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Application of a health promotion program aimed at reducing stress and burnout in healthcare workers after COVID-19 pandemic

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*Ai miei genitori,
a mio marito,
e alle mie figlie,
fonte di ispirazione e amore puro e incondizionato.*

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Abstract

Background: The World Health Organization (WHO) on March 11, 2020, proclaimed a global pandemic due to the unfortunate global spread of the coronavirus (COVID-19), which was discovered in early 2020. All of the workers' lives and physical and mental health have been profoundly impacted by COVID-19. Healthcare professionals (HCPs) experience significant levels of workplace stress, which is linked to worsening psychological health, lower care quality, and lower patient satisfaction. A comprehensive evaluation of the evidence on the benefits of yoga and mindfulness for healthcare professionals' stress management was produced after a thorough investigation of the literature. Other research has over time shown how beneficial visual thinking techniques and forest bathing are for managing and lowering stress and burnout in healthcare professionals.

Aim: To establish a clinical trial was the goal. Following multiple systematic reviews that enabled a more comprehensive investigation of the topic, a research protocol was drafted prior to the clinical trial's implementation. Through a single center, randomized controlled trial, this study aimed to examine the impact of yoga, mindfulness-based intervention and visual thinking techniques on the mental health of healthcare workers (HCWs) at one hospital in Rome. This trial will adhere to the 1975 Helsinki Declaration, as updated in 2000. The participants' informed written consent will be sought.

Methods: Healthcare personnel from the teaching hospital "*Policlinico Umberto I*" in Rome were chosen for this investigation. In several course editions, the intervention was given to the hospital's doctors, nurses, psychologists, and technicians. Under Italian law, the explicit requirement to assess work-related stress hazards was established by Legislative Decree

81/2008. It is the employer's duty to assess any risks to workers' health and safety, including those brought on by stress at work. The selected staff members will be expected to complete an RSL training course. It will take place outside of regular business hours because it is a mandatory course that enlistees must finish in order to obtain credit, although this should have no effect on enrollment or dropout rates. As a course, the intervention will meet once a week for four weeks. The three identified interventions are yoga, visual thinking strategies (VTS) and mindfulness-based intervention (MBI). Before and after the health promotion program is implemented, the levels of depression, client burnout, personal and work burnout, and work-related stress will be assessed for each of the participants. Different surveys that are given to participants at the start and finish of the courses are the primary instruments used to assess the effectiveness of the various techniques.

Results: Preliminary results involve 82 HCWs (78% females; most aged 51-60 years; 48,8% nurses and 32,9% physicians). These results indicate best performances of the yoga and mindfulness courses, and good performance of the VTS in reducing work related stress, anxiety and depression, compared to the non-intervention group.

Conclusion: These days, there has been a lot of interest in and significance for the research of worker well-being. The clinical research results showed that the intervention group participants' mood, emotional stability, and mental health had improved, which is particularly concerning during pandemics. The various interventions were developed with the intention of putting the participating healthcare professionals' psychological talents into practice. In order to enhance employee well-being, employers in the health sector want to think about introducing workplace wellness programs that incorporate these strategies. Effective interventions that can assist

enhance the psychological functioning of healthcare workers include yoga, MBI, VTS, and FB.

Keywords: healthcare workers, stress, burnout, well-being, public health.

Introduction

The coronavirus (COVID-19), identified in early 2020, unfortunately spread rapidly around the world and was declared a global pandemic by the World Health Organization (WHO) on 11 March 2020. Typical manifestations of this virus are pneumonia, bronchitis and acute respiratory syndromes, which in many cases required hospitalization of the patient and in worst cases intensive care (1). Due to the numerous changes made in hospitals in order to cope with this infection, COVID-19 has heavily affected the life and psycho-physical health of all medical professionals involved (2). Several studies carried out last year investigated the experience of nurses involved in COVID-19 wards during the first wave (3). The sensations that emerged were different: lack of organizational support, the initial challenge with the procurement of personal protective equipment (PPE), physical impacts such as insomnia and headache, and the constant fear of being infected and being able to infect family and friends. Depression, anxiety and post-traumatic stress disorder were the most common issues encountered by the health professionals involved (4,5). In the 21st century, social media are part of everyday life and are therefore used by nurses (6), both professionally and personally. On the one hand, social media made it possible to improve the public image of nurses, but on the other hand they have negatively influenced public opinion depending on the information that is provided. A year ago there was enthusiasm, adrenaline and a great desire to do. The nurses felt the closeness and support of the people, representing the only salvation in the face of that unknown virus that has caused the deaths of many people. To date, one year after the onset of the pandemic, nurses feel tired, discouraged and unmotivated. After a year, many things have changed, but the emergency has remained constant: nurses have found

themselves overwhelmed by appreciation from national institutions, to the point of being candidates for the 2021 Nobel Peace Prize. substance. The study conducted by Brooks et al. (7) showed that nurses, during an emergency, can develop a post-traumatic disorder that can last for years. During the COVID-19 epidemic, doctors and nurses had to face growing challenges that had never been addressed before, all with limited resources. Prolonged use of PPE causes breathing difficulties and limited access to the toilet and water, resulting in physical and mental fatigue. Therefore, many caregivers who work with COVID-19 patients are subjected to greater psychological pressure and experience high rates of psychiatric morbidity.

Chapter 1 – Mental health in healthcare workers:

work-related stress, burnout and depression

1.1 Work-related stress

In the social, behavioral, and medical sciences, stress is a condition that is extensively researched and debated. This is particularly true when it comes to its primary causes and potential workplace variables that can have an impact on both individuals and organizations (8). As of right now, there are several meanings accessible. They all spring from the notion that man, like all living systems, is dependent on preserving a positive interaction with his surroundings and that his capacity to attain internal balance is a necessary condition for survival (9).

Although this word has been understood in many ways over the ages, stress is now recognized as a normal and essential part of life for all people (10). An excess of stress damages the body severely or, in the worst situations, has long-term effects. However, it has been demonstrated that an individual needs a specific dosage in order to survive (10). Numerous research have demonstrated the high occurrence of stress in helping professions; in particular, recent studies have examined the job of health care workers and the factors that contribute to stress (11). Workplace stress and familial pressure in one's personal life can compound to cause major health problems that can develop into genuine work-related illnesses.

Stressor-determined responses actually have the function of bringing about changes through adaptation, i.e., the process that enables one to implement all of the measures meant to manage and solve issues (11). Therefore, stress cannot be avoided because, within certain bounds, it is a necessary physiological condition for life. Stress turns pathological, though, when the

various stressful stimuli act intensely and persistently, failing to trigger the body's adaptation mechanisms and overwhelming the body's ability to cope. In actuality, stress factors can also arise from the work context, resulting in mental and physical conditions that harm employees' ability to work, their effectiveness, their mental and physical health, their job satisfaction, and the quality of their work (12).

One of the biggest problems of the twenty-first century, according to the World Health Organization (WHO), is work-related stress, which has an impact on both the individual and the organization. In actuality, it is linked to a number of issues that negatively impact workers' quality of life, including depression, anxiety, asthma, diabetes, heart disease, and back pain. It is also linked to absenteeism, termination from employment, workplace accidents, and decreased productivity.

1.1.1 Symptomatology

Therefore, this phenomena may have a major impact on employees' physical and mental well-being. The wide range of symptoms linked to occupational stress illustrates the intricate relationship between human health and the workplace (13). Thus, we can divide them into four categories:

Psychological symptoms:

Anxiety is a prevalent symptom of work-related stress, characterized by ongoing concern, uneasiness, and tenseness. According to scientific research, working in stressful environments for an extended period of time can raise your risk of acquiring anxiety disorders (14). This condition and depression are strongly associated in parallel. According to one study, those who experience ongoing stress at work may be more susceptible to depression, which is characterized by low mood, disinterest in routine

tasks, and feelings of worthlessness (15). Lastly, there is also a common correlation between sleep difficulties and stress at work. Persistent work-related stress can disrupt sleep-wake cycles, leading to insomnia and worse quality sleep, according a poll. These illnesses may in turn aggravate the perception of stress, creating a vicious circle that further compromises the worker's mental and physical health (15).

Physical symptoms:

Stress at work has a major effect on cardiovascular health. In this context, a meta-analysis carried out by Kivimäki et al. (16) found that it is linked to a higher risk of heart disease, which includes hypertension, myocardial infarction, and stroke. A number of mechanisms, including extended activation of the sympathetic nervous system and elevated levels of the stress hormone cortisol, are responsible for this relationship in particular. Gastrointestinal symptoms are another typical physical sign. In fact, research suggests that stress might impact stomach acid secretion and intestinal motility, which can result in conditions including gastroesophageal reflux, peptic ulcers, and irritable bowel syndrome (IBS). Lastly, a study conducted by Santos et al. (17) discovered a strong link between migraine frequency and work-related stress exposure.

Behavioral symptoms:

One prevalent behavior among stressed workers is absenteeism, or missing work due to illness. However, presenteeism—that is, showing up for work in spite of health issues—is also troublesome. It has been demonstrated, in fact, that stressed individuals who frequently labor through discomfort decrease productivity and raise the possibility of mistakes (18). Increased use of substances like alcohol, tobacco, and narcotics is also linked to stress at work. According to one study, stress can lead to hyperphagia, or overindulging in eating, especially high-fat and sugar foods. Although this

unhealthy eating pattern is frequently an attempt at emotional self-regulation, it can eventually result in weight gain and associated health problems such as obesity and type 2 diabetes (19).

Cognitive symptoms:

Stress at work can seriously impede cognitive abilities. It may also impair employees' capacity for making decisions. In this regard, Starcke and Brand (20) investigated how acute stress can impair one's capacity for deliberate decision-making, raising the possibility of rash and dangerous choices that have detrimental effects on the organization as a whole as well as the individual because poor decisions can jeopardize job quality and safety. Consequently, there are numerous and complex effects of stress at work on overall health. However, stress at work also has a detrimental impact on social relationships, which has repercussions for families and communities as well.

1.1.2 Measurement instruments

In recent years, the increasing focus on occupational well-being has led to the development of several measurement scales to assess work-related stress. These tools are essential for identifying and managing it, helping to improve workers' mental health and productivity:

- ***Work Stress Questionnaire (WSQ):*** was created as a self-administered questionnaire by Holmgren et al. (21) with the intention of early identification of people at risk of stress-related sick leave absenteeism. With just 21 questions, it is appropriate for use in a clinical context when time is frequently of the essence. Moreover, unlike other screening tools, it does not aim to provide a specific diagnosis; rather, it can be used to identify work-related stress without regard to the patient's underlying condition. In reality, the WSQ considers the interplay between

environmental and personal factors and is based on the experiences of workers who are missing due to sickness (22).

- ***ILO-WHO Workplace Stress Scale:*** is a quantitative support tool offered by the World Health Organization and the International Labour Organization. It consists of 25 items pertaining to the seven work activity segments that Ivancevich and Mattesson identified: territory, technology, group support, leader influence, lack of cohesion, organizational climate, and organizational structure. The Likert paradigm was used in the scale's construction, and each item had seven possible answers, ranging from 0 (never) to 6 (always). Its usefulness resides in its capacity to anticipate the origins of psychological hazards, and it was verified on a sample of 38,072 workers from all industries (23).
- ***Perceived Stress Scale (PSS):*** The Cohen et al. (24) questionnaire is self-administered and measures the degree to which respondents perceive their lives to be unpredictable, unmanageable, and overburdened. There have been three iterations of the PSS created. The first was a 14-item scale (PSS-14), which was eventually shortened to 10 items (PSS-10).
- ***Job Stress Scale (JSS):*** was created by Parker and DeCotiis (25) with the intention of developing a tool that could measure the primary causes of work-related stress in a legitimate and reliable manner. This 13-item scale evaluates two primary dimensions: role ambiguity, which includes items evaluating role confusion, unclear responsibilities, and lack of necessary information, and work overload, which looks at things like tight deadlines, a high volume of work, and not enough time.
- ***Occupational Stress Indicator (OSI):*** This tool was created by Cooper et al. (26) to evaluate a variety of characteristics of work-related stress, such as contributing factors, worker reactions, and the effects on

workers' physical and mental health. It has been used in a variety of organizational contexts and has been validated by multiple studies that have confirmed its validity and reliability. It has six components: sources of stress (workload, role, relationships with others, career, and organization); individual characteristics (personality type and locus of control); coping strategies; job satisfaction; psychological well-being (existence of psychological symptoms, such as depression and anxiety); and physical well-being (measures physical symptoms of stress, such as exhaustion and poor sleep).

1.2 Burnout

The term "*burnout*" originates from the English expression "*to burn out*" which can be literally translated as "*to burn out*" or "*to extinguish*" aptly describing those experiencing this condition (27). Many definitions of burnout have been proposed in the literature over time, most of them are based on clinical observation. All concur, meanwhile, that it is a disorder brought on by ongoing work stress, which depletes one's intellectual, social, psychological, and physical resources and creates negative psychological capital (27). According to Maslach et al. (28,29), affected professionals frequently feel that there is a persistent mismatch between their needs, values, and the work they accomplish. This can cause emotional instability and make them more prone to depressed or neurotic episodes. The term "*helping professions*" used to refer only to occupations like healthcare that required a great deal of emotional investment in providing care for others. But these days, it's not connected to a particular professional setting. It was redefined by Schaufeli (30) as a condition marked by mental resource depletion, indifference, detachment from work,

and a sense of professional ineffectiveness that might be noticed in any work context (27). This is due to the fact that, while individuals who work closely with illness and the suffering of others are more exposed, this problem can affect anyone in a career that deals with the issues of others, including teaching, law enforcement, or the legal field, as well as anyone who works in a highly competitive atmosphere. However, a number of studies indicate that burnout is more prevalent and incisive among health workers, in part because of a "vocation" that occasionally obstructs a clear grasp of one's own boundaries and resources (27). Realizing this, the World Health Organization (WHO) included burnout in the ICD-11, the 11th version of the International Classification of Diseases, and formally recognized it as an occupational syndrome in 2019. The WHO (31) also offered instructions for the first time on how to recognize it and set it apart from other types of discomfort, including anxiety or depression. According to the definition, burn-out is distinguished by three factors:

- 1) a sense of tiredness or low energy
- 2) a greater psychological detachment from one's work, or emotions of pessimism or cynicism about one's job
- 3) *reduced professional efficacy* (31).

The World Health Organization stressed that it is an occupational phenomena and not categorized as a medical ailment, but rather as one of the factors that lead individuals, especially workers, to seek medical attention. "Burn-out refers specifically to phenomena in the occupational context and should not be applied to describe experiences in other areas of life," the definition concludes (31). Since Burnout Syndrome has been formally recognized, there are now more worldwide support networks for those who experience it thanks to the creation of focused therapies for both prevention and therapy (31).

1.2.1 From Stress to Burnout: Maslach's Theory

Without a consensus definition, the term "burnout" was first used quite broadly. But over time, agreement grew around the three essential aspects of this syndrome, prompting Christine Maslach to create a multifaceted theory (28). In a study by Maslach, Schaufeli, and Leiter (29), these traits—which are now used to define burnout within the ICD-11—are specifically represented by the following:

- 1) emotional weariness
 - 2) depersonalization
 - 3) decreased personal accomplishment.
- ***Emotional Exhaustion*** is characterized by a lack of energy necessary to face daily life and the prevalence of feelings of apathy and emotional detachment from work. The individual, therefore, feels empty, exhausted, and emotionally drained (28,29).
 - ***Depersonalization***, according to Maslach, refers to an attitude characterized by detachment and hostility that primarily involves the professional helping relationship, which is experienced with discomfort, coldness, and cynicism.
 - ***Reduced Personal Accomplishment*** refers to a feeling of "*professional failure*" due to the perception of one's inadequacy at work, underpinned by an awareness of disinterest and intolerance towards the suffering of others, and the consequent feelings of guilt for the impersonal and dehumanized relational methods that have now replaced the effectiveness and competence in dealing with other suffering human beings (28,29).

Many theories about the evolutionary trajectory of burnout have been established over time, but few research have provided evidence to support these beliefs. For instance, the phase model suggested that all potential combinations of the three dimensions' high and low scores may produce eight different models, or phases, of burnout. On the other hand, a different model proposed depersonalization as the initial stage, which was followed by decreased personal achievement and emotional fatigue. Eventually, another model suggested that cynicism would develop as a result of tiredness and that cynicism would lead to inefficacy. Research to date has verified a sequential relationship between tiredness and cynicism; nevertheless, the next step towards inefficacy is yet unknown, as the evidence points to the concurrent emergence of this third dimension. Burnout is a lasting reaction to ongoing work-related pressures, as evidenced by the fact that burnout scores do not change over time (28,29). Stress is a risk factor for burnout syndrome because it can result in pessimism, a sense of helplessness, operational blockages, and/or a detachment from motivation due to recurrent negative feedback and outcomes.

