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DEPRESSION AND LONELINESS AS MEDIATORS BETWEEN SOCIAL SUPPORT AND MOBILE PHONE ADDICTION

Yu Peng[1*], Huili Mao[2*], Bin Zhang[1], Anqi Zhang[1], Yixin Zeng, [1] Chengwei Zeng[1] & Jieyang Li[1]

[1]Department of Applied Psychology, Hunan University of Chinese Medicine, Changsha, Hunan, China
[2]Mental Health Education Centre, Changsha University, Changsha, Hunan, China

[*]Yu Peng and Huili Mao contribute equally to the study. They should be regarded as joint first authors

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SUMMARY

Background: *Mobile phone addiction among adolescents has attracted a lot of attention in recent years. Previous researches revealed a significant relation between low social support and addiction. This study aim to investigated the association between social support and mobile phone addiction, and the mediating effects of depression and loneliness.*

Subjects and methods: *A total of 1,400 Chinese adolescents aged from 12 to 23 years old was recruited from two middle schools and a college in Hunan Province, China. Participates were selected using the cluster random sampling method. They completed the Mobile Phone Addiction Index, the Self-Rating Depression Scale, the UCLA Loneliness Scale, and the Adolescent Social Support Scale. The study analyzed the correlations between the study variables and the mediating role of depression and loneliness in the relationship between social support and mobile phone addiction.*

Results: *There were significant negative correlation between social support and depression, loneliness, and mobile phone addiction ($p<0.001$). Both depression and loneliness demonstrated significant positive correlation with mobile phone addiction ($p<0.001$). Structural equation modeling revealed that both depression and loneliness mediated the association between social support and mobile phone addiction ($p<0.001$). Depression and loneliness sequentially mediated the association between social support and mobile phone addiction ($p<0.001$). However, the relation between social support and mobile phone addiction was not significant ($p>0.05$).*

Conclusions: *Social support can lower levels of mobile phone addiction among adolescents by reducing depression and loneliness. This study sheds light on the underlying mechanisms between social support and mobile phone addiction, which has profound implications for the prevention and interventions of adolescent problematic mobile phone use.*

Key words: *social support; depression; loneliness; mobile phone addiction; adolescents*

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INTRODUCTION

With the development of new technologies and virtual communication, the functions of mobile phones have been becoming increasingly diverse, leading to easy social contact, on-line shopping, and ride-hailing. Within a few years, the mobile phone has been transformed from a communication tool to a necessity of life. However, the overuse of products and services based on new technologies may result in dependence, especially with respect to the use of mobile phones. Research in China has shown that excessive or maladaptive use of mobile phones can lead to phone addiction among young adults (Chen et al. 2016). Mobile phone addiction refers to a strong desire to engage in mobile phone use, leading to obvious physical and psychological maladjustment in individuals (Liu et al. 2018). Chóliz (2010) pointed that mobile phone is a technology, of which many attributes and characteristics makes it very attractive to adolescents. The occurrence rate of mobile phone addiction has been estimated to be 10-46% in college students and 10-30% in adolescents between the ages of 12-18, which indicate that mobile phone addiction presents high prevalence rate among young people (Jun 2016, Lian et al. 2016). It has been noted that the media landscape created by teenagers can, not only articulate their personal space, but also define their relationships with others, which therefore, encourages them to indulge in this form of communication (Oksman & Turtiainen 2004, Zhang et al. 2017). A previous study reported that 42.6% of Turkish college students had nomophobia (fear of being without a mobile phone); mainly being afraid they would have no way to communicate with others or acquire information (Yildirim et al. 2016). The first thing mobile phone users do in morning and the last thing they do at night is check their mobile phone (Lee et al. 2014). Research has documented that mobile phone addiction can have negative effects on adolescents, including physical illness, poor sleep quality, interpersonal problems, and lower learning efficiency and comprehension ability (Billieux et al. 2008).

