

The Effect of Future Time Perspective on Internet Dependence Among College Students in Pandemic Time: A Moderated Mediation Analysis

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Purpose: Social isolation during the COVID-19 pandemic has greatly increased the probability of Internet dependence. This study sought to examine the relation between future time perspective and college students' Internet dependence, as well as the mediating role of boredom proneness and the moderating effect of self-control in the link between boredom proneness and Internet dependence.

Materials and Methods: A questionnaire survey was carried out among college students from two universities in China. A sample of 448 participants varying from freshmen to seniors completed questionnaires on future time perspective, Internet dependence, boredom proneness and self-control.

Results: Results indicated that college students with high future time perspective were less likely to fall into Internet dependence and boredom proneness mediated this relationship. The relation between boredom proneness and Internet dependence was moderated by self-control. Boredom proneness had a greater impact on Internet dependence for students with low self-control.

Conclusion: Future time perspective could influence Internet dependence through the mediating role of boredom proneness, which is moderated by self-control. The results advanced our understanding of how future time perspective affected college students' Internet dependence, revealing that intervention strategies which could improve students' self-control would be instrumental in reducing Internet dependence.

Keywords: future time perspective, Internet dependence, boredom proneness, self-control

Introduction

The unexpected development of the COVID-19 pandemic and long-term home isolation may make people feel that the future is uncertain,¹⁻³ especially for college students who are ill-equipped to adaptively deal with the sudden stressful event.^{4,5} COVID-19 pandemic also has time-distorting effects by creating distorted time perceptions such as accelerating, stopping or slowing down time.⁶ The feeling of future uncertainty and the inability to perceive time all affect an individual's time planning about their future. Students with future time perspective consider it possible to prevent waste of time because they hope to get a competitive edge in today's tight job market,⁷ therefore they are less likely to kill their time on the Internet. In contrast, others may get addicted to the Internet because long-term online learning during the isolation period will increase the time of using Internet and then the risk of Internet dependency.⁸

Internet dependence, manifested in excessive use and even dependence on the Internet, is a kind of discomfort caused by improper use of it.⁹ It will reduce learning efficiency, and cause physical (eg, impaired vision) and psychological (eg, depression, loneliness, irritability, and anxiety) problems.¹⁰⁻¹² In severe cases, it may lead to the abnormality of an individual's nervous system.¹³ Given the pervasiveness and harmfulness of Internet dependence, a significant number of studies investigate the mechanisms (eg, future time perspective, life purpose, interpersonal relationship, family cohesion, family adaptability, and negative emotions) that may place individuals at risk for Internet dependence.¹⁴⁻¹⁶ However, previous studies concerning future time perspective (FTP) focus mainly on the direct relation between FTP and Internet

dependence; little is known about the mediating and moderating mechanisms underlying this link. In this context, it is of great theoretical and practical significance to explore the influence of FTP on college students' Internet dependence and its internal influencing mechanisms.

FTP and Internet Dependence

Time perspective is an orientation toward past, present and future occurrences^{17,18} and is regarded as an essential human characteristic.^{19–21} FTP is an individual's cognition, emotional experience and behavioral tendencies toward the future.^{22,23} Time perspective theory emphasizes that the longer the future time perspective, the higher the motivation to act and the higher resistance to temptation.²⁴ Future orientation makes it possible for people to consider the results of their actions, which manifests itself in greater responsibility for their behaviors.^{25,26}

A body of empirical research indicates that individuals with future orientation are more likely to plan their behaviors and restrain themselves from temptations and harmful habits in order to obtain expected results.^{27,28} FTP correlates negatively with gambling-addictive behaviors,²⁹ substance-addictive behaviors like tobacco, alcohol, cannabis, and drugs,^{30–32} as well as the length of time spent on the massive multiplayer online role-playing game.^{33,34} What is more, FTP is linked to conscientiousness¹⁷ and self-esteem,²³ two personality traits closely associated with Internet dependence.^{35–37} Thus, we expected that FTP can also negatively predict college students' Internet dependence in this study (H1).

