

Original Research Article

Correlation between mobile phone addiction tendency and its related risk factor among Chinese college students: A cross-sectional study

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Abstract

Purpose: Mobile phone addiction prevalence is a global concern which has attracted great attention. It is now considered that excessive mobile phone usage is associated with potentially harmful and/or disturbing behaviors. The present study was aimed at exploring the current situation and related factors of mobile phone addiction tendency and providing a scientific suggestion for its prevention among college students.

Methods: A cross-sectional study was applied for stratified cluster random sampling among college students, including five survey tools: the basic information questionnaire, UCLA loneliness scale, college students' interpersonal comprehensive diagnostic scale, the Pittsburgh sleep quality index scale and mobile phone addiction tendency scale (MPATS). SPSS v 17.0 statistical tool was applied to analyze data from the survey.

Results: A total of 760 questionnaires were administered of which 735 questionnaires were retrieved and the valid questionnaires were 730. Classification of mobile phone addiction tendency has statistical significance with grade. Also, classification of loneliness has statistical significance with major, grade and home address. Furthermore, classification of interpersonal relationship has statistical significance with romance status and grade. Additionally, classification of MPATS was positively correlated with classification of UCLA loneliness scale, Pittsburgh sleep quality index scale and interpersonal relationship scale. Interpersonal relationship, sleep quality, and loneliness were linearly correlated with mobile phone addiction tendency.

Conclusion: Grade, interpersonal relationship, sleep quality and loneliness were positively correlated with mobile phone addiction tendency, which are the associated risk factors. Therefore, concerns and interventions are required to decrease the risk factor for the sake of college students' health.

Keywords: College students, Interpersonal relationship, Loneliness, Mobile phone addiction tendency, Sleep quality

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INTRODUCTION

Mobile phone addiction prevalence has attracted great attention around the world; for instance, in China, South Korea, Turkey, Japan, Spain, India,

Iran, etc. There are several valid and reliable self-administered scale to evaluate mobile phone addiction levels or tendency which are specific to adapt to different cultural backgrounds and races[1-5]. There are several associated factors

of mobile phone addiction which have been explored and reported. Some reports showed that mobile phone and internet addictions are positively correlated [6,7]. The related factors for mobile phone addiction including female gender, internet use, alcohol drinking, anxiety, love-affair stress, academic stress, major of the students, poor family income, parents' education level, self-esteem, type A personality, age of owning first mobile phone and duration of daily mobile phone use [7-10].

Excessive mobile phone usage is now considered to be associated with potentially harmful and/or disturbing behaviors; For example, symptoms of problematic use, negative impact on various aspects of daily life, like relationship problems. Presently, problematic mobile phone usage is generally defined as a kind of behavioral addiction [11]. Additionally, a Turkey report showed that there was a negative correlation between mobile phone addiction and academic achievement and a positive association between mobile phone addiction and the level of depression among college students, which was a serious social and health problem [12]. Meanwhile, some reports showed that sleep quality was also positively correlated with mobile phone addiction level and rumination might partially mediate this relationship [13,14]. A similar report found that a fairly large proportion of medical college students in South India suffered from ringxiety and they were very upset at restricted time and place for the reason of problematic mobile phone usage [15]. Some research also showed that loneliness and mobile phone dependence were positively related to degree of addiction in Japanese and Indian students [16]. Also, some other research has shown that mental disorders such as depression, anxiety, impulsivity and obsessive-compulsive disorder had positive correlation with mobile phone addiction [17]. Mental disorder affects and is used to predict the social behaviors of human beings. Several scientific researchers have found that university students' stress of interpersonal relationship, self-career, family life, and time management significantly influenced their life satisfaction which was positively correlated with smart mobile phone addiction, and that the rate of mobile phone addiction was reduced with increased and improved mental health [13].

There were 788 million mobile phone users to surf the internet and they consisted of 98.3 % proportion of internet users until June 2018 according to the 42th Statistical Report on the Development of Internet Network in China. Young adults (age 18 to 22) were among the largest and fastest growing groups possessing and using mobile phone in China[18]. Therefore,

just like internet addiction in the past few decades, mobile phone addiction has attracted more and more attention in China, currently.

