

EMPIRICAL RESEARCH QUANTITATIVE

Perceived social support and sleep quality in patients with arteriosclerotic obliterans: The mediating roles of psychological flexibility

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Abstract

Aim: The aim of the study was to investigate the effect of perceived social support (PSS) on sleep quality in arteriosclerotic obliterans patients in China and examined whether psychological flexibility (PF) has a mediating effect between PSS and sleep quality.

Design: A cross-sectional survey.

Methods: A cross-sectional study was conducted between September 2020 and December 2021 on 172 patients with atherosclerotic obliterans recruited from a hospital in China.

Results: PSS was negatively associated with sleep quality and PF, whereas PF was positively associated with sleep quality. This relationship between PSS and sleep quality was mediated by PF.

Patient or public contribution: Vascular surgery specialist nurses assisted the members of the research group in distributing the questionnaires after the patients gave oral informed consent, and the patients cooperated to complete the questionnaires. We thank both parties for their contributions to this survey.

KEYWORDS

arteriosclerosis obliterans, nursing, psychological flexibility, sleep quality, social support

1 | INTRODUCTION

As the world's third-most common atherosclerotic disease (Song et al., 2019), arteriosclerosis obliterans (ASO) affects 236 million people across the globe (Lupilov et al., 2021), including about 45 million people in China (Wang et al., 2019). ASO is a manifestation of atherosclerosis in the lower extremities and causes limb pain that severely affects patients' sleep quality. Sleep is an activity of daily living (ADL) closely related to human physiological and psychological health. Long-term low-quality sleep affects the quality of life (QOL) as well as physical and psychological health of individuals

(Lund et al., 2010). Studies (Lee et al., 2022; Zhao et al., 2021) have shown that pain patients often experience psychological problems and stressful life events that affect sleep quality. Sleep quality is a modifiable risk factor of the rehabilitation process and has become a focus on clinical scholars (Lao et al., 2018).

2 | BACKGROUND

Sleep disturbance accompanies 40%–86% of chronic pain patients (Alhalal et al., 2021). To the effects of lower limb pain cause ASO

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patients to suffer from sleep disorders such as insomnia, excessive daytime sleepiness, interrupted sleep at night and reduced sleep duration. Compared to patients without sleep disorders, ASO patients have poorer limb function and a lower QOL (Lee et al., 2021). In addition to physiological factors, patients' economic status, marital status, education level and employment history also influence their sleep quality (Qian et al., 2017).

However, studies (Yang et al., 2018) have shown that sleep is also associated with social support, meaning that positive social support can improve sleep quality for individuals. Perceived social support (PSS) generally refers to the help and support that individuals receive from social relationships and interactions, including significant others (family members, relatives and friends) and extended relationships (neighbours, classmates and colleagues) (Thoits, 2011). A cross-sectional survey (Zhao et al., 2021) also confirmed that social support has a significant direct effect on sleep quality. Furthermore, social support is a protective factor of individuals experiencing stressful life events (Laopoulou et al., 2020).

Psychological flexibility (PF) is another essential aspect of health. Kashdan (Kashdan & Rottenberg, 2010) defined this as the ability of a person to flexibly apply psychological resources by considering gradual environmental changes, while balancing their own competitive needs and making behavioural shifts in a changing environment. The two-level model of sleep-related arousal involves *secondary cognitive arousal*, which is an important factor related to sleep disturbance. This form of arousal tends to amplify negative emotions or focus too much on thoughts and behaviours not conducive to falling asleep. It also centres on four aspects: emotional bias, rigid beliefs about sleep-related behaviours, fusion of sleep expectations and an obsession with solving sleep problems, which are the manifestations of low PF (Ong et al., 2012). Studies (McCracken et al., 2011) have also shown that low PF is an important predictor of severe insomnia, problems with sleep and rest, sleep efficiency and fatigue.

Several Chinese studies have focused on the two-two relationship between PF, PSS, and sleep quality in different populations, but none of these studies emphasize the relationship between these three aspects. Hayes (Wang et al., 2021), the founder of Acceptance Commitment Therapy (ACT), pointed out that PF is often used as a mediating variable in applied research. Therefore, our study investigated the effect of PSS and PF on sleep quality in ASO patients by using PF as a mediating variable, to provide a reference for improving sleep quality in ASO patients.

3 | THE STUDY

3.1 | Design, setting and participants

Our study was a cross-sectional survey. Participants were recruited from September 2020 to December 2021 by using convenience sampling taken from the vascular surgery department of a tertiary hospital in Nanchang, China. Patients were considered eligible if they not only were diagnosed with ASO during colour Doppler flow imaging (CDFI) or CT angiography (CTA) and were aged ≥ 45 years, but also if they were able to understand and complete the questionnaires. The elimination criteria were patients who clearly did not carefully or correctly answer the questionnaire. Based on an $N:q$ ratio of 10:1, the target sample size was calculated as 150 patients with ASO. A total of 181 patients were included in this study. However, nine patients did not correctly answer the questionnaire. Therefore, this study ultimately included 172 patients with ASO (Figure 1).

