

The Effect of Parent Phubbing on Chinese Adolescents' Smartphone Addiction During COVID-19 Pandemic: Testing a Moderated Mediation Model

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Purpose: COVID-19 has affected the health and well-being of tens of millions of people and contributed to smartphone addiction. The prior studies found several characteristics that influenced smartphone addiction, but little research was undertaken on the epidemic. This study aims to test a moderated mediation model of smartphone addiction.

Methods: Three classes in each grade from grade 7 through grade 9 at random were recruited in the target junior high schools. A total of 931 Chinese adolescents ($M_{\text{age}}=13.54$ years, $SD_{\text{age}}=1.08$) completed valid questionnaires via online surveys from February 5–19, 2021.

Results: Parent phubbing had a positive effect on smartphone addiction. Boredom proneness played a mediating role in this relationship. Additionally, refusal self-efficacy moderated the effect of parent phubbing on smartphone addiction. Refusal self-efficacy moderated the effect of boredom proneness on smartphone addiction.

Conclusion: Findings of this study shed light on a correlation between parent phubbing and smartphone addiction. Moreover, this study emphasizes the value of intervening in adolescents' boredom proneness and increasing the ability of refusal self-efficacy to prevent and intervene in the context of COVID-19.

Keywords: coronavirus, Chinese adolescents, smartphone addiction, parent phubbing, boredom proneness, refusal self-efficacy

Introduction

As the global outbreak of COVID-19, the governments had initiated the appropriate program of health education and relevant regulations to strictly prevent the spread of COVID-19, including controlling outdoor activities, keeping social distancing, and reducing public gatherings in response to the pandemic,^{1–3} which have changed adolescents' s everyday life. At this time, the use of Internet on smartphones have become an important tool and way of life and learning during COVID-19.⁴ Adolescents use smartphones to surf the Internet to understanding the world, learning, entertainment, and socializing.⁵ Despite smartphones could bring convenience to people, inappropriate usage of mobile devices has the potential to be detrimental. For example, many people used smartphones frequently, leading to Internet addiction.^{4,6,7} During the epidemic, the likelihood of a person addicted is substantial (eg, Addiction to mobile devices)^{8–10} due to content related to epidemic-related information or social media engagement¹¹ via smartphone. Smartphone addiction is described as the compulsive habit of avoiding reality or producing excitement via smartphone use,^{12,13} with symptoms such as salience and withdrawal.¹⁴ Numerous types of research have shown that smartphone addiction has significant negative consequences for physical pain, Mental health problems, and academic performance.^{15–18} As a result, it is

critical to investigate the primary determinants of smartphone addiction and their underlying mechanisms of influence during the COVID-19 epidemic.

Parent Phubbing and Smartphone Addiction

Parent phubbing refers to the parent who is distracted by their mobile phones when interacting with adolescents. “Phubbing” refers to the habit of individuals focusing on their smartphones and disregarding others in social environments.¹⁹ The increased time adolescents spent with their parents during the outbreak was due to the government’s request for people to gather less and stay at home.²⁰ The emerging phenomenon of parents has a significant effect on adolescents.^{21,22} The survey showed that 73% of parents used their smartphones when they ate with their children,²³ and 35% of parents often used smartphones in their interactions with their children.²⁴ Empirical studies have found that parents using smartphones could increase the rate of language and motor delay in children, form unsafe attachments, reduce satisfaction and increase negative behaviours.²⁵ According to social learning theory, individuals learn specific behaviors by observing the behaviors of others, especially family members.²⁶ Intergenerational transmission is evident in the conduct of parents and their children.²⁷ For instance, Skopp, McDonald, Jouriles and Rosenfield²⁸ found that aggression between spouses increased children’s externalizing problems. Likewise, Chotpitayasunondh and Douglas¹⁹ found that adolescents were phubbed by their parents under certain circumstances, and they perceived phubbing as the norm and developed the tendency of phubbing. Researchers have substantiated that parent phubbing was a reliable predictor of adolescents’ smartphone addiction.^{6,22} All of these studies have reported the significant associations between parent phubbing and adolescents’ smartphone addiction. Nevertheless, most studies have focused on analyzing the phenomenon of smartphone addiction and its influencing factors under Normal conditions. Therefore, the purpose of this study is to examine the connection between parent phubbing and smartphone addiction during the pandemic. Based on the social learning theory and empirical evidence, it is advanced the following hypothesis:

Hypothesis 1: During the epidemic, parent phubbing is positively related to smartphone addiction.

