Open Access Full Text Article

ORIGINAL RESEARCH

The Relationship Between Smartphone Addiction and the Interpersonal Competence of Chinese Private College Students: A Moderated Mediation Model

Yunjing Su[1,2], Zhonglian Yan[1], Wenqi Lin[1], Xuelin Liu[1]

[1]Faculty of Education, Northeast Normal University, Changchun, Jilin, People's Republic of China; [2]School of Child Welfare, Changchun Humanities and Sciences College, Changchun, Jilin, People's Republic of China

Correspondence: Yunjing Su, Faculty of Education, Northeast Normal University, No. 5268 Renmin Street, Changchun, Jilin Province, 130024, People's Republic of China, Email suyj774@nenu.edu.cn

Purpose: As an aspect of the lives of private college students in China, interpersonal competence (IC) is important to their socialization and employment competence. This study aimed to investigate the relationship between Chinese private college students' smartphone addiction (SPA) and IC, the mediating effect of negative emotions (NE), and the moderating effect of psychological resilience (PR).
Samples and Methods: Using simple random sampling, 5473 Chinese private college students (male 74.5%, urban household registration 51.6%, served as a student leader 31.5%) were recruited.
Results: The results showed that (1) SPA positively predicted IC; (2) NE partially mediated the relationship between SPA and IC; and (3) PR moderated the relationships between SPA and NE, NE and IC, SPA and IC.
Conclusion: These findings provide a new perspective to improve Chinese private college students' socialization and their employment competitiveness.
Keywords: Chinese private college students, interpersonal competence, negative emotions, psychological resilience, smartphone addiction

Introduction

Interpersonal competence is the embodiment of college students' socialization.[1] It is also an important factor influencing college students' employment ability.[2] IC is the ability that enables individuals to communicate willingly, participate in social events positively, perform appropriately and effectively.[3] Good IC promotes teenagers' social adaptation,[4] rate of employment and level of salary.[5] Poor IC can lead to interpersonal rejection, lower academic achievement and difficulties with psychological adaptation.[6,7] Improving IC is an important topic to let college students transform from students to social adults.

As China entered the Internet era, there were 10.65 billion mobile cellular subscriptions at the end of 2022. Individuals widely use smartphone for entertainment and interpersonal communication.[8] Smartphone Addiction is caused by prolonged use of smart phone. Research has shown that college students are heavily influenced by smartphone use.[9] Previous study conducted in Chinese context have found that Chinese college students revealed an addiction rate of 37.9%.[10] College students' smartphone addiction can positively forecast social fear,[11] and they tend to use their smartphone more frequently for communication. According to the China Statistical Yearbook of Education 2022, Chinese private colleges enroll a significant number of students, accounting for 25.27% of the total college student population. However, Chinese private colleges differ from foreign private colleges in the quality of students, teachers, and school management.[12] It is still unclear whether the relationship between SPA and the IC of foreign private college students is similar to that of Chinese private college students.[13] Furthermore, recent study mainly focused on the single-level relationship between SPA and psychological factors.[14]

653

Meanwhile, multi-level factors among SPA, psychological factors and personal abilities needs further research. Therefore, this study aimed to examine the influence of SPA, IC, NE, PR of Chinese private college students. This will not only enrich cross-cultural research but also improve Chinese private college students' socialization level.

Smartphone Addiction and Interpersonal Competence

SPA occurs when individuals are addicted to smartphone-based activities and exhibit strong and continuous engagement with their smartphones. It leads to obvious social and psychological damage.[15] Previous research has shown that using smartphones constantly in communication may have a more positive influence than a negative influence.[16] When using smartphones frequently and becoming addicted to them, there may be some positive influence on college students' IC.[17] The compensating effect hypothesis suggests that using smartphones to communicate can break the space-time boundary. It can expand the range of communication, increase the frequency of human interactions and make tighter connections.[18] Earlier studies have demonstrated that college students with extroversion are more likely to have SPA. They use smartphones to chat with others more frequently.[19] Compared with extroverted college students, introverted college students use smartphones to offset difficulties in face-to-face communication.[20,21] They employ smartphone communication in place of face-to-face interaction, utilize websites to forge relationships with friends and enhance their emotional experiences.[22] Furthermore, using smartphones for communication with others can also promote personal intimacy.[23]

Based on the related studies, we hypothesize as follows:

Hypothesis 1 (H1): Private college students' smartphone addiction is positively related to their interpersonal competence.

Negative Emotion as a Mediator

Prior research has shown that the relationship between SPA and IC may be influenced by many psychological effects.[24,25] Emotional regulation theory suggests that individuals have different levels of emotional regulation flexibility when facing their own emotions.[26,27] Individuals with poor emotion regulation ability have more negative emotions.[28] NE is a series of individuals' unpleasant emotional experiences, such as depression, anxiety and stress.[29] In the Internet era, college students' NE influence their social behaviors.[30] Therefore, negative emotion may mediate the relationship between SPA and IC.

On the one hand, SPA may lead to more NE. After a long time using a smartphone, individuals may easily experience emotional regulation difficulty. The higher the level of SPA is, the more NE.[31] Especially when college students use smartphones for extended periods at night, they tend to exhibit more negative emotions.[32] Individuals who are addicted to smartphones will experience more NE when they encounter sudden things or stress events.[33] Chen et al found that Chinese young people's SPA is positively related to NE, especially the SPA group, which experience more negative emotions than the possible SPA group and non-SPA group.[34]

On the other hand, NE influences IC. According to interpersonal competence theory, negative emotions can lead to the generation of additional negative energy, which in turn can adversely affect the outcomes of interpersonal communication, thereby hindering individuals from meeting their communication needs.[35] For college students experiencing puberty, their emotions are easily up and down. Therefore, their relationships tend to be strained, and social fear and social avoidance can occur. Research from Korea has found that the higher negative emotions were, the more negative the effect on IC.[36]

In addition, the second hypothesis is as follows:

Hypothesis 2 (H2): Negative emotion mediate the relationship between private college students' SPA and IC.

