

Association Between Occupational Stress and Sleep Quality: A Systematic Review

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Abstract: Occupational stress and sleep quality are prevalent issues that can impact the physical and mental well-being of adults. An association between occupational stress and sleep quality has been found. However, this association is not entirely the same across different occupational groups. Additionally, variations are present in the research design and instruments employed. This systematic review aims to investigate the association between these two factors and identify gaps and limitations in current research. Articles published between January 1, 2011, and December 31, 2022, were retrieved from the WOS, Scopus, and PubMed databases. Out of 1225 articles, 38 studies met the predetermined inclusion and exclusion criteria and were included in the review. In the study, research designs, samples, instruments, and associations between occupational stress and sleep quality were statistically analyzed. These studies encompassed a diverse range of occupations, including both blue-collar and white-collar workers. Cross-sectional study is the most common research method. The Pittsburgh Sleep Quality Index (PSQI) was the most frequently utilized tool for assessing sleep quality, while there was a wide variety of measurement tools employed to assess occupational stress. The association between occupational stress and sleep quality consistently demonstrated a negative association, although the specific dimensions varied among studies. Moreover, several other factors were identified to have direct or indirect effects on occupational stress and sleep quality. For future research in this field, we propose four recommendations: (1) Consider utilizing objective measures to assess occupational stress and sleep quality. (2) Employ controlled experiments to further validate the causal relationship between occupational stress and sleep quality. (3) Investigate occupational groups that have received less attention. (4) Take into account the potential influence of other factors on occupational stress and sleep quality.

Keywords: occupational stress, sleep quality, systematic review, occupational safety and health

Introduction

Occupational stress, also referred to as job stress, work stress, or work-related stress, encompasses the detrimental reactions that arise when job demands surpass an individual's capacities, resources, or requirements, leading to adverse effects on their cognition and psychology.¹ Common job demands encompass workload, work-life balance, physical environment, and emotional involvement.² With societal development, job demands have generally risen across diverse industries, amplifying the prevalence of occupational stress and garnering increased attention.^{3,4} Occupational stress has emerged as a significant factor that affects adults, impairing not only work efficiency⁵ but also exerting an impact on physical health^{6,7} and mental well-being.^{8,9} Research on factors associated with occupational stress examines both stressors¹⁰ and their repercussions.^{11,12} Certain factors, such as sleep quality,¹³ appear to interact with occupational stress. Additionally, other studies delve into strategies aimed at alleviating occupational stress. Other studies explore strategies for alleviating occupational stress.^{4,14}

Sleep plays a vital role in human health. Sleep quality is associated with various physical health problems, such as obesity,¹⁵ metabolic syndrome,¹⁶ and cardiovascular issues.¹⁷ Furthermore, sleep quality is linked to psychological factors, including mild cognitive impairment,¹⁷ low mood,¹⁸ heightened aggression,¹⁹ and depression.¹⁷ Nonetheless, sleep problems prevail among various populations, encompassing industrial workers,²⁰ nurses,²¹ drivers,²² and

students.²³ Evaluating sleep quality entails subjective experiences, posing challenges to depend solely on objective assessments.²⁴ Research on sleep quality primarily centers on sleep measurement,²⁵ investigating factors associated with sleep quality,^{21,26} and exploring interventions to enhance sleep quality.²⁷

Numerous studies have established an association between occupational stress and sleep quality. Research as early as 1988 indicated a link between self-reported poor sleep quality and work-related stressors.²⁸ An investigation was conducted, involving 2116 Chinese oilfield workers in Xinjiang, in a cross-sectional survey.²⁹ The study examined the association between occupational stress and sleep quality, which revealed that the sleep quality of these oilfield workers was poor, and as occupational stress increased, the prevalence of sleep disturbances rose. Factors such as shift work and job titles also influenced sleep quality. In a longitudinal two-wave study conducted in the Netherlands, 877 employees participated in two online surveys, and researchers employed structural equation modeling to analyze the data.¹³ This study also found a negative correlation between occupational stress and sleep quality, with perseverative cognition mediating the relationship between occupational stress and sleep quality. This association extends beyond blue-collar workers to include white-collar workers as well. Instances of this association have been observed in various occupations, including oil workers,³⁰ cable manufacturing workers,³¹ and couriers,³² as well as in nurses,³³ dentists,³⁴ and office workers.³⁵ Work-related factors, such as workload,³⁶ job title,³⁷ and role conflict,³⁸ have been found to be associated with sleep quality. Likewise, occupational stress is also related to various dimensions of sleep quality, such as daytime dysfunction,^{38,39} sleep duration,⁴⁰ sleep disturbances,³³ and the use of sleeping medication.⁴¹

Several systematic reviews have examined the associations between occupational stress and various factors, including burnout,⁴² cardiovascular risk factors,¹² and workplace exercise interventions.⁴ Some systematic reviews have also discussed the association between sleep quality and factors such as diet,⁴³ depression,⁴⁴ and exercise.⁴⁵ However, a systematic review specifically examining the association between occupational stress and sleep quality has not been found.

