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**Do Mindfulness and Exercise Reduce Occupational Stress and  
Burnout? A Meta-Analysis**

A thesis  
submitted in partial fulfilment  
of the requirements for the degree  
of  
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at  
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## Abstract

The effects of job stress and burnout pose a large threat to employee health and organisational success in modern society. Company spending is highly affected by increased employee turnover, absenteeism, stress-related sick leave, and other issues that arise from exposure to workplace stress. For these reasons, organisations often implement stress management initiatives such as mindfulness-based interventions (MBIs) to help manage stress and prevent burnout. Mindfulness-based interventions have already provided researchers with significant results in workplace stress reduction, therefore, the purpose of this present study was to examine this relationship whilst investigating exercise as a potential moderating variable. This was achieved by conducting a meta-analysis of 17 controlled and uncontrolled studies and calculating a combined effect size using meta-analysis software. The combined effect size (Hedge's  $g$ ) for all controlled mindfulness-based intervention studies was 1.366 (95% confidence interval = 0.678, 2.055), a very large, significant effect. The combined effect size for controlled studies whilst accounting for exercise as a moderator was 0.992 (95% confidence interval = 0.386, 1.597), which also indicates a very large effect. Due to a lack of studies in the extant literature which incorporated moderate to high intensity exercise, it was not possible to examine the impact of different intensities of exercise on workplace mindfulness-based interventions. In order to gain a more comprehensive understanding of the effects of mindfulness, future research needs to incorporate exercise of moderate to high intensities, as well as examine the potential mediators of the main relationship between mindfulness, job stress, and burnout. This meta-analysis should encourage organisations to use mindfulness-based interventions to improve employee well-being.

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# Chapter 1: Introduction

## Literature Review

### Mindfulness

Mindfulness is thought to have originated from Buddhist philosophy thousands of years ago, yet only in the last few decades has it become popular in Western culture (Lomas, Medina, Ivztan, Rupprecht, & Eiroa-Orosa, 2010). From clinical practice, to academia and society in general, many have realised that mindfulness practice, mindfulness-based therapy (MBT), and mindfulness-based interventions (MBI) can yield a variety of beneficial effects.

The study of mindfulness is complicated by definitional issues. Some researchers have stated that mindfulness can be described as a state of mind, while others have described it as an enduring dispositional trait, an attitude, a cognitive or affective process, a set of behaviours, a type of meditation, or an intervention program (Choi & Leroy, 2015). The definition of mindfulness can influence people's understanding of the construct. If mindfulness is defined as a dispositional trait, for example, this may affect how invested an individual is in mindfulness practice. They may believe it to be a characteristic that they have no control over or which they are unable to develop. Evidence has shown, however, that an individual's level of mindfulness can in fact be increased due to practice i.e. state mindfulness. In a study conducted by Isbel and Mahar (2015), participants with mindfulness experience reported significantly higher scores of mindfulness, compared to participants with no experience. This shows that mindfulness can be increased over time through specific training programs and practice (e.g. Isbel & Mahar, 2015; Khoury, Sharma, Rush, & Fournier, 2015; Grossman, Niemann, Schmidt, & Walach, 2004).

For these reasons, it is important to achieve consensus regarding definitions used in the academic literature. Definitions affect how interventions are developed, their effectiveness in achieving the desired outcomes, and they can influence how people's perceptions of a concept can reduce their effort in an intervention. Agreed upon definitions among academics promote standardization,

validity, and reliability of measures. They also facilitate replicability of studies for other researchers. The most popular definition of mindfulness in the psychological literature is attributed to Brown and Ryan (2003), who define it as “the presence of attention to, and awareness of, what is occurring in the present moment” (p.824). This is the definition that will be used in the present meta-analysis when referring to the concept of mindfulness. Similarly, the definition used by Kabat-Zinn (2003) to develop a popular type of mindfulness intervention, operationalised mindfulness by stating that it is “an awareness that emerges by paying attention on purpose to the present moment, and nonjudgmentally to the unfolding of experience moment by moment” (p.145).

### **Benefits of Trait Mindfulness**

Many studies have provided evidence of the beneficial effects of trait mindfulness on the different areas of people’s lives. The effects range from improvements in psychological health such as decreased depression (Aikens et al., 2014), anxiety (Brown et al., 2007; Carmody, 2009; Holzel et al., 2011), stress (Dane, 2011; Glomb et al., 2011; Brown et al., 2007; Carmody, 2009; Holzel et al., 2011), as well as increased life satisfaction (Schutte & Malouff, 2011), problem-solving skills (Ostafin & Kassman, 2012), and resilience (Choi & Leroy, 2015; Dane, 2011; Glomb et al., 2011). In terms of physical health, there are both direct and indirect benefits that come from mindfulness practice. An example of this is trying to reduce stress using mindfulness (the desired effect) and consequently improving cardiovascular health (Klatt, Buckworth, & Malarkey, 2009).

Mindfulness practice has also been evidenced as positively affecting work outcomes that benefit the employee and their relationships, the organisation, and the society, particularly when mindfulness is used to buffer demands in the helping professions. Work outcomes associated with mindfulness practice include improved work-family balance (e.g. Choi & Leroy, 2015; Allen & Kiburz, 2011), work engagement (Choi & Leroy, 2015; Dane & Brummel, 2013), reduced job burnout (Choi & Leroy, 2015; Weinstein & Ryan, 2011), reduced stress (Brown & Ryan, 2003; Weinstein & Ryan, 2011; Geiger et al., 2016), reduced turnover (Dane & Brummel, 2013; Aikens et al., 2014), reduced absenteeism (Beshai, McAlpine, Weare, & Kuyken, 2016), and increased ethical decision-making

(Ruedy & Schweitzer, 2010). This suggests that mindfulness can affect the bottom line of a company and increase its competitive advantage by improving the well-being of its employees. These employees then engage in positive organisational behaviour, perform better, whilst reducing company spending due to fewer healthcare costs (Aikens et al., 2014).

### **Previous Meta-Analyses and Systematic Reviews**

An intervention consists of specific services or activities that are implemented to change or improve outcomes such as attitudes or behaviour. Although many studies have provided evidence of the beneficial effects of mindfulness-based interventions in the workplace, they have not all confirmed the same findings about job stress and burnout. Lomas et al. (2010) found that while in three studies burnout was reduced after an MBI, two studies found no significant changes from baseline to post-intervention. Likewise, four studies confirmed a significant reduction in stress after an MBI was employed, while two others found no significant change compared to the baseline measurement (Lomas et al., 2010). In a recent meta-analysis, Khoury et al. (2013) found that mindfulness-based interventions had a moderate effect in pre-post studies, the effects were maintained over time, and little was known about the moderators of the relationship between mindfulness and work outcomes.

For these reasons, this meta-analysis will focus on summarizing the effects of mindfulness from both older and more recent studies on reducing job stress and prevalence of burnout. We also aim to explore the effects of different forms of exercise as a moderating variable to the relationship of mindfulness, job stress, and burnout, as research is currently lacking in this area.

### **Mindfulness-Based Interventions**

Choi and Leroy (2015) found that most mindfulness studies use mindfulness-based interventions based on Kabat-Zinn's (1994) MBSR program, which has been used and validated in both clinical and nonclinical populations (Leroy et al., 2013; Dane & Brummel, 2013). MBIs have been developed to improve employee well-being (Klatt, Buckworth, & Malarkey, 2009) and reduce the effects of job stress in certain professions (Burton, Burgess, Dean, Koutsopoulou, & Hugh-

Jones, 2017). There are several different types of mindfulness-based interventions, some of which can be completed online, while others are led by a qualified instructor. In the most popular type of mindfulness-based intervention, MBSR, an instructor leads classes in sitting meditations, body scans, and yoga (Choi & Leroy, 2015), as well as facilitating the practice of specific stress management techniques such as observing events without reacting and reducing rumination by focusing on the present moment (Crain, Schonert-Reichl, & Roeser, 2016). Many different types of MBIs and study designs are now employed in organisational settings along with modified versions of MBSR (Burton et al., 2017).

Mindfulness-Based Resilience Training (MBRT) is suited to specific populations (e.g. the military) and aims to both reduce stress and increase resilience, while Mindfulness-Based Cognitive Therapy (MBCT; Splevins et al., 2009) studies have provided evidence of a greater effect on individuals with depression than the frequently used MBSR program (O'Connor et al., 2014; Geiger et al., 2016; Hoffman et al., 2010). Cognitive therapy helps to reduce negative thought patterns. MBCT, therefore, incorporates mindfulness practices such as breathing exercises into cognitive therapy.

Most studies use pre-post intervention designs, and the duration of an intervention ranges from one day to 10 weeks. Different study designs allow researchers to examine the effectiveness of mindfulness-based interventions. This allows researchers to determine how long it takes before mindfulness-based interventions influence desired outcomes, whether shorter interventions can produce the same effects as longer interventions, and whether longer interventions result in longer-lasting effects.

Selection into studies has also been examined. It is common for studies to use participants who have self-selected, as MBIs are thought to be most effective when people choose to participate in them (Burton et al., 2017). This may be because when participants choose to take part, they have more incentive to engage with the programme (Burton et al., 2017).

### **Measures of Mindfulness**

There are several scales used by researchers to measure mindfulness (Choi & Leroy, 2015). The two most popular scales that have been used to measure trait

mindfulness are the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003) and the Five-Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006). The MAAS is the most often-cited instrument, comprised of 15 items asking respondents to indicate on a 6-point Likert scale when they lack mindfulness in their thoughts, feelings, or behaviour (Leroy et al., 2013; Isbel & Mahar, 2015). The FFMQ is a larger instrument which incorporates five facets of mindfulness into its 39 items. It differs from the MAAS in that as well as a focus on attention and awareness to events, it also incorporates an attitudinal component (Choi & Leroy, 2015). The five facets include observing, acting with awareness, describing, non-reactivity, and non-judgment of inner experience. The 39 items are rated on 5-point Likert-type scales, and a total score for mindfulness is calculated based on the mean of the five subscales (Crain et al., 2016; Aikens et al., 2014). The MAAS and FFMQ are well-validated measures, suggesting that they are appropriate for use in general work settings (Choi & Leroy, 2015). Other less-frequently used measures include the Cognitive and Affective Mindfulness Scale (CAMS-R; Feldman et al., 2007), the Kentucky Inventory of Mindfulness Skills (KIMS; Baer et al., 2004), the Toronto Mindfulness Scale (TMS; Lau et al., 2006), the Freiburg Mindfulness Inventory (FMI; Buchheld, Grossman, & Walach, 2001), and the Southampton Mindfulness Questionnaire (SMQ; Chadwick et al., 2008). It is important to note that multiple measures may be developed and used by researchers in order to increase scale reliability, yet this can complicate the comparison of research findings and lead to erroneous conclusions (Siegling & Petrides, 2014).

