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Research Article

Multifactor Analysis of Insomnia Influences: Predictive Effects of Patients' Lifestyle and Health Status in China

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Abstract

Introduction: This study aims to investigate the effects of different lifestyles, health conditions, and environmental factors on insomnia through a multifactor comprehensive analysis based on data from patients in China. Methods: The study consists of two parts: Study 1 used interviews to collect information on living habits, health conditions, and sleep environments from 97 individuals with poor sleep. Study 2 employed a questionnaire survey method to analyze insomnia-related data from 300 patients. Results: Using Spearman correlation analysis and binary logistic regression analysis, the study identifies significant correlations between insomnia and factors such as age, sleep environment, sleep habits, tea drinking, coffee drinking, night snacking, and watching videos before bed. An increase in age significantly correlates with a decrease in insomnia incidence ($B = -0.34$, $p<0.01$); A good sleep environment ($B = 1.23$, $p<0.01$) and regular sleep habits ($B = 1.03$, $p<0.01$) can significantly reduce the risk of insomnia; Conversely, drinking tea ($B = -0.68$, $p<0.05$), drinking coffee ($B = -0.94$, $p<0.05$), night snacking ($B = -1.15$, $p<0.01$), and watching videos before bed ($B = 1.46$, $p<0.01$) significantly heighten the risk of insomnia. Discussion: This study mainly investigates the impact of various factors like lifestyle habits, health conditions, and sleep environment on insomnia. Study 1, through interviews and subsequent analysis, identified 24 factors that might relate to sleep; Study 2, through surveys and analysis, found that age, sleep environment, sleep habits, tea drinking, coffee drinking, late-night snacking, and watching videos before bed formed a valid logistic regression prediction model for insomnia. Implications: This study supports the comprehensive effects of multiple factors on insomnia and underscores the importance of optimizing living habits and environment to enhance sleep quality. Future research may consider further investigating the effects of different factors on insomnia and exploring interventions and treatments for insomnia.

Keywords

Insomnia, Lifestyle, Health Status, Sleep Environment, Logistic Regression

1. Introduction

Insomnia is a prevalent sleep disorder impacting a vast population globally. Insomnia is generally defined as a disorder involving excessive arousal during both night and day, acting as both a cause and consequence of insomnia, with cognitive, emotional, and physiological manifestations [1-5]. People with insomnia often describe themselves as exces-

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sively anxious, mentally confused, and selectively attentive to stimuli [6, 7]. The physiological hyperarousal in insomnia patients is evidenced by increased metabolic rate, elevated cortisol levels, higher whole-brain glucose consumption during wakefulness and sleep, elevated blood pressure during sleep, and increased high-frequency EEG activity [8]. It is reported that around 30%-35% of adults experience short-term insomnia, while 10%-16% are affected by long-term insomnia [2, 4]. Insomnia not only affects individuals' daily functioning but is also closely associated with various psychological and physiological disorders, such as depression, anxiety, and cardiovascular diseases [6, 7]. Consequently, insomnia is widespread and its detrimental impacts are significant; comprehending the various factors influencing insomnia is essential for developing effective prevention and treatment strategies.

Living habits are a key factor influencing sleep quality [5, 9]. For example, research on factors related to insomnia among Japanese truck drivers found, via a cross-sectional survey, that habits like drinking, smoking, long working hours, lack of exercise, and irregular sleep patterns are significantly associated with their insomnia symptoms [1, 10]. Additionally, an analysis of the association between insomnia and lifestyle among college students during COVID-19 isolation found that diet, sleep, and internet usage significantly modulate insomnia symptoms [11]. These results indicate that modifying lifestyle habits could be a crucial method for enhancing sleep quality. Therefore, it is necessary to explore and analyze the impact of various living habits on insomnia.

The relationship between health conditions and insomnia has also been widely studied. Numerous studies have found that chronic diseases such as diabetes, heart disease, and chronic pain often accompany insomnia symptoms [10, 12, 13]. Furthermore, in terms of mental health, psychological issues such as anxiety and depression are closely related to insomnia [14-16]. Therefore, physical and mental health conditions profoundly affect sleep quality and should be considered in the treatment of insomnia，and it would be worthwhile to further explore the effects of such factors on insomnia.

The impact of the sleep environment on insomnia is equally important. Studies have found that the comfort of the sleep environment, such as the lighting, noise, and temperature of the bedroom, directly affects sleep quality [17-19]. It is worth mentioning that a study on Croatian medical and non-medical students during the COVID-19 lockdown found that students' sleep quality generally declined, especially among medical students, whose sleep habits, physical activity, and mental health were more adversely impacted [9]. These results suggest that the sleep environment may also be closely related to insomnia，and it is worth exploring the effect of such factors on insomnia.

This study aims to comprehensively investigate the effects of factors such as lifestyle habits, health conditions, and sleep environment on insomnia. We used interviews and questionnaires to systematically collect relevant data for statistical analysis, revealing the relationships between various factors and insomnia. This research not only corroborates previous findings but also offers new evidence to understand the multifactorial impacts on insomnia. Through in-depth analysis of the impact of living habits, health conditions, and sleep environment on insomnia, this research provides a scientific foundation for creating more comprehensive and personalized insomnia interventions. Understanding the combined effects of these factors can help healthcare professionals better identify and manage insomnia patients, enhancing treatment outcomes and improving patients' quality of life.

