary effect consists of indirect effects generated by three paths: overuse through social networks → attention concentration → indirect effect 1 (0.035) from Internet addiction, accounting for 15.91% of the total effect; through overuse of social networks → interpersonal self-efficacy →

indirect effect 2 (-0.040) from Internet addiction, accounting for 18.18% of the total effect; overuse through social networks → attention concentration → interpersonal self-efficacy → indirect effect 3 (0.010) from Internet addiction, accounting for 4.55% of the total effect. The Bootstrap 95% confidence interval for each indirect effect does not include 0, indicating that all three indirect effects have reached a significant level.

TABLE III. TESTS OF THE INTERMEDIARY EFFECT OF ATTENTION CONCENTRATION AND INTERPERSONAL SELF-EFFICACY

Path	Effect value	Boot Standard error	Boot CI Lower limit	Boot CI Lower limit	Relative mediation Effect
Indirect effect 1	0.035	0.013	0.011	0.063	15.91%
Indirect effect 2	-0.040	0.015	-0.074	-0.014	18.18%
Indirect effect 3	0.010	0.004	0.003	0.018	4.55%

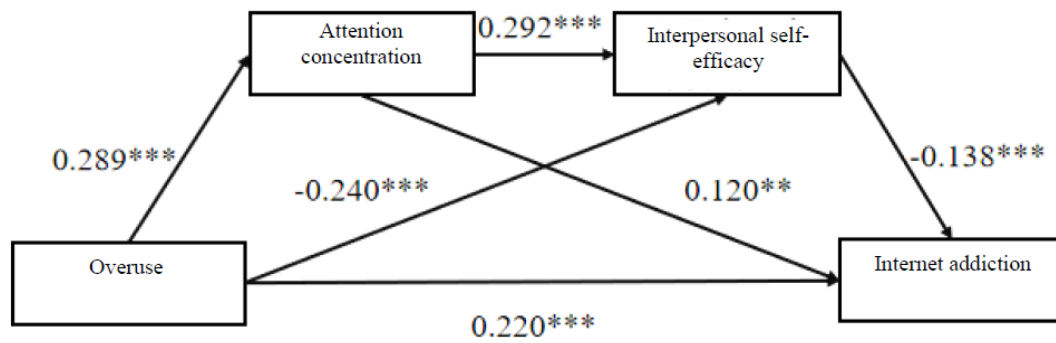


Fig. 1. Schematic of the intermediary effect of attention concentration and interpersonal self-efficacy.

V. DISCUSSION

Middle school students' internet addiction and overuse of social networks do not occur by themselves, but are superimposed on the individual's self-judgment and surrounding environment. Most of the existing researches have studied Internet addiction as a whole, and this study separately discusses Internet addiction and social network overuse as two aspects of network use. And when it comes to internet addiction or overuse of social networks, previous studies often focused on the surrounding environment and personal personality traits; in contrast, this study focuses on the attention concentration of middle school students and the self-efficacy of interpersonal communication. In the past, more attention was paid to the prejudgment and self-evaluation of middle school students for their own behaviors. The subjective feelings of middle school students were connected with internet addiction and social network overuse, and more emphasis was placed on the subjectivity and controllability of network overuse.

A. Status of Internet addiction, social network overuse, attention concentration, and interpersonal self-efficacy

Middle school students generally refer to adolescents aged 11-18. At the middle school level, adolescents' psychological development includes cognitive development and personality social development. Cognitive development mainly includes the development of perception, attention, memory, thinking, imagination, and creativity. At the middle school level, the purpose of attention is gradually increased, the stability is gradually improved, and intentional attention is dominant (Lin Chongde, 1995). This research mainly explores the degree of concentration of attention in the use of the Internet. Generally, studies that focus on concentration are linked to sports and performance, and are less related to the behavior of network use. Attention concentration was significantly positively correlated with social network overuse and Internet addiction, and significantly negatively correlated with interpersonal self-efficacy; attention concentration was significantly negatively predictive of interpersonal self-efficacy.

In middle school, teenagers gradually overcome group communication, and the importance of friend relationships is beginning to emerge (Lin Chongde, 1995). For adolescents, support from families, schools and peers is key to their healthy growth. If all fields are filled with a large number of unfavorable factors, individuals will lack the necessary "comfortable place" in real life (Jennie Long Dilworth, 2001), which will push them to seek satisfaction in other contexts (such as the virtual online world). Interpersonal self-efficacy belongs to the pre-judgment before the behavior of interpersonal communication, and it is significantly negatively related to Internet addiction and attention concentration, which is consistent with previous research. Middle school students have low self-efficacy in interpersonal communication, and scores on internet addiction and attention concentration have increased significantly.

Wang Wenxiu's (2009) research suggests that entertainment preferences and information exchange preferences have a significant positive prediction effect on Internet addiction, and information acquisition preferences have a significant negative prediction effect on Internet addiction. Social network overuse is also a preference for information exchange. Social network overuse and Internet addiction significantly predict Internet addiction, which is consistent with the results of this study.