Khoury et al. (2013) found that fewer than 50% of mindfulness studies measure differences in mindfulness from pre to post-intervention. This may be because as levels of mindfulness increase, we are often more aware that our minds are wandering. In a research publication this may seem like mindfulness has decreased, which is why it was expected that most of the studies used in this meta-analysis would not include a mindfulness measure.

## **Job Stress**

One of the main benefits associated with mindfulness practice is that it can be used to reduce the symptoms of stress. Stress is commonly defined as “a particular

relationship between the person and environment that is appraised by the person as taxing or exceeding his or her resources and damaging his other well-being” (Manocha, Black, Sarris, & Stough, 2011, p.2). An individual’s perceptions of control over their life can determine their ability to cope effectively with negative events and, in turn, experience less stress (Manocha et al., 2011). Similarly, job stress has been defined as a situation in which job-related factors affect an employee by causing changes to their normal psychological and/or physiological functioning (Richardson & Rothstein, 2008).

Many societal factors have contributed to creating an atmosphere of almost chronic stress in the Western world (de Bruin et al., 2016). The economy has changed the way we live, and the workplace has become an environment characterised by competition, insecurity, deadlines, constant availability due to rapidly advancing technology, an excess of stimuli, and the need for multi-tasking to meet multiple expectations (de Bruin et al., 2016). These characteristics have resulted in immense pressure, which leaves individuals feeling rushed and overwhelmed on a daily basis (de Bruin et al., 2016). Our perception of stress, however, has changed in recent years due to technological advancements. The modern Western world is far less stressful than most societies in history, yet technological changes have led to the automation of many jobs, for example, which has changed the way we work and changed our perceptions of stress. Previously, people suffered from stress which was likely caused by being physically endangered such as during wartime or a time of famine. In modern society, however, our physical responses to stress can be influenced by our diets (e.g. caffeine and processed foods), the form of exercise we engage in (e.g. high versus low intensity activity), as well as normal workplace stressors (e.g. workload, deadlines, and lack of managerial support).

### **Stress and Work Populations**

Certain populations of individuals are more at risk than others when it comes to experiencing job stress. According to Shapiro, Brown, and Biegel (2007), people who work in the helping professions are at great risk of developing stress-related symptoms. Such professions include nursing (Craigie et al., 2016), mental health professionals (Shapiro et al., 2007), and law enforcement officers (LEOs;

Bergman et al., 2016; Christopher et al., 2016). Depending on the resources available to them, employees may have lower or higher levels of perceived stress. Nurses are constantly exposed to stressful situations including patient trauma and distress, as well as high workloads (Craigie et al., 2016). Mental health professionals often deal with clients who have experienced abuse and trauma (Shapiro et al., 2007). This can be stressful due to the emotional labour required to talk about these painful experiences (Shapiro et al., 2007). Several studies have examined the effects of working in a stressful environment such as policing. Law enforcement officers are exposed to both organisational stressors (e.g. following policies, shift work, and perceived injustices) and operational stressors (e.g. exposure to death and violence), which can have a detrimental effect on their overall mental health (Bergman et al., 2010; Christopher et al., 2016).

### **Effects of Job Stress**

The list of effects that can arise due to job stress is extensive. Effects at an individual well-being level most commonly cited in the literature range from depression and anxiety (Shapiro et al., 2007; Klatt et al., 2009; Bergman et al., 2016), to sleep disorders (Christopher et al., 2016; Klatt et al., 2009), PTSD (Bergman et al., 2016), and alcohol and substance abuse (Bergman et al., 2016). According to Shapiro et al. (2007), in the workplace, manifestations of stress emerge as impaired attention, concentration, and decision-making skills. This can lead to an increased risk of workplace accidents (Manocha et al., 2011), decreased job satisfaction (Shapiro et al., 2007), and decreased performance (Klatt et al., 2009), which have the potential to have a negative effect at both an organisational and a societal level. Increased absenteeism and employee turnover are examples of organisational-level effects. Reduced quality of care and patient satisfaction are examples of how job stress can impair employees and affect those they are responsible for. At a societal level, mistakes made by those in power (e.g. LEOs or healthcare professionals) can have a negative impact on the general public. Due to the serious repercussions, it is important to minimize the risks that can occur when the effects of stress reduce an individual's ability to perform their job (Burton, Burgess, Koutsopoulou, & Hugh-Jones, 2017; Beshai et al., 2016; Christopher et al., 2016; de Bruin et al., 2016).

## **Coping with Job Stress**

According to a meta-analysis conducted by Richardson and Rothstein (2008), although stress is an inevitable part of our lives, by using the appropriate training programs, people can learn how to cope with it. Stress management training programs are initiated by organisations to help their employees minimize the negative effects of exposure to stressors (Richardson & Rothstein, 2008). This may be due to the fact that it is both cheaper and easier than trying to remove stressors from the workplace altogether.

## **Mindfulness-Based Interventions**

According to Bergman et al. (2016), MBSR is one of the most commonly studied mindfulness-based interventions and has been evidenced in a broad range of populations and settings (Bergman et al., 2016). MBSR has proven to be an effective method for reducing the effects of daily stress in and outside of the workplace (Christopher et al., 2016; Malarkey et al., 2013; Beshai et al., 2016; Burton et al., 2017).

The cognitive mechanism in which MBSR (and MBIs in general) work is by the idea that paying attention to present-moment experience reduces the occurrence of self-related thoughts and emotions over time. Stress is associated with negative thoughts, evaluations, and rumination, which can lead to poor mental health (Shapiro et al., 2007). Mindfulness practice via MBSR can enhance awareness of thoughts, feelings, behaviours, sensory experiences, and somatic sensations (Shapiro et al., 2007), which, as a result, can benefit an individual's mental health. According to Bergman et al. (2016), MBSR is one of the most commonly studied mindfulness-based interventions and has been evidenced in a broad range of populations and settings (Bergman et al., 2016). Other interventions, such as MBRT (Resilience Training) was based on the same principles as MBSR but was developed to manage daily stressors as well as enhance resilience. Some researchers state that mindfulness-based interventions' effects on reducing stress are due to its ability to reduce physiological arousal, such that muscle tension is decreased, and the body is told that it is not in danger and can return to its normal functioning. Others claim that it is a combination of

two steps: reducing reactivity to stressors and changing one's cognitive appraisal of self-efficacy and how one copes with stressors (Manocha et al., 2011).

The aim of the current study is to investigate how mindfulness practice can reduce symptoms of job stress, as the current literature lacks agreement as to whether the effects of interventions are attributed to mindfulness or to some other variable.

### **Measures of Job Stress**

There are multiple scales cited in the literature that have been used to measure workplace stress such as the Perceived Stress Scale (PSS; Cohen Kamarck, & Mermelstein, 1983), the Depression Anxiety Stress Scale (DASS), and the Symptom Checklist-90-Revised (SCL-90-R). The PSS is one of the most commonly employed self-report instruments used to measure current stress levels, with high levels of internal consistency (Klatt, Norre, Reader, Yodice, & White, 2017). Biological measures such as resting blood pressure (Klatt et al., 2009) and cortisol levels (Malarkey et al., 2013; Christopher et al., 2016; Klatt et al., 2009) are sometimes employed as more objective measures of stress. They are, however, more expensive, more difficult to administer, and more difficult to analyse, and were therefore not used in the present study.

### **Burnout**

Prolonged stress has been suggested to be the most common cause of burnout (Taylor & Milliar, 2016; Wollseiffen et al., 2016; Bakker & Demerouti, 2007). According to Schaufeli, Taris, and van Rhenen (2008), burnout is a metaphor which describes a psychological condition of extreme fatigue. The most commonly used definition is attributed to Maslach (1993) who suggested that burnout is comprised of three different components: exhaustion; cynicism; and lack of professional efficacy (Maslach, 1993; Taylor & Milliar, 2016). Cases of individuals suffering from burnout have risen and contribute to national economies' growing healthcare costs (Wollseiffen et al., 2016).

Burnout symptoms are associated with impairments to areas of the brain that are required for higher-order cognitive functioning (Duarte & Pinto-Gouveia,

2016). Marchand (2014) found evidence via functional neuroimaging studies that the practice of mindfulness may positively affect brain functioning in these same areas. Therefore, the relationship between mindfulness and negative work outcomes is valuable to the field of organisational psychology. Burnout symptoms cause impairments to the brain, yet results from functional neuroimaging studies suggest that mindfulness may be able to repair these areas and allow individuals to regain cognitive functioning.

### **Effects of Burnout**

Burnout can lead to physical and mental health problems which can have a negative impact on both an individual's home and work life (Schaufeli et al., 2007; Duarte & Pinto-Gouveia, 2016; Testa & Sangganjanavanich, 2016; Taylor & Millier, 2016; Maricutoiu, Sava, & Butta, 2016). Physical and mental health outcomes most commonly noted in the literature include fatigue (Testa & Sangganjanavanich, 2016), insomnia and hypertension (Duarte & Pinto-Gouveia, 2016), depression (Schaufeli et al., 2007; Shapiro et al., 2007), and anxiety (Testa & Sangganjanavanich, 2016; Duarte & Pinto-Gouveia, 2016). Negative work outcomes include reduced job satisfaction (Blankertz & Robinson, 1997), increased turnover within agencies (Alexander, Lichtenstein, Oh, & Ullman, 1998), reduced quality of care (Shanafelt et al., 2002; Salyers et al., 2015), and the desire to retire early or leave the helping professions (Testa & Sangganjanavanich, 2016). These outcomes, along with an increase in self-reported medical errors, can affect the individual, the organisation (e.g. healthcare costs, turnover, and absenteeism), and the wider society especially when dealing with healthcare professionals and other helping professions (West et al., 2006).