The Mediating Role of Boredom Proneness

A low degree of physical stimulation with deficits in excitement and interests is the characteristic of boredom proneness.²⁹ Adolescents may get addicted to their smartphones because of parent phubbing, according to the social learning theory.²⁶ However, many people are not vulnerable. Thus, when analyzing the effects of parent phubbing, it is vital to explore the mediators that affect increasing smartphone addiction. Researchers revealed that the adverse effect living conditions on smartphone addiction, and boredom could operate as a mediating factor between the association. Boredom proneness was a significant risk factor for developing smartphone addiction.^{6,30–32} In conformity with the arousal theory,³³ there is a mismatch between the availability of stimulation and personal needs that contributes to boredom proneness. Even though keeping social distancing and reducing public gatherings could decrease the spread of COVID-19, they can also negatively affect family life.³⁴ While many parents care for their children, they attempt to work with digital devices (eg, smartphones) remotely during COVID-19.³⁵ Then, the parent may exhibit phubbing behaviour, which has been found to harm interpersonal relationships.³⁶ Relationship satisfaction will be reduced by phubbing.³⁷ Parent interrupts the interaction with adolescents because of phubbing, which makes adolescents have more negative emotions (eg, boredom).^{6,21,22} Consequently, parent phubbing may be associated with boredom proneness.

There were fewer alternatives for socializing because of epidemic prevention policies.⁴ Compensatory Internet use theory interpreted how people excessively utilize technology to relieve or compensate for lousy feelings.³⁸ Along with the variety of internet-based services and smartphone accessibility during COVID-19,¹ smartphone usage may increase. Smartphones may be used to alleviate boredom while people feel restless. Individuals prone to boredom are more likely to use smartphones to ease their boredom symptoms.²⁹ Then, this study proposed the hypothesis:

Hypothesis 2: During the epidemic, the effect of parent phubbing on smartphone addiction is mediated by boredom proneness.

Refusal Self-Efficacy as a Moderator

Smartphone addiction may be connected to parent phubbing via the mediation of boredom. Nevertheless, the extent to which individuals are sensitive to parent phubbing varies widely. That is to say, parent phubbing or boredom proneness

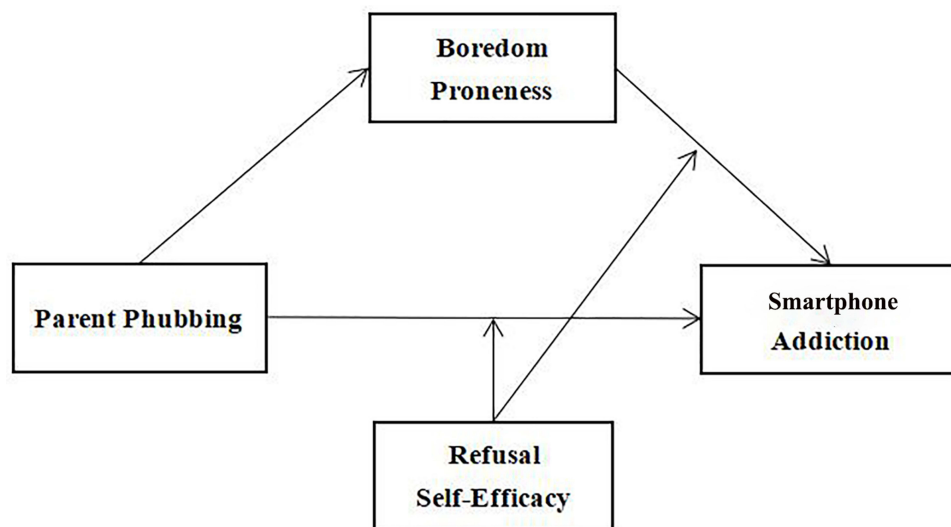


Figure 1 Diagram of the hypothesized model.

