



# Roles of Mindfulness and Perceived Social Support in Mediating the Effect of Psychological Distress on Sleep Quality of College Students

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## ABSTRACT

This paper aims to disclose the role of mindfulness and perceived social support (PSS) in relationship between psychological distress and sleep quality of college students. For this purpose, 480 questionnaires were issued to students from two colleges in Shaanxi, China. 443 (92.29%) of the questionnaires were returned. Then, the respondents were subject to depression anxiety stress survey (DASS-21), five facet mindfulness questionnaire (FFMQ), the PSS scale (PSSS) and Pittsburgh sleep quality index (PSQI). The main conclusions are as follows: 25.5% of college students had sleep problems and the situation was worse for females; psychological distress had a significant effect on sleep quality and mindfulness, while mindfulness acted as a mediator between psychological distress and sleep quality; the PSS regulated the effect of mindfulness on the sleep quality, and mindfulness partially mediated those with low PSS; the mediation effect of mindfulness was insignificant for those with high PSS, and their sleep quality directly hinged on psychological distress. Therefore, the sleep quality among college students can be improved by promoting their mindfulness and PSS. This research provides new insights into the field of sleep quality.

**Key Words:** Psychological Distress, Sleep Quality, Mindfulness, Perceived Social Support (PSS), College Students

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93

## Introduction

The high pace of modern life has brought immense pressure to ordinary people, exerting negative effects on their sleep quality. Sleep disorders are now commonplace among modern people, especially college students. Facing heavy academic and social pressures, college students are more likely to suffer from sleep problems than other people (Zhao *et al.*, 1995; Ye *et al.*, 2013). Sleep disorders pose a serious threat to their physiological state, mental health and social skills. To solve the problem, cognitive neuroscientists (Watkins *et al.*, 2000) held that cognitive interventions can promote changes in brain mechanisms and thus enhance the sleep quality.

The previous studies have shown that sleep quality affects the physical fitness, mental health and academic progress of college students. There are many influencing factors for the sleep quality of college students, including but not limited to social demography, dorm condition, personal emotion, academic pressure, interpersonal relation, and stress of life. The sleep quality varies with personal features like mindfulness. One of the ways to improve sleep quality lies in sleep intervention, e.g. enhancing mindfulness (Gu *et al.*, 2014; Xu, 2017; Zhao and Wang, 2017).

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In light of the above, this paper attempts to disclose the effect of mindfulness on the sleep quality of college students, and verify if the perceived social support (PSS) promotes the effect of mindfulness on sleep quality. For these purposes, the author explored the relationship between psychological distress and the sleep quality. Then, the mediation effect was adjusted of mindfulness and the PSS in the mediation chain of psychological distress and sleep quality, laying the basis for effective intervention in sleep quality problems.

### Related description

Sleep is essential for our brain to maintain its physiological activities. It is regarded as the most powerful driver of brain activity other than severe pain and respiration (Liu, 1996). In physiology, sleep is a resting activity of human body that promotes the integration of physiological functions, physical recovery and memory enhancement. Chronic sleep deprivation (Chen *et al.*, 2016) undermine the functions of metabolism and hormones, leading to premature aging, obesity, hypertension and memory loss. Over the time, sleep disorders will damage the immune system, brain memory and other cognitive functions.

Psychological distress is manifested as an unpleasant emotional experience, such as depression, anxiety and stress. In theory, psychological distress occurs when a person cannot withstand a long-lasting or highly stressful situation. Psychological distress is a global public health problem. Long-term psychological distress weakens the adaptability, and induces physical and mental illnesses (Jin *et al.*, 2015).

Under academic stress, interpersonal tension and economic stress, college students are extremely vulnerable to psychological distress. The students suffering from the problem often become depressed, irritable and unpleasant. In severe cases, psychological distress may cause insomnia, sleep disorders and disturbance to the psychological mechanism.

Indfulness, a significant element of Zen Buddhism, is the psychological process of bringing one's attention to the current internal and external experiences without making any judgement or self-regulation (Duan, 1996). In other words, it is a conscious, non-judgemental way to focus on the experiences occurring in the present moment.