### **Preventing Burnout**

Although it may be impossible to avoid stress or burnout completely, there are methods that have been proven to reduce stress, prevent burnout, and even increase positive work outcomes. Resources (either in the workplace environment or personal traits) can buffer against demands and prevent the negative effects of stress from developing (Taylor & Millier, 2016). These resources include autonomy, social support, work climate, skill discretion, as well as self-efficacy

and optimism (Bakker & Demerouti, 2007). Many studies have also demonstrated the benefits of mindfulness practice and have successfully used interventions to reduce stress and prevent burnout in different working populations (e.g. Testa & Sangganjanavanich, 2016; Duarte & Pinto-Gouveia, 2016; Taylor & Millier, 2016; Cohen-Katz, Wiley, Capuano, Baker, & Shapiro, 2005). The current study investigates how mindfulness practice can reduce symptoms of burnout, and whether the effects of interventions are attributed to mindfulness or to some other variable.

There are several conflicting arguments with regard to the effectiveness of interventions in reducing the symptoms of burnout. In their review, Richardson and Rothstein (2008) stated that cognitive-based therapy (CBT) was the most efficient method for reducing the symptoms of stress because it requires the individual to take an active approach to their recovery. The researchers also stated that shorter interventions (i.e. less than four weeks) were effective at reducing stress and burnout. In contrast, Maricutoiu et al. (2016), found that one to two months is an appropriate duration for an intervention, as fewer than four weeks in their study resulted in a null effect on emotional exhaustion and personal accomplishment, and had a negative effect on depersonalisation (Maricutoiu et al., 2016). It is also important to establish the kind of intervention setting which may lead to the best results. In the case of burnout, group interventions as opposed to individual interventions have led to greater reductions in burnout symptoms, but it is unclear as to why this is the case (Maricutoiu et al., 2016). It may be due to the perceived social support that comes with participating in a group intervention, but it is difficult to determine at this stage.

### **Measuring Burnout**

According to the Job Demands-Resources model, burnout occurs when employees believe the quality and quantity of demands exceed the resources available to them (Bakker & Demerouti, 2007). Approximately 90% of all studies use the Maslach Burnout Inventory to measure burnout (Schaufeli et al., 2007). It is a well-validated and reliable measure which will be the most likely scale to facilitate accurate data collection in measuring burnout in different populations

(e.g. Bakker, Demerouti, & Schaufeli, 2002; Schutte, Toppinen, Kalimo, & Schaufeli, 2000).

## **Exercise**

Exercise programs are valued due to their ability to release stress and tension in a physical way, provide a distraction or something to focus on, or they can be used as an outlet for an individual's anger (Richardson & Rothstein, 2008). The negative effects of job stress and burnout can impact both an individual's psychological and physical health. Mindfulness practice can reduce job stress and burnout and, in turn, improve psychological and physical health. Physical activity is often encouraged by health and well-being advocates as a way of improving one's well-being. For these reasons, it is important to consider how different forms of exercise can moderate the relationship between mindfulness practice, job stress, and burnout. Meta-analyses that investigate mindfulness and negative work outcomes whilst accounting for the moderator of physical activity are rare.

### **Definition of Exercise**

Physical activity (also referred to as "exercise" or "fitness" in the literature) can be defined as any movement of the body produced by muscle action, that leads to greater energy expenditure than when resting (Caspersen, Powell, & Christenson, 1985). It can include many different forms of activity from walking and playing sports, to doing household chores (Ryde & Brown, 2017).

### **Benefits Associated with Exercise**

Harvey et al. (2010), state that there are many benefits associated with regular physical activity. Physical activity can stimulate the release of serotonin and beta-endorphins, which leads to enhanced mood (Harvey et al., 2010). This explains part of the relationship between exercise and psychological disorders such as depression and anxiety (Ryde & Brown, 2017). Exercise can yield physiological effects such as reduced risk of cardiovascular disease, obesity, and chronic disease by promoting weight loss and reducing blood pressure (Ryde & Brown, 2017). Physical activity is, therefore, beneficial not only in the treatment of disorders, but

also in the prevention of the disorders occurring in different populations (Ryde & Brown, 2017).

Yoga is a distinct form of practice that can bring about benefits on a physical, mental, and emotional level (Meissner, Cantell, Steiner, & Sanchez, 2016). It has been referred to as “mindfulness in motion” and focuses not only on physical postures and control of the breath, but on universal moral and ethical principles (Meissner et al., 2016). A common format for yoga practice begins with “checking in, breath awareness and centering, sun salutations, standing poses, sitting poses, backbends, finishing poses, and relaxation” (Meissner et al., 2016, p.3). As both physical activity and mindfulness practice have been shown to reduce the effects of negative work outcomes, it is important to investigate the effects of exercise on mindfulness-based interventions.

Depending on whether an individual exhibits symptoms of depression, anxiety, or stress, for example, a relaxing yoga practice may be more beneficial than moderate to heavy exercise. Studies have shown that vigorous physical activity can exacerbate the symptoms of job stress, as it increases physiological arousal in the brain and the release of stress hormones such as cortisol (Jacks, Sowash, Anning, McGloughlin, & Andres, 2002). On the other hand, a leisurely walk or yoga practice can have a negative effect on stress (Kirkcaldy et al., 1994). The type of yoga can also determine the quality of the benefits experienced, with traditional approaches to yoga yielding more positive effects than Western approaches (Meissner et al., 2016). The traditional yoga approach is characterised by yoga practice five mornings per week, compared to Western yoga practice, which involves between one and three evenings per week of yoga practice (Meissner et al., 2016). The benefits associated with yoga include, but are not limited to, reducing stress by decreasing the level of cortisol in the bloodstream (Granath et al., 2006), improving relaxation and sleep, reducing muscle tension, improving strength and flexibility, and controlling blood pressure, heart, and metabolic rate (Raub, 2002). The findings from certain studies have suggested that high intensity physical activity has greater effects on decreasing symptoms of depression (Harvey et al., 2010), while others have found that yoga-style practices are more beneficial for reducing job stress and anxiety (Meissner et al., 2016; de Bruin et al., 2016). It is also important to consider whether an individual’s

perceptions of their mental recovery are associated with the physical activity itself or because of the social interactions associated with participation in the exercise (Wollseiffen et al., 2016; Kirkcaldy et al., 1994).

### **Interventions Involving Exercise**

Exercise interventions have provided evidence of the beneficial physiological and psychological effects of practicing regular physical activity (Dugdill et al., 2008; Ryde & Brown, 2017; Kirkcaldy et al., 1994; Meissner et al., 2016). At an organisational level, having mentally and physically healthy employees leads to decreased turnover, absenteeism, and stress in the workplace (Pak, Olsen, & Mahoney, 2000). A review of different interventions has identified several types of workplace interventions for increasing physical activity. These can be categorised as inter/intrapersonal-level interventions and social or environmental-level interventions (To, Chen, Magnussen, & To, 2013). Examples of common workplace exercise interventions at an intra or interpersonal level include providing employees with pedometers, learning materials, fitness classes, and regular exercise consultations (To et al., 2013). At an environmental or social level, interventions include fitness expos, improvement of exercise facilities, and senior management endorsement of company exercise programs (To et al., 2013). Using the stairs instead of escalators and elevators as well as encouraging active travel and workplace walking groups are cheap and easy ways for employees (who have primarily sedentary work) to lead a more active lifestyle (Dugdill et al., 2008). In fact, it has been suggested that walking interventions in the workplace could be as much as four times more beneficial than other physical activity interventions (Abraham & Graham-Row, 2009). Like the studies on burnout which found that group interventions are more effective than individual-level interventions (e.g. Maricutoiu et al., 2016), it has been suggested that walking interventions in the workplace may be more beneficial due to the social interactions or perceived peer support from other group members.

The above studies suggest that workplace exercise interventions produce benefits on individual and organisational levels. The present meta-analysis is valuable because there have been no meta-analyses to compare the effects of

different forms of exercise on the relationship between mindfulness, job stress, and burnout.

### **Study Objectives**

Based on the above findings, the present meta-analysis will examine the effectiveness of mindfulness interventions for reducing job stress and burnout. Due to the mental and physical benefits associated with exercise, this study will also investigate how different forms of physical activity moderate the relationship between mindfulness, job stress, and burnout.

### **Chapter Summary**

Job stress and the prevalence of burnout in modern society can be extremely detrimental to individuals, their families, organisations, and to society. Mindfulness research has shown evidence of reducing these negative effects through workplace mindfulness-based interventions.

Furthermore, the type of exercise engaged in can lead to distinct outcomes. While vigorous exercise such as running may be beneficial for individuals suffering from depression, yoga may be a more appropriate activity for individuals with symptoms of stress. The wrong form of exercise can reduce the desired effects of mindfulness and its associated psychological and physiological benefits (in and outside of the workplace), so it is important to review this information in relation to stress and burnout.

This meta-analysis has two goals: To examine the relationship between mindfulness and job stress and burnout; and to examine the effects of different forms of exercise in moderating the above relationship.

## **Chapter 2: Methodology**

### **Materials and Methods**

#### **Purpose of Meta-Analysis**

According to Field and Gillett (2010), meta-analysis is a statistical tool which uses empirical studies based on similar research questions to estimate the overall effect size of a treatment or intervention on some other variable. Meta-analyses are conducted in order to answer questions on a wider scale than what is possible with single pieces of research. If we base our estimates of effects on small samples, they will be less accurate than if we analyse data from many relevant studies (Field & Gillett, 2010).

During the search and selection process for the present meta-analysis, relevant data were recorded on an Excel spreadsheet. This data included: article titles; authors; databases; search terms; measures; types of exercise; types of studies; types of subjects; sample sizes; control group data; effect size/correlations; reasons for exclusion; as well as means and standard deviations for all measures, samples, and time points.

