Investigation on the Relationship between Mobile Phone Dependence and Diet, Sleep, Anxiety and Depression of Medical Students

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Abstract. Objective: To investigate the correlation between mobile phone dependence and diet and sleep quality, anxiety and depression of medical students in Lanzhou, and to provide countermeasures and suggestions for the prevention and intervention of mobile phone dependence, diet and sleep quality, and anxiety and depression improvement. Methods: From January 16 to April 2020, 484 medical students in Lanzhou City were selected as the research object. Mobile Phone Dependence Inventory (MPIQ), Pittsburgh Sleep Quality Index (PSQI), Self-Rating Anxiety Scale (SAS), Body Mass Index (BMI), Diet Questionnaire R21 (TFEQ-R21) and Baker Depression Inventory (BDI) were used to evaluate mobile phones Dependent use, quality of diet and sleep, anxiety and depression were performed on the data by t test, analysis of variance, pairwise correlation analysis and multiple linear regression analysis. Result: A total of 484 questionnaires were issued, and 484 valid questionnaires were returned. The effective return rate was 100.00%. People with chronic diseases, using mobile phones before going to bed, recent interest in learning, learning to cope with stress and mobile phone dependence are significantly positively correlated. Comparison of BDI, PSQI, MPIQ and TFEQ-R21 scores showed statistically significant differences (P<0.05). Conclusion: Dependent use of mobile phones is related to the quality of diet, sleep and depression. Schools and parents should promote and intervene students with severe dependence, which requires great attention.

Keywords: College Students; Mobile Phone Dependence; Diet and Sleep Quality; Anxiety; Depression.

1. Introduction

Since the advent of mobile phones, people began to consider the negative effects of mobile phones on health. With the rapid development of science and technology network, these concerns are aggravated, and more and more evidence show that mobile phone addiction has become a social concern. Studies at home and abroad show that the higher the dependence of college students on mobile phone use, the worse the sleep quality, resulting in decreased appetite. In addition, the use of mobile phones will also make students feel alienated and lonely, which will cause or aggravate psychological problems such as anxiety and depression [1-4]. At present, there are few studies on the use of mobile phones by medical students in Lanzhou in terms of diet, sleep quality, anxiety and depression. Through investigation, this study explores the relationship between mobile phone dependence and diet sleep quality, anxiety and depression, aiming at rational use of mobile phones and providing basis for related research.

2. Objects and Methods

2.1 Objects

In April 2020, a total of 484 students from two medical colleges in Lanzhou were surveyed and evaluated online in the form of "Questionnaires" (Changsha Ranxing Information Technology Co., Ltd.), and a total of 484 valid questionnaires were collected, with an effective recovery rate of 100%. Among them, there were 141 males (29.1%) and 343 females (70.9%). 472 people (97.5%) used mobile phones before going to bed, and 317 people (65.5%) learned to cope with difficulties. All the respondents volunteered to conduct questionnaire survey to analyze the basic characteristics of the research objects. See table 1.

Table 1. Analysis of the frequency and composition ratio of personal basic characteristics of 484 students in Lanzhou Medical College

Projects	Investigation number (person)	Composition ratio (%)	Projects	Investigation number (person)	Composition ratio (%)
Gender			Use your cell phone before going to bed		
male	141	29.1%	Use	472	97.5%
female	343	70.9%	Study		
body mass index			Difficult to cope with	45	9.3%
become thin	97	20.1%	Coping with hardship	317	65.5%
Normal	278	57.7%	Cope with ease	122	25.2%
overweight	42	8.7%	Father's educational level		
Obesity	65	13.5%	Primary school	121	25.0%
Is it an only child			middle school	283	58.5%
Yes	80	16.5%	University and above	80	16.5%
No	404	83.5%	Mother's educational level		
Health status			Primary school	202	41.7%
Good	470	97.1%	middle school	234	48.3%
chronic ailment	14	2.9%	University and above	48	9.9%
Learning interest			Monthly household income (yuan)		
Lack of	85	17.6%	<5000	315	65.1%
General	360	74.4%	5000-15000	154	31.8%
Strong	39	8.1%	>15000	15	3.1%

2.2 Methods

2.2.1 Basic Data Questionnaire

Social demographic data include basic social demographic data such as age, sex, whether you are an only child, height, health status, body weight, parents' education level, and family monthly income.

2.2.2 Related Scales

This study mainly includes six scales: MPIQ, TFEQ-R21, PSQI, SAS, BDI and BMI. See table 2.