3.2 | Data collection

The researcher conducted the investigation into the hospital through face-to-face interaction. Before distributing the

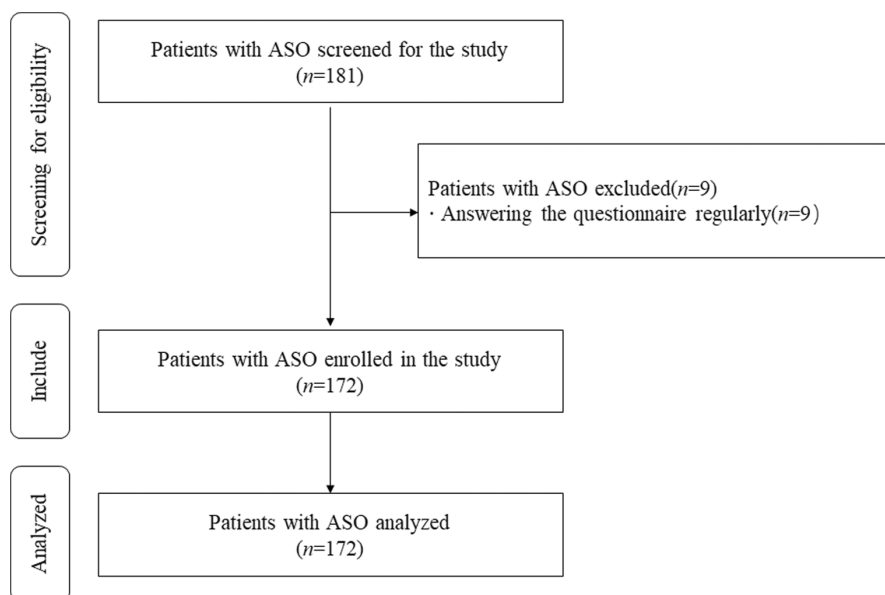


FIGURE 1 Flow diagram of participants

TABLE 1 Single factor analysis of influencing factors of sleep quality in ASO patients

Variable	N	%	PSQI (Mean \pm SD)	t/F	p
Age				-34.715	<.001
<75	106	61.6	11.31 \pm 2.87		
\geq 75	66	38.4	13.41 \pm 2.78		
Gender				-0.714	.476
Male	130	75.6	12.02 \pm 2.98		
Female	42	24.4	12.40 \pm 3.11		
BMI				0.519	.670
<18	37	21.5	11.97 \pm 3.21		
18-23.99	86	50.0	12.37 \pm 2.93		
24-27.99	42	24.4	11.69 \pm 3.10		
\geq 28	7	4.1	12.29 \pm 2.50		
Education level				1.767	.155
Primary and below	29	16.9	12.90 \pm 2.96		
Secondary school	58	33.7	11.79 \pm 3.05		
High school/technical Secondary school	63	36.6	12.38 \pm 3.04		
College and above	22	12.8	11.18 \pm 2.70		
Per capita monthly income, RMB				4.557	.012
<2,500	31	18.0	12.55 \pm 2.81		
2,500-3,500	108	62.8	12.42 \pm 2.97		
>3,500	33	19.2	10.73 \pm 3.00		
Residence				2.523	.013
City	71	41.3%	11.44 \pm 2.85		
Village	101	58.7%	12.59 \pm 3.04		
Marital status				4.031	<0.001
Married	111	64.5	11.46 \pm 2.89		
Single/Widowed	61	35.5	13.31 \pm 2.86		
Living situation				2.098	.037
Living alone	47	27.3	12.89 \pm 2.96		
Live with children	125	72.7	11.82 \pm 2.99		
Pain level				-2.204	.029
Mild pain	60	35.0	11.43 \pm 3.10		
Medium pain/Severe pain	112	65.0	12.48 \pm 2.91		
Hypertension				-0.799	.426
Have	111	64.5	12.25 \pm 2.99		
No	61	35.5	11.87 \pm 3.06		
Diabetes				0.200	.842
Have	110	64.0	12.08 \pm 2.97		
No	62	36.0	12.18 \pm 3.09		
Smoking				-0.499	.619
Have	65	37.9	11.97 \pm 3.02		
No	107	62.2	12.21 \pm 3.01		

Abbreviations: BMI, body mass index; PSQI, Pittsburgh Sleep Quality Index.

questionnaire, we informed the patients that it was anonymous, and informed them of the research purpose as well as the directions for filling it in. The patients filled out and returned the

questionnaires on the spot, and informed consent was obtained from all participants. As some elderly people in this survey had a low education level and decreased eyesight, the researcher

combined the data collection with the interview survey method and helped them to fill in the questionnaire. A total of 181 questionnaires were distributed and 172 were received with an effective recovery rate of 95.03%.