1.2.3 Clinical Characteristics

The three principal types of symptoms that the burnout-affected person displays are physical, psychological, and behavioral. These symptoms might manifest as primary symptoms or exacerbate latent symptoms that are already present (28,29).

Among the somatic complaints are:

- Digestive dysfunctions.
- Damage to the central nervous system
- Cognitive problems and neural damage (32)
- Erectile dysfunction

- Skin diseases
- Appetite disorders
- Psychosomatic components of arthritis, heart disease, diabetes
- Allergies and asthma
- Musculoskeletal disorders (33)
- Insomnia, parasomnia, and other sleep disorders: the results of one study, in particular, suggest a relationship between physical and emotional exhaustion and sleep disorders (34)

Conversely, and perhaps more importantly for the person, psychic symptoms fall into four types:

- Collapse of psychic energy (anxious-depressive syndromes)
- Collapse of motivation (depersonalization)
- Collapse of self-esteem (deficit in personal security)
- Collapse/loss of control (hallway syndrome).

Finally, behavioral symptoms include:

- Increased likelihood of using alcohol, psychotropic drugs, and narcotics
- Increased likelihood of antisocial, cynical, and sarcastic behaviors
- Increased likelihood of depressive disorders
- Increased likelihood of voluntary work isolation
- Increased likelihood of eating disorders

- Increased likelihood of aggressive behaviors
- Increased likelihood of social and work avoidance (35)

Additionally, burnout syndrome leads to a number of grave repercussions, especially from an organizational perspective: a marked decline in the caliber of work, a rise in absenteeism, a worsening of the work environment, and a rise in job desertion (36). In fact, dismissing the employee is frequently thought of as a fix for the issue. However, this strategy doesn't really address the fundamental issues; instead, it only costs the company a valuable human resource—possibly an experienced and dedicated people. Failure thus comes at a psychological and personal cost to the worker. However, the detrimental impacts of burnout extend beyond the individual and also impact users, who experience "less human" and lower-quality service (37).

1.2.4 Assessment Tools

Various scales have been suggested for measuring burnout, including *The Active and Passive Indexes of Burnout*, *The Gillespie-Numerof Burnout Inventory* (GNBI), *the Job Burnout Inventory*, *the McDermott Burnout Inventory*, and *the SBS-HP*. However, the *Maslach Burnout Inventory* (MBI), developed by Maslach and Jackson (1981), currently represents the most widely used tool for both research and operational purposes. The MBI is a standardized questionnaire consisting of 22 items written in the form of personal statements (e.g., "I feel exhausted after work") and divided into three subgroups that measure the three dimensions of burnout syndrome: emotional exhaustion (EE), with nine items dedicated to it; depersonalization (DEP), with five items dedicated to it; and personal

accomplishment (PA), with eight items dedicated to it. The frequency and intensity with which the subject undergoing the test experiences the feelings related to each scale are assessed using a six-point response format, with extremes defined as "never" and "every day"; depending on the score, therefore, the test quantifies EE from 0 to 54, DEP from 0 to 30, and PA from 0 to 48, assigning the subject a degree of burnout: low, moderate, or high (Table 1) (28).

Burnout	High	Moderate	Low
<i>Emotional Exhaustion</i>	>30	18-29	<17
<i>Depersonalization</i>	>12	6-12	<5
<i>Personal Accomplishment</i>	<36	34-39	>40

Table 1. Subgroup MBI scores

It is crucial to stress that the results for every subgroup ought to be taken into account independently and shouldn't be added up to a single overall score. Ultimately, a subject's level of burnout is indicated by a higher score in the "Emotional Exhaustion" and/or "Depersonalization" subgroups (28). In actuality, the MBI views burnout as a continuous variable that represents the range of emotions involved, as opposed to a binary variable that can either be present or absent.

The questionnaire has also been developed in different versions:

- MBI-HSS (*Maslach Burnout Inventory – Human Services Survey*), for personnel working in human services and helping professions (28,29);
- MBI-HSS-MP (MBI – *Human Services Survey for Medical Personnel*), exclusively for medical personnel (28,29);

- MBI-ES (*Maslach Burnout Inventory Educators Survey*), for educators and teaching staff (28,29);
- MBI-GS (*Maslach Burnout Inventory General Survey*), for all other categories (30).

Initially, this application was intended at helping professions, those vocations that involve significant emotional engagement between the operator and the user.

An evolution of the Maslach Burnout Inventory is the *Organizational Checkup System* (OCS) by Michael Leiter and Christina Maslach (28), which represents a fundamental step forward compared to other assessment tools, as it aims to measure the level of burnout in the work organization, identify the main causes, and plan recovery paths along the burnout-engagement continuum, extending the concept of burnout to all forms of organization and shifting attention from the individual to the organization as a whole. Based on the construct developed by Maslach, the OCS identifies the three dimensions of job burnout:

- Individual resistance, ranging from exhaustion to energy;
- Reaction to others and work, ranging from work disaffection to engagement;
- Individual reaction to one's work, ranging from a sense of inefficacy to a sense of professional efficacy.

These three dimensions are associated with six areas on the two sides of burnout and engagement: workload, control, recognition, social integration, equity, and values. To address the six areas of burnout, three

managerial processes have been identified, focused on leadership, skill development, and group cohesion.

Other examples of tools used in the diagnosis of burnout include:

- *Oldenburg Burnout Inventory* (OLBI)
- *Copenhagen Burnout Inventory* (CBI)
- *Brief Burnout Questionnaire* (BBQ)
- **Burnout Assessment Tool** (BAT)

1.3 Depression

Depression is a common and dangerous mental illness that is marked by a loss of interest in activities, a continuous sense of sadness, and a host of other physical and mental symptoms that make it difficult to go about daily tasks. According to estimates from the World Health Organization (WHO), depression affects over 264 million people worldwide, making it one of the main causes of disability in the world (38). Genetic, biochemical, environmental, and psychological components are all part of the complex etiology of depression (39). Changes in neurotransmitter systems, including those involving serotonin, norepinephrine, and dopamine, are frequently linked to the illness (40). Antidepressant medication and cognitive-behavioral therapy (CBT) are popular treatment modalities that have been shown to be effective in reducing depression symptoms (41). Rush et al. (42) noted that although there are therapies for depression, many people do not experience complete remission, which emphasizes the need for continued research into more potent approaches.

1.3.1 Clinical Characteristics

An individual's capacity to function in daily life is severely hampered by the emotional, cognitive, and physical symptoms that make up the clinical features of depression. According to the American Psychiatric Association (43), clinical depression is characterized by a persistently depressed mood, anhedonia, or the loss of interest or pleasure in almost all activities, and exhaustion or a lack of energy. According to Beck (44), cognitive symptoms frequently include trouble concentrating, difficulty making decisions, and recurring negative thoughts, such as feelings of overwhelming guilt or worthlessness. Changes in weight or appetite, sleep disorders such as hypersomnia or insomnia, and psychomotor agitation or retardation are examples of physical signs (45). Furthermore, somatic complaints, including headaches or digestive problems, are often associated with depression and may not have a clear medical reason but are linked to the underlying depressive condition (46). Major depressive disorder (MDD) diagnosis requires certain clinical symptoms to be sustained for a minimum of two weeks and to constitute a substantial deviation from the patient's baseline (47).

1.3.2 Assessment tools

Various assessment scales are used in the medical field to help with diagnosis and therapy planning by gauging the degree and presence of depression symptoms. Depression assessment measures are essential instruments for assessing the degree and presence of depressed symptoms in clinical and research contexts. One of the oldest and most popular scales used by clinicians to assess depression is the **Hamilton Depression Rating Scale** (HDRS), sometimes referred to as the HAM-D. The HDRS, created by

Max Hamilton in 1960, addresses a number of areas, including physical symptoms, mood, guilt, suicidal thoughts, sleeplessness, and anxiety. It usually has 17–21 items, and the overall score determines how severe depression is (48).

The **Beck Depression Inventory** (BDI), developed in 1961 by Aaron T. Beck, is another well-known instrument. The BDI is a self-report questionnaire consisting of 21 items that assesses the degree of cognitive, emotional, and physical aspects of depression symptoms. According to Beck et al. (49), it is especially helpful for screening for depression in general populations and tracking treatment results.

A relatively modern self-administered measure that has become popular is the **Patient Health Questionnaire-9** (PHQ-9), particularly in primary care settings. The PHQ-9, which was created in 2001 by Robert L. Spitzer and associates, consists of nine items that match the DSM-IV criteria for major depressive disorder. According to Kroenke et al. (50), it is appreciated for its simplicity, usability, and capacity to offer a diagnosis as well as a severity rating. These measures play a critical role in the diagnosis, severity assessment, therapy planning, and long-term patient progress evaluation of depression. They are particularly important in research studies since they are used to gauge the effectiveness and results of interventions (51).

Chapter 2 – The use of Yoga and Mindfulness-based Intervention to reduce stress and burnout in healthcare workers: an umbrella review

2.1 Background

The novel coronavirus (Covid-19), identified in early 2020, spread rapidly around the world and was declared a pandemic by the World Health Organization (WHO) on March 11, 2020. The typical manifestations of this disease are pneumonia, bronchitis, and acute respiratory syndromes, which in many cases require hospitalization, and in the most severe cases, hospitalization in intensive care units. Because of the changes hospitals have had to make to cope with this infection, Covid-19 has severely affected the lives and the mental and physical health of all the workers involved. Workplace stress is high amongst healthcare professionals (HCPs) and is associated with reduced psychological health, quality of care, and patient satisfaction (52-54). Several studies have demonstrated the impact of Covid-19 on the emotional well-being of frontline healthcare workers. It was found that HCPs experience high levels of stress, anxiety, depression and burnout, and sleep disorders, which inevitably led to medication errors and lower standards of care. This work- related stress may further lead to severe distress and burnout (52,53). Consequently, these symptoms may negatively affect the quality of their service, the patient's health and outcomes, and the viability of the healthcare system (52-54). There are three main effects of stress on HCPs: burnout, depression, and stress (55). Burnout has been defined as a syndrome characterized by depersonalization, emotional exhaustion, and a sense of low personal accomplishment (56). Burnout does not appear to have a universally

agreed-upon definition. Maslach et al developed a model of burnout in which they describe it as a work-related syndrome with three components: emotional exhaustion, depersonalization, and diminished feelings of personal accomplishment (28,29). Emotional exhaustion refers to employees having a reduced ability to experience emotions relating to their work. Depersonalization is a process that involves employees distancing themselves from their patients. Personal accomplishment relates to an employee's feelings of achievement from working with a patient (28,29). Occupational stress and burnout have been associated with physical and mental problems, including anxiety, depression, diabetes, fatigue, heart disease, hypertension, insomnia, and obesity (56,57). There is a lot of research evidence that suggests that mindfulness-based interventions and yoga can help HCPs reduce stress and burnout (56,58). Although there are varying definitions of mindfulness, it is commonly and operationally defined as the quality of awareness that occurs when one intentionally focuses on present moment experiences in an accepting and non-judgmental manner. Mindfulness-based interventions (MBIs) have emerged as a unique approach for addressing a range of clinical and subclinical difficulties such as stress, chronic pain, anxiety, and recurrent depression. MBIs have proven to be a promising intervention in reducing the stress experienced by HCPs (55). MBIs are recommended by the NHS and the National Institute for Health and Care Excellence (NICE) for the prevention and management of stress (National Institute for Health and Care Excellence, 2009). Mindfulness is a form of attention training, which shifts a person's relationship to everyday, present-moment experiences. These practices are believed to promote healthier ways of relating to inner experiences through enhanced awareness, attention regulation, and acceptance of thoughts, emotions, and states without the need to invest in,

alter, or escape from them (59). Healthcare workers form a vulnerable group where work pressure often leads to burnout. Burnout is a three-dimensional syndrome characterized by high emotional exhaustion, depersonalization, and a diminished sense of personal accomplishment (28). This symptom is highly prevalent in healthcare workers (60-62).

There is strong evidence regarding the positive effects of yoga practice on stress management and the prevention of burnout among healthcare workers. The discipline of yoga was originally defined as confined within a predominantly spiritual and meditative field. It evolved and assumed a more multifaceted nature with mixed techniques that combine mental and physical well-being. This integrated approach guarantees holistic benefits for the individual (63). Firstly, aerobic and anaerobic exercises improve the musculoskeletal structure, insulin circuit, hormone system, and metabolism (64-66). Further, the benefits achieved from sports or gymnastic exercise are enhanced by the association with meditation activities and psychoanalytic techniques, which help to induce relaxation and self-awareness; this technique helps to improve cognitive flexibility and increases attention, acceptance, and control of emotional reactions (67-69).

The integration of mindfulness and yoga training in our intervention is supported by evidence that indicates that both practices influence not only individual brain networks but also integrated brain states and brain-body interactions (70-72). Both strategies can be regarded as synergic in terms of their effects on body and mind states (70-72). This research review aims to provide an updated umbrella review of all systematic reviews and meta-analyses of the use of MBIs and yoga to reduce stress, burnout, anxiety, and other mental problems in healthcare workers.

Ethics Statements

As the present study was a systematic review, no ethics statement was needed.

2.2 Materials and methods

2.2.1 Identification of relevant studies

The review was conducted by following the recommendations of the PRISMA Statement (Preferred Reporting Items for Systematic Review and Meta-Analysis) (73). The protocol of this review has not been registered or published. The objective was to analyze how the use of yoga and mindfulness reduce stress, anxiety, depression, burnout, and sleep disorders in healthcare workers. Accordingly, the authors drafted a protocol based on the PIOS (population, intervention, outcome, and setting) (Table 1).

P (population)	Healthcare workers (HCPs)
I (intervention)	Yoga and Mindfulness-based intervention (MBI)
O (outcome)	To reduce stress and burnout
S (setting)	Hospital setting

Table 1. Clinical research Question Identified Through the PIOS Methodology.

2.2.2 Study selection and eligibility criteria

The eligibility criteria for the inclusion of the studies to be reviewed were defined. An umbrella review was conducted in January 2022 by consulting the major electronic databases of scientific interest such as PubMed, Scopus, Cochrane Library, Web of Sciences, APA PsycInfo, and CINAHL. All the relevant literature was collected. The following keywords were combined

using the Boolean operators “*AND*” and “*OR*” to search the database: stress, anxiety, burnout, healthcare workers, intervention, yoga, and mindfulness. No restrictions on year, publication, or language were applied during the study selection. Any disagreement between the reviewers was resolved through a consensus session with a third reviewer. In January 2022, eligible studies were selected through a multi-step approach (title reading, abstract, and full-text assessment) by two independent researchers.

In the first phase, the results obtained from the research were imported into Zotero, a software for the management of bibliographic references, and duplicates were eliminated. In the second phase, each article uploaded to the database was carefully and independently examined. Initially, they were analyzed by reading the title and abstract. Thereafter, the irrelevant ones were excluded while those relevant for full-text reading were selected. Articles that did not answer the research questions were excluded after an in-depth reading by two reviewers who worked independently.

2.2.3 Quality assessment

The quality assessment of the systematic reviews included in the paper was conducted using the AMSTAR checklist (Assessing the Methodological Quality of Systematic Reviews). AMSTAR is the most widely used tool to quantify the methodological rigor of systematic reviews. The studies selected in the review had a moderate or high-quality rating. The quality rating score is shown in Table 2.

2.3 Results

Twelve articles were included in the review. The procedure for their selection has been summarized graphically in the PRISMA Flowchart (Figure 1).

