

*Scoping Review in Occupational and Public Health*

# Stress, sleep, and cardiovascular risk in police officers: A scoping review

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## **Abstract**

**Introduction:** Law enforcement workers are generally considered to be at an increased risk of cardiovascular disease. This review aimed to evaluate the cardiovascular risk and metabolic syndrome (MetS) in police officers, focusing on issues related to stress and sleep.

**Methods:** A literature review was conducted using PubMed, Medline and Scopus databases and following the guidelines for scoping literature reviews. Eight studies were included, seven with a cross-sectional design and one longitudinal study, which revealed an association between occupational stress, sleep disturbances, metabolic factors, and cardiovascular risk.

**Results:** Specifically, sleep duration and quality were associated with metabolic syndrome. Occupational stress factors, such as psychosocial burden and required effort, were predictive of metabolic syndrome.

**Discussion:** A strategy for managing cardiovascular risk in law enforcement workers was proposed, including health promotion activities within ongoing occupational health surveillance programs to prevent work-related risks.

**Take-home message:** This study reviews the impact of stress and sleep issues on cardiovascular and metabolic syndrome risks in police officers, suggesting integrating health promotion strategies into occupational health programs to address these risks.

**Key words:** Metabolic syndrome; occupational health; psychosocial risk factors; health promotion; health surveillance.

**Cite this paper as:** Magnavita N, Chirico F, Garbarino S, Ciprani F. Stress, sleep, and cardiovascular risk in police officers: A scoping review. *J Health Soc Sci.* 2024;9(1):9-23. Doi: 10.19204/2024/STRS1

Received: 19 December 2023; Accepted: 15 February 2023; Published: 15 March 2024

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## INTRODUCTION

Adverse cardiovascular events, including myocardial infarction and ventricular arrhythmias, are the leading causes of death globally [1]. Law enforcement officers are generally considered to be at an increased cardiovascular risk. Some studies focused on cardiovascular diseases (CVD), the prevalence of metabolic syndrome (MetS) [2], and metabolic risk factors, which are more common among retired police officers than in the general population of the same age [3]. Moreover, cerebrovascular diseases, myocardial infarction, and cardiac arrhythmias have higher incidence rates among active law enforcement workers compared to the general population [4]. Building upon this relatively well-established evidence, although it remains unclear whether the observed increase is attributed to occupational factors or lifestyle, the issue arises of interpreting this phenomenon, identifying root causes, and devising preventive measures that occupational health surveillance services can implement for workers.

This task is far from simple, considering police work encompasses highly diverse occupational contexts. Law enforcement officers engage in various activities, from crime prevention to maintaining public order, territory, communication control, population assistance, etc. "police work" should be understood as a synecdoche, reflecting deeply varied occupational risk profiles. The health surveillance of the police forces traditionally focuses on evaluating the state of health of candidates for admission into service. Still, it is less effective in following the evolution of the police officers' career through different workplaces.

However, cardiovascular risk [5,6], MetS [7,8], musculoskeletal pathologies [9-10], stress, and mental health disorders, including suicide [11,12], are more frequent in police officers than in general population. Sometimes, these problems are only evident after retirement, supporting the need to act proactively by integrating health promotion activities to prevent work-related risks [13].

Some cardiovascular risk factors in police officers are shared with other job categories, while others are specific. Among the latter, two distinct shapes commonly emerge in the profession: exposure to violence and work-related stress and continuous vigilance duties interfering with sleep patterns. Police work is unanimously considered stressful [14-16]. Studies conducted on workers showed that psychological stress is associated with CVD and metabolic problems [17-21]. Sleep disorders, particularly obstructive sleep apnea, are prevalent among shift workers [22,23], often remaining undiagnosed [24]. Sleep disorders are associated with MetS [25] and CVD, such as hypertension, coronary artery disease, and heart failure [26-28]. The question we intended to answer was: could it be useful to involve physicians responsible for monitoring law enforcement officers' health in promotion programs for these two major categories of cardiovascular risk factors, stress and sleep?

