Original Article

Structural Relationship among Mobile Phone Dependence, Self-Efficacy, Time Management Disposition, and Academic Procrastination in College Students

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Abstract

Background: We aimed to investigate the relationship among mobile phone dependence, self-efficacy for self-regulated learning, time management disposition, and academic procrastination in Chinese students majoring in physical education. In addition, we explored the mediating roles of self-efficacy for self-regulated learning and time management disposition in the relationship between mobile phone dependence and academic procrastination.

Methods: We adopted a random sampling method to identify 324 physical education majors at five universities in Shaanxi Province, China in 2020. Data were analyzed via exploratory factor analysis, confirmatory factor analysis, correlation analysis, structural equation model analysis, and path analysis.

Results: Mobile phone dependence had significant positive effects on academic procrastination ($P<0.001$) and self-efficacy for self-regulated learning ($P<0.05$) but a significant negative effect on time management disposition ($P<0.001$). Self-efficacy for self-regulated learning had a significant positive effect on academic procrastination ($P<0.001$), while time management disposition had a significant negative effect on academic procrastination ($P<0.01$). Notably, self-efficacy for self-regulated learning and time management disposition mediated the relationship between mobile phone dependence and academic procrastination ($P<0.05$).

Conclusion: In addition to its direct effect on academic procrastination, mobile phone dependence exerts an indirect effect via time management disposition and self-regulated learning efficacy. Reducing students' dependence on mobile phones is necessary for attenuating academic procrastination on university campuses. Thus, universities should aim to restrict the use of mobile phones in the classroom, actively cultivate students' confidence in their self-regulated learning ability, and educate them regarding appropriate time values.

Keywords: Academic procrastination; Mobile phone dependence; Time management disposition

Introduction

In today's network environment, learning, entertainment, and online payment are all carried out through mobile terminals, and mobile phones have become a common tool in people's daily lives. According to the "Statistical Report on China's Internet Development Status" released

by the China Internet Network Information Center (CNNIC), as of December 2020, the number of Internet users in China has reached 989 million, and the Internet penetration rate has reached 70.4%, of which mobile Internet users account for the highest proportion (1). Various forms of mobile Internet use have penetrated our daily lives, leading to the development of new social norms and changes in basic lifestyle patterns. However, despite their convenience, mobile phones have been associated with a series of adverse effects including dependence and addiction. National and international studies have verified that excessive or frequent use of mobile phones can impact physical and psychological functioning, quality of life, and performance at work or school (2,3).

Mobile phone dependence refers to an obsessive state in which individuals are unable to control their use of mobile phones, resulting in impaired physiological, psychological, and social functioning (4). Some scholars have also suggested that individuals with such dependence experience anxiety when deprived of mobile phone access (5). College students represent the most active group in the Internet era. According to a 2020 survey, netizens aged 10–39 years account for 61.8% of all Internet users, with those in their 20s accounting for the highest proportion. Research has demonstrated that overuse of mobile phones among college students can also lead to boredom with academic work and a serious tendency to procrastinate (6,7). Therefore, the need to investigate the relationship between mobile phone dependence and academic procrastination remains urgent.

Academic procrastination is defined as the presence of serious procrastination behaviors in the process of learning or completing related tasks. While students affected by academic procrastination typically exhibit the intention and tendency to learn, they do not show behavior consistent with their intentions in actual learning settings (8). Klingsieck (9) summarized research related to procrastination into the following four perspectives: From the perspective of differential psychology, responsibility and various related aspects

are negatively correlated with the degree of procrastination (10), and the degree of academic procrastination is often influenced by low self-discipline and high impulsivity. Procrastination can also be understood in terms of motivation (internal and external motivation, goal orientation, self-efficacy) or volition (self-control, time management, learning strategies, etc.). In addition to affecting learning and performance, habitual procrastination can lead to anxiety, self-blame, low self-esteem, and other negative emotions, in turn leading to various problem behaviors (11).

Time management disposition refers to the psychological and behavioral characteristics displayed by different individuals with regard to time-related values, time monitoring, and time efficacy (12). An individual's disposition for time management is influenced by both external factors and internal factors such as needs-related self-monitoring and personality. A relevant study has reported a significant positive relationship between time management ability and academic performance in college life (13) and that students with poor time management ability tend to procrastinate in their study (14). Individuals who lack self-control are likely to use mobile phones without restraint (15).