Social Support and Mobile Phone Addiction

Studies have concluded that excessive use of mobile phones is caused by a number of factors, but lack of social support seems to be the main factor. Social support is defined as psychological and material resources provided by social network to benefit an individual's ability to cope with stress (Cohen 2004). A study by

Herrero et al. (2019), which used a cross-lagged model, found social support predicted later addiction to mobile phones at a one-year follow-up, with lower levels of social support predicting higher levels of mobile phone addiction. A study exploring the interweaving nature of on-line and off-line social networks similarly found that individuals with less social support in real life and the virtual world had higher levels of mobile phone addiction (Kwak & Kim 2017). The habitual use of a mobile phone is related to fear of missing messages and failing to maintain interpersonal communication. While mobile phones provide users with a wide variety of information and opportunities for social contact, frequent use of internet communication also increases the risk of mobile phone addiction (Salehan & Negahban 2013). Researchers have argued that social support offers positive resources, including activities that should relieve sensation seeking among college students and also reduce their tendency for excessively using their mobile phones (Zhao et al. 2017).

The Mediating Role of Depression

Depression is a significant indicator of the mental health of adolescents. In recent years, a growing body of research has investigated the prevalence and mechanisms underlying the development of depression. Herman-Stahl and Petersen (1996) confirmed that depressive symptoms among adolescents were intrinsically related to their level of social support. Depressive symptoms are strongly associated with low personal and environmental resources, and symptomatic adolescents report more negative relationships with their parents and peers than do asymptomatic adolescents. Research in China has also confirmed that social support has a negative association with depression, with students who have higher social support being less likely to have depression as well as anxiety (Li & Tao 2003).

According to the cognitive-behavioral model of pathological Internet use developed by Davis, a person with a tendency toward depression, social anxiety, and substance dependence will be enthralled by the Internet and have a tendency for developing pathological Internet use (Davis 2001). Mobile phone addiction is in the same category of behavioral addiction as Internet addiction and shares many features with it; therefore, depression should predict and contribute to mobile phone addiction (Billieux et al. 2015).

The Mediating Role of Loneliness

Loneliness refers to the negative emotion that a person experiences when longing for interpersonal contact and intimate relationships, while not being satisfied with one's situation. A recent study demonstrated that social support predicted loneliness, with social support having a significant negative relationship with loneliness. The study, which examined three types of social support (emotional, informational, and instrumental), further highlights prior findings that emotional support is the best predictor of loneliness (Hombrados-Mendieta et al. 2013). Blazer (2002) similarly defined loneliness as an unpleasant subjective state of sensing a discrepancy between the desired amount of emotional support and that which is available in the individual's environment.

Furthermore, as a pervasive emotional experience, loneliness is thought to have a profound influence on mobile phone addiction. Research in China has shown that loneliness is significantly and positively correlated with mobile phone addiction (Qing et al. 2017). Higher levels of loneliness make it easier for individuals to use networks pathologically to make up for the absence of emotional support in the real world. They make acquaintances and companions via the Internet, and thus, experience a sense of belonging (Cacioppo et al. 2010). The Internet can provide an ideal social situation for those who feel alone, because it makes it possible for them to interact with others; but this situation also makes it easy for them to become addicted to the Internet.

Sequential Mediating Effects of Depression and Loneliness

The Center for Epidemiological Studies Depression (CES-D) scale (Radloff 1977) includes the item "I felt lonely" as part of its diagnostic criteria of depressive symptomology because there is a close association between depression and loneliness. From a theoretical perspective, loneliness and depression are overlapping revolting and disgusting states. Self-disgust is defined as an unpleasant, self-conscious emotional schema which mirrors disgust directed towards the self or the behavior of an individual (Overton et al. 2008). Some research suggests that individuals with depressive symptoms have higher levels of self-disgust (Ypsilanti et al. 2019). Furthermore, individuals with higher levels of self-disgust tend to have higher social anxiety, which affects their communication with others and can lead to loneliness (Amir et al. 2010).

Main purpose and principal aims

In this study, we aim to test three research questions: (a) to test the mediating role of depression in the relationship between social support and mobile phone addiction; (b) to test the mediating role of loneliness in the relationship between social support and mobile phone addiction; and (c) to test the sequential model that depression and loneliness work together in pathway from social support to mobile phone addiction.

SUBJECTS AND METHODS

Participants

For this study, conducted in 2017, we selected 1,400 adolescent students from two middle schools and a college in Hunan Province, China, to participate in the survey. Participants were selected using the cluster random sampling method. This study was approved by

the Research Ethics Committee of the corresponding author's institution. The questionnaires were distributed to all students by well-trained researchers after informed consent were provided by the schools, teachers and participants. The parents of the children younger than 18 also signed informed consent. All participants were asked to participate voluntarily and were told they could withdraw at any time. Students completed anonymous, paper and pencil questionnaires in approximately 20 min during school classes. The authenticity, independence of all answers and confidentiality of the data collected were stressed to all participants. Everyone involved in the study were rewarded with a small gift (a notebook or pen). After careless or incomplete questionnaires were excluded, the sample included 1,120 participants. 671 (accounting for 59.9%) were female. The ages of the respondents ranged from 12 to 23 years with an average of 16.94 ±2.23; 211 junior high school students, 334 high school students, and 575 college students constituted the sample. In total, 67.85% of participants were from rural area.