He early studies on mindfulness

highlighted the clinical effect on physical and mental diseases. Recent years saw the research focus shifting to the action mechanisms. On psychological mechanism, mindfulness is about the sensory perception of change, attention, memory and emotional improvement (Tang *et al.*, 2007). On brain mechanism, mindfulness is expressed as the variations in frontal  $\theta$  wave, occipital  $\gamma$  wave and the P300 component of the event-related potential (ERP), and is associated with the functional activation and structural changes in brain regions like the prefrontal cortex and cingulate gyrus (Watkins *et al.*, 2000; Wang and Huang, 2011). These findings provide a scientific basis for the training of mindfulness, and the relevant intervention in sleep quality.

Ocial support is a system of spiritual or material support from different people, ranging from families, relatives to friends. It is an important determinant of sleep quality (Guo *et al.*, 2014; Kong *et al.*, 2014). In general, the material support involves material assistance and direct service, while the spiritual support contains the respect, encouragement and other emotional incentives. Zhu and Zhuo (2015) suggested that the perception of social support is positively correlated with sleep quality and mental health. Luo and Mu (2017) discovered that the PSS promotes positive psychological qualities, namely, justice, courage and intelligence, and enhances the individual well-being.

### Methods

#### Recipients

From March to June 2017, 480 questionnaires were issued to students from two colleges in Shaanxi, China. 443 (92.29%) of the 202 males (45.6%) and 241 females (54.4%). Among them, 176 (39.7%) major in liberal arts, and 267 (60.3%) in science and engineering; 144 (32.5%) are juniors and 62 (14%) are seniors. All recipients fall between 17 and 26, putting the median age at 20.67 (SD=1.32).

#### Tools

DASS-21 was proposed by Lovibond *et al.*, (1995). The revised version (Gong Xu, 2010) was adopted to measure the negative emotions like depression, anxiety and stress. As its name suggests, DASS-21 involves such three dimensions as depression, anxiety and stress. A total of 21 items were graded against a 4-point scale, in which 1 means mismatch and 4 means complete match. The score of each item was added up to obtain the score of

**Table 1.** Cluster sampling of college students

Variable		Grade				Total college Student Sampling
		Frist	Second	Third	Forth	
Gender	Man	57	62	76	28	223
	Female	68	70	78	41	257
Profession	liberal arts	51	54	62	29	196
	Science and engineering	74	78	92	40	284
Total		125	132	154	69	480

each dimension, which fell between 0 and 21. If the score of a dimension is equal to or greater than 8, it means the recipient suffers from the corresponding psychological distress. The score is positively correlated with the seriousness of the distress. Here, the internal consistency of the DASS-21 is expressed as Cronbach's alpha: 0.83, 0.81 and 0.84. The confirmatory factory analysis (CFA) shows that the questionnaire has good structural validity:  $\chi^2/df=3.96$ , CFI=0.91, NFI=0.94, GLI=0.93, and RMSEA=0.043.

The FFMQ, compiled by Baer (2006) and Deng (2010), was employed to investigate the mindfulness of the recipients from such 5 dimensions as observation, perceived action, description, non-reaction and non-judgement. A total of 39 items were graded against a 5-point scale, in which 1 means never and 5 means always. The score is positively correlated with the mindfulness. Here, the internal consistency of the FFMQ is expressed as Cronbach's alpha: 0.88. The CFA shows that the questionnaire has good structural validity:  $\chi^2/df=2.73$ , CFI=0.94, NFI=0.93, GLI=0.94 and RMSEA=0.016.

The revised PSS scale (PSSS) (Zimet, 1998) consists of 12 items, namely, family support, friend support, leader support, colleague support and classmate support, to name but a few. These items were graded against a 7-point scale, in which 1 means strongly disagree and 7 strongly agree. The score is positively correlated with the PSS. Here, the internal consistency of the PSSS is expressed as Cronbach's alpha: 0.84. The CFA shows that the questionnaire has good structural validity:  $\chi^2/df=3.59$ , CFI=0.92, NFI=0.94, GLI=0.91 and RMSEA=0.023.