Mental and social health such as interpersonal relationship and loneliness status are important for college students. Poor sleep quality is able to influence the academic achievement which may cause inattention among young students [18]. Considering that mobile phone addiction affected interpersonal relationship, loneliness status and sleep quality as reported independently, an overall understanding is really in need to be explored. However, the association of interpersonal relationship, sleep quality and loneliness with mobile phone addiction is not reported yet. In order to decrease mobile phone addiction trends and prevent its risk factors, there is need to be concerned and intervened for the sake of college students' health. This study was carried out to control demographic characteristic variables of university students by cross-sectional study design and probe into this relationship taking the possible confounders in mobile phone addiction users into consideration.

METHODS

Subjects

Stratified cluster random sampling was applied to sample undergraduate students from different departments of liberal arts, science, engineering and medicine from February to April, 2018 in Guangdong Pharmaceutical University, China. All students were either freshers or junior students.

Study design

Our investigating group provided direction for answering a questionnaire and explaining the meaning of this investigation before delivering the questionnaire in the interval of class or after class. Trained investigators retrieved questionnaires and checked the completion and quality of each questionnaire immediately after students had completed and handed in the questionnaires.

Investigative tools

Basic information contained include: age, gender, major, grade, home address, one-child family status, romance status and monthly living cost. Other investigative tools include:

Mobile phone addiction tendency scale (MPATS): MPATS was based on the fundamental symptoms of internet addiction by

Young's report and considered common phenomena and problems along with using mobile phone. MPATS was verified by Chinese college students in Wuhan, China with great reliability and validity. The MPATS contains 16 items and each item is separated into 5 grading system which includes: not match for 1 point, match seldomly for 2 points, match generally for 3 points, match relatively for 4 points, match perfectly for 5 points. The higher the answer scores, the higher the tendency of mobile phone addiction [2].

University of California at Los Angeles loneliness scale (UCLALS): The first edition of the UCLALS was established and reported by Russell in 1978 and the second and third editions were refined in 1980 and 1988, respectively. The third edition was chosen in this study to evaluate the gap between the desire and reality levels of social communication which is a kind of loneliness. This loneliness scale contains 20 items and each item is separated into 4 grading systems which include: never has this feeling for 1 point, has this feeling seldomly for 2 points, has this feeling sometimes for 3 points, always has this feeling for 4 points. There are 9 items which are antitone score. The higher the answer score, the higher the level of loneliness.

Pittsburgh sleep quality index (PSQI) scale: PSQI scale was established and reported by Buysse, a psychiatrist from university of Pittsburgh, in 1989. This scale could be applied to evaluate sleep quality for sleep disorders, mental disorders and also ordinary people.

College students' interpersonal comprehensive diagnostic scale (CSICDS): This scale was established and reported by Professor Richang Zheng from Beijing Normal University to evaluate social interpersonal confusion level for Chinese students. This scale contains 28 items and each item is separated to 2 grading systems which include: "Yes" for 1 point, "No" for 0 point. The higher the answer score, the higher the level of social interpersonal confusion.

Quality control

Investigators were trained together with the same direction standard and the meaning of our investigation was explained to them before delivering the questionnaires. Taking the whole class as a unit to make sure questionnaire collection rate and improved quality of questionnaires were achieved. The questionnaires were checked one after the other to make sure all answers were completed on the entire questionnaire when handed in

immediately. If the whole questionnaire was affirmed to be completed by students with some certain rules or the students selected more than one answer for each item, such questionnaire was defined as invalid questionnaire.

Statistical analysis

Data collected from valid questionnaires were inputted using EpiData 3.1. The analysis of variance (ANOVA) was used to identify statistical differences between scales and demographic features. Pearson correlation analysis was used to identify classification correlation of scales and logistic analysis was utilized to identify linear association of scales using SPSS v 17.0. $P < 0.05$ was considered as statistically significance (for logistic analysis, $p < 0.10$).

RESULTS

Basic information

A total of 760 questionnaires were administered and 735 questionnaires were retrieved, the valid questionnaires were 730. The response rate was 96.71 % and ratio of valid questionnaire was 96.05 %. The age of subjects is in a range of 16 to 25 years old and average age is 20.5 ± 1.733 years old. The number of male students is 258 (35.3 %) and the number of female students is 472 (64.7 %). The distribution of subjects' major and grade is similar. The rest demographic characteristics are shown in Table 1.