In this work, we will not deal with some modifiable risk factors strictly linked to CVD, such as diet or physical exercise, because they are common to other categories of workers and consequently are included in all health promotion interventions conducted in workplaces. Conversely, we will focus on stress and sleep, particularly important to the police.

This study aims to assess CVD risk and MetS among law enforcement officers, focusing on stress and sleep-related issues. To this end, a scoping review of the scientific literature was conducted to gather insights for health surveillance measures.

## METHODS

This review utilized a scoping review methodology, enabling the mapping of key concepts and characteristics of the phenomenon from a broad array of resources.

The review used the Joanna Briggs Institute (JBI) methodology for scoping reviews, refined by Peters et al. [29] and following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) [30].

### *Review Question*

This scoping review aimed to synthesize and map what was reported in the international literature on the relationship between stress, sleep, and cardiovascular risk in police officers.

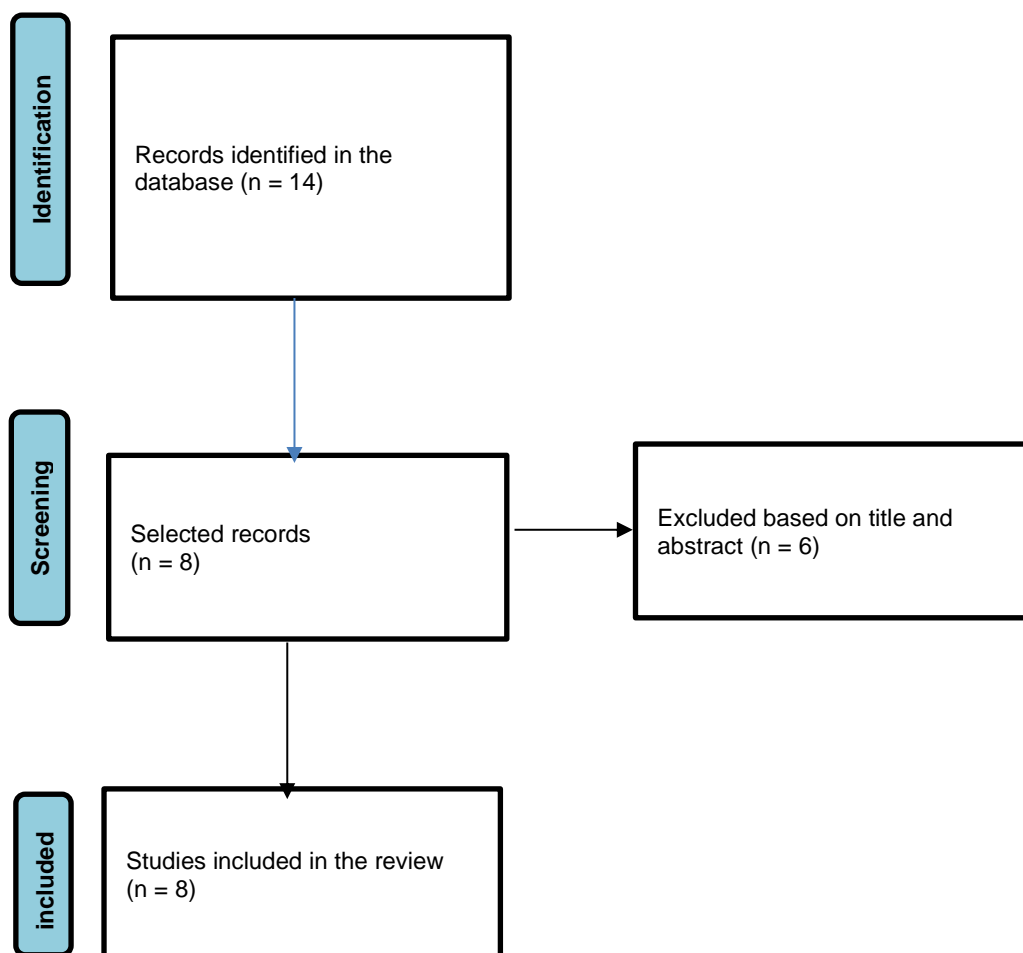
The search was conducted in PubMed, Medline, and Scopus databases using the PICO search phrase: "(police officer\* OR police) AND (psychosocial stress OR sleep problems) AND (cardiovascular disease\* OR metabolic syndrome)." Studies were included if they were: (a) published in English, (b) with full-text availability, (c) conducted with any research methodology, (d) primary (cross-sectional or longitudinal). No search filters were used. Works published up to June 11, 2023, were selected. We did not collect any online sources or grey literature. No time limits were set for the publication date. The collection was expanded by including articles from search lists of selected works.