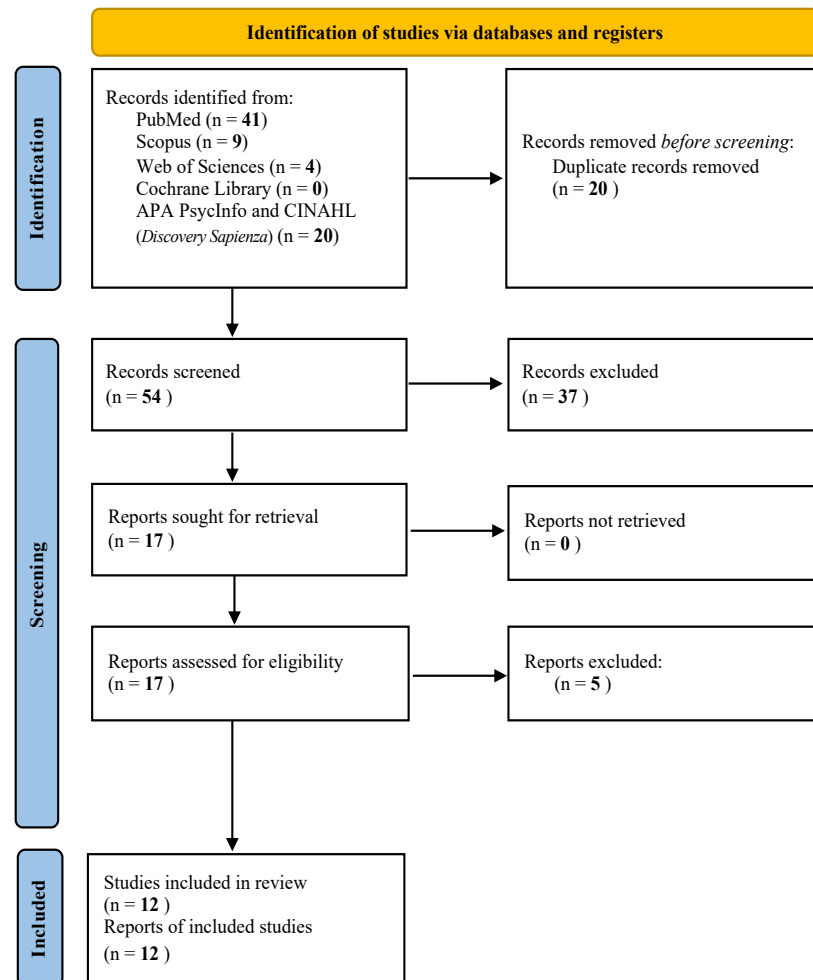


Figure 1. PRISMA Flowchart

The same selection strategy was used for data extraction: two different reviewers collected the data and any disagreement was resolved by a consensus session. The main characteristics of the ten studies included in the systematic review are summarized in Table 2. For each review, the

following points were reported: first author and year of publication, country, title, objective, the number of articles selected, quality assessment, and main results.

The selected reviews were conducted in different countries around the world: the USA, Korea, UK, France, Italy, Spain, Slovenia, and Portugal. This allowed us to have a broader view of the phenomenon. The research results were organized into three points of interest: each point describes which intervention was proposed and from which different point of view.

Nº	Authors and Year	Title	Country	Rating of Quality	Objective	Results
1	Salvado M, et al. 2021	<i>Mindfulness - based intervention to reduce burnout in primary healthcare professionals: a systematic review and meta-analysis</i>	Portugal	High	To analyzed the effects of mindfulness-based intervention to reduce burnout in primary healthcare professionals.	A total of ten studies were included in this review (four trials and six observational studies). The findings of this systematic review and meta-analysis suggest that mindfulness-base intervention might be a practical approach for inducing significant improvements in different burnout symptoms in healthcare workers. These findings can potentially be relevant for healthcare professional, mainly due to the exponential increase in reported cases of healthcare workers with burnout, recently exacerbated due to the COVID-19 pandemic.
2	Jung SE, et al. 2021	<i>The effectiveness and safety of mind-body modalities for mental health of nurses in</i>	Korea	Moderate	To evaluate whether mind-body mentalities (yoga and mindfulness-based intervention) improve burnout and	Seventeen trials were included in the review. Data on mindfulness- based interventions (MBIs) and yoga were available for burnout, and there was no evidence that multimodal resilience

		<i>hospital setting: a systematic review</i>			other mental health aspects of nurse.	programs including MBIs statistically significantly improved burnout levels compared to no intervention or active control groups. However, one study reported that yoga could significantly improve emotional exhaustion and depersonalization, which are subscales of burnout, compared to usual care. In addition, the effects of MBIs, relaxation, yoga, and music on various mental health outcomes and stress-related symptoms have been reported. In conclusion, there was some evidence that yoga was helpful for improvement in burnout of nurses.
3	Zhang M, et al. 2021	<i>Physical relaxation for occupational stress in healthcare workers: a systematic review and network meta-analysis for randomized controlled trials</i>	USA	High	To determinate the effects of yoga, massage therapy, progressive muscle relaxation, and stretching on alleviating stress and improving physical and mental health in healthcare workers.	Fifteen trials were identified. Physical relaxation may help reduce occupational stress in healthcare workers. Yoga is particularly effective and offers the convenience of online delivery.

4	Tement S, et al. 2021	<i>The impact of psychological interventions with elements of Mindfulness (PIM) on empathy, well-being, and reduction of burnout in physicians: a systematic review</i>	Slovenia	Moderate	To analyze research articles where psychological intervention with elements of mindfulness (PIMs) were used to support physicians in order to reduce burnout and foster empathy and well-being.	Eighteen studies were included in the review. Results of this systematic review demonstrate the positive impact of psychological interventions with elements of mindfulness on empathy, well-being, and reduction in burnout in physicians.
5	Kriakous SA, et al. 2020	<i>The effectiveness of mindfulness-based stress reduction on the psychological functioning of healthcare professionals: a systematic review</i>	UK	Moderate	To investigate the reduction of stress amongst HCPs using MBI.	Thirty studies were included. MBI is an effective intervention which can help improve the psychological functioning of HCPs.
6	Suleiman-Martos N, et al. 2020	<i>The effect of mindfulness training on burnout syndrome in nursing: a systematic review and meta-analysis</i>	Spain	High	To analyze the effect of mindfulness training on level of burnout among nurses.	Seventeen studies (eight trials and nine described quasi-experimental studies) were included in the review. Mindfulness-based training reduce the emotional burden and hence levels of burnout, among nurses.

7	Cocchiara AR, et al. 2019	<i>The use of yoga to manage stress and burnout in healthcare workers: a systematic review</i>	Italy	Moderate	To analyze and summarize the current knowledge regarding the use of yoga to manage and prevent stress and burnout in healthcare workers.	According to the literature, yoga appears to be effective in the management of stress in healthcare workers.
8	Klein A, et al. 2019	<i>The benefits of Mindfulness-Based Interventions on burnout among health professionals: a systematic review</i>	France	Moderate	To summarize and evaluate the existing literature on the potential benefits on mindfulness-based intervention to minimize burnout risk.	Thirty-four articles were included. This review shows the overall insufficient level of evidence offered by the literature assessing the effect of mindfulness-based intervention on burnout in healthcare professionals population.
9	Lomas T, et al. 2017	<i>A systematic review of the impact of mindfulness on the well-being of healthcare professionals</i>	UK	Moderate	To analyze studies pertaining to mindfulness in healthcare professionals.	Eighty-one studies were included. Mindfulness was generally associated with positive outcomes in relations to most measures. Mindfulness does appear to improve the well-being of healthcare professionals.
10	Luken M, et al. 2016	<i>Systematic review of mindfulness practice for reducing job burnout</i>	USA	Moderate	To evaluate the evidence for practicing mindfulness to treat job burnout and to explore	Eight studies were included. There is strong evidence for the use of mindfulness practice to reduce job burnout among healthcare workers.

					implications for occupational therapy practitioners.	Research needed to fill the gap on whether mindfulness is effective for treating burnout in occupational therapy practitioners.
11	Burton A, et al. 2016	<i>How effective are mindfulness-based interventions for reducing stress among healthcare professionals? A systematic review and meta-analysis</i>	UK	High	To evidence the effectiveness of mindfulness-based intervention for reducing stress in healthcare workers.	Eight studies were included. Results of the meta-analysis suggest that MBIs have potential to significantly improve stress among HCPs.
12	Dharmawardene M, et al. 2015	<i>A systematic review and meta-analysis of meditative interventions for informal caregivers and health professionals</i>	USA	High	To explore the effect of meditative interventions on physical and emotional markers of well-being as well as job satisfaction and burnout among informal caregivers and health professionals.	Twenty-seven studies were included in this review. Meditation provides a small to moderate benefit for informal caregivers and health professionals for stress reduction, but more research is required to establish effects on burnout and caregiver burden.

Table 2. Data Exstraction Table

Yoga Intervention:

Cocchiara et al. (74) summarize the current knowledge regarding the use of yoga to reduce stress and burnout in HCPs. According to the literature, yoga is effective in the prevention and management of musculoskeletal and psychological issues. In addition to an improvement in physical problems and quality of sleep, both stress levels and burnout are consistently reduced in subjects who practice yoga techniques and mind-body meditation (74).

Zhang et al. (75) investigate the effects of yoga on alleviating stress and improving physical and mental health in healthcare workers. The interventions in the studies included in the meta-analysis incorporate the use of various scales for the evaluation of the given intervention such as PSS, CSQ, MBI, etc. They find that physical relaxation may help reduce stress in HCPs and that yoga is specifically effective and offers the convenience of online delivery (75).

Mindfulness-based Intervention:

Savado et al. (76) investigate how MBIs reduce burnout in healthcare professionals. Therefore, it is evident that burnout represents a major occupational health problem among HCPs and an enormous challenge for healthcare systems worldwide. Their meta-analysis suggests that MBIs effectively reduce burnout symptoms in HCPs, although with a small to moderate magnitude of effect. For the analysis of the studies, they use the 22-item Maslach Burnout Inventory. This scale is considered the gold standard to measure burnout in clinicians. From a practical standpoint, implementing MBIs in HCPs will reduce burnout and enhance well-being, compassion for themselves, colleagues, and patients, and contribute to a sustainable healthcare organization (76).

Suleiman-Martos et al. (77) assess the impact of MBI on nurses to determine the relationship between this intervention and burnout. The interventions

in the studies included in their meta-analysis use different scales for evaluating the intervention such as MBI, MBSCR, MBSR, etc. According to Savado,¹³ before the intervention, the nurses in each of the study populations showed high levels of burnout. In every case, the mindfulness program produced a reduction in burnout among these nurses (77).

Luken et al. (78) evaluate the evidence for practicing mindfulness to treat job burnout in HCPs. Job burnout is a problem across the workforce, especially for workers in highly emotional. This review provides strong evidence for the use of MBIs to reduce job burnout (78).

Tement et al. (79) analyze research articles where psychological interventions with elements of mindfulness were used to support physicians to reduce burnout. Results of this systematic review demonstrate the positive impact of these interventions on empathy, well-being, and burnout reduction in physicians (79).

Klein et al. (80) suggest that burnout in HCPs affects performance and harms healthcare as a whole and that they report frequent feelings of psychological distress. The review focuses on an article concerned with the possible benefits and limitations of MBI. Overall, there is insufficient evidence offered by the literature assessing the effect of MBI on burnout. However, some studies report promising results for future research (80).

Lomas et al. (81) assess how MBI affects the mental health of HCPs. HCPs can face particular challenges that can be detrimental to their physical and mental health. The evidence in support of MBIs for HCPs is very strong. They find that mindfulness is generally associated with positive outcomes in relation to most measures. Overall, MBI appears to improve the well-being and job performance of HCPs (81). As per Dharmawardene et al. (82) meditative interventions are gaining acceptance as tools to improve well-being in HCPs. This review explores the effect of meditative interventions

on physical and emotional markers of well-being. Meditative interventions demonstrate a statistically significant improvement in levels of emotional exhaustion, personal accomplishment, self-efficacy, and life satisfaction among HCPs (82). In accordance with some studies (75-81), the findings of Kriakous et al. (83) provide further evidence that MBIs were effective in improving particular aspects of psychological functioning in different types of HCPs, including reducing anxiety, depression, and stress and increasing self-compassion. These findings support theories that an MBI can generate a positive shift in perspective and foster an ability to view one's life experiences more objectively (83). However, this review also highlights that MBIs are less effective in reducing burnout and increasing resilience, compared with other aspects of psychological functioning (83).

Burton et al. (84) found that MBIs have a moderate effect on the stress levels of HCPs. Mindfulness is an activity requiring a high level of engagement and commitment, with participants often asked not only to take part in the intervention sessions but to also complete intervention "homework". This review only focuses on stress as an outcome measure. A variety of self-report outcome measures were used to assess intervention effectiveness in addition to interviews and focus groups. The measures of stress include different types of scales, like the Perceived Stress Scale, the Mental Health Professionals Stress Scale, the Depression Anxiety Stress Scale, etc. This review indicates that MBIs have the potential to be an effective means of reducing stress among HCPs (84).

Yoga and Mindfulness-based Intervention:

Jung et al. (85) evaluate whether mind-body modalities improve burnout and other mental health aspects. Data on MBIs and yoga were available for

burnout, and there was no evidence that multimodal resilience programs, including MBSR or mindful eating, and MBIs, statistically significantly improved burnout levels compared to the no-intervention group or active control groups. However, one study reports that yoga could significantly improve emotional exhaustion and depersonalization, which are subscales of burnout, compared to usual care. For burnout, which was the primary outcome, there was some evidence that yoga helped improve the condition. Perceived stress was also an outcome measure that influenced improvements in all mind-body modalities, including MBIs, relaxation, yoga, and music (85).

2.4 Discussion

HCPs experience high levels of stress, which can impact their physical and psychological health and, subsequently, the quality of patient care. Health and educational organizations have implemented stress management and well-being enhancement programs in response to the presented concerns. Mind-body modalities have been used to cope with stress-related problems for a long time and, as evaluated in this paper, they are becoming mainstream based on empirical clinical evidence (86). Thanks to MBIs and meditation, participants learn to be purposefully alert and attentive to the present moment and self-observe in an objective and detached manner. In accordance with some studies selected (76-84), mindfulness practice is also being considered an effective self-management method or a stress reduction technique for healthcare workers, including nurses exposed to the Covid-19 pandemic (86,87). In accordance with Cocchiara (74), Jung (85), and Zhang (75), increasing the use of yoga and meditation can provide help to healthcare workers in achieving stable psycho-physical well-being

that enhances their value within their work environment. This is mainly through simple meditation exercises, which do not require a specific setting and can even be performed in a workplace (88-90). The published literature confirms that yoga and other mind-body meditation programs provide some innovative solutions, scientifically recognized as effective methods to enhance empathy, reduce stress, and improve physical work-related issues in HCPs (91). Health systems must provide nurses with occupational health resources that foster self-care and resilience in the work environment. Nurses and other healthcare workers who can exercise self-reflection, self-care, and self-discovery can manage different problems. Attention to self-care strategies serves to prevent burnout and improve self-efficacy. Yoga and mind-body practice are strategies that nurses can deploy for psychophysical well-being.

Strengths and Limitations of the Study:

A strength of this review is that, to the best of our knowledge, it is the first comprehensive umbrella review to determine the pooled effect of MBIs and yoga on HCPs for reducing burnout, stress, and other mental problems. Still, the moderate quality of the evidence, as well as the strong heterogeneity of the data collected, and the complexity of the variable involved, represent one limitation of this study. The second limitation of this research is that the small number of studies does not allow us to generalize the results. Despite the limitations, this umbrella review contributes to strengthening the current evidence on the implementation of MBIs and yoga in HCPs.

2.4.1 Practical implication

Healthcare workers face a multitude of stressors in their work environment. Employers in the healthcare industry should consider implementing

workplace wellness programs that integrate these methods to promote the well-being of their staff. Increasing the use of yoga and MBIs can help HCPs achieve stable psycho-physical well-being that enhances their value within their work environment. This is mainly through simple meditation exercises that do not require a specific environment and can be performed in any workplace setting. More research on this matter will help to understand which techniques of yoga and MBIs can be incorporated into the work of HCPs. According to the evidence, it would be appropriate to implement a study with a comprehensive methodological structure, on bigger sample groups, to demonstrate the effectiveness of yoga and MBIs on the mental health of healthcare workers.

2.5 Conclusion

This review indicates that MBI and yoga have the potential to be effective means of reducing stress among HCPs. Burnout, depression, anxiety, and stress are serious risks among HCPs who work in emotionally demanding professions. This umbrella review demonstrates strong evidence to support the efficacy of MBI and yoga in reducing stress, burnout, and depression in HCPs. This is an important addition to the literature base as stress levels in HCPs are high and improvements can increase the quality of care. The use of MBI and yoga has considerable potential in fostering self-care and helping HCPs improve their mental health. However, additional research in this area is required to study the phenomena.