The PSQI was developed by Buysse *et al.*, (1989) and revised by Liu *et al.*, (1996). To the PSQI sleep quality of the last month, 18 items were graded against a 4-point scale from such 7 dimensions as subjective sleep quality, time to fall asleep, sleep time, sleep efficiency, sleep disorders, hypnotic drugs and daytime dysfunction. The score of each item was added up to obtain the score of each dimension, which fell between 0 and 21. If the score of a dimension is equal to or greater than 8, it means the recipient is

troubled by poor sleep quality. Here, the internal consistency of the PSQI is expressed as Cronbach's alpha: 0.86. The CFA shows that the questionnaire has good structural validity:  $\chi^2/df=2.12$ , CFI=0.94, NFI=0.93, GLI=0.95 and RMSEA=0.033.

### Test procedures

The recipients were tested class by class. In each class, a student was selected to receive a pilot psychological training, so as to provide uniform guidance to other students in his/her class. The investigation is for research purpose only. The recipients were asked to answer the questions anonymously on the spot and in light of their own situation. All the data were kept confidential, and there was no limit on the measurement time.

### Data statistical analysis using SPSS19.0

The data were analysed on SPSS 19.0. The adopted statistical methods include descriptive statistics, t-test, variance analysis, Pearson's correlation analysis, and hierarchical regression analysis.

## Results

### Common method deviation test

Due to the objective conditions, the self-report method used in the data collection may lead to the deviation of the common method. Thus, the data collection process was controlled, e.g. the survey was performed anonymously and reverse problems were designed for some topics. Then, the common method deviation was measured by Harman's single-factor test. The results show that all the eigenvalues of non-rotating and rotating factors are greater than 1, indicating that the common method deviation is within the acceptable range.

### Descriptive Statistics

The average sleep quality (PSQI) of college students was  $5.93 \pm 2.88$ , and the sleep problem detection rate was 25.5% (113 persons). Specifically, the rate was 22.3% (45 persons) for male students, and 28.2% (68 persons) for female students.

The average score of depression (DASS-

21) among college students was  $13.31 \pm 9.33$ , putting the mean depression score at  $3.95 \pm 3.49$ . Hence, 15.3% (68 persons) of the respondents suffered from depression. The percentage was 13.4% (27 persons) among male students.

The average score of anxiety was  $4.06 \pm 3.32$ . Thus, the percentage of anxious students was 14.4% (64 persons) among all respondents, 12.9% (26 persons) among male students, and 15.8% (38 persons) among female students.

The average score of stress was  $5.30 \pm 3.54$ . Therefore, the percentage of stressful students was 22.3% (99 persons) among all respondents, 21.8% (44 persons) among male students, and 22.8% (55 persons) among female students. Through independent samples t-test, it is concluded that the sleep quality varied greatly with genders and majors ( $t = -2.03, P < 0.05; t = 3.77, P < 0.01$ ); the depression remained largely the same across genders and majors; the stress differed greatly among the majors ( $t = 2.20, P < 0.05$ ), but not so significantly across the genders. The descriptive statistics of sleep quality and psychological distress of different groups are listed in Table 3.

**Relationship among psychological distress, mindfulness, PSS and sleep quality**

Table 4 shows the mean, standard deviation and correlation coefficients of each variable. As shown in the table, the psychological distress had

significant positive correlations with sleep quality ( $P < 0.01$ ), and significant negative correlations with mindfulness and the PSS ( $P < 0.01$ ); there was a significant negative correlation between mindfulness and sleep quality ( $P < 0.01$ ), a positive correlation between mindfulness and the PSS ( $P < 0.01$ ), and a significant negative correlation between the PSS and sleep quality ( $P < 0.01$ ).

**Roles of in order to test the Mindfulness and the PSS in mediating the effect of psychological distress on sleep quality**

These sections tests the mediation effect of mindfulness on psychological distress and sleep quality, and verifies if the mediation effect is influenced by the PSS, that is, whether the PSS has a significant impact on the mediation model. According to the test procedure, the four variables, namely psychological distress, mindfulness, sleep quality and the PSS were clustered for hierarchical regression analysis.