After the bibliographic search, two authors (NM, FCh) performed the selection, and any uncertainties were resolved through consultation with a third researcher (FCi). Based on the research questions, the main data from the included studies were extracted into an Excel® spreadsheet, analyzed, and discussed collectively by all authors. The analysis of the studies was carried out through a narrative synthesis of the results. The quality of cohort studies was assessed using the Qumseya Scale [31], which evaluates cohort study criteria, assigning a maximum score of 9 points. The quality of other studies was evaluated using an adapted version of the Newcastle-Ottawa Quality Assessment Scale (NOS-A) for cross-sectional studies, which assigns a maximum score of 10 points [32].

## RESULTS

The initial search yielded 14 results (Figure 1). The selection of relevant articles led to excluding 6 of these works due to their lack of relevance: one was a collection of conference proceedings, two regarded other workers (truck drivers, nurses), two regarded patients from the general population, and one was a review. The remaining 8 articles were studied and synthesized.

Figure 1. Article selection algorithm.



The research findings are summarized in Table 1. Except for one, the studies were all cross-sectional and were conducted on numerically limited samples. Three of the studies were from the same group of police officers in Buffalo, USA, in a numerically restricted population followed by a research group for over 20 years. Five studies were conducted in the USA, one each in Taiwan, France, and Italy. The quality of all retrieved studies was deemed to be good.

**Table 1.** Summary of included studies [n = 8].

Author, year	Country	Sample	Study design	Main findings	Variables and tools	Study quality
McCanlies et al, 2012 [33]	USA	98 police officers [59 males]	Cross-sectional	Metabolic syndrome [MetS] was present in 22.0% of males and 2.6% of females. In women, sleep duration was associated with the number of MetS components. Sleep-disordered breathing was associated with MetS components.	MetS and sleep duration [short < 6 hours, long ≥ 6 hours]	9
Violanti et al, 2009 [34]	USA	98 police officers	Cross-sectional	Police officers on the night shift, despite being younger, had more MetS components. Low sleep duration and increased overtime work duration were associated with MetS.	MetS, shift work, sleep duration, and overtime work	7
Chang et al, 2015 [35]	Taiwan	796 male police officers	Cross-sectional	The prevalence of MetS was 24.5%. Sleep quality was associated with MetS [p = 0.029] and abdominal obesity [p = 0.009]. Short sleep duration [<5 hours] was associated with abdominal obesity.	MetS, sleep duration, and quality. MBI	6
Schilling et al, 2019 [36]	USA	201 police officers [64% males]	Cross-sectional	Average cardiorespiratory fitness mediates the relationship between stress, cardiovascular risk, and mental health.	Occupational stress ["Effort-Reward Imbalance" and "Job Demand-Control"]. Cardiovascular risk factors, burnout, insomnia, and psychological distress. Cardiorespiratory fitness [stress test].	9

Ramey et al, 2012 [37]	USA	85	male	Cross-sectional	Sleep deprivation and poor sleep quality in police officers on night shifts. No association with C-reactive protein [CRP] levels.	Sleep duration and quality ["Pittsburgh Sleep Quality Index"], CRP, body mass index.	6
Ma et al., 2013 [38]	USA	257	police officers	Cross-sectional	Increased intima-media thickness [IMT] in police officers with <5 or >8 hours of sleep.	Actigraphy. Cardiac ultrasound.	9
Prunier-Poulmaire et al, 1998 [39]	France	302	police officers	Cross-sectional	Shift work and job type affected sleep disturbances.	Shift type, job type, symptoms	6
Garbarino and Magnavita, 2019 [40]	Italy	242	male	Longitudinal [5-year follow-up]	Occupational stress and sleep quality were significantly correlated with incident cases of Metabolic Syndrome [MetS]. A mediation analysis confirmed that sleep mediates the relationship between stress and MetS.	Stress ["Demand-control-support" and "Effort-reward-imbalance"]. Quantity and quality of sleep ["Pittsburgh Sleep Quality Index"], excessive daytime sleepiness ["Epworth Sleepiness Scale"].	8