Psychological Resilience as a Moderator

Psychological resilience allows individuals to confront pressures and adversities by activating their cognitive processes to coordinate their abilities, processes, and outcomes in problem-solving, thereby achieving positive results. Therefore, individuals can protect their inner motives from negative event damage.[34,37] Development system theory suggests that different people have different levels of resilience, and their protection levels when confronting adversity are also different.[38]

Researchers have divided the resilience model into four sub-models.[39,40] The protect-improve sub-model indicates that if individuals have strong resilience, they will have fewer psychological problems when experiencing high stress or adversity.[41] Therefore, psychological resilience may moderate the relationship between SPA and resilience. Individuals with higher psychological resilience may have higher self-regulation ability.[42] A study on Korean college students found that while students with higher psychological resilience appear to have SPA, they also have stronger self-control ability. They can maintain a high level of IC and navigate complex interpersonal relationships flexibly.[43]

Second, psychological resilience may moderate the relationship between SPA and negative emotion. Although using smartphones frequently may cause SPA, higher-resilience students can use emotion to produce more positive emotions so that their negative emotions can decrease in a timely manner.[40] In contrast, students with lower resilience may feel more negative emotions.[44]

Finally, psychological resilience may also moderate the relationship between negative emotion and IC. When individuals with high resilience experience negative emotions, they will communicate less. The possible reason may be that individuals who have higher self-efficacy and interpersonal sensitivity can experience more positive emotions.[45,46] At the same time, they have less interpersonal conflict, so their IC is steadier.[47]

Accordingly, hypothesis 3 is proposed as follows:

Hypothesis 3 (H3): Psychological resilience moderates the relationships between smartphone addiction and negative emotions, negative emotions and interpersonal competence, and smartphone addiction and interpersonal competence.

Present Research

Based on the above hypothesis, this study will present the mechanisms of SPA, IC, NE and PR for Chinese private college students. The hypothesis model of this study is shown in Figure 1.
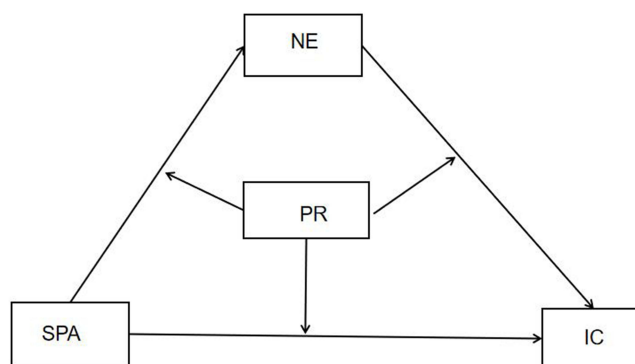

Figure 1 The hypothesis model.
Abbreviations: SPA, smart phone addiction; IC, interpersonal competence; NE, negative emotion; PR, Psychological Resilience.

Materials and Methods
Participants

The Ethics Committee of the first author's university approved the study. Private college students in Jilin Province were surveyed by an online questionnaire. A total of 5937 questionnaires were sent out and recycled. Due to the large number of questions, we delete the data within 300 seconds to improve the data quality. After excluding invalid questionnaires, we obtained 5473 valid data points, resulting in a return rate of 92.2%. The questions could be submitted only by completing all questions, and there were no missing values.

Among the questionnaires, 25.5% were completed by males, and 74.5% were completed by females. A total of 51.6% came from the city, and the other 48.4% came from the country. A total of 31.5% of private college students in this survey had experience being a student cadre, and the other 68.5% did not.

Measures

Interpersonal Competence Questionnaire

The interpersonal competence questionnaire was created by Buhrmester et al.[48] The Chinese version was translated by Wei,[49] and it is suitable for measuring college students. This questionnaire contains forty items divided into five dimensions: active communication, appropriate rejection, self-expression, conflict management and emotional support. Each dimension has eight items, for example, one item is "believe in new friends or opposite-sex friends, and can show them your sensitive side". All items in the scale were rated on a 5-point Likert scale (from 1=strongly disagree to 5=strongly agree); the higher the score is, the higher the IC ability. The Cronbach's alpha coefficient of the scale was 0.956, and the five dimensions' were 0.837, 0.857, 0.791, 0.837, 0.903. The CFA fit was good (x^2/df=26.311, RMSEA=0.068, CFI=0.839, TLI=0.827, IFI=0.839).

Smartphone Addiction Scales

The smartphone addiction scales were developed by Kwon et al, who created as a shortened version for easy measurement.[50] The Chinese version was translated by Xiang et al, and it is suitable for measuring adolescents.[51] This short version scale has only one dimension with ten items. One of the items is "can't endure without smartphone". In this study, a 6-point Likert scale, from ranging 1 (strongly disagree) to 6 (strongly agree) was used; the higher the score is, the higher the level of smartphone addiction. The Cronbach's alpha coefficient of this scale was 0.915, and the CFA fit was good (x^2/df=51.235, RMSEA=0.096, CFI=0.952, TLI=0.982, IFI=0.952).

Depression Anxiety Stress Scale

The depression anxiety stress scale was developed by Lovibond et al and a shortened version containing 21 items has been created.[52,53] The Chinese version was translated by Wen et al.[54] This scale has been proven to be suitable for measuring Chinese college students. The questionnaire has three dimensions: depression, anxiety and stress. One of the items is "I found that it's hard to do something of my own initiative". This scale uses a 4-point Likert scale, with each item ranging from 0 (never) to 3 (always). The higher the score is, the more negative the emotions are. The Cronbach's alpha coefficient of this scale was 0.963, and the three dimensions' were 0.931, 0.884, 0.908. It had good CFA fit (x^2/df=35.268, RMSEA=0.079, CFI=0.930, TLI=0.920, IFI=0.930).

Psychological Resilience Scale

The psychological resilience scale(CD-RISC) was created by Connor and Davidson in 2003 and has been shorted into the CD-RISC-10 by Campbell-Sills and Stein in 2007.[55,56] The Chinese version was translated by Ye et al.[57] The scale contains ten items in one dimension. One of the items is "When I met troubles, I try to think it positively." The Cronbach's alpha coefficient for this scale was 0.951, and it had good CFA fit (x^2/df=29.034, RMSEA=0.072, CFI=0.982, TLI=0.974, IFI=0.982).