Dating back to the 1990s, the phenomenon of overuse of the Internet has attracted people's attention. "Internet Addiction Disorder" (Goldberg, 1991) was first proposed by the American psychiatrist Ivan Gordonberg in 1995. Later, Kimberly Young (1998), a professor at the University of Pittsburgh, developed the term "pathological network use", and some scholars referred to "network overuse" as "problem network use". The essence of these descriptions refers to the obvious physical, psychological and social adverse effects on individuals caused by the inappropriate use of the Internet. Although these descriptions have different external appearances, their cores are basically similar, that is, they overuse the network and then rely on the network. In the research on middle school students, internet addiction is often closely related to personality traits, negative emotions, family intimacy, etc. In this paper, the self-efficacy of

interpersonal relationships in peer relationships and the attention concentration that rarely co-occurs with peer relationships are used to influence Internet addiction and social network overuse. Social network overuse is significantly positively correlated with interpersonal self-efficacy and attention concentration, and social network use can positively predict attention concentration. Internet addiction is also significantly positively related to social network overuse and attention concentration. Interpersonal self-efficacy is significantly negatively related to internet addiction and attention concentration. The stronger the interpersonal self-efficacy, the less internet addiction and attention concentration score. The total score of shyness, interpersonal distress, and significant positive correlation between each factor and excessive use of mobile Internet is consistent with Jiang Yongzhi (2015).

B. Paying attention to the chain mediation of concentration and interpersonal self-efficacy between internet addiction and social network overuse

Internet addiction was significantly positively correlated with attention concentration and social network overuse; interpersonal self-efficacy was significantly negatively correlated with Internet addiction and attention concentration; the overuse of social networks was significantly positively correlated with attention concentration and interpersonal self-efficacy. This study found that when interpersonal self-efficacy, attention concentration, and social network overuse simultaneously predict Internet addiction, interpersonal communication self-efficacy significantly negatively predicts Internet addiction, attention concentration significantly predicts Internet addiction, and social network overuse significantly predicts Internet addiction. The junior high school stage is a critical period in the development of young people's lives. The interpersonal interactions that junior high school students face will affect their mental health and all aspects of learning and life, and they will easily form psychological confusion and communication barriers. Therefore, it plays an important role in self-efficacy in the self-system (Liu Yanhua, 2008). Interpersonal communication has a low degree of self-efficacy, and teenagers will shift to other "comfortable environments", and the Internet plays exactly this role.

This study also shows that when attention concentration and social network overuse simultaneously predict interpersonal self-efficacy, attention concentration significantly negatively predicts interpersonal self-efficacy, and social network overuse significantly predicts interpersonal self-efficacy. Social learning theory holds that behavior can be best explained through the interaction of cognition, behavior, and environmental determinants. Attention concentration belongs to a cognitive process. The score of attention concentration is low. It can be said that the lower the middle school student's cognitive level, the higher the interpersonal communication self-efficacy score. The study with junior high school students in Liu Yanhua (2008) because of psychological development in a special period, the juveniles of this period have the contradictions of

independence and dependence, consciousness and impulsivity, maturity and naivety. The result is consistent that the imbalance of physical and mental development makes them often very confident, often overestimates themselves, and the conclusion that self-efficacy scores are generally high. Mao Chenlei's (2017) research shows that the use of social networks has a significant impact on interpersonal relationships. The study believes that the expressions used in social networks are completely different from real-life communication, and less face-to-face communication will reduce self-confidence in real-world communication, contrary to the findings of this paper. This study believes that overuse of social networks significantly predicts interpersonal self-efficacy. The positive feedback obtained through network communication on social networks will increase middle school students' interpersonal communication self-efficacy score. Self-efficacy mainly refers to the degree of self-confidence in a certain aspect. Qin Jiangxia (2018) pointed out that in the study of social self-efficacy / satisfaction and mobile social network use, there is a positive correlation between mobile social network use and social self-efficacy, which is consistent with the conclusions of this study.

This study found that attention concentration and interpersonal self-efficacy play a mediating role between overuse of social networks and Internet addiction. The intermediary effect is composed of indirect effects generated by three paths: Path one is the indirect effect of social network overuse → attention concentration → Internet addiction. Attention concentration in this path acts as an indirect intermediary. Overuse of social networks can improve middle school students' attention concentration. The intentional attention on social networks betting is increasing, and attention concentration is also negatively related to internet addiction; path two is through social network overuse → interpersonal self-efficacy → indirect effects of Internet addiction. From this path, it can be seen that the higher the score of social network overuse, the higher the score of interpersonal self-efficacy, and it shows the negative effect of interpersonal self-efficacy and internet addiction. Path three overuse through social networks → attention concentration → interpersonal self-efficacy → indirect effects of internet addiction. Attention concentration and interpersonal self-efficacy serve as intermediaries for social network overuse and internet addiction. When attention concentration and social network overprediction simultaneously predict interpersonal self-efficacy, attention concentration significantly predicts interpersonal communication Self-efficacy, overuse of social networks significantly negatively predicts interpersonal self-efficacy; when interpersonal self-efficacy, attention concentration, and social network overuse simultaneously predict Internet addiction, interpersonal self-efficacy significantly negatively predicts Internet addiction, attention concentration significantly predicts Internet addiction, and social network overuse significantly predicts Internet addiction.

VI. CONCLUSION

This study reveals the relationship between attention concentration and interpersonal self-efficacy, Internet addiction, and social network overuse, deepens people's understanding of the mechanisms of social network overuse and Internet addiction, and further verifies the psychological mechanisms of attention concentration and interpersonal self-efficacy on internet addiction and social network overuse. However, there are still shortcomings in this study. First, previous studies often used interpersonal relationships and parent-child relationships to obtain interpersonal communication scores. However, the self-efficacy and attention concentration in interpersonal communication in this study belong to self-evaluation, belonging to their own judgments on themselves, and have certain limitations. Second, this study selected middle school students in three regions for questionnaire distribution. Although the growth environment and education level of students in the same school are basically the same, the results of mixed analysis with the results of middle school students in other regions cannot fully confirm the causal relationship between the four, and further long-term tracking is needed to verify and support it.

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