The observations showed that occupational stress and sleep problems were associated with MetS in police officers. Mc Canlies et al. showed that sleep disorders were associated with MetS components [33]. Violanti et al. [34] highlighted that shorter sleep duration and increased overtime hours, combined with night shifts, are associated with a high prevalence of MetS. In Chang et al.'s study [35], sleep deprivation (<5 hours per day) and poor sleep quality were linked to MetS. Schilling et al. [36] observed that cardiorespiratory fitness is an important mediator in the relationship between stress and health, suggesting that health promotion programs for police officers should consider early screening for burnout, sleep disorders, and mental well-being, including fitness tests and promoting physical activity. Night shifts of police officers were associated with poor sleep quality [37]. According to Ma et al. [38], adequate sleep duration could prevent atherosclerosis among police officers. The study of Prunier-Poulmaire et al. [39] indicates the need for a multifactorial approach in designing shift work, especially in public-facing activities. The longitudinal study by Garbarino and Magnavita [40] demonstrates a reciprocal relationship between occupational stress and sleep, contributing to an increased risk of MetS.

## DISCUSSION

The studies collected confirmed the association between stress, sleep problems, and cardiovascular risk in police officers. The evidence, however, is weak, as samples are numerically limited, and there is only one longitudinal study demonstrating an increased incidence of MetS in police workers with poor sleep and high stress.

Occupational epidemiology in the police force is based on a few studies. Longitudinal studies are infrequent because this professional category is not systematically subjected to health checks,

except on hiring or admission to courses required for obtaining specific licenses or permits. Cross-sectional studies do not allow us to infer causality. Moreover, studies are often episodic, and methodological differences make synthesizing findings challenging. However, the causal role of stress and sleep alterations on vascular risk is plausible, based on the studies on metabolic disorders in other populations, as well as in the few studies on police officers.

A high rate of MetS has been reported in the Indian police force compared to the general population [41]. In contrast, in an international comparison of various occupational groups, female German police officers showed the lowest MetS rate among the different professional categories [42]. A meta-analysis of studies conducted on armed forces from different countries demonstrated a low prevalence of MetS, with higher prevalence rates in the police force than other military personnel [43]. To explain the variability in epidemiologic data, some researchers compared operational and non-operational police officers, observing that the former have slightly higher cardiometabolic risk markers than the latter [44].

Efforts have been made to globally compare the rate of MetS across various professions and determine whether police officers have a higher MetS rate than other professional categories. However, this endeavor is far from straightforward from an epidemiological standpoint. Indeed, MetS prevalence varies among nationalities, within and between occupational groups, and across genders. The reasons for this variation appear complex and are supported by various causal explanations. Furthermore, the varying definitions of MetS complicate the comparison between studies [45]. Overall, the results indicate that valid data on this topic are insufficient, and further randomized and controlled studies are needed.

Psychosocial factors, particularly stress, have captured researchers' attention for their postulated relationship with cardiovascular risk. Literature studies often distinguish between the general term "organizational stressor" (related to context) and "operational stressor" (related to content, such as exposure to dangers, threats, and trauma) [46]. Organizational stressors are common to other professions: for example, shift work [47], technostress, i.e., the inability to adapt or cope with new information and communication technologies in a healthy way [48], relationships with superiors and colleagues or with other categories of workers [49], working hours of prolonged service [50], work scheduling [51], work-family conflict [52], abusive supervision [53]. Operational stressors are typical of police work, such as exposure to events that have the potential to be psychologically traumatizing [54], violence [55], brutality [56], and shooting under pressure [57,58].