2. Study 1: Investigation and Analysis of Factors Affecting Insomnia

Study 1 primarily used interviews to investigate insomnia patients and identify potential factors related to insomnia.

2.1. Methods

Population and sample: The study recruited 100 patients with poor sleep from the Acupuncture and Tuina Rehabilitation Clinic of the First Affiliated Hospital of Yunnan University of Chinese Medicine and the Acupuncture Department of the Cooperation of Chinese and Western Medicine Hospital of Yunnan Province, for interviews regarding insomnia-related factors. Specifically, the study employed "snowball" interview information collection and frequency statistics to interview 100 individuals with sleep difficulties. Due to incomplete information from 3 respondents, the final data set included 97 participants (35 males, 62 females).

Instruments: Based on the concept of insomnia, defined as a disorder characterized by difficulty falling asleep, reduced sleep duration, decreased sleep quality, or decreased memory and attention, leading to daytime fatigue, decreased work efficiency, increased drowsiness during rest, and, over time, symptoms like palpitations, chest tightness, headaches, abdominal bloating, diarrhea, autonomic dysfunction, decreased immunity, and endocrine dysfunction, the study used the Pittsburgh Sleep Quality Index for diagnosis and conducted related interviews [3, 5, 8, 20-22]. The main interview questions involved demographic information (such as gender, age, education level), daily living habits, work conditions, pre-sleep behaviors, physical and mental health status, and sleep habits and environment, using semi-structured and open-ended interviews to gather relevant information.

Process: The study invited patients with poor sleep to complete the Pittsburgh Sleep Quality Index in a specially prepared quiet and comfortable room to assess their sleep quality. Based on this, following the principle of informed consent, the study investigated the actual factors affecting the participants' sleep over the past month according to the interview outline. Initially, using open-ended interviews, the researcher recorded demographic information, daily living

habits, work conditions, pre-sleep behaviors, physical and mental health status, and sleep habits and environment from the participants. Information was collected through a "snowball" method until no new influencing factors emerged [22, 23].

2.2. Results

The study compiled the information collected from the interviews and conducted frequency statistics, with results presented in Table 1.

Table 1. *Frequency Distribution of Various Influencing Factors.*

Influencing factor	Y	N
Gender	Female 35	Male 62
Occupation	44	53
Trait	50	47
IR	93	4
SE	73	24
CD	15	82
MC	49	48
ES	College or above 71	Junior College and below 26
SH	43	54
WS	59	38
Napping	57	40
EBD	19	78
Smoking	11	86
DA	19	78
DT	34	63
DC	25	72
ELNS	20	77
WVBS	88	9
DHCBS	25	72
CWBS	61	36
RBS	47	50
SFBS	44	53
Pain	16	81

Notes: IR = Interpersonal Relation, SE = Sleep Environment, CD = Chronic Diseases, MC = Mental Condition, ES = Educational Status, SH = Sleep Habits, WS = Work Stress, EBD = Exercising before Bed, DA = Drinking Alcohol, DC = Drinking Coffee, ELNS = Eating Late-night Snacks, WVBS = Watching Videos before Sleep, DHCBS = Doing Household Chores before Sleep, CWBS = Chatting on WeChat before Sleep, RBS = Reading before Sleep, SFBS = Soaking Feet before Sleep (The same below).

The analysis revealed that the participants' occupations spanned various industries, including healthcare workers, retirees, teachers, corporate employees, advertising professionals, construction workers, researchers, freelancers, and farmers.

Information related to "daily living habits" primarily included napping, smoking, drinking alcohol, drinking tea, drinking coffee, and eating late-night snacks. The interviews revealed that the participants' "work conditions" mainly reflected job stability and work stress levels. "Pre-sleep behaviors" mainly included exercising before bed, watching videos, doing household chores, chatting on WeChat, reading, and soaking feet before sleep.

"Physical and mental health status" primarily included fac-

tors such as whether the person had an irritable temperament, good interpersonal relationships, or chronic diseases or pain.

"Sleep habits and environment" mainly included whether sleep habits were stable and good, and whether the sleep environment was comfortable and pleasant.

Study 1 mainly investigated the factors influencing insomnia through interviews. The interviews and statistical analysis indicated that different factors, such as "demographic information," "daily living habits," "work conditions," "pre-sleep behaviors," "physical and mental health status," and "sleep habits and environment," could affect insomnia.

3. Study 2: Research on the Effects of Various Factors on Insomnia

Study 2 primarily utilized surveys to gather data on various factors and insomnia-related information, investigating the effects of these factors on insomnia.

3.1. Methods

Population and Sample

The study recruited patients concerned about sleep quality from the Acupuncture and Tuina Rehabilitation Clinic of the First Affiliated Hospital of Yunnan University of Chinese Medicine and the Acupuncture Department of the Cooperation of Chinese and Western Medicine Hospital of Yunnan Province, by having them fill out questionnaires, collecting data from 314 participants. These included patients with sleep issues and others.

Instruments

The "Questionnaire on Factors Influencing Insomnia" included 24 items, such as: gender (male or female), age (six options: 1≦30, 30≦2≦40, 40≦3≦50, 50≦4≦60, 60≦5≦70, 6>70, specifically: choose 1 for under 30, 2 for 30-40, 3 for 40-50, and so on, 6 for over 70), job stability (select "yes" if stable, "no" if frequently changing), and other items like chronic disease presence and sleep environment quality. For diagnosing insomnia, the study applied the Pittsburgh Sleep Quality Index for sleep quality assessment, with scores ≧7 indicating sleep problems. Participants diagnosed with insomnia scored 1, while those without scored 0.