In summary, it is evident that occupational stress and poor sleep quality have become significant issues affecting workers in various professions. Despite numerous survey and experimental studies focusing on the association between occupational stress and sleep quality, a systematic analysis and summary of these connections across different professions and regions remains a research gap. To address this gap, the primary objective of this systematic review is to examine the association between occupational stress and sleep quality. Specifically, the research questions include:

1. What were the study designs, samples, locations, and instruments used in the researches that examined the relationship between occupational stress and sleep quality?
2. Did these researches find associations between occupational stress and sleep quality, and if so, what were these associations?
3. What limitations were present in these studies?

Through analysis and discussion, the relationship between occupational stress and sleep quality is elucidated. Occupational stress and sleep quality can be assessed using various dimensions, and our interest lies in investigating the associations among these dimensions. Independent or interactive factors affecting occupational stress or sleep quality are also summarized. These conclusions can serve as references for scholars in related fields. Furthermore, based on the summary, this systematic review provides recommendations for future research in the field, including instrument selection, study design, population considerations, and analytical methods.

Materials and Methods

Search Strategy

This study was conducted following the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) checklist.⁴⁶ The search encompassed three databases: Web of Science (WOS), Scopus, and PubMed. The search queries used to retrieve articles were as follows: In WOS, the query was ((AB=("occupational stress" OR "job stress" OR "work stress" OR "work-related stress")) AND AB=(sleep)) AND LA=(English). In Scopus, the query was ((AB=("occupational stress" OR "job stress" OR "work stress" OR "work-related stress")) AND AB=(sleep)) AND LA=(English). In PubMed, the query

was ((“occupational stress” [Title/Abstract] OR “job stress”[Title/Abstract] OR “work stress” [Title/Abstract] OR “work-related stress” [Title/Abstract]) AND (sleep[Title/Abstract])) AND (English[Language]). Publications were limited to those written in English, and the time frame spanned from January 1, 2011, to December 31, 2022.

Inclusion and Exclusion Criteria

This study investigated the relationship between occupational stress and sleep quality. The study employed three inclusion criteria: (a) empirical studies that collected primary data and drew conclusions based on data analysis, (b) measurement of both occupational stress and sleep quality using objective or subjective methods with statistical description, and (c) utilization of statistical methods to examine the relationship between occupational stress and sleep quality. Consequently, articles that were not empirical studies, lacked statistical information on either occupational stress or sleep quality, or did not analyze the relationship between occupational stress and sleep quality were excluded. Importantly, only articles that directly analyzed the relationship between occupational stress and sleep quality were included. For example, studies that independently examined the relationship between occupational stress and well-being or sleep quality and well-being would not be included. [Table 1](#) provides the inclusion and exclusion criteria used in this systematic literature review.

Selection of Articles and Data Extraction

Data extraction involved retrieving the following information from each article: (a) key study characteristics (study design, occupation, sample size, location, and measurement tools for occupational stress and sleep quality), and (b) study findings. The initial focus was to ascertain the presence of a direct positive association, negative association, or no association between occupational stress and sleep quality. Subsequently, the researchers identified specific dimensions associated with occupational stress and sleep quality. Moreover, additional factors related to occupational stress or sleep quality were also extracted. Two independent researchers conducted data extraction from the initially screened articles and organized the data in a table. Studies with missing data or data not collected directly by the authors were excluded. The two researchers conducted a quality assessment, referring to the modified 22-item Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist⁴⁷ which is attached in [Supplementary Material](#). Any discrepancies were resolved through discussion.

Results

The search strategy yielded a total of 1225 articles, comprising 421 from WOS, 458 from Scopus, and 346 from PubMed. After removing 410 duplicate articles, 815 articles remained. After evaluating titles and abstracts against the inclusion and exclusion criteria, 750 articles were excluded, resulting in 65 articles remaining. Subsequently, the two researchers conducted data extraction and review, resulting in the inclusion of 37 articles, representing 38 studies, for further analysis. [Figure 1](#) presents the PRISMA flow diagram illustrating this process.

Research Design

[Table 2](#) presents a comprehensive list of the 38 included studies, including their references, study designs, sample characteristics (occupation, sample size, location), and the instruments utilized to assess occupational stress and sleep

Table 1 Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Empirical studies	Reviews, commentaries, methodological articles, theoretical articles or practical articles
Statistical description of occupational stress and sleep quality	Lack of statistical description of occupational stress or sleep quality
Association between occupational stress and sleep quality	Lack of association between occupational stress and sleep quality