Chapter 3 – The relationship between working night and depression among nurses: a systematic review and meta-analysis

3.1 Introduction

There is ample evidence linking shift work, and especially night work, with poor health. Humans are diurnal and normally follow a sleep-wake cycle that involves sleep during the night and wakefulness during the day (92). Nurses work on different shift schedules, and night shift is often included in the schedule. Wakefulness and alertness are essential if nurses are to provide high-quality patient care. Nurses working night shifts may experience sleep deprivation and fatigue, which, in turn, may pose a threat to patient safety (93). Sleep deprivation, also known as sleep insufficiency or sleeplessness, is the condition of not having adequate duration and/or quality of sleep to support decent alertness, performance, and health (94). Night shift work significantly increases the prevalence of sleep deprivation due to disruption of the sleep-wake cycle, which is associated with the altered sequence of activity and rest. Insomnia means difficulty falling or staying asleep that is accompanied by daytime impairments related to those sleep troubles (94). Sleepiness, or drowsiness, is a state of strong desire for sleep, or sleeping for unusually long periods. It can refer to the condition of being in a drowsy state due to circadian rhythm disorders or be a symptom of other health problems (95). It can be accompanied by lethargy, weakness, and a lack of mental agility. The excessive sleepiness and impaired driving performance resulting from shift work increase the risk of motor vehicle crashes by two to four times during the commute to and from work (96). Shift work can result in circadian disruptions that are associated with

cardiometabolic diseases, cancers, gastrointestinal health issues, and the worsening of mood disorders and depressive symptoms (97). Shift work is associated with depressive symptoms and may exacerbate symptoms in individuals with a history of depression and mood disorders (98). According to the World Health Organization, depression is a common mental disorder (99). It is characterized by persistent sadness and a lack of interest or pleasure in previously rewarding or enjoyable activities. It can also disturb sleep and appetite. Tiredness and poor concentration are common. Depression is a leading cause of disability around the world and contributes greatly to the global burden of disease. The effects of depression can be long-lasting or recurrent and can dramatically affect a person's ability to function and live a rewarding life (99). The impact of shift work on sleep and health has been examined in the past. Based on the findings of a 2017 integrated review, the researchers, are unable to say for sure if nurses who work shifts perform psychologically worse than those who do not. Instead, they argue that some nurses may have negative psychological effects from working shifts, and that these effects may be strongly influenced by both environmental and personal factors (100).

Disrupted circadian rhythm and insufficient sleep quality and quantity have been recognized as two of the most significant factors in the long-term impacts of night shift work on nurses' mental health (101). Both factors can reduce nurses' alertness and cognitive performance during the night shift (102). One study found that women who work shifts, especially night shifts, are more likely than men to have depressive symptoms (103). Since women make up the majority of the nursing workforce, this is a serious concern. However, the coronavirus pandemic served as a wake-up call for hospital administrators and nurse managers to recognize nurses' susceptibility to

mental health issues like depression and sleep issues, as well as how the two are related, in order to develop effective strategies to reduce the psychological burden of nurses working various shifts (104). The objective of this study was to systematically summarize and quantitatively evaluate some selected cross-sectional, case-control, and cohort studies in order to determine the relationship between night shift work and the risk of depression in nurses.

3.2 Methods

A protocol, explaining the objectives, search strategies, inclusion and exclusion criteria, outcomes and methods of analysis was developed before the implementation of this study, and it was successfully registered on PROSPERO (**CRD42022354487**). The protocol adheres to the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols guidelines (105). Experimental studies, case-control studies, cross-sectional and longitudinal studies that quantitatively estimated the relationship between night shift work and depression in nurses were assessed for selection. The criteria for conducting a meta-analysis were whether at least 3 results were available and whether outcome measures could be pooled.

3.3 Literature search strategy

We systematically searched three reputable academic databases for experimental studies, case-control studies, cross-sectional studies, and cohort studies that quantitatively estimated the relationship between night shift work and depression in nurses. PubMed, Scopus, and Web of Science

were searched from onset to September 2022. We used the following Medical Subject Headings terms and their combinations of free words to search:

- **Web of science:** ((nurses) AND night shift) AND depression , ((nurses) AND rotating shift) AND depression, ((nurses) AND shiftwork) AND depression , (((nurses) AND wellbeing) AND night shift work AND mental health)), (((nurses) AND occupational stress) OR burnout AND shift work AND psychological health)) , (((nurses) AND circadian rhythm) AND mental health)) .
- **Scopus:** ((nurses) AND night shift) AND depression, ((nurses) AND rotating shift) AND depression, ((nurses) AND shiftwork) AND depression, (((nurses) AND wellbeing) AND night shift work AND mental health)), (((nurses) AND occupational stress) OR burnout AND shift work AND psychological health)), (((nurses) AND circadian rhythm) AND mental health)).
- **PubMed:** ((nurses) AND night shift) AND depression , ((nurses) AND rotating shift) AND depression, ((nurses) AND shiftwork) AND depression, (((nurses) AND wellbeing) AND night shift work AND mental health)), (((nurses) AND occupational stress) OR burnout AND shift work AND psychological health)), (((nurses) AND circadian rhythm) AND mental health)).

Study selection and the removal of duplicates were managed using Zotero. For the selection of studies, two reviewers will be involved (CO and SM).

3.4 Study selection and data extraction

We included studies that reported an association between sleep deprivation and/or circadian rhythm disruption and depression among nurses working night shifts. Studies were excluded if the researchers investigated an unrelated topic, used an uncategorised population, or had insufficient data. Reviews, conference abstracts, editorial letters, qualitative research or animal model papers, or duplicate reports were excluded. If there were duplicate studies, the most recent or complete version was selected. If multiple languages were used to describe and publish the same data, the English version was selected. We extracted data on the first author, year of publication, country of origin, study design, participant numbers and characteristics, exposure, and outcomes and their measurement tools. The data from all the included studies was extracted and independently reviewed by four review. Any dispute or disagreement between the two reviewers that could not be agreed upon was resolved by other two review.

3.5 Assessment of risk of bias and grading the evidence

The methodological quality of all included studies was independently assessed using the modified version of the Newcastle-Ottawa Scale (NOS) (106). Potential risk of bias was identified and assessed using the 13-item version of the Research Triangle Institute Item Bank tool, which is a development of the 29-item original questionnaire (107). The 13-item Research Triangle Institute Item Bank is a tool for observational studies assessing selection, confounding, performance, attrition, detection, and reporting biases, with high reliability. Items were scored as having a high, low, unclear, or not applicable risk of bias. Each study was assigned an

overall risk of bias score based on the proportion of high and valid items and a cut-off of 50%. The degree of confidence in the estimate for the outcome was determined by the Grading of Recommendations Assessment, Development, and Evaluation approach (GRADE). The rating criteria were based on the risk of bias, inconsistency, indirectness, imprecision, publication bias, and other considerations. The overall quality of the evidence in the included studies was moderate.

3.6 Outcomes and statistical analysis

Our main interest was to estimate the relationship between sleep deprivation and depression among nurses working night shifts. The association between sleep and depression was expressed as the odds ratio (OR). We obtained the ORs and corresponding 95% confidence intervals (CI) from most of the included studies. The statistical analysis was conducted using RevMan 5.4.1 (Cochrane Collaboration, 2020). Outcomes were assessed by a pooled logOR among all included studies, and the corresponding 95% CIs were calculated by a fixed effects model or a random effects model. Statistical heterogeneity was defined by I^2 value $\geq 50\%$. Potential publication bias was assessed by testing the asymmetry of the funnel plot.

3.7 Results

Study identification and selection

A total of 2074 studies were identified through a preliminary database search, and 411 duplicates were excluded from Zotero. By browsing the

titles and abstracts, 1663 studies were available and entered full-text screening. After reading these documents carefully, 1630 studies were excluded (1020 had data that was not extractable, 328 were reviews or conference abstracts, 49 were editorial letters, 182 were qualitative research studies, and 51 full texts could not be obtained).

Finally, a total of 20 eligible studies were included in the systematic review and 8 studies in this meta-analysis. Figure 1 shows the detailed research identification and selection process.

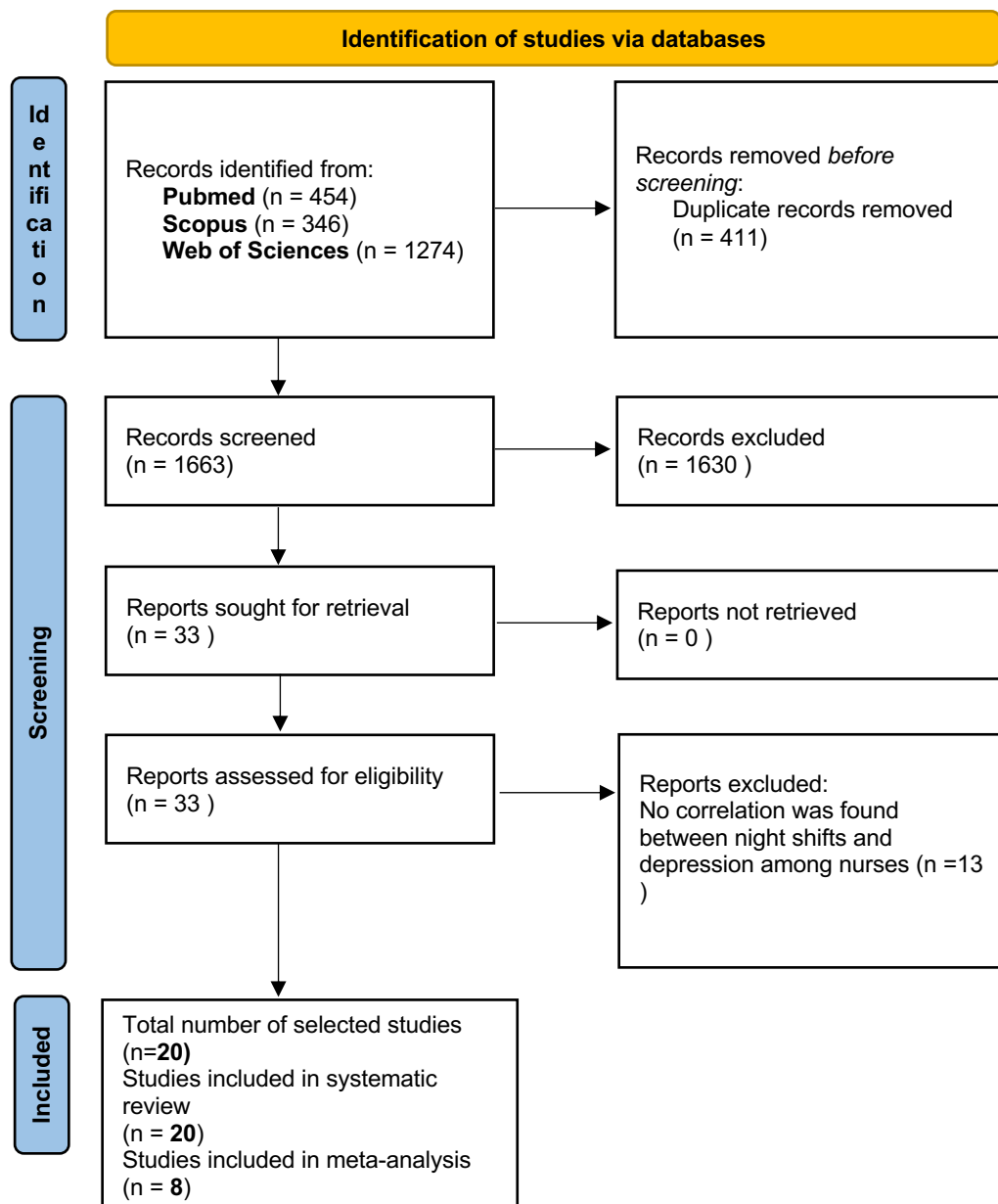


Figure 1. PRISMA Flow Diagram of selected study

Study characteristics

The 20 studies included were published between 1990 and 2022, covering a total of 37,983 participants. There were 18 cross-sectional studies and 2 cohort studies. The sample sizes in each study varied from 39 to 11,450, and most participants were registered nurses working various shifts. The majority of the studies ($n = 9$) used the Hospital Anxiety and Depression Scale to assess depression among the nurses. This is a self-assessment scale that has been developed and found to be a reliable instrument for detecting states of depression and anxiety. The characteristics of the included studies are shown in Table 1. Table 2 shows the differences in the characteristics of the 20 studies with respect to population, sex and age distribution, exposure and comparator variables, outcome measures, and study design. Except for one study, which sampled firefighters and government workers, all studies recruited nurses. Five studies recruited only female nurses. The mean age of the study population ranged from 25.3 to 50 years. However, three studies did not state the age of their study population. All studies assessed depression as the outcome variable using different tools. Although seven studies had a similar definition of night shift as the exposure of interest, the other studies had varied definitions of shift work, with some incorporating the intensity and frequency of the shifts over time. The comparison group was also defined differently; nine studies used day shift workers, while one used the general population. Table 3 summarizes the statistical output of the studies, including the effect measures, variations in effects, strength of association, and heterogeneity. Eight studies measured the association

between night shift work and depression using the odds ratio; five used the mean difference, and four used the regression coefficient. Eleven studies performed further statistical analysis to adjust for confounding variables; this included five of the eight studies that used the odds ratio as an effect measure. Also, 11 studies reported a statistically significant association between night shift work and the development of depression.

N°	First Author	Year	Country	Study design	Sample size	Assessment tool for depression	Aim of the study	Main outcomes
1	James (108)	1990	United States	Cross-sectional study	463	Hospital anxiety and depression scale	To determine the relationships between physical health and depression among nurses working shifts.	There was no significant correlation between shift work and signs of depression among nurses.
2	Ruggiero (109)	2003	United States	Cross-sectional study	142	Beck Depression Inventory-II	To examine shift-related differences in chronic fatigue and the contributions of sleep quality, anxiety, and depression to chronic fatigue among a random-nationwide sample of female critical care nurses	Night nurses reported more depression and poorer sleep quality than did day nurses.
3	Bjorvanth (110)	2012	Norway	Cross-sectional study	267	Hospital anxiety and depression scale	To investigate sleep, sleepiness, fatigue, subjective health complaints (musculoskeletal,	21.5% and 14.8% of the intensive care nurses in the present study scored above the cut-off values for anxiety

							gastrointestinal), anxiety and depression in a sample of Intensive-care unit nurses.	and depression, respectively.
4	Øyane (111)	2013	Norway	Cross-sectional study	2059	Hospital, Anxiety, and Depression Scale	To determine the relationship between working the night shift with sleep problems and psychological wellbeing.	There was a significant positive correlation between insomnia and depression among night shift nurses.
5	Thun (112)	2014	Norway	Cross-sectional study	633	Hospital anxiety and depression scale	To compare the developmental trajectories of anxiety and depressive symptoms among nurses working night shifts (night only, or a three-shift schedule) with those of nurses working shifts that do not include nights (day only, or a two-shift schedule).	Nurses who changed from night work to day work reported a significant decrease in symptoms of both anxiety and depression over time compared to day workers.
6	Gong (113)	2014	China	Cross-sectional study	3474	Chinese version of the 20-item Zung Self-Rating Depression Scale	To investigate the association between working conditions and depressive symptoms among	There were 1320 nurses with depressive symptoms, giving an overall prevalence of depressive symptoms

							nurses using a cross-sectional study.	of about 38%. Among all nurses, 13.21% worked 60 hours or more per week, and 20.82% had two or more-night shifts per week.
7	Berthelsen (114)	2015	Norway	Cohort study	2059	Hospital, Anxiety, and Depression Scale	To investigate factors that may lead to shift work disorder in Norwegian nurses	A reduction in the number of night shifts or cessation of working night shifts was associated with a decrease in depression and shift work disorder.
8	Togo (115)	2017	Japan	Cross-sectional study	2669	The Center for Epidemiologic Studies Depression Scale	To determine the relationships between depressive symptoms, morningness-eveningness, sleep duration and rotating shift work among nurses	Depression was more prevalent in rotating shift nurses compared to nurses who work only day shifts.
9	Hall (116)	2018	Canada	Cross-sectional study	11450	Composite International Diagnostic Interview Short Form, Major Depression section	To investigate relationships between work schedule and depression in a large survey of Canadian nurses.	The high-precision exposure grouping model showed the strongest relationships between work

								schedule and depression.
10	Booker (117)	2018	Australia	Cross-sectional study	202	Patient Health Questionnaire	To assess the relationship between shift work disorder risk, depression and anxiety using validated tools.	Nurses at high risk of shift work disorder had higher depression.
11	Tahghighi (118)	2019	Australia	Cross-sectional Study	1,369	Depression, Anxiety and Stress Scale-21 Items	To compare nurses who work shifts with nurses who work regular hours in order to comprehend the effects of shift work on psychological health and resilience.	There was relatively high levels of depression among both shift and non-shift nurses, but there was no significant difference between the two groups.
12	Khade (119)	2019	India	Cross-sectional study	190	Hospital, Anxiety, and Depression Scale	To determine the relationship between working the night shift with sleep problems and psychological wellbeing.	There was a significant positive correlation between insomnia and depression among night shift nurses.
13	Mbanga (120)	2019	Cameroon	Cross-sectional study	143	9-item Patient Health Questionnaire	To determine the prevalence and predictors of depression among nurses in Cameroon.	Night nurses reported more depression and poorer sleep quality than day nurses.
14	Bukhari (121)	2019	Pakistan	Cross-sectional study	250	Agha Khan University Anxiety	To find out the factors that were associated	The prevalence of depression in nurses

						and Depression Scale	with depression in Pakistani nurses working in a Federal Government Tertiary Care Hospital in Islamabad.	working on rotating shifts was significantly higher.
15	Dai (122)	2019	China	Cross-sectional study	865	Hospital Anxiety and Depression Scale	To compare sleep quality as well as depressive symptoms in nurses working night shifts to those working day shifts only.	Among the 865 nurses, 353 (40.8%) were considered to have depressive symptoms. The logistic regression analysis demonstrated that night work was independently associated with the presence of depressive symptoms.
16	Bilge (123)	2020	Turkey	Cross-sectional study	163	Beck Depression Inventory	To determine the effect of nurses' way of working on depression indications and their sexual lives.	Nurses who worked night shifts had higher rates of depression and higher rates of sexual dysfunction.
17	Choi (124)	2020	South Korea	Cross-sectional study	77	Hospital Anxiety and Depression Scale	To compare the developmental trajectories of anxiety and depressive symptoms among nurses working night shifts (night only, or a	Depressive mood and anxiety symptom were significantly worse in nurses working 3 shift-schedule.