To verify the impact of the PSS, it is necessary to verify whether the direct path, the first half of the mediation chain and the second half of the mediation chain reflect the effect of the mediation variables. To this end, the author only checked if the second half of the mediation chain is affected by mediation variables. The mediation effect exists if the chain serves both as an intermediary and a mediator. Table 5 presents the mediation effect of the variables.

**Table 2.** Detection rate of sleep problem and psychological distress among college students

ITEM	N	Sleep Quality		Psychological Distress					
		n	%	Depression		Anxiety		Stress	
				n	%	n	%	n	%
Men	202	45	22.3%	27	13.4%	26	12.9%	44	21.8%
Female	241	68	28.2%	41	17.0%	38	15.8%	55	22.8%
total	443	113	25.5%	68	15.3%	64	14.4%	99	22.3%

**Table 3.** Difference of sleep quality and psychological distress in difference groups (M ± SD)

Variable	ITEM	n	Sleep Quality	Depression	Anxiety	Stress
Gender	Men	202	5.62±2.96	3.77±3.53	3.99±3.32	5.01±3.75
	Female	241	6.18±2.78	4.10±3.48	4.11±3.33	5.56±3.30
	t		-2.03*	-0.98	-0.36	-1.68
profession	liberal arts	176	6.55±3.08	4.09±3.74	4.26±3.39	5.76±3.77
	Science and engineering	267	5.51±2.66	3.86±3.34	3.93±3.27	5.00±3.34
	t		3.77**	0.69	1.02	2.20*

\*p<0.05, \*\*p<0.01, \*\*\*p<0.01. The same below

**Table 4.** Correlations among psychological distress, mindfulness, the PSS and sleep quality

Variables	Depression	Anxiety	Stress	Psychological distress	mindfulness	Perceived social support
Anxiety	0.72**	1				
Stress	0.68**	0.75**	1			
Psychological distress	0.89**	0.91**	0.90**	1		
Mindfulness	-0.26**	-0.28**	-0.35**	-0.33**	1	
Perceived social support	-0.15**	-0.21**	-0.26**	-0.23**	0.52**	1
Sleep quality	0.33**	0.33**	0.41**	0.40**	-0.59**	-0.57**



**Table 5.** Roles of mindfulness and the PSS in mediating the effect of psychological distress on sleep quality

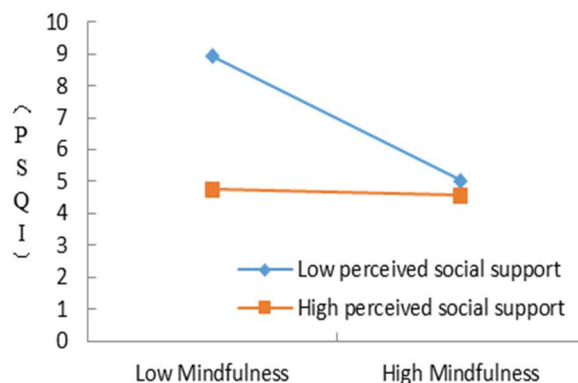
Variables	Equation 1 (Y: sleep quality)			Equation 2 (M: mindfulness)			Equation 3 (Y: sleep quality)		
	B	SE	$\beta$	B	SE	$\beta$	B	SE	$\beta$
Psychological distress	1.64	0.25	0.25***	-0.52	0.11	-0.21***	1.23	0.23	0.19***
Perceived social support	-1.65	0.13	-0.49***	0.59	0.05	0.46***	-1.04	0.13	-0.31***
X×V	-0.47	0.27	-0.06	0.07	0.12	0.02	0.07	0.26	0.01
Mindfulness							-0.68	0.11	-0.26***
M×V							0.67	0.12	0.22***
Gender	0.74	0.21	0.13**	-0.25	0.08	-0.11**	0.49	0.19	0.09*
Profession	-0.46	0.22	-0.07*	0.22	0.09	0.10*	-0.24	0.20	-0.04
R <sup>2</sup>	0.42			0.33			0.53		
F	64.35***			44.19***			71.09***		