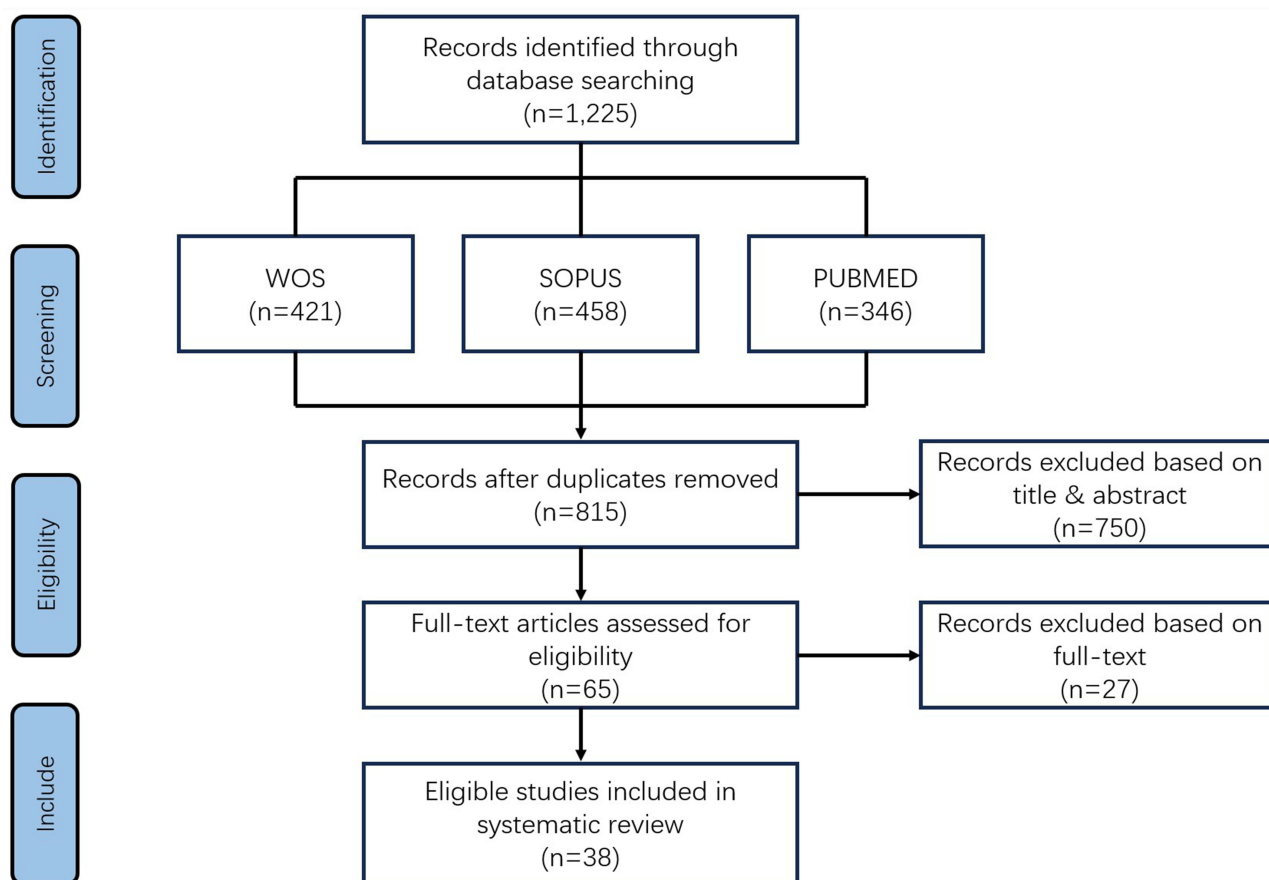


Figure 1 PRISMA flow diagram of study-selection process for systematic review.

quality. Out of all the studies, only six employed a longitudinal design, with the remaining studies utilizing a cross-sectional approach.

Most of the research samples were obtained from hospitals, comprising ten studies on nurses, two studies on dentists, and one study on physicians. Six studies encompassed blue-collar workers, including two studies on oil workers, two studies on firefighters, one study on emergency workers, one study on cable manufacturing workers, one study on couriers, and one study on male industrial workers. Additionally, five studies focused on white-collar workers, comprising one study on office workers, one study on professionals from a public institution, one study on day-shift public servants, one study on non-manual workers, and one study on professors. Ten studies did not specify a specific occupation and employed terms such as “workers” or “employees” to describe their respective samples. One study centered on retirees. Two studies specifically concentrated on males, namely male industrial workers and male firefighters. Additionally, one study investigated a specific work schedule (shift-working nurses), while another study examined a unique period (nurses working during the COVID-19 pandemic).

The studies included samples from diverse regions, with the majority of studies conducted in Asia (14 in China, five in Korea, three in Japan, one in Malaysia, and one in Iran), followed by Europe (one in the Netherlands, one in Egypt, one in Denmark, three in Germany, one in Italy, one in Switzerland, one in Finland, and one in Sweden). Additionally, there were two studies conducted in the United States, one in Brazil, and one in Turkey (a transcontinental country). Two cross-sectional studies had sample sizes below 100, consisting of 95 nursing internship students³⁶ and 24 professors.⁴¹ Furthermore, two longitudinal studies included fewer than 100 individuals, namely 60 patients with prolonged work-related stress⁵⁴ and 60 full-time employees.⁵⁸ The rest of the studies had sample sizes exceeding 100, with 13 studies surpassing a sample size of 1000.