							three-shift schedule) with those of nurses working shifts that do not include nights (day only, or a two-shift schedule).	
18	Park (125)	2020	South Korea	Cross-sectional study	39	Hospital Anxiety and Depression Scale	To propose the mediating role of grey matter structure in the relationship between sleep disturbance and depressive symptom.	All day-working nurses reported depressive symptom within the normal range, whereas 39% of the shift-working nurses reported mild depression beyond the normal range.
19	Vitale (126)	2022	Italy	Cohort study	408	Depression, Anxiety and Stress Scale-21 Items	To evaluate variations in body mass index features, shift, work history, and nurses' levels of stress, anxiety, and depression.	There was no significant difference in the rate of depression between night shift nurses and their day shift colleagues.
20	Yuxin li (127)	2022	China	Cross-sectional study	11061	9-item Patient Health Questionnaire	To evaluate and describe the mental health status of Chinese nurses, including symptoms of depression and anxiety, while focusing	Shift work correlated with higher levels of depression among all nurses.

							on the effects of shift work-related characteristics.	
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Table 1. Characteristics of included studies

N°	Author	Year	Population	Sex	Exposures	Comparator	Outcomes	Study Design	Mean Age (years)
1	James	1990	Nurses	B	Night shift	Other shifts	depression	cross-sectional	35
2	Ruggiero	2003	Nurses	F	Night shift	Day shift	depression	cross-sectional	44.9
3	Bjorvantrn	2012	Nurses	B	Shift work	General population	depression	cross-sectional	39.4 (9.1)
4	Øyane	2013	Nurses	B	Current Night shift	No Night shift	depression	cross-sectional	33.1 (8.2)
5	Thun	2014	Nurses	F	Night shifts	Day shift	depression	cross-sectional study	33.1 (8.2)
6	Gong	2014	Nurses	B	Night shift(>=2/week)	Night shift (<2/week)	depression	cross-sectional	31.93 (7.55)
7	Berthelsen	2015	Nurses	B	Night shift (current/previous)	No Night shift	depression	cohort study	30-39

8	Togo	2017	Nurses	B	Rotating shift	Day shift	depression	cross-sectional	Day worker = 41.5 (9.7), Rotating shift = 40.2 (10.4)
9	Hall	2018	Nurses	B	High-precision work schedule (regular days)	High-precision work schedule (Rapid frequency rotating shifts)	depression	cross-sectional	45-54
10	Booker	2018	Nurses	B	High-risk SWD	Low-risk SWD	depression	cross-sectional	35.28 (12.02)
11	Tahghighi	2019	Nurses	B	Shift work	non-Shift work	depression	cross-sectional	Shift work = 46.8 (11.50), non-Shift work = 50.0 (9.99)
12	Khade	2019	Nurses	B	Number of Night Shift in last 1 month	None	depression	cross-sectional	25.3 (5.4)

13	Mbanga	2019	Nurses	B	Number of Night Shift in last 1 week	None	depression	cross-sectional	29.8 (6.55)
14	Bukhari	2019	Nurses	F	Rotating shift	Not stated	depression	cross-sectional	Not stated
15	Dai	2019	Nurses	B	Night shift	Day shift	depression	cross-sectional	Not stated
16	Bilge	2020	Nurses	F	Night shift	Day shift	depression	cross-sectional	36.0 (6.37)
17	Choi	2020	Nurses, Firefighters, Day workers	B	Nurses working 3 shifts schedule	Other Day workers	depression	cross-sectional	Nurses-28.7 (5.13), Firefighter- 42.8 (9.38), Day workers- 40.1 (8.30)
18	Park	2020	Nurses	F	Shift work	Day shift	depression	cross-sectional	Shift work-28.1 (3.2), Day shift-30.8 (4.6)
19	Vitale	2022	Nurses	B	Night shift	Day shift	depression	cross-sectional	Not stated
20	Yuxin li	2022	Nurses	B	Shift work	No shift work	depression	cross-sectional	33.24 (7.31)

B: both male and female,, F:female only

Table 2. Clinical heterogeneity of included studies

N°	Author	Year	Effect Measure	Study group	Comparator Group	OR (95% CI)/B/r/ π /p-value	Statistical Adjustment	Direction of effect
1	James	1990	Regression coefficient	NA	NA	B=0.09	not done	negative
2	Ruggiero	2003	Mean difference	10.35 (7.89)	7.18 (6.65)	p<0.01	not done	positive
3	Bjorvantn	2012	Mean difference	5.0 (2.3)	3.5 (3.1)	p<0.001	not done	positive
4	Øyane	2013	Odds ratio	Not stated	Not stated	1.35 (0.75 - 2.42)	done	negative
5	Thun	2014	Regression coefficient	NA	NA	B=-0.05	done	negative
6	Gong	2014	Regression Coefficient	NA	NA	B=1.53	done	positive
7	Berthelsen	2015	Odds ratio	Not stated	Not stated	1.20 (0.71 - 2.03)	not done	negative
8	Togo	2017	Cohen's d /Odds ratio	550/1006	351/762	Cohens'd=0.084	not done	positive
9	Hall	2018	Odds ratio	Not stated	Not stated	1.51 (0.91 - 2.51)	done	negative

10	Booker	2018	Mean difference/R-squared	7.54 (4.28)	3.78 (3.24)	R ² = 0.184	done	positive
11	Tahghighi	2019	Mean difference	Not stated	Not stated	p = 0.514	done	negative
12	Khade	2019	Correlation coefficient	Not stated	Not stated	not stated	not done	negative
13	Mbanga	2019	Odds ratio	Not stated	Not stated	1.58 (1.01 - 2.48)	done	positive
14	Bukhari	2019	Proportional difference	Not stated	Not stated	p=0.012	not done	positive
15	Dai	2019	Odds ratio	Not stated	Not stated	1.83 (1.23 - 2.72)	done	positive
16	Bilge	2020	Mean difference	Not stated	Not stated	p<0.001	done	positive
17	Choi	2020	Mean difference/Odds ratio	7.64 (3.35), 41/36	6.30 (3.64), 41/98	p=0.014	not done	positive
18	Park	2020	Mean difference	43.1 (6.4)	35.3 (4.9)	p=0.0003	not done	positive
19	Vitale	2022	Regression coefficient	NA	NA	B=-0.019	done	negative
20	Yuxin li	2022	Odds ratio	2305/3773	1515/1588	1.54 (1.4 - 1.69)	done	positive

OR (95% CI): odds ratio (95% confidence interval), B: regression coefficient, r: correlation coefficient, π : prevalence/proportion, NA: not applicable

Table 3. Methodological heterogeneity of included studies

Evaluation of risk of bias and quality assessment

The risk of bias in included studies was appraised using the 13-item version of the Research Triangle Institute Item Bank tool. The risk-of-bias appraisal was performed by two authors independently, with discrepancies being resolved by discussion and, if needed, by a third author. Items were scored as having a high, low, unclear, or not applicable risk of bias. Each study received an overall risk of bias score based on the ratio of high and valid items (excluding not applicable items) and an arbitrary cutoff of 50%. The quality of the included articles was assessed using the NOS. Green highlighted articles have 9 stars or more, indicating high quality; yellow highlighted articles have 7 or 8 stars, indicating moderate quality; and red highlighted articles have 6 stars or fewer, indicating low quality. Six of the cross-sectional studies in our review are of high quality, 11 are of moderate quality, and one is of low quality. On the cohort studies One study has high quality and the other has low quality. The details regarding the methodology for risk of bias assessment and quality assessment in the overall study and for each study are shown in Figure 2 and table 4, respectively.

Risk-of-bias criteria													Quality score			
Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Valid score	No. of high-risk criteria	Risk-of-bias score, %	Overall risk of bias	
												10	3	30	Low	
												10	4	40	Low	
												10	4	40	Low	
												10	5	50	Low	
												10	4	40	Low	
												10	4	40	Low	
												10	4	40	Low	
												10	4	40	Low	
												10	3	30	Low	
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												10	4	40	Low	
												10	4	40	Low	
												10	4	40	Low	
												10	2	20	Low	
												10	4	40	Low	
												10	4	40	Low	

											12	3	25	Low
											10	3	30	Low
											10	3	30	Low
											10	4	40	Low

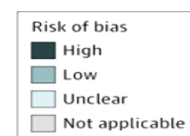


Figure 2. Risk-of-bias assessment of the included studies based on the Research Triangle Institute Item Bank

Dai (2019)	****	*	**
Khade (2019)	****	*	**
Mbanga (2019)	****	*	**
Tahghighi (2019)	****	*	**
Bilge (2020)	****	*	**
Choi (2020)	****	*	**
Yuxin li (2022)	****	*	**
Bukhari (2019)	**	*	**
Cohort studies (n = 2)			
Berthelsen (2015)	****	**	***
Vitale (2022)	****	*	**

Table 4. Newcastle-Ottawa assessment scale for the cross-sectional and cohort studies included in the systematic review and meta-analysis

3.8 Meta-analysis and outcome

Figure 3 shows the Forest plot of the individual and summary estimates of eight studies included in the meta-analysis. These 8 studies were included in the meta-analysis due to their common use of the odds ratio (OR) as an effect measure. The random effect model was used to test for heterogeneity among the 8 studies. Overall, the model was statistically significant ($p < 0.00001$). A 50% heterogeneity was estimated using the I² at $p = 0.05$. This indicates low heterogeneity among the 8 studies. The individual studies' effects range from an odds ratio of 1.19 (1.01, 1.40) to 2.72 (1.53, 4.85). All individual effect estimates were to the right of the line of no effect (OR = 1). However, the confidence interval of 5 studies cuts across the line of no effect. The 7th study had the widest confidence interval and was thus the least precise, while the 5th study had the smallest confidence interval, making it the most precise. The 5th study also contributed the most weight (31.4%) to the summary estimate, while the 7th contributed the least (1.2%). The inverse variance method was used for weighting the studies. We discovered that nurses who work night shifts have a significant risk of

depression after combining the ORs reported in the eight studies, yielding an overall estimate of 1.49 (1.26, 1.76).

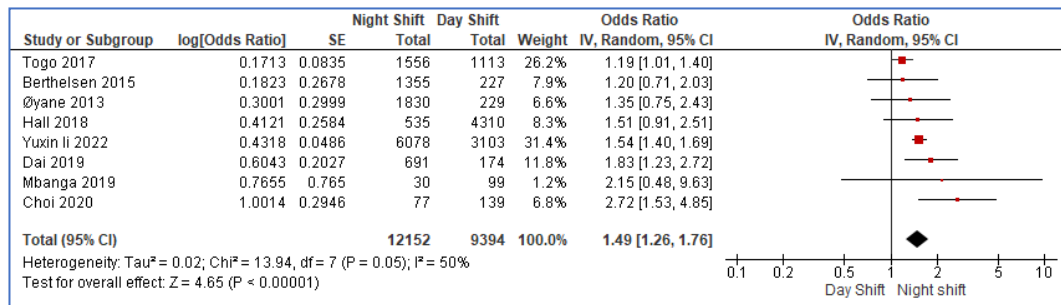


Figure 3. Forest plot and the summary of odds ratio of the comparable studies

Publication bias

Given the studies that were included in the meta-analysis, Figure 4 is a funnel plot to investigate publication bias. No signs of publication bias may be seen in the way the included studies were symmetrically dispersed on each side of the overall effect line.

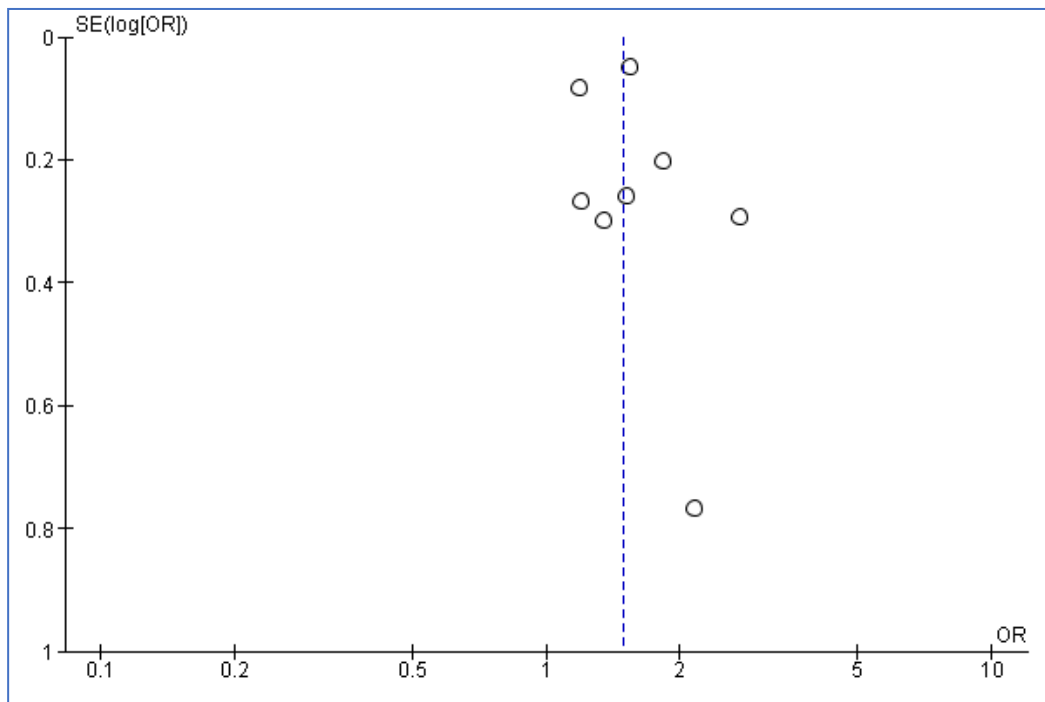


Figure 4. Funnel plot to explore publication bias

GRADE assessment of all included studies

The overall quality of the evidence of all included studies in this review, as shown in Table 5, was rated as moderate for the association between sleep disturbance and depression among nurses working night shifts. Moreover

there is less heterogeneity among selected studies, and no publication bias was discovered.