Table 2. Correlation analysis of mobile phone dependent use, diet sleep quality, anxiety and depression

Projects	Composition	Scoring and evaluation methods	References
MPIQ	Eight items: withdrawal, euphoria, conflict with others and daily activities, significance of cognition and behavior, recurrence and recovery.	The consistency is 0.80, and each item is scored from 1 (completely inconsistent) to 7 (completely consistent). The study shows that the eight items are all single-dimensional, and the higher the total score of the eight items, the higher the dependence on mobile phones	[5-7]
TFEQ-R21	There are three dimensions: uncontrolled eating (UE): when hungry or stimulated by external factors, there are 9 items in total; cognitive restricted eating (CR): consciously limiting food intake to control weight or promote weight loss, there are 6 items in total; emotional eating (EE): negative emotions, with a tendency to overeat, there are 6 items in total.	1-20 is entitled 1-4, and 21 is entitled 1-8 (1-2 counts as 1 point; 2 points for 3-4 and 3 points for 5-6; 4 points from 7 to 8); Dimension score (Question 1-16, reverse scoring), the items obtained from each dimension are integrated to obtain the total score of each dimension, and the total score of the three dimensions is the total score of the scale.The higher the scores of each dimension, the higher the tendency of eating out of control, eating with limited cognition and emotional eating, that is, the higher the indication of bad eating behavior.	[8]
PSQI	(Sleep time, sleep quality, sleep time, sleep efficiency, sleep disorder, hypnotic drugs, daytime dysfunction)	It is composed of 18 items, including 7 factors. The sum of the scores of each factor is PSQI. The total score ranges from 0 to 21. The higher the score, the worse the sleep quality (0~10 indicates normal sleep and 11~21 indicates sleep disorder). The total score of PSQI > 8 is the detection standard of poor sleep quality.	[9-10]
SAS	SAS is used to evaluate anxiety state, which consists of 20 items	The higher the score, the heavier the anxiety. (0~49 indicates no anxiety, 50~59 indicates mild anxiety, 60~69 indicates moderate anxiety, and 70~80 indicates severe anxiety)	[11]
BDI	BDI was used to evaluate depression, which consisted of 21 items	The total score ranged from 0 to 63, and the higher the score, the more severe the depression.(0~4 points means no depression, 5~13 points are mild depression, 14~20 points are moderate depression, and 21~63 points are severe depression)	[12]
BMI	BMI= body mass (kg)/ height (m)^2, in order to evaluate the degree of obesity,	According to the classification of adults recommended by China obesity working group: lean (BMI<18.5 kg/m^2), normal (18.5kg/m^2 ≤ BMI<24.0 kg/m^2), overweight (BMI≥ 24.0 kg/m^2)	[13]

2.2.3 Statistical Analysis

SPSS 22.0 was used for analysis, T test was used for comparison between two groups, and one-way variance analysis was used for comparison among multiple groups. Pearson correlation analysis was used for correlation analysis. Multivariate linear regression analysis was used to analyze the influencing factors of mobile phone dependence. $P<0.05$ was the difference with statistical significance.

3. Results

3.1 The Relationship between Mobile Phone Dependence and Social Demographic Characteristics

Sleep Quality, Eating Behavior and Mobile Phone Use. The results show that there are no significant differences in BMI, only child status and family income in people's use of mobile phones. In the group with chronic diseases, using mobile phones before going to bed, recent interest in learning and coping with stress are significantly and positively correlated with the degree of dependence on mobile phones. See table 3. [15]

Table 3. Significant test of mobile phone dependence and social demographic characteristics

Projects	MPIQ	Statistic	Sig
Gender		0.55	0.579
Men	(23.48±10.57)		
women	(22.93±9.49)		
body mass index		0.84	0.472
become thin	(23.84±9.64)		
Normal	(22.77±9.48)		
overweight	(24.52±12.17)		
Obesity	(22.02±9.65)		
Is it an only child		1.247	0.213
Yes	(24.34±11.33)		
No	(22.84±9.48)		
Health status		-3.603	<0.01
Good	(22.81±9.67)		
chronic ailment	(32.29±9.40)		
Learning interest		30.513	<0.01
Lack	(29.20±11.08)		
General	(22.40±8.93)		
Strong	(16.13±7.81)		
Use cell phone before bedtime		2.246	0.023
Yes	(23.25±9.76)		
No	(16.83±10.29)		
Recent learning pressure		26.047	<0.01
Difficult to cope with	(29.00±10.46)		
Cope with difficulty	(24.05±9.50)		
Cope with ease	(18.40±8.43)		
Monthly family income (yuan)		1.556	0.212
<5 000	(23.18±9.66)		
5 000-15 000	(22.51±10.09)		
>15 000	(27.13±9.61)		