Procedure

We introduced the study to patients at the Acupuncture and Tuina Rehabilitation Clinic of the First Affiliated Hospital of Yunnan University of Chinese Medicine and the Acupuncture Department of Yunnan Province Integrated Traditional and Western Medicine Hospital After obtaining patient consent and ensuring voluntary participation, participants filled out the questionnaire alone in a comfortable and quiet room. After completion, pairs of researchers entered the completed questionnaires into an Excel spreadsheet. This process obtained 314 questionnaires; after excluding 14 incomplete or improperly filled forms, 300 valid questionnaires remained, resulting in an efficiency rate of 95.5%. Following data collection, researchers input the data into SPSS27 for collinearity tests, correlation analysis, and logistic regression analysis.

3.2. Results

To examine the presence of multicollinearity issues between various factors and insomnia, the study initially analyzed "yes or no" factors such as gender, job stability, irritability, and insomnia, and then compiled the results into Table 2.

Examination showed that the variance inflation factor (VIF) between these influencing factors and insomnia had a maximum value of 2.40, which is below 10, suggesting no multicollinearity between these factors and insomnia, permitting further analysis [24].

Table 2. *Multicollinearity Diagnosis of Various Factors Influencing Insomnia.*

Model	Unstd. B	se	Std. Beta	t	p	Tolerance	VIF
gender	0.04	0.07	0.04	0.61	0.55	0.62	1.62
Age	-0.06	0.02	-0.24	-3.29	0.00	0.54	1.87
Occupation	0.06	0.08	0.05	0.70	0.48	0.50	1.99
Trait	0.09	0.06	0.10	1.64	0.10	0.79	1.27
IR	-0.07	0.08	-0.06	-0.85	0.40	0.54	1.84
SE	0.18	0.07	0.17	2.47	0.01	0.62	1.62
CD	0.03	0.06	0.03	0.53	0.60	0.67	1.49
MC	0.04	0.07	0.04	0.61	0.54	0.66	1.52
ES	0.02	0.06	0.02	0.31	0.76	0.61	1.64
SH	0.19	0.06	0.20	3.26	0.00	0.73	1.37

Model	Unstd. B	se	Std. Beta	t	p	Tolerance	VIF
WS	0.05	0.06	0.06	0.86	0.39	0.69	1.46
Napping	0.01	0.05	0.01	0.23	0.82	0.82	1.22
EBD	-0.03	0.08	-0.02	-0.35	0.73	0.61	1.63
Smoking	-0.08	0.08	-0.08	-0.99	0.32	0.50	2.00
DA	0.07	0.09	0.07	0.81	0.42	0.42	2.40
DT	-0.14	0.06	-0.14	-2.23	0.03	0.70	1.43
DC	-0.18	0.09	-0.15	-2.15	0.03	0.59	1.70
ELNS	-0.21	0.07	-0.19	-2.78	0.01	0.64	1.58
WVBS	0.22	0.06	0.23	3.45	0.00	0.63	1.58
DHCBS	0.06	0.06	0.06	0.96	0.34	0.77	1.30
CWBS	0.06	0.06	0.07	1.02	0.31	0.62	1.61
RBS	-0.06	0.06	-0.06	-0.93	0.35	0.74	1.36
SFBS	0.00	0.05	0.00	0.04	0.97	0.86	1.16
Pain	0.10	0.06	0.10	1.61	0.11	0.74	1.36

Notes: * indicates P＜0.05; ** indicates P＜0.01; *** indicates P＜0.001.

3.2.1. Spearman Correlation Analysis of Various Influencing Factors and Insomnia

To test the correlation between different influencing factors and insomnia, and considering the data's non-normal distribution, the study conducted a non-parametric Spearman correlation analysis on insomnia and various influencing factors, as shown in Table 3.

Table 3. *Spearman Correlation Analysis of Various Influencing Factors and Insomnia.*

	1	2	3	4	5	6	7	8	9	10	11	12
1Insomnia	1											
2gender	0.02	1										
3Age	-.16**	-0.05	1									
4Occupation	0.05	.27**	.13*	1								
5Trait	.15**	.18**	.10*	.35**	1							
6IR	0.03	.21**	-0.04	.50**	.19**	1						
7SE	.17**	.16**	0.03	.34**	.15**	.35**	1					
8CD	.13*	0.03	-.39**	-0.02	-0.01	.26**	.16**	1				
9MC	.14**	.14**	-.16**	.32**	.14**	.39**	.38**	.27**	1			
10ES	-0.06	0.02	.34**	.19**	0.06	0.08	0.06	-0.06	0.03	1		
11SH	.20**	.10*	.13*	.24**	.23**	.26**	.40**	-0.02	.22**	0.05	1	
12WS	0.04	.25**	.26**	.29**	.27**	.19**	.18**	-0.06	0.03	.25**	.18**	1
13Napping	-0.06	-0.09	0.05	.12*	-0.05	.11*	0.09	0.05	-0.03	.25**	-0.03	0.07
14EBD	0.01	.20**	0.06	.34**	.15**	.34**	.35**	0.06	.22**	.30**	.29**	.23**