Self-efficacy refers to a learning method in which individuals utilize cognitive strategies, self-motivation, behavioral advancement, and active participation (16). Self-regulated learning requires individuals to choose appropriate learning strategies, assess their own knowledge level, make self-corrections when necessary, and understand the importance of using appropriate strategies (16). Self-efficacy for self-regulated learning refers to an individual's belief in actively using learning strategies, self-inspection, self-adjustment, and completion of schoolwork (17). Self-efficacy for self-regulated learning is a key factor that can influence and predict academic procrastination (18). Academic procrastination is considered as a behavioral manifestation of failed self-regulation during learning, in which students cannot use cognitive or motivational strategies. Individuals who procrastinate cannot effectively adjust learn-

ing strategies under high stress and cognitive load to achieve effective learning (19).

Therefore, we aimed to investigate the relationships among mobile phone dependence, self-efficacy for self-regulated learning, time management disposition, and academic procrastination in Chinese physical education majors, and to examine whether self-efficacy for self-regulated learning and time management disposition mediate the relationship between mobile phone dependence and academic procrastination. As shown in Fig. 1, we hypothesized that mobile

phone dependence exerts significant impacts on academic procrastination (H1), self-efficacy for self-regulated learning (H2), and time management disposition (H3). We also hypothesized that self-efficacy for self-regulated learning exerts a significant impact on academic procrastination (H4), that time management disposition exerts a significant impact on academic procrastination (H5), and that self-efficacy for self-regulated learning and time management disposition mediate the relationship between mobile phone dependence and academic procrastination (H6).
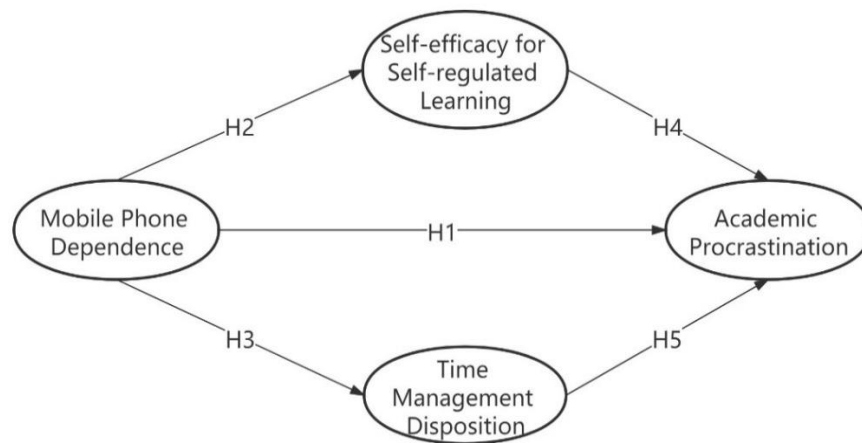

Fig. 1: Research Model

Methods

Participants

We adopted a random sampling method to identify physical education majors at five universities in Shaanxi Province, China. A total of 350 questionnaires (Table 1) were distributed following

stratified sampling based on gender, grade, and other factors, and 324 questionnaires were effectively returned.

All study participants provided informed consent, and the study design was approved by Xianyang Normal University, China.

Table 1: General participant characteristics

Variables		*n*	*%*
Gender	Men	228	70.4
	Women	96	29.6
Grade	Freshman	155	47.8
	Sophomore	90	27.8
	Junior	57	17.6
	Senior	22	6.8
Total		324	100

Assessment Tools

All responses were assessed using a 5-point Likert scale, with scores of 1–5 representing "strongly disagree" to "strongly agree." Reliability and validity were tested using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). The aggregate validity index of the average variance extracted (AVE) and construct reliability (CR) were assessed based on previously specified criteria (AVE>0.50, CR>0.70) (20). The results are shown in Table 2.