may not affect every adolescent. Refusal self-efficacy might serve as a valuable buffering. Refusal of self-efficacy refers to a person's ability to withstand temptation.³⁹ Self-efficacy, as described by social-cognitive theory, is a trust in one's capabilities and the confidence in one's ability to implement those capabilities to be used.⁴⁰ Previous findings have shown a negative correlation between refusal self-efficacy and addicted behaviours. Refusal self-efficacy played a role in counteracting the influence of risk factors.^{39,41} According to the risk-buffering hypothesis,⁴² several individual characteristics, such as refusal self-efficacy, have been linked to reducing the effect of environmental risk factors and behaviour problems. High refusal self-efficacy may benefit cognitions.⁴³ Adolescents have "cognitions" that can resist parent phubbing, which may help lower the risk of smartphone addiction. Additionally, adolescents with strong self-efficacy in their refusals can maintain positive emotions and decrease boredom proneness.⁴⁴ Therefore, smartphone addiction may be reduced in adolescents since they can cope with negative occurrences.

The hypothesis has been supported by previous research. For instance, Jang, Rimal and Cho⁴⁵ revealed that refusal self-efficacy had a moderating effect on the association between normative beliefs and teenage alcohol consumption. Likewise, a study by Ehret, Ghaidarov and LaBrie⁴⁶ revealed that the likelihood of developing alcohol dependency was greater in those with lower self-efficacy when it came to refusing alcohol. Golestan and Abdullah⁴⁷ also found that adolescent smoking risk characteristics are influenced by self-efficacy. In the light of that, we present the third hypothesis:

Hypothesis 3: Refusal self-efficacy moderates the effect of parent phubbing on smartphone addiction. Refusal self-efficacy moderates the effect of boredom proneness on smartphone addiction.

The Present Study

This research had three objectives. To begin with, we examined parent phubbing was positively related to smartphone addiction. Secondly, the goal of this study was to see whether boredom acted as a mediator of the relationship between parent phubbing and smartphone addiction. Furthermore, this study evaluated whether refusal self-efficacy would moderate the link between parent phubbing and smartphone addiction and whether refusal self-efficacy would act as a moderator of the association between boredom proneness and smartphone addiction (Figure 1).

Method

Participants

We recruited three classes in each grade from grade 7 through grade 9 at random in the target School (four ordinary junior high schools), in China. 968 students from the target classes were asked to participate voluntarily in the

anonymous survey. The criteria for unqualified samples were less than 60 seconds to complete questionnaires with a total of 33 questions and regularity of answers, such as the same score in each item or a regular pattern of scores (1,2,3,4,5,1,2,3,4,5,1,2,3,4,5, etc.). After excluding unqualified samples (eg, completed questionnaire less than 60 seconds and answered regularly), we finally collected 931 valid questionnaires with an effective response rate of 96.19% from 968 primary questionnaires. Among the 931 participants ($M_{\text{age}} = 13.54$ years, $SD = 1.08$, age-range = 11–16 years), regarding their grades, 40.11% were grade 7, 36.85% were grade 8, 23.04% were grade 9.

Measures

Parent Phubbing Scale

This is a 9-item scale was adapted from the Partner Phubbing Scale.⁴⁸ It was revised by Ding, Wang and Zhang.⁴⁹ Participants answered these items (eg, When the phone rings/vibrates, parents will take it out to check, even if we are talking at the time). The higher the total scores, the higher levels of parent phubbing (1 = never, 5 = always). Confirmatory factor analysis (CFA) showed the data well. CFI=0.97, TLI=0.96, RMSEA=0.06, 90% CI = [0.05, 0.08], SRMR=0.03. Cronbach's alpha in our sample was 0.89.

Refusal Self-Efficacy Scale

This is a 5-item scale that was revised by Xu, Su and Lin.^{50,51} Participants answered these items (eg, Suppose you are with parents, some of them are playing with smartphones. Are you willing to refuse verbally and do not play with smartphones?). The higher the total scores, the higher levels of resistance efficacy of the individual (1 = never, 5 = always). Cronbach's alpha in our sample was 0.90.

Smartphone Addiction Index Scale

This is a 17-item scale that was revised by Huang, Niu, Zhou and Wu.^{52,53} Participants answered these items (eg, You never feel like you have spent enough time on your phone.). The higher the total scores, the higher levels of smartphone addiction (1 = never, 5 = always). Cronbach's alpha in our sample was 0.89.