	1	2	3	4	5	6	7	8	9	10	11	12
15Smoking	-0.03	.51**	0.03	.37**	.21**	.39**	.30**	0.09	.25**	0.07	.22**	.26**
16DA	0.01	.44**	0.02	.43**	.17**	.37**	.41**	0.06	.31**	0.02	.32**	.17**
17DT	-.10*	.29**	0.02	.22**	.10*	.18**	.21**	0.03	.16**	.23**	.19**	.20**
18DC	-.12*	.14**	.12*	.34**	0.08	.34**	.29**	-0.01	.20**	.30**	.20**	.35**
19ELNS	-.11*	.22**	.20**	.33**	.21**	.30**	.31**	-0.06	.20**	0.09	.26**	.20**
20WVBS	.11*	-0.05	.43**	0.07	0.09	-.10*	-0.07	-.26**	-0.08	.20**	0.06	.240**
21DHCBS	.12*	-0.04	-0.08	0.08	0.08	.15**	.21**	.16**	.15**	.12*	0.04	.15**
22CWBS	0.02	0.01	.42**	0.08	.11*	0.09	0.03	-.17**	0.07	.30**	0.1	.21**
23RBS	-0.03	.13*	0.02	0.08	0.01	.12*	0.08	-0.01	-0.02	.34**	-0.01	.17**
24SFBS	0.03	.14**	-0.08	0.05	-0.05	0.08	.11*	.12*	0.04	.18**	-0.01	0.01
25Pain	.12*	0.05	-.29**	0.04	0.06	.19**	.15**	.37**	.29**	-0.05	0.04	-0.09

Table 3. *Continued.*

13	14	15	16	17	18	19	20	21	22	23	24	25
1												
.18**	1											
-0.03	.35**	1										
-0.02	.38**	.61**	1									
.12*	.26**	.34**	.42**	1								
.23**	.40**	.30**	.38**	.36**	1							
0.1	.31**	.36**	.46**	.20**	.39**	1						
-0.01	-0.01	0.01	0.01	0.05	.10*	.17**	1					
.12*	.28**	.10*	0.06	0.06	.17**	0.07	.13*	1				
0.09	.21**	0.05	0.02	0.07	.23**	.25**	.46**	.15**	1			
.13*	.28**	.12*	.15**	.16**	.23**	0.1	.13*	.24**	.19**	1		
0.08	.10*	0.04	0.02	0.04	0.05	-0.04	-0.09	.10*	-0.01	.13*	1	
-0.02	.13*	.15**	.13*	0.07	.14**	0.07	-.18**	0.08	-0.04	.11*	.14**	1

Notes: * at 0.05 level (single tail), the correlation was significant; ** at level 0.01 (single tail), the correlation was significant.

The findings indicated statistically significant correlations between insomnia and factors such as age, irritability, sleep environment, chronic diseases, mental status, sleep habits, tea drinking, coffee drinking, late-night snacking, watching videos before bed, doing housework before bed, and pain [25].

3.2.2. Logistic Regression Analysis of Related Influencing Factors on Insomnia

To examine the impact of relevant influencing factors on insomnia, the study selected factors significantly correlated with insomnia for binary logistic regression analysis [26], with results presented in Table 4.

Table 4. Logistic Regression Analysis of Related Influencing Factors on Insomnia.

		B	se	Wald	p	Exp (B)	LLCI	ULCI
Step 1a	Age	-0.34	0.11	9.96	0.00	0.72	0.58	0.88
	Trait	0.55	0.30	3.30	0.07	1.74	0.96	3.15
	SE	1.23	0.46	7.17	0.01	3.42	1.39	8.41
	CD	0.18	0.35	0.26	0.61	1.19	0.61	2.35
	MC	0.32	0.39	0.67	0.41	1.37	0.64	2.94
	SH	1.03	0.35	8.91	0.00	2.81	1.43	5.55
	DT	-0.68	0.32	4.55	0.03	0.51	0.27	0.95
	DC	-0.94	0.43	4.83	0.03	0.39	0.17	0.90
	ELNS	-1.15	0.39	8.70	0.00	0.32	0.15	0.68
	WVBS	1.46	0.37	15.46	0.00	4.30	2.08	8.90
	DHCBS	0.22	0.36	0.38	0.54	1.25	0.62	2.51
	Pain	0.36	0.35	1.05	0.31	1.43	0.72	2.82

The results showed that five factors—personality, chronic diseases, mental status, doing housework before bed, and pain—did not achieve statistical significance in their regression effects on insomnia.

The study examined the fit of the logistic regression model for age, sleep environment, sleep habits, tea drinking, coffee drinking, late-night snacking, and watching videos before bed on insomnia. The results showed that the Hosmer-Lemeshow significance was 0.63, indicating an acceptable model fit, and the model's Nagelkerke R2 was 0.27. These results indicate that the model for the effects of age, sleep environment, sleep habits, tea drinking, coffee drinking, late-night snacking, and watching videos before bed on insomnia is valid and reaches a large effect size [27, 28].

4. Discussion

This study mainly investigates the impact of various factors like lifestyle habits, health conditions, and sleep environment on insomnia. Study 1, through interviews and subsequent analysis, identified 24 factors that might relate to sleep; Study 2, through surveys and analysis, found that age, sleep environment, sleep habits, tea drinking, coffee drinking, late-night snacking, and watching videos before bed formed a valid logistic regression prediction model for insomnia.