#### **Data Set**

The literature search was carried out over a period of four months, from November 1, 2017 to February 28, 2018. Due to the nature of the study, there was limited time available to carry out the research, so any difficulties retrieving unpublished data resulted in the study's exclusion from this meta-analysis. Thirty-three initial review and 13 supplementary review studies were retrieved and read in full, from a total of nine database searches (see Figure 2). All required statistics were retrieved for 17 articles and could therefore be used in the present meta-analysis. This included 32 independent samples. The studies were in the form of journal articles (n=15) and Masters theses (n=2).

## Search Strategy

Studies that assessed the impact of trait mindfulness or mindfulness-based interventions in the workplace were collected from a variety of sources. Firstly, an electronic search of six databases was conducted: PsycINFO, Web of Science, Emerald, Scopus, NZ Research, and the University of Waikato Research Commons, using the same or similar search terms. These databases were chosen in order to obtain studies from different countries in a broad range of research fields, including the social sciences and human resource management. One of these databases only included research conducted in New Zealand, while another included unpublished studies in the form of dissertations and Masters theses completed by postgraduate students from the University of Waikato. Certain databases can be used to retrieve unpublished studies as opposed to only listing published and/or peer-reviewed journal articles. It is important to include unpublished studies in a meta-analysis since the results are not likely to be significant. This means that without their inclusion, the combined effect size of an intervention or treatment will be overestimated. Effect size statistics are especially important when conducting meta-analyses, so it is important to test for publication bias.

## Operational Definitions

For the purposes of this study, the following operational definitions were chosen or modified during the literature review stage and used to describe the following variables in the research model (see Figure 1):

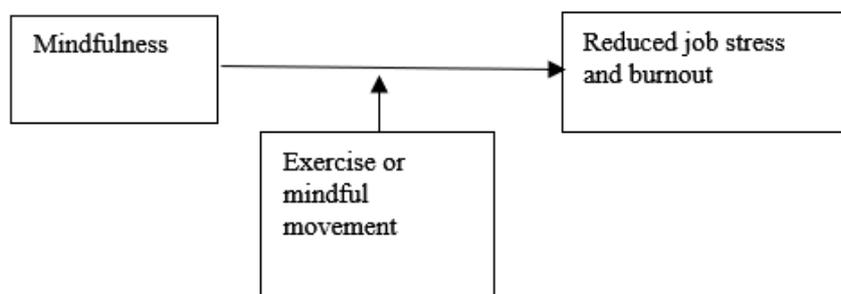
**Mindfulness:** The presence of attention to, and awareness of, what is occurring in the present moment.

**Exercise:** Any movement of the body produced by muscle action that leads to greater energy expenditure than when resting.

**Mindful movement:** Exercise performed with awareness.

**Job stress:** A particular relationship between the person and their work environment that is appraised by the person as taxing or exceeding their resources and damaging their other well-being.

**Burnout:** A psychological condition of extreme fatigue comprised of three components: exhaustion, cynicism, and lack of professional efficacy.



*Figure 1.* Research model

## **Inclusion and Exclusion Criteria**

To be considered eligible for this meta-analysis, research had to meet several inclusion criteria (see Figure 2). These criteria are outlined below.

### **Initial Review Inclusion Criteria**

Firstly, to determine whether the articles needed to be read in full, the titles and abstracts for each study that resulted from a database search were read by the reviewer. The following questions were asked:

1. Does the article examine the impact of trait mindfulness or mindfulness interventions on job stress and/or burnout? (Required)
2. Is the study quantitative? (Required)
3. Is there an exercise component? (Optional)

### **Initial Review Exclusion Criteria**

Studies could be immediately excluded from the meta-analysis if they met any of the following criteria:

1. The study was qualitative or descriptive in nature.
2. Samples in the study were from the non-working population:
  - a. Children less than 18 years old
  - b. Students or graduates

- c. Professionals in training
- d. People who are retired (65+ years old)

The titles and abstracts were read for 172 of the 3362 database search results. Thirty-six articles, five theses, three meta-analyses, and two systematic reviews were identified at this stage.

### **Supplementary Review**

Three meta-analyses and two systematic reviews were identified in the initial review and since secondary analyses are not able to be included in a meta-analysis, they were moved aside for supplementary review of any relevant information that could be included in the thesis. In addition, eight relevant journal articles were set aside for supplementary review after not meeting initial review inclusion criteria.

### **Secondary Review Inclusion Criteria**

Thirty-three documents were downloaded for full-text review as they met the initial review inclusion criteria. Sixteen articles were excluded after not meeting secondary review inclusion criteria. To determine whether each study could be included in the meta-analysis, the articles needed to report sample sizes, means, and standard deviations for all samples, time points, and measurement scales, as well as either a correlation or effect size. If means and standard deviations were not reported, some other type of statistic that could be converted into a standardized mean effect size (e.g. Cohen's  $d$ ) or correlation (e.g. Pearson's  $r$ ) was necessary. If articles did not report these statistics, the author(s) of the study were contacted.

### **Secondary Review Exclusion Criteria**

Due to the nature of the study as a student's Masters thesis, if the authors did not reply to the email request for additional data within three weeks, their article had to be excluded from this study. Discarded articles were still included in the reference list if any relevant information was used in the final copy of the meta-analysis.

## Final Review

The necessary statistics were retrieved for 17 studies (15 journal articles and 2 Masters theses) that met all other inclusion criteria and none of the exclusion criteria.

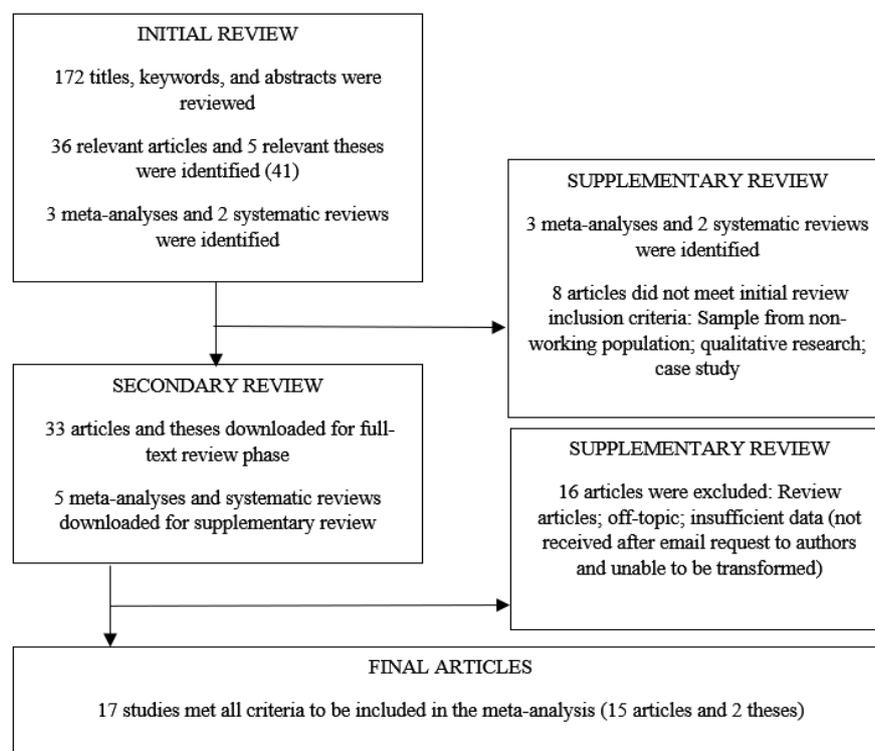


Figure 2. Review process flow diagram

## Database Searches

Firstly, an electronic search of six databases was conducted. These databases included PsycINFO, Web of Science, Emerald, Scopus, NZ Research, and the University of Waikato Research Commons. Then, searches using ProQuest Social Sciences and EBSCOHost were carried out because the original results were extremely limited. Finally, a search using Google Scholar was conducted to check whether the previous database searches had missed any eligible studies. Table 1 summarises these searches.

### **PsycINFO**

For the PsycINFO database, the following search terms were entered on three lines - Index terms: “mindfulness” AND Index terms: “occupational stress” AND Index terms: “exercise” OR “physical fitness” OR “yoga”. The database search originally produced four results. The “Index terms” filter on the third line was then replaced with the “Any field” filter. This resulted in a total of 16 “hits” instead of four. Nine out of the 16 articles needed to be read in full to determine their eligibility for inclusion in this study. Three articles were included in the final sample for the present meta-analysis.

### **Scopus, Web of Science, and University of Waikato Research**

#### **Commons**

For the Scopus, Web of Science Core Collection, and University of Waikato Research Commons databases, the following search terms were used - Keywords: “mindfulness” AND Keywords: “occupational stress” AND Keywords: “exercise” OR “physical fitness” OR “yoga”. The Scopus and Web of Science databases resulted in the same two articles which did not meet the inclusion criteria. One of these was a meta-analysis and was, therefore, able to be used in the supplementary review. The University of Waikato Research Commons search resulted in a different article, but it used a qualitative approach and, therefore, did not meet the inclusion criteria.

#### **NZ Research**

For the NZ Research database, the following keywords were used in the search - Keywords: “mindfulness” AND Keywords: “stress”. The database search resulted in 23 “hits”. There were three articles that appeared to be relevant and needed to be read in full by the reviewer. One article was included in the final sample of this meta-analysis.

#### **Emerald**

The Emerald database produced no results when originally searching the terms used for the PsycINFO, Web of Science, and Scopus databases. The search terms were then simplified to include - Keywords: “mindfulness” AND Keywords: “job

stress” AND Keywords: “exercise” OR “yoga”. This search received 31 “hits”. Of the 31 results, there were two articles that needed to be read in full. One of the two articles was used the final sample.

### **ProQuest Social Sciences and EBSCOHost**

As the searches produced fewer articles than had been anticipated from a database search of this scale, a search of ProQuest Social Sciences database and EBSCOHost was carried out using the same search terms as with the databases previously mentioned. The ProQuest Social Sciences database found a total of eight documents. Four journal articles met the exclusion criteria for this meta-analysis. Among the other four articles, one was a duplicate, therefore only three additional articles needed to be read in full. One of these articles was included in the final sample. The EBSCOHost database search resulted in a total of nine documents. Five met the exclusion criteria, whereas the other four needed to be read in full. Of these four articles, none met the criteria to be included in the final sample.