3.2 Analysis of Related Factors of Mobile Phone Dependent Use

Prior to multiple regression analysis, correlation analysis was used to test the correlation between study variables. See table 4. From the results of correlation analysis, there was a significant correlation between mobile phone dependence and most variables. From the results, except for its non-correlation with EE, other variables were significantly correlated with mobile phone dependence. Specifically, mobile phone dependence was positively correlated with PQSI, UE, and whether to use mobile phone before going to bed, while the others were negatively correlated. [14–15]

Table 4. Handset dependence and correlation analysis between each variable

	BDI	SAS	EE	CR	UE	PQSI	BMI	Q7_2	Q7_1	Q6_2	Q6_1	Q51	Q41	MPQI
BDI	1	.687**	.197**	.005	.250**	.589**	.039	-.088	.132**	-.088	-.152**	.039	-.164**	.478**
SAS		1	.317**	.022	.336**	.518**	.004	-.110*	.120**	-.110*	-.104*	.051	-.167**	.374**
EE			1	.392**	.833**	.071	-.005	.034	-.007	.034	-.048	-.032	-.011	.061
CR				1	.347**	-.057	-.058	.061	-.003	.061	.143**	-.025	.073	-.095*
UE					1	.178**	.018	-.051	.028	-.051	-.034	-.025	-.053	.145**
PQSI						1	.013	-.113*	.127**	-.113*	-.090*	.075	-.208**	.389**
BMI							1	-.014	-.063	-.014	.027	.007	-.264**	.024
Q7_2								1	-.200**	1.000**	-.504**	-.099*	.051	-.210**
Q7_1									1	-.200**	.171**	-.032	.030	.136**
Q6_2										1	-.504**	-.099*	.051	-.210**
Q6_1											1	-.002	.096*	-.120**
Q51												1	-.028	.102*
Q41													1	-.162**
MPQI														1

Notes: *P<0.05; **P<0.001.(Q41 for chronic disease, Q51 Use the phone before bedtime, Q6 and Q7 for learning interest and stress).

3.3 Multiple Linear Regression Analysis of Mobile Phone Dependence

As the results of the correlation analysis of factors and mobile phone dependence in the above article are relatively one-sided, because they are all related to a single variable, it is necessary to conduct subsequent regression analysis, incorporate all the variables into the model at the same time, and conduct comprehensive test to reach a sounder conclusion. [16–17] The specific steps were as follows. In the first step, demographic variables were included in Inclusion Model 1. In the second step, BMI index was included in Model Equation 2. In the third step, sleep quality was included in Model 3. In the fourth step, diet scale was included in Model 4. In the fifth step, depression and anxiety scale was included in Model 5. Through continuous inclusion of variables, it was found that, in the regression result, there was a significant correlation between learning engagement, PQSI and mobile phone dependence. Overall, the number of people who participated in learning negatively

correlated with their mobile phone dependence. There was a significant negative correlation between sleep quality and mobile phone dependence. From the perspective of anxiety and depression, the regression coefficient of anxiety and mobile phone dependence is not significant, but the regression coefficient of depression and mobile phone dependence is significant. See table 5. [18] [19] [20].

Table 5. Multiple linear regression analysis of mobile phone dependence

	MODE1		MODE2		MODE3		MODE4		MODE5	
Q41	-6.997	-2.8***	-6.990	-2.7***	-3.506	-1.4	-3.370	-1.35	-.83	-1.178
Q51	4.432	1.65	4.372	1.63	3.267	1.28	3.489	1.37	3.55	1.454
Q6_1	-6.519	-5.84***	-6.600	-5.91***	-5.389	-5.02***	-5.044	-4.58***	-2.84	-3.594**
Q7_1	2.630	2.94***	2.637	2.94***	1.777	2.07**	1.752	2.04**	1.26	1.527**
Q7_2	-11.453	-6.35***	-11.47	-6.36***	-9.71	-5.62***	-9.149	-5.19***	-.96	-4.687***
BMI			.000	0.07	.000	0.28	.000	0.17	.00	-.084
PQSI					.907	7.26***	.857	6.73***	.32	2.150**
UE							.185	1.53	.17	1.456
CR							-.140	-1.02	-.15	-1.141
EE							-.065	-0.47	-.16	-1.151
SAS									.03	.446
BDI									.29	5.541***
r^2	0.145		0.147		0.233		.240		0.306	
Δr^2	0.137		0.137		0.222		.223		0.289	
F	16.275		13.696		20.552		14.843		17.257	
p	<0.01		<0.01		<0.01		<0.01		<0.01	

Notes: *$P<0.1$; **$P<0.05$; ***$P<0.01$.(Q41 for chronic disease, Q51 Use the phone before bedtime, Q6 and Q7 for learning interest and stress).