The regression coefficient for age is -0.34 ($p<0.01$), indicating that with each additional unit of age, the probability of insomnia decreases by 0.72 times (Exp (B) = 0.72). This aligns with the correlation analysis results and further confirms the negative impact of age on insomnia. The increase in age may relate to factors like greater regularity of life and reduced sleep needs. This suggests that the incidence of insomnia decreases with age. This result may be due to the reduced sleep demand and relatively stable lifestyle in older adults [14]. Moreover, older adults are more likely than younger individuals to report insomnia symptoms, but actual insomnia diagnoses are less common among them as the impact of insomnia on daytime functioning seems less significant [22].

Tea drinking (B = -0.68, $p<0.05$) and coffee drinking (B = -0.94, $p<0.05$) significantly affect insomnia, suggesting that reducing the intake of these beverages can decrease the risk of insomnia. Especially, reducing caffeine intake in the evening can help improve sleep quality [29]. Exp (B) values are 0.51 and 0.39, indicating that each unit reduction will decrease the probability of insomnia by about 49% and 61%, respectively. Excessive caffeine intake may extend the time needed to fall asleep and reduce deep sleep stages [30]. It is worth mentioning that the effect of caffeine on sleep is relatively complex, and more research is needed to further discover the mechanism of its influence [31].

Late-night snacking significantly impacts insomnia (B = -1.15, $p<0.01$), suggesting that avoiding eating at night can significantly reduce the risk of insomnia. Exp (B) = 0.32, indicating that each unit reduction in late-night snacking will decrease the probability of insomnia by 68%. Consistent with previous research findings, this further confirms the negative relationship between nighttime eating and sleep quality [32-34]. Nighttime eating may increase the digestive system burden, impacting sleep quality [33].

Watching videos before bed significantly impacts insomnia (B = 1.46, $p<0.01$), suggesting that reducing screen time before bed can lower the incidence of insomnia. Exp (B) = 4.30, indicating that each unit increase in watching videos before bed will increase the probability of insomnia by approximately 330%. Blue light and stimulating content from

electronic devices can hinder falling asleep and lower sleep quality [35]. To ensure better sleep quality, the use of electronic devices should stop at least one hour before bedtime.

A good sleep environment significantly affects insomnia (B = 1.23, $p<0.01$), increasing the probability of insomnia by 3.42 times (Exp (B) = 3.42). This result underscores the crucial role of optimizing the sleep environment to improve sleep quality. A comfortable, quiet, and dark sleep environment enhances sleep quality [18]. A comfortable sleep environment improves sleep quality and reduces insomnia incidence. This aligns with many research findings, highlighting the importance of the environment for sleep. Good sleep habits significantly negatively impact insomnia (B = 1.03, $p<0.01$), with good sleep habits increasing the probability of insomnia by 2.81 times (Exp (B) = 2.81). Regular routines and healthy sleep habits are essential for preventing insomnia [19]. Regular sleep habits help stabilize the biological clock, thus enhancing sleep quality [17].

The influence of health conditions, especially pain, on insomnia did not reach statistical significance, which may relate to individual pain tolerance and adaptation mechanisms. Research shows that although chronic pain is frequently linked to poor sleep quality, there is significant variation in how individuals perceive and respond to pain [20, 36]. Some people may reduce the negative impact of pain on sleep through long-term pain management strategies, such as medication, physical therapy, or psychological adjustment [37, 38]. Moreover, the impact of pain on sleep may also be modulated by other variables, such as emotional state, lifestyle habits, and social support [39, 40]. For instance, psychological factors like depression and anxiety mediate the relationship between pain and insomnia, and differences in individual mental health conditions may obscure the direct impact of pain on insomnia [41, 42]. Therefore, although this study did not significantly demonstrate the impact of pain on insomnia, it does not rule out the potential negative effect of pain on sleep quality in specific contexts. Future research should further explore the roles of pain management strategies and psychological adjustment factors in insomnia to more comprehensively understand the complex relationship between health conditions and insomnia.

Recommendations

The study investigated the effects of various lifestyle and health factors on insomnia. Statistical analysis showed significant logistic regression effects of age, sleep environment, sleep habits, tea drinking, coffee drinking, late-night snacking, and watching videos before bed on insomnia. The other 18 factors did not significantly affect insomnia and were thus excluded from further analysis. Future research should further investigate these factors' impact on insomnia. Secondly, the study used questionnaires based on self-reports, which may introduce memory bias or social desirability effects, impacting data accuracy. Future research could incorporate objective sleep monitoring data, such as polysomnography (PSG) and wearable device data, to enhance the study's scientific validity and data objectivity [43, 44]. Future research should further explore the effects of acupuncture on insomnia treatment. Notably, future studies could explore the effects of various psychological interventions, such as cognitive-behavioral therapy, meditation, and relaxation training, on improving insomnia based on these factors, offering more practical treatment recommendations [8]. Existing research suggests that acupuncture can improve sleep by regulating the autonomic nervous system, but more high-quality randomized controlled trials are needed to verify its efficacy and mechanisms [3, 45, 46].

5. Conclusion

This study revealed the significant impact of various factors such as age, sleep environment, sleep habits, tea drinking, coffee drinking, late-night snacking, and watching videos before bed on insomnia. It found that increasing age is associated with a decrease in insomnia incidence, while good sleep environment and habits significantly reduce insomnia risk, and poor lifestyle habits significantly increase insomnia risk. Through Spearman correlation analysis and logistic regression model, the study provided a scientific basis for personalized insomnia interventions, emphasizing the importance of optimizing lifestyle habits and sleep environment.