Table 2 Research Designs, Samples and Instruments

Reference	Study Design	Sample			Instruments	
		Occupation	N	Location	Occupational Stress	Sleep Quality
(Deng et al, 2020) ³³	Cross-sectional study	Nurse	180	China	Job Stress Questionnaire	Pittsburgh Sleep Quality Index
(Peng et al, 2022) ⁴⁸	Cross-sectional study	Worker	729	China	Generic Job Stress Questionnaire	Pittsburgh Sleep Quality Index
(Song et al, 2017) ³⁴	Cross-sectional study	Dentist	231	Korea	Doctor Job Stress Scale	Pittsburgh Sleep Quality Index
(Song & Kim, 2019) ⁹	Cross-sectional study	Dentist	231	Korea	Dentist Job Stress	Pittsburgh Sleep Quality Index
(Rabei et al, 2020) ³⁶	Cross-sectional study	Nursing internship student	95	Egypt	Expanded Nursing Stress Scale	Pittsburgh Sleep Quality Index
(Jiang et al, 2016) ⁴⁹	Cross-sectional study	Worker	700	China	Occupational Stress Inventory-Revised questionnaire	Pittsburgh Sleep Quality Index
(Li et al, 2022) ³⁰	Cross-sectional study	Oil worker	1142	China	Occupational Stress Inventory	Pittsburgh Sleep Quality Index
(Li et al, 2019) ²⁹	Cross-sectional study	Oilfield worker	2116	China	Occupational Stress Inventory Revised Edition	Pittsburgh Sleep Quality Index
(Gao et al, 2018) ³⁹	Cross-sectional study	Physician	504	China	Job Stress Survey	Pittsburgh Sleep Quality Index
(Yook, 2019) ⁵⁰	Cross-sectional study	Firefighter	705	Korea	Occupational stress scale	Pittsburgh Sleep Quality Index
(Takaesu et al, 2021) ³⁵	Cross-sectional study	Office worker	4645	Japan	Brief Job Stress Questionnaire	Subjective sleep schedule
(Van Laethem et al, 2015) ¹³	Longitudinal study	Employee	877	Dutch	A one-item measure	Jenkins Sleep Scale
(Sousa et al, 2018) ⁴¹	Cross-sectional study	Professor	24	Brazil	Work Stress Scale	Pittsburgh Sleep Quality Index
(Gu et al, 2019) ⁵¹	Cross-sectional study	Nurse	2889	China	Nurse Job Stressor Questionnaire	Pittsburgh Sleep Quality Index
(Han et al, 2016) ³⁷	Cross-sectional study	Nurse	2033	China	Effort-Reward Imbalance Questionnaire	Pittsburgh Sleep Quality Index
(Jiang et al, 2020) ⁵²	Cross-sectional study	Professional from a public institution	812	China	Effort-reward Imbalance Scale	Pittsburgh Sleep Quality Index
(Dong et al, 2022) ⁵³	Cross-sectional study	Emergency worker	7688	China	Job Content Questionnaire	Pittsburgh Sleep Quality Index

(Continued)

Table 2 (Continued).

Reference	Study Design	Sample			Instruments	
		Occupation	N	Location	Occupational Stress	Sleep Quality
(Eskildsen et al, 2017) ⁵⁴	Longitudinal study	Patient with prolonged work-related stress	60	Denmark	Perceived Stress Scale	Pittsburgh Sleep Quality Index
(J. Wang et al, 2022) ⁵⁵	Cross-sectional study	Non-manual worker	1700	China	Effort-Reward Imbalance Inventory	Pittsburgh Sleep Quality Index
(Saalwirth & Leipold, 2021) ⁴⁰	Cross-sectional study	Daytime worker	438	German	Trier Inventory for the Assessment of Chronic Stress	Pittsburgh Sleep Quality Index
(Dong et al, 2020) ⁵⁶	Cross-sectional study	Emergency nurse	4856	China	Job Content Questionnaire	Pittsburgh Sleep Quality Index
(D'Ettorre et al, 2020) ⁵⁷	Cross-sectional study	Nurse	658	Italy	Job Content Questionnaire	Bergen Insomnia Scale
						Epworth Sleepiness Scale
(Pereira & Elfering, 2014) ⁵⁸	Longitudinal study	Full-time employee	60	Swiss	A scale of Frese and Zapf	An original scale including sleep-onset latency, sleep efficiency and sleep fragmentation;
						Subjective sleep diaries
(Wu et al, 2023) ⁵⁹	Cross-sectional study	Shift-working nurse	390	China	Chinese Nurses Stressor Scale	Pittsburgh Sleep Quality Index
(Iwasaki et al, 2018) ³⁸	Cross-sectional study	Day-shift public servant	243	Japan	Generic Job Stress Questionnaire	Pittsburgh Sleep Quality Index
(Rasdi, 2018) ³¹	Cross-sectional study	Cable manufacturing worker	140	Malaysia	Stress Overload Scale	Pittsburgh Sleep Quality Index
(Xie et al, 2021) ³²	Cross-sectional study	Courier	2831	China	Work stress scale	“Over the past month, how do you feel your subjective sleep quality has been?”
(Myllyntausta et al, 2019) ⁶⁰	Longitudinal study	Retiree	2053	Finnish	Job Content Questionnaire	An original scale including sleep duration, sleep difficulties, daytime tiredness, and sleep loss
(Kim et al, 2020) ⁶¹	Cross-sectional study	Study 1: Working adult	1031	Korea	A measure including perceived job insecurity and negative work spillover	Sleep Problems Questionnaire
	Longitudinal study	Study 2: Working adult	152	Korea		
(Shimura et al, 2020) ²⁶	Cross-sectional study	Employee	5640	Japan	Brief Job Stress Questionnaire	Pittsburgh Sleep Quality Index