Criteria	No of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Publication bias	Other considerations	No of subjects	Relative (95% CI)	Overall quality of evidence	Importance
Nurses, shift work and depression	20	Cross-sectional studies and Cohort studies	Low	Significant	Not significant	Not significant	Not significant	None	37983	-	⊕⊕⊕⊖ Moderate	Critical

Table 5. GRADE assessment of evidence quality

3.9 Discussion

This study was conducted to estimate the association between sleep deprivation and depression among nurses working night shifts. At the end of the literature search, 20 articles were selected, and there was a total population of 37,983 participants, and 8 studies were included in the meta-analysis. At the end of the statistical analysis, the main results demonstrated that there was a significant increased risk of developing depression for nurses working night shifts. A study by Torquati et al. (103) showed that shift work enhanced the overall risk of adverse mental health outcomes (e.g., depression and anxiety) by 28% among 28,431 participants. As mentioned, humans by nature follow a sleep-wake cycle that involves sleeping during the night and waking during the day (101), whereby insufficient sleep has been associated with cognitive problems, mood alterations, reduced job performance, reduced motivation, increased safety risks, and physiological changes (128). Confirming this, it is interesting to see the finding reported in the studies by Thun et al., (112) and Berthelsen et al. (114), included in our review, that nurses who changed from night work to day work reported a significant decrease in symptoms of anxiety, depression, and other shift work disorders over time compared to day workers. From our review, it also emerges that depression is often accompanied by sleep disorders, particularly insomnia, as found in the studies of Øyane et al. (111) and Khade et al. (119). This result is partially consistent with that of a previously reported study, which found that healthcare-seeking nurses were at higher risks for some subtypes of insomnia (129). In the study of Bilge et al. (123), it was pointed out that nurses who worked night shifts had higher rates of depression and higher

rates of sexual dysfunction. This result is confirmed by the study of Chen et al. (111), which shows that nurses who worked night shifts had higher rates of depression and higher rates of sexual dysfunction. Even though nurses may be more vulnerable to stress-related psychiatric disorders, a study by Huang et al. (130) discovered that nurses do not seem to seek medical help for certain types of disorders, especially anxiety and depression. The reasons why nurses are resistant to seeking help for psychological or behavioral health problems may be due, in part, to the nurses' own attitudes regarding such problems (130). More specifically, the barriers appear to be that seeking help for mental health issues could be stigmatizing in terms of what peers and employers might think of them, which could, in turn, cause unfavorable consequences for their career development (131,132). Depression and anxiety were discovered in 58.82% and 62.08% of shift nurses, respectively, according to the findings of the study by Li et al. (127). These rates were influenced by fatigue during shift work, psychological stress before/during/after night shifts, feeling energetic after resting before/after night shifts, using sleep medication before/after night shifts, physical discomfort during night shifts, being occupied during night shifts, and food intake during shift work. They suggested that minimizing shift nurses' workloads, preventing causes of stress during night shifts, and promoting rest and relaxation could help with depression and anxiety (127). To reduce the incidence of shift work sleep disorders in nurses, nursing managers should increase night shift staffing, extend rest days after shifts, increase night shift spacing, and reduce overtime (133). The findings from our study agree with those of previous meta-analyses conducted in different populations. Considering sociodemographic factors, the outcome of subgroup meta-analysis by gender, night shift work duration, type of occupation, and continent carried out by Lee et al. (134) showed that night

shift work was consistently associated with an increased risk of depression. Moreover, a meta-analysis of five studies revealed a 42% increase in the risk of depression among persons working the night shift, as conducted by Angerer et al. (135), but the researchers believe that this evidence is not strong enough to sustain a general medical recommendation against night shift work for workers with depressive conditions and that it would seem appropriate to address this question on an individual basis, with strong support from physicians and close attention to the negative psychosocial factors associated with night shift work. According to one study in China, night shift work, shift frequency, and sleep disturbances were associated with an increased risk of depression among workers, and the association between night shift work and depression appeared to be partially mediated by sleep disturbances (136). According to the Heinz Nixdorf Recall Study, which investigated various demographic, lifestyle, and work-related characteristics to examine the relationship between shift work and depressive symptoms, women working night shifts show increased relative risks for depressive symptoms, particularly when working night shifts for 20 years or more (137). Until the 5-year follow-up, 896 participants were observed, and 486 participants survived through the 10-year follow-up. Working night shifts consistently increased the likelihood of women developing depression symptoms, according to stratified analysis (137).

3.10 Strengths and limitation

From the outcome of this study, circadian rhythm disruption and sleep deprivation should be considered as clinical risk factors for depression in nurses working night shifts. Circadian and sleep disruptions should be among the therapeutic targets in order to prevent and treat depression

among nurses working night shifts and in the planning of occupational health interventions for nurses. One of the major limitations of our review was that it included studies that assessed night shift work effects based on working rotating shifts and casual night shifts and, therefore, could not demonstrate a strong reciprocity of associations between working night shifts and depression. Second, all the included studies were either cross-sectional or cohort studies, so causality was difficult to establish. Second, there was a lack of uniform diagnostic criteria and diagnostic tools as the authors used diverse assessment tools for depression, which might reduce the comparability between studies. Lastly, the pooled effect sizes of the studies selected for the meta-analysis are small.

3.11 Conclusions

This systematic review and meta-analysis clearly show a significant relationship between working night shifts, the disturbance of sleep and circadian rhythm linked to night work, and the risk of depression in nurses. This indicates that nurses who work night shifts are more likely to experience depression. A thorough examination of whether sleep deprivation caused by working night shifts significantly increases the incidence of depression in nurses may aid in the development of strategies to improve nurses' performance during night or rotating shifts, as well as effective shift Rota planning. Examples of such strategies include improving workplace standards, personalizing work schedules according to individuals' circadian rhythm, which will synchronize their biological clock with a schedule, and treating sleep problems and depression among nurses.

Chapter 4 – Strategies to reduce stress and burnout in healthcare workers: an RTC research protocol

4.1 Introduction

Stress-related ill health is a growing issue representing major challenge for both the individual and society, as it leads to huge costs in terms of work disability and puts pressure on the healthcare system (104). The coronavirus (COVID-19), recognized in 2020, has spread rapidly around the world and was declared a global pandemic by the WHO. The typical manifestations of this disease are pneumonia, bronchitis and acute respiratory syndromes, which in many cases require hospitalization of the affected patients, in the most severe cases in intensive care units. Since the numerous variations completed in hospitals to improve coping with this infectious disease, COVID-19 has strictly affected the lives and the mental and physical health of all labors involved (104,138,139).

Workplace stress is elevated between HCWs and is related with cut-rate psychological vigor, quality of care and patient fulfilment (52,53,140). Several studies have demonstrated that the COVID-19 on the emotional health of the healthcare labors (140,141) involved, who have always been on the front line. They demonstrated elevated levels of stress, anxiety, depression and burnout, and sleep disorders, which unavoidably led to medication mistakes and inferior standards of care. This job-related stress may lead healthcare professionals to severe distress and burnout (52,53). Therefore, these symptoms may harmfully touch the worth of their service provision, the patient's health and outcomes, and the viability of the healthcare system (52,53). Different studies present in literature (71,74,142,143), demonstrate the efficacy of yoga and mindfulness in

rocketing the mental health of HCWs. Though there are variable meanings of mindfulness, it is generally and operationally defined as the value of consciousness that transpires over intentionally focusing on present-moment experiences in an accepting and non-judgmental manner (142). Mindfulness-based interventions (MBIs) have occurred as sole methods for addressing a range of clinical and subclinical difficulties such as stress, chronic pain, anxiety, or recurrent depression. Mindfulness-based interventions have proven to be a promising intervention in reducing the stress experienced by HCWs (144,145).

Mindfulness-based interventions (MBIs) (19) are suggested by the NHS and the National Institute for Health and Care Excellence (NICE) for the avoidance and controlling of stress (National Institute for Health and Care Excellence 2009). Mindfulness is a procedure of attention training, which shifts a person's relationship to every day, present-moment experience.

Additionally, there is solid evidence about the encouraging effects of yoga practice on stress controlling and the avoidance of burnout among healthcare labors. Yoga was initially described as restrained within a primarily spiritual and meditative field. It developed over time and assumed a new complex nature of assorted methods that conglomerate mental with physical health. This combined method promises universal benefits for the individual (65). Firstly, aerobic and anaerobic exercises improve the musculoskeletal structure, the insulin circuit, the hormone system, and the metabolism (66,67). Additionally, the benefits realized from sports or gymnastic exercise are improved by the association with meditation activities and psychoanalytic methods that aid to encourage relaxation and self-awareness. This method aids to advance cognitive flexibility and increase attention, acceptance and control of emotional reactions (68).

Visual thinking strategies (VTS) is also used in mental health management as a tool for neurological rehabilitation. VTS is an art-based pedagogic approach that over close looking, reflection, and open discussions of visual art fosters critical thinking skills, communication and collaboration, and personal growth (146,147). The application of VTS can be useful for improving Life Skills. Life skills are actions that empower persons to adapt and deal effectively with the demands and challenges of life with the promotion of lifelong learning, quality of life and limiting stress.

Research steered in transcontinental Japan and China points to a plethora of positive health benefits for the human physiological and psychological systems associated with the practice of Shinrin-Yoku, also known as Forest Bathing (FB) (148). It is a traditional Japanese exercise of immersing oneself in nature by mindfully using all five senses. The reported research findings associated with the healing components of FB specifically hones the therapeutic effects on: the immune system function, cardiovascular system, the respiratory system, depression, anxiety, stress and mental health. FB may be considered a form of nature therapy (148).

4.2 Objectives of the studies

The objective of the study is to conduct a randomized controlled trial consisting of four different interventions to determinate the efficacy of Yoga, Mindfulness-Based Intervention (MBI), Visual Thinking Strategies (VTS) and Forest Bathing in improving mental health of HCWs working at Sapienza University of Rome, and promote an active lifestyle among HCWs.

Ethical issues

This trial will conform with the declaration of Helsinki 1975, as revised in 2000. Informed written consent will be obtained from the participants. The Sapienza University of Rome, institutional ethics committee and review board approval will be requested for this study.

4.3 Methods

4.3.1 Study design

This study will be a single-center, randomized controlled trial. In this study, HCWs and physicians will be recruited from the Sapienza University of Rome teaching Hospital Policlinico Umberto I in Rome, Italy, and the written consent will be taken to participate in this study. Participants will be recruited through all departments in the hospital. In Italian law, the explicit obligation to assess work-related stress risks was introduced by Legislative Decree 81/2008. It is the employer's obligation to assess all risks to workers' health and safety, also taking into account those inherent to work-related stress. The selected personnel will be involved in a mandatory RSL training course. As it is a compulsory course with credits for enlisted personnel, it will be conducted outside working hours, hopefully not affecting the enrolment and drop-out rates.

4.3.2 Participants

Participants will be randomly assigned to each group. All physicians and health workers (nurses, paediatric nurses, midwives, physiotherapists, ...) working at the Umberto I hospital in Rome will be recruited to the study. They will be recruited from different departments in the hospital: emergency, pediatrics, hematology, oncology, COVID, psychiatry, general

surgery, internal medicine, and more. The aim is to recruit 1000 participants for the study, to be allocated to the different groups in a randomized manner. Occupational factors (work tension, working hours, shift work and work-privacy conflict) will be evaluated because they have an impact on mental health and may change during the study period.

4.3.3 Inclusion and exclusion criteria

All HCWs aged 24-70 years can be included in the study. Participants with a history of psychiatric illness, neurological and musculoskeletal disorders will be excluded from this study.

4.4.4 Instruments

All the participants involved will be analyzed on the levels of depression, personal and work burnout, client burnout and work-related stress, before and after the application of the health promotion program. The main tools used to evaluate the efficacy of the different strategies are different questionnaires which will be administered to the participants at different times:

- **Copenhagen Burnout Inventory (CBI):** The Copenhagen Burnout Inventory (CBI) is a survey with three sub-dimensions: personal burnout, work-related burnout, and client-related burnout. The three distinct portions of the survey were intended to be applied in different domains. The questions on personal burnout were formulated in a way so that all human beings can answer them (a truly generic scale). The job-related burnout queries assume that the respondent has paid work of some kind. Finally, the client-related burnout questions include the

term “*client*” (or a similar term when appropriate such as patient, student, inmate, etc.). In our theoretical exertion we distinguish between working with clients, customers, and colleagues.

- **SF-12:** This survey was developed as a shorter form of the SF-36 (149) (Short Form Health Survey). Developed for measuring patient’s well-being by the Medical Outcome Study (MOS). The SF-12, an even shorter survey, was later developed and used for assessing one’s health status (64), through the calculation of mental and physical health, MCS-12 and PCS-12 respectively (150).
- **PANAS:** The Positive and Negative Affect Schedule (PANAS) is also a self-report questionnaire, based on 20-item questions concerning the assessment of positive (emotions, sensation, and sentiments in terms of enthusiasm, energy, self-confidence, and determination) and negative (anger, contempt, guilt, and fear) affect (151,152).
- **STAI:** The State-Trait Anxiety Inventory (STAI) is a psychological inventory consisting of 40 questions on a self-report basis (153), developed to measure state anxiety, or anxiety about an event, and trait anxiety, or anxiety level as a personal characteristic.
- **Positivity Scale:** This questionnaire was intended as a rapid tool with which to directly assess Positivity, developed by Caprara et al (154).
- **Hospital Anxiety and Depression Scale (HADS):** this inventory was initially settled by Zigmond and Snaith (155), has the aim of measuring the levels of anxiety and depression that a person is experiencing, using a fourteen-item scale.

In this regard, an on-going control will be carried out: the investigators will carry out controls, through the administration of the different questionnaires, at T0, before the beginning of the interventions, a check at the end of the course, so as to assess an initial impact of the interventions

on the participants, and the last control will be carried out at a Tn that will be 6 months after the end of the training.

4.4.5 Interventions

The intervention will be structured as a 4-week course, once a week.

Four different interventions have been defined: Yoga, Mindfulness-Based Intervention (MBI), Visual Thinking Strategies (VTS) and Forest Bathing (FB).

Yoga:

A certified expert steered the yoga course. Participants were requested to carefully consider posture and breathing as a valued technique to manage their minds. During the yoga sessions, the following scheme was followed:

- 5–10 minutes of preliminary session with motivational commitments.
- 30 minutes of breathing, posture, and sound movements meant to accomplish benefits for job-related stress and burnout (shoulders, neck, hips, and leg muscles were the most treated body district).
- 20 minutes of pranayama, pointing at deceleration and controlling breathing with diaphragmatic respiration exercises to reduce perceived anxiety.
- 20 minutes of precise meditation exercises with movements and postures for releasing tension, relieving fatigue, and achieving mental well-being.
- 5 minutes of mantra (method repeated many times with meditative purposes).
- 10 minutes of relaxation.

Mindfulness:

One certified mindfulness instructor steered the mindfulness sessions. Each session included four main mindfulness meditation movements, a period

of review about the practice with feedback from the mindfulness teacher, and instructions about the exercise at the end. The first exercise included in each mindfulness session was a "body scan" exercise, which consisted of concentrating and focusing on different body parts. The second exercise of mindfulness of the breath sensations or focused attention meditation. The third exercise of on foot meditation was achieved in which applicants were mindful of their steps during gentler walking by supporting their consideration on each step from the start to the conclusion. In the end, the four exercises are open checking meditation exercises with mindfulness and available consciousness of any rising feelings, sensations.

Visual Thinking Strategies (VTS):

During the session of VTS, this approach offers the tools for detecting and studying an image and can be matched to the actions that physicians and HCWs achieve during clinical practice. Each session included a VTS discussion on a picture of a work, an individual written VTS exercise with a subsequent collective conversation, and an active listening practice with the drawing of an image described by a facilitator.

Forest Bathing (FB):

Forest bathing is represented by a slow, mindful nature walk that can improve people's physical and psychological health. It has been hypothesized that fewer deaths in southern and insular Italy can be explained by Forest Bathing (156). In this sense, forest bathing can be considered a therapeutic practice, and designing nasal sprays containing plant-volatile organic compounds could be a new therapeutic approach. During the into-the-nature session, the forest bathing activities will be performed in the Botanic Garden of Sapienza University of Rome, using all our senses to connect with nature: touch, listen, look, smell and taste.

Moreover, the online version of the course will be delivered by sending the links to join the weekly online forest bathing sessions.

4.4.6 Intervention framework

The participants will be divided into four intervention groups and one control group. The participants in the control group will only carry out a generic course on burnout and stress in hospital workers, without implementing any intervention strategy. The courses will be delivered in presence. Different classes will be created to allow as many participants as possible to be included in the trial. participants divided causally into the following groups: Yoga, Mindfulness, Visual Thinking Strategies (VTS), Forest Bathing (FB) and a Control Group.

Once the effectiveness of the interventions on stress and burnout reduction in HCWs has been proven, the in-presence lessons will be recorded so that the online courses can be carried out and thus evaluate whether the online courses have the same impact on the participants as the in-presence courses. Each course will be taught and moderated by a leader specialized in the field. With the COVID-19 pandemic, distance learning was used. The second objective of the trial will be to demonstrate how online courses will have the same impact as face-to-face courses. This will enable us to recruit as many staff as possible, and this will certainly have less of a negative influence on possible drop-out rates on the part of participants.

4.4.7 Data analysis

At the end of the course, the investigators will proceed to the analysis of the results. In order to assess the differences between the pre-and post-intervention results, univariate analysis of the scores using the Wilcoxon test will be applied. In addition, the T-test and the Mann-Whitney test will

be used to assess the differences between the groups for delta scores. Finally, a multiple linear regression analysis will be performed with delta scores as dependent variables and age (continuous variable), gender and hospital ward as independent variables. The quality of model fit will be assessed using the R² index. An analysis intention-to-treat will be carried out. All statistical analyses will be performed using SPSS statistical software version 27.0 (IBM SPSS Statistics 27). The significance level will be set at $p < 0.05$. The study will be carried out following the principles laid down in the Helsinki Declaration of 1975, revised in 2000.

4.4.8 Randomized

This is a randomized clinical trial, with a parallel assignment, open-label (no masking).

Randomization will be done by producing a randomization list using EpiCalc2000. Each HCW will be paired with a number. In order to prevent imbalance between intervention groups for known factors that influence intervention responsiveness, stratified randomization will be used, taking into consideration the following parameters:

- *Gender* (females and males)
- *Age group* (< 50 and over 50 years)
- *Job type* (medical doctors, nurses, technicians, other HCWs).