Abbreviations

IR	Interpersonal Relation
SE	Sleep Environment
CD	Chronic Diseases
MC	Mental Condition
ES	Educational Status
SH	Sleep Habits
WS	Work Stress
EBD	Exercising Before Bed
DA	Drinking Alcohol
DC	Drinking Coffee
ELNS	Eating Late-night Snacks
WVBS	Watching Videos Before Sleep
DHCBS	Doing Household Chores Before Sleep
CWBS	Chatting on WeChat Before Sleep
RBS	Reading Before Sleep
SFBS	Soaking Feet Before Sleep

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Compliance with Ethical Statement

This study was conducted in accordance with the tenets of the Declaration of Helsinki. Ethical approval was obtained

from the Institutional Review Board of Yunnan University of Chinese Medicine (XLL2024-001-01).

Informed Consent

All participants signed an informed consent before participating in the study. For all participants under the age of 18, parents were informed and provided their consent.

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Data Availability Statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Conflicts of Interest

No potential conflict of interest was reported by the authors.

References

[1] Miyachi, T.; Nomura, K.; Minamizono, S.; Sakai, K.; Iwata, T.; Sugano, Y.; Sawaguchi, S.; Takahashi, K.; Mishima, K. Factors Associated with Insomnia Among Truck Drivers in Japan. *Nat Sci Sleep*. 2021, 13: 613-623. https://doi.org/10.2147/NSS.S307904

[2] Perlis, M. L.; Posner, D.; Riemann, D.; Bastien, C. H.; Teel, J.; Thase, M. Insomnia. *Lancet*. 2022, 400: 1047-1060. https://doi.org/10.1016/S0140-6736(22)00879-0

[3] Wang, C.; Xu, W. L.; Li, G. W.; Fu, C.; Li, J. J.; Wang, J.; Chen, X. Y.; Liu, Z.; Chen, Y. F. Impact of Acupuncture on Sleep and Comorbid Symptoms for Chronic Insomnia: A Randomized Clinical Trial. *Nat Sci Sleep*. 2021, 13: 1807-1822. https://doi.org/10.2147/NSS.S326762

[4] Winkelman, J. W. Insomnia Disorder. *New Engl J Med*. 2015, 373(15): 1437-1444. https://doi.org/10.1056/NEJMcp1412740

[5] Wong, V. W.; Yiu, E. K.; Ng, C. H.; Sarris, J.; Ho, F. Y. Unraveling the associations between unhealthy lifestyle behaviors and mental health in the general adult Chinese population: A cross-sectional study. *J Affect Disorders*. 2024, 349: 583-595. https://doi.org/10.1016/j.jad.2023.12.079

[6] Riemann D, K. L. W. K. Sleep, insomnia, and depression. *Neuropsychopharmacol*. 2020, 45(1): 74-89. https://doi.org/10.1038/s41386-019-0411-y

[7] Chellappa, S. L.; Aeschbach, D. Sleep and anxiety: From mechanisms to interventions. *Sleep Med Rev*. 2022, 61: 101583. https://doi.org/10.1016/j.smrv.2021.101583

[8] Riemann, D.; Espie, C. A.; Altena, E.; Arnardottir, E. S.; Baglioni, C.; Bassetti, C. L. A.; Bastien, C.; Berzina, N.; Bjorvatn, B.; Dikeos, D.; et al. The European Insomnia Guideline: An update on the diagnosis and treatment of insomnia 2023. *J Sleep Res*. 2023, 32(6). https://doi.org/10.1111/jsr.14035

[9] Pavlinac, D. I.; Lusic, K. L.; Demirovic, S.; Pecotic, R.; Valic, M.; Dogas, Z. Sleep and Lifestyle Habits of Medical and Non-Medical Students during the COVID-19 Lockdown. *Behav Sci-Basel*. 2023, 13(5). https://doi.org/10.3390/bs13050407

[10] Sugano, Y.; Miyachi, T.; Ando, T.; Iwata, T.; Yamanouchi, T.; Mishima, K.; Nomura, K. Diabetes and anxiety were associated with insomnia among Japanese male truck drivers. *Sleep Med*. 2022, 90: 102-108. https://doi.org/10.1016/j.sleep.2022.01.014

[11] Zhang, J.; Mi, L.; Zhao, J.; Chen, H.; Wang, D.; Ma, Z.; Fan, F. The Moderating Role of Lifestyle on Insomnia in Home Quarantine College Students During the COVID-19 Epidemic. *Front Psychiatry*. 2022, 13: 830383. https://doi.org/10.3389/fpsyt.2022.830383

[12] Javaheri S, R. S. Insomnia and Risk of Cardiovascular Disease. *Chest*. 2017, 152(2): 435-444. https://doi.org/10.1016/j.chest.2017.01.026

[13] Groeneveld, L.; den Braver, N. R.; Beulens, J. W. J.; van der Heijden, A. A.; van der Reep, A. C.; Remmelzwaal, S.; Elders, P. J. M.; Rutters, F. The prevalence of self-reported insomnia symptoms and association with metabolic outcomes in people with type 2 diabetes: the Hoorn Diabetes Care System cohort. *J Clin Sleep Med*. 2023, 19(3): 539-548. https://doi.org/10.5664/jcsm.10380