Procedure

First, a moderated mediation model was constructed. Second, the sampled college were contacted and the purpose of this study were explained. After obtaining their permission and cooperation, the survey was carried out. Third, through college teachers, some college students were invited to complete the questionnaire. Before they completed the questionnaire, their consent were obtained. Then they completed all the items independently. It took approximately 10 minutes to complete the questionnaire. Then, the data was inputted and filtered out invalid data.

Data Analysis

SPSS 27.0 was used to perform the common method deviation test, descriptive statistical analysis, and correlation analysis. Amos 24.0 was used to perform tests and bootstrap analysis of structural equation models.[58] In this case, the bootstrap method was used to draw samples 5000 times and estimate 95% confidence intervals.

656

Psychology Research and Behavior Management 2024:17

Results

Common Methods Bias Test

The collected data were analyzed using Harman's one-way factorial analysis to test for common method bias. The maximum factorial variance explained was 21.95%, less than the critical value of 40%, so there was no serious common method bias.

Descriptive Statistics and Correlations

The descriptive statistics and correlation analysis of the twelve variables are shown in Table 1. The results showed that private college students' SPA, IC and NE had two-way correlations. Among them, SPA was significantly positively correlated with IC (r=0.110, p<0.01), SPA was significantly positively correlated with NE (r=0.529, p<0.01), and NE was significantly negatively correlated with IC (r=−0.039, p<0.01). Hypothesis 1 was supported.

Table 1 Descriptive Statistics and Correlations Among Variables

	1	2	3	4	5	6	7	8	9	10	11	12
1. SPA	–											
2. PR	−0.101**	–										
3. NE	0.529**	−0.206**	–									
4. Stress	0.505**	−0.161**	0.943**	–								
5. Depression	0.494**	−0.260**	0.935**	0.809**	–							
6. Anxiety	0.502**	−0.173**	0.954**	0.873**	0.837**	–						
7. IC	0.110**	0.434**	−0.039**	−0.015	−0.077**	−0.022	–					
8. IR	0.074**	0.386**	−0.059**	−0.049**	−0.087**	−0.034*	0.869**	–				
9. ADWO	0.105**	0.342**	−0.031*	−0.035*	−0.041**	−0.02	0.827**	0.668**	–			
10. DPI	0.162**	0.306**	0.006	0.014	−0.02	0.026	0.873**	0.736**	0.675**	–		
11. MIC	0.074**	0.408**	−0.038**	−0.011	−0.070**	−0.025	0.893**	0.691**	0.650**	0.719**	–	
12. PESAA	0.071**	0.434**	−0.045**	0.015	−0.107**	−0.037**	0.881**	0.680**	0.616**	0.682**	0.820**	–
M	2.768	2.362	0.809	1.914	1.713	1.800	3.085	24.337	24.471	22.728	25.099	26.761
SD	0.910	0.813	0.571	0.630	0.622	0.571	0.494	4.652	4.410	4.282	4.361	5.045

Notes: N = 5473, *p<0.05, **p<0.01.
Abbreviations: SPA, Smart Phone Addiction; PR, Psychological Resilience; NE, Negative Emotion; IC, Interpersonal Competence; IR, initiating relationship; ADWO, asserting displeasure with others; DPI, disclosing personal information; MIC, managing interpersonal conflict; PESAA, providing emotional support and advice.

The Mediating Role of Negative Emotions

AMOS 24.0 was used to test the mediating effect of negative emotion. After standardizing all variables, the samples were repeated 5000 times using the bootstrap method to estimate 95% confidence intervals. Testing this mediation model showed that the mediation model fit well: χ^2/df = 25.861, RMSEA = 0.067, CFI = 0.984, GFI = 0.976, AGFI = 0.954, NFI = 0.983, and IFI = 0.984.

Table 2 indicates that the direct effect of the SPA on IC was 0.171(95% CI (0.131,0.212), $p < 0.001$), indicating that SPA positively predicts IC. The indirect effect of the SPA, NE, IC was −0.064(95% CI (−0.084,-0.042), $p < 0.001$), with all confidence intervals not containing 0. The direct and indirect effects were significant, indicating that the NE partially mediates the relationship between SPA and IC. Hypothesis 2 was supported.

Table 2 Mediating Effect and 95% Confidence Interval Estimated by the Bootstrap Method

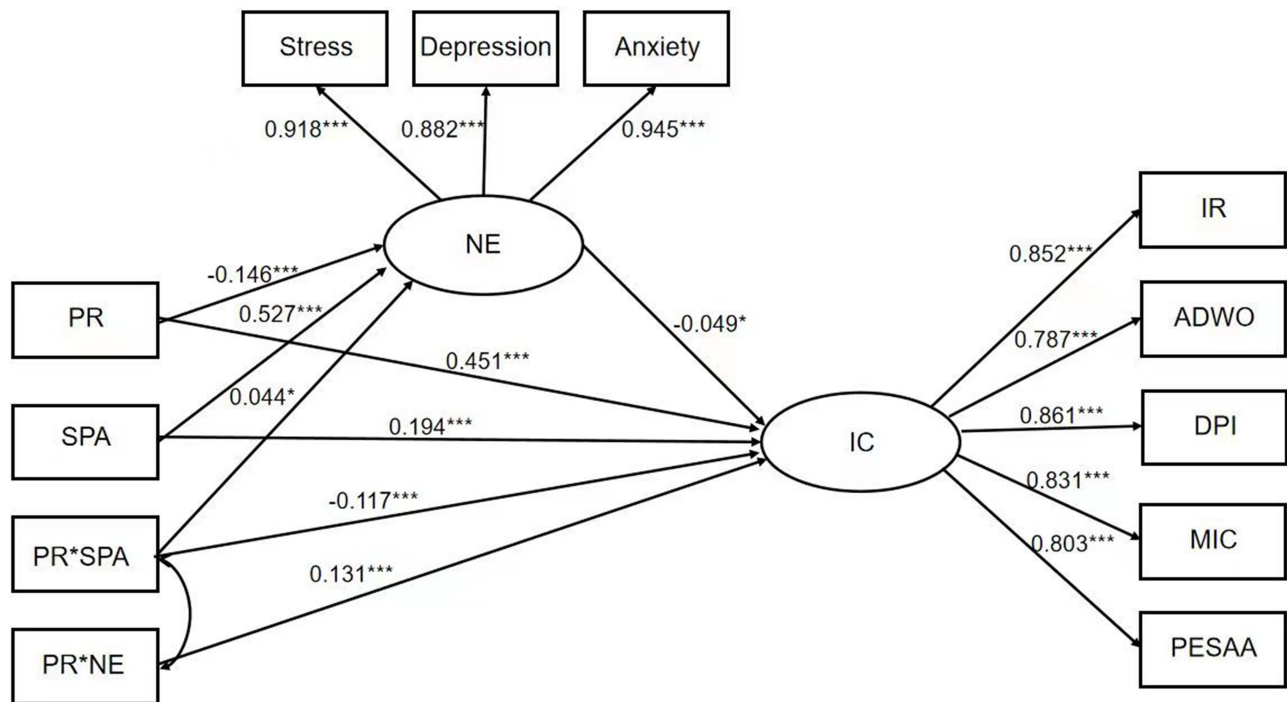|	Estimate	Percentile 95% CI		p	Percentage of Effect
		Lower	Upper		
Indirect effect	−0.064	−0.084	−0.042	***	59.81%
Direct effect	0.171	0.131	0.212	***	40.19%
Total effect	0.107	0.075	0.150	***	