4.5 Conclusions

At the end of this trial, we suppose a development in mood, emotional well-being, and mental health among participants in the intervention group, of particular concern in times of pandemic. The different interventions were created to implement the psychological skills of the healthcare involved. Employers in healthcare should be considered implementing workplace

wellness programs that integrate these methods to promote the well-being of their staff. MBI yoga, VTS, and FB are effective intervention that can help the psychological functioning of healthcare professionals. The members are expected to continue exercising throughout their lifetime. The study's main objective is to demonstrate the effectiveness of at least one intervention on stress and burnout of healthcare workers, but also to show how possible recorded online lectures can be as practical an intervention as lectures delivered in person by teachers.

Chapter 5 – Yoga, Mindfulness and Visual Thinking

Strategies as a tool to reduce stress and burnout in healthcare workers: preliminary results of a single center clinical trial

5.1 Introduction

All healthcare workers experienced severe consequences to their bodily and mental well-being as a result of COVID-19. Healthcare personnel experience significant levels of workplace stress, which is linked to worsening psychological health, lower treatment quality, and lower patient satisfaction (53,54,157). The pandemic's effects on frontline healthcare professionals' emotional health have been shown by a number of research that have been published in the literature (53-157). Research has shown that significant levels of stress, anxiety, depression, burnout, and sleep problems are experienced by healthcare personnel. These factors inevitably result in medication errors and subpar patient care. Burnout may result from further significant mental discomfort brought on by this work-related stress (53,157). Working under pressure, not having control over work tasks, working long hours, or shift work, not having support, are all important risk factors for the onset of stress, burnout and fatigue in employees.

Stress at work is characterized as an organism's condition of tension brought on by external stimuli, which prompts the body to protect itself against potentially dangerous situations or find ways to adjust to novel circumstances. Although this word has been understood in many ways over the ages, stress is now recognized as a normal and essential part of life for all people (10). An excess of stress damages the body severely or, in the

worst situations, has long-term effects. However, it has been demonstrated that an individual needs a specific dosage in order to survive (10). Numerous research have demonstrated the high occurrence of stress in helping professions; in particular, recent studies have examined the job of health care workers and the factors that contribute to stress (11). Workplace stress and family pressure can exacerbate each other, resulting in major health issues that may eventually become true work-related illnesses.

Conversely, the onset of burnout is significantly influenced by one's age at work. Young people are most vulnerable, according to the findings of several studies, because their idealistic ideals too frequently do not meet the reality of their work (158). Conversely, those with greater professional experience tend to be less vulnerable, as their increased capacity to handle work-related challenges is directly proportional to their expertise accumulated throughout time (158). There is no doubt that burnout and stress at work have a variety of negative effects. They have been linked to a number of mental and physical health issues, including as obesity, diabetes, heart disease, anxiety, depression, and exhaustion (56,57).

If employees are heavily affected by work-related stress or burnout, it is obvious that this can have a major impact on company performance. It is therefore necessary, at organizational level, to improve the conditions under which work-related stress can best be managed.

Various research (71,74,142,159) that are available in the literature show how effective yoga and mindfulness are at improving the mental health of healthcare workers. According to Di Mario et al. (142), mindfulness-based therapies and yoga have shown promise in lowering the stress levels experienced by healthcare workers.

Furthermore, a strong body of research supports the positive impacts of yoga on stress management and the prevention of burnout among

healthcare professionals. At first, yoga was defined as confined to a mostly spiritual and meditative domain (65).

In mental health treatment, Visual Thinking Strategies (VTS) are employed as a neurological rehabilitation aid. VTS is an art-based pedagogical technique that promotes critical thinking abilities, communication and teamwork, and personal development through close examination, reflection, and open debates of visual art (147).

This study set out to investigate the effects of a yoga, mindfulness-based intervention and visual thinking strategies on the mental health of healthcare workers (HCWs) at one hospital in Rome through a single center, randomized controlled trial. The idea under investigation was that combining mindful interventions with yoga or visual thinking strategies could lead to improvements in quality of life, stress at work, and positive and negative affect scores.

Ethical issues:

This trial will conform with the declaration of Helsinki 1975, as revised in 2000. Informed written consent will be obtained from the participants. The Sapienza University of Rome, institutional ethics committee and review board approval will be requested for this study.

5.2 Materials and Methods

Setting and participants:

For this study, healthcare workers of one hospital in Rome, the teaching hospital “*Policlinico Umberto I*”, were recruited in the period from October 2023 to September 2024. Physicians, nurses, psychologists, and technicians of these hospital received the intervention in different editions of the course. Participants who attended at least three of four meetings and who filled out

both the entrance and final questionnaires were included in the analysis. All hospital departments will be used to find participants. Legislative Decree 81/2008 established the explicit duty to evaluate work-related stress risks under Italian law. It is the employer's responsibility to evaluate all hazards to the health and safety of employees, including those associated with stress at work. An RSL training course will be required of the chosen staff members. Since it is a required course that enlistees must complete and receive credit for, it will take place outside of regular business hours, which should have no impact on enrollment or dropout rates.

A research protocol was published for the preparation of the clinical trial (160).

Intervention:

The intervention will meet once a week for four weeks as a course.

Yoga, Mindfulness-Based Intervention (MBI), Visual Thinking Strategies (VTS), and Forest Bathing (FB) are the four defined interventions.

Yoga:

The class was led by a certified specialist. It was recommended of the participants to carefully consider breathing and posture as important mental health techniques. The schedule that was followed for the yoga sessions was as follows:

- 5–10 minutes of the preliminary session with motivational commitments.
- 30 minutes of breathing, posture, and sound movements meant to accomplish benefits for job-related stress and burnout.
- 20 minutes of pranayama, pointing at deceleration and controlling breathing with diaphragmatic respiration exercises to reduce perceived anxiety.

- 20 minutes of precise meditation exercises with movements and postures for releasing tension, relieving fatigue, and achieving mental well-being.
- 5 minutes of mantra.
- 10 minutes of relaxation.

Mindfulness:

The mindfulness classes were led by a single qualified mindfulness instructor. Four primary mindfulness meditation movements, a review of the practice with feedback from the mindfulness teacher, and directions for the exercise were all included in each session. Each mindfulness session began with a "body scan" activity, in which participants focused on various body regions while maintaining concentration. The second practice is focused attention meditation or mindfulness of breath sensations. The third on-foot meditation exercise was completed by the participants, who supported their evaluation of each step from beginning to end while walking more gently. The four exercises ultimately consist of open-checking meditation practices with awareness and availability consciousness of any rising emotions.

Visual Thinking Strategies (VTS):

This method can be compared to the actions performed by doctors and other healthcare workers in clinical practice and provides the means to identify and analyze an image during a VTS session. Every session had a picture-of-work-based VTS discussion, a written individual VTS exercise followed by a group discussion, and an active listening exercise including the drawing of an image that the facilitator described.

Instruments:

All the participants involved will be analyzed on the levels of depression, personal and work burnout, client burnout and work-related stress, before and after the application of the health promotion program. The main tools used to evaluate the efficacy of the different strategies are different questionnaires which will be administered to the participants at the beginning of the courses and at the end:

- **Karasek Questionnaire:** Robert Karasek was the one who designed the Job Content Questionnaire (JCQ) (161). In its initial form, it was a self-administered tool with 49 questions intended to quantify the social and psychological aspects of work. This questionnaire's objective is to provide an assessment of job demand, control, and support. Various measures are used to make this: work insecurity; decision latitude; psychological demands; social support; and physical needs. The most widely accepted demand/control model hypothesis states that when psychological demands are high and workers' decision freedom is low, the most detrimental effects of psychological strain would manifest as job strain. This is the reason the study's analysis focused on the final three factors. The original questionnaire, which had fifteen items, was condensed and used.
- **HADS Questionnaire:** This fourteen-item questionnaire, which was first developed by Zigmond and Snaith (155) is intended to gauge an individual's current state of anxiety and despair.
- **Copenhagen Burnout Inventory (CBI):** Three sub-dimensions make up the Copenhagen Burnout Inventory (CBI): personal, work-related, and client-related burnout. The survey's three separate sections were designed to be used in various contexts. The questions about personal burnout were designed to be answered by anyone,

using a truly generic scale. The questions about burnout in the workplace presume that the respondent has done some sort of paid labor. Lastly, the phrase "client" (or a similar term when applicable, such as patient, student, convict, etc.) appears in the client-related burnout questions. We make a distinction between working with clients, customers, and coworkers in our theoretical effort.

- **SF-12 Questionnaire:** The SF-36 (149) (Short Form Health Survey) was the source of this survey's truncation. created by the Medical Outcome Study to gauge patients' levels of well-being (MOS). Later, a shorter survey called the SF-12 was created and is used to evaluate an individual's health condition using the MCS-12 and PCS-12 measures of physical and mental health, respectively (145).

Statistical analysis:

Univariate analysis and descriptive statistics were both used in the statistical analysis. Additionally, the three groups' differences with respect to the delta values of each dependent variable were evaluated using the ANOVA test. The statistical program SPSS version 25.0 for Windows (IBM SPSS Statistics 25) was used to conduct all statistical analyses. At $p < 0.05$, the threshold for statistical significance was established.

5.3 Results

A total of 82 participants attended the Continuing Medical Education (CME) course, divided as follows: 17 (20.7%) attended the single edition of the mindfulness course, 37 (45.1%) participated in the two editions of the Visual Thinking Strategies (VTS) course, and 28 (34.1%) attended the two

editions of the yoga course. The socio-demographic characteristics of the participants enrolled in the course are described in Table 1.

Variable	N (%)
Sex:	
Female	64 (78%)
Male	18 (22%)
Marital status:	
Married	49 (59.8%)
Divorced	13 (15.9%)
Single	19 (23.2%)
Widowed	1 (1.2%)
Has children?	
Yes	51 (62.2%)
No	10 (12.2%)
Role:	
Healthcare worker	10 (12.2%)
Nurse	40 (48.8%)
Physician	27 (32.9%)
Technician	5 (6.1%)
Age:	
18-30 years	2 (2.4%)
31-40 years	18 (22%)
41-50 years	8 (9.8%)
51-60 years	37 (45.1%)
over 60 years	17 (20.7%)
Region of residence:	
Abruzzo	1 (1.2%)
Basilicata	1 (1.2%)
Calabria	2 (2.4%)
Campania	1 (1.2%)
Lazio	74 (90.2%)
Lombardia	2 (2.4%)
Puglia	1 (1.2%)
Department:	
General surgery and organ transplantation	1 (1.2%)
Vascular surgery	2 (2.4%)
Cardiac surgery	2 (2.4%)
Cardiovascular diseases	1 (1.2%)
Abdominal surgery	1 (1.2%)
Emergency medicine	4 (4.9%)

Emergency surgery	1 (1.2%)
Anaesthesia and resuscitation in specialist surgery and transplantation	11 (13.4%)
Fever	1 (1.2%)
Traumatology and orthopaedics	1 (1.2%)
Anaesthesia and intensive care in cardiac surgery	1 (1.2%)
Emergency surgery	1 (1.2%)
Implant dentistry	1 (1.2%)
Haematology	2 (2.4%)
Infectious diseases	8 (9.8%)
Internal medicine	1 (1.2%)
Pneumology	2 (2.4%)
Hormone diagnostics	1 (1.2%)
Tropical diseases	1 (1.2%)
Gastroenterology	1 (1.2%)
Rheumatology	1 (1.2%)
Internal medicine translation	1 (1.2%)
Gynaecology and oncology surgery	2 (2.4%)
Obstetrics	1 (1.2%)
Neonatology	3 (3.7%)
Paediatric gastroenterology	2 (2.4%)
Paediatrics	4 (4.9%)
Paediatric emergency room	2 (2.4%)
Cystic fibrosis centre	1 (1.2%)
Neurosurgery	1 (1.2%)
Paediatric neuropsychiatry	2 (2.4%)
Clinical pathology	1 (1.2%)
Medical genetics	1 (1.2%)
Regenerative medicine	1 (1.2%)
Diagnostic imaging	1 (1.2%)
Orthognathodontics	1 (1.2%)
Ophthalmology	2 (2.4%)
Administrative offices	1 (1.2%)
Other	10 (12.2%)

Table 1. Socio-demographic characteristics.

78% of the sample is female, 59.8% is married, 62.2% has children, and 45.1% is between the ages of 51 and 60. Lazio is the most common place of residence (90.2%), while the majority of the workers are nurses (48.8%) and

doctors (32.9%). Participants in the study were drawn from several departments within the hospital that was referred.

All of the results from the various questionnaires given prior to the start of the course in the various courses offered are displayed in Table 2. The MCS 12 (mental health) and PCS 12 (physical health) are two variables taken into account in the SF-12 questionnaire. Three scores—decision latitude, job demand, and job strain—were obtained from the JCQ. Personal, client, and work burnout are the three viewpoints from which the CBI investigates burnout. The HADS questionnaire yielded the anxiety and depression variable. As can be observed, none of the variables analyzed show a significant difference between the four courses at t0. There is no correlation between the courses and the factors being studied.

Variable	Mindfulness Mean (SD)	VTS Mean (SD)	Yoga Mean (SD)	p
Decision latitude	49.4 (6.6)	49.5 (5.2)	51.3 (7.5)	0.477
Job demand	28 (7)	29.2 (5.6)	27.8 (5.6)	0.182
Job strain	0.9 (0.2)	0.8 (0.1)	0.9 (0.1)	0.369
Anxiety	8.8 (4.5)	8.3 (4.6)	9.9 (3.8)	0.331
Depression	5.9 (3)	5.3 (4.2)	6.8 (4.1)	0.302
Personal burnout	58.6 (18.7)	53.8 (19.5)	62.5 (14.6)	0.154
Client burnout	29.7 (23.1)	29.7 (24.9)	38.1 (19.6)	0.293
Work burnout	47.5 (16.7)	48.1 (16)	54.3 (13.5)	0.199
PCS12	49.2 (9.6)	46.5 (7.9)	48.5 (8.3)	0.489
MCS12	37.7 (9)	40.3 (10)	34.9 (10.9)	0.112

Table 2. Pre-CME results.

Delta Score:

An additional analysis was carried out to see whether certain participant characteristics would indicate any correlation between the intervention and the dependent variables (differences in scores before and after the

intervention). The comparison of the four courses' pre and after data reveals improvements, particularly in the MCS and depression levels. Yoga was unquestionably the training that produced the biggest improvement in anxiety, burnout, and despair. Though not as much, VTS and mindfulness also produced improvements.

Variable	Mindfulness Mean (SD)	VTS Mean (SD)	Yoga Mean (SD)	p
Delta PCS	-2.4 (9.3)	2.2 (9.6)	1.7 (8.4)	0.215
Delta MCS	-1.2 (12.6)	0.6 (13)	10.5 (5.2)	0.007
Delta Anxiety	1.2 (6.1)	-1.7 (4.2)	-2.4 (5.2)	0.062
Delta Depression	2.2 (6.4)	-0.5 (3.8)	-2.1 (6.4)	0.036
Delta Personal Burnout	0.5 (27.9)	-1.8 (22.2)	-9 (22.8)	0.335
Delta Client Burnout	8.3 (25.5)	3.5 (26.3)	-7.4 (23.5)	0.091
Delta Work Burnout	3.8 (22.5)	-0.4 (19.6)	-7.1 (17.8)	0.169
Delta DL	1.4 (8)	-0.3 (6.3)	-3.2 (7.5)	0.085
Delta JD	-1.1(8.7)	0.1 (6.3)	-1.9 (3.3)	0.398
Delta Strain	-0.1 (0.2)	0.1 (0.2)	-0.0 (0.1)	0.424

Table 3. Analysis on the delta (pre- and post-intervention difference) scores.

5.4 Discussion

For a number of reasons, the healthcare setting can be quite stressful. Working in a hospital entails handling challenging cases and administrative concerns on a regular basis, in addition to the ongoing risk of an emergency and the diagnosis and treatment of specific illnesses. Worsening work-related stress is frequently caused by additional stressors. Health workers can experience high levels of stress due to a variety of factors, including a bad work environment with unpleasant coworkers or supervisors, a lack of honesty and transparency among employees, poor workplace conditions, and, most importantly, ongoing contact with patients, meaning that people

are in pain. This study's primary goal was to give healthcare professionals a tool to help them deal with the stressors of their daily jobs. Assisting medical staff in managing their anxiety, sadness, and burnout improves both their general quality of life and the standard of care they provide to patients. Numerous facets of mental and physical health have already been demonstrated to benefit from the suggested interventions, including yoga, mindfulness, and VTS.

In agreement with different studies (9-12), our results confirm what has already been widely said: yoga and mindfulness reduce stress, anxiety and burnout. VTS also helps with stress reduction (14).

