Fear of COVID-19 and adolescents' mobile phone addiction: The experiential avoidance model

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Abstract. Based on the experiential avoidance (EA) model, we explored the impact of fear of COVID-19 (FOC) on adolescents' mobile phone addiction (MPA) as well as the sequential mediating effect of depression and EA. We recruited a sample of 1,132 middle school students; they filled out the Fear of COVID-19 Scale, the Depression Anxiety Stress Scale (DASS), the Acceptance and Action Questionnaire–II (AAQ–II), and the Mobile Phone Addiction Scale (MPAS). First, correlation analysis showed a significant positive correlation among FOC, depression, EA, and MPA. Second, the mediating effect test indicated that FOC influenced MPA through the sequential mediating effect of depression and EA. FOC increases suicidal ideation; this effect is achieved through the combination of depression and EA.

Keywords: Fear of COVID-19; Mobile phone addiction; Depression; Experiential avoidance.

1   Introduction

The emergence of the COVID-19 pandemic at the end of 2019 severely affected people's work, studies, and daily life. To this day, people are still suffering from the impact of the pandemic. Due to its high mortality rate and strong infectivity, COVID-19 can easily trigger fear. This fear amplifies the threat of the disease itself, causing numerous physiological and psychological difficulties for individuals who have never been infected or who have a very low risk of infection. Individuals with a strong fear of COVID-19 (FOC) tend to experience more somatic symptoms and negative emotions, such as anxiety and depression[1][2]. Although previous research has accumulated valuable findings, it has overlooked the effect of FOC on mobile phone addiction (MPA). During the pandemic, offline interactions were greatly restricted due to the impact of policies that aimed to prevent the spread of infection. In such situations, people may spend more time using their mobile phones to access the internet, which may increase their risk of MPA. Adolescents have not yet completed their psychological development, and their self-control is relatively weak; therefore, their risk of MPA may be greater. MPA is a typical manifestation of maladaptation among adolescents in the digital age that can damage their physical and mental development, academic growth,

and interpersonal relationships[3][4]. As such, we investigated the effect of FOC on MPA among adolescents and explored its mechanism based on the experiential avoidance (EA) model.

1.1   Fear of COVID-19 and Adolescents' Mobile Phone Addiction

FOC refers to the physiological and psychological experiences of fear caused by the threat of COVID-19, including tension, cold hands and feet, an accelerated heartbeat, and insomnia[1]. Individuals in a state of fear often use various behaviors, including collecting information, to alleviate this uncomfortable experience. To prevent important pandemic-related information from being missed, individuals with strong FOC may spend a lot of time gathering pandemic-related information, which can ultimately evolve into an addiction to collecting information. Previous empirical studies support our hypothesis that there is a positive correlation between pandemic risk perception and information collection addiction as well as that there is also a strong relationship between pandemic risk perception and FOC[5]. For adolescents, the Internet is their primary means of obtaining information, whereas mobile phones are their main means of accessing the Internet. Therefore, excessive gathering of pandemic-related information by adolescents may lead to overreliance on mobile phones and loss of control over mobile phone use; in turn, this can disrupt daily life and learning, causing adolescents to develop MPA. Thus, we propose Hypothesis 1 (H1): There is a positive correlation between FOC and MPA.

1.2   Fear of COVID-19 and Adolescents' Mobile Phone Addiction: the Intermediary Role of Depression and Experience Avoidance

To further explore the mechanism of FOC in MPA, we investigated the sequential mediation effect of depression and EA based on the EA model. This model is often used to explain self-harm, but it also has strong explanatory power for other self-injurious behaviors[6][7]. Specifically, negative emotions (e.g., anxiety, depression, anger, shame) triggered by a stimulus event are unbearable, and individuals try their best to avoid them, thereby increasing the tendency of EA. To achieve EA, individuals choose to engage in highly stimulating behaviors that can help them shift their focus (e.g., self-injury, tobacco and alcohol use, and Internet use); subsequently, they can easily develop self-injurious behaviors (e.g., self-harm, substance abuse, Internet addiction) in this process[6][7][8].