Boredom Proneness Scale

This is a 12-item scale that was revised by Li, Xin, Zhang, Du and Lv.^{54,55} Participants answered these items (eg, I struggled to find an academic course or work assignment that I was very excited about.). The higher the total scores, the higher levels of boredom proneness (1 = strongly, 7 = strongly agree). Cronbach's alpha in our sample was 0.89.

Procedure

The ethics committee of Jiangxi Normal University's School of Psychology approved the research. Every participant consented voluntarily. In obeying the epidemic prevention policy and minimize on face-to-face contact, we sent out the questionnaires through SurveyStar (Chinese online data collection software) from February 5–19, 2021. The questionnaire had standard instructions, and all participants were assured that the responses were confidential. At any time, participants have the alternative to decline. Before data collection, informed consent was acquired from all participants and their parents. Participants are voluntary and without remuneration.

Statistical Analysis

According to the normality test, all study variables showed normality (ie, Skewness < |3.0| and Kurtosis < |10.0|).⁵⁶ We first calculated descriptive statistics. In testing the mediation and moderated mediation models, the PROCESS Models 4 and 15 macros for SPSS were used (CIs).⁵⁷ Before data analysis, all variables were normalized to ensure comparison.

Results

Preliminary Analyses

Table 1 presents the descriptive statistics and bivariate correlation coefficients of the core variables. Parents' Phubbing was positively associated with boredom proneness and smartphone addiction. A positive correlation exists between

Table 1 Descriptive Statistics and Correlations Among Variables

	M	SD	1	2	3	4	5	6
1.Age	13.54	1.08	1					
2.Gender	0.51	0.09	-0.05	1				
3.Parent phubbing	2.51	0.19	-0.06	0.06	1			
4.Boredom proneness	3.19	0.21	0.03	-0.03	0.15**	1		
5.SA	2.83	0.13	0.12**	-0.09*	0.48**	0.16**	1	
6.RSE	3.39	0.29	0.01	0.04	-0.04	0.04	-0.22**	1

Notes: * $p < 0.05$, ** $p < 0.01$.

Abbreviations: SA, smartphone addiction; RSE, refusal self-efficacy.

smartphone addiction and boredom proneness. The relationship between smartphone addiction and refusal self-efficacy was negative. The results supported Hypothesis 1.

Mediation Effect Test

We expected parent phubbing and smartphone addiction were mediated by boredom proneness in Hypothesis 2. We used Model 4 of the PROCESS macro.⁵⁷ As Table 2 shows, the findings revealed that boredom proneness was positively associated with parent phubbing after controlling for the covariate, $\beta = 0.16$, $p < 0.001$, 95% CI [0.08, 0.24]. Smartphone addiction was positively associated with parent phubbing after controlling for covariate, $\beta = 0.45$, $p < 0.001$, 95% CI [0.38, 0.52]. Parent phubbing has a positive residual direct effect on smartphone addiction, $\beta = 0.43$, $p < 0.001$, 95% CI [0.37, 0.51]. Therefore, the result supported Hypothesis 2. Boredom proneness mediated the association between parent phubbing and smartphone addiction, indirect effect = 0.12, 95% CI = [0.06, 0.19]. 26.67% of the overall effect was accounted for by the mediation effect.

Moderated Mediation Effect Test

In Hypothesis 3, this study expected that the indirect relationship between parent phubbing and smartphone addiction through boredom proneness might be moderated by refusal self-efficacy. The results of the moderated moderation test using Model 15 of the SPSS macro Process are shown in Table 2.