(Leitaru et al, 2019) ⁶²	Cross-sectional study	Employee	1973	Swedish	General Nordic Questionnaire for Psychosocial and Social factors at work	"How do you rate the overall quality of your sleep?"
(Bilgic et al, 2021) ⁶³	Cross-sectional study	Nurse working during the COVID-19 pandemic	316	Turkey	Perceived Stress Scale	Pittsburgh Sleep Quality Index
(Herr et al, 2018) ⁶⁴	Longitudinal study	Male industrial worker	101	German	Stress Reactivity Scale	Parts of the Diagnostic and Statistical Manual of Mental Disorders
(Bernburg et al, 2021) ⁶⁵	Cross-sectional study	Outpatient nurse	166	German	10-item Perceived Stress Scale	Pittsburgh Sleep Quality Index
(Hartley et al, 2014) ⁶⁶	Cross-sectional study	Police officer	356	USA	Spielberger Police Stress Survey	Pittsburgh Sleep Quality Index
(Abbasi et al, 2018) ⁶⁷	Cross-sectional study	Firefighter	118	Iran	HSE questionnaire for occupational stress	Pittsburgh Sleep Quality Index
(Zhang et al, 2016) ⁶⁸	Cross-sectional study	Nursing assistant	650	USA	Work features questionnaire including three physical domains and five psychosocial domains	Modified questionnaire from Pittsburgh Sleep Quality Index

The Pittsburgh Sleep Quality Index (PSQI)⁶⁹ was the most frequently utilized instrument for assessing sleep quality, employed in 28 studies. Out of the remaining 10 studies, one study employed a modified version of the PSQI, four studies used original scales, and five studies utilized other established scales. Two of the original scales comprised a single item. The assessment tools employed for measuring occupational stress exhibited greater diversity. The most commonly utilized instruments were the Job Content Questionnaire, Occupational Stress Inventory, and Perceived Stress Scale, which were employed in four, three, and three studies, respectively. The Brief Job Stress Questionnaire, Generic Job Stress Questionnaire, Occupational Stress Scale, and Work Stress Scale were utilized in two studies, whereas the remaining studies employed scales distinct from those used in other studies.

Research Findings

Table 3 displays the findings pertinent to this systematic literature review from all the studies included. The results regarding the association between occupational stress and sleep quality were extracted from each study. To account for variations in the reporting of results among different studies, a unified presentation was adopted as follows: “Negative (N)” denotes a decrease in

Table 3 Association Between Occupational Stress and Sleep Quality

Reference	Association Between Occupational Stress And Sleep Quality			Other Factors
		Occupational stress	Sleep quality	
(Deng et al, 2020) ³³	N	Type of nurse contract;	Sleep quality	None.
		Self-reported job stress		
		Job difficulty factor;	Sleep disturbances	
		Doctor-patient relationships;		
		Psychosomatic state;		
		Environment or events;		
		Promotion or competition;		
		Total pressure scores		
(Peng et al, 2022) ⁴⁸	N	Job stress	Sleep quality	Occupational stress and PER3 genotype had both separate and combined effects on poor sleep quality.
(Song et al, 2017) ³⁴	N	Patient factors;	Sleep quality	Depression and anxiety revealed a significant association with the doctor job stress.
		Clinical responsibility/judgment factors		
(Song & Kim, 2019) ⁹	N	Job stress	Sleep quality	Dentists' job stress was significantly associated with income, work time, job satisfaction and depression.
(Rabei et al, 2020) ³⁶	N	Number and duration of shifts;	Sleep quality	None.
		Problems related to peers		
		Demanding patients and their families	Sleep duration	
		Demanding patients and their families;	Sleep efficiency	
		Work load;		
		Discrimination;		
		Uncertainty regarding treatment		

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Table 3 (Continued).

Reference	Association Between Occupational Stress And Sleep Quality			Other Factors
(Jiang et al, 2016) ⁴⁹	N	Job stress	Sleep quality	5-HTR2A genotype was significantly associated with sleep quality;
				Occupational stress and 5-HTR2A genotypes in workers are associated both independently and in combination with increased risk of poor sleep quality.
(Li et al, 2022) ³⁰	N	Occupational stress	Sleep quality	Age, junior college and above, borehole operation, extraction of oil, drilling, shift work, and mental disorders are risk factors for sleep disorders.
(Li et al, 2019) ²⁹	N	Occupational stress	Subjective sleep quality;	The higher the level of glycosaminoglycan, the less likely the subject is to have sleep disorders.
			Sleep disorder;	
			Daytime dysfunction	
(Gao et al, 2018) ³⁹	N	Occupational stress	Sleep disturbances;	Stress can increase the risk of poor sleep quality, but this effect is worse in a group of people with specific gene polymorphisms.
			Daytime dysfunction	
(Yook, 2019) ⁵⁰	N	Occupational stress	Sleep quality	Occupational stress was significantly correlated with cardiorespiratory fitness and arterial stiffness.
(Takaesu et al, 2021) ³⁵	N	Occupational stress	Insufficient sleep;	None.
			Long sleep durations on free days;	
			Social jetlag	
(Van Laethem et al, 2015) ¹³	N	Work-related stress	Sleep quality	Perseverative cognition could be an important underlying mechanism in the association between work-related stress and sleep quality;
				Work-related stress, perseverative cognition, and sleep quality mutually influence each other over time.
(Sousa et al, 2018) ⁴¹	N	General stress level	Use of sleeping medication	None.
(Gu et al, 2019) ⁵¹	N	Professional and career issues	Sleep quality	Occupational stress was correlated with anxiety.