As an internal stimulus, FOC may induce depression in adolescents. Depression is a typical negative emotion that manifests as low mood, loss of interest, and feelings of worthlessness. The cognitive theory of depression holds that negative views of the world, oneself, and the future play a key role in the development of depression[9]. FOC may increase one's negative impression of the world, oneself, and the future, ultimately leading to depression. First, FOC can cause adolescents to overestimate the risk of infection, believing that the external world is full of risks, thereby enabling them to form a negative perspective of the external world, inducing low mood and loss of interest in the outside world and related activities. Second, FOC can cause adolescents

to experience physical discomfort (e.g., an accelerated heartbeat, cold hands and feet, and difficulty sleeping); this may disrupt learning activities and social life, leading to a negative view of oneself and feeling worthless. Third, we do not know exactly when the COVID-19 outbreak will completely disappear. This situation may cause adolescents to develop a strong FOC, leading them to anticipate that they will continue to live in pain and have a negative impression of the future.

Second, depression in adolescents may increase EA. EA refers to individuals wanting to avoid undesired internal experiences, including emotions, memories, and thoughts[7]. Depression is a painful, unbearable emotion. When depression occurs, individuals instinctively want to escape. Although avoidance cannot ultimately eliminate depression, it can help individuals shift their attention in the short term and reduce psychological pain. Hence, depression may increase the tendency toward EA. Several empirical studies have found a positive correlation between the two[7].

Finally, EA may increase MPA. Individuals must engage in specific behaviors to achieve EA. These behaviors usually have highly stimulating features and can help individuals quickly transfer their attention from unpleasant internal experiences to activities. Although these behaviors can achieve EA in the short term, they often have self-injurious characteristics, including substance use, self-harm, and even suicide. Similar to the above behaviors, mobile phone use can help individuals attain EA and has certain advantages. Mobile phones can provide adolescents with immersive content-rich activities, making it easy for them to achieve their goals of transferring their attention and engaging in EA. Moreover, mobile phones in China are cheap and easy to operate, and the mobile Internet supporting them is well developed, making mobile Internet access very convenient for adolescents. Thus, adolescents can easily achieve EA through mobile phone use. The use of mobile phones for EA can be seen as a type of negative reinforcement; through continuous negative reinforcement, adolescents may become overly dependent on their mobile phones and develop MPA. Previous empirical studies have also found a positive correlation between EA and Internet addiction[8], indirectly supporting the above conclusions.

In sum, this study suggests that depression and EA mediate the relationship between FOC and MPA among adolescents. Based on this, we developed Hypothesis 2 (H2): Adolescents' FOC affects MPA through the sequential mediation of depression and EA.

2   Objects and Methods

2.1   The Subject

We used convenience sampling to select participants from four middle schools in Henan Province, China. We distributed a total of 1,278 questionnaires, and after excluding invalid questionnaires with missing responses and consistent answers, we collected 1,132 valid questionnaires (the effective response rate was 88.58%). The average age of all participants was 13.49 years (standard deviation [SD] = 0.79), including 612 males and 520 females; 583 were in Grade 7 and 549 were in Grade 8.

2.2　The Methods

2.2.1 Fear of COVID-19 Scale

We used the Fear of COVID-19 Scale, revised by Feng et al., to measure FOC in the Chinese population[10]. The scale consists of seven items and is rated on a 5-point Likert scale, ranging from strongly disagree to strongly agree. Higher scores indicate greater levels of FOC. The internal consistency coefficient (α) of this study was 0.88.

2.2.2 Depression-Anxiety-Stress Scale (DASS)

We used the depression subscale of the revised DASS, developed by Gong et al., to measure individual levels of depression[11]. The scale consists of seven items and is rated on a 4-point Likert scale, ranging from does not apply to me at all to applies to me very much or most of the time. Higher scores suggest deeper levels of depression. In this study, the internal consistency coefficient was 0.86.

2.2.3 Acceptance and Action Questionnaire-II (AAQ-II)

We used the AAQ-II, translated and revised by Zhang et al., to measure the degree of EA of unwanted internal experiences[12]. The scale consists of seven items and is rated on a 7-point Likert scale, ranging from never true to always true. Higher scores imply greater levels of EA. The internal consistency coefficient of the questionnaire was 0.92.