Notes: N = 5473, ***p<0.001.

Figure 2 A moderated mediation model.
Notes:*p<0.05,*** p<0.001.
Abbreviations: IC, Interpersonal Competence; SPA, Smart Phone Addiction; NE, Negative Emotion; PR, Psychological Resilience; IR, initiating relationship; ADWO, asserting displeasure with others; DPI, disclosing personal information; MIC, managing interpersonal conflict; PESAA, providing emotional support and advice.

Test of the Moderated Mediation Model

The latent variable structural equation model shown in Figure 2 was conducted to further examine the research hypothesis. The model was tested based on previous studies using the same bootstrap method with 5000 replicate samples and estimated 95% confidence intervals. The results show that the moderated mediating model fits well (χ^2/df = 30.715, RMSEA = 0.074, CFI = 0.966, GFI = 0.955, AGFI = 0.927, NFI = 0.965, and IFI = 0.966). Based on Table 3, after adding psychological resilience to the model, the interaction term between SPA and PR significantly and negatively predicted NE (β=0.044, 95% CI[0.002, 0.086]), with confidence intervals not containing 0. This means that PR moderates the relationship between SPA and NE. Additionally, the interaction term between NE and PR significantly and positively predicted IC (β=0.131, 95% CI[0.073, 0.188]), with confidence intervals not containing 0. This means that PR moderated the relationship between NE and IC. The interaction term between SPA and PR significantly and negatively affected IC (β=−0.117,95% CI[−0.179, −0.055]), with confidence intervals not containing 0. This means PR moderated the relationship between SPA and IC.

Table 3 The Test of the Moderated Mediation Model

Path	Estimate	Bias-Corrected 95% CI	
		Lower	Upper
PR→NE	−0.146	−0.177	−0.115
SPA→NE	0.527	0.498	0.555
SPA×PR→NE	0.044	0.002	0.086
NE→IC	−0.049	−0.092	−0.009
SPA→IC	0.194	0.155	0.239
SPA×PR→IC	−0.117	−0.179	−0.055
NE×PR→IC	0.131	0.073	0.188
PR→IC	0.451	0.417	0.483

Abbreviations: PR, Psychological Resilience; NE, Negative Emotion; SPA, Smart Phone Addiction; IC, Interpersonal Competence.

To explore the mechanism underlying the relationship between SPA and IC, this study divided PR into high (M+1SD) and low (M-1SD) subgroups and plotted a simple slope plot. As shown in Figure 3, for private college students with high PR, SPA significantly and positively predict IC. However, for private college students with lower PR, SPA can significantly and positively predict, but it is slower. Based on Figure 4, for private college students with higher PR,
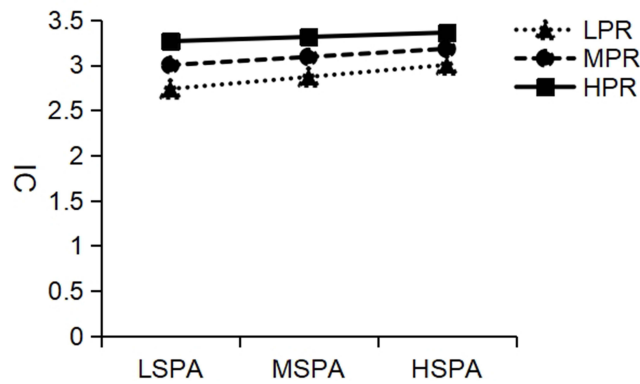

Figure 3 The moderation of PR to SPA and IC.
Abbreviations: IC, Interpersonal Competence; LSPA, Low Smart Phone Addiction; MSPA, Middle Smart Phone Addiction; HSPA, High Smart Phone Addiction; LPR, Low Psychological Resilience; MPR, Middle Psychological Resilience; HPR, High Psychological Resilience.
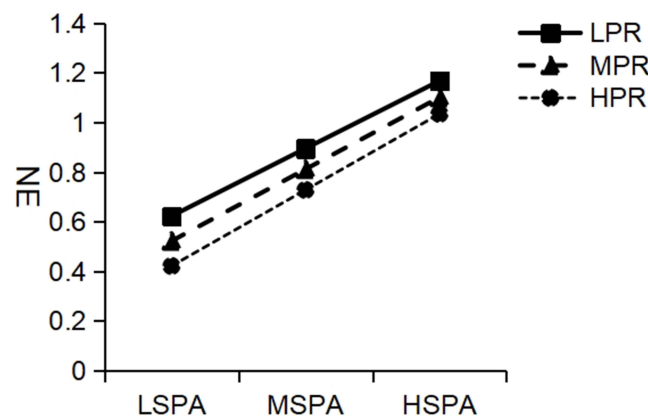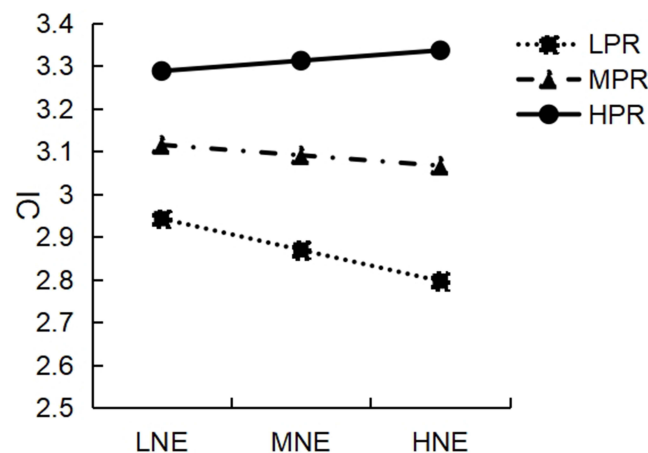