3.3 | Measurements

3.3.1 | Demographic characteristics

The participants' demographic characteristics included age, gender, height, weight, education level, per capita monthly income, marital status, living situation, residence, pain level, as well as history of hypertension, diabetes and smoking. Pain values were derived from the use of numerical rating scale (NRS) results during the admission nursing assessment. A score of 1–3 was mild pain level, 4–6 was medium pain level, and 7–10 was severe pain level. Some of the preceding information came from electronic medical record (EMR). Otherwise, the participant orally provided it.

3.3.2 | Pittsburgh Sleep Quality Index (PSQI)

The Chinese version of the Pittsburgh Sleep Quality Index (PSQI) (Buysse et al., 1989) was used to assess the sleep quality of individuals over the past month. This consists of 19 items divided into seven dimensions, which include subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, daytime dysfunction and use of sleep medication. Total scores can range from 0 to 21 with higher scores representing poorer sleep quality. A score of >7 indicated the presence of sleep disorders. In this study, Cronbach's α of this version was .756.

3.3.3 | Perceived Social Support Scale (PSSS)

The Perceived Social Support Scale (PSSS) (Zimet et al., 1988) was used to measure individual feelings and perceptions of multilevel social support. This scale consists of 12 items divided into three dimensions, which include family, friends, and significant others (with four items in each sub-scale). It uses a seven-point scoring system that ranges from 1 to 7 points from very strongly disagree to very strongly agree. Total scores can range from 12 to 84, with higher scores representing higher levels of perceived social support. In this study, Cronbach's α was .868.

3.3.4 | Psychological Inflexibility in Pain Scale (PIPS)

The Chinese version of the Psychological Inflexibility in Pain Scale (PIPS) (Xie et al., 2021) was used to measure PF in patients with chronic pain. This scale consists of 12 items divided into eight items

assessing pain avoidance and four items assessing cognitive fusion. A seven-point scoring system is used, ranging from 1 to 7 points from never true to always true. Total scores can range from 12–84, with higher scores representing poorer levels of PF. In this study, Cronbach's α was .846.

3.4 | Data analysis

SPSS 25.0 was used to conduct statistical analysis. Descriptive statistics, which include frequencies, percentages (%), mean and standard deviation (SD), were used for the demographic characteristics of ASO patients and the scores of each scale. Two independent samples *t* tests or one-way ANOVA were used to compare the sleep quality of patients with ASO to identify differences in demographic characteristics, and statistically significant variables were included in linear regression analysis. Pearson's correlation coefficient was used to analyse the correlations between sleep quality, PSS and PF. A simple mediational model (Model 4) with 5,000 bootstraps using PROCESS of SPSS 25.0 was implemented to test the mediating effect. Statistical significance was inferred when the 95% confidence interval (CI) did not include 0. In addition, $p < .05$ for all tests was considered statistically significant.

3.5 | Ethical considerations

The study was approved by the ethics committee of the hospital (NO. 202060).

4 | RESULTS

4.1 | Description of participants

Table 1 shows the demographic characteristics of the participants. The mean age of patients was 71.99 ± 5.96 years, and 75.6% were males. Half of the patients were a normal weight. A total of 22 patients (12.8) were college graduates. There were 108 patients (62.8%) who earned 2,500–3,500 RMB per month, and 101 patients (58.7%) lived in villages. Approximately 64.5% of patients

TABLE 2 Correlation analysis of PIPS, PSSS and PSQI scores in ASO patients

	PIPS	PSSS	PSQI
PIPS	1		
PSSS	-0.405 ^a	1	
PSQI	0.553 ^a	-0.577 ^a	1

Abbreviations: PIPS, Psychological Inflexibility in Pain Scale; PSQI, Pittsburgh Sleep Quality Index; PSSS, Perceived Social Support Scale.
^a $p < .01$.

were married, while 47 patients (27.3%) lived alone. There were 60 patients (35.0%) who were in mild pain. The number of patients diagnosed with hypertension and diabetes were 111 (64.5%) and 110 (64.0%), respectively. There were 65 patients (37.9%) who were current smokers.

4.2 | Comparative analysis of sleep quality among ASO patients with different characteristics

The PSQI mean scores of all patients was 12.12 ± 3.01 . There were statistically significant differences in age, per capita monthly income, residence, marital status, living situation and pain level (Table 1).

4.3 | Correlation analysis of PIPS, PSQI and PSSS

Patients' sleep quality was positively correlated with PF ($r = .553$, $p < .01$). However, it was negatively correlated with PSS ($r = -.577$, $p < .01$) (Table 2).