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Table 3 (Continued).

Reference	Association Between Occupational Stress And Sleep Quality			Other Factors
(Han et al, 2016) ³⁷	N	Many years of working;	Sleep quality	None.
		Job title;		
		Registered nurse;		
		Many times of night shift per month;		
		No frequent exercise		
		Many efforts and few rewards;		
		High decision-making autonomy		
(Jiang et al, 2020) ⁵²	N	Professional and career issues	Sleep quality	Serum DA levels may interrelate with job stress to affect sleep.
(Dong et al, 2022) ⁵³	N	Occupational stress	Sleep quality	The sleep quality was poorer in doctors than in nurses, and poorer in those working in secondary and tertiary hospitals than in primary hospitals;
				High prevalence of sleep disturbance was significantly associated with shift work, musculoskeletal pain, fewer breaks in a work shift, and less exercise during leisure time;
				Sleep disturbance occurred in emergency workers in the following order: two-shift rotation > three-shift rotation > permanent night shift > permanent day shift.
(Eskildsen et al, 2017) ⁵⁴	N	Occupational stress	Sleep quality	Improvement in cognitive impairments is partly mediated by decreasing levels of perceived stress and, to a lesser extent, decreasing levels of sleep disturbances.
(J. Wang et al, 2022) ⁵⁵	N	Work stress	Sleep quality	The interaction between work stress and Per3 gene polymorphism may increase the risk of sleep quality problems
(Saalwirth & Leipold, 2021) ⁴⁰	N	Work-related stress	Shorter sleep duration;	The effect of a flexible start of work for daytime worker's well-being depends on a person's individual sleep timing and chronotype.
			Greater need for additional sleep;	
			Late chronotype	
(Dong et al, 2020) ⁵⁶	N	Occupational stress	Sleep quality	The following factors were associated with poor sleep: hospital level (tertiary vs primary, secondary vs primary), female sex, less of exercise, long work hours per week, many patients in the charge of at night, high monthly night shift frequency (4–6 vs never, ≥ 7 vs never).

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Table 3 (Continued).

Reference	Association Between Occupational Stress And Sleep Quality			Other Factors
(D'Ettorre et al, 2020) ⁵⁷	/			Significantly more women than men experienced high job strain, insomnia and daytime sleepiness; among women the level of social support was significantly and negatively associated with insomnia and daytime sleepiness.
(Pereira & Elfering, 2014) ⁵⁸	N	Social stressors at work	Objectively assessed sleep fragmentation	Social stressors at work were positively related to psychosomatic health complaints;
				Objectively assessed sleep fragmentation mediated the effect of social stressors at work on psychosomatic health complaints.
(Wu et al, 2023) ⁵⁹	N	Occupational stress	Sleep quality	Work stress could indirectly affect sleep quality through circadian rhythm amplitude and stability.
(Iwasaki et al, 2018) ³⁸	N	Higher role ambiguity	Sleep quality	None.
		Role conflict	Sleep disturbance;	
			Daytime dysfunction	
(Rasdi, 2018) ³¹	N	Work stress	Sleep quality	Higher level of being avoidance as a coping strategy were found to be significantly correlated with poorer sleep quality.
(Xie et al, 2021) ³²	N	Occupational stress	Sleep quality	Work stress was negatively correlated with job satisfaction and psychological capital;
				Psychological capital plays a mediating role between work stress and sleep quality among couriers.
(Myllyntausta et al, 2019) ⁶⁰	/			None.
(Kim et al, 2020) ⁶¹	N	Perceived job insecurity	Subjective sleep quality	Negative work spillover mediates the relationship between perceived job insecurity and subjective sleep quality.
(Shimura et al, 2020) ²⁶	N	Job stressors and social support	Sleep quality	Irregular meal time, not eating vegetables every day, night-cap, weight gain, lack of sunlight in the morning in the bedroom, waking up before dawn, electronic display use in bed, and daily caffeine intake were significantly associated with sleep disturbance.
(Leitaru et al, 2019) ⁶²	N	Job stressors	Sleep quality	Self-rated health plays an important moderating role in the association between job strain and sleep quality.

(Continued)

Table 3 (Continued).