Table 2: Reliability and validity test results

Variable		Item	Estimate	Squared multiple correlation	Standardized residuals	Construct reliability	Average variance extracted	Cronbach's α
Mobile phone dependence	Inability to control craving	1	0.646	0.417	0.583	0.695	0.432	0.833
		2	0.706	0.498	0.502			
		3	0.617	0.381	0.619			
	Withdrawal or escape	5	0.651	0.424	0.576	0.747	0.497	0.842
		6	0.749	0.561	0.439			
		9	0.711	0.506	0.494			
	Feeling anxious and lost	10	0.743	0.552	0.448	0.918	0.652	0.933
		11	0.766	0.587	0.413			
		13	0.875	0.766	0.234			
		14	0.821	0.674	0.326			
		15	0.842	0.709	0.291			
		19	0.790	0.624	0.376			
	Productivity loss	16	0.755	0.570	0.430	0.744	0.493	0.840
		17	0.712	0.507	0.493			
		18	0.635	0.403	0.597			
Self-efficacy for self-regulated learning		2	0.865	0.748	0.252	0.976	0.805	0.976
		3	0.885	0.783	0.217			
		4	0.873	0.762	0.238			
		5	0.896	0.803	0.197			
		6	0.900	0.810	0.190			
		7	0.907	0.823	0.177			
		8	0.908	0.824	0.176			
		9	0.927	0.859	0.141			
		10	0.886	0.785	0.215			
		11	0.926	0.857	0.143			
Time management disposition	Time values		0.824	0.679	0.321	0.903	0.758	0.944
	Time efficiency sense		0.980	0.960	0.040			0.938
	Sense of time monitoring		0.797	0.635	0.365			0.975
Academic procrastination		1	0.722	0.521	0.479	0.954	0.675	0.954
		2	0.719	0.517	0.483			
		4	0.850	0.723	0.278			
		5	0.859	0.738	0.262			
		7	0.851	0.724	0.276			
		8	0.850	0.723	0.278			
		10	0.807	0.651	0.349			
		11	0.853	0.728	0.272			
		13	0.848	0.719	0.281			
		14	0.837	0.701	0.299			

Root mean square error of approximation (RMSEA)=0.070, Tucker-Lewis index (TLI)=0.914, Comparative fit index (CFI)=0.922, χ^2=1,642.655 (p<0.001), *df*=634, χ^2/df=2.591

Cronbach's α was above 0.80 for all questionnaire variables, indicating high internal consistency of the latent variables and good reliability. Meanwhile, the AVE and CR values were above 0.50 and 0.70, respectively, indicating good polymerization validity of the model.

Mobile Phone Dependence
Assessments of mobile phone dependence were based on the Mobile Phone Addiction Index (MPAI) (21) and validated for use in Chinese students by Huang (22). The questionnaire included 20 questions across four aspects. Among them, Cronbach's α values for inability to control cravings, feeling anxious/lost, withdrawal/escape, and productivity loss were 0.833, 0.933, 0.842, and 0.840, respectively.

Self-efficacy for Self-regulated Learning
The Self-Efficacy for Self-Regulated Learning Scale (SESRLS) was based on the questionnaire (23) translated by Wang (24), with proven reliability and validity in the Chinese population. A modified version of the SESRLS with a Cronbach's α of 0.976 was used in the present study.

Time Management Disposition
Time management was assessed based on the Adolescence Time Management Disposition Inventory (ATMD) (25). The questionnaire included 35 questions across the aspects of time values, time efficiency sense, and sense of time monitoring. Cronbach's α values for these aspects were 0.944, 0.938, and 0.975, respectively.

Academic Procrastination
The questionnaire used to assess academic procrastination was compiled by Solomon and Rothblum (26), based on the questionnaire translated. The questionnaire included 10 questions and had a Cronbach's α of 0.954.

Statistical Analysis
We used SPSS and Amos version 25.0 (IBM Corp., Armonk, NY, USA) for data processing and statistical analysis. Data analysis methods included EFA and CFA, correlation analysis, structural equation model (SEM) analysis, path analysis, and detection of mediating effects via bootstrapping. After verifying the fit of the structural relationship of each variable in the hypothetical model, the data were analyzed. Statistical significance was set at $P<0.05$.