4.4 | Mediating effect analysis

Mediating effects were tested for the relationship between PF in PSS and sleep quality, controlling for age, monthly per capita income, residence, marital status and living situation. The results showed that PSS had a significant effect on sleep quality ($\beta = -.211$, $p < .001$). The direct effect of PSS on sleep quality remained significant after the mediation of PF was included ($\beta = -.147$, $p < .001$). PSS had a significant negative impact on PF ($\beta = -.376$, $p < .001$), and PF had a significant positive impact on sleep quality ($\beta = .169$, $p < .001$), as shown in Table 3 and Figure 2. The upper and lower limits of bootstraps 95% CI of the mediating effect of PF did not include 0, indicating that PSS could not only directly predict sleep quality but also indirectly predict sleep quality through the mediating effect of PF. The mediating effect ($\beta = -.064$) accounted for 30.33% of the total effect ($\beta = -.211$), as shown in Table 4.

TABLE 3 Regression analysis of perceived social support, psychological flexibility and sleep quality in ASO patients

Regression equation		Fitting index			Regression coefficient significance		
Outcome variable	Predictor variables	R ²	R ² change	F	β	t	p
PSQI ^a	PSSS	.418	.393	16.812*	-.211	-7.784	<.001
PIPS ^a	PSSS	.320	.291	11.031*	-.376	-6.167	<.001
PSQI ^a	PSSS	.502	.478	20.568*	-.147	-5.263	<.001
	PIPS				.169	4.717	<.001

Abbreviations: PIPS, Psychological Inflexibility in Pain Scale; PSQI, Pittsburgh Sleep Quality Index; PSSS, Perceived Social Support Scale.

^aStatistically significant demographic characteristics were included in the linear regression, including age, per capita monthly income, residence, marital status, living conditions and pain level.

* $p < .001$.

5 | DISCUSSION

5.1 | Sleep quality of ASO patients

This study showed that the average sleep quality score of ASO patients was 12.12 ± 3.01 , which was worse than that of other patients (Alhalal et al., 2021). There were 35% of patients with mild pain, but their sleep quality score was 11.43 ± 3.10 , which still indicated sleep disturbance. This study (Haack et al., 2020) shows that pain is a significant influencing factor of sleep quality, chronic pain is highly comorbid with sleep disturbance, and there is a well-established bidirectional relationship between sleep disturbance and pain. This may be related to the nocturnal resting pain symptom of ASO, which causes patients to experience disrupted sleep at night, making it difficult for them to fall asleep again. Meanwhile, sleep deprivation lowers pain thresholds, decreases cognitive ability to cope with pain and increases pain perception, which exacerbates poor sleep (Duan et al., 2021). Therefore, these patients' sleep quality is poor in comparison with other patients. This study also found that women had poorer sleep quality than men. However, there was no significant difference in overall sleep quality between men and women, which was consistent with Tang (Tang et al., 2017) and Keilani (Keilani et al., 2018). We also reached an interesting conclusion, which was that hypertension had no significant effect on sleep quality in this study, which was inconsistent with Yang (Yang et al., 2021). This may be related to the pathogeny of ASO. In addition, as hypertension is one of the important causes of atherosclerosis, as a risk factor for this disease, 64.5% of patients had hypertension, which did not demonstrate a significant difference.

5.2 | Psychological flexibility and perceived social support are strongly associated with sleep quality

The results of this study showed that when ASO patients have lower levels of PSS, they tend to have worse sleep quality. The two factors are negatively correlated ($r = -.577$, $p < .01$), which is consistent with previous studies (Hao et al., 2021; Seol et al., 2021). The reason for

this if patients receive less understanding and support from their society, family and friends, they are more likely to deal with this disease negatively, which reduces their confidence in disease recovery (Fivecoat et al., 2018; Liu et al., 2021). It also amplifies their negative emotions during the disease progression, which reduces their sleep quality (Grey et al., 2020). The results of this study indicate that the sleep quality of ASO patients was usually worse when their PF was lower, and these two factors were positively correlated ($r = .553, p < .01$), which is consistent with the results of previous studies (Daly-Eichenhardt et al., 2016; Kato, 2020). Avoidance behaviour is a natural human reaction, but excessive avoidance leads to psychological rigidity (Dawson & Golijani-Moghaddam, 2020). Patients with low PF are sensitive to insomnia, pay close attention to their sleep and try to eliminate it. However, when individuals do this more deliberately by focusing on sleep while aggravating their psychological inflexibility, they are more likely to use pessimistic and avoidance coping methods, which aggravates their sleep problems and forms a vicious cycle. High PSS and PF are closely related ($r = -.405, p < .01$). The physiological function and adaptability of ASO patients decreased with their increased age, and the support from their surrounding care was less sensitive, which decreased their PSS level. Furthermore, their cognitive functions weakened, and their comprehension ability gradually declined, causing them to easily become depressed and worried about their disease prognosis, which aggravated their psychological inflexibility (Shi et al., 2016). If patients can receive enough material and emotional support from society, family and friends, they can maintain a good healthy mindset (Fu et al., 2022). This suggests that medical staff can establish a social support path that involves acquiring both inpatient and outpatient core knowledge, strengthening inpatient ASO-related health