[14] Cross, N. E.; Carrier, J.; Postuma, R. B.; Gosselin, N.; Kakinami, L.; Thompson, C.; Chouchou, F.; Dang-Vu, T. T. Association between insomnia disorder and cognitive function in middle-aged and older adults: a cross-sectional analysis of the Canadian Longitudinal Study on Aging. *Sleep*. 2019, 42(8). https://doi.org/10.1093/sleep/zsz114

[15] Morin, C. M.; Bjorvatn, B.; Chung, F.; Holzinger, B.; Partinen, M.; Penzel, T.; Ivers, H.; Wing, Y. K.; Chan, N. Y.; Merikanto, I.; et al. Insomnia, anxiety, and depression during the COVID-19 pandemic: an international collaborative study. *Sleep Med*. 2021, 87: 38-45. https://doi.org/10.1016/j.sleep.2021.07.035

[16] Mbous YPV, N. M. M. R. Psychosocial Correlates of Insomnia Among College Students. *Prev Chronic Dis*. 2022, 16: E60. https://doi.org/10.5888/pcd19.220060

[17] Hu, S.; Chen, Y.; Chen, J.; Guo, Y.; Li, Y.; Shao, Y.; Yao, P.; Lu, L.; Tang, X.; Sun, H. The insensitivity of sleep to an unfamiliar sleeping environment in patients with insomnia disorder. *Sleep Breath*. 2024, 28(1): 467-473. https://doi.org/10.1007/s11325-023-02914-0

[18] Desaulniers, J.; Desjardins, S.; Lapierre, S.; Desgagné, A. Sleep Environment and Insomnia in Elderly Persons Living at Home. *J Aging Res*. 2018, 2018: 1-7. https://doi.org/10.1155/2018/8053696

[19] Mantua, J.; Ritland, B. M.; Naylor, J. A.; Simonelli, G.; Mickelson, C. A.; Choynowski, J. J.; Bessey, A. F.; Sowden, W. J.; Burke, T. M.; McKeon, A. B. Physical sleeping environment is related to insomnia risk and measures of readiness in US army special operations soldiers. *Bmj Military Health*. 2023, 169(4): 316-320. https://doi.org/10.1136/bmjmilitary-2021-001801

[20] Ando, T.; Miyachi, T.; Sugano, Y.; Kamatsuka, M.; Mishima, K.; Nomura, K. The Relationship between Insomnia and Lifestyle-Related Diseases among Japanese Male Truck Drivers. *Tohoku J Exp Med*. 2023, 261(1): 1-11. https://doi.org/10.1620/tjem.2023.J052

[21] Riemann, D.; Baglioni, C.; Bassetti, C.; Bjorvatn, B.; Dolenc Groselj, L.; Ellis, J. G.; Espie, C. A.; Garcia Borreguero, D.; Gjerstad, M.; Gonçalves, M.; et al. European guideline for the diagnosis and treatment of insomnia. *J Sleep Res*. 2017, 26(6): 675-700. https://doi.org/10.1111/jsr.12594

[22] Gharzeddine, R.; McCarthy, M. M.; Yu, G.; Dickson, V. V. Associations of insomnia symptoms with sociodemographic, clinical, and lifestyle factors in persons with HF: Health and retirement study. *Res Nurs Health*. 2022, 45(3): 364-379. https://doi.org/10.1002/nur.22211

[23] Bredeli, E.; Vestergaard, C. L.; Sivertsen, B.; Kallestad, H.; Øverland, S.; Ritterband, L. M.; Glozier, N.; Pallesen, S.; Scott, J.; Langsrud, K.; et al. Intraindividual variability in sleep among people with insomnia and its relationship with sleep, health and lifestyle factors: an exploratory study. *Sleep Med*. 2022, 89: 132-140. https://doi.org/10.1016/j.sleep.2021.12.006

[24] Zeng, G.; Zeng, E. On the relationship between multicollinearity and separation in logistic regression. *Communications in statistics. Simulation and computation*. 2021, 50(7): 1989-1997. https://doi.org/10.1080/03610918.2019.1589511

[25] Gauthier, T. Detecting Trends Using Spearman's Rank Correlation Coefficient. *Environ Forensics*. 2001, 2(4): 359-362. https://doi.org/10.1006/enfo.2001.0061

[26] Doos, A. V. H.; Hooman, F.; Sardarzehi, R.; Bastami, M.; Jansson-Frojmark, M. Prediction of insomnia severity based on early maladaptive schemas: a logistic regression analysis. *Sleep Breath*. 2024, 28(2): 919-927. https://doi.org/10.1007/s11325-023-02873-6

[27] Sperandei, S. Understanding logistic regression analysis. *Biochem Medica*. 2014: 12-18. https://doi.org/10.11613/BM.2014.003

[28] Fagerland, M. W.; Hosmer, D. W. A generalized Hosmer – Lemeshow goodness-of-fit test for multinomial logistic regression models. *The Stata Journal*. 2012, 12(3): 447-453. https://doi.org/10.1177/1536867X1201200307

[29] Chabal, S.; Folstein, J. R.; Chinoy, E. D.; Markwald, R. R.; Lieberman, H. R. Caffeine consumption and sleep in a submarine environment: An observational study. *J Sleep Res*. 2023, 32(5): e13901. https://doi.org/10.1111/jsr.13901

[30] Roehrs, T.; Roth, T. Caffeine: Sleep and daytime sleepiness. *Sleep Med Rev*. 2008, 12(2): 153-162. https://doi.org/10.1016/j.smrv.2007.07.004