Limitations and strengths:

The study's strength is that no similar continuing education program has previously been developed in an Italian university hospital that uses these interventions to lower stress, depression, and burnout. This offers a strong foundation for reproducing the same course in various Italian contexts and then in other foreign situations to get comparable outcomes. The mental health of healthcare professionals should be addressed in the workplace since it invariably affects the standard of patient treatment. The fact that the sample represents the primary demographics of healthcare professionals working at the reference hospital is another advantage of the research. The subjects are drawn from several hospital departments to further enhance the sample's variability, confirming that this is the general population examined. Unfortunately, the only limitation is the small sample size due to the fact that the courses provided were only offered in person.

Directive for future research:

Finding practical and long-lasting ways to lessen the psychological strain brought on by the hospital work environment should be the main goal of future studies on public health and stress management in healthcare professionals. It would be helpful to look into how stress management strategies like mindfulness and cognitive-behavioral intervention, as well as psychological support programs, affect the wellbeing of employees. To create focused interventions, it is crucial to look at how stress levels vary among various staff groups, including physicians, nurses, and administrative personnel. Additionally, studies should look into how well institutional policies, like fewer shifts or more resources, works to enhance working conditions and avoid burnout. These research may contribute to the development of a more comprehensive understanding of mental health needs in the hospital sector and inform public health policies aimed at promoting a healthier and more balanced work environment.

5.5 Conclusion

Burnout, depression, anxiety and stress are serious risks for health care workers working in emotionally demanding professions. The use of mindfulness, yoga, and VTS has considerable potential in promoting self-care and helping healthcare workers improve their mental health. The inherent demands of the job, individual susceptibility and poor work organization contribute to increased stress in workers. All this, especially in the helping professions, can lead to prolonged stress, which in turn can be associated with the development of burnout, chronic fatigue, absenteeism, high staff turnover, reduced patient satisfaction, and increased errors in diagnosis and treatment.

Chapter 6 – The Urbino Charter: a declaration for well-being of working people

6.1 Introduction

The “*Urbino Charter*” is a document aimed at promoting the well-being of the working person that the Olympus Observatory of the University of Urbino Carlo Bo and the Rubes Triva National Foundation, a joint body in the field of environmental hygiene, presented in Bilbao at a public conference in March 2023. The Charter has the objective of stimulating reflection on the issues related to prevention while drawing attention to the essential values for the effective protection of workers' health, safety and well-being. At the website of the presentation of the Charter (<https://www.festivalsalutesicurezzaalavoro.it/urbino-charter/>) it is clearly reported that “people’s psychological and physical integrity is an absolute and inalienable right”. This charter is intended to make a reflection on the issues related to the prevention on the workplace, and indicates values not only for an effective protection of health and safety, but also for a real well-being of employees. This commentary has the aim of presenting the 10 statements of the Chart, from a perspective of Occupational health and safety.

6.2 Commentary

1) *Work, however it may be carried out, must be inspired by values such as safeguarding a person’s life, their dignity, the free expression of their personality, and health and safety- intended as their physical, psychological, relational, social and organizational well-being.*

This passage underscores the importance of upholding core values in all types of work. It asserts that work should be based on essential principles, including:

Protection of Life: work should not endanger lives but rather aim to preserve and enhance them.

Dignity of the Individual: workers should be treated with respect and dignity, free from unjust or inhumane treatment such as all forms of forced or compulsory labor.

Freedom of Personal Expression: every individual should have the freedom to express their individuality at work without oppression. We must ensure the elimination of discrimination in employment and profession.

Safety and Health: work should ensure the safety and health of those involved, encompassing physical, psychological, relational, social, and organizational well-being, including a healthy work environment.

These principles reflect a holistic approach to work, placing workers' rights and well-being at the core of work activities. Such principles are often enshrined in labor laws and regulations and are promoted by international organizations like the International Labour Organization (ILO) (162) and the European Union to ensure workers' rights worldwide. The ultimate goal for any organization should be to create a work environment where workers are treated with dignity, respect, and fairness, leading to their satisfaction and productivity, as well as the stability and success of the organization itself (163). Achieving these values can be complex and challenging in some work situations and requires the commitment of all involved parties, including workers, employers, and government institutions.

2) *People first, then work. Under no circumstances can the loss of life or health constitute a necessary sacrifice.*

Modernity has led to a heavy focus on work, often pushing health and life into the background. However, it's imperative to remember that life and health are non-negotiable priorities. Under no circumstances, whether personal or professional, can the loss of life or health be justified as a necessary sacrifice. Human life is of immeasurable value, and health is its cornerstone. Every individual possesses intrinsic worth, and preserving life and health should be society's utmost priority. While work is crucial for individuals, it should never compromise their health or life. Unfortunately, in many cases, working conditions put employees' health at risk. Ensuring safe workplaces and practices that do not jeopardize workers' physical and mental well-being is fundamental. According to the National Institute of Statistics (ISTAT), in 2022, "accidents at work are increasing but fatal cases have decreased" (164). These statistics underscore the need to improve workplace safety to preserve workers' lives and health.

The Italian Republic, through the Constitution, protects health as a fundamental right of the individual and interest of the community (165). This provision emphasizes the importance of ensuring adequate healthcare and safe working conditions for all. Preserving human life and health should be a primary goal, far above any economic or work-related considerations. This commitment requires a cultural, political, and economic shift that places the human being at the center of decisions and actions. Life and health are the foundations upon which to build a prosperous and sustainable society. It is time to make this unquestionable priority a tangible reality.

3) *Ensuring the well-being of working people cannot be separated from an organized prevention system that is based on adequate company policies, and inspired by ethical, and not by financial principles alone.*

The protection of the well-being of individuals in the workplace is a fundamental principle that should guide every aspect of the world of work. The focus is on the importance of an organized system of prevention based on appropriate corporate policies inspired by ethical principles rather than solely economic ones. Ethical corporate policies emphasize the social responsibility of businesses, recognizing that they are not just economic entities but also have a significant impact on the lives of their employees and society as a whole. An ethical approach to work involves promoting the well-being of workers as the primary objective, not only to comply with the law but to do the right thing. According to a study conducted by the International Labour Organization (ILO), companies that adopt ethical corporate policies tend to record lower rates of workplace injuries and absenteeism due to occupational illnesses. This demonstrates that ethical companies invest in prevention and the safety of their workers, resulting in a healthier and safer working environment (166).

An organized prevention system is an essential element to guarantee the well-being of workers. This system should be aimed at promoting a culture of safety, which is fundamental for achieving improvements in workplace health (167). According to the European Agency for Safety and Health at Work (EU-OSHA), the implementation of occupational health and safety management systems can significantly reduce the number of workplace injuries and occupational illnesses. For example, companies that have adopted such systems in Europe have seen a reduction of the accidents at work in the EU; decreased by about 70% between 1994 and 2018 (168). Protecting the well-being of workers should not be merely a matter of legal compliance but a priority based on solid ethical principles. Statistical data confirms that ethical corporate policies and an organized prevention system can significantly improve workplace safety and employee well-being.

Companies should adopt an ethical approach that places the individual at the center, demonstrating that it is possible to pursue economic success without sacrificing the health and well-being of those who work. Ultimately, the well-being of workers should be at the heart of every business decision.

4) Organising work can be done in a healthy and safe manner only if, since its inception, all the risks are constantly assessed, according to the best knowledge and experience available and adopting the necessary prevention and protection measures.

The process of evaluating the risks to safety and health arising from hazards at work, the so called risk assessment, is a worker protection measure and in Italy it is one of the employer's obligations under Legislative Decree 81/2008 (169). In fact, the purpose of this assessment is to enable the employer to effectively take the following measures: the prevention of occupational risks; the provision of information to workers; the provision of training to workers; the organisation and means to implement the necessary measures (169). Risk assessment is used to identify the aspects of work that can cause injury or harm, the workers potentially exposed, the hazards that can be eliminated and the preventive or protective measures for risks that cannot be eliminated. In 2022, the World Health Organization (WHO) defined several strategies that aim to improve health and safety conditions at work, precisely including the development of evidence-based programmes for the prevention of occupational risks (physical, chemical, biological and psychosocial) (170). It is important, as also stated in this point, that such programmes are evidence-based, which means based on the best knowledge and experience available. According to the WHO, moreover, for a workplace to be healthy, safe and resilient, it must be an environment in which workers can perform their tasks without falling

victim to illness or injury (171). Organising work, therefore, can be done in a healthy and safe manner not only through the promotion of workers' health and well-being, but also through prevention and protection from risks assessed at work, according to the Total Worker Health (TWH) approach (171).

5) No injury to the health and safety of the working person is accidental or unavoidable. We mustn't give in to any risk.

Injury to the health and safety of the working person may be the result of an accident or occupational disease. These are two aspects of the same organisation that doesn't protect the health and safety of the worker, but which have different characteristics. An accident is an injury event due to a violent cause acting in a time-concentrated manner at work; an occupational disease, on the other hand, is an injury event that occurs due to a prolonged action over time of a harmful factor in the work environment. According to the National Prevention Plan (NPP) 2014 – 2018, work-related health injuries can benefit from effective interventions by public administrations. This is possible through the implementation of programmes that have as their basis qualitative and quantitative knowledge of risks and methods to prevent them, as well as knowledge of damage, both in terms of epidemiology and causal determinants (172). The NPP 2020 – 2025, in line with the previous one, recognises in the Targeted Prevention Plan (TPP), the tool to ensure greater awareness by employers of the risks and consequences of non-compliance with safety regulations (173).

No injury to the health and safety of the working person is, therefore, accidental or unavoidable if risk factors are identified and appropriate preventive measures are put in place.

"We mustn't give in to any risk" can be considered an encouragement for the participation of all institutions and social partners at national, regional and territorial level.

6) *Safety and well-being concern working people and not only the work environment. Some people fall ill and die at work and because of work.*

Safety and well-being in the workplace and the influence, that the work environment has on worker's state of health, are two crucial issues. Organisations not only have an obligation to provide safe and hazard-free work environments but also have a responsibility to promote the health of workers and favour healthy work environments. Thus, a healthy workplace involves both health protection to prevent work-related injuries and health promotion to improve workers well-being (174). According to the WHO definition, the problems that can affect a healthy work environment may concern four areas: the physical work environment, the psychosocial work environment, including organisation of work and workplace culture, personal health resources in the workplace, and ways of participating in the community (175).

Depending on the area concerned, workers may suffer injury, illness (physical disorders, psychological distress, health problems related to unhealthy lifestyles) or even death. It is crucial, therefore, not only to consider the impact that unhealthy workers have on the work organisation in terms of costs and productivity, but mostly the impact that an unhealthy workplace has on the worker. Some people fall ill and die at work and because of work.

7) *Safety and well-being require training that will positively affect the way people behave at work. Only informed people can help manage an effective prevention system.*

Organizations often adopt safety management system or behavior-based system approaches to managing their safety functions in an attempt to achieve performance excellence (162). A worker's beliefs, values, and vision are present during the design and implementation of safety management systems and eventually when they are conducting work, according to a behavioral perspective (176,177). The degree, caliber, and consistency of engagement can be influenced by the workers' motivation to participate, which can be influenced by their ideas and values¹⁶. By increasing workers' involvement in and awareness of their jobs, surroundings, associated dangers, and potential error traps, worker engagement in safety may systematically lower the likelihood that human errors will occur (176).

8) An effective organization of the prevention system requires the active and responsible participation of all the working people, thanks to a collaborative and inclusive approach that values everybody's contribution

Working people face a multitude of stressors in their work environment. Employers in the industry should consider implementing workplace wellness programs that integrate these methods to promote the well-being of their staff (142). Each organization needs to develop time management procedures. To our understanding, there is still a gap between actualizing expected productivity and enhancing middle management performance (142). Working efficiently involves producing high-quality work rather than a lot of work. Additionally, setting goals and priorities, planning ahead, and delegating duties can all help to increase productivity and success while promoting efficiency, keeping a healthy work-life balance, and fostering job satisfaction (142,178).

9) A participatory prevention system implies the effective involvement in the decision-making processes of the representatives of the working people

Most healthcare employees are taught to prioritize patients. Because they could feel guilty about taking care of themselves or fear criticism from others, therapists don't always prioritize their own needs (179). However, engaging in self-care activities may be essential for health professionals to manage the responsibilities, workload, and demands of their line of work and to achieve a better balance or integration between work and leisure time—as well as to safeguard their health, well-being, and satisfaction with both their work and overall life (87). On an individual, organizational, and societal level, world leaders and other decision-makers need to fully understand the critical importance and value of investing in the mental health and well-being of the workforce. Additionally, there are societal, economic, and personal advantages to doing so (87). Different interventions will have to be created to implement the psychological skills of the workers involved. Employers in healthcare should be considered implementing workplace wellness programs that integrate these methods to promote the well-being of their staff (161).

10) Health and safety concern not only the working people, but the entire community, and require effective prevention policies set out by institutional and social players

Occupational safety and health (OSH) can be defined as the science of the “anticipation, recognition, evaluation and control of hazards arising in or from the workplace that could impair the health and well-being of workers, taking into account the possible impact on the surrounding communities and the general environment” (180). There is the involvement of a large amount of disciplines and several workplace and environmental hazards. In this context, it is really important to include in the assessment not only the workers but also the environment. In fact, based on this assumption, OSH's importance has been increased, taking into account the changes

occurred at the social, political, technological and economic levels. We need to recognize that in times of globalization of the world's economies, the impact of these changes has been profound, with several pros and cons. Events such as the introduction of liberalization of world trade, the quick growing of technological progress, the changes in transport and communication, the different patterns in work organization, and the size, structure and life cycles of enterprises and of new technologies are all elements capable to generate new types and patterns of hazards, exposures and risks (180), that can have an impact on health and safety. In this context, we need to consider that health and safety issues are of interest not only for the workers, but for all the community, and institutional and social players are required to put in place effective prevention policies.

Conclusion

The study of worker well-being is a topic of great importance and relevance in recent times.

From the results obtained from the clinical trial, we demonstrated an improvement in the mood, emotional well-being and mental health of the intervention group participants, which is of particular concern in times of pandemic. The different interventions were created with the aim of implementing the psychological skills of the healthcare personnel involved. Employers in the health sector should consider implementing workplace wellness programmers that integrate these methods to promote staff well-being. Yoga, MBI, VTS and FB represent effective interventions that can help improve the psychological functioning of healthcare personnel. Participants are expected to continue exercising for life. The primary objective of the study is to demonstrate the effectiveness of at least one intervention on stress and burnout of health care workers, but also to show how possible recorded online lessons can be as effective an intervention as lectures that are given in-person by teachers.

The training modules were created with the aim of implementing the psychological skills of the nursing staff involved. The HCWs is able to work on the different psychological factors, and will be less likely to develop work burnout. Establishing an easy-to-access and remote training program, conducted by experts in the field, will allow to increase the psychological well-being of the staff involved, with the aim of decreasing medical errors and increasing standards of care for patients. A tracing network and active and continuous surveillance of all the operators involved could allow companies to prevent their healthcare personnel from being so emotionally exhausted that they leave their profession. An adequate orientation and

professional selection of personnel, based on self-concept, personality, interests and skills, will allow to maximize the positive effects of work and reduce risks such as work-related stress, burnout and job dissatisfaction.

Research indicates that a positive work environment is closely linked to high performance. Therefore, it is essential to enhance the organizational environment for the most effective management of work-related stress. It is essential for managers and employees to communicate regularly in order to identify early indicators of stress and burnout. It should be made sure that supervisors and employees meet once a week to talk about and resolve issues related to stress and workload. Supervisors must ensure that they keep an eye on their team's workload and that it is divided fairly. It should be acceptable for staff members to decline further work when they are working above their capabilities and to approach their superiors for assistance in doing so.

One further thing that needs to be addressed is the possibility that certain employees may not find fixed working hours to be optimal. Working hours can frequently clash with other obligations, including picking up kids from school or looking after an elderly relative. You may help your employees achieve a better work-life balance and, as a result, lessen stress and burnout at work by providing flexible working hours. It should be urged of every employee to take all of their allotted yearly vacation days.

Individual workers are more likely to experience and develop burnout and stress related to their jobs. In this way, promoting teamwork among workers balances workloads and lessens stress associated with the workplace. Even with all the precautions a company has taken to avoid stress and burnout, some employees may unavoidably still experience these issues. Numerous businesses provide multiple days for mental health

promotion to their employees. Employees are able to take these days off anytime they feel overworked and don't have to ask.

Thus, it would seem crucial to carry out individual interventions using a minimum of three strategies:

a) **Using psychosocial interventions** that are widely acknowledged as beneficial, such as mindfulness, yoga, meditation, and VTS, FB, or cognitive-behavioral techniques, to foster positive mental health, lessen emotional discomfort, and enhance stress management skills.

b) **Offer psychological therapies** to medical and emergency personnel who are experiencing emotional distress, such as stress management, self-care, and communication skills training.

c) **Promoting physical exercise** to enhance mental health and productivity, such as resistance training, strength training, aerobic training, weight training, and brisk walking.

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