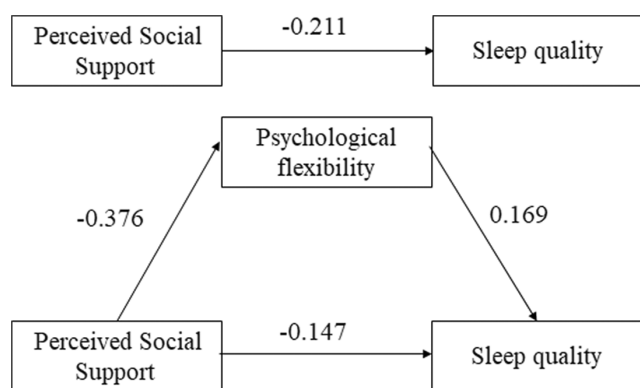


FIGURE 2 Mediating model and regression coefficient of psychological flexibility in the relationship between perceived social support and sleep quality

	Effect	Boot SE	Boot 95% CI	Relativistic effect
Total effect	-0.211	0.027	-0.264 ~ -0.157	
Direct effect	-0.147	0.028	-0.202 ~ -0.092	69.67%
Indirect effect	-0.064	0.017	-0.099 ~ -0.035	30.33%

education and treatment knowledge, and reducing fear resulting from diseases. Strengthening psychological counselling for ASO patients can relieve their disease stress by providing them with relaxation training and other methods. Other approaches include urging family members, relatives and friends to give prompt emotional and material support to patients, improve patients' confidence in their disease recovery, maintain their healthy psychological state and improve their sleep quality.

5.3 | Psychological flexibility partially mediated the relationship between perceived social support and sleep quality

The mediating effect analysis showed that PSS negatively predicted sleep quality ($\beta = -.211, p < .001$), PF partially mediated the relationship between PSS and sleep quality ($\beta = -.064, p < .001$) and the mediating effect accounted for 30.33%. It also showed that PSS can not only directly and negatively predict sleep quality of ASO patients but can also indirectly and negatively predict sleep quality through PF. Disease is a negative life event, and some patients find it difficult to accept. A higher perceived vulnerability to disease leads to avoidant behaviour and social withdrawal, which results in lower psychological well-being (Mallett et al., 2021). At the same time, ASO impairs self-care ability and also needs family care and psychological support. However, unaccompanied care or family's anxiety about causing inconvenience and creating economic pressure for their children leads to severe cognitive distortions in patients (Fu et al., 2022). This affects their social interactions and working conditions and also reduces their degree of social support and increases their psychological burden, which ultimately reduces their sleep quality. On the contrary, social support is an important external resource for maintaining an individual's physical and mental health and can reduce the negative effects of stressful events (Zheng et al., 2021). When patients receive social support such as material security, emotional support and psychological assistance from spouse, children, friends and relatives (Xie et al., 2020), which can increase their sense of security and confidence in restoring their health, thus improving their sleep quality. With the dramatic increase in the number of empty nesters, mental health problems caused by the lack of spouse's or children's companionship for the elderly are frequent, so patients with low social support are more likely to have negative emotions. (Tang et al., 2022). These cause the patient to obsess about the fear created due to the disease, making them psychologically inflexible. Their subsequent mental stress creates high levels of activity in the hypothalamic-pituitary-adrenal (HPA) axis, which tends to impede

TABLE 4 Analysis of the mediating role of psychological flexibility on the relationship between social support comprehension and sleep quality in ASO patients

sleep onset and maintenance (Peltz et al., 2020). Therefore, reasonable and effective measures must be taken to continuously improve PSS and reduce PF to improve the sleep quality of ASO patients. In terms of PSS, the hospital can create a healthy environment for patients, patients can communicate with and encourage each other, family and friends can strengthen their emotional care and material help for these patients, and they can constantly improve the level of PSS for patients. Based on the premise that physical conditions allow, patients should actively participate in outdoor activities. These can not only enable them conducive to recover their physical functions but can also aid them with actively integrating into society, maintaining a positive attitude, reducing their negative emotions and improving their psychological inflexibility, which can improve their sleep quality.

6 | LIMITATIONS

This study had several limitations in this study. First, its cross-sectional design meant that it was not possible to rely on the results to deduce causality or vertically track and verify the causal relationship of the sleep quality of ASO patients. Secondly, the population of this study was from one Chinese province. As each part of China may express differences in ASO patients, it is necessary to further expand the sample size of this study to verify its conclusions. Thirdly, the questionnaire for this study was collected with self-reporting, which may have caused recall bias. In addition, because PF and PSS can influence each other, this study only analysed the mediating role of PF in PSS and sleep quality, without investigating the two-way influence mechanism between PF and PSS, and we will further analyse it according to the relevant theories in future studies.