Subjects' general situation of MPATS

To have an overall understanding of subjects' mobile phone addiction tendency situation, the top five high mean score items were showed and the highest mean score was the first item that "I will check message or missed calls in a while", which reflected mobile phone dependence level. The rest of top 5 items reflected anxiety, scare, loneliness and frustration levels separately. In a nutshell, mobile phone addiction tendency had affected college students' mental health (Table 2). A comparison with demographic characteristic, mobile phone addiction tendency had statistical significance with grade, while no statistical significance with major, home address, gender, one-child family, romance status and monthly living cost were found (Table 3).

Subjects' general situation of UCLA loneliness scale, CSICDS and PSQI scale

In order to have an overall view of subjects' loneliness, interpersonal relationship and sleep quality situation, the relationship between

Table 1: Basic information of subjects

Demographic characteristics	Classification	Number (N)	Ratio (%)
Gender	Male	258	35.3
	Female	472	64.7
Grade	Freshmen	364	49.9
	Juniors	366	50.1
Major	Liberal arts	254	34.8
	Science & engineering	242	33.2
	Medicine	234	32.1
One-child family	Yes	184	25.2
	No	546	74.8
Home address	Urban	154	21.1
	Suburban & county	171	23.4
	countryside	405	55.5
Romances status	Yes	218	29.9
	No	512	70.1
Monthly living cost	Under 500 Yuan	124	17.0
	501 to 1000 Yuan	473	64.8
	above 1001 Yuan	133	18.2

Table 2: Top 5 items' mean scores in MPATS in subjects

Item scores	Mean	Standard deviation
1	3.42	1.331
3	2.79	1.120
11	2.65	1.165
6	2.51	1.080
4	2.46	1.127

*: Mean score was the average score of 730 valid questionnaires. Item 1: I will check message or missed calls in a while. Item 3: I will make a phone call to ask where the person is when I am waiting for him/her, if not, I will feel anxious. Item 11: I always feel scared of when my mobile phone is off automatically. Item 6: I will feel lonely without mobile phone beside me. Item 4: I will feel frustrated when I did not use mobile phone for a long time. MPATS: Mobile phone addiction tendency scale

demographic characteristic and UCLA loneliness scale, CSICDS and PSQI scale were compared. The average score of UCLALS was 46.85 ± 7.75 and 95 % confidence interval was 46.28 to 47.41. Total score of UCLALS was shown as normal distribution after normality test ($P < 0.05$). Loneliness had statistical significance with major, grade and home address while no statistical significance with gender, one-child family, romance status and monthly living cost were found (Table 4). The average scores of CSICDS was 19.32 ± 5.25 and 95 % confidence interval was 18.94 to 19.70. Total scores of CSICDS was shown as normal distribution after normality test ($P < 0.05$). Interpersonal relationship had statistical significance with grade and romance status while no statistical significance with major, gender, home address, one-child family and monthly living cost were found (Table 5). The average scores of PSQI was 4.83 ± 2.62 and 95 % confidence interval was 4.64 to 5.02. Total scores of PSQI was shown as normal distribution

after normality test ($P=0.001$). Sleep quality had no statistical significance with all demographic characteristic that were explored (Table 6). There are no common confounding demographic factors of UCLA loneliness scale, CSICDS and PSQI scale.

Association of MPATS with UCLALS, CSICDS and PSQI

To further find out certain relationship of mobile phone tendency with loneliness, interpersonal relationship and sleep quality, firstly classification association of MPATS with UCLALS, CSICDS and PSQI was compared. Classification of MPATS was significantly positively correlated with classification of UCLALS, CSICDS, PSQI using Pearson correlation test. This correlation suggested that the higher the addiction tendency level of the student, the more serious loneliness the student felt, the poorer interpersonal relationship problem the student encountered and the poorer sleep quality the student suffered (Table 7). To further explore the linear correlation of MPATS with UCLALS, CSICDS and PSQI, logistic analysis was applied to identify the possible linear correlation. It was found that interpersonal relationship, sleep quality, and loneliness were linearly correlated with mobile phone addiction tendency (Table 8).

DISCUSSION

There were lots of reports focusing on mobile phone addiction among college students from different cultural backgrounds and several valid and reliable self-administered scale to assess this behavior problems [1-4]. Considering that this behavioral problem has connection with tremendous factors such as female gender,

Table 3: Association of MPATS and demographic characteristic using one-way analysis of variance

Demographic characteristics	Variance	Sum of squares	Mean of squares	F value	P-value
Major	interclass	38.44	0.69	1.03	0.42
	intraclass	449.01	0.67		
	total	487.45			
Grade	interclass	45.35	0.81	1.45	0.02
	intraclass	375.28	0.56		
	total	420.63			
Gender	interclass	12.67	0.23	0.99	0.50
	intraclass	154.15	0.23		
	total	166.82			
One child family	interclass	10.76	0.19	1.02	0.44
	intraclass	126.86	0.19		
	total	137.62			
Romances status	interclass	12.11	0.22	1.03	0.41
	intraclass	140.79	0.21		
	total	152.90			
Monthly living cost	interclass	21.48	0.38	1.10	0.30
	intraclass	235.41	0.35		
	total	256.89			
Home address	interclass	36.82	0.66	1.01	0.45
	intraclass	435.88	0.65		
	total	472.70			

MPATS: Mobile phone addiction tendency scale

Table 4: Association of loneliness grading and demographic characteristics

Demographic characteristics		Classification of loneliness*			χ^2 value	P value
		Weakness	General	Strong		
Major	Liberal arts	4	95	155	10.51	0.033
	Science & Engr.	1	73	168		
	Medicine	1	99	134		
Grade	Freshmen	3	123	238	10.42	0.034
	Juniors	3	144	219		
Home address	Urban	2	60	92	10.22	0.037
	Suburban & county	4	55	112		
	countryside	0	152	253		
Gender	Male	2	90	166	0.51	0.773
	Female	4	177	291		
One-child family	Yes	3	68	113	2.02	0.364
	No	3	199	344		
Romance status	Yes	3	91	124	5.05	0.080
	No	3	176	333		
Monthly living cost	Under 500 Yuan	0	46	78	2.94	0.567
	501 to 1000 Yuan	4	178	291		
	Above 1001 Yuan	2	43	88		

*: Value of less than 28 points was defined as weakness group; Value of 28 to 44 points was defined as general group; Value of more than 44 points was defined as strong group.

Table 5: Association of interpersonal relationship grading and demographic characteristics

Classification of interpersonal relationship*						
Demographic characteristics		Seldom	General	Severity	χ^2 value	P value
Major	Liberal arts	137	76	41	7.14	0.128
	Science & engineering	118	74	50		
	Medicine	126	80	28		
Grade	Freshmen	170	122	72	12.68	0.013
	Juniors	211	108	47		
Home address	Urban	91	38	25	5.31	0.257
	Suburban & county	83	57	31		
	countryside	207	135	63		
Gender	Male	130	76	52	4.42	0.110
	Female	251	154	67		
Romance status	Yes	132	54	32	9.14	0.010
	No	249	176	87		
One-child family	Yes	110	48	26	5.72	0.057
	No	271	182	93		
Monthly living cost	Under 500 Yuan	57	45	22	2.72	0.607
	501 to 1000 Yuan	250	146	77		
	Above 1001 Yuan	74	39	20		

*: Value of less than 9 points was defined as seldom group; Value of 9 to 14 points was defined as general group; Value of more than 14 points was defined as severe group.

Table 6: Association of sleep quality grading and demographic characteristics

Classification of sleep quality*					
Demographic characteristics		No somniphathy	Somniphathy	χ^2 value	P value
Major	Liberal arts	197	57	0.381	0.826
	Science & engineering	182	60		
	Medicine	179	55		
Grade	Freshmen	288	76	2.909	0.233
	Juniors	270	96		
Home address	Urban	117	37	0.223	0.895
	Suburban & county	133	38		
	Countryside	308	97		
Gender	Male	194	64	0.343	0.558
	Female	364	108		
One-child family	Yes	142	42	0.074	0.786
	No	416	130		
Romance status	Yes	162	56	0.780	0.377
	No	396	116		
Monthly living cost	Under 500 Yuan	95	29	1.142	0.565
	501 to 1000 Yuan	366	107		
	Above 1001 Yuan	97	36		

*: Value less than 7 points was defined as no somniphathy group; Value equal or greater than 7 points was defined as somniphathy group.