The Mediating Role of Boredom Proneness

Boredom proneness, characterized by a lack of motivation and low physiological arousal,³⁸ refers to the unhappiness and monotony experienced by people in the absence of meaning, challenge or interest.³⁹ There is a certain relationship between an individual's orientation towards time and bored feeling, and indifference to time is one of the typical characteristics of boredom syndrome.⁴⁰ The cognitive capacity theory posits that individuals' attention resources are limited, when individuals turn their attention to events with future value, the attention resources occupied by negative emotions are reduced and the arousal levels are decreased, thus the boredom is effectively suppressed.⁴¹ Empirical studies show that students' time management level significantly relates negatively to their boredom proneness.^{20,42,43} Besides, students with FTP would deal with boredom using behavioral-approach and cognitive-approach boredom coping strategies.⁴⁴

The compensatory Internet use theory (CIUT) maintains that an unsatisfactory state of affairs may motivate people to overuse the Internet to alleviate their negative feelings,^{45–47} of which boredom is one kind of manifestation.⁴⁸ In order to get rid of this negative feeling, individuals often immerse themselves in behaviors that can help them get stimulation immediately,⁴⁹ such as television or the Internet.⁵⁰ Similarly, studies state that boredom proneness is one of the possible etiologies responsible for the high risk of Internet dependence.^{51–53}

Based on the above theoretical and empirical studies, we propose hypothesis 2: **boredom proneness would play a mediating role between FTP and Internet dependence (H2).**

The Moderating Role of Self-Control

Although boredom proneness was a risk factor for Internet dependence, one study failed to find a significant correlation between each other.⁵⁴ Heterogeneity of outcomes may originate from individuals' characteristics that moderate (ie, buffer or exacerbate) the effect of boredom proneness on Internet dependence, such as self-control. Self-control refers to the ability to regulate oneself, and this concept involves impulsive behavior, attentional control, psychological states and interpersonal relationship.^{55,56} Individuals' ability to self-control varies greatly when using new media.^{57,58} High self-control can serve as a gatekeeper to stop individuals from being addicted to the Internet.^{59,60}

Moreover, self-control toward Internet may moderate the relation between boredom proneness and Internet dependence. The risk-buffering model points out that favorable individual characteristics mitigate the effects of risk factors on mental health and misbehaviors.⁶¹ Self-control consists of a set of adaptive capacities to monitor, persevere, adapt, and inhibit one's emotions, behavior, desires, and thoughts in order to achieve a long-term goal.⁶² These adaptive capacities could therefore be favorable characteristics for alleviating the effect of risk factors (boredom proneness) on maladaptive

behaviors (Internet dependence). Empirical research also shows that a high level of self-control protects adolescents who experience interparental conflict from Internet dependence,⁶³ attenuates the association between low self-esteem and Internet dependence,⁶⁴ weakens the negative effect of school connectedness on problematic behaviors,^{65,66} and mitigates the adverse impact of external risk factors on individuals' online deviant behaviors,⁶⁷ in contrast, low level of self-control would amplify the effect of stressors on Internet dependence⁶⁸ or other risk factors (eg, peer deviance or being bullied) on problematic behaviors.^{69–71} The moderating role of self-control has also been studied in relation to addiction problems other than Internet dependence.^{72–74}

Based on the literature review, this study proposes hypothesis 3: **self-control plays a moderating role in the influence path of boredom proneness and Internet dependence, and the positive relationship between boredom proneness and Internet dependence decreases with the increase of self-control (H3).**

The Present Study

In this study, we tested a model of the process by which FTP will be a protective factor against students' Internet dependence. In particular, the purposes of this study were threefold: (a) to test the link between FTP and Internet dependence; (b) to investigate the mediating role of boredom proneness, and (c) to explore the moderating role of self-control between boredom proneness and Internet dependence. Altogether, these three research questions constitute a moderated mediation model. This integrated model can address questions about both mediation (ie, how does FTP effects students' Internet dependence?) and moderation (ie, when is the link least or most potent?). The proposed model is shown in Figure 1.

Methods

Study Design

This study was conducted with the aim of exploring the relationship between college students' FTP and their Internet dependence. According to our research objective, this study adopted simple random sampling technique to target specific people (ie, college students). We recruit participants through social media platforms as the study was conducted during the school vacation. Our research was a cross-sectional one to investigate the relationships among FTP, Internet dependence, boredom proneness and self-control.

Participants

This study was conducted in February 2020 at two universities-Shanxi Datong University and Huaibei Normal University, which are in two mid-sized cities in the middle of China. Initial data revealed the total number of participants to be 448, and 448 questionnaires were returned, with the recovery rate of 100%. The participants consisted of 76 boys (16.96%) and 372 girls (83.04%). The sample contained 64 freshmen (14.29%), 164 sophomores (36.61%), 60 juniors (35.71%) and 160 seniors (13.39%). The place of origin of participants was as follows: 76 Cities (17.00%), 92 counties (20.50%), 28 towns (6.30%) and 252 villages (56.20%).

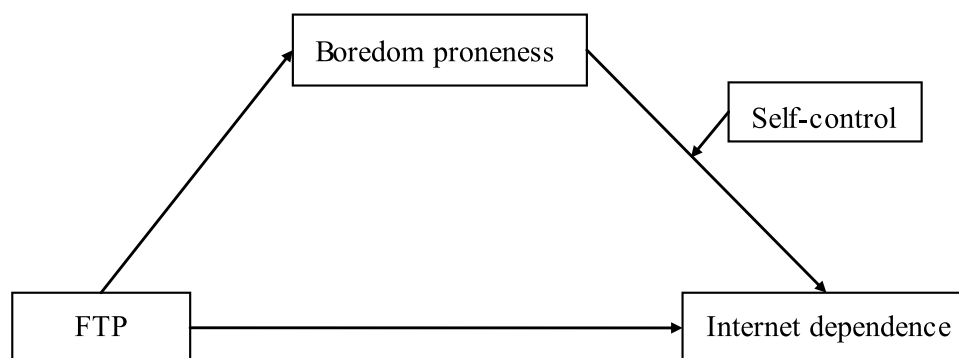


Figure 1 The proposed moderated mediation model. FTP is the abbreviation of future time perspective.

Measures

FTP

The General Future Time Perspective Questionnaire⁷⁵ was used to assess FTP. A 20-item questionnaire had items such as “I think my future is bright”. Participants responded on a 5-point Likert scale (1 = strongly agree to 5 = strongly disagree). Higher scores indicated higher levels of positive attitude to future. In this study, the confirmatory factor analysis (CFA) indicators of future time perspective questionnaire were better: $\chi^2/df = 2.71$, RMSEA = 0.06, RMR = 0.02, AGFI = 0.94, GFI = 0.98, CFI = 0.98. McDonald’s omega was 0.87 and Cronbach’s α was 0.86.

Internet Dependence

The revised Chinese version of Internet Dependence Scale⁷⁶ was used. Participants rated each item on a 4-point scale (1 = never; 4 = always). Higher scores indicated higher levels of Internet dependence. Based on the scale, this study made a slight adjustment and deleted some items with high similarity in order to simplify the scale. There are 12 items in the revised scale, which maintains the original four dimensions: withdrawal symptoms (3 items), tolerance symptoms (3 items), interpersonal and health-related problems (3 items) and time management problems (3 items). Sample item included the following: “The time of using Internet was longer than originally planned”. A Confirmatory Factor Analysis (CFA) was conducted in order to check whether the four-factor model with 12 items fit to the data well in the present sample. The results of CFA showed that the four-factor model with 12 items had acceptable fit to the current data ($\chi^2/df = 1.77$, RMSEA = 0.06, NFI = 0.94, RFI = 0.89, IFI = 0.97, CFI = 0.97, TLI = 0.95). The Measures of Absolute Fit, Incremental Fit Measures and Parsimonious Fit Measures of the model were good. High values of internal consistency were found in four dimensions (withdrawal symptoms: McDonald’s omega = 0.73; tolerance symptoms: omega = 0.82; interpersonal and health-related problems: omega = 0.74; time management problems: omega = 0.71). Finally, the McDonald’s omega was computed as 0.86. Cronbach’s α for the combination of four dimensions (withdrawal symptoms: alpha = 0.71; tolerance symptoms: alpha = 0.81; interpersonal and health-related problems: alpha = 0.67; time management problems: alpha = 0.63) was computed as 0.85.

Boredom Proneness

The revised Chinese version of Boredom Proneness Scale-Short Form (BPS-SF scale)⁷⁷ was used. The scale included two parts: internal stimulus (6 items: eg, I find it easy to entertain myself) and external stimulus (6 items: eg, When I was young, I used to feel bored). Internal stimulus referred to the stimulus that can make an individual feel comfortable or enjoy. External stimulus referred to the novelty and excitement that an individual seeks. There were 12 items in the scale. Participants responded on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). The total result of a questionnaire was the add-together of all scores, among which, No.1–6 entries were reversely scored. Higher scores indicated higher levels of boredom proneness. In this study, the CFA indicators of boredom proneness scale were better: $\chi^2/df = 2.71$, RMSEA = 0.06, RMR = 0.04, AGFI = 0.92, GFI = 0.97, CFI = 0.96. High values of internal consistency were found in both scales (Internal stimulus: McDonald’s omega = 0.74; External stimulus: omega = 0.68). Finally, the McDonald’s omega was 0.65. Cronbach’s α for the combination of the two scales (Internal stimulus: alpha = 0.72; External stimulus: alpha = 0.68) was 0.65.

Self-Control

The revised self-control scale⁷⁸ was used. The 19-item scale had items such as “I do a lot of things on impulse”. The total result of the scale was the add-together of all scores, among which, items 1, 5, 11 and 14 were reversely scored. Higher scores represented high level of tendency to self-control. In this study, the CFA indicators of self-control scale were better: $\chi^2/df = 2.87$, RMSEA = 0.07, RMR = 0.04, AGFI = 0.91, GFI = 0.96, CFI = 0.94. McDonald’s omega was 0.80 and Cronbach’s α was 0.79.

Procedure

The present study obtained approval from the Research Ethics Committee of the first researcher’s University. All questions were listed in Questionnaire Star, which is a professional and trusted questionnaire collection platform, and then this platform automatically generated a webpage link. The link of the questionnaire was distributed to students via

WeChat, and students could get access to the questionnaire after clicking the link. Before answering the questions, all participants were requested to check the box marked “informed consent”, which introduced their right to withdraw, anonymity, and confidentiality prior to taking the survey. If a respondent refuse to check the box, the survey will be ended. Finally, the participants began to answer our formal questionnaire after content was given.

Data Analyses

All data were entered and analyzed in SPSS 20.0. Variables were standardized prior to analyses. First, we computed descriptive statistics and conducted Pearson correlations to examine the relationships among FTP, boredom proneness, Internet dependence and self-control. Second, Hayes's⁷⁹ PROCESS macro (Model 4) was used to examine whether boredom proneness mediated the relationship between FTP and Internet dependence. Third, Hayes's⁷⁹ PROCESS macro (Model 14) was used to estimate whether self-control moderated the relationship between boredom proneness and Internet dependence. What is more, the bias-corrected nonparametric percentile bootstrap method was applied to examine the significance of all the effects. We generated 5000 bootstrapped samples to estimate the confidence interval (CI) based on the original sample ($n = 448$), and 95% CI without 0 indicated statistical significance. In addition, gender was included in the analyses as covariates.

Results

Common Method Deviation Test

Procedural control and statistical testing were used to reduce and verify common method deviation problem. Procedural control included emphasizing the confidentiality and anonymity to the participants, and the setting of reverse items. Additionally, single factor control method was applied to test the common method deviation.⁸⁰ We firstly constructed a confirmatory factor analysis model M1, and then built a model M2 adding methodology factors. The results showed no significant change in the fit indexes between model M1 and model M2 ($\Delta RMSEA = 0.02$; $\Delta SRMR = 0.03$; $\Delta CFI = 0.01$; $\Delta TLI = 0.08$). Therefore, there is no serious common method deviation.

Descriptive Analyses

Means, standard deviations and the inter correlations for four variables utilized in each analysis can be found in Table 1. As indicated, all study variables were correlated with each other, among which FTP and self-control were significantly correlated with boredom proneness and Internet dependence negatively. In addition, boredom proneness was significantly correlated with Internet dependence positively.

Testing for Mediating Effect

In Hypothesis 2, the current study anticipated that boredom proneness would mediate the relation between FTP and Internet dependence.

The results of the analysis of the mediating effect showed: (1) FTP significantly negatively predicted Internet dependence, $b = -0.18$, $p < 0.001$ (Path c). (2) FTP significantly negatively predicted boredom proneness, $b = -0.48$, $p < 0.001$ (Path a). (3) boredom proneness significantly positively predicted Internet dependence, $b = 0.29$, $p < 0.001$ (Path b), but the direct effect of FTP on Internet dependence was not significant ($b = -0.04$, $p > 0.05$) (Path c').

Table 1 Correlation Coefficients, Means, and Standard Deviations of Variables

	M	SD	1	2	3	4
1. FTP	3.52	0.53	1			
2. Internet dependence	2.89	0.68	-0.18**	1		
3. Boredom proneness	2.72	0.41	-0.49**	0.30**	1	
4. Self-control	3.15	0.45	0.38**	-0.49**	-0.36**	1

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

Abbreviations: FTP, future time perspective; M, means; SD, standard deviations.

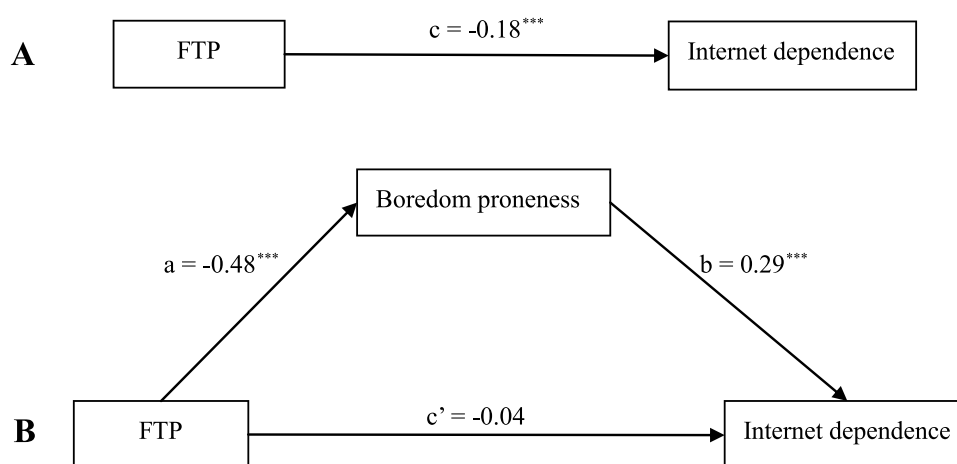


Figure 2 The total effect of FTP on Internet dependence (**A**), a mediation model (**B**). FTP is the abbreviation of future time perspective. *c* quantifies the total effect of FTP on Internet dependence, *a* quantifies the effect of FTP on boredom proneness, *b* quantifies the effect of boredom proneness on Internet dependence and *c'* quantifies the direct effect of FTP on Internet dependence. ****p* < 0.001.

Bootstrapping indicated that there was a significant role of boredom proneness in explaining the association between FTP and Internet dependence (indirect effect = -0.14 , 95% CI = $[-0.20, -0.09]$). The mediation effect accounted for 78% of the total effect. These findings indicated that boredom proneness fully mediated the association between students' FTP and Internet dependence. The results are shown in Figure 2. In the language of path analysis, Figure 2A represents FTP's total effect on Internet dependence. Figure 2B represents a simple mediation model.

Testing for Moderated Mediation

In Hypothesis 3, we expected that the association between boredom proneness and Internet dependence was moderated by self-control.

As Table 2 illustrates, the effect of boredom proneness on Internet dependence was significant ($b = 0.09$, $p < 0.05$); and more importantly, the interaction coefficient between boredom proneness and self-control was significant ($b = -0.08$, $p < 0.01$), indicating that the relationship between boredom proneness and Internet dependence (the latter half path of mediating effect) was regulated by self-control. That is, self-control moderated the path from boredom proneness to Internet dependence.

To facilitate the interpretation of this interaction effect, we plotted the predicted Internet dependence by boredom proneness separately for high and low self-control (1 SD above the mean and 1 SD below the mean, respectively) (Figure 3). Simple slope tests showed that the boredom proneness had a positive predictive effect on Internet dependence

Table 2 Testing the Moderated Mediation Effect of FTP on Internet Dependence

Predictors	Model 1 (Boredom Proneness)		Model 2 (Internet Dependence)	
	<i>b</i>	<i>t</i>	<i>b</i>	<i>t</i>
Gender	-0.21	-5.26***	-0.07	-1.67
FTP	-0.48	-12.03***	0.08	1.57
Boredom proneness			0.09	1.99*
Self-control			-0.47	-10.46***
Boredom proneness x self-control			-0.08	-2.73**
R ²	0.28		0.28	
F	87.56***		42.09***	

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

Abbreviation: FTP, future time perspective.

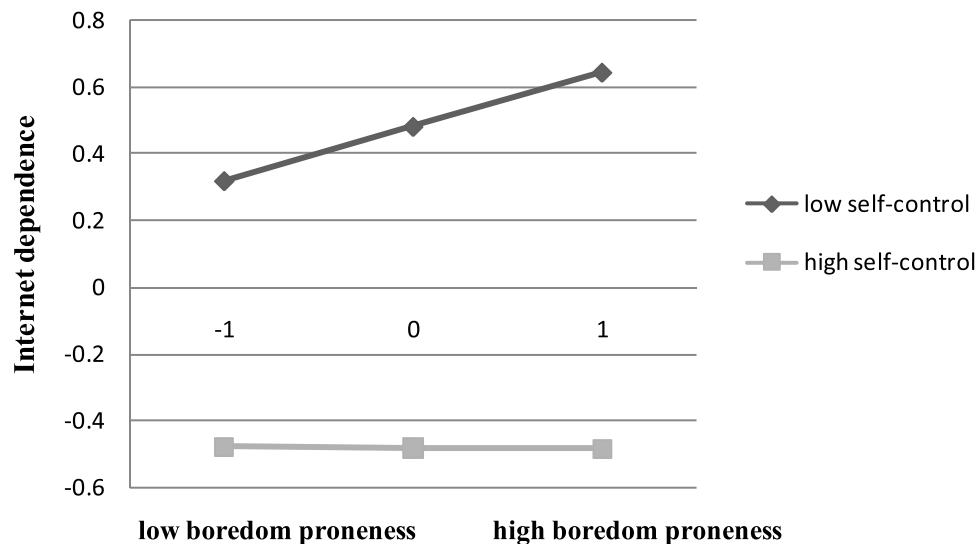


Figure 3 Self-control as a moderator of the relationship between boredom proneness and Internet dependence.

for college students with low self-control ($b_{\text{simple}} = 0.18$, $t = 3.57$, $p < 0.001$). However, for those with high self-control, boredom proneness still had a positive predictive effect on Internet dependence, but the association became nonsignificant ($b_{\text{simple}} = 0.01$, $t = 0.17$, $p > 0.05$).

In sum, the predicting role of boredom proneness on Internet dependence was significant among those with low self-control; in contrast, for those with high self-control, the relation between boredom proneness and Internet dependence was nonsignificant.

Discussion

Consistent with our expectations, boredom proneness had a mediating effect in the relationship between FTP and Internet dependence, and self-control moderated the link between boredom proneness and Internet dependence.

The Mediating Role of Boredom Proneness

The result further validates the Interaction of Person-Affect-Cognition-Execution (I-PACE) model, which includes four components: person's core characteristics, subjectively perceived situation, affective and cognitive responses and decision to use a certain Internet application.⁸¹ The core characteristics of individuals affect subjectively perceived situation, and individuals will then make affective and cognitive responses. According to this model, students with low levels of FTP are more likely to feel bored. When being confronted with boredom, an urge to reduce their negative feeling may develop. They are more inclined to immerse themselves in the Internet to avoid boredom experience or escape realistic problems. Internet is used in a dysfunctional way to cope with these aversive feelings.

Two separate associations in the mediation model are worth explaining besides the overall mediation result. For the first stage of the mediation process, this finding is congruent with previous findings that state students with high level of time utilization rate, clear goal, positive outlook on future time and behavior commitment have low level of boredom proneness.⁸² Those who are future-oriented are more likely to feel positive emotions in school.⁸³ For the second stage of the mediation process, this finding is consistent with the cognitive-behavioral model of Internet dependence that exclaims existing negative personality traits, boredom proneness is conceived as one of which,⁸⁴ are distal necessary causes of Internet dependence.^{85,86} This finding also parallels previous research that suggests students who are prone to feel bored are more likely to habitually abuse the Internet neglecting other aspects of their lives.^{87–89}

The Moderating Role of Self-Control

The predicting role of boredom proneness on Internet dependence was significant among those with low self-control. This result can be explained by general bad behavior theory, which states that self-control is a key variable that buffer or exacerbate other factors' influence on individuals' bad behavior, and the absence of self-control is an important psychological mechanism of individual's misbehavior.⁹⁰ Given that individuals with high self-control are less affected by their own psychological states and better able to regulate their behaviors,⁹¹ they may resist the influence of boredom; even if feel bored they will not indulge in the Internet.^{92–94} However, for those with low self-control, boredom may drive them to spend more time on the Internet games, chattering videos, Tiktok and WeChat.

Limitations and Implications

Several limitations in the current study should be addressed. First, the findings of the current study were based on Chinese college students. In response to the COVID-19 pandemic, governments in many countries implemented comprehensive lockdown and quarantine measures. Since COVID-19 pandemic is a global problem, college students in other countries have also experienced those changes. Future studies should include students from different cultural groups to make the samples more representative. Second, the current study only focused on one relationship among the four variables, as there may be more complex relationships which have not been explored, future study needs to combine qualitative research methods to improve the rigorousness of the results. Third, although the epidemic has occurred in the objective environment, individuals' perceptions of the influence of pandemic are different. It is likely that some people are more sensitive to the boredom and inconvenience, while others may regard quarantine as an opportunity to upgrade themselves. Future research can take individual difference into consideration.

Despite these limitations, the findings in the current study have practical implications as it provides information on the mechanisms among variables related to Internet dependence. Firstly, orientation toward future goals can guard against Internet dependence. Besides, boredom proneness's mediating role suggests that programs that can reduce college students' boredom proneness may be more helpful than simply focusing on the Internet dependence itself. Additionally, considering that reducing boredom proneness may take a long time, interventions that can improve self-control can be instrumental since this study finds the moderation effect of self-control to be significant. For example, researchers found among various subconstructs of self-control, cognitive factors (eg, FTP, use of avoidance strategies, and attention control) can be strengthened with short-term interventions.⁶⁴ If interventions for these cognitive factors are fully carried out, effects of reducing Internet dependence will be maximized.

Conclusions

This study aimed to provide insights into how (the role of boredom proneness as a mediator) and under what situations (the role of self-control as a moderator) FTP could influence Internet dependence. Research found that FTP could influence Internet dependence through the mediating role of boredom proneness, which was moderated by self-control. The effect was only significant among students with low self-control. The results advanced our understanding of how FTP affected college students' Internet dependence. Based on the findings of this study, intervention strategies that could improve students' self-control and reduce their boredom proneness would be effective on preventing Internet dependence.

Data Sharing Statement

The datasets used or analyzed during the current study are available from the corresponding author on reasonable request. And all data generated or analyzed during this study are included in this article.

Ethics Statement

The present study obtained approval from the Research Ethics Committee of Shanxi Datong University and complied with the Declaration of Helsinki.

Consent for Publication

All authors confirm that the details of any images and tables can be published, and that the persons providing consent have been shown the article contents to be published.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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