### **Google Scholar**

A search using the same search terms was performed using Google Scholar, which came back with 3270 results. Titles and abstracts were read for the first 80 articles that resulted from the search. Search results were displayed in order of relevance to the search terms. This meant that it was only necessary to examine the first eight pages of Google results, as each page decreased in relevance to the topic of this study. Twenty-five documents were downloaded and read in full. Of these 25 articles, nine were excluded and the other 16 met the first set of inclusion criteria. Eleven of these 16 articles were included in the final sample for this meta-analysis.

Table 1

*Database Search Results*

Database	Search terms	No. of results	No. to read	Reasons for exclusion	Final no. included in meta-analysis
EBSCOHost	Mindfulness; Occupational stress; Physical fitness, Exercise, Yoga.	9	4	Qualitative	0
Emerald	Mindfulness and job stress; Exercise or yoga	31	2	Qualitative; Samples from the non-working population; Reviews of mindfulness literature; Related to religion or spirituality	1
Google Scholar	Mindfulness; Occupational stress; Physical fitness, Exercise, Yoga.	3270	25	Not relevant; Samples from non-working population; Qualitative; Double-ups	11

NZ Research	Mindfulness; Stress	23	3	Qualitative; Samples from the non-working population; Focused on improving well-being scales	1
ProQuest Social Sciences	Mindfulness; Occupational stress; Physical fitness, Exercise, Yoga.	8	3	Qualitative; Sample from non-working population; Double-up	1
PsycINFO	Mindfulness; Occupational stress; Physical fitness, Exercise, Yoga.	16	9	Samples from the non-working population	3
Scopus	Mindfulness; Occupational stress; Physical fitness, Exercise, Yoga.	2	0	Meta-analysis; Qualitative study	0
University of Waikato Research Commons	Mindfulness; Occupational stress; Physical fitness, Exercise, Yoga.	1	0	Qualitative study	0

Web of Science

Mindfulness;  
Occupational stress;  
Physical fitness,  
Exercise, Yoga.

2

0

Meta-analysis; Qualitative  
study

0

## **Reasons for Exclusion**

The main reasons for articles being excluded from this study were because the samples were from the non-working population (children, students, or people of retirement age), they included only qualitative data, were not original studies, and some were related to religion and spirituality which was beyond the scope of this meta-analysis (see Table 1). Due to the nature of this study, meta-analyses and systematic reviews could not be included either. They were, however, downloaded and read in full as part of the supplementary review process. Their reference lists did not help to identify any additional studies as they referred to studies already found in the initial database searches.

## **Data Extraction**

Means, standard deviations, and correlations were extracted from each study for each sample group, measurement scale, and time point. If the means, standard deviations, and correlations were not reported, effect sizes could be reported instead and converted to Pearson's  $r$  (pre-post correlation statistic). If no effect sizes were reported, the author(s) of the studies were contacted via email to request the data (see Table 2).

## **Effect Size Data**

In addition to the pre and post-intervention means and standard deviations, each study needed to report correlations or effect size data before it was able to be entered into the statistical program Comprehensive Meta-Analysis (CMA) [Version 3]. Several articles reported Cohen's  $d$  statistics, while others reported effect size data calculated from ANOVAs (e.g. (partial) eta-squared). If a correlation was not reported, it was calculated by converting the other effect size data. For the purposes of this meta-analysis, reported effect size statistics were converted to Pearson's Correlation Coefficient ( $r$ ) before they were entered in CMA (see Table 3). The statistical program then calculated effect sizes using Hedge's  $g$ .

Cohen's  $d$  and Hedge's  $g$  are often used as an effect size measures as they indicate the standardised difference between the means of two or more sample

groups and transform effect sizes to a common metric (Borenstein, Hedges, Higgins, & Rothstein, 2009). This allows researchers to analyse data from different outcome measures at the same time. In this meta-analysis, these sample groups engaged in different mindfulness-based interventions and different forms of physical activity. Hedge's *g* and Cohen's *d* are extremely similar except with small sample sizes (<20), where Hedge's *g* outperforms Cohen's *d*. For this reason, it is sometimes called the "corrected" effect size (Lakens, 2013). For Hedge's *g*, 0.2 is interpreted as a small effect size, while 0.5 is a medium effect, and 0.8 is interpreted as a large effect.

### **Transformational Statistics**

Where multiple means and standard deviations were reported for one measurement scale (e.g. five subscales of the FFMQ, for both control and experimental groups, across multiple time points), the grand mean and composite variance were calculated before the data could be entered into CMA (see Table 2).

The grand mean was calculated by dividing the mean of each subscale by the total number of subscales. This grand mean was then used to calculate the composite variance, and the standard deviation is then calculated by taking the square root of this grand/composite variance.

To calculate the "grand mean" for the whole dataset, the following formula from Burton (2016) was used: Grand mean = Sum of the Mean of all Sets / Total Number Sets.

The "grand variance" for the whole dataset of *N* observations is then calculated using the following equation:  $GV = ((X1-GM)^2 + (X2-GM)^2 + \dots + (Xn-GM)^2) / (N-1)$ .

According to Burton (2016), the overall standard deviation or "grand standard deviation" for the whole dataset is then calculated by taking the square root of the variance,  $\sqrt{GV}$ .

To convert Cohen's *d* to Pearson's Correlation Coefficient (*r*), the following formula from Borenstein et al. (2009) was used:

$$r = \frac{d}{\sqrt{d^2 + a}}$$

The correction factor (*a*) is a ratio (of "n"), not an absolute value. Therefore, if the sample size of all groups within each study in the meta-analysis are equal, the correction factor (*a*) can be accurately substituted into the above equation as "4" (Borenstein et al., 2009).

To convert (partial) eta-squared to Pearson's Correlation Coefficient (*r*), the square root of the effect size was taken. This was in accordance with the assumption that eta-squared is identical to partial eta-squared with one independent variable, and identical to  $r^2$  (Lakens, 2013). All studies included in this meta-analysis had one independent variable (i.e. a mindfulness-based intervention) so it was possible to treat partial eta-squared and eta-squared in the same way. Pearson's *r* was then calculated based on the assumption that if  $\eta^2 = r^2$ , then  $\sqrt{\eta^2} = r$ .

It is important to note at this stage that although the calculations of and conversions to Pearson's *r* were based on the most accurate information available, they should be considered estimates and, therefore, they should be interpreted with caution.

## **Data Analysis**

Data analysis was carried out using a statistical software package called Comprehensive Meta-Analysis (CMA) [Version 3]. All data for the 17 eligible studies were entered and six separate analyses were run.

The first and second analyses consisted of controlled ( $n=12$ ) and uncontrolled studies ( $n=5$ ). These analyses examined the effect of the main relationship between mindfulness, job stress, and burnout. Tables 4 and 5 summarise this statistical data. These two analyses also produced forest plots to

summarise effect size data (see Figures 5 and 6) and funnel plots to test for publication bias (see Figures 3 and 4).

The remaining four analyses examined the same relationship whilst accounting for exercise as a moderator. Controlled studies that included an exercise component (n=10) were compared against uncontrolled studies (n=3). Tables 6 and 7 summarise the statistical data produced by CMA. Finally, controlled studies that did not include an exercise component (n=2) were next compared with uncontrolled studies (n=2). Tables 8 and 9 summarise this data.

Separate analyses were run because it is not possible to combine controlled with uncontrolled studies. Controlled studies use control groups (show the effect of an independent variable and examine between-group differences) while uncontrolled studies only examine the changes in one group before and after an intervention (i.e. within-group comparisons).

### **Fixed Effect Versus Random Effect Models**

Depending on whether a fixed or random effects model is used, this changes the meaning of the effect being analysed. Under the fixed effects model there is only one true effect, and the combined effect is an estimate of that value. Under the random effects model there is a distribution of true effects, and the summary effect is an estimate of that distribution's mean (Borenstein et al., 2009). The above information indicates that the random effects model will be the most appropriate model to use for the present meta-analysis.

Table 2

*Retrieval of Statistics*

Author	Title	Database	Type of document	Statistics
Aikens, Astin, Pelletier, Levanovich, Baase, Park, and Bodnar	Mindfulness goes to work: Impact of an online intervention	Google Scholar	Journal Article	FFMQ five subscales transformed into grand mean and composite variance  Cohen's d converted to Pearson's r
Ancona and Mendelson	Feasibility and preliminary outcomes of a yoga and mindfulness intervention for school teachers	Google Scholar	Journal Article	Cohen's d converted to Pearson's r
Christopher, Goerling, Rogers, Hunsinger, Baron, Bergman, and Zava	A pilot study evaluating the effectiveness of an MBI on Cortisol Awakening Response and health outcomes among LEOs	PsycINFO	Journal Article	Cohen's d converted to Pearson's r

de Bruin, Formsma, Frijstein, and Bogels	Mindful2Work: Effects of combined physical exercise, yoga, and mindfulness meditations for stress relief in employees. A proof of concept study	PsycINFO	Journal Article	Emailed authors for additional statistics  Partial eta squared converted to Pearson's r
Flook, Goldberg, Pinger, Bonus, and Davidson	Mindfulness for teachers: A pilot study to assess effects on stress, burnout and teaching efficacy	Google Scholar	Journal Article	FFMQ, SCL-90-R, and MBI subscales transformed into grand mean and composite variance  Mean of subscales (Cohen's d) converted to Pearson's r
Foureur, Besley, Burton, Yu, and Crisp	Enhancing the resilience of nurses and midwives: Pilot of a mindfulness-based program for increased health, sense of coherence and decreased depression, anxiety and stress	Google Scholar	Journal Article	Cohen's d calculated and converted to Pearson's r
Franco, Manas, Cangas, Moreno, & Gallego	Reducing teachers' psychological distress through a mindfulness training program	ProQuest Social Sciences	Journal Article	Cohen's d was converted to Pearson's r