Treating the broad category of "police officers" as homogenous overlooks that exposure to trauma only pertains to a small portion. The prevalence of post-traumatic stress disorder (PTSD) in the police varies considerably among studies, ranging from 0% to 44% (M = 14.87%, median = 9.2%). Despite this variability, strong evidence suggests that PTSD among police officers is higher than in the general population. Among the responsible factors, age or length of service have no particular importance, while the intensity of the trauma is significant [59]. A meta-analysis of available police studies, including more than 270,000 police officers, indicated that PTSD affects 14.2% of workers, depression 14.6%, anxiety 9.6%, suicidal ideation 8.5%; all these disorders are associated with occupational stress, and the most decisive risk factors are higher occupational stress and avoidant coping strategies [60]. A metanalytic study on military and police workers, including more than 7 million observations, showed that the exposures associated with PTSD were several army deployments and confrontations with death [61]. The lack of social support from colleagues is a factor that increases the risk of psychological problems [62].

A particular aspect of operational stress in police officers is the unpredictability of requests for service, which often require them to go from observation to maximum alert in a very short time. This aspect often makes routine activity more stressful than involving a relevant but well-defined danger. For example, the policemen who were called to deal with terrorists during the international G8 meeting in L'Aquila in 2009 were less stressed during the event than during the everyday routine activities carried out during the year [63]. It is important to remember that stressors are not harmful but can become so depending on the worker's response methods and capacity for resilience. The

worker's sensitivity to stress can be measured as "Work Annoyance": everyone has a different resistance to occupational stressors [64], and this explains why the same experience can be stressful for one, neutral for another, and advantageous for a third worker. Therefore, it is essential to evaluate how each police officer perceives stress to promptly identify and help those who need it.

Undoubtedly, there is a close relationship between occupational stress and metabolic syndrome, as a Mexican study also indicates: the worst levels of burnout syndrome can be found among police officers without regular mealtimes, bad sleep habits, and elevated Body Mass Index [65]. The Buffalo Cardio-Metabolic Occupational Police Stress Study (BCOPS) from the American context, conducted on a small group of police officers who were offered periodic health check-ups, observed that police stress, particularly organizational pressure and lack of support, was associated with MetS among women but not among men [66]. Another study within the same group of police officers found that agents with severe symptoms of post-traumatic stress disorder (PTSD) were about three times more likely to have MetS [67]. However, these findings are significantly tempered by a British study involving over 40,000 police officers, which observed lower rates of potential mental disorders, especially PTSD, than those reported in other studies on police employees [68]. Furthermore, although mental disorders in this study were associated with increased diastolic blood pressure, this result was unlikely to be clinically significant [68]. A systematic review of cross-sectional studies on the relationship between police officers' occupational stress levels and their rate of cardiovascular diseases concluded that stress exposure is weakly associated with hypertension, obesity, dyslipidemia, and glucose metabolism alteration [69]. A longitudinal study conducted among officers of a mobile unit engaged in operational public order tasks supports the hypothesis that work-related stress induces MetS, mainly through its effects on blood lipids. Most police officers in this special unit had high levels of stress. At follow-up, police officers in the highest quartile of stress had significantly higher average triglyceride levels and lower HDL cholesterol levels than their colleagues in the lowest quartile. Police officers with high - stress levels had a higher risk of developing MetS (adjusted odds ratio aOR = 2.68; 95% CI = 1.08-6.70) and hypertriglyceridemia (aOR = 7.86; 95% CI = 1.29-48.04). Among various stress components, the demand variable, psychosocial load, and the effort variable, the effort put into work, were significant predictors of MetS, while job control and rewards received did not exert a significant protective effect [70].