Figure 4 The moderation of PR to SPA and NE.
Abbreviations: NE, Negative Emotion; LSPA, Low Smart Phone Addiction; MSPA, Middle Smart Phone Addiction; HSPA, High Smart Phone Addiction; LPR, Low Psychological Resilience; MPR, Middle Psychological Resilience; HPR, High Psychological Resilience.

Figure 5 The moderation of PR to NE and IC.
Abbreviations: IC, Interpersonal Competence.; LNE, Low Negative Emotion; MNE, Middle Negative Emotion; HNE, High Negative Emotion; LPR, Low Psychological Resilience; MPR, Middle Psychological Resilience; HPR, High Psychological Resilience.

SPA can significantly and positively predict NE. However, for a lower levels of PR, the predicted affect is lower. Based on Figure 5, for private college students with lower PR, NE can significantly and positively predict IC, but for those with lower PR, NE can negatively predict IC. Above all, different levels of psychological resilience moderate the relationships among SPA, NE and IC.

Discussion

This research explored the relationship between SPA and IC. The mediating role of NE and the moderating role of PR were also tested. The results showed that SPA is positively correlated to IC. NE played a mediating role and PR played a moderating role. Chinese private college students were focused on and the hypotheses were supported.

SPA is Positively Related to IC

Research has shown that SPA can positively predict private college students' IC. When private college students spend a large amount of time using smartphone social apps, they are using websites to expand their relationships.[59] Communication online can also fill the time and space limitations of face-to-face communication to maintain social relationships.[60] Introverts use their phones to make more friends and be more socially active so that they can obtain more emotional support.[21,61] However, private college students who seldom use smartphones to communicate with others often neglect the maintenance of interpersonal relationships.[62] This is not conducive to their socialization. According to a survey of nursing college students, the dimension of the cyberspace relationship in mobile phone addiction is significantly positively correlated with interpersonal skills. This means that the more frequently the internet is used, the closer the interpersonal relationship built.[63] This research also supports weak connection theory. Smartphones promote interpersonal connections between people who are not familiar with each other and diversify the forms of interpersonal communication.[64]

The Mediating Role of Negative Emotion

This research showed that NE partially mediates the relationship between SPA and IC. On the one hand, this means that when private college students experience a high level of smartphone addiction, they experience more negative emotions.[65] Specifically, smartphone addiction may lead to depression and anxiety for adolescent.[66,67] Previous study showed that female SPA is significantly related to emotional stability.[68] This means that the higher the level of SPA is, the higher the negative emotions. SPA has a negative influence on individuals' emotions,[69] which means that overusing smartphones may influence psychological health.[70] On the other hand, if private college students use smartphones mainly for communication, negative emotions can be reduced to promote their social development.[33] In the Internet era, improving Chinese private college students' interpersonal communication frequency can decrease their loneliness and effectively alleviate their face-to-face social anxiety.[71] Meanwhile, this can also present a new way to communicate for college students who fear face-to-face communication.[72] For private college students, the desire to participate with others is a universal characteristic, so the more interpersonal communication activities individual conduct by smartphones, the less negative emotions they have.[73] Cognitive behavioral theory proposes that individuals' emotions affect their behaviors. When individuals' negative emotions are lower, they can interact with others more proactively.[74] Meanwhile, they can improving their interpersonal communication skills such as how to deal with the conflicts, how to refuse others suitably and accumulating interpersonal communication strategies.

Moderating Role of Psychological Resilience

Psychological resilience is a phenomenon that can lead to better adaptation or smooth development, even in the face of severe threats.[75] Psychological resilience is found to exert a moderating influence on the study of Chinese college students' psychology and behavior.[76] It may moderate the relationship among SPA, IC, NE. First, compared with low psychological resilience, private college students with higher psychological resilience who increase their SPA levels experience less influence of affect on IC.[77] Therefore, they can maintain relatively stable interpersonal skills. This may be because private college students with higher psychological resilience have better anti-interference ability, adjustment ability and adaptability. Therefore, they do not easily change their behavior patterns of interpersonal communication because of the negative

impact of mobile phone addiction.[78] Second, compared with those with low psychology resilience, private students with higher levels of psychological resilience may have lower NE. This is because psychological resilience acts as a buffer, providing intrinsic social support to individuals through their cognitive systems.[79] Based on the protective factor-protective model, individuals with high psychological resilience can use psychological resilience to buffer the negative effects of mobile phone addiction and reduce the level of negative emotions, thus alleviating the negative effects on individual mental health.[76,80] Third, compared with those with low mental resilience, individuals with high mental resilience still have better interpersonal skills scores when they have higher levels of negative emotions. The possible reason is that private college students with a high level of psychological resilience can relieve their negative emotions through their own adjustment mechanism to reduce interference with interpersonal skills.[81]

Limitations and Future Directions

There are some limitations in this research. First, in the era of websites, the influencing factors are important, but this research mainly focuses on the entire variables of individual's psychological mechanism. Subsequent studies should further explore the complex relationships among the dimensions of the variables such as negative emotion and interpersonal competence. Second, this research adopts cross-sectional research methods and cannot dynamically reflect changes in IC ability during the four years in college.