Harrison	Assessing Generic and Program-Specific Dose-Response Relations Between Engagement in Contemplative Practices and Reductions in Teachers' Occupational Stress and Burnout	Google Scholar	Masters Thesis	Statistics available
Hartfiel, Burton, Rycroft-Malone, Clarke, Havenhand, Khalsa, and Edwards	Yoga for reducing perceived stress and back pain at work	Google Scholar	Journal Article	Cohen's d calculated and converted to Pearson's r
Hartfiel, Havenhand, Khalsa, Clarke, and Krayner	The effectiveness of yoga for the improvement of wellbeing and resilience to stress in the workplace	Google Scholar	Journal Article	POMS-Bi subscales transformed into grand mean and composite variance  Eta squared converted to Pearson's r
Klatt, Norre, Reader, Yodice, and White	Mindfulness in motion	PsycINFO	Journal Article	Partial eta squared converted to Pearson's r
Lin, Huang, Shiu, and Yeh	Effects of Yoga on Stress, Stress Adaptation, and Heart Rate Variability Among Mental Health Professionals—A Randomized Controlled Trial	Google Scholar	Journal Article	Cohen's d calculated and converted to Pearson's r

Martin-Asuero and Garcia-Banda	The Mindfulness-Based Stress Reduction Program (MBSR) Reduces Stress-Related Psychological Distress in Healthcare Professionals	Google Scholar	Journal Article	Cohen's d converted to Pearson's r
Roeser, Schonert-Reichl, Jha, Cullen, Wallace, Wilensky, Oberle, Thomson, Taylor, and Harrison	Mindfulness Training and Reductions in Teacher Stress and Burnout: Results from Two Randomized, Waitlist-Control Field Trials	Google Scholar	Journal Article	Cohen's d converted to Pearson's r
Taylor, Harrison, Haimovitz, and Oberle	Examining Ways That a Mindfulness-Based Intervention Reduces Stress in Public School Teachers: a Mixed-Methods Study	Google Scholar	Journal Article	Cohen's d converted to Pearson's r
Thomas	The use of a self-help book based on acceptance and commitment therapy: to improve general well-being and reduce stress among support workers in disability sector	NZ Research	Masters Thesis	Cohen's d converted to Pearson's r
Wasylikiw, Holton, Azar, and Cook	The impact of mindfulness on leadership effectiveness in a health care setting	Emerald	Journal Article	Eta squared converted to Pearson's r

Table 3

*Studies Included in the Meta-Analysis: Measures and Effect Size Data*

Study (First author, publication year)	Subjects	Mindfulness measure	Type of Physical Activity	Negative outcome measure(s)	<i>Effect size and correlational data</i>
Aikens, K. A. (2014)	89 Dow Chemical Company employees from Michigan, USA	Five Facet Mindfulness Questionnaire (FFMQ) (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006)	Mindful movement e.g. walking meditation	Perceived Stress Scale (PSS) (Cohen, Kamarck, & Mermelstein, 1983)	FFMQ Time 1-2 $r=0.305$ Time 1-3 $r=0.414$ PSS Time 1-2 $r=0.458$ Time 1-3 $r=0.415$
Ancona, M. R. (2014)	43 school teachers	Not measured	Yoga	Teacher Stress Inventory (TSI; Fimian, 1988) Emotional Exhaustion subscale of the	Emotional Exhaustion $r=0.205$ Teacher Stress Inventory $r=0.261$

				Maslach Burnout Inventory (MBI; Maslach, Jackson, & Leiter, 1996)	
Christopher, M. S. (2016)	43 police officers	FFMQ	Mindful movement, as well as participants' normal exercise regime	PSS Oldenburg Burnout Inventory (OLBI; Demerouti et al. 2003)	FFMQ r=0.511 OLBI r=0.347 PSS r=0.351
de Bruin, E. I. (2017)	26 company doctor referrals for work-related stress and/or burnout	Not measured	Yoga and sports	PSS	PSS Time 1-2 r=0.721 Time 1-3 r=0.806

Flook, L. (2013)	18 public elementary school teachers	FFMQ	Yoga	The Symptom Checklist-90-R (SCL-90-R; Derogatis, 1994) MBI	FFMQ r=0.153 MBI r=0.205 SCL-90-R r=0.256
Foureur, M. (2013)	28 hospital staff (nurses and midwives)	Not measured	No exercise component	Stress subscale of the Depression Anxiety Stress Scale (DASS; Lovibond & Lovibond, 1995)	Stress subscale r=0.320
Franco, C. (2010)	68 secondary school teachers	Not measured	No exercise component	SCL-90-R	SCL-90-R r=0.498
Harrison, J. L. (2014)	102 US and Canadian teachers	Not measured	Whole body movement practices e.g. yoga	Occupational Stress MBI	Occupational Stress Time 1-2 r=0.660 Time 1-3 r=0.620 MBI Time 1-2 r=0.740 Time 1-3 r=0.550

Hartfiel, N. (2011)	48 university employees	Not measured	Dru yoga	Profile of Mood States Bipolar Scale (POMS-Bi; Lorr, McNair, & Fisher, 1982)	POMS-Bi r=0.400
Hartfiel, N. (2012)	74 government employees	Not measured	Yoga	PSS	PSS r=0.242
Klatt, M. (2017)	52 bank employees from Copenhagen, Denmark	Not measured	Yoga	PSS	PSS r=0.480
Lin, S.-L. (2015)	60 mental health professionals	Not measured	Yoga	Derived from Work-related Stress Scale (Lan, 2004)	Work-related stress r=0.400

Martin-Asuero, A. (2010)	29 healthcare professionals	Not measured	Yoga	Survey of Recent Life Experiences (SRLE; Kohn and Macdonald, 1992)	SRLE $r=0.191$
Roeser, R. W. (2013)	113 school teachers	FFMQ	Yoga	From a longer inventory of teacher stress (Lambert, McCarthy, & Abbott-Shim, 2001) MBI	FFMQ Time 1-2 $r=0.367$ Time 1-3 $r=0.399$ Stress Time 1-2 $r=-0.155$ Time 1-3 $r=-0.392$ MBI Time 1-2 $r=-0.411$ Time 1-3 $r=-0.362$
Taylor, C. (2016)	59 public school teachers	Not measured	Mindful movement	From a longer inventory of teacher stress (Lambert et al., 2001)	Teacher stress Time 1-2 $r=0.410$ Time 1-3 $r=0.292$

Thomas, L. P. (2011)	22 support staff working in the disability sector	Mindful Attention and Awareness Scale (MAAS; Brown & Ryan, 2003)	No exercise component	PSS MBI	MAAS r=0.318 PSS r=0.407 MBI r=0.371
Wasyliw, L. (2015)	21 mid-level healthcare managers	MAAS	No exercise component	PSS	MAAS r=0.762 PSS r=0.728

## Chapter 3: Results

This chapter reports the results of this study which were calculated using Comprehensive Meta-Analysis (CMA) [Version 3].

### Meta-Analysis Results

Individual effect sizes were calculated for each study using Hedge's  $g$  via CMA. The random effects model was selected before the analyses were carried out, due to the variation that exists between the different study populations (Cooper & Hedges, 2009). Factors varying from study to study include: age, sex, outcome measures, mindfulness measures, form of physical activity, profession, and culture, among other variables. These factors can lead to variance in effect size, and therefore a random effects model was considered more appropriate than the fixed effects model.

As mentioned previously, due to the different study designs used in each article, two different analyses were conducted in order to examine the effects of the main relationship between mindfulness, job stress, and burnout. The first analysis combined the data from studies that had no control group ( $n=5$ ), while the second analysis combined studies that had both treatment and control groups ( $n=12$ ).

In order to examine the effect of the moderating variable (exercise), four additional analyses were performed. These analyses combined data from controlled studies that had an exercise component ( $n=10$ ) with uncontrolled studies ( $n=3$ ). The other two analyses combined controlled studies that did not have an exercise component ( $n=2$ ) with uncontrolled studies ( $n=2$ ).

### Tests of Heterogeneity

According to Hak, Van Rhee, and Surmond (2016), before interpreting the results of a meta-analysis, it is necessary to look at the statistics regarding heterogeneity to determine whether the findings can be generalised to diverse populations. Firstly, the I-squared statistic needs to be examined. I-squared is a measure for the proportion of observed variance, reflecting real differences in effect size (Hak et

al., 2016). It is expressed as a percentage, with higher percentages meaning that the studies used in the analysis cannot be from the same population. If this number is over, for example, 25%, it would be better to use the Tau-squared statistics as a measure of dispersion of true effect sizes between studies (Hak et al., 2016).

For the first analysis (studies with both experimental and control groups), the I-squared statistic was 94.164. This is extremely high, meaning that the studies are very unlikely to be from the same population. The Tau-squared statistic is 1.361. The square root of Tau-squared indicates the standard deviation of effect sizes across studies ( $SD=1.167$ ). This indicates that the means of the samples in the analysis are 1.167 standard deviations apart.

For the second analysis (studies without a control group), the I-squared statistic was still high (48.212). This means that although lower than the first analysis, it is not possible to assume that the studies were from the same population. The Tau-squared statistic was 0.044, whose square root would provide the standard deviation of effect sizes across all studies in the analysis ( $SD=0.209$ ). This indicates that the means of the samples are 0.209 standard deviations apart.

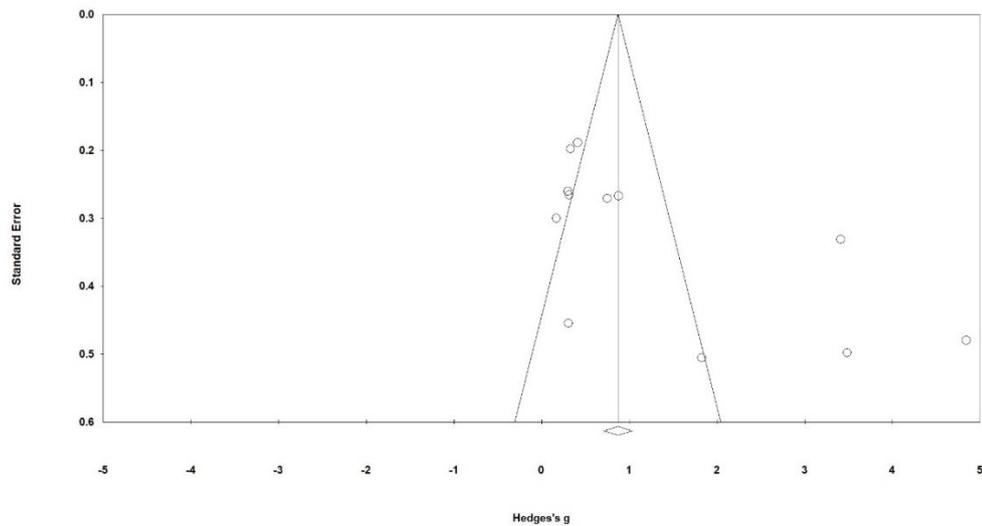
The I-squared value for both studies was very high, which suggests that there is a lot of dispersion amongst the effect sizes. It would be valuable to follow up this meta-analysis with an examination of this dispersion and its possible determinants.