Results

The results of the correlation analysis among mobile phone dependence, self-efficacy for self-regulated learning, time management disposition, and academic procrastination are shown in Table 3. There was a positive correlation between mobile phone dependence and self-efficacy for self-regulated learning ($r=0.136$; $P=0.014$). The withdrawal or escape factor was positively correlated with self-efficacy for self-regulated learning ($r=0.143$; $P=0.010$), as was feeling anxious and lost ($r=0.140$; $P=0.012$). Mobile phone dependence was negatively correlated with time management disposition overall ($r=-0.168$; $P<0.001$). Both mobile phone dependence ($r=0.464$; $P<0.001$) and self-efficacy for self-regulated learning ($r=0.167$; $P<0.001$) exhibited a positive correlation with academic procrastination. There was a negative correlation between time efficiency sense and academic procrastination ($r=-0.109$; $P=0.049$).

Suitability of the Research Model
This study established an SEM to explore the relationship among mobile phone dependence, self-efficacy for self-regulated learning, time management disposition, and academic procrastination. The results indicated that the research model was well fitted, with a goodness-of-fit index (GFI) greater than 0.80 and incremental fit index (IFI), Tucker–Lewis index (TLI), and comparative fit index (CFI) values all greater than 0.90 (Table 4). All fitting indexes were within a reasonable range and met the standards for appropriateness. These results reflect a high degree of fitting between the theoretical model and the survey data, highlighting their suitability for empirical analysis.

Table 3: Correlations among mobile phone dependence, self-efficacy for self-regulated learning, time management disposition, and academic procrastination

Variable	Inability to control craving	Withdrawal or escape	Productivity loss	Feeling anxious and lost	Time values	Sense of time monitoring	Time efficiency sense	Mobile phone dependence	SESRL	Time management disposition	Academic procrastination
Inability to control craving	1.000										
Withdrawal or escape	0.729**	1.000									
Productivity loss	0.649**	0.687**	1.000								
Feeling anxious and lost	0.658**	0.689**	0.706**	1.000							
Time values	0.192**	0.251**	0.210**	0.083	1.000						
Sense of time monitoring	0.066	0.123*	0.006	0.116*	0.703**	1.000					
Time efficiency sense	0.165**	0.212**	0.109*	0.151**	0.810**	0.773**	1.000				
Mobile phone dependence	0.847**	0.865**	0.849**	0.918**	0.188**	0.097	0.180**	1.000			
SESRL	0.103	0.143**	0.072	0.140*	0.651**	0.713**	0.848**	0.136*	1.000		
Time management disposition	-0.153**	0.212**	0.117*	0.127*	0.912**	0.902**	0.937**	-0.168**	0.803**	1.000	
Academic procrastination	0.386**	0.367**	0.402**	0.444**	0.044	0.068	-0.109*	0.464**	0.167**	0.080	1.000

SESRL, self-efficacy for self-regulated learning
*$P<0.05$, **$P<0.01$; tested via correlation analysis

Table 4: Suitability of the research model

	χ^2	df	GFI	NFI	IFI	TLI	CFI	RMR	RMSEA
Model fit	1155.032	310	0.803	0.887	0.915	0.903	0.914	0.049	0.092

GFI, goodness-of-fit-index; NFI, normed fit index; IFI, incremental fit index; TLI, Tucker–Lewis index; CFI, comparative fit index; RMR, root mean square residual; RMSEA, root mean square error of approximation
Model fit cutoff values: RMSEA <0.100, TLI ≥0.900, CFI ≥0.900

Hypothesis Verification

We analyzed path relationships among mobile phone dependence, self-efficacy for self-regulated learning, time management disposition, and academic procrastination (Table 5). Among all variables, mobile phone dependence had a significant effect on academic procrastination (β=0.437, P<0.001) and self-efficacy for self-regulated learning (β=0.146, P=0.017). Mobile phone dependence also had a significant negative effect on time management disposition (β=-0.200, P<0.001). Self-efficacy for self-regulated learning (β=0.355, P=0.001) had a significant positive effect on academic procrastination, while time management disposition (β=-0.322, P=0.005) had a significant negative effect on academic procrastination, indicating that a stronger disposition to manage time was associated with less delay in completing school work.