Another psychosocial factor associated with MetS in the police is poor sleep. Police officers are often sleep-deprived. This can result from sleep disorders, such as obstructive sleep apnea (OSA), or from working night shifts. The two risk factors can combine, resulting in greater impairment. Changes in sleep architecture, with an increased number of electroencephalographic activations, apnea/hypopnea index, sleep latency, lower levels of oxygen saturation, and increased daytime sleepiness can be observed in policemen with OSA and night work, especially if they are of advanced age and with a high body mass index [71]. OSA is known to be associated with an increased risk of CVD [72]. In Chinese policemen, OSA is associated with hypertension [73]. OSA undoubtedly increases the risk of road accidents among police officers [74], significantly reducing workers' well-being and quality of life [75].

However, in those who do not suffer from sleep disorders, work commitments can disturb the duration of sleep and its quality. Nightshift imposes irregular sleep-wake and meal timing, and this circadian disruption may contribute to chronic disease in police officers [76]. Sleep loss, sleepiness, and fatigue are the most critical determinants of absenteeism in police officers [77].

Experimental studies have shown that sleep deprivation induces epigenetic and neuropathological changes in mammals [78]. Maintaining wakefulness is particularly difficult in humans when combined with sleep restriction and circadian misalignment [79]. In police officers, sleep-destroying conditions induce pathological alterations that translate into an increased cardiovascular risk. Police officers working rotating shifts for 7 consecutive nights showed changes in the urinary metabolome's daily rhythms, with the most notable impact observed for acylcarnitines and organic acids, which are involved in mitochondrial function [80]. Even if a study reported that the number of consecutive night shifts did not affect the self-reported levels of sleepiness among a

sample of police officers [81], the use of hormone tests instead of questionnaires demonstrated signs of desynchronization (suppressed amplitude of melatonin and phase delay of salivary cortisol) because of the increasing number of consecutive night shifts among police officers at work [82]. Working atypical schedules leads to temporal misalignments between a worker's rest-activity cycle and their endogenous circadian system. A recent study demonstrated the disruption of several peripheral clocks in police shift workers [83].

The two risk factors we studied, stress and sleep, are strongly linked to each other, both directly and indirectly. The direct relationship is reciprocal: occupational stress is associated with sleep problems, but it is also true that sleep-deprived workers are more exposed to occupational stress [40,75]. Furthermore, the two variables have indirect relationships. Sleep deprivation plays a mediating role in the relationship between stress and health [84]. It influences profound reactions to highly stressful situations, such as the decision to shoot or not shoot people of different skin colors [85]. The observation of a sample of 430 policemen indicated that occupational stress is associated with a reduction in the duration and quality of sleep [86].

Stress increases mental disorders, such as anxiety and depression, which are, in turn, associated with sleep problems. Even in a selected population such as police officers, enjoying better levels of mental health than the general population, the effort made to respond to job demands (measured in the effort-reward imbalance model of stress) or the psychosocial workload (the "demand" variable in Karasek's demand/control/support model) induce an increase in levels of anxiety and depression over time [87]. Anxiety has been shown to act as a mediator in the relationship between stress and sleep problems in workers [88]. Depression, on the other hand, includes sleep problems in its picture. Sleep quality is significantly and independently associated with depressive symptoms in police officers [89]. Significant correlations were found between sleep problems, higher degrees of depressed symptoms, and passive coping. These results show that various forms of police stress can harm sleep quality, and that people with greater levels of depressive symptoms and those who engage in passive coping mechanisms like self-blame or denial may be more vulnerable to the adverse effects of police stress [90]. PTSD-induced by intense occupational stress, is associated with insomnia, hyperarousal, and avoidance symptoms. There is evidence that sleep problems may mediate the relationship between PTSD symptoms and health outcomes in officers with probable partial PTSD and depression [91]. Studies in Canadian police officers observed that differences in clinical symptom severity may be partially accounted for by worsened sleep quality [92]. Burnout, caused by prolonged exposure to occupational stress, leads to sleep problems in shift-working officers [93]. Violence at work, in addition to causing an increase in perceived stress, is associated with sleep problems [94,95].

Sleep deprivation and sleep disorders are associated with MetS and CVD in many categories of workers and in the general population. This has been consistently demonstrated in OSA [96], and insomnia [97]. Occupational stress and insufficient sleep are modifiable cardiovascular risk factors that an occupational health promotion program can improve [98].