Conclusion

Although there are some limitations in this study, it yielded notable findings. Firstly, it is found that mobile phone addiction in the Internet era can positively predict the interpersonal skills of private college students. Secondly, negative emotion, as an internal psychological factor, partially mediates the relationship between mobile phone addiction and interpersonal skills. Thirdly, As college students are in an important period of emotional and psychological function development, different levels of psychological resilience regulate the relationships between mobile phone addiction and negative emotions, negative emotions and interpersonal skills, and mobile phone addiction and interpersonal skills. In addition, this study expands the empirical research on interpersonal skills in Chinese private university students and further clarifies the external network environment and internal individual psychology, emotions and other complex mechanisms of interaction with interpersonal skills for reference.

Ethics Approval and Consent to Participate

All methods were implemented in accordance with the Declaration of Helsinki. Before data collection, the participants were informed about the purpose of this study.

Funding

Disclosure

The authors report no conflicts of interest in this work.

References

1. Lin L, Yang YN, Yang Y, et al. The impact of interpersonal relationships on college students' self-injury behaviors: the mediating effect of negative affect. *Heilongjiang Res High Educ*. 2020;9:146–150.
2. Deming DJ. The growing importance of social skills in the labor market. *Q J Econ*. 2017;132(4):1593–1640. doi:10.1093/qje/qjx022
3. Sun Y, Tao WW, Ma ZS, Gao FQ, She RQ, Han L. The relationship between shyness and college students' dormitory belonging: the mediating role of interpersonal competence, paranoia and trust. *Chin J Spec Educ*. 2020;6:75–81.
4. Yang C, Brown BB. Factors involved in associations between Facebook use and college adjustment: social competence, perceived usefulness, and use patterns. *Comp Hum Behav*. 2015;46:245–253. doi:10.1016/j.chb.2015.01.015
5. Xiong RX, Y HE. Interpersonal skills and labor market performance. *World Econ Papers*. 2021;5:33–47.
6. Liu J, Chen X, Zhou Y, Li D, Fu R, Coplan RJ. Relations of shyness–sensitivity and unsociability with adjustment in middle childhood and early adolescence in suburban Chinese children. *Int J Behavioral Develop*. 2016;41(6):681–687. doi:10.1177/0165025416664195

7. Ni LY, Deng WG. An empirical study on mobile internet dependence, self-esteem and interpersonal skills of vocational college students. *Educ Res Mon*. 2017;4:89–95.

8. Lian L, You X, Huang J, et al. Who overuses smartphones? Roles of virtues and parenting style in smartphone addiction among Chinese college students. *Comp Hum Behav*. 2016;65:92–99. doi:10.1016/j.chb.2016.08.027

9. Liu H, Wang HL. Mobile phone addiction tendency and loneliness in college students. *Chin Mental Health J*. 2012;26(1):66–69.

10. Wang YQ, Zhang Y. Relationship of mobile phone addiction to perceived social support and subjective well-being in college students. *Chin Mental Health J*. 2015;29(11):868–873. doi:10.1002/bab.1331

11. Hou J, Zhu Y, Fang X. Mobile phone addiction and depression: multiple mediating effects of social anxiety and attentional bias to negative emotional information. *Acta Psychol Sin*. 2021;53(4):362–373. doi:10.3724/sp.j.1041.2021.00362

12. Zheng GQ. *Establishment, Management and Development of Modern Private Colleges in China*. Guangzhou: Guangdong People's Publishing House; 1995:54–68.

13. Venkatesh E, Jemal M, Samani A. Smart phone usage and addiction among dental students in Saudi Arabia: a cross sectional study. *Int J Adolesc Med Health*. 2019;31(1):20160133. doi:10.1515/ijamh-2016-0133

14. Lin L, Wang X, Li Q, Xia B, Chen P, Wang W. The influence of interpersonal sensitivity on smartphone addiction: a moderated mediation model. *Front Psychol*. 2021;12:670223. doi:10.3389/fpsyg.2021.670223

15. Wu XL, Luo J, BaiI JY, Hou ML, Li X. Effect of security on mobile addiction: mediating role of actual social avoidance. *Psychol Dev Educ*. 2019;35(5):589–596.

16. Peng HY, Qiu FS, Liu HT, Liang X, Wang JR, S.f X. The changing trends of mobile phone addiction among Chinese college students and macro-social influencing factors. *Chin J Appl Psychol*. 2022;28(6):523–529.

17. Tang WQ, Huang X, Wang EJ. Relation of mobile phone addiction tendency to interpersonal disturbance and loneliness in college students. *Chin Mental Health J*. 2018;32(12):1045–1049.

18. McKenna KY, Green AS, Gleason ME. Relationship formation on the internet: what's the big attraction? *J Soc Issues*. 2002;58(1):9–31. doi:10.1111/1540-4560.00246

19. Hong F-Y, Chiu S-I, Huang D-H. A model of the relationship between psychological characteristics, mobile phone addiction and use of mobile phones by Taiwanese University female students. *Comp Hum Behav*. 2012;28(6):2152–2159. doi:10.1016/j.chb.2012.06.020

20. Kuss DJ, Griffiths MD. Online social networking and addiction—a review of the psychological literature. *Int J Environ Res Public Health*. 2011;8(9):3528–3552. doi:10.3390/ijerph8093528

21. Morahan-Martin J, Schumacher P. Loneliness and social uses of the internet. *Comp Hum Behav*. 2003;19(6):659–671. doi:10.1016/s0747-5632(03)00040-2

22. Guo Y, Zheng Q, He X, Zhou T. Development of the mobile social networking interpersonal communication questionnaire for university students. *J Sichuan Norm Univ*. 2016;43(6):38–45.

23. Kahlow JA, Coker MC, Richards R. The multimodal nature of Snapchat in close relationships: toward a social presence-based theoretical framework. *Comp Hum Behav*. 2020;111:106409. doi:10.1016/j.chb.2020.106409

24. Zhang YL, Lu GZ, Jin TL, S. LI, Jiang HB, Liang L. The effect of college students' mobile phone addiction tendency on their interpersonal adaptability: the intermediary role of alexithymia. *Chin J Spec Educ*. 2018;2:83–88.