Table 5: Path relationships among mobile phone dependence, self-regulating efficacy, time management disposition, and academic procrastination

Hypotheses	Path		β	Standard error	Critical ratio	Assessment
H1	Mobile phone dependence	→ Academic procrastination	0.437	0.061	7.717*** (P<0.001)	Accept
H2	Mobile phone dependence	→ Self-efficacy for self-regulated learning	0.146	0.061	2.397* (P=0.017)	Accept
H3	Mobile phone dependence	→ Time management disposition	-0.200	0.059	-3.390*** (P<0.001)	Accept
H4	Self-efficacy for self-regulated learning	→ Academic procrastination	0.355	0.109	3.258*** (P<0.001)	Accept
H5	Time management disposition	→ Academic procrastination	-0.322	0.113	-2.834** (P=0.005)	Accept

***P<0.001, **P<0.01, *P<0.05; tested by path analysis

Mediating Effects

We examined the mediating effects of self-efficacy for self-regulated learning and time management disposition on the relationship between mobile phone dependence and academic procrastination using a bootstrapping method with a confidence interval of 95% (Table 6). The lower and upper limits of the confidence interval for

the indirect effects of mobile phone dependence on academic procrastination did not include zero, indicating a significant mediating effect. This finding suggests that mobile phone dependence affects academic procrastination not only directly but also indirectly by influencing self-efficacy for self-regulated learning and time management disposition.

Table 6: Direct, indirect, and total effects

Path of influence	Direct effect	Indirect effect	Total effect
Mobile phone dependence → self-efficacy for self-regulated learning	0.142*	-	0.142*
Mobile phone dependence → time management disposition	-0.201*	-	-0.201*
Mobile phone dependence → academic procrastination	0.492**	-0.013	0.479**
Self-efficacy for self-regulated learning → academic procrastination	0.378*	-	0.378*
Time management disposition → academic procrastination	-0.332	-	-0.332

**P<0.01, *P<0.05; tested by bootstrap method

Discussion

The present study investigated the relationships among mobile phone dependence, self-efficacy for self-regulated learning, time management disposition, and academic procrastination in college physical education majors, and examined the mediating roles of self-efficacy for self-regulated learning and time management disposition in the relationship between mobile phone dependence and academic procrastination.

In accordance with H1, mobile phone dependence exerted a positive impact on academic procrastination, meaning that greater dependence on mobile phones was associated with more severe procrastination. This is basically consistent with the results of previous studies (7,27). Mobile phone dependence is accompanied by higher levels of anxiety and other negative emotions (28). Academic procrastination also causes anxiety due to unfinished academic tasks, and college students who are addicted to mobile phones often resist spending more time on academic tasks. In daily life, students who rely on mobile phones tend to not only play mobile phone games in their spare time, watch videos, and surf the Internet, but also to use their mobile phones during

class time, which delays the completion of academic tasks (29). In light of this situation, some institutions stipulate that students' mobile phones will be collected in mobile phone storage bags during class to reduce dependence on these devices during class periods.

In accordance with our second hypothesis, we also observed that mobile phone dependence had a positive effect on self-efficacy for self-regulated learning, which is in contrast to previous findings (30). This discrepancy may be because some college students use mobile phones for online learning, e-book reading, and video teaching and learning, which may improve their self-efficacy for self-regulated learning to some extent (31).

As argued in H3, mobile phone dependence had a significant negative impact on time management disposition. That is, greater mobile phone dependence was associated with worse time management ability, which is consistent with the results of previous studies (7,29). Excessive dependence on mobile phones or excessive use of mobile phones can cause students to lose the ability to monitor and manage time, which may be reflected by an inability to plan or a failure to implement plans that have been made. This may

in turn lead to future difficulties conceptualizing time, planning tasks, and learning (32).