2.2.4 Smartphone Addiction Scale

We used the Smartphone Addiction Scale, revised by Hong et al., to measure individual levels of MPA[13]. The scale consists of eleven items and is rated on a 6-point Likert scale, ranging from not at all to completely agree. Higher scores indicate greater MPA. The internal consistency coefficient of the questionnaire was 0.83.

3　　Result

3.1　　Common Method Deviation Test

We used exploratory factor analysis to test for possible common method deviations. The results of Harman's single factor test revealed that the characteristic root of six factors was greater than 1, and the cumulative variability explained by the first factor accounted for 24.97%, which is less than the critical value of 40%, meaning that there was no serious common method deviation in this study.

3.2　　Related Analysis

The descriptive statistics and relevant results of analysis for each variable (see Table 1) showed a significant positive correlation between FOC, depression, EA, and MPA.

3.3   Sequence Mediation Effect Test

First, we standardized all variables and used the non-parametric percentage bootstrap method of the SPSS macro program PROCESS 2.0, compiled by Hayes, to test the mediation effect. After controlling for sex and age, we analyzed the sample 5,000 times to calculate the 95% confidence interval (CI). The outcomes of regression analysis revealed (see Table 2 and Figure 1) that FOC significantly and positively predicted depression (B=0.11, P<0.01) and EA (B=0.09, P<0.01); and depression significantly and positively predicted EA (B=0.66, P<0.001). When we entered FOC, depression, and EA into the regression equation at the same time, FOC (B=0.13, P<0.01), depression (B=0.19, P<0.01), and EA (B=0.11, P<0.01) still significantly predicted MPA and the CI of the intermediary effect did not include 0. Thus, the sequential mediation effect between depression and EA on the relationship between FOC and MPA was significant.

Analysis of the intermediary effect (see Table 3) indicated that depression and EA played an intermediary role between FOC and MPA. The intermediary effect value was 0.04, which accounted for 25% of the total effect of FOC on MPA (0.16). Specifically, the intermediary effect consists of three paths: (1) indirect effect 1 through the path of FOC → depression → MPA (effect value: 0.02); (2) indirect effect 2 through the path of FOC → EA → MPA 2 (effect value: 0.01); (3) indirect effect 3 through the path of FOC → depression → EA → MPA 3 (effect value: 0.01). The 95% CI of the bootstrap of the three paths did not contain a zero value, suggesting that the mediation effect reached a significant level.

Table 1. Describe statistics and correlation analysis between variables

|	M	SD	1	2	3	4
1 Fear of COVID-19	2.83	0.98	—			
2 Depression	0.56	0.62	0.12**	—		
3 Experience avoidance	2.49	1.38	0.17**	0.65**	—	
4 Mobile phone addiction	3.24	1.06	0.16**	0.26**	0.24**	—

Notes: n=1132; *P<0.05, **P<0.01.

Table 2. Regression analysis of variable relationships in the mediation model

Equation		Overall fit index			Regression coefficient significance	
Result variables	Predictive variables	R	R^2	F	B	t
Depression	Sex	0.13	0.02	5.75**	0.04	1.35
	Age				0.03	0.98
	Fear of				0.11	

	COVID-19					3.51**
Experience avoidance	Sex	0.66	0.44	217.33**	0.05	2.48*
	Age				0.01	0.30
	Fear of COVID-19				0.09	3.36**
	Depression				0.66	25.04**
Mobile phone addiction	Sex	0.32	0.10	21.34**	-0.11	-4.04**
	Age				-0.01	-0.46
	Fear of COVID-19				0.13	3.95**
	Depression				0.19	4.49**
	Mobile phone addiction				0.11	2.71**