[31] Irish, L. A.; Mead, M. P.; Cao, L.; Veronda, A. C.; Crosby, R. D. The effect of caffeine abstinence on sleep among habitual caffeine users with poor sleep. *J Sleep Res*. 2021, 30(1): e13048. https://doi.org/10.1111/jsr.13048

[32] Faris, M. E.; Vitiello, M. V.; Abdelrahim, D. N.; Cheikh, I. L.; Jahrami, H. A.; Khaleel, S.; Khan, M. S.; Shakir, A. Z.; Yusuf, A. M.; Masaad, A. A.; et al. Eating habits are associated with subjective sleep quality outcomes among university students: findings of a cross-sectional study. *Sleep Breath*. 2022, 26(3): 1365-1376. https://doi.org/10.1007/s11325-021-02506-w

[33] Crispim, C. A.; Zimberg, I. Z.; Dos, R. B.; Diniz, R. M.; Tufik, S.; de Mello, M. T. Relationship between food intake and sleep pattern in healthy individuals. *J Clin Sleep Med*. 2011, 7(6): 659-664. https://doi.org/10.5664/jcsm.1476

[34] Spaeth, A. M.; Dinges, D. F.; Goel, N. Sex and race differences in caloric intake during sleep restriction in healthy adults. *The American Journal of Clinical Nutrition*. 2014, 100(2): 559-566. https://doi.org/10.3945/ajcn.114.086579

[35] Li, L.; Sheehan, C. M.; Petrov, M. E.; Mattingly, J. L. Prospective associations between sedentary behavior and physical activity in adolescence and sleep duration in adulthood. *Prev Med*. 2021, 153: 106812. https://doi.org/10.1016/j.ypmed.2021.106812

[36] Arnison, T.; Schrooten, M.; Bauducco, S.; Jansson-Frojmark, M.; Persson, J. Sleep phase and pre-sleep arousal predicted co-developmental trajectories of pain and insomnia within adolescence. *Sci Rep-Uk*. 2022, 12(1): 4480. https://doi.org/10.1038/s41598-022-08207-y

[37] Nordstoga, A. L.; Adhikari, S.; Skarpsno, E. S. The joint association of insomnia disorder and lifestyle on the risk of activity-limiting spinal pain: the HUNT Study. *Sleep Med*. 2024, 114: 244-249. https://doi.org/10.1016/j.sleep.2024.01.016

[38] Selvanathan, J.; Tang, N.; Peng, P.; Chung, F. Sleep and pain: relationship, mechanisms, and managing sleep disturbance in the chronic pain population. *Int Anesthesiol Clin*. 2022, 60(2): 27-34. https://doi.org/10.1097/AIA.0000000000000346

[39] Lee, S.; Smith, C. E.; Wallace, M. L.; Buxton, O. M.; Almeida, D. M.; Patel, S. R.; Andel, R. Ten-Year Stability of an Insomnia Sleeper Phenotype and Its Association with Chronic Conditions. *Psychosom Med*. 2024, 86(4): 289-297. https://doi.org/10.1097/PSY.0000000000001288

[40] Fidler, A. L.; Chaudhari, P.; Sims, V.; Payne-Murphy, J.; Fischer, J.; Cottler, L. B. Insomnia among community members in Florida: Associations with demographics, health conditions, and social support. *J Clin Transl Sci*. 2023, 7(1): e128. https://doi.org/10.1017/cts.2023.536

[41] Luo, X.; Yu, T.; Yang, Z.; Wang, D. Psychotic-Like Experiences and Suicidal Ideation Among Adolescents: The Chain Mediating Role of Insomnia Symptoms and Resilience. *Psychol Res Behav Ma*. 2023, 16: 3519-3530. https://doi.org/10.2147/PRBM.S426363

[42] Ahorsu, D. K.; Imani, V.; Potenza, M. N.; Chen, H. P.; Lin, C. Y.; Pakpour, A. H. Mediating Roles of Psychological Distress, Insomnia, and Body Image Concerns in the Association Between Exercise Addiction and Eating Disorders. *Psychol Res Behav Ma*. 2023, 16: 2533-2542. https://doi.org/10.2147/PRBM.S414543

[43] Kaplan, K. A.; Talbot, L. S.; Gruber, J.; Harvey, A. G. Evaluating sleep in bipolar disorder: comparison between actigraphy, polysomnography, and sleep diary. *Bipolar Disord*. 2012, 14(8): 870-879. https://doi.org/10.1111/bdi.12021

[44] Yuan, H.; Hill, E. A.; Kyle, S. D.; Doherty, A. A systematic review of the performance of actigraphy in measuring sleep stages. *J Sleep Res*. 2024: e14143. https://doi.org/10.1111/jsr.14143

[45] Zhao, F.; Fu, Q.; Spencer, S. J.; Kennedy, G. A.; Conduit, R.; Zhang, W.; Zheng, Z. Acupuncture: A Promising Approach for Comorbid Depression and Insomnia in Perimenopause. *Nat Sci Sleep*. 2021, 13: 1823-1863. https://doi.org/10.2147/NSS.S332474

[46] Choi, Y.; Yu, D.; Ha, K.; Min, J.; Choi, W.; Yun, D.; Kwak, B.; Kim, S.; Yoon, J.; Kim, H.; et al. Acupuncture for patients with insomnia and predictors of treatment response: a chart review. *Acupunct Med*. 2024, 42(2): 100-112. https://doi.org/10.1177/09645284231210582