25. Giromini L, de Campora G, Brusadelli E, et al. Validity and reliability of the Interpersonal Competence Questionnaire: empirical Evidence from an Italian study. *J Psychopathol Behav Assess*. 2015;38(1):113–123. doi:10.1007/s10862-015-9499-5

26. Gross JJ. The emerging field of emotion regulation: an integrative review. *Rev General Psychol*. 1998;2(3):271–299. doi:10.1037/1089-2680.2.3.271

27. Aldao A, Nolen-Hoeksema S, Gross JJ. Emotion regulation flexibility. *Cognitive Ther Res*. 2015;39(3):263–278. doi:10.1007/s10608-014-9662-4

28. Wang XQ, Tan YF, Meng J, et al. The influence of emotion regulation flexibility on negative emotions: evidence from experience sampling. *Acta Psychol Sin*. 2023;55(2):192–209. doi:10.3724/SP.J.1041.2023.00192

29. Pan ZX, Li BB. Differences in negative emotion regulation efficacy of college students: the role of psychological quality and gender. *J Southwest Univ*. 2019;45(1):113–119.

30. Jia LP, Lu GH, Song YP, Li FH. The mechanism of negative emotional priming on response inhibition for trait anxiety individuals. *Stud Psychol Behav*. 2019;17(5):604–612.

31. Yue H, Huang H, Zhang YQ, Zhou CY. The relationships between negative emotions and latent classes of smartphone addiction. *PLoS One*. 2021;16(3):e0248555. doi:10.1371/journal.pone.0248555

32. Demirci K, Akgönül M, Akpinar A. Relationship of smartphone use severity with sleep quality, depression, and anxiety in university students. *J Behav Addict*. 2015;4(2):85–92. doi:10.1556/2006.4.2015.010

33. Hu Y, Huang H, Zhang YQ, Zhou CY. The mediating effect of negative emotions between mobile phone dependence and cognitive failure. *Chin J Clin Psychol*. 2017;25(6):1088–1092.

34. Chen QZ, Xu HQ, Zheng MN. The relationship between professional identity and self-directed learning motivation of preschool education students: analysis of sequence mediating effect of psychological resilience and learning burnout. *Xueqian Jiaoyu Yanjiu*. 2019;10:56–66.

35. Sullivan HS. *The Interpersonal Theory of Psychiatry*. Abington: Routledge; 2011.

36. Wonju Park. The effect of adult attachment on interpersonal competence ——the mediating effects of emotional clarity and negative emotions. *Korea J Couns Psychol*. 2016;17(6):21–41. doi:10.15703/kjc.17.6.201612.21

37. Lazarus RS. From psychological stress to the emotions: a history of changing outlooks. *Ann Rev Psychol*. 1993;44(1):1–22. doi:10.1146/annurev.ps.44.020193.000245

38. Xi JZ, Zuo ZH, Wu W. Approaches to research on resilience. *Adv Psychol Sci*. 2012;20(9):1426–1447. doi:10.3724/SP.J.1042.2012.01426

39. Luthar SS, Cicchetti D, Becker B. The construct of resilience: a critical evaluatioin and guidelines for future work. *Child Dev*. 2000;71(3):543–562. doi:10.1111/1467-8624.00164

40. Peng L, Li M, Zuo X, et al. Application of the Pennsylvania resilience training program on medical students. *Pers Individ Dif*. 2014;61(62):47–51. doi:10.1016/j.paid.2014.01.006

41. Xiao X, Guo L, Zhao YP, Chen FG. Cumulative ecological risk on bullying victimization in junior high school students: the moderating effects of resilience. *Psychol Dev Educ*. 2022;38(5):648–657.

42. Shen X. Is psychological resilience a protective factor between motivations and excessive smartphone use? *J Pac Rim Psychol*. 2020;14. doi:10.1017/prp.2020.10

43. Sok SR, Seong MH, Ryu MH. Differences of self-control, daily life stress, and communication skills between smartphone addiction risk group and general group in Korean nursing students. *Psychiatr Q*. 2018;90(1):1–9. doi:10.1007/s11126-018-9596-1

44. Yi F, Li X, Song X, et al. The underlying mechanisms of psychological resilience on emotional experience: attention-bias or emotion disengagement. *Front Psychol*. 2020;11. doi:10.3389/fpsyg.2020.01993

45. Aydogdu BN, Celik H, Eksi H. The predictive role of interpersonal sensitivity and emotional self-efficacy on psychological resilience among young adults. *Eurasian J Educ Res*. 2017;17(69):37–54. doi:10.14689/ejer.2017.69.3

46. Lyu MS, Xi JZ, Luo YR. Daily emotional characteristics in individuals with different resilience levels: Supplementary evidence from experience-sampling method. *Acta Psychol Sin*. 2017;49(7):928. doi:10.3724/SP.J.1041.2017.00928

47. Del Pérez-Fuentes M, Molero Jurado MD, Barragán Martín AB. Validation of the resilience scale for adolescents in high school in a Spanish Population. *Sustainability*. 2020;12(7):2973. doi:10.3390/su12072943

48. Buhrmester D, Furman W, Wittenberg MT, et al. Five domains of interpersonal competence in peer relationships. *J Pers Soc Psychol*. 1988;55 (6):991–1008. doi:10.1037/0022-3514.55.6.991

49. Wei Y. Evaluation of the reliability and validity of interpersonal skills questionnaire in college students. *School Health China*. 2005;26 (12):1046–1048.

50. Kwon M. The smartphone addiction scale: development and validation of a short version for adolescents. *PLoS One*. 2013;8(12):1. doi:10.1371/journal.pone.0083558

51. Xiang MQ, Wang ZR, Ma B. Reliability and validity of Chinese version of the smartphone addiction scale in adolescents *Chin J Clin Psychol*. 2019;27(5):959–964.