### **Test of Publication Bias**

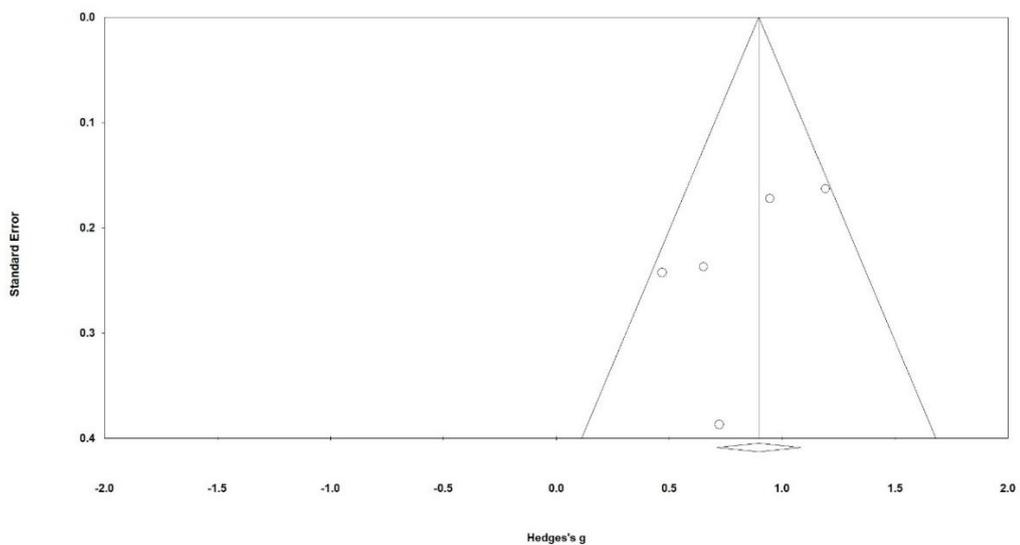
Publication bias occurs when only studies with significant results are chosen for publication in academic journals. This means that unpublished studies may not be included in meta-analyses as they are not easily found in common database searches. This can lead to an over or underestimation of results that may affect the overall effect size in a meta-analysis.

Funnel plots are used to evaluate publication bias in a meta-analysis. A symmetrical figure resembling a funnel shape indicates the absence of publication bias (Borenstein et al., 2009). If publication bias exists, there will be more studies on one side of the mean than the other. Figure 3 shows a funnel plot for the first

analysis (studies with experimental and control groups). It has an asymmetrical shape, indicating that publication bias exists. Figure 4 shows a funnel plot for the second analysis (experimental groups only). It is more symmetrical in shape than Figure 3, indicating an absence of publication bias. It does, however, only include five studies. It is important to note that a minimum of 10 samples are required for a funnel plot to detect publication bias, so this may have affected the results of this study.



*Figure 3.* Funnel plot for analysis 1 showing the Hedge's g for each independent sample plotted against the standard error.



*Figure 4.* Funnel plot for analysis 2 showing the Hedge's g for each independent sample plotted against the standard error.

### Combined Effect Size

Before we can report the combined effect sizes for each analysis, we need to explicitly state that the populations covered by this empirical research are the working population from developed countries. Other populations have not been covered by this study, meaning that different effects might be observed to those reported in this meta-analysis (Hak et al., 2016).

Table 4 summarises the results for the first analysis (studies with both experimental and control groups). A combined effect size (Hedge's  $g$ ) was calculated using the random effects model. This statistic was 1.366, which is interpreted as an extremely large effect size (large effect size  $> 0.8$ ). Figure 5 shows the forest plot for all independent samples and the overall Hedge's  $g$  effect size, based on a 95% confidence interval using the random effects model.

Table 4. *Results from analysis 1: Studies with both experimental and control groups.*

Model	Hedge's $g$	Variance	Lower limit	Upper limit	P value
Random	1.366	0.123	0.678	2.055	<0.001

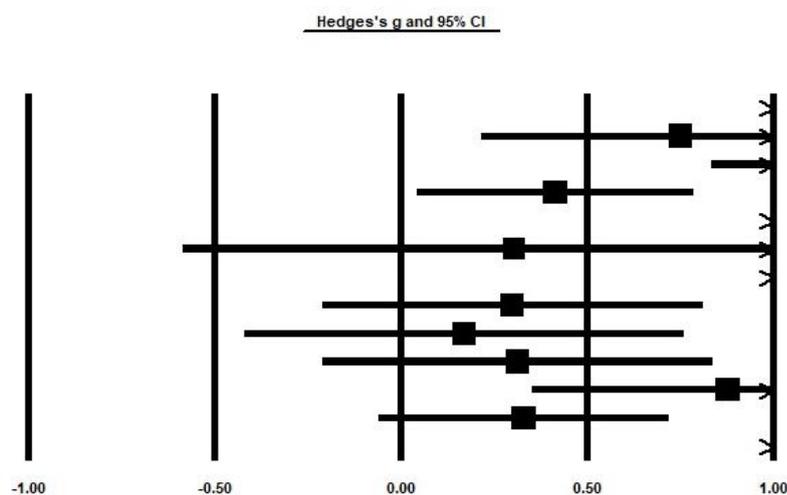


Figure 5. Forest plot from analysis 1 showing all independent samples and the overall Hedge's  $g$  effect size and 95% confidence interval using the random effects model

Table 5 summarises the results for the second analysis (studies without control group data). Hedge's  $g$  was 0.846 under the random effects model. These effect size statistics can be interpreted as there being a larger effect size of controlled as opposed to uncontrolled studies on workplace mindfulness-based interventions. Figure 6 shows a forest plot of all independent samples and the overall effect size, based on a 95% confidence interval using the random effects model.

Table 5. Results for analysis 2: Studies without control groups.

Model	Hedge's $g$	Variance	Lower limit	Upper limit	P value
Random	0.846	0.019	0.576	1.117	<0.001

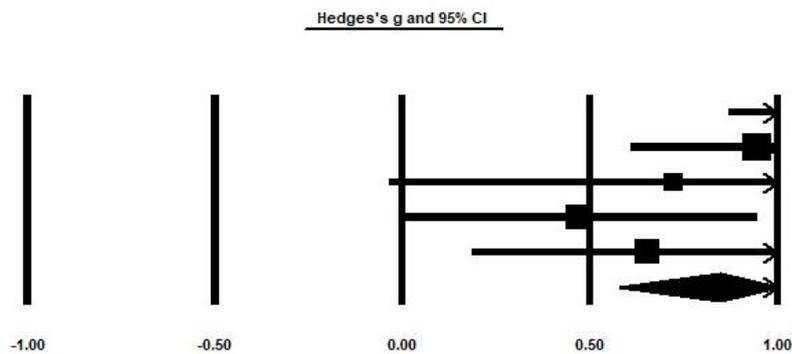


Figure 6. Forest plot for analysis 2 showing all independent samples and the overall Hedge's  $g$  effect size and 95% confidence interval using the random effects model.

In this study, the impact of physical activity as a moderator to the main relationship (mindfulness to stress and burnout) was also examined. Table 6 summarises the results of the third analysis – controlled studies with an exercise component. A combined effect size (Hedge's  $g$ ) was calculated using the random effects model. This statistic was 0.992, which can be interpreted as a large effect. Table 7 summarises the results of the fourth analysis – uncontrolled studies with an exercise component. A combined effect size (Hedge's  $g$ ) was calculated using

the random effects model. This statistic was 0.904, which can be interpreted as a large effect.

Table 6. *Results from analysis 3: Moderator analysis – Studies with an exercise component and with both experimental and control groups.*

Model	Hedge's g	Variance	Lower limit	Upper limit	P value
Random	0.992	0.095	0.386	1.597	<0.001

Table 7. *Results from analysis 4: Moderator analysis – Studies with an exercise component and without control groups.*

Model	Hedge's g	Variance	Lower limit	Upper limit	P value
Random	0.904	0.037	0.528	1.280	<0.001

Table 8 provides a summary of the results of the fifth analysis – controlled studies without an exercise component. The combined effect size calculated using the random effects model was 3.339. This is an extremely large effect size. Finally, Table 9 summarises the results of the sixth and final analysis – uncontrolled studies without an exercise component. The combined effect size (Hedge's g) was calculated using the random effects model and had a statistic of 0.672. This can be interpreted as a medium effect. The practical implications of these findings will be discussed in the next chapter.

Table 8. *Results from analysis 5: Moderator analysis – Studies without an exercise component and with both experimental and control groups.*

Model	Hedge's g	Variance	Lower limit	Upper limit	P value
Random	3.339	2.272	0.385	6.293	0.027

Table 9. *Results from analysis 6: Moderator analysis – Studies without an exercise component and without control groups.*

Model	Hedge's g	Variance	Lower limit	Upper limit	P value
Random	0.672	0.041	0.275	1.068	<0.001

## Chapter 4: Discussion

In this chapter, we will discuss the results of the meta-analysis as well as the practical implications of the findings, the strengths and limitations of the study, as well as any suggestions for future research.

### Summary

Trait mindfulness can benefit an individual's physical and mental health, with effects ranging from decreased depression (Aikens et al., 2014) and increased resilience (Choi & Leroy, 2015; Dane, 2011; Glomb et al., 2011) to improved cardiovascular health (Klatt et al., 2009). In the workplace, mindfulness can yield many benefits such as increased work-family balance (e.g. Choi & Leroy, 2015; Allen & Kiburz, 2011), reduced absenteeism (Beshai et al., 2016), and increased ethical decision-making (Ruedy & Schweitzer, 2010). For these reasons, research that employs mindfulness-based interventions is extremely valuable to the field of organisational psychology.