The results showed that boredom proneness was positively linked with parent phubbing, $\beta = 0.16$, $p < 0.001$, 95% CI [0.08, 0.24], following the mediation model's results. Besides, there was a positive correlation between parent phubbing and smartphone addiction, $\beta = 0.42$, $p < 0.001$, 95% CI [0.36, 0.49], and a positive correlation was found between

Table 2 Linear Regression Models

Predictors	Model 1 (Boredom proneness)		Model 2 (SA)		Model 3 (SA)		Model 4 (SA)	
	β	t	β	t	β	t	β	t
Age	0.01	0.03	0.03	0.08	0.12	3.46***	0.11	3.42***
Gender	-0.07	-1.21	-0.05	-1.15	-0.04	-1.29	-0.05	-1.36
Parent phubbing	0.16	3.97***	0.45	12.95***	0.43	12.46***	0.42	12.58***
Boredom proneness					0.08	2.29*	0.07	2.01*
RSE							-0.23	-6.71***
Parent phubbing \times RSE							-0.07	-2.13*
Boredom proneness \times RSE							-0.08	-3.08**
R^2	0.03		0.25		0.26		0.31	
F	7.25***		66.28***		51.39***		39.54***	

Notes: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Abbreviations: SA, smartphone addiction; RSE, refusal self-efficacy.

boredom proneness and smartphone addiction, $\beta= 0.07, p < 0.001, 95\% \text{ CI } [0.01, 0.13]$, based on the dependent variable model. Furthermore, parent phubbing and refusal self-efficacy's interaction for smartphone addiction, $\beta= -0.07, p < 0.05, 95\% \text{ CI } [-0.14, -0.01]$, as well as the interaction between boredom proneness and refusal self-efficacy for smartphone addiction, $\beta= -0.08, p < 0.01, 95\% \text{ CI } [-0.13, -0.03]$, had significant predictive effects. In this study, refusal self-efficacy moderated indirect associations between parent phubbing and smartphone addiction via boredom proneness. Figure 2 shows the interaction effect graphically. Simple slope tests showed that boredom proneness had a significant effect on smartphone addiction for in those with low- level refusal self-efficacy, $b_{simple} = 0.14, t = 3.81, p < 0.001$, but not for in those with high-level refusal self-efficacy, $b_{simple} = 0.03, t = 0.12, p > 0.05$, indicating a partial enhancing effect (Figure 2A). Likewise, the interaction effect is visually plotted in Figure 2B. The effect of parent phubbing on smartphone addiction was greater for adolescents with low refusal self-efficacy ($b_{simple} = 0.50, t = 10.46, p < 0.001$) than for adolescents with high refusal self-efficacy ($b_{simple} = 0.36, t = 8.16, p < 0.001$).

An additional finding from the bias-corrected percentile bootstrap analysis was that the indirect effect of parent phubbing on smartphone addiction via boredom proneness was mitigated by refusal self-efficacy. The indirect effect of parent phubbing on smartphone addiction via boredom proneness was significant for adolescents with weak refusal self-