X, V, M and Y, respectively, represent psychological distress, comprehend life support, mindfulness and quality of sleep, the same below

As shown in Table 5, the sleep quality was positively affected by psychological distress in Equation 1 had a positive effect on sleep quality, but not significantly influenced by the interaction between psychological distress and the PSS. In Equations 2 and 3, the psychological distress exerted a significant effect on mindfulness, and the sleep quality was significantly impacted by the interaction between mindfulness and the PSS. This means mental distress, mindfulness, the PSS and sleep constitute a mediation mechanism, in which mindfulness acts as a mediator between psychological distress and sleep quality, and the PSS mediates between mindfulness and sleep quality.

For better understanding of the interaction between mindfulness and the PSS and its effect on sleep quality, the PSS was divided into high and low groups according to the positivity/negativity of the standard deviation, and a simple slope test was carried out to examine the relationship between mindfulness and sleep quality.

Figure 1 illustrates the mediation effect of the interaction between mindfulness and the PSS on sleep quality. For those with high PSS, mindfulness did not significantly affect the sleep quality (B simple=0.01, SE=0.01, P<0.05). This means the interaction had a weak mediation effect. For those with low PSS, the mediation effect was quite prominent (B simple=0.04, SE=0.01, P<0.01). Therefore, the psychological distress directly bears on the sleep quality for those with high PSS, eliminating the mediation effect of mindfulness; for those with low PSS, the sleep quality is not only directly affected by psychological distress, but also indirectly impacted by mindfulness.



**Figure 1.** The mediation effect of the interaction between mindfulness and the PSS on sleep quality

Further tests show that the integration model has a better fitness than before ( $\chi^2/df=4.07$ , CFI=0.92, NFI=0.96, GLI=0.93, RMSEA=0.031). The fitness index satisfies the statistical requirements. Thus, the model was considered as acceptable (Figure 2).

Through the simulation of the model, it is observed that the sleep quality was subject to a significant positive impact from psychological distress ( $\beta=0.25$ ,  $P<0.01$ ), and significant negative impacts from the PSS ( $\beta=0.49$ ,  $P<0.01$ ) ( $\beta=-0.21$ ,  $P<0.01$ ) and mindfulness ( $\beta=-0.26$ ,  $P<0.01$ ). Thus, mindfulness negatively affected psychological distress, and indirectly influenced sleep quality. Meanwhile, the interaction between mindfulness and the PSS had a significant positive effect on sleep quality ( $\beta=0.22$ ,  $P<0.01$ ).

According to the above results, the PSS can significantly mediate the effect of mindfulness on sleep quality, and the mediation effect occurs in the second half of the mediation chain. The effect of mindfulness on sleep quality is supported by the PSS mediation among the college students.



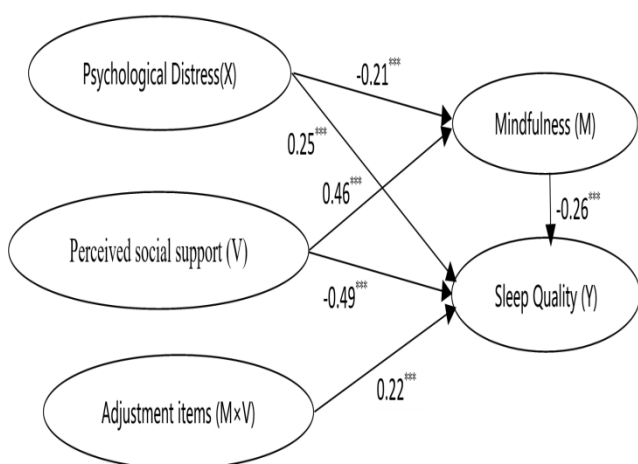


Figure 2. Model with mediation effect

## Conclusions

### Poor sleep quality of college students

The average sleep quality (PSQI) of college students was  $5.93 \pm 2.88$ , and the sleep problem detection rate was 25.5%. The data are consistent with those in previous studies. The sleep problem detection rate of the existing studies ranges 14.52%~37.96%, e.g.  $5.12 \pm 3.24$  (19.7%),  $5.04 \pm 6.62$  (16.4%) (Shi, 2012), and  $5.59 \pm 2.67$  (30.6%) (Niu, 2017). The results show that college students have poor sleep quality. The situation is the result of various internal and external factors, such as learning pressure, collective life, and personal emotions.