Many researchers have already investigated the relationship between mindfulness-based interventions, occupational stress, and burnout. Job stress can lead to depression and anxiety (Shapiro et al., 2007; Klatt et al., 2009; Bergman et al., 2016), sleep disorders (Christopher et al., 2016; Klatt et al., 2009), PTSD (Bergman et al., 2016), and alcohol and substance abuse (Bergman et al., 2016). In the workplace, symptoms of stress can lead to impaired attention, concentration, and decision-making skills. This can increase the risk of workplace accidents from occurring (Manocha et al., 2011), as well as reduce job satisfaction and performance (Shapiro et al., 2007; Klatt et al., 2009). Job stress has the ability to cause negative repercussions on an individual, organisational, and societal level. In addition to this, prolonged stress can lead to burnout, a condition of extreme fatigue, characterised by emotional exhaustion, depersonalisation, and a low level of personal accomplishment (Taylor & Millier, 2016; Wollseiffen et al., 2016; Bakker & Demerouti, 2007). Burnout causes physical and mental health problems such as insomnia and hypertension (Duarte & Pinto-Gouveia, 2016), depression (Schaufeli et al., 2007; Shapiro et al., 2007), and anxiety (Testa & Sangganjanavanich, 2016; Duarte & Pinto-Gouveia, 2016). In the workplace,

burnout can lead to reduced job satisfaction (Blankertz & Robinson, 1997), increased turnover (Alexander et al., 1998), and reduced quality of care (Shanafelt et al., 2002; Salyers et al., 2015). The outcomes of stress and burnout, therefore, can affect the individual, the organisation (e.g. increased healthcare costs, turnover, and absenteeism), and the wider society especially when dealing with healthcare professionals and other helping professions (West et al., 2006).

Exercise interventions have provided evidence of the beneficial physiological and psychological effects of practicing regular physical activity (Dugdill et al., 2008; Ryde & Brown, 2017; Kirkcaldy et al., 1994; Meissner et al., 2016). At an organisational level, health benefits caused by physical activity can decrease employee turnover, absenteeism, and stress in the workplace (Pak et al., 2000). Organisations often employ physical activity interventions which include walking groups, the promotion of active travel, and using the stairs instead of elevators. Due to the benefits associated with physical activity and, in particular, its ability to reduce stress, it was important to investigate whether exercise moderates the relationship between mindfulness, job stress, and burnout.

The main objective of this meta-analysis was to investigate the relationship between mindfulness, occupational stress, and burnout. The second objective was to evaluate the effect of exercise as a potential moderating variable to the above relationship.

## **Overview of Findings**

This meta-analysis included 17 studies representing a range of different professionals exposed to normal workplace stressors, from teachers and healthcare professionals to police officers and office workers.

Two analyses were run to summarise the effects of mindfulness interventions on within-group study designs versus studies that used control or wait-list control groups. Four more analyses were carried out to examine the effect of exercise as a moderator.

The first two analyses involved controlled and uncontrolled studies which examined the effectiveness of mindfulness-based interventions on job stress

and/or burnout. Results show that the overall effect size for the first analysis (controlled studies) was 1.366. For the second analysis (uncontrolled studies), the overall effect size was 0.846. These effect sizes suggest that a large, positive relationship exists between workplace mindfulness interventions and their ability to reduce job stress and employee burnout. The effect size was extremely large for the first analysis, reinforcing the previously established relationship between the ability of mindfulness to reduce negative work outcomes.

With the second analysis (studies without control groups), a large effect was found, but this only considered within-group data (i.e. from before and after treatment of the same group of participants). Since it is sometimes not possible to employ control groups in psychological research, the five studies combined in the second analysis only examined the impact on the outcome variables from pre to post-intervention. Findings gain reliability and validity when we can compare treatment with control groups (i.e. no treatment) and determine that it was in fact the intervention that caused any changes.

These effect sizes were significantly higher than the effect sizes found in previous meta-analyses. Virgili (2015) conducted a meta-analysis to examine the effectiveness of mindfulness-based interventions on work outcomes and found a significant, medium to large effect. For both within-group and between-group comparisons, a Hedge's  $g$  of 0.68 was found. Additionally, Khoury et al. (2013) conducted a meta-analysis of mindfulness-based therapy and found a moderate within-group effect (Hedge's  $g$ ) of 0.55, while between-group analysis indicated a Hedge's  $g$  of 0.53. Their study compared mindfulness-based therapy with other active treatments ( $g=0.33$ ) and psychological treatments ( $g=0.22$ ), indicating that mindfulness may yield more significant results than these methods.

In the present meta-analysis, the impact of physical activity as a moderator to the main relationship (mindfulness on stress and burnout) was also examined. Controlled studies with an exercise component had a combined effect size (Hedge's  $g$ ) of 0.992, indicating a very large effect. Uncontrolled studies with an exercise component had a combined effect size of 0.904. This statistic was very similar to the comparison with controlled studies and can also be interpreted as a very large effect.

Controlled studies without an exercise component had a combined effect size (Hedge's  $g$ ) of 3.339. This can be considered extremely large when considering that a large effect is indicated by a Hedge's  $g$  statistic of  $>0.8$ . It would be valuable to follow-up on this finding to determine why this effect size was much larger than what was found in the other analyses. Uncontrolled studies without an exercise component had a combined effect size of 0.672, which indicates a moderate to large effect.

Conn, Hafdahl, Cooper, Brown, and Lusk (2009) conducted a meta-analysis of workplace physical activity interventions. The effect on occupational stress (the outcome variable) was 0.33, indicating a small effect according to the interpretation of Cohen's  $d$  effect size statistics. This effect size may be smaller than the effect size found in the present study and suggests that there is a greater effect of physical activity when combined with mindfulness-based interventions. In contrast to these findings, Richardson and Rothstein (2008) conducted a meta-analysis of stress management interventions. Exercise formed part of the "alternative" methods group, which had a combined effect of Cohen's  $d = 0.909$ . Including occupational stress as the outcome variable for the "alternative" treatment type, the effect size (Cohen's  $d$ ) was 1.367. These statistics suggest an extremely high effect size when the effects of exercise are examined in conjunction with reducing job stress.

### **Practical implications**

This study has significant practical implications for organisations. For the most part, it is extremely important that organisations manage their employees' stress as it can lead to burnout and can have short and long-term negative implications on an individual, organisational, and societal level.

The results from the analysis on controlled studies that examined the relationship between mindfulness, job stress, and burnout found a very large effect size of 1.366. This statistic suggests that job stress can be reduced through a mindfulness-based intervention and, consequently, can improve work outcomes such as attention, concentration, and decision-making skills. A reduction in job stress may also reduce the risk of workplace accidents and increase job

satisfaction and performance. This shows how the present study contributes to the mindfulness at work literature.

Numerous studies have now confirmed the effectiveness of mindfulness-based and physical activity interventions for stress management in the workplace. The results from this meta-analysis suggest that a combination of these two strategies may yield more significant results. Analysis 3 (controlled studies with an exercise component) resulted in an overall effect size of 0.992, indicating a very large effect. This result supports claims that workplace interventions which involve physical activity can reduce stress and burnout and, in turn, decrease other negative work outcomes such as employee turnover and absenteeism. These findings provide valuable information for organisations which aim to reduce or prevent employee stress and burnout.

Although the results from this study were inconclusive due to several limitations, there appears to be reason to suggest that mindfulness-based interventions in the workplace should ideally be combined with low intensity forms of physical activity such as walking, yoga, and other types of mindful movement to produce maximum effects.

### **Strengths**

To our knowledge, there are no meta-analyses that examine the relationship between mindfulness, job stress, and burnout, and whether exercise moderates this relationship. Although there were several limitations, it was an important first step in the investigation and provides the reader with recommendations and opportunities for future research.

Although narrow search criteria and limited time affected the number of studies that were able to be included in this meta-analysis, the database search process was very thorough, incorporating studies found across nine popular academic databases. It also included the University of Waikato Research Commons which lists unpublished studies, reducing the possibility of publication bias.

## **Limitations**

Several limitations became apparent throughout the process of conducting this meta-analysis. They are discussed below.

Despite an extensive search using the study criteria, only 17 studies were retrieved. This may be due to several reasons. Firstly, the keywords used may have affected the results of the database searches. A final search using Google Scholar came up with 25 studies that did not result from the previous searches on eight databases. Of these 25 studies, 11 were used in the final meta-analysis (11/17 studies), suggesting that the database searches were not as comprehensive as they could have been. Secondly, due to the specific topic chosen for this meta-analysis, the search criteria were very narrow. Many relevant studies may have been excluded when they would have increased the reliability of the findings of the present study. Moreover, the limited time available to complete the thesis may have led to the exclusion of relevant studies because all required statistics could not be retrieved within the time frame. Thus, future researchers could modify the search terms, widen the inclusion criteria, and perhaps follow up on the studies that needed to be excluded due to lack of available data.

There were limitations regarding the investigation of physical activity as a moderating variable. These limitations included a lack of current research that employed moderate to high intensity physical activity and a lack of consensus regarding the measurement of exercise. There are also other factors that need to be considered to fully understand the relationship between mindfulness, exercise, job stress, and burnout. For example, physical activity and yoga practice may help to relieve stress due to the perceived social support of taking part in these activities with peers. In addition to this, what we eat and drink can impact our body's reaction to stressors. The amount and quality of sleep can also affect the results. Finally, social support and relationships outside of work can impact a person's ability to manage daily workplace stressors. Without an examination of all these variables, it is incorrect to claim that the effect size found in this study was only due to mindfulness or the form of exercise in which participants engaged. Thus, future researchers would be advised to examine, if possible, social support, sleep, and food as additional, potential moderating variables.

Although there are both psychological and physiological advantages associated with regular exercise, there are possible barriers as to why research is lacking in this area. As mentioned above, with regard to the “ideal” exercise intensity, it is possible that research and consensus are lacking in this area because exercise is difficult to measure. This is because the intensity and the number of kilocalories used varies between exercises and between different individuals (Pak, Olsen, & Mahoney, 2000). According to Pