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Class-Level Mobile Phone Addiction Moderates the Relationship between College Adjustment and State Boredom in College Students: A Linear Mixed-Effects Model

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Abstract: Most of the previous studies have not examined the connection between college adjustment and state boredom for students in classes. Classrooms that are overly reliant on mobile phones may not provide good opportunities for students to build their own experiences of college life and could lead to boredom. To show that the classroom environment affects students' degrees of boredom, this paper studies the relationship between mobile phone addiction in class and state boredom.

Keywords: Classroom Environment; Mobile Phone Addiction; State Boredom; College Adjustment; Mixed Mixed-Effects Model

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1. Introduction

State boredom is an unpleasant emotion that arises in people when they are not interested in or motivated by what they are doing at the moment, and they cannot escape this state. A person can be in a bad mood because they are bored. There will be all sorts of problems, such as changes in thinking, emotions and behaviour, particularly among young children. Therefore, understanding the reasons and ways in which students are bored at school can help us improve the mental health of students[1]. Among the factors that cause state boredom, the problem of college adjustment for college students has also drawn the attention of scholars. College adjustment refers to a person's ability to adapt well to changes in the environment at home and outside their home; it is how they adjust themselves or respond to these changes in the college environment to better fit in and thrive during their college years. It is a simple adjustment to the external environment, but it is also an adjustment of one's own mind. At this time, if people are unable to handle the problems caused by some serious events, such as the internal and external changes mentioned earlier, they may miss the opportunities for development provided by the window of plasticity and end up with various maladjustments, mental and physical disabilities, or diseases.

When a person is in a new environment, there is a lack of enthusiasm for facing challenges in the face of development opportunities; it is easy to experience inner conflict or cognitive dissonance, and they are unable to adjust to the new environment. According to the previous research, poor college adjustment can cause students to experience various negative emotions, such as depression and anxiety; they are unable to cope with the difficulties of life in a new environment. Such maladjustment may reduce a person's interest or motivation for the current activity or task and cause them to feel bad. That

is, a lack of the ability and will to adapt to the changes in life may lead to depression. Therefore, we believe that the poorly adjusted students will be more bored by school[2].

It should be pointed out that in the study of the relationship between college adjustment and state boredom in college students, no previous research has considered the environment of the entire classroom culture. However, this environment may be detrimental to the development of college adaptation and causes boredom in college students. For college students, the classroom is a microsystem where they will inevitably interact with others in the process of learning and growing. According to the ecological system theory, it is known that people need to interact with their environment in order to adapt; thus, changes in individuals' behaviour and lives are influenced by both their own traits and the external environment. Especially for students who have just entered university, the classroom is one of the most important social environments for psychosocial development. If they are placed in a negative class psychological environment, this may cause the students to be less adaptable in college and significantly increases their negative emotions.

In light of the negative class environment, people are beginning to pay more attention to the harms of mobile phone addiction at present. Some scholars have pointed out that in a relatively free campus environment, college students spend a lot of time using mobile phones for entertainment and information sharing, and even play with their mobile phones in class, which may lead to mobile phone addiction and further create a negative class environment. Mobile phone addiction is an excessive dependency on all sorts of activities carried out through mobile phones that results in significant harm to one's social and mental health[3].

According to the media system dependence theory, the more dependent a person is on the media system, the more harm this system can cause. Research has shown that extended use of mobile phones can harm students' adaptation to college life by reducing their decision-making and communication skills, as well as causing all sorts of mental health problems. Therefore, mobile phone addiction among college students may reduce their adaptability to school life and increase the probability of boredom. It is hypothesized that mobile phone addiction in the classroom is a type of negative factor for the psychological environment of the classroom, and it may moderate the relationship between college students' adaptability and state boredom. Classrooms with a high proportion of phone addiction are likely to increase the boredom of students who are already struggling to adapt to college life because of the extra pressure in such a negative environment. At the same time, in a class without phone addiction, students who find it difficult to adapt to college life may not be bored because of high stress in the environment. However, this speculation has not been verified yet. Therefore, this paper will study the moderating effect of class-level mobile phone addiction on college adjustment and state boredom. Previous studies have found that the degree of boredom among college students varies according to differences in gender and age. Therefore, Gender and Age are taken as control variables. Given the above reasons, the following two hypotheses are put forward[4].

1.1 College adjustment can negatively predict the state of boredom among college students.

1.2 The degree of mobile phone addiction can influence the relationship between college adjustment and state boredom of college students; that is, the higher the level of mobile phone addiction in class, the closer the relation[5] ship between college adjustment and state boredom. Specifically, we believe that the negative impact of college adjustment on state boredom is more pronounced for students who are more addicted to mobile phones in class.

2. Methods

This paper has been uploaded to the Open Science Framework in advance.

2.1 Participants

The data in this paper are the results of a large-scale study on admission adaptation. 3276 first-year college students were recruited from the mental health research project on college students in Guizhou Province, China. In order to guarantee the reliability of the study, classes will be used as the sampling unit. A total of 42 classes were selected, and their sizes ranged from 49 to 108 students (M = 72, SD = 21). Each student belonged to only one class, and there was no movement of students among the classes. The participation rates of the different classes ranged from 83.58% to 99.07% (M = 91.80, SD = 3.95).

In order to be included in the analysis, the participants had to provide data on state boredom, college adjustment and mobile phone addiction, as well as their reported age and gender. Finally, a total of 3002 college students participated in the study

(effective rate 91.63%), and among them, there were 898 male students (29.91%) and 2,106 female students (70.09%) aged 17-24 years (M = 19.47, SD = 1.10).

2.2 Measures

2.2.1 Individual-level measures

State Boredom. The Chinese revised edition of the State Boredom Scale was employed to determine people's sense of boredom. There are 24 items and five subscales. The seven points of the scale are 1 (strongly disagree) and 7 (strongly agree). The higher the sum of the scores in this scale, the more boring one's current life is. It is reliable and valid for Chinese college students and adolescents (Liu et al., 2013). The Cronbach's alpha (α) of the scale in this study was 0.93.

Chinese college student adjustment. The Chinese College Student Adjustment Scale was developed by Fang et al. . This scale can be used to measure the level of adjustment of college students in Chinese culture. There are 60 items and seven subscales. The five levels of the scale are 1 (disagree) to 5 (agree). The higher the total score of this scale, the more well-adjusted a person is to college life. It is suitable and valid for Chinese university students. The Cronbach's alpha of the scale in this study was 0.95.

2.2.2 Class-level measures

Mobile Phone Addiction. The Chinese revised edition of the Mobile Phone Addiction Index Scale was employed to gauge mobile phone addiction. There are 17 items and four subscales. The five levels of the scale are 1 (almost never) and 5 (always). The higher the total score of this scale, the more severe the problem of mobile phone addiction in a person. It has good reliability and validity for the re-measurement of domestic college students and adolescents. The Cronbach's alpha coefficient of the scale in this paper is 0.89.

2.3 Procedure

At the same time, the psychologists in charge of data collection were also present to guide the students in completing the questionnaires and ensure that all the information remained confidential.

On average, it took students 20 minutes to finish the questionnaire in one class. Researchers had all the questionnaires completed by the time the participants left, so there was no missing data and the data were reliable.

2.4 Statistical Analysis

SPSS was used to calculate the mean, standard deviation, correlation coefficients and centre the data. First, college adjustment was chosen as the individual-level variable and mobile phone addiction was taken as the class-level variable. Therefore, the raw scores of state boredom, college adjustment and mobile phone addiction were used in the descriptive statistics and correlation analyses. Second, the individual scores for college adjustment and the group-mean-centred scores for mobile phone addiction were used in the inferential statistics.

Linear mixed-effects models were used on the data, and the 3002 students belonged to 42 college classes. This way was chosen because students in the same class are more likely to give very relevant answers, so there is a cluster in the data. The LMM analysis was carried out in the R language using the lme4 and ggplot2 packages. The R code for all LMM analyses has been added to OSF.

The three parts of LMM analysis are: First, we carried out some preliminary descriptive statistics and drew scatter plots with regression lines to observe the relationship among the variables.

Second, for each LMM, the minimal random effect structure was chosen based on the random effect, and then the fixed effects were added in the following order: State boredom, mobile phone addiction, and the interaction term of both. In addition to Maximum Likelihood Estimation, the following three goodness-of-fit indices were used to select the best model: Restricted Maximum Likelihood, Akaike Information Criterion and Schwarz's Bayesian Criterion. If the two alternative models have the same random-effects structure, a smaller value of the goodness-of-fit index indicates that the model is more in line with the data.

Third, in order to investigate the influence of college adjustment and mobile phone addiction on state boredom, the following series of nested models were fitted separately. Model 1 studies the effect of individual-mean-centred college adjustment at the individual level on state boredom, controlling for covariates. In Model 2, we added the group-mean-centred mobile phone

addiction as a class-level predictor to Model 1. In Model 3, we have added the cross-level interaction of college adjustment and mobile phone addiction to Model 2. Finally, the top two slopes are considered to determine the main interaction effect. This analysis will show that the relationship between college adjustment and state boredom is different at different levels of mobile phone addiction.

3. Results

3.1 Describe Statistics and Correlation Analysis

Based on the correlation analysis, college adjustment, mobile phone addiction and state boredom are all positively correlated. College adjustment is negatively correlated with state boredom ($r = -0.47$, $p < 0.001$) and also negatively correlated with mobile phone addiction ($r = -0.35$, $p < 0.001$); at the same time, mobile phone addiction is positively correlated with state boredom ($r = 0.40$, $p < 0.001$). Based on the above results, it can be seen that these factors are related and worth studying further.

Table 1 Descriptive Statistics and Correlation Analysis of the Main Variables (n = 3002)

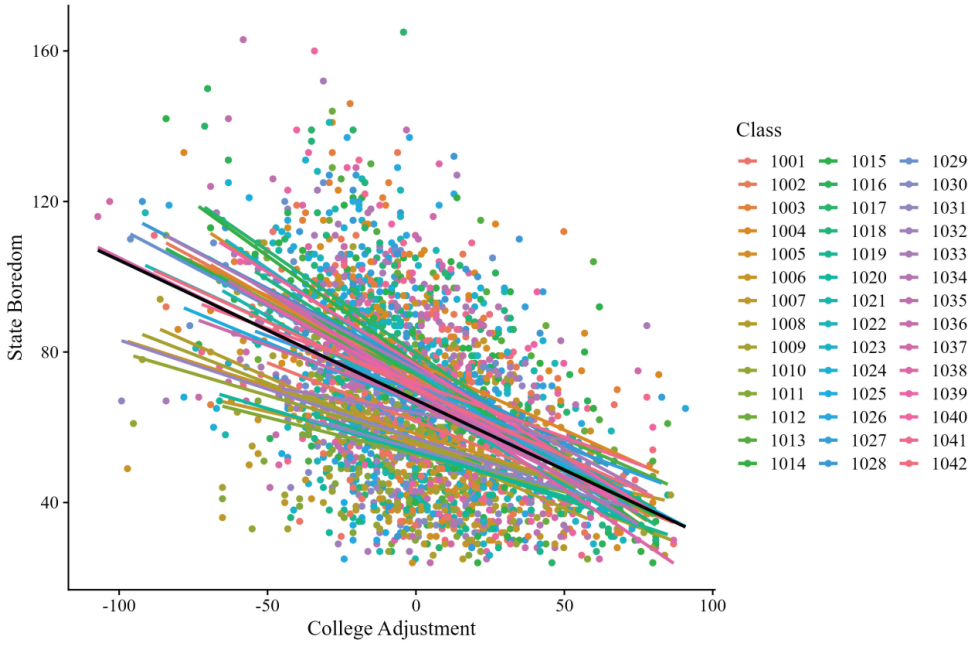
	1	2	3	4
1College Adjustment	–			
2 Mobile Phone Addiction	−0.35***	–		
3 State Boredom	−0.47***	0.40***	–	
4 Age	0.01	0.02	−0.05**	–
Gender	−0.07***	0.01	0.03	−0.10***
M	67.24	201.18	45.83	19.47
SD	23.24	29.16	10.83	1.09
Skewness	0.11	0.39	−0.13	0.36
Kurtosis	0.54	0.17	0.11	0.58

Note: Gender was dummy-coded (male = 0, female = 1), M = Mean number, SD = Standard dev**iation, $p < 0.01$,*** $p < 0.001$.

3.2 Preliminary Analysis

The scatterplot in Figure 1 shows the linear regression curve for overall classes; it can be seen that college adjustment is negatively correlated with state boredom, and the linear regression curves of each class reveal the variation in this correlation among the different classes.

Figure 1 The Scatterplot and Fitted Regression Line



Note: Each point is a person's raw score. The colours are all different groups. Each class has a particular Class number, such as "1001". Each coloured fitting line is the class regression trend for all individuals in that class, and the black fitting line is the overall regression trend of all classes.

3.3 Main Analyses

The results of LMMs are shown in Table 2. College Adjustment negatively predicted state boredom in Model 1 after adjusting for age and sex. Therefore, it can be concluded that students who adjust better to college life will feel less boredom.

In Model 2, we found that class mobile phone addiction was also positively associated with people's sense of boredom, after controlling for age and sex. Classes with many students addicted to mobile phones had a relatively high rate of boredom among the participants. Based on the above, it can be concluded that collective mobile phone addiction among students affects their feelings of boredom at school.

Notably, the Model 3 showed that college adjustment is associated with mobile phone addiction at all levels. Therefore, it can be concluded that the effect of college adjustment on state boredom is moderated by class-level mobile phone addiction. Therefore, the intersection of the cross-section is relatively small and thus not included.

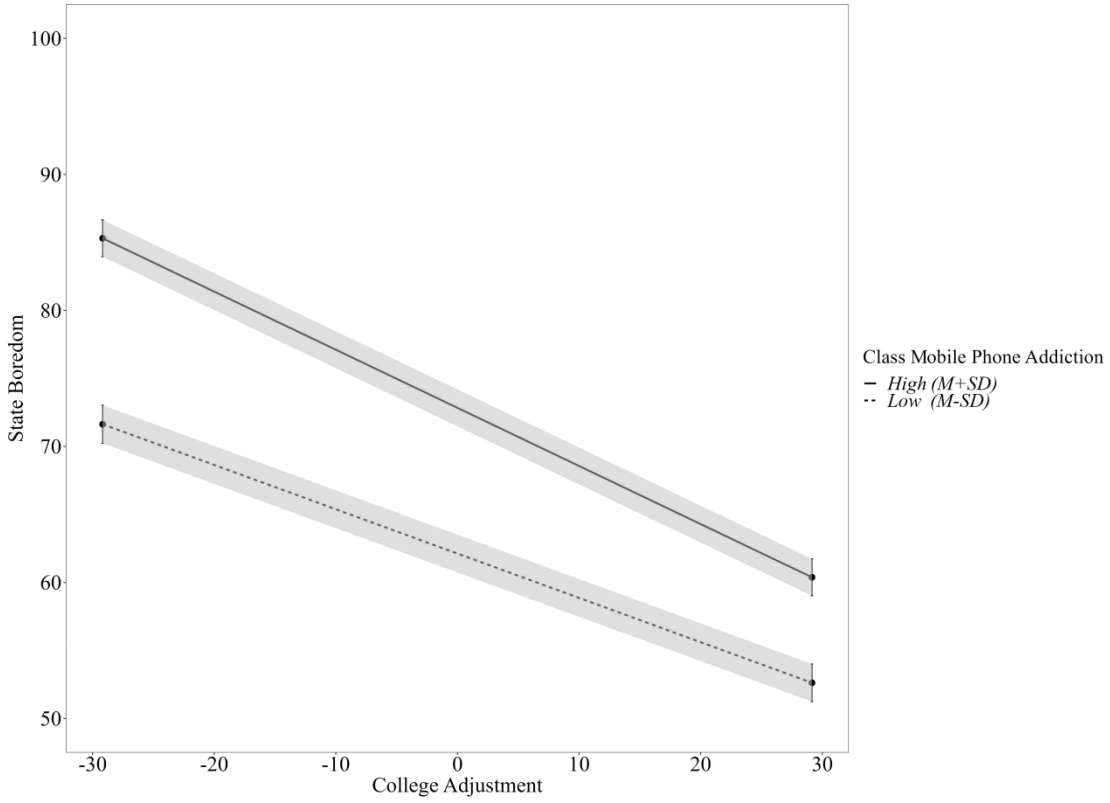
Table 2 Parameter Estimates and Variances of the Multilevel Model Predicting State Boredom Based on College Adjustment and Mobile Phone Addiction.

		Model 1			**Model 2**			**Model 3**		
		Estimate	**SE**	**β**	**Estimate**	**SE**	**β**	**Estimate**	**SE**	**β**
Fixed effects	Intercept	80.93***	6.50	0.06	80.72***	6.43	0.05	80.38***	6.42	0.05
	Age	−0.64*	0.32	−0.03	–0.63	0.32	−0.03	–0.61	0.32	−0.03
	Sex	−1.25	0.84	−0.05	–1.40	0.83	−0.05	–1.44	0.83	−0.06
	College Adjustment	−0.38***	0.01	−0.48	–0.38***	0.01	−0.47	–0.38***	0.01	−0.47
	Class Mobile Phone Addiction				3.18***	0.54	0.23	3.21***	0.54	0.23
	College Adjustment× Mobile Phone Addiction							−0.03**	0.01	−0.06
Random effects	Intercept Class variance	57.96			29.49			29.28		
	Residual variance	359.37			359.34			357.35		
Fitting index	AIC	26300.66			26276.32			26268.64		
	BIC	26336.70			26318.37			26316.69		
	REML	26288.70			26262.30			26252.60		

Note: SE = Standard error, β = Standard regression coefficient; AIC = Akaike information criterion, BIC = Bayesian information criterion, REML = Restricted maximum likelihood.* $p < 0.05$,** $p < 0.01$,*** $p < 0.001$.

As shown in Figure 2, although the classes are different, college adjustment is positively and significantly correlated with state boredom, and as mobile phone addiction in classes increases, so does the state boredom experienced by college students. The slope of the two lines is different; that is, the slope of high-level class mobile phone addiction is steeper than that of low-level addiction. Therefore, as mobile phone addiction among college students increases, so too do the negative impacts of college adjustment and state boredom. That is to say, compared with the low-level class scenario, the influence of high-level class mobile phone addiction on the relationship between college adjustment and state boredom is stronger, and there is a considerable negative adjustment.

Figure 2 The simple slope plot of the effect of class mobile phone addiction on the relationship between college adjustment and state boredom of college students.



Note: M = Mean, SD = Standard Deviation. The gray shadow band is the standard error of the fitted trend line, and it shows the range of variation in the whole trend. The error bar is ±1 standard error of the mean.

4. Discussion

4.1 Relationship between College Adjustment and State Boredom

On the relationship between college adjustment and state boredom, we found that college adjustment negatively predicted state boredom. It may be that college adjustment actually refers to the ability of college students to adapt well to campus life and the social environment. Students who cannot adjust well often engage in social avoidance behaviour to cope with the new environment of university life. Social withdrawal may prevent children from exploring and participating in new environments; thus, they may lose interest in the current social activity or task and experience negative emotions. The above are the low expressions of state boredom. Therefore, college adjustment may be one of the reasons for a person's boredom in life.

4.2 The Moderating Effect of Class Mobile Phone Addiction on the Relationship between College Adjustment and State Boredom

We studied the relationship between college adjustment and state boredom in light of the spread of mobile phone addiction in the classroom. Mobile phone addiction at the class level was found to moderate the relationship between college students' college adjustment and state boredom. Students who have not adapted well to college life and study in a class with a high degree of mobile phone addiction are more likely to feel bored than those in a class with a low level of mobile phone addiction. The reasons for the above results are as follows:

According to the media system dependency theory, the higher the level of mobile phone addiction, the more severe the negative consequences. When the spread of mobile phone addiction reaches the level of a class, students may be influenced by their peers and fail to participate in or enjoy the class activities and socialisation. Therefore, students in classes with a high degree of mobile phone addiction who are less well-adjusted to college life will be under more psychological stress in the face of new social and academic situations. Therefore, they find it difficult to participate in the class and are even more reluctant to do so. Social isolation will make these students feel more lonely and anxious, and they are likely to experience boredom. At

the same time, in classrooms where students are less reliant on mobile phones, college-aged maladjusted students will be less distracted socially and can thus participate more actively in class and feel less bored.

4.3 Limitations and Outlook

In short, this study has found that the effect of class-level mobile phone addiction on state boredom is stronger for students who have had difficulty adapting to college life. However, there are still some defects. First, it may be limited by the selection of the sample and may only represent the situation of one university or a particular group. To strengthen the external validity and generalizability of the research, future studies can use a more varied sample and include different kinds of universities and students from all walks of life. Second, the cross-sectional design will not show changes in the coming years. In the future, I will conduct a long-term study to observe changes in students' college adaptation and boredom over time and learn more about how they are related and why. Third, there are some other factors not considered in this study, such as individual traits and family environment, which may also affect the relationship between college adjustment and state boredom. In the future, we will add some control variables to reduce the impact of other factors.

4.4 Conclusions and Suggestions

This paper has explored the connection between class mobile phone addiction, college adjustment and state boredom, and found that class mobile phone addiction is one of the reasons for changes in the relationship between college adjustment and state boredom. Therefore, in order to create a good learning atmosphere for students, schools and teachers should be more mindful of how students use mobile phones and foster an inclusive and joyful learning environment. This will help the students better adapt to college life, reduce the occurrence of state boredom, and create a favourable learning environment for all-round development of the students.

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Conflict of Interests

The authors declare that there is no conflict of interest regarding the publication of this paper.

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