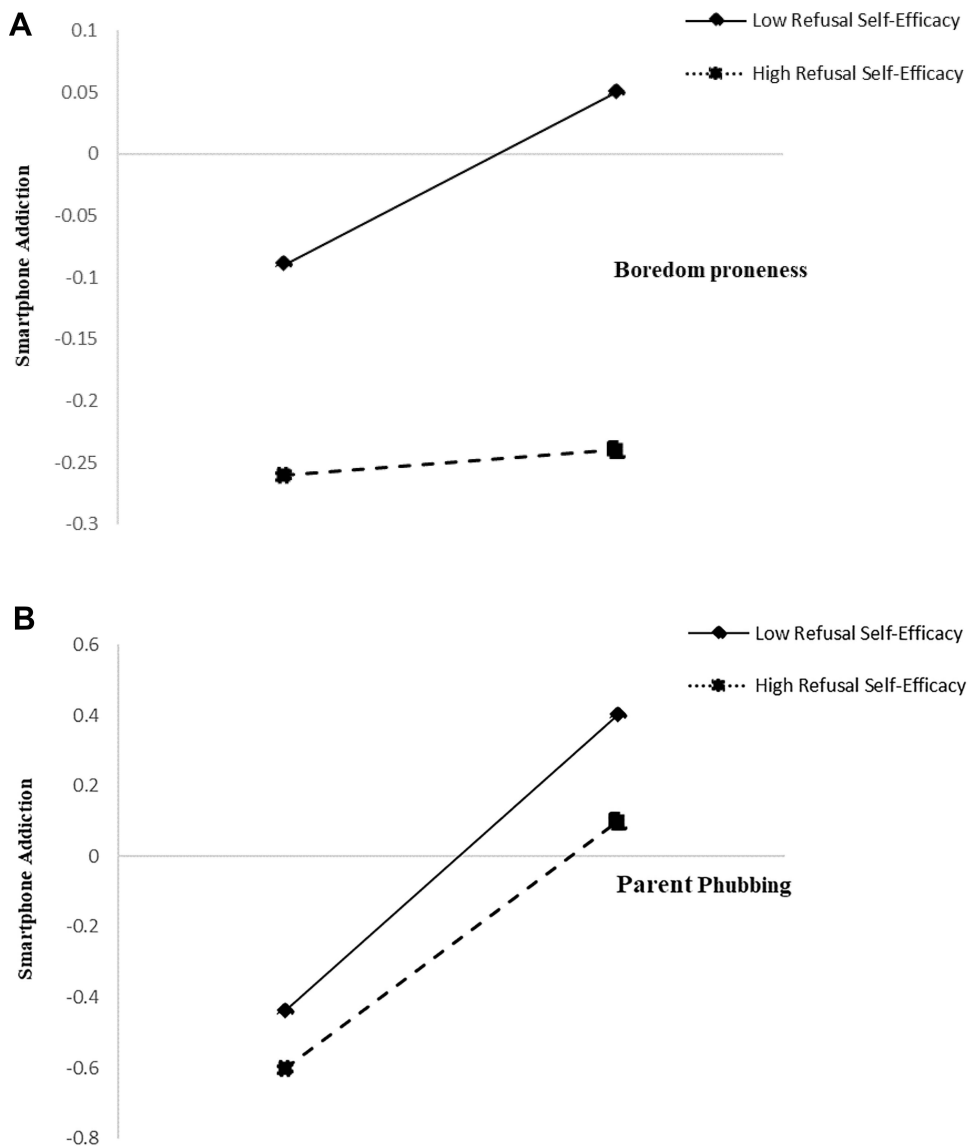


Figure 2 Interaction graphs. (A) Interaction effect of boredom proneness with refusal self-efficacy. (B) Interaction effect of parent phubbing with refusal self-efficacy.

efficacy, $\beta = 0.02$, $SE = 0.01$, 95% $CI = [0.01, 0.05]$. Nevertheless, the indirect effect was not significant for adolescents with strong refusal self-efficacy, $\beta = 0.01$, $SE = 0.01$, 95% $CI = [-0.01, 0.02]$. The results support Hypothesis 3.

Discussion

The current research developed a moderated mediation model during COVID-19 pandemic that was complemented with the previous research. This result revealed that parent phubbing played a mediating role in linking between parent phubbing and smartphone addiction. Moreover, refusal self-efficacy functioned as a moderating role in the second part of the mediation process, as well as the association between parent phubbing and smartphone addiction.

The Association Between Parent Phubbing and Smartphone Addiction

Parent phubbing was a significant effect of Chinese adolescents' smartphone addiction, as expected by the study, while several empirical studies have shown the effect of parent phubbing on smartphone addiction.^{6,21,22} Our results were congruent with the social learning theory.²⁶ Parents are role models for children who would learn attitudes, behaviours, and social norms from their parents.²⁶ During the epidemic, the government suggested people to minimize gathering activities and maintain social distance, so parents and children could spend more time together. Parents used their smartphones to work remotely, acquired epidemic risk information, and engaged in entertainment and social activities.⁵⁸ As adolescents observed parent phubbing frequently occurring around them and experienced it, they might conclude that phubbing is socially acceptable,¹⁹ increasing the risk of adolescents' smartphone addiction.