Reference	Association Between Occupational Stress And Sleep Quality			Other Factors
(Bilgic et al, 2021) ⁶³	N	Perceived stress;	Sleep quality	Age, years worked, fear of infecting the family with COVID-19, receiving COVID-19 education, regular nutrition, were effective predictors of stress level.
		Shift work;		
		Stress level;		
		A coworker having COVID-19;		
		Being out of home due to the risk of transmission;		
		Having a person older than 65 in the home		
(Herr et al, 2018) ⁶⁴	N	Improvement of the prolonged reactivity;	Sleep quality	The improvement of stress reactivity resulting from a work stress intervention was effective and generally long-lasting in preventing mental health.
		Reduction of the reactivity to social conflicts		
(Bernburg et al, 2021) ⁶⁵	N	Pandemic-related stress	Sleep quality	None.
(Hartley et al, 2014) ⁶⁶	N	Perception of stress severity and frequency of stressors	Sleep quality	None.
(Abbasi et al, 2018) ⁶⁷	/			Musculoskeletal disorders (MSDs), shift work, and high body mass index are associated with poor sleep quality.
(Zhang et al, 2016) ⁶⁸	N	Work features	Sleep duration;	None.
			Sleep quality	

sleep quality with increasing occupational stress, “Positive (P)” indicates an improvement in sleep quality with increasing occupational stress, and “/” signifies no significant association. Out of all the studies, only three reported no significant association between occupational stress and sleep quality, whereas the remaining studies demonstrated a negative association. Out of the 35 studies displaying a significant negative association, 15 studies addressed dimensions of occupational stress, while 12 studies focused on dimensions of sleep quality. Sleep disturbances and daytime dysfunction were the most frequently cited factors pertaining to sleep quality, with each dimension mentioned in three studies, both of which are dimensions captured by the PSQI. Given the absence of uniformity in measuring occupational stress and the diverse range of occupational categories, the factors associated with occupational stress exhibited a relatively dispersed nature. While some factors, such as social support and work load, are general, others are specific to particular occupations and are frequently encountered in hospital-related studies, including doctor-patient relationships, demanding patients and their families, and type of nurse contract. The findings from 31 studies addressed the association of additional variables with either occupational stress or sleep quality. Certain variables exhibited independent effects on either occupational stress or sleep quality, including depression, age, and regular nutrition. Moreover, certain variables demonstrated more intricate relationships between occupational stress and sleep quality, such as specific gene polymorphisms, perseverative cognition, and circadian rhythm.

Discussion

Research Design

Before examining the association between occupational stress and sleep quality, we conducted a review of the study designs used in research conducted from 2011 to 2022. The objective was to identify the limitations and gaps in the

existing literature. The majority of studies investigating the association between occupational stress and sleep quality were cross-sectional in nature, while only a limited number were longitudinal studies. No experimental studies were identified. In terms of study design, all researchers employed a non-interventional approach, primarily focused on describing and observing the relationship or trends between occupational stress and sleep quality. These study designs offer the advantage of large sample sizes and robust descriptive information. However, due to the absence of controlled experiments, causal relationships cannot be established. Therefore, investigating causality represents a crucial gap that researchers should address in future studies.

Healthcare professionals emerged as the most extensively studied group, which could be attributed to the convenience sampling facilitated by researchers based in hospitals. Notably, a greater emphasis was placed on Asian studies within this domain, evidenced by the highest number of relevant research articles. However, in light of the physiological and social variations among workers across continents and regions, it is imperative to supplement the existing body of research with studies conducted in other locations.

All studies employed subjective scales to measure occupational stress and sleep quality, which is understandable considering the subjective nature of these aspects. However, it is worth noting that objective measurement tools can complement these scales. For instance, sleep quality can be assessed using brain imaging techniques,⁷⁰ polysomnography (PSG), and actigraphy.⁷¹ Some studies have utilized electroencephalogram (EEG)⁷² or surface electromyography (EMG)⁷³ to evaluate stress levels. The majority of researchers relied on the PSQI⁶⁹ to measure sleep quality, highlighting the widespread use and recognition of this scale. However, it also suggests that there has been limited progress in sleep quality measurement methods over the past two decades. In contrast, there is a greater diversity and specificity in the categories of occupational stress scales, such as the Expanded Nursing Stress Scale⁷⁴ and the Spielberger Police Stress Survey.⁶⁶ Subsequent researchers have made adjustments and developments to many of these scales, indicating advancements in this field.

Association Between Occupational Stress and Sleep Quality

Occupational stress and poor sleep quality are significant concerns on a global scale. A survey in 2022 found that 44% of respondents worldwide experienced significant work-related stress daily.⁷⁵ Eastern Asia emerged as the region with the highest levels of occupational stress, with 55% of individuals reporting work stress, while North America ranked second with a rate of 50%. More than half of Generation Z and Millennials reported that work stress had a negative impact on their sleep in the word.⁷⁶ In the United States, over one-third of adults sleep for less than 7 hours per night.⁷⁷ It's estimated that approximately 50 to 70 million Americans suffer from sleep disorders.⁷⁸ Sleep quality among the Chinese population is also a concern, with 25.9% of residents sleeping less than 7 hours per night, and 10.04% of respondents rating their sleep quality as very poor.⁷⁹

In this systematic review, the majority of the included studies consistently demonstrated a negative association between occupational stress and sleep quality. High levels of occupational stress and poor sleep quality often coexisted in many cases. Only three studies, involving nurses in Italy,⁵⁷ retirees in Finland,⁶⁰ and firefighters in Germany,⁶⁷ using either cross-sectional surveys or longitudinal studies, reported no significant association between occupational stress and sleep quality. Based on the number and proportion of studies, we can confidently conclude that there is a reliable negative association between occupational stress and sleep quality. This association is not specific to a particular occupation, country, or region, but has been observed across various occupations and countries or regions. However, it is important to note that the causal relationship between these two factors cannot be determined at present. While one study mentioned the mutual influence between occupational stress and sleep quality,¹³ the mechanisms underlying this negative association cannot be identified solely through cross-sectional or longitudinal studies.