Table 3. Bootstrap analysis of the significance test of sequence effect

path	Effect value	95% confidence interval		Effect Size (%)
		Floor	Upper limit	
Fear of COVID-19→Depression→Mobile phone addiction	0.02	0.01	0.04	12.50
Fear of COVID-19→Experience avoidance→Mobile phone addiction	0.01	0.003	0.02	6.25
Fear of COVID-19→Depression→Experience avoidance→Mobile phone addiction	0.01	0.002	0.02	6.25
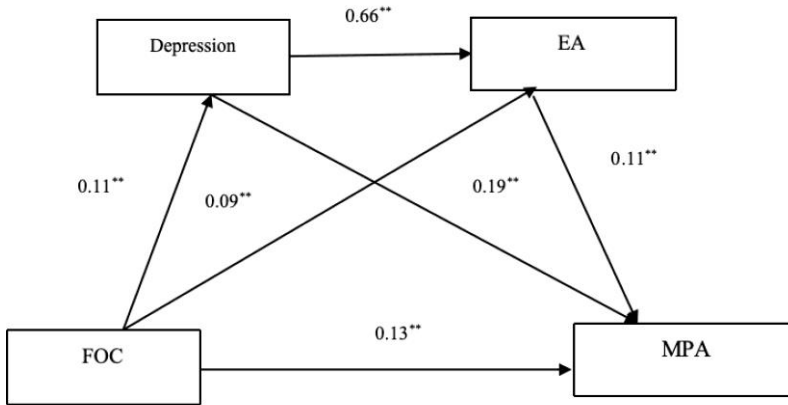
Fig. 1. Intermediary effect path map

4   Conclusion

Based on the EA model, we examined the relationship and underlying mechanism between FOC and MPA in adolescents. The results showed a positive association between FOC and MPA. FOC had a sequential mediating effect through depression and the EA of MPA, thereby supporting H1 and H2.

First, we found a positive correlation between FOC and MPA, which is consistent with previous research on the negative effects of FOC. Although past studies have focused on the impact of FOC on negative emotions and physical symptoms[12][13], they have neglected its influence on MPA. Since MPA adversely affects various aspects of adolescent development[3], the impact of FOC should not be ignored. When people are under stress and fear, they often need an object to soothe them, just as a frustrated baby requires a pacifier. Nowadays, smartphones have many advantages, such as their small size, comfortable touch, convenient use, and diverse functions, making them a tool for people to relieve stress and fear[14]. Adolescents who are fearful of COVID-19 may rely heavily on their smartphones to perform soothing functions. Overreliance on smartphones to relieve fear and buffer against stress can lead to MPA through negative reinforcement. Although some studies have examined the impact of fear on MPA, they have focused only on specific fears[15][16], and there is little research on the role of fear in COVID-19. Combined with the results of prior research, we believe that different types of fear may contribute to MPA, providing insights into practical work.

Second, based on the EA model, we found a sequential mediating effect of depression and EA on FOC and MPA. Previous research on the EA model has primarily focused on problematic behaviors, such as self-harm, substance abuse, and obsessive-compulsive disorder[17]. Our results indicate that the model also explains MPA, which is a problematic behavior in the digital age. This finding expands the scope of applicability of the EA model and helps practitioners understand the coexistence of MPA and other problematic behaviors (such as self-harm and substance abuse) within

an integrated theoretical framework based on EA, which can then be addressed simultaneously. In addition, the results expand the theoretical perspective of MPA. Previous studies have mostly explored the formation mechanism of MPA from the perspectives of attachment theory, basic needs theory, cognitive-behavioral models of pathological Internet use, and the interaction of the person-affect-cognition-execution model[18][19][20][21][22]. However, little research has been conducted to explain MPA from the view of the EA model.

This study also has practical implications in the context of normalized pandemic prevention and control. First, it is important to pay attention to the negative impact of FOC on adolescents. In the process of pandemic prevention and control, measures such as vaccination, nucleic acid testing, and zoning have received sufficient attention; however, relatively little attention has been paid to the threat that FOC poses to adolescents' mental health, which may increase their risk of MPA. Governments and schools can help alleviate FOC among adolescents through online courses, group counseling, and individual consultations to ultimately reduce the risk of MPA. Second, helping adolescents regulate their depression and EA is also an important way to prevent MPA. Acceptance and commitment therapy (ACT) has been proven to effectively treat visitors' problems with depression and EA[7]. Thus, practitioners can use this therapy to help adolescents experiencing fear due to the pandemic, reduce their depression and EA, and ultimately inhibit MPA. According to the ACT, focusing on the present moment and reducing excessive thoughts about the past and future are key to maintaining mental health and avoiding problematic behaviors. Many artistic activities such as music, dance, and yoga can help individuals become more aware of their current physical sensations and increase their mindfulness. In addition, such artistic activities can also help alleviate addictive behaviors and help adolescents struggling with FOC.

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