Following the previous study (Mei et al. 2018), the prevalence of mobile phone addiction among Chinese adolescent students were 21.3%, so $\pi = 21.3\%$. A relative error of 15% was allowed in the present study. The absolute error can be calculated by $\delta = 0.15 \times \pi = 0.15 \times 21.3\%$. We adopt 95% confidence intervals; thus, $\mu_a = 1.96$. According to the following equation for the sample size, we calculated the minimum sample size:

$$n = \left(\frac{u_a^2 \pi(1-\pi)}{\delta^2}\right)$$

$n = [1.96^2 \times 21.3\% \times (1–21.3\%)]/(0.15 \times 21.3\%)^2 \approx 631$. Considering the invalid cases, the desired sample size should increase by 10%: $631 \times (1 + 10\%) \approx 695$. In this study, the effective sample size was 1120 suitable for the requirements.

Measures

Mobile Phone Addiction

Mobile phone addiction was measured by the Mobile Phone Addiction Index (Huang et al. 2014), which was developed based on Leung's (2008) Internet Addiction Scale. The scale consists of 17 items with four dimensions related to mobile phone addiction, including inability to control cravings, anxiety and feeling lost, withdrawal and escape, and productivity loss. The items were rated on a 5-point scale from 1 = totally disagree to 5 = totally agree, with higher scores indicating a higher level of mobile phone addiction. addiction. This scale has been used in Chinese teenagers and young adults with good reliability and validity (Lian et al. 2016; Liu et al. 2017). In our study, the index of CFA suggested a good fit: χ^2/df=6.22, NFI=0.92, TLI=0.92, GFI=0.93, RMSEA= 0.07. Cronbach's alpha in this study was 0.909.

Depression

Depressive symptoms were measured by the Self-Rating Depression Scale (Zung 1965), which consists of 20 items rated on a 4-point Likert scale. Scores of 53, 63, and 73, respectively, represent low to mild, moderate, and severe depression. Cronbach's alpha in this study was 0.909.

Loneliness

Loneliness was measured with the UCLA Loneliness Scale (Li & Zhong 2005), which contains 20 items that are rated on a 4-point Likert scale; the higher the score, the higher level of loneliness. The Cronbach's alpha for the scale was 0.811 in the present study.

Social Support

Social support was measured using the Adolescent Social Support Scale (ASSS) (Ye & Dai 2006). The scale consists of 17 items on three dimensions: subjective support, objective support, and support utilization. Subjective support refers to the emotional experience of being respected, supported and understood. Objective support relates to the actual help that individual obtains in society. Support utilization refers to the degree to which an individual makes use of his or her social resources. The items are rated on a 5-point scale, with higher scores indicating higher levels of social support. The ASSS has been used in Chinese teenagers and adults with good reliability and validity (Luo et al. 2014, Ye & Dai 2006). In our study, the index of CFA suggested a good fit: χ^2/df=7.09, NFI=0.93, TLI=0.93, GFI=0.92, RMSEA = 0.07. The Cronbach's alpha for the scale in this study was 0.935.

Data analyses

The analyses of descriptive statistics and correlation were conducted using the SPSS 18.0. The analysis of descriptive statistics was used to determine the demographic characteristics of the participants, and Pearson' s correlations were performed to determine the intercorrelations between the study variables.

Structural equation modeling (SEM) was used to analyze the relationships among social support, depression, loneliness, and mobile phone addiction. Amos 18.0 was used to build the SEM models with maximum likelihood estimation. The Bootstrapping method was used to test the mediation effects. We bootstrapped 5000 samples from the data and calculated the 95% bootstrap confidence intervals (95%CI).

RESULTS

Common Method Bias

Harman's one-factor method was applied to 4 questionnaires to test for the presence of common method bias. The chi-square statistic of Bartlett's test of sphericity was significant. Principal component analysis extracted 15 eigenvalues greater than 1, which together accounted for 58.73% of the total variance. The first factor explained 23.96% of the variance, which was less than the critical value of 40%, demonstrating that common method bias was not a problem in the current study.

Correlation Analysis

The results of the correlation analysis are shown in Table 1. All three dimensions of social support had significant negative correlations with depression, loneliness, and mobile phone addiction (p<0.001), and mobile phone addiction had significant positive correlations with depression and loneliness (p<0.001). Depression also had a significantly positive correlation with loneliness.

Multiple mediation model

Figure 1 shows the multiple mediation model, which had a good fit with the data: χ^2/df=4.05, NFI = 0.94, TLI = 0.92, GFI = 0.95, and RMSEA = 0.08. The sequential multiple mediation model accounted for a significant amount of variance in mobile phone addiction (R^2=0.29). As can be seen in Figure 1, all the path coefficients were significant, except for the path between the independent variable (social support) and the dependent variable (mobile phone addiction), which demonstrated that there existed complete mediation in the relation between social support and mobile phone addiction. Specifically, the analyses showed that depression mediated the association between social support and mobile phone addiction, and loneliness mediated the association between social support and mobile phone addiction. Furthermore, loneliness, via depression, mediated the association between social support and mobile phone addiction.

To further understand the results, Table 2 showed that the 95%CIs for the three path of the indirect effects and the total indirect effects excluded zero, which confirmed the multiple mediating effects of depression and loneliness on the association between social support and mobile phone addiction. The total indirect effect was -0.366, which accounted for 87.98% of the total direct and indirect effects, which was -0.416. The mediating effects consisted of three indirect effects: the sole mediation effect of depression (-0.172), which accounted for 41.35% of the total effects;

Table 1. Descriptive statistics and pearson's correlations of the research variables

	1	2	3	4	5	6	7	8	9	10	11
Subjective support	1										
Objective support	0.663	1									
Support utilization	0.675	0.661	1								
Social support	0.873*	0.877	0.894	1							
Depression	-0.529	-0.484	-0.425	-0.540	1						
Loneliness	-0.719	-0.511	-0.534	-0.661	0.673	1					
Lose of control	-0.314	-0.277	-0.290	-0.332	0.398	0.396	1				
Withdrow	-0.197	-0.213	-0.170	-0.218	0.321	0.298	0.515	1			
Avoidance	0.182	-0.142	-0.109	-0.161	0.266	0.315	0.452	0.539	1		
Inefficiency	-0.304	-0.276	-0.306	-0.335	0.410	0.398	0.681	0.475	0.409	1	
Mobile phone addiction	-0.318	-0.289	-0.280	-0.334	0.439	0.441	0.881	0.783	0.721	0.782	1
M±SD	54±0.97	3.89±0.88	3.49±0.96	3.65±0.83	1.96±0.41	2.15±0.48	2.75±0.83	2.13±0.96	2.95±1.11	23.0±0.94	2.56±0.75

p<0.001; *p<0.01

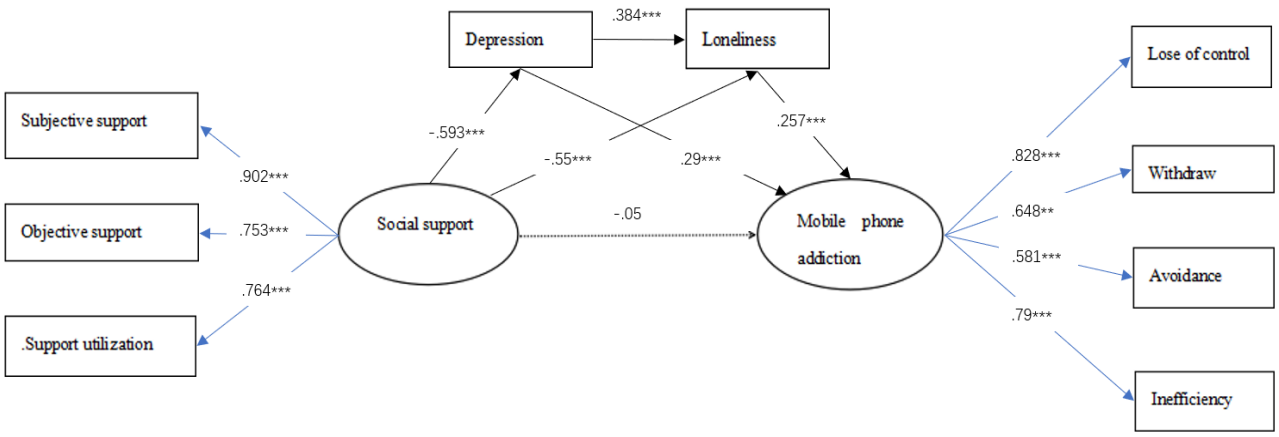

Figure 1. Multiple mediation model

Table 2. Multiple mediation analysis based on bootstrapping

Path	Standardized indirect effect value	95%CI	Mediating effect
social support → depression → mobile phone addiction	-0.172	(-0.229, -0.126)	41.35%
social support → loneliness → mobile phone addiction	-0.141	(-0.203, -0.085)	33.89%
social support → depression → loneliness → mobile phone addiction	-0.053	(-0.077, -0.031)	12.74%
Total indirect effects	-0.366	(-0.446, -0.292)	87.98%

the sole mediation effect of loneliness (-0.141), which accounted for 33.89% of the total effects; and the sequential mediation path of depression and loneliness (-0.053), which accounted for 12.74% of the total effects. Significance tests of the differences between the mediating effects indicated that there was no significant difference between the sole mediation effects of depression and loneliness (z=-0.645, p=0.519), but the mediating effects of each them were significantly higher than the sequential mediating effect of depression and loneliness (respectively, z=-3.622, z=-4.292, p<0.001).

Therefore, as mentioned above, H1, H2 and H3 were supported.

DISCUSSION

The current study formulated a multiple mediation model to clarify the mechanisms underlying the relation between social support and mobile phone addiction among Chinese adolescents. As expected, the results validated the mediating roles of depression and loneliness in the association between social support and mobile phone addiction. However, it is worth noting that the direct effect of social support on mobile phone addiction was only about 12% of the total effect, whereas the indirect effect of social support on mobile phone addiction through depression and loneliness accounted for 87.98% of the variance. The results showed that the relation between social support and mobile phone addiction was completely mediated by depression and loneliness not only parallelly but also sequentially. Social support is more likely to affect adolescents' mobile phone addiction indirectly through depression and loneliness than affect mobile phone addiction directly.

The Mediating Role of Depression

SEM was used in this study to test the hypotheses discussed above and the SEM results confirmed those hypotheses. Firstly, the association between social support and mobile phone addiction was mediated by depression. The less social support adolescents received, the higher their level of depression was, and the higher the likelihood they were addicted to mobile phones was. A meta-analysis revealed that less social support is a risk factor for adolescent depression (Rueger et al. 2016). According to the main-effects model of social support, social support is conducive to maintaining good emotional experiences, and thus, better mental health (Lin et al. 2004). According to Erikson's stage theory of psychosocial development, adolescents are troubled and confused because of the new social demands and conflicts, and when they do not receive sufficient social support they are unable to obtain good advice and a sense of security to help them solve their current problems, which leads to negative emotions, such as frustration and depression. Individuals with depression may use the internet to express their feelings and attend more to the cyberspace existence provided by a mobile phone. Proper use of mobile phones could alleviate the depression of teenagers. For example, adolescents could use mobile phones to avoid depression by building on-line network relationships to expand their sources of social support, which could help them deal with depression. However, this increases the likelihood of mobile phone addiction (Li et al. 2017).

The Mediating Role of Loneliness

Second, our study found the association of social support with mobile phone addiction was mediated by loneliness. Individuals with low levels of social support had higher levels of loneliness, which might increase the possibility of mobile phone addiction. To be specific, the following reasons may explain the mediating effect of loneliness on the relationship between social support and mobile phone addiction. Adolescence is considered to be the loneliest stage of one's life, especially when the interpersonal relationships between adolescents and their family members are poor, and the adolescents do not get sufficient social support, which makes their experience of loneliness much stronger. A study of loneliness and mobile phone addiction among foreign students in China found more than half of the participants exhibited a variety of symptoms of adal support, thereby producing a strong susceptibility to mobile phone addiction (Jiandiction and experienced severe loneliness when they were unable to obtain adequate socig et al. 2018). Another study found low social support brought about more loneliness, making it difficult for people to establish good relationships in

the real world. Mobile phones are convenient and popular tools for contacting others (Mattila et al. 2010), and individuals with low social support will use them to build virtual networks of relationships to obtain social support on the Internet to reduce their feeling of loneliness. Engelberg and Sjoberg (2004) suggested that lonely individuals were more likely to develop mobile phone addiction when they lacked good social skills.

The Sequential Mediation Model

Moreover, consistent with our hypotheses, the results of the present study support the sequential mediation model, which indicates that social support exerts an indirect effect on mobile phone addiction through depression and loneliness sequentially. Individuals experience more depression when they receive lower levels of social support. Depression is a state of negative emotion and a serious emotional disorder, which not only has an adverse effect on an individual's studies, work, and life, but also affects one's social communication, including intimate and safe interpersonal relationships. Loneliness, as an experience in which individuals feel lonely, isolated, and lack a sense of intimacy, can occur when there are qualitative and quantitative deficits in interpersonal relationships (Wang et al. 2000). Therefore, individuals may use mobile phones to escape loneliness and depression and obtain social support; thus, increasing their tendency to use mobile phones, which can lead to mobile phone addiction.

To sum up, although social support had an indirect effect on mobile phone addiction through the three pathways already described, there were differences in the indirect effects of these three pathways. The results showed that the mediating effects of depression and loneliness on the association between social support and mobile phone addiction were not significantly different, but the separate mediating effects of depression and loneliness were greater than the combined sequential mediation effect of depression and loneliness on the association between social support and mobile phone addiction. Comparing the indirect effects of different paths is helpful for determining the status of different mediating variables and finding the most effective mediating factors. Furthermore, doing so helps to shed light on ways to design effective prevention programs for reducing mobile phone addiction among youth based on the most effective factors.

Limitations

This study was only able to present preliminary conclusions about the association between social support and mobile phone addiction, and certain limitations of this study need to be acknowledged. First, the cross-sectional design of the study makes it impossible to make causal inferences about the observed relationships; therefore, future research should use longitudinal and experimental designs. In addition, there is research indicating that loneliness and depression influence one another reciprocally (Qualter et al. 2010). Therefore, the effect of loneliness on depression will be a topic worthy of future studies. Furthermore, the validity of the self-report data may be restricted by a social desirability bias. Multi-rater assessments should be used in future research to overcome these limitations, such as collecting information not just from students themselves, but from their parents, teachers, and peers.

Implications

In spite of these limitations, this research has important implications for preventing and intervening mobile phone addiction among adolescents. Given the penetration of mobile phones in teenagers' daily lives and the adverse outcomes related to mobile phone addiction, it is vital to clarify how the lack of social support may lead to adolescent mobile phone addiction. This study indicates that depression and loneliness are two of the explanatory factors for how social support can associate with mobile phone addiction of adolescents. First, our findings remind us that increasing the level of social support of adolescents can be viewed as a crucial target to preventing adolescents mobile phone addiction. Practitioners should help adolescents acquire the knowledge of how to turn to social support. Second, it is particularly significant to lower the occurrence of depression among adolescence, and thus preventing adolescents from maladaptive outcomes such as mobile phone addiction. Third, it is essential to help adolescents decrease their tendency to feel the sense of loneliness, which might also consequently reduce the risk of addicting to mobile phones.

CONCLUSIONS

The present research examined 1120 Chinese adolescent students and revealed that social support, depression, loneliness, and mobile phone addiction were significant correlated with each other. A significant negative correlation existed between social support and depression, loneliness, and mobile phone addiction, as well as significant positive correlation between depression, loneliness and mobile phone addiction. The present study also found that depression and loneliness solely and sequentially mediated the association between social support and mobile phone addiction. These findings shed light on the underlying mechanisms between social support and mobile phone addiction, which has profound implications for the preventions and interventions of adolescent problematic mobile phone use. This study suggest that more support and care should be given to adolescents to prevent them developing depression and loneliness, thus decrease the risk of mobile phone addiction. Schools and teachers should pay attention to adolescents' mobile phone addiction, ensure timely detection and make

early interventions to prevent and alleviate effectively the symptoms of mobile phone addiction. Teachers should organize more group counseling, help adolescents to learn interpersonal communication skills and obtain more peer support. Furthermore, parents play an important role in adolescents' development, they should adopt a moderate and equal education style to strengthen adolescents' perception of social support and to alleviate their feelings of depression and loneliness, thus reduce the possibility of mobile phone addiction.

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Contribution of individual authors:

Yu Peng & Huili Mao were the principal investigator and performed the statistical analysis and initial data, and wrote the first draft.

Bin Zhang supervised and guided the study and contributed to the project design.

Anqi Zhang, Yixin Zeng, Chengwei Zeng & Jieyang Li was involved in data collecting and processing.

All authors had full access to all study data and take responsibility for the integrity of the data and the accuracy of data analysis.

References

1. *Amir N, N ajmi S, Bomyea J & Burns M: Disgust and anger in social anxiety. International Journal of Cognitive Therapy 2010; 3:3-10*
2. *Billieux J, Maurage P, Lopez-Fernandez O, Kuss DJ & Griffiths MD: Can disordered mobile phone use be considered a behavioral addiction? An update on current evidence and a comprehensive model for future research. Current Addiction Reports 2015; 2:156-162*
3. *Billieux J, Van der Linden M, & Rochat L: The role of impulsivity in actual and problematic use of the mobile phone. Applied Cognitive Psychology: The Official Journal of the Society for Applied Research in Memory and Cognition 2008; 22:1195-1210*
4. *Blazer DG: Self-efficacy and depression in late life: a primary prevention proposal. Aging & Mental Health 2002; 6:315-324*
5. *Cacioppo JT, Hawkley LC & Thisted RA: Perceived social isolation makes me sad: 5-year cross-lagged analyses of loneliness and depressive symptomatology in the Chicago Health, Aging, and Social Relations Study. Psychology and Aging 2010; 25:453*
6. *Chen L, Yan Z, Tang W, Yang F, Xie X, & He J: Mobile phone addiction levels and negative emotions among Chinese young adults: The mediating role of interpersonal problems. Computers in Human Behavior 2016; 55:856-866*
7. *Choliz M: Mobile phone addiction: A point of issue. Addiction 2010; 105:373-374*
8. *Cohen S: Social relationships and health. American psychologist 2004; 59:676*
9. *Davis RA: A cognitive-behavioral model of pathological Internet use. Computers in Human Behavior 2001; 17:187-195*
10. *Engelberg E, & Sjöberg L: Internet use, social skills, and adjustment. Cyberpsychology & Behavior 2004; 7:41-47*
11. *Herman-Stahl M, & Petersen AC: The protective role of coping and social resources for depressive symptoms among young adolescents. Journal of Youth and Adolescence 1996; 25: 733-753*
12. *Herrero J, Urueña A, Torres A, & Hidalgo A: Socially connected but still isolated: Smartphone addiction decreases social support over time. Social Science Computer Review 2019; 37: 73-88*
13. *Hombrados-Mendieta I, García-Martín MA, & Gómez-Jacinto L: The relationship between social support, loneliness, and subjective well-being in a Spanish sample from a multidimensional perspective. Social Indicators Research 2013; 114:1013-1034*
14. *Huang H, Niu LY, Zhou CY, & Wu HM: Reliability and validity of mobile phone addiction index for Chinese college students. Chinese Journal of Clinical Psychology 2014; 22:835-838*
15. *Jiang Q, Li Y & Shypenka V: Loneliness, individualism, and smartphone addiction among international students in China. Cyberpsychology, Behavior, and Social Networking 2018; 21:711-718*
16. *Jun S: The reciprocal longitudinal relationships between mobile phone addiction and depressive symptoms among Korean adolescents. Computers in Human Behavior 2016; 58: 179–186*
17. *Kwak D, & Kim W: Understanding the process of social network evolution: Online-offline integrated analysis of social tie formation. PloS one 2017; 12:e0177729*
18. *Lee YK, Chang CT, Lin Y, & Cheng ZH: The dark side of smartphone usage: Psychological traits, compulsive behavior and technostress. Computers in Human Behavior 2014; 31:373-383*
19. *Leung L: Linking psychological attributes to addiction and improper use of the mobile phone among adolescents in Hong Kong. Journal of children and media 2008; 2:93-113*
20. *Li CQ, & Zhong GK: Application of several mental health rating scales commonly used in psychiatry. Chinese Journal of Tissue Engineering Research 2005; 12:34-35*
21. *Li M, Jiang X & Ren Y: Mediator effects of positive emotions on social support and depression among adolescents suffering from mobile phone addiction. Psychiatr Danub 2017; 29:207-213*
22. *Li W & Tao S: The relationship between perceived stress, depression and anxiety in college students: The effect of social support. Chinese Journal of Clinical Psychology 2003; 11:108-110*
23. *Lian L, You X, Huang J & Yang R: Who overuses smartphones? Roles of virtues and parenting style in*

smartphone addiction among Chinese college students. Computers in Human Behavior 2016; 65:92–99