52. Lovibond SH, Lovibond PF. *Manual for the Depression Anxiety Stress Scales*. Sydney: Psychology Foundation; 1995.

53. Lovibond PF, Lovibond SH. The structure of negative emotional states: comparison of the Depression Anxiety Stress Scales (DASS) with the beck depression and anxiety inventories. *Behav Res Ther*. 1995;33(3):335–343. doi:10.1016/0005-7967(94)00075-u

54. Wen Y, D. W, H. L, et al. Psychometric properties of the Chinese short version of depression anxiety and stress scale in Chinese adults. *China J Health Psychol*. 2012;28:1436–1438.

55. Connor KM, Davidson JR. Development of a new resilience scale: the Connor-Davidson Resilience Scale (CD-RISC). *Depress Anxiety*. 2003;18 (2):76–82. doi:10.1002/da.10113.PMID:12964174

56. Campell-Sills L, Stein MB. Psychometric analysis and refinement of the Connor-Davidson Resilience Scale (CD-RISC): validation of a 10-item measure of resilience. *J Trauma Stress*. 2007;20(6):1019–1028. doi:10.1002/jts.20271.PMID:18157881

57. Ye ZJ, Qiu HZ, Li PF, et al. Validation and application of the Chinese version of the 10-item Connor-Davidson Resilience Scale (CD-RISC-10) among parents of children with cancer diagnosis'. *Eur J Oncol Nurs*. 2017;27:36–44. doi:10.1016/j.ejon.2017.01.004

58. Wen Z, Ye B. Different methods for testing moderated mediation models: competitors or backups? *Acta Psychol*. 2014;22:731–745.

59. Lee E-J, Kim YW. How social is Twitter use? Affiliative tendency and communication competence as predictors. *Comp Hum Behav*. 2014;39:296–305. doi:10.1016/j.chb.2014.07.034

60. Ramirez A, Broneck K. `Im me': instant messaging as Relational Maintenance and everyday communication. *J Soc Pers Relat*. 2009;26(2–3):291–314. doi:10.1177/0265407509106719

61. Mesch GS. Social relationships and internet use among adolescents in Israel. *Social Sci Q*. 2001;82(2):329–339. doi:10.1111/0038-4941.00026

62. Bardi CA, Brady MF. Why shy people use instant messaging: loneliness and other motives. *Comp Hum Behav*. 2010;26(6):1722–1726. doi:10.1016/j.chb.2010.06.021

63. Wu QH, G.b L. An analysis of the practical significance of college students' network interpersonal communication. *Stud Ideological Educ*. 2015;8:81–83.

64. Granovetter MS. The strength of weak ties. *Am J Sociol*. 1973;28(6):1360–1380. doi:10.1086/225469

65. Beranuy M, Oberst U, Carbonell X, et al. Problematic internet and mobile phone use and clinical symptoms in college students: the role of emotional intelligence. *Comp Hum Behav*. 2009;25(5):1182–1187. doi:10.1016/j.chb.2009.03.001

66. Wang P-W, Liu T-L, Ko C-H, et al. Association between problematic cellular phone use and suicide: the moderating effect of family function and depression. *Compr Psychiatry*. 2014;55(2):342–348. doi:10.1016/j.comppsych.2013.09.006

67. Yang X, Zhou Z, Liu Q, Fan C. Mobile phone addiction and adolescents' anxiety and depression: the moderating role of mindfulness. *J Child Fam Stud*. 2019;28(3):822–830.

68. Augner C, Hacker GW. Associations between problematic mobile phone use and psychological parameters in young adults. *Int J Public Health*. 2011;57(2):437–441. doi:10.1007/s00038-011-0234-z

69. De-Sola Gutiérrez J, Rodríguez de Fonseca F, Rubio G. Cell-phone addiction: a review. *Front Psychiatry*. 2016;7:175. doi:10.3389/fpsyt.2016.00175

70. Koh KB, Kim DK, Kim SY, et al. The relation between anger management style, mood and somatic symptoms in anxiety disorders and somatoform disorders. *Psychiatry Res*. 2008;160(3):372–379. doi:10.1016/j.psychres.2007.06.003

71. Zhang RW, Ke SJ, Lian R, Dan L. The association between interpersonal competence and meaning in life: roles of loneliness and grade. *Psychol Dev Educ*. 2020;36(5):576–583.

72. Deng LY, Fang XY, Wan JJ, Zhang JT, Xia CC. The relationship of psychological needs and need gratification with internet addiction among college students. *J Psychol Sci*. 2012;35(1):123–128.

73. Guo XX, Zhang Q. Internet use and physical and mental health of youth group: a mediating effect analysis based on social interaction and internet dependence. *Contemp Youth Res*. 2023;1:87–97.

74. Klinkosz W, Iskra J, Artymiak M. Interpersonal competences of students, their interpersonal relations, and emotional intelligence. *Curr Issue Pers Psychol*. 2021;9(2):125–134. doi:10.5114/cipp.2021.105733

75. Masten AS. Ordinary magic:resilience processes in development. *Am Psychologist*. 2001;56:227–238. doi:10.1037/0003-066X.56.3.227

76. Chen CP, Sun MZ, Wang DF, Sun M. School connectedness and current psychotic-like experiences in college students: resilience as a mediator and moderator. *Chin J Clin Psychol*. 2022;30(4):959–963.

77. Zheng LJ, Zheng G. Study on the impact of online interpersonal interaction on college students' psychological resilience——mediation of sense of meaning in life and regulating mechanism of network literacy. *Chin Youth Soc Sci.* 2023;42(03):61–73.

78. Huang L, Huang J, Chen Z, et al. Psychometric properties of the Chinese version of the brief interpersonal competence questionnaire for adolescents. *Children.* 2022;10(1):59. doi:10.3390/children10010059

79. Frydman MI. Social support, life events and psychiatric symptoms: a study of direct, conditional and interaction effects. *Soc Psychiatry.* 1981;16 (2):69–78. doi:10.1007/bf00582690

80. Fergus S, Zimmerman MA. Adolescent resilience: a framework for understanding healthy development in the face of risk. *Ann Rev Public Health.* 2005;26(1):399–419. doi:10.1146/annurev.publhealth.26.021304.144357

81. Zhang Q, Miao L, He L, et al. The relationship between self-concept and negative emotion: a moderated mediation model'. *Int J Environ Res Public Health.* 2022;19(16):10377. doi:10.3390/ijerph191610377