4. Discussion

Many studies have shown that mobile phone addiction is closely related to diet, sleep quality, anxiety and depression. The adverse effects of mobile phone dependence are often not negligible.

In this study, the MPIQ scores of males and females were (23.48 10.57) and (22.93 9.49), respectively, and the results showed that there was no difference between males and females in the aspect of mobile phone dependence, which was consistent with the results of multiple domestic studies. Other studies have shown that female students rely more on mobile phones than male students because they are more willing to use their mobile phones to communicate, and because of their online shopping interests, personality traits, and the willingness to share information and feelings. At the same time, Fang Yueqin pointed out that medical students generally have a heavy academic burden and study for a long time, so the proportion of using mobile phone for a long time and before going to bed is lower, which reduces the difference in mobile phone dependence between male and female students.

In the past, scholars have always focused on the overweight and obesity among Chinese students and surveys have found that sitting for a long time and not sleeping well are likely to lead to obesity. Similarly, the excessive use of mobile phones also has a certain effect on the formation of obesity, and there is a correlation between the two. The result of this study shows that obesity is related to mobile phone dependence, which is consistent with the results of previous studies.

From the health status, the users with chronic diseases among the groups with chronic diseases have a higher degree of dependence on mobile phones, mainly because the people with chronic diseases have difficulties in being active outside, so they are more dependent on mobile phones for fun. At the same time, mobile health technology is used for management and treatment for most patients with chronic diseases. Jiao pointed out that mobile exercise app provides a new type of exercise management for patients with chronic diseases, suggesting that health care personnel can try to help cardiovascular and cerebrovascular patients with exercise management through the smartphone app.

The more interested in learning, the greater the pressure, the higher the degree of dependence on mobile phones. Xu Bixia pointed out that the lower the learning interest, the greater the pressure, the higher the degree of mobile phone dependence, medical students learn more content, learning interest is too low, resulting in unstable knowledge reserve, facing the pressure of learning and examination, will indulge in mobile phone games. It can be seen that a single low interest in learning does not necessarily lead to the occurrence of mobile phone dependence.

The analysis of psychological characteristics revealed that the BDI score was positively correlated with the MPIQ score, while the SAS score was not significantly correlated with the MPIQ score. In the research of Xu, MPIQ was positively correlated with SAS scores and BDI scores, which was inconsistent with the results of this study. Consider the possible reasons: there are many causes for anxiety, with different levels. For example, it is possible that the slight anxiety caused by schoolwork pressure or the anxiety caused by friends' relationship. The slight anxiety can improve the motivation to achieve goals, so it may improve the motivation to work, but has no significant impact on mobile phone dependence. Depression in the will is a kind of relatively strong state of mind, is more likely to be a larger setback in reality, lead to depression in the heart, this kind of situation of the crowd is more likely to appear escapism and other behavior, so it is easier to indulge with mobile phone, so depression on mobile phone dependence has a more significant effect.

This study showed a positive correlation between dependence and PQSI, UE. This study is consistent with most studies. For example, Fang et al. conducted a survey on cell phone dependence and sleep quality among 2,122 school medical students and found that cell phone dependence affected sleep quality. The people who used cell phone frequently before going to bed had poorer sleep quality. In addition, studies have shown that dietary behavior can affect the quality of sleep.

This study also has certain limitations: (1) The sample size in this study is small, which cannot represent the situation of all medical students. (2) Although the study showed statistically significant differences in BDI, PSQI, MPIQ and EE scores ($P<0.05$), it could not explain the cause and effect.

The problem of mobile phone dependence affecting college students' physical and mental health has become increasingly prominent. The government should take corresponding measures to limit online time such as online media and games. Schools and parents should take correct guidance and persuasion to the students with high degree of dependence, and reasonably use mobile phones. Students should understand the harm of mobile phone dependence and monitor themselves. To construct a healthy online lifestyle for college students in the new media era, and improve the happiness index of mobile phone use at the same time.

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