All these considerations support our view that it is necessary to provide sleep health promotion and stress reduction programs for-police workers. Health promotion in these workers is particularly significant because this group is not subjected to periodic health controls. Many police officers are seen by a doctor only at enlistment and have no subsequent mandatory check-ups during service unless they have to earn patents or special leave [99]. Law enforcement guidelines, which the authors of this article contributed to in 2016 [100], emphasize the need for continuous health improvement for these workers who perform critical societal tasks. Health promotion activities among police officers have proved to be effective in reducing stress [101]. Programs including measures of sleep hygiene obtained a reduction of occupational injuries [102] and CVD risk [103]. A literature review of programs for stress reduction observed that police officers may benefit from continuous and well-sustained interventions targeting work-related stress and potential psychological disorders [104]. It is not superfluous to note that stress and sleep disorders in this particular category of workers cannot



be treated with drugs that modify the state of vigilance so as not to interfere with alertness and speed of judgment.

In this review of the literature, we must remember that although all our observations converge in the direction of indicating the importance of stress and sleep problems, the paucity of available studies means that the overall evidence of an association between stress, poor sleep, and cardiovascular disease risk in the police is weak. A precautionary principle would be to adopt workplace health promotion programs to implement stress and sleep management strategies in this category of workers. Considering that sleep in police officers can often be of poor quantity and quality [24], it is crucial to assume the role that sleep deprivation could play in determining cardiovascular risk conditions. Therefore, health promotion should involve stress management, increased worker resilience, and proper sleep hygiene.

It is important to remember that excessive stress in police officers engaged in maintaining public order could cause a reduction in their performance and judgment, which is extremely dangerous for public health since social security is entrusted to these workers. An association between burnout and reduced patient safety has been demonstrated in healthcare workers [105]; we can assume that the same happens for the police and the general population. Similarly, the evidence that sleep deprivation impairs endurance performance is well established [106]. Health surveillance of police workers should, therefore, include sleep health promotion and stress control activities. Some of these sleep hygiene programs have achieved a short-term reduction in the frequency of workplace accidents [102]. Our study supports health promotion efforts to achieve a long-term reduction in cardiovascular risk, following the comprehensive approach to worker health known as “Total Worker Health<sup>®</sup>” recommended by NIOSH [107-116]. Health promotion interventions must be included in the control and prevention of professional risks in a continuous and sustainable effort to improve the work culture of the police force.

#### ***Strengths and limitations of the review***

This study has some limitations. The first derives from the fact that the literature almost exclusively includes cross-sectional studies. The paucity of longitudinal studies on police officers has forced researchers to rely on longitudinal population studies to interpret the results in a purposive sense. We have no reason to believe that police officers are different from the general population, however longitudinal studies on police officers are necessary to clarify the strength of the association between stress, sleep problems and cardiovascular risk. Moreover, the heterogeneity in methodologies and populations across the included studies presents challenges in synthesizing and generalizing the findings. Additionally, the exclusion of non-English language studies and grey literature might have led to the omission of relevant data. Despite these limitations, this review sheds light on the crucial interplay between occupational stress, sleep quality, and health risks in police officers, emphasizing the need for comprehensive health surveillance and intervention programs in law enforcement settings.

#### **CONCLUSION**

This scoping review of the literature confirms the relationship between excessive stress and poor sleep, two modifiable risk factors very common in police activity, and the metabolic damage associated with cardiovascular risk. Although the evidence for increased cardiovascular risk in police is weak based on the studies available, the findings support health promotion activities aimed at reducing stress and improving sleep in police officers.

**Author Contributions:** Conceptualization, N.M.; data curation, N.M, F.Ch., and F.Ci.; writing—original draft preparation, N.M. and F.Ch.; writing—review and editing, N.M.; supervision, S.G. and F.Ci. All authors have read and agreed to the published version of the manuscript.

**Funding:** None

**Acknowledgments:** None

**Conflicts of Interest:** The authors declare no conflict of interest.

**Publisher's Note:** Edizioni FS stays neutral with regard to jurisdictional claims in published maps and institutional affiliation.

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