

MEDIATOR EFFECTS OF POSITIVE EMOTIONS ON SOCIAL SUPPORT AND DEPRESSION AMONG ADOLESCENTS SUFFERING FROM MOBILE PHONE ADDICTION

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SUMMARY

Background: Depression is a common mental disorder that is widely seen among adolescents suffering from mobile phone addiction. While it is well known that both positive emotions in adolescents' emotions and social support can have a positive impact by helping individuals to maintain a positive attitude, the correlation between positive emotions, social support, and depression among these adolescents remains to be investigated. This study examined the mediator effects of positive emotions on the relationship between social support and depression among adolescents suffering from mobile phone addiction.

Subjects and methods: For this study, conducted in 2016, we selected 1,346 adolescent students from three middle schools (ranging from Junior Grade One to Senior Grade Three) in Hunan Province of China, to participate in the survey. Participants were selected using the stratified cluster random sampling method, and all participants remained anonymous throughout the study. Each participant completed the Self-made General Situation Questionnaire, the Social Support Rating Scale, the Positive and Negative Affect Schedule, the Center for Epidemiological Studies Depression Scale, and the Mobile Phone Addiction Tendency Scale.

Results: There was significant positive correlation between positive emotions and social support. Both positive emotions and social support demonstrated significant negative correlation with depression. Positive emotions had partial mediator effects on the relationship between social support and depression ($P < 0.01$).

Conclusions: Both social support and positive emotions can lower levels of depression among adolescents suffering from mobile phone addiction. Social support contributes to positive emotion mobile phone addiction, thereby reducing their levels of depression. These findings suggest that more support and care should be given to this particular adolescent population.

Key words: depression - mobile phone addiction – adolescents - mood disorder - positive emotions - social support

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INTRODUCTION

In recent years, products based on advances in electronic technology have played an increasingly important role in daily life. Consequently, excessive use of technology-based goods and services can lead to dependence on, or even addiction to, these products, such as Internet Addiction and Mobile Phone Addiction (Chen et al. 2016). Mobile phone addiction is a relatively new phenomenon of human behavior that can impact users who have developed an extreme reliance on their phones for any reason. Users who have developed mobile phone addiction exhibit behavior characterized by damaged psychological and social functions (Billieux et al. 2015). Because of the convenience and capabilities of mobile phones, an increasing number of adolescents have been found to suffer mobile phone addiction. Mobile phone addiction brings many noticeably negative effects to adolescents, such as inducing physiological diseases, affecting rest or sleep, impacting interpersonal relationships, reducing classroom learning efficiency, increasing economic pressure, and reducing comprehension ability. Mobile phone addiction can also lead to personality disorders (Montag et al. 2015, Zhou 2013). In a study that compared college students who

have mobile phone addiction to non-addicted students, Chen et al. (2017) detected reduction in the functional connectivity of the bilateral hippocampus and bilateral frontal lobe among the addicted students. The changes of these structures were correlated with emotional problems, impulsive behavior, low self-esteem, and the quality of sleep.

Although mobile phone addiction is not the same as Internet addiction, they both belong to the general category of addiction to high-tech electronic products, and both are a type of behavioral addiction. Previous related studies have demonstrated significant positive correlations between Internet addiction and anxiety, depression, loneliness, and negative emotions. In addition, research has shown that normal use of the communication functions of the Internet can help alleviate symptoms of depression, whereas use of other non-communication functions of the Internet will aggravate symptoms of depression among individuals (Su et al. 2011, Meekyung 2014). Because of the similarities between these two types of addiction, studies of mobile phone addiction can learn from research on Internet addiction.

There are many factors influencing mobile phone addiction in adolescents. Studies have revealed that lack

of social support may be one of the main factors leading to behavioral addiction among adolescent students (Ruan et al. 2011). The interpersonal relationship theory model argues that when faced with stressful life events, individuals who receive lower levels of social support are more prone to depression. Social support refers to various functions provided by a social network to improve an individual's mental health or reduce his/her psychological problems (Theodoritsi et al. 2016). Some researchers have proposed that social support can reduce adolescent depression, and good social support can be effective in alleviating psychological pressure, promoting mental health, enhancing social adaptability, and improving the quality of life (Vyavaharkar et al. 2011). Nonetheless, the moderate degree of correlation between social support and depression shows that they are not directly correlated. A thorough understanding of the mediator effects of social support on depression is conducive to the development of strategies for targeted intervention and prevention of depression.

As the diagnostic criteria of depression indicate, depression is closely related to the loss of positive emotions. Positive emotions are the emotions marked by happy feelings (Luo 2012, Truță & Cazan 2015). Research has shown that positive emotions can restore the state of various types of cardiovascular activity previously reduced by negative emotions, bringing cardiovascular activity back to the normal baseline (Chiew 2014). At the same time, studies have suggested that fewer negative emotions are observed in participants with higher levels of positive emotions, and the lack of positive emotions can be followed by the appearance of depression (MacKenzie 2015). According to the "shock absorber" model of social support, social support can improve an individual's positive emotions and absorb the negative effects of stress, highlighting the role of positive emotions in the process of dealing with depression. Individuals who have good social support have higher levels of positive emotions and lower levels of negative emotions (Lyubomirsky & Layous 2013).

To sum up, social support and positive emotions have positive effects on depression, and there is certain correlation between social support and positive emotions. Past research has explored the proposal that social support can affect depression either directly or through the mediator role of other variables. Accordingly, this study was designed to examine the mediator effects of positive emotions on the relationship between social support and depression among adolescents suffering mobile phone addiction.

SUBJECTS AND METHODS

Participants

For this study, conducted in 2016, we selected 1,346 adolescent students from three middle schools (ranging from Junior Grade One to Senior Grade Three) in

Hunan Province, China, to participate in the survey. Participants were selected using the stratified cluster random sampling method. All participants were between thirteen and seventeen years old. To protect the privacy of these students, they remained anonymous throughout the study. For the survey, 1,302 valid copies of the questionnaire were returned, with a recovery rate of 96.7%, from 690 boys (accounting for 53.0%) and 612 girls (accounting for 47.0%). Of the total group, 645 participants were only children (accounting for 49.5%), and 657 participants had siblings (accounting for 50.5%). Further, 674 students came from cities and towns (accounting for 51.8%), while 628 students were from rural areas (accounting for 48.2%). Consent for the survey was obtained from the students, their parents, their teachers, and their school leaders. Participation by all subjects was voluntary.

Instruments

The questionnaire gathered general information about the research subjects (including gender, age, origin place, and whether the one-child) and four rating scales were employed.

- *Social Support Rating Scale (SSRS)*: The Social Support Rating Scale, designed by Xiao (1994), had 10 items, including three dimensions: objective support (3 items), subjective support (4 items), and the degree of use of social support (3 items). SSRS generally uses a multi-axis evaluation method for rating. Because of the scale's reasonable design, it is easy to understand the items correctly. The test-retest reliability was 0.92, with the consistency of each item between 0.89 and 0.94. Undoubtedly, this scale was well able to reflect participants' levels of social support because of its good reliability and validity. In this measurement, the Cronbach alpha coefficient was 0.72.
- *Positive and Negative Affect Schedule (PANAS)*: The Positive and Negative Affect Schedule (PANAS), developed by Watson et al. (1988), contained two parts, including a total of 20 questions about positive emotions and negative emotions. Positive emotions were covered by Questions 1, 3, 5, 9, 10, 12, 14, 16, 17 and 19, while negative emotions were covered by Questions 2, 4, 6, 7, 8, 11, 13, 15, 18 and 20. The five-point Likert scale was used for scoring, ranging from "almost no" =1 to "very much" =5. The homogeneity degree of the two subscales was 0.85 for positive emotions and 0.83 for negative emotions. The test-retest reliability of the two subscales was 0.47 for positive emotions and 0.47 for negative emotions. In terms of structure validity, the varimax rotation method was utilized to determine the load from each factor. The load of each item on positive emotions was between 0.76 and 0.40, with an average load of 0.65. The load of each item on negative emotions was between 0.75 and 0.45, with an average load of 0.62.

- **Center for Epidemiological Studies Depression Scale (CES-D):** The Center for Epidemiological Studies Depression Scale (CES-D) was designed especially for evaluating the frequency of current symptoms of depression (Devins & Orme 1985). The scale focused on depressive emotions, aiming to compare the investigation results of different time sections. The scale, a type of self-reported measuring tool, was composed of 20 items in total, with each item scored at four levels: “occasionally or no,” “sometimes,” “often or half the time,” and “most of the time, or continuously.” The total possible score ranged from 0 to 60 points. A higher score indicated higher frequency of the appearance of depression. The Cronbach α coefficient and Spearman-Brown coefficient were both above 0.90. The test-retest reliability within 12 months was 0.32; the test-retest reliability within 4 weeks was 0.67. In this measurement, the α coefficient was 0.87.
- **Mobile Phone Addiction Tendency Scale (MPATS):** The MPATS scale, developed by Xiong et al. (2012), included a total of 16 items in four dimensions: withdrawal, salience, social comfort, and mood alteration. “Withdrawal” referred to the physiological or psychological negative reaction when the user was not participating in mobile phone related activities. “Salience” implied that the use of mobile phones dominated the center of thinking and activities. “Social comfort” referred to the role played by mobile phone use in interpersonal communication. “Mood alteration” referred to a change of mood caused by the use of mobile phones. A scale from 1-5 was used for scoring, ranging from “extremely not accordant” to “very accordant.” Mobile phone addiction tendency and each dimension were scored based on the average score of their items. A higher score indicated a higher tendency toward mobile phone addiction. Respondents who scored above three points were defined as mobile phone addicts. In this study, the Cronbach α coefficient of each dimension was 0.79-0.86; the Cronbach α coefficient of the entire scale was 0.90; the correlation between each item and the scale was 0.66-0.85.

For this study, each of the classes underwent group testing. Prior to distributing the test, we provided uniform instructions accompanied by an introductory expla-

nation of the purpose of the test, along with clarification of all corresponding requirements. The participants were required to fill in the questionnaire independently within 30 minutes and return it on the spot.

Statistical Analysis

All data were processed and analyzed statistically using SPSS 17.0. An independent sample test was employed to provide a comparison between the two groups of quantitative data. Pearson correlation analysis was utilized for correlating the analyses of the two variables, and a chi-square test was used to compare the two groups of qualitative data. A path analysis model was used to analyze the mediator effects of positive emotions on social support and depression among adolescents suffering mobile phone addiction, with $P < 0.05$ to indicate that the difference was statistically significant.

RESULTS

Detection Rate and Related Factors of Mobile Phone Addiction

In our study, users who scored three points or above on the Mobile Phone Addiction Tendency Scale were defined as mobile phone addicts. Among the 1,302 subjects, a total of 354 participants were found to be mobile phone addicts, with a detection rate of 27.1% (see Table 1). Gender, origin place, and status as an only child were not associated statistically with the detection rate of mobile phone addiction ($P > 0.05$).

Comparison of Scores in Social Support, Positive Emotions, and Depression between Mobile Phone Addicts and Non-addicts

Comparison of scores for social support, positive emotions, and depression between mobile phone addicts and non-addicts showed that mobile phone addicts scored lower in social support and positive emotions than non-addicts, but scored higher in depression than non-addicts, with differences that are all statistically significant ($P < 0.05$). Social support was manifested mainly as subjective and objective support (see Table 2).

Table 1. Comparison of the detection rate of mobile phone addiction between different subjects

		Total No.	No. of mobile phone addicts	Detection rate (%)	χ^2	<i>P</i>
Gender	M	690	174	25.22	2.882	0.090
	F	612	180	29.41		
Origin place	Urban	674	189	28.04	0.513	0.474
	Rural	628	165	26.27		
Whether an only child	Y	645	188	29.15	2.476	0.116
	N	657	166	25.27		
Total		1302	354	27.19		

Table 2. Comparison of scores in social support, positive emotions and depression between mobile phone addicts and non-addicts

Group	Total score in social support	Subjective support	Objective support	Degree of using support	Positive emotions	Score in depression
Addicts	35.75±4.98	14.79±3.25	13.59±2.22	7.37±1.32	2.69±0.66	15.03±3.18
Non-addicts	37.71±4.18	15.71±3.02	14.52±2.38	7.48±1.12	3.02±0.71	13.04±3.58
<i>t</i>	7.133	4.789	6.387	1.500	7.604	9.191
<i>P</i>	<0.001	<0.001	<0.001	0.134	<0.001	<0.001

Table 3. Correlation analysis of scores in social support, positive emotions and depression

Subjects		Social support	Positive emotions	Depression
	Social support	1		
Mobile phone addicts	Positive emotions	0.306*	1	
	Depression	-0.303*	-0.359*	1

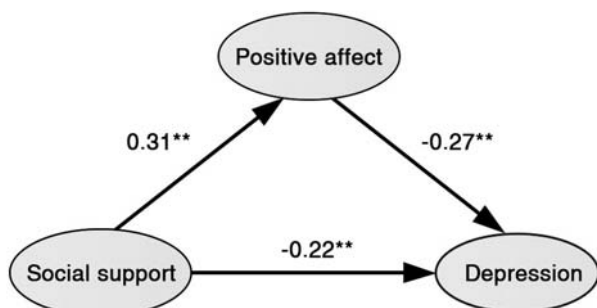
* represents $P < 0.05$

Correlation Analysis of Scores in Social Support, Positive emotions and Depression

Pearson correlation analysis was used to analyze scores for social support, positive emotions, and depression. The total score in social support of adolescents suffering mobile phone addiction was correlated positively with positive emotions ($r=0.306$), while the score of these subjects in depression was correlated positively with social support and positive emotions ($r=0.303$; $r=0.359$) (see Table 3).

Analysis of Mediator Effect

The model of was constructed based on the theory of Introduction. In this model, social support is an exogenous observation variable; depression is an endogenous variable; positive emotions are the mediator variable. The path analysis demonstrated that among adolescents suffering mobile phone addiction, positive emotions play a partial mediator role in the relationship between social support and depression. In other words, social support can reduce depression directly, and social support can mitigate depression through positive emotions (see Figure 1).



Note: * represents $P < 0.05$; ** represents $P < 0.01$.

Figure 1. Mediator effects of positive emotions on social support and depression among adolescents suffering mobile phone addiction

DISCUSSION

Among the 1,302 adolescent students surveyed in this study, a total of 354 students were determined to be mobile phone addicts, with a detection rate of mobile phone addiction of 27.1%. The detection rate of mobile phone addiction in this study was lower than the rate achieved by Ge et al. (2014). Their research surveyed a total of 1,200 adolescents in school, used the same measuring tools, and obtained a detection rate of 30.78% for mobile phone addiction. There are several possible reasons for the difference between their results and ours. First, the inconsistency might be associated with the sample size, since our survey involved a larger number of participants. Second, the subjects of our study included both Junior Middle School students and Senior High School students. However, the subjects of the research by Ge et al. (2014) were secondary and higher vocational students. Whether there is homogeneity between these two samples needs further research. Third, the tool used by Ge et al. (2014) to measure mobile phone addiction was different from the one used in our study. Their mobile phone addiction index scale was developed by Leung (2008), and included a total of 17 items in four dimensions: out of control, withdrawal, escape, and inefficiency. It is common knowledge that inconsistency between different research results can be related to the nature of the sample, sample size, test tools, test environment, and other factors. Future research should employ standardized research processes and comparable research tools to acquire rigorous research results (Du et al. 2014).

Our study also found a significant difference in the detection rate of mobile phone addiction between students of liberal arts as compared to students of science. Specifically, the detection rate was significantly higher among students of liberal arts than among students of science, but there was no significant difference in gender, origin place, or status as an only-child. This result reveals a certain universality and a certain particularity of mobile phone addiction in adolescents.

Students of liberal arts and students of science deal with different learning content and different distributions of learning time. Research (Yan & Chen 2016) shows that liberal arts students have relatively lower motivation and less interest in learning than science students when they are not studying. Therefore, students of liberal arts are likely to be more obsessed with mobile phones, resulting in a higher level of mobile phone addiction.

Regarding the total scores of mobile phone addicts in the area of social support, as well as the two dimensions of objective and subjective support, this study found that their scores in positive emotions were significantly lower than non-addicts. There was no significant difference between addicts and non-addicts in the degree of use of social support, but addicts' scores in depression were significantly higher than non-addicts. From the results of previous Internet addiction-related research, it can be shown that Internet addicts have a lower level of mental health, with their depression levels significantly higher than non-Internet addicts, which is consistent with the findings of this study (Gou et al. 2013).

According to the interpersonal relationship theory model, when individuals are faced with stressful life events, if the support gained from social networks is not sufficient to help them weather these events, they are more likely to seek virtual psychological support through other means, such as the Internet or mobile phones. Therefore, it can be demonstrated that there is a negative correlation between social support and mobile phone addiction (Du et al. 2014). Meanwhile, when individuals, either mobile phone addicts or non-addicts, need to get more social support, they will have a higher incentive to look for a source of support, as well as more enthusiasm for maximizing their use of existing social support. Thus, in the dimension of the degree of using support, there might not be a significant difference between mobile phone addicts and non-addicts.

Our finding that the scores of mobile phone addicts for positive emotions were significantly lower than the scores of non-addicts was closely related to the addicts' perceptions of their social support. Following the analysis above, in the face of stressful life events, if individuals perceive that they have more social support, they have more positive emotional experiences. Positive emotions can play a buffer role in negative stressful life events, thus reducing the probability of dependence on mobile phones and the onset of depression (Wei et al. 2014).

The results of this study demonstrated that the total score for social support of adolescents suffering mobile phone addiction was positively correlated with positive emotions, and their scores in depression were negatively correlated with social support and positive emotions. The relationship between depression and positive emotions is self-evident: the development of depression is often accompanied by reduction in positive emotions (Carl et al. 2014). A substantial number of studies have

revealed a negative correlation between depression and positive emotions. With the rise of positive psychology, more and more attention has been paid to the effects of positive emotions on depression (Carl et al. 2013, Greening et al. 2014).

Positive emotions are an important resource for regulating internal psychological activities. With the help of this resource, individuals are more likely to believe that they are loved, that others are concerned about them, and they are being respected. Furthermore, social support is an important source of positive emotions (Yang et al. 2016). For example, intervention studies of female drug addicts have demonstrated that after a period of receiving ongoing social support (including objective support and subjective support), female drug addicts have been found to experience significantly higher positive emotions. This perception leads to a more firm belief to abandon drug habits, which in turn results in more successful detoxification. The consistency between the results of those studies and our current research further illustrates the positive correlation between social support and positive emotions.

The path analysis of this study found that among adolescents suffering mobile phone addiction, positive emotions play a partial mediator role in the relationship between social support and depression. In other words, social support directly affects depression, and social support also affects depression by means of positive emotions. Ge et al. (2014) explored the proposed idea that social support has a direct effect on mobile phone addiction in adolescents. They found that adolescents suffering from lack of social support had a higher probability of seeking social support from phones or the virtual network space, and the psychological satisfaction they received from the virtual space could, in turn, enhance their dependence on mobile phones. Yang et al. (2016) conducted a meta-analysis of 92 articles from CNKI, VIP, Wanfang Data, and other foreign databases. These reports treated Chinese college students as the research subjects, and viewed social support and depression as the main research variables. Their findings suggested the existence of a stable, moderate negative correlation between Chinese college students' social support and depression. Furthermore, it has been noticed that there is a high level of similarity in the types and amounts of social support provided by individuals living in the same culture. Therefore, it is likely that the relationship between social support and depression among adolescent mobile phone addicts is basically the same across China (Taylor et al. 2004). In addition, the research by Yang et al. (2016) demonstrated that there is a moderate correlation between social support and depression, which leaves open the possibility of other mediators or regulating variables.

Combining the theoretical analysis above and statistical results of the research data, it is possible to conclude that social support can affect depression either directly or through positive emotions. Research has shown that perceived social support has a closer corre-

lation with depression than actual social support. In other words, an individual's perception of an event and emotional experience is more significant than the event itself for predicting the level of depression (Uchino 2009). When an individual perceives events in a manner that results in positive emotions, his/her self-esteem, self-efficacy, positive psychological capital, and other positive psychological resources increase. To a certain extent, the increase of psychological resources will lead the individual toward perceiving more social support, and will suffer the effects of negative emotions as well, thus reducing levels of depression.

This study has opened new avenues of thought for the research of social support and depression among adolescents suffering mobile phone addiction, supported by our demonstrated results and research progress. However, inevitably, there are some shortcomings because of limited research resources. For instance, the sample has certain limitations; the choice of subjects was limited by the interpersonal relationship of the researcher. Therefore, the findings remain to be proven further in later research involving broader regions and cultures.

CONCLUSIONS

Applying the perspective of positive psychology, this study examined the mediator effects of positive emotions on the relationship between social support and depression among adolescents suffering mobile phone addiction. We found significant positive correlation between positive emotions and social support. Both positive emotions and social support demonstrated significant negative correlation with depression. Positive emotions had partial mediator effects on the relationship between social support and depression. These findings are of great significance because they provide a scientific basis for prevention of depression among adolescents suffering mobile phone addiction and for the improvement of their mental health. These findings suggest that more support and care should be given to adolescents suffering from mobile phone addiction. These adolescents should participate in more positive emotional experiences by seeking support from family, school, and society to ease their mobile phone addiction and related depression.

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Contribution of individual authors:

All the authors have taken part in the preparation of the study, data collection and analysis, writing of the manuscript and approval of the final version.

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