Table 7: Pearson correlation of MPATS with UCLALS, CSICDS and PSQI

MPATS classification*	Pearson correlation coefficient	P value
UCLALS classification	0.216	0.001
CSICDS classification	0.220	0.001
PSQI classification	0.170	0.001

*: Value less than 37 points was defined as weakness tendency group; Value of 38 to 59 points was defined as general tendency group; Value more than 60 points was defined as strong tendency group; MPATS: Mobile phone addiction tendency scale UCLALS: University of California at Los Angeles loneliness scale; CSICDS: College students' interpersonal comprehensive diagnostic scale; PSQI: Pittsburgh sleep quality index

Table 8: Logistic variable analysis of MPATS with UCLALS, CSICDS and PSQI (Wald step forward, $\alpha = 0.10$)

Variable	Beta coefficient	Standard error	P value
Interpersonal relationship	0.061	0.017	0.001
Sleep quality	0.054	0.031	0.093
Loneliness	0.023	0.012	0.065
Constant	-1.841	0.775	0.819

MPATS: Mobile phone addiction tendency scale UCLALS: University of California at Los Angeles loneliness scale; CSICDS: College students' interpersonal comprehensive diagnostic scale; PSQI: Pittsburgh sleep quality index

internet and alcohol uses, anxiety, love-affair and academic stress, loneliness, sleep quality, interpersonal relationship etc., we concentrated on the relationship of mobile phone addiction tendency with loneliness, sleep quality and interpersonal relationship. In this study, we found that the highest mean score item in MPATS was that of "I will check message or missed calls in a while", which reflected mobile phone dependence level. Some articles have shown similar results that mobile phone dependence was epidemic among university students [5,6,17]. It was also found that grades of the students influenced on MPATS, while major, home address, gender, one-child family, romance status and monthly living cost had no association with mobile phone addiction.

A similar report showed that mobile phone addiction level was higher in the second-year university students [16]. Another report showed that mobile phone addiction was associated with different grades among Chinese senior school students [15]. However, an article showed that there was no difference for nomophobia, mobile phone dependence, between postgraduate students and undergraduate students in medical college in South India [18]. This paradoxical result could be ascribed to the different general background of the investigating subjects such as age and major, which could be confounders.

Also, it was discovered that loneliness had statistical significance with major, grade and home address. Furthermore, it was found that interpersonal relationship had statistical significance with grade and romance status. A report showed that a positive correlation was determined between mobile phone addiction and

depression [14] and other two reports found that loneliness and mobile phone dependence were positively related to degree of addiction [18,19]. Furthermore, interpersonal problems linked mobile phone addiction levels to negative emotions among mobile phone addicts and possible-mobile phone addicts were reported [19]. More so, Taiwan university students' love-affair and academic stresses positively influenced smart mobile phone addiction and stress of interpersonal relationship influenced their life satisfaction [9].

Although, there was no statistical significance between sleep quality and all demographic characteristics that were explored, some findings suggested that sleep quality was positively correlated with mobile phone addiction level and rumination might partially mediate this relationship [8,15,16]. However, certain association of mobile phone addiction with interpersonal relationship, loneliness status and sleep quality remain not yet clear. Here, it was found that interpersonal relationship, sleep quality and loneliness were positively correlated with mobile phone addiction tendency using both classification correlation and linear correlation methods, which suggested that mobile phone addiction affected college students' social network, mental health and sleep quality and it is now an emerging and major public health concern.

CONCLUSION

The findings from this study showed that grade, interpersonal relationship, sleep quality and loneliness are correlated with mobile phone addiction tendency, which serve as risk factors.

Therefore, in order to decrease mobile phone addiction trends, prevent its risk factors and the emerging public health problem, there is a great need to be concerned and serious interventions are urgently required for the sake of college students' health.

DECLARATIONS

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Ethical considerations

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

Conflict of interest

No conflict of interest is associated with this work.

Contribution of authors

We declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors.

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