7 | CONCLUSION

This study demonstrated that PSS impacts PF and sleep quality, in which PF mediates the relationship between PSS and sleep quality. Its results help to provide a more in-depth understanding of how PSS affects sleep. In addition to the influence of disease symptoms on sleep, health professionals should realize that the psychological and physical needs of patients are equally important. Furthermore, they need to implement measures to meet these patients' positive psychological needs, increase their PSS level and enhance their sleep quality.

AUTHOR CONTRIBUTIONS

YL and YJY designed the study. HYG and YYY analyse the data. CYZ, LIB and ZFZ are responsible for collecting questionnaires. LIB and ZFZ are responsible for data entry. YL drafted the manuscript.

All authors have agreed on the final version and meet at least one of the following criteria [recommended by the ICMJE (<http://www.icmje.org/recommendations/>)]:

- substantial contributions to conception and design, acquisition of data or analysis and interpretation of data.
- drafting the article or revising it critically for important intellectual content.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

DATA AVAILABILITY STATEMENT

Research data is not shared.

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REFERENCES

- Alhalal, E. A., Alhalal, I. A., Alaida, A. M., Alhweity, S. M., Alshojaa, A. Y., & Alfaori, A. T. (2021). Effects of chronic pain on sleep quality and depression: A cross-sectional study. *Saudi Medical Journal*, 42(3), 315–323. <https://doi.org/10.15537/smj.42.3.20200768>
- Buyse, D. J., Reynolds, C. F., 3rd, Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. *Psychiatry Research*, 28(2), 193–213. [https://doi.org/10.1016/0165-1781\(89\)90047-4](https://doi.org/10.1016/0165-1781(89)90047-4)
- Daly-Eichenhardt, A., Scott, W., Howard-Jones, M., Nicolaou, T., & McCracken, L. M. (2016). Changes in sleep problems and psychological flexibility following interdisciplinary acceptance and commitment therapy for chronic pain: An observational cohort study. *Frontiers in Psychology*, 7, 1326. <https://doi.org/10.3389/fpsyg.2016.01326>
- Dawson, D. L., & Golijani-Moghaddam, N. (2020). COVID-19: Psychological flexibility, coping, mental health, and wellbeing in the UK during the pandemic. *Journal of Contextual Behavioral Science*, 17, 126–134. <https://doi.org/10.1016/j.jcbs.2020.07.010>
- Duan, H., Wang, Y. J., & Lei, X. (2021). The effect of sleep deprivation on empathy for pain: An ERP study. *Neuropsychologia*, 163, 108084. <https://doi.org/10.1016/j.neuropsychologia.2021.108084>
- Fivecoat, H. C., Sayers, S. L., & Riegel, B. (2018). Social support predicts self-care confidence in patients with heart failure. *European Journal of Cardiovascular Nursing*, 17(7), 598–604. <https://doi.org/10.1177/1474515118762800>
- Fu, L. T., Men, R. X., Fan, Z. G., Zheng, S. S., & An, Q. Q. (2022). Effects of perceived social support on sleep quality in older adults: Mediating and moderating effects of ruminative thinking. *Chinese Journal of Gerontology*, 42(1), 208–211. <https://doi.org/10.3969/j.issn.1005-9202.2022.01.055>
- Grey, I., Arora, T., Thomas, J., Saneh, A., Tohme, P., & Abi-Habib, R. (2020). The role of perceived social support on depression and sleep during the COVID-19 pandemic. *Psychiatry Research*, 293, 113452. <https://doi.org/10.1016/j.psychres.2020.113452>
- Haack, M., Simpson, N., Sethna, N., Kaur, S., & Mullington, J. (2020). Sleep deficiency and chronic pain: potential underlying mechanisms and