24. *Lin CR, Li YX, Hu Y: A Research on the Moderation Effects of Social Support. Journal of Psychological Science 2004; 27: 1116-1119*
25. *Liu QQ, Zhou ZK, Yang XJ, Kong FC, Niu GF, & Fan CY: Mobile phone addiction and sleep quality among Chinese adolescents: a moderated mediation model. Computers in Human Behavior 2017; 72: 108-114*
26. *Liu QQ, Zhang DJ, Yang XJ, Zhang CY, Fan CY, & Zhou ZK: Perceived stress and mobile phone addiction in Chinese adolescents: a moderated mediation model. Computers in Human Behavior 2018; 87:247-253*
27. *Luo J, Cui HQ, Dai XY, & Zhao SY: The relationship between the social support of upper secondary school students and their coping styles: The mediating effect of self-efficacy. Chinese Journal of Special Education 2014; 10:92-96*
28. *Mattila AK, Luutonen S, Ylinen M, Salokangas RK & Joukamaa M: Alexithymia, human relationships, and mobile phone use. The Journal of Nervous and Mental Disease 2010; 198:722-727*
29. *Mei S, Xu G, Gao T, Ren H & Li J: The relationship between college students' alexithymia and mobile phone addiction: Testing mediation and moderation effects. BMC psychiatry 2018 18:1-7*
30. *Qing ZH, Wu CH, Cao JP, Liu XC & Qiu XY: Inter-parental conflict and mobile phone addiction: A chain mediating model. Chinese Journal of Clinical Psychology 2017; 25:1083-1087*
31. *Oksman V & Turtiainen J: Mobile communication as a social stage: Meanings of mobile communication in everyday life among teenagers in Finland. New media & Society 2004; 6:319-339*
32. *Qualter P, Brown SL, Munn P & Rotenberg KJ: Childhood loneliness as a predictor of adolescent depressive symptoms: an 8-year longitudinal study. European Child & Adolescent Psychiatry 2010; 19:493-501*
33. *Overton PG, Markland FE, Taggart HS, Bagshaw GL & Simpson J: Self-disgust mediates the relationship between dysfunctional cognitions and depressive symptomatology. Emotion 2008; 8:379*
34. *Radloff LS: The CES-D scale: A self-report depression scale for research in the general population. Applied Psychological Measurement 1977; 1:385-401*
35. *Rueger SY, Malecki CK, Pyun Y, Aycock C & Coyle S: A meta-analytic review of the association between perceived social support and depression in childhood and adolescence. Psychological Bulletin 2016; 142:1017*
36. *Salehan M & Negahban A: Social networking on smartphones: When mobile phones become addictive. Computers in Human Behavior 2013; 29:2632-2639*
37. *Wang XL, Ren GY, Zhao XM: Relationship of loneliness and depressive emotion. Chinese Mental Health Journal 2000; 14:367-369*
38. *Ye YM & Dai XY: Development of Social Support Scale for University Students. Chinese Journal of Clinical Psychology 2006*
39. *Yildirim C, Sumuer E, Adnan M & Yildirim S: A growing fear: Prevalence of nomophobia among Turkish college students. Information Development 2016; 32:1322-1331*
40. *Ypsilanti A, Lazuras L, Powell P & Overton P: Self-disgust as a potential mechanism explaining the association between loneliness and depression. Journal of Affective Disorders 2019; 243:108-115*
41. *Zhang B, Yuan MQ, Li ZH, Wang YF, Chen Y & Qiu ZY: Relationship between personality and mobile phone addiction: A mediating role of affect. Chinese Journal of Clinical Psychology 2017; 25:1098-1100*
42. *Zhao JF, Zhang SC, Du YL, Jiang YZ, Liu Y: Association among sensation seeking, perceived social support and mobile phone addiction of university students. Chinese Journal of School Health 2017; 38:876-878*
43. *Zung WW: A self-rating depression scale. Archives of General Psychiatry. 1965; 12:63-70*

Correspondence:
Bin Zhang, MD, PhD
Department of Applied Psychology, Hunan University of Chinese Medicine
Changsha, Hunan, 410208, P.R. China
E-mail: zb303@163.com