According to independent samples t-test, male students tend to sleep better than female students (trend 1), and science and engineering students tend to sleep better than liberal arts students (trend 2). The trends agree well with the findings in previous research. Trend 1 is mainly caused by the gender difference in the amount of time and intensity of physical exercise, while trend 2 is attributed to the flexible learning environment and high emotional sensitivity of those majoring in liberal arts.

### Prominent psychological distress among college students

This research also reveals the prominent psychological distress among college students. The percentage of anxious students was 14.4% among all respondents, that of stressful students was 22.3%, and that of depressed students was 15.3%. The prevalence of distress is closely related to the lack of social experience.

Further comparison shows stress is the top negative emotion among college students, followed in descending order by anxiety and

depression. The negative emotions mainly stem from the joint effect of academic pressure, employment stress and living pressure on campus. Specifically, liberal arts students are faced with greater employment pressure than science and engineering students.

### Relationship between mindfulness, the PSS, psychological distress and sleep quality

The correlation analysis demonstrates that the psychological distress had a significant negative correlation with mindfulness, and a significant positive correlation with sleep quality; moreover, there was a significant negative correlation between mindfulness and sleep quality. This means the psychological distress (e.g. depression, anxiety and stress) may drag down the mindfulness and sleep quality among college students. The result echoes with the previous findings.

Furthermore, the author found a significant negative correlation between the PSS and sleep quality among college students, which is consistent with the results of the previous studies. Specifically, those with high PSS perceive more respect, understanding and support from others, while those with low PSS feel more loneliness, helplessness, and desperation. The negative emotions give rise to sleep problems.

### The role of mindfulness in the effect of psychological distress on sleep quality

It is concluded that mindfulness is a mediator in the relationship between psychological distress and the sleep quality of college students, that is, psychological distress affects the sleep quality through mindfulness. Thus, mindfulness, as opposed to negative emotions, is a proximal factor of sleep quality. The result agrees well with the previous findings (Nordin, 2012; King *et al.*, 2013; Lei *et al.*, 2016), and confirms the idea of positive psychology.

Under chronic psychological distress, the college students tend to have a lower level of mindfulness, thus a greater chance of getting sleep problems. The tendency can be explained from the following aspects. First, the psychological distress enhances the irrational and negative cognition of the students. Second, the psychological distress inhibits the cognitive ability to complete tasks efficiently and lowers the degree of satisfaction. Third, the positive effect of mindfulness on cognitive function (Xu, 2017) is undermined by long-term psychological distress.



### *The role of the PSS in the effect of psychological distress on sleep quality*

This research proves that the PSS has a mediation effect on the relationship between psychological distress and sleep quality. The mediation effect of mindfulness on sleep quality is supported by the PSS mediation among the college students. To be more specific, mindfulness has a greater mediation effect among those with low PSS than those with high PSS.

The source of social support is of equal importance with the perception of the support. Comparatively, intangible spiritual support is more duration than tangible material support; the perception of social support is essential to the cognitive fitness of college students. For instance, those with low PSS is more likely to experience cognitive bias and behavioural disorders than those with high PSS (Christian, Steven & Mark, 2003). It is concluded that the PSS has a significant positive effect on sleep quality and also a mediation effect on other influencing factors of sleep quality.

In summary, psychological distress had a significant positive effect on sleep quality and a negative effect on mindfulness; mindfulness played a partial mediating role between psychological distress and the sleep quality; the PSS mediated the effect of mindfulness on the sleep quality. The mediation effect of mindfulness is remarkable at low PSS and insignificant at high PSS. The research shows the sleep quality among college students can be improved by promoting their mindfulness and PSS.

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