- clinical implications. *Neuropsychopharmacology*, 45(1), 205–216. <https://doi.org/10.1038/s41386-019-0439-z>
- Hao, X., Li, M., Li, J., Lv, M., Qin, Y., & Li, K. (2021). Sleep quality in relation to social support and resilience among rural empty-nest older adults in China. *Sleep Medicine*, 82, 193–199. <https://doi.org/10.1016/j.sleep.2021.03.026>
- Kashdan, T. B., & Rottenberg, J. (2010). Psychological flexibility as a fundamental aspect of health. *Clinical Psychology Review*, 30(7), 865–878. <https://doi.org/10.1016/j.cpr.2010.03.001>
- Kato, T. (2020). Effect of psychological inflexibility on depressive symptoms and sleep disturbance among Japanese young women with chronic pain. *International Journal of Environmental Research and Public Health*, 17(20), 7426. <https://doi.org/10.3390/ijerph17207426>
- Keilani, M., Crevenna, R., & Dorner, T. E. (2018). Sleep quality in subjects suffering from chronic pain. *Wiener Klinische Wochenschrift*, 130(1–2), 31–36. <https://doi.org/10.1007/s00508-017-1256-1>
- Lao, X. Q., Liu, X., Deng, H. B., Chan, T. C., Ho, K. F., Wang, F., Vermeulen, R., Tam, T., Wong, M. C. S., Tse, L. A., Chang, L. Y., & Yeoh, E. K. (2018). Sleep quality, sleep duration, and the risk of coronary heart disease: A prospective cohort study with 60,586 adults. *Journal of Clinical Sleep Medicine*, 14(1), 109–117. <https://doi.org/10.5664/jcsm.6894>
- Laopoulou, F., Kelesi, M., Fasoi, G., Vasilopoulos, G., & Polikandrioti, M. (2020). Perceived social support in individuals with diabetic foot ulcers: A cross-sectional survey. *Journal of Wound, Ostomy, and Continence Nursing*, 47(1), 65–71. <https://doi.org/10.1097/WON.0000000000000614>
- Lee, G. S., Kim, H. K., & Kim, M. E. (2022). Relevance of sleep, pain cognition, and psychological distress with regard to pain in patients with burning mouth syndrome. *Cranio*, 40(1), 79–87. <https://doi.org/10.1080/08869634.2019.1681621>
- Lee, S., Kim, J. H., & Chung, J. H. (2021). The association between sleep quality and quality of life: A population-based study. *Sleep Medicine*, 84, 121–126. <https://doi.org/10.1016/j.sleep.2021.05.022>
- Liu, J., Wei, W., Peng, Q., & Guo, Y. (2021). How does perceived health status affect depression in older adults? Roles of attitude toward aging and social support. *Clinical Gerontologist*, 44(2), 169–180. <https://doi.org/10.1080/07317115.2019.1655123>
- Lund, H. G., Reider, B. D., Whiting, A. B., & Prichard, J. R. (2010). Sleep patterns and predictors of disturbed sleep in a large population of college students. *The Journal of Adolescent Health*, 46(2), 124–132. <https://doi.org/10.1016/j.jadohealth.2009.06.016>
- Lupilov, A., Krause, D., Klaassen-Mielke, R., Trampisch, H. J., & Rudolf, H. (2021). Effects of three different methods defining onset of peripheral artery disease on the assessments of incidence and important predictors – results from the German epidemiological trial on ankle brachial index (getABI). *Vascular Health and Risk Management*, 17, 421–429. <https://doi.org/10.2147/VHRM.S307675>
- Mallett, R., Coyle, C., Kuang, Y., & Gillanders, D. T. (2021). Behind the masks: A cross-sectional study on intolerance of uncertainty, perceived vulnerability to disease and psychological flexibility in relation to state anxiety and wellbeing during the COVID-19 pandemic. *Journal of Contextual Behavioral Science*, 22, 52–62. <https://doi.org/10.1016/j.jcbs.2021.09.003>
- McCracken, L. M., Williams, J. L., & Tang, N. K. (2011). Psychological flexibility may reduce insomnia in persons with chronic pain: A preliminary retrospective study. *Pain Medicine*, 12(6), 904–912. <https://doi.org/10.1111/j.1526-4637.2011.01115.x>
- Ong, J. C., Ulmer, C. S., & Manber, R. (2012). Improving sleep with mindfulness and acceptance: A metacognitive model of insomnia. *Behaviour Research and Therapy*, 50(11), 651–660. <https://doi.org/10.1016/j.brat.2012.08.001>
- Peltz, J. S., Daks, J. S., & Rogge, R. D. (2020). Mediators of the association between COVID-19-related stressors and parents' psychological flexibility and inflexibility: The roles of perceived sleep quality and energy. *Journal of Contextual Behavioral Science*, 17, 168–176. <https://doi.org/10.1016/j.jcbs.2020.07.001>
- Qian, Y., Sun, L., Zhou, C., Ge, D., & Zhang, L. (2017). The association between suicidal ideation and sleep quality in elderly individuals: A cross-sectional study in Shandong, China. *Psychiatry Research*, 256, 453–457. <https://doi.org/10.1016/j.psychres.2017.07.017>