The Mediation of Boredom Proneness

Results showed that boredom proneness partially mediated the relation between parent phubbing and adolescents' smartphone addiction, supporting our initial conjecture that parent phubbing positively connected to boredom proneness, which in turn positively associated with smartphone addiction. In the initial step of the mediation (ie, parent phubbing \rightarrow boredom proneness), according to our findings, parent phubbing was positively related to adolescents' boredom proneness. In other words, adolescents who experienced parent phubbing had higher levels of boredom proneness. During the epidemic, children spent more time with their parents than others. When parents exhibited phubbing who reduced the interaction between parents and children. It is simple to develop a sensation of boredom when external stimuli are reduced,²⁹ which is consistent with arousal theory.^{33,59} As part of our second step of mediation, there was a positive relationship between adolescents' boredom proneness and smartphone addiction. In other words, the more bored individuals are, the more addicted individuals are to smartphone. In line with the theory of sensation seeking,⁶⁰ individuals need to require a particular level of excitement in their life. As such, people who are more prone to boredom may choose to aspire to a life of purposeful excitement through smartphones.⁶¹ When they feel bored, they actively seek out novel stimuli to increase their level of arousal.⁶² External stimulus is difficult to get by during the COVID-19 epidemic. Due to the mobility and usefulness, smartphones are an important tool for adolescents to combat boredom but also raise the risk of smartphone addiction by enabling individuals to spend significantly more time using the Internet.^{30,63} To get rid of boredom, adolescents find novel excitement and satisfaction through the Internet with using smartphones, which confirms the compensatory Internet use theory.³⁸

The Moderation of Refusal Self-Efficacy

Refusal self-efficacy played a moderating role in this study. These patterns are consistent with the risk-buffering model.⁴² The results showed that parent phubbing and boredom proneness had less effect on smartphone addiction among adolescents with high refusal self-efficacy. In other words, refusal self-efficacy works to buffer the negative effects of parent phubbing and boredom proneness on smartphone addiction.

There are two possible explanations. Firstly, positive psychological resources like self-efficacy help reduce adverse emotional problems effectively.⁴³ Even when adolescents have a strong proclivity towards boredom during the pandemic of COVID-19, people have strong refusal self-efficacy in controlling their emotions. So, it is unlikely that they will resort to smartphone addiction to cope with emotional satisfaction. Secondly, individuals who perceived a higher level of self-efficacy usually possessed more confidence and perseverance to cope with interpersonal troubles, resulting in decreased

exposure to problematic behaviour.⁴³ During COVID-19 pandemic, adolescents with strong refusal self-efficacy would rarely tend to behave negatively because they know more about the negative effects of smartphone addiction. As a result, this result supports the necessity of exploring the risk-buffering hypothesis.⁴²

Limitations

This study has several limitations that need to consider. Firstly, since our research was cross-sectional, we cannot deduce causation. Future studies should utilize experiments and longitudinal studies to establish causality. Secondly, the response biases arising from self-reporting might affect the study result. Replicable findings with broader and more representative samples are required. Thirdly, similar research should be undertaken with samples from various cultural nations since this individual's generalizability is restricted. Fourthly, due to the epidemic, this study only collected data online. Future studies should use better methods to collect data.

Conclusion

In sum, understanding how parent phubbing affects smartphone addiction is critical among Chinese adolescents during the COVID-19 pandemic. The authority has attached great importance to adolescents' smartphone addiction and has issued policies to remind the parent to fulfill their educational responsibilities and strengthen supervision and management. The parent should not be careless and should warn about the seemingly phubbing behavior. Boredom is a mediator in the effect of parent phubbing on smartphone addiction. It is crucial to urge parents to be sensitive to adolescents. Through effective communication, adolescents would be more active in their daily lives and generate positive emotional experiences. Adolescents would reduce the tendency to boredom and increase interest in activities such as sports, reading books. Furthermore, in this study, refusal self-efficacy played a moderating role. Adolescents' refusal self-efficacy should be enhanced through targeted interventions.

Highlights

During the epidemic, parent phubbing was correlated to Chinese adolescents' smartphone addiction.

During the epidemic, the effect of parent phubbing on smartphone addiction was mediated by boredom proneness.

During the epidemic, refusal self-efficacy moderated the effect of parent phubbing on smartphone addiction. Refusal self-efficacy moderated the effect of boredom proneness on smartphone addiction.

Data Sharing Statement

The authors will make all raw data supporting their results freely accessible.

Ethics Statement

The study protocol was reviewed and approved by the institutional review board of Jiangxi Normal University's School of Psychology on October 9, 2020, in line with the Declaration of Helsinki. The protocol number is IRB-JXNU-PSY-2020029. Adolescents and their caregivers gave written informed permission for this research.

Acknowledgments

We would like to thank the reviewers for their helpful comments and feedback on this article.

Funding

This study was funded by the Jiangxi University Party Construction Research Project, grant number 20DJQN020.

Disclosure

The authors report no conflicts of interest for this work.

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