As mentioned earlier, the studies included in this systematic literature review utilized subjective assessment methods, leading to the determination of occupational stress and sleep quality dimensions based on the employed scales. The PSQI consists of seven dimensions, namely subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction.⁶⁹ Among these dimensions, sleep disturbances and daytime dysfunction were frequently found to be correlated with occupational stress. On the other hand, the division of dimensions related to occupational stress varied across studies and could be broadly categorized as job demands, work

environment, psychological aspects of work, and job rewards. While an overall negative association between occupational stress and sleep quality exists, drawing definitive conclusions at more specific dimensions is challenging. This challenge arises due to the variations in stress sources and subjective stress perceptions among different occupations.^{80,81} Therefore, when the study population does not consist of specific occupations, researchers should consider the type of work as a variable. Currently, studies primarily focus on exploring the dimensions of occupational stress among nurses or doctors, while investigations into other professions generally identify associations only at the overall level of occupational stress. Conducting more detailed studies on other professions would be a valuable area for future research. It would be meaningful to examine the association between occupational stress and sleep quality in different occupations, particularly among underrepresented groups. However, it is not sufficient to solely verify the negative association; further confirmation of the specific dimensions involved and exploration of the causal relationship between them are required.

Other Factors

Researchers have actively investigated additional factors to gain a better understanding of the relationship between occupational stress and sleep quality. Genetics has received considerable attention in this regard, as it has been found to have indirect effects on the association between occupational stress and sleep quality. Several genetic factors, such as PER3 genotype,⁴⁸ 5-HTT2A genotypes,^{39,49} and Per3 gene polymorphism,⁵⁵ have been identified to have combined effects with occupational stress on sleep quality. It is worth noting that these four studies originate from China, and caution should be exercised when generalizing their findings to other countries or regions. Additionally, physical factors like circadian rhythm⁵⁹ and serum dopamine (DA) levels,⁵² as well as psychological factors including perseverative cognition,¹³ psychological capital,³² negative work spillover,⁶¹ and self-rated health,⁶² also play indirect roles in the association between occupational stress and sleep quality. In most of these studies, sleep quality was considered as the dependent variable, with a focus on how other factors interacted with occupational stress to influence sleep quality. The results of these studies indicate the involvement of multiple factors, highlighting the importance of considering their interactions. For instance, examining the combined influence of the three aforementioned genetic factors in future research would be meaningful. Moreover, exploring potential interactive effects among genetics, physiological factors, and psychological factors could be a promising direction for future investigation.

Various factors have been investigated as independent variables to explore their relationship with occupational stress or sleep quality. Psychological factors have received repeated attention, including depression and anxiety^{9,34,51} mental health,^{30,58,64} cognitive impairments,⁵⁴ avoidance,³¹ and psychological capital.³² Other workplace-related factors^{9,53,56,63,67} have been found to impact both occupational stress and sleep quality. Gender, age, educational level,^{30,56,57,63} lifestyle habits,^{26,53,56} illnesses,^{29,50,53,56} and pandemic situations^{63,65} have also shown associations. However, it is important to note that these factors may yield different results in different studies, being associated with either occupational stress, sleep quality, or showing no significant association. While these research findings enhance our understanding of occupational stress and sleep quality, limitations still exist. There is a multitude of factors that can influence occupational stress or sleep quality, and a clear framework for selecting or defining these factors is lacking in previous studies, which poses challenges for systematic reviews and hinders the integration and support among these studies. Measurement tools, particularly scales related to subjective factors, require further development. Lastly, some factors have demonstrated associations with both occupational stress and sleep quality, suggesting the potential for considering them as mediating or moderating variables in future research.

Conclusion

The conclusion of this systematic review examines the research designs and findings of quantitative studies conducted between 2011 and 2022 that investigate the association between occupational stress and sleep quality. Cross-sectional studies were the most frequently employed method, and all studies utilized subjective scales to assess occupational stress and sleep quality. The findings consistently demonstrated a negative association between occupational stress and sleep quality, which was observed across various industries, countries, and regions. However, regarding specific dimensions, no definitive statistical conclusion could be drawn. The studies also identified several other factors that impact

occupational stress or sleep quality, including genetics, psychological factors, diseases, and lifestyle habits. Based on these findings, we offer suggestions for future research in this field:

1. Consider incorporating objective measures in addition to subjective scales to assess occupational stress and sleep quality.
2. Conduct controlled experiments to establish the causal relationship between occupational stress and sleep quality.
3. Direct Attention Towards Occupational Groups That Have Not Been Extensively Studied.
4. Explore the associations between different dimensions of occupational stress and sleep quality, as well as the influence of mediating and moderating variables.

Disclosure

The authors report no conflicts of interest in this work.

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