- Seol, J., Lee, J., Nagata, K., Fujii, Y., Joho, K., Tateoka, K., Inoue, T., Liu, J., & Okura, T. (2021). Combined effect of daily physical activity and social relationships on sleep disorder among older adults: cross-sectional and longitudinal study based on data from the Kasama study. *BMC Geriatrics*, 21(1), 623. <https://doi.org/10.1186/s12877-021-02589-w>
- Shi, X. X., Wang, G. W., Qi, Y. L., Zhang, X. M., Gao, H., Fu, C., Du, Y. J., & Li, W. (2016). Quality of life and influencing factors of the elderly in urban communities in Shandong Province. *Chinese Journal of Gerontology*, 36(8), 1972–1974. <https://doi.org/10.3969/j.issn.1005-9202.2016.08.088>
- Song, P., Rudan, D., Zhu, Y., Fowkes, F. J. I., Rahimi, K., Fowkes, F. G. R., & Rudan, I. (2019). Global, regional, and national prevalence and risk factors for peripheral artery disease in 2015: An updated systematic review and analysis. *The Lancet Global Health*, 7(8), e1020–e1030. [https://doi.org/10.1016/S2214-109X\(19\)30255-4](https://doi.org/10.1016/S2214-109X(19)30255-4)
- Tang, J., Liao, Y., Kelly, B. C., Xie, L., Xiang, Y. T., Qi, C., Pan, C., Hao, W., Liu, T., Zhang, F., & Chen, X. (2017). Gender and regional differences in sleep quality and insomnia: A general population-based study in Hunan province of China. *Scientific Reports*, 7, 43690. <https://doi.org/10.1038/srep43690>
- Tang, M. L., Chen, C. Y., Wu, Y. X., Xu, W. L., & Feng, Z. C. (2022). Based on PLS-SEM analysis of risk prevention influencing factors for the elderly. *Chinese Journal of Health Statistics*, 39(3), 413–416+421. <https://doi.org/10.3969/j.issn.1002-3674.2022.03.020>
- Thoits, P. A. (2011). Mechanisms linking social ties and support to physical and mental health. *Journal of Health and Social Behavior*, 52(2), 145–161. <https://doi.org/10.1177/0022146510395592>
- Wang, F., Mao, X., Li, C., & Man, W. (2021). Mediating effect of mental flexibility on health perception and quality of life in elderly patients with chronic pain. *Journal of Nursing*, 28(11), 51–55. <https://doi.org/10.16460/j.issn1008-9969.2021.11.051>
- Wang, Z., Wang, X., Hao, G., Chen, Z., Zhang, L., Shao, L., Tian, Y., Dong, Y., Zheng, C., Kang, Y., Gao, R., & China hypertension survey investigators. (2019). A national study of the prevalence and risk factors associated with peripheral arterial disease from China: The China hypertension survey, 2012–2015. *International Journal of Cardiology*, 275, 165–170. <https://doi.org/10.1016/j.ijcard.2018.10.047>
- Xie, C. J., Xu, X. H., Ou, M. J., & Chen, Y. Y. (2021). Chinese version of the psychological inflexibility in pain scale for cancer patients reporting chronic pain. *Cancer Nursing*, 44(3), 180–189. <https://doi.org/10.1097/NCC.0000000000000772>
- Xie, Z., Liu, K., Or, C., Chen, J., Yan, M., & Wang, H. (2020). An examination of the socio-demographic correlates of patient adherence to self-management behaviors and the mediating roles of health attitudes and self-efficacy among patients with coexisting type 2 diabetes and hypertension. *BMC Public Health*, 20(1), 1227. <https://doi.org/10.1186/s12889-020-09274-4>
- Yang, B., Wang, Y., Cui, F., Huang, T., Sheng, P., Shi, T., Huang, C., Lan, Y., & Huang, Y. N. (2018). Association between insomnia and job stress: A meta-analysis. *Sleep & Breathing*, 22(4), 1221–1231. <https://doi.org/10.1007/s11325-018-1682-y>
- Yang, Z., Heizhati, M., Wang, L., Li, M., Pan, F., Wang, Z., Abudureyimu, R., Hong, J., Yao, L., Yang, W., Liu, S., & Li, N. (2021). Subjective poor sleep quality is associated with higher blood pressure and prevalent hypertension in general population independent of sleep disordered breathing. *Nature and Science of Sleep*, 13, 1759–1770. <https://doi.org/10.2147/NSS.S329024>
- Zhao, Y., Hu, B., Liu, Q., Wang, Y., Zhao, Y., & Zhu, X. (2021). Social support and sleep quality in patients with stroke: The mediating roles of

- depression and anxiety symptoms. *International Journal of Nursing Practice*, e12939, e12939. <https://doi.org/10.1111/ijn.12939>
- Zheng, S. S., Men, R. X., Fan, Z. G., Fu, L. T., & Wan, T. L. (2021). The effect of perceived social support on depression in older adults: The mediating and moderating role of optimism. *Chinese Journal of Gerontology*, 41(16), 3557–3561. <https://doi.org/10.3969/j.issn.1005-9202.2021.16.046>
- Zimet, G., Dahlem, N., Zimet, S., & Farley, G. (1988). The multidimensional scale of perceived social support. *Journal of Personality Assessment*, 52, 30–41. https://doi.org/10.1207/s15327752jpa5201_2

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