In accordance with H4, self-efficacy for self-regulated learning had a positive effect on academic procrastination, suggesting that the degree of academic procrastination decreases with increases in self-efficacy for self-regulated learning. However, this is in contrast to many previous reports that the degree of academic procrastination decreases with increases in self-efficacy for self-regulated learning (29,33). Academic procrastination is a behavioral manifestation of self-regulated learning failure and high self-efficacy for self-regulated learning. When students have enough confidence to manage effectively their studies, they have a positive attitude towards academic problems and seldom experience academic delays. Self-efficacy for self-regulated learning can predict the tendency to procrastinate (18,34). When individuals lack confidence in their ability to complete a task or learn, they are less invested in the task and are prone to evading and delaying the task. When individuals feel that they may not be well-qualified for the task (low sense of efficacy), they experienced higher levels of anxiety, making it easier to procrastinate (11,34). This is consistent with the results of our study.

As noted in H5, time management disposition had a negative impact on academic procrastination. That is, the degree of academic delay tended to increase with poorer time management disposition. This is consistent with the results of previous study (35). Good time values can guide students to develop correct study habits. Related studies have shown that effective time management skills can improve academic performance, while poor time management skills can lead to procrastination (13,14). Time management disposition could predict academic procrastination (36), while poor time management is an important cause of academic delay (37).

Finally, as argued in H6, self-efficacy for self-regulated learning and time management disposition exerted mediating effects on the relationship between mobile phone dependence and academic procrastination. That is, in addition to its direct effects, mobile phone dependence indirectly in-fluenced academic procrastination via self-efficacy for self-regulated learning and time management disposition. This is basically consistent with the results of previous studies (7,32). Individuals who rely on mobile phones may underestimate the value of time and be unable to ration their time due to the pleasure brought by these devices, which may, in turn, lead to academic delays (7).

Conclusion

The present findings highlight the direct and indirect effects of mobile phone dependence on academic performance among college students majoring in physical education. Therefore, to reduce academic procrastination, universities should aim to actively cultivate students' confidence in self-regulating learning ability, foster appropriate time values, strengthen time management skills, and promote the ability to adjust one's physical learning state.

Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of interest

The authors have no conflicts of interest to declare.

References

1. China Internet Network Information Center (2021). The 47th 'Statistical Report on the Development of China's Internet'. *China Internet Network Information Center*. http://www.gov.cn.
2. Ghasempour A, Mansour MA (2015). The role of depression and attachment styles in pre-

dicting students' addiction to cell phones. *Addict Health,* 7(3-4):192-7.

3. Masahiro T, Satoko E (2013). Multifactorial study of mobile phone dependence in medical students: Relationship to health-related lifestyle, Type A behavior, and depressive state. *Open J Prev Med,* 3(1):99-103.

4. Yen CF, Tang TC, Yen JY, et al (2009). Symptoms of problematic cellular phone use, functional impairment its association with depression among adolescents in Southern Taiwan. *J Adolesc,* 32(4):863-73.

5. Lee DJ (2002). College students' hand-phone usage culture survey. *University Culture Newspaper,* 8(1):253-72.

6. Huang JX, Liang YL, Chen BF, et al (2018). Studying on the status of mobile phone use and dependence in college management. *The Chinese Health Service Management,* 35(7):534-8.

7. Qing ZH, Wu CH, Cao JP (2018). The association between mobile phone dependence and academic procrastination in college students: The mediating role of time management disposition. *Journal of Hubei University of Education,* 35(8):73-6.

8. Krause K, Freund AM (2014). Delay or procrastination - A comparison of self-report and behavioral measures of procrastination and their impact on affective well-being. *Pers Individ Differ,* 63(9):75-80.

9. Klingsieck KB (2013). Procrastination: When good thing don't come to those who wait. *Eur Psychol,* 18, 24-34.

10. Steel P (2007). The nature of procrastination: A meta-analytic and theoretical review of quintessential self-regulatory failure. *Psychol Bull,* 133 (1):65-94.

11. Lay CH (1994). Trait procrastinayion and affective experiences: Describing past study behavior and its relation to agitation and dejection. *Motiv Emot,* 18:269-84.

12. Huang XT, Zhang ZJ (2001). On individual time management disposition. *Psychol Sci,* 24(5):516-8.

13. Macan TH, Shahani C, Dipboye RL, et al (1990). College students' time management: Correlations with academic performance and stress. *J Educ Psychol,* 82(4):760-8.

14. Lei JP, Lu Y, Pu M, et al (2014). Academic procrastination and time management disposition among adolescent. *Chinese Journal of School Health,* 35(1):64-6.

15. King ALS, Valen AA (2013). Nomophobia: Dependency on virtual environments or social phobia? *Comput Hum Behav,* 29(1):140-4.

16. Bandura A (1993). Perceived self-efficacy in cognitive development and functioning. *Educ Psychol,* 28(2):117-48.

17. Zimmerman BJ, Bandura A, Martine-Pons M (1992). Self-motivation for academic attainment: The role of self-efficacy beliefs and personal goal setting. *Am Educ Res J,* 29(3):663-76.

18. Klassen RM, Krawchuk LL, Rajani S (2008). Academic procrastination of undergraduates: Low self-efficacy to self-regulate predicts higher levels of procrastination. *Contemp Educ Psychol,* 33(4):915-31.

19. Rebetez MML, Rochat L, Barsics C, et al (2018). Procrastination as a self-regulation failure: The role of impulsivity and intrusive thoughts. *Psychol Rep,* 121(1):26-41.

20. Hair JF, Black WC, Babin BJ, et al (2006). *Multivariate data analysis.* (6th ed). Pearson Prentice Hall, Upper Saddle River, NJ. USA.

21. Leung L (2008). Linking psychological attributes to addiction and improper use of the mobile phone among adolescents in HongKong. *J Child Media,* 2(2):93-113.

22. Huang H, Niu LY, Zhou CY, et al (2014). Reliability and validity of mobile phone addiction index for Chinese college students. *Chinese Journal of Clinical Psychology,* 22(5):835-8.

23. Zimmerman BJ, Martine-Pons M (1986). Development of structure interview for assessing student use of self-regulated learning strategies. *Am Educ Res J,* 23(4):614-28.

24. Wang M, Qian MY (2015). The Chinese revision of self-regulated learning scale. *China J Health Psychol,* 23(10):1532-6.

25. Huang XT, Zhang ZJ (2001). The compiling of adolescence time management disposition inventory. *Acta Psychol Sin,* 33(4):338-43.

26. Solomon LJ, Rothblum ED (1984). Academic procrastination: Frequency and cognitive-behavioral correlates. *J Couns Psychol,* 31(4):504-10.

27. Ma J, Zhong YJ, Liang H, et al (2020). Study on interaction among mobile phone dependence, academic procrastination and learning burnout of nursing students in Guangzhou City. *Occup and Health,* 36(6):837-41.

28. Zhang C, Zhang L, Wang C (2017). Mediating effect of self-control on the relationship between mobile phone dependence and academic procrastination in college students. *China Journal of Health Psychology,* 25(1):145-8.

29. Ji JJ, Wu Y, Tian XH (2014). The relationship among mobile phone dependence, academic procrastination and subjective well-being of college students. *Journal of Hangzhou Normsl University (Natural Science Edition),* 13(5):482-7.

30. Liu LY (2016). Research on the relationship between college students' interpersonal relationship, self-regulated learning and mobile phone dependence. *Adv Psychol,* 6(7):836-45.

31. Chen CH, Su CY (2019). Using the bookroll e-book system to promote self-regulated learning, self-efficacy and academic achievement for university students. *J Educ Techno Soc,* 22(4):33-46.

32. Zhang J (2020). Research on the relationship between mobile phone dependence tendency, time management disposition and procrastination behavior of freshmen. *The Science Education Article Collects,* 497(6):158-9.

33. Klassen RM, Ang RP, Chong WH, et al (2009). A cross-cultural study of adolescent procrastination. *J Res Adolesc,* 19(4):799-811.

34. Clark JL, Hill OW (1994). Academic procrastination among African-American college students. *Psychol Rep,* 75(2):931-6.

35. Bi CZ, Peng XP (2005). Procrastination validity of time management disposition inventory. *Journal of Southwest China Normal University,* 31(6):10-3.

36. Shi Y (2009). *Relationship among university-freshman' academic procrastination, locus of control and time management.* Master Thesis, Northeast Normal University, JiLin, China.

37. Gan LM, Yu JY (2009). Status and reasons of academic procrastination of university students. *Journal of Sichuan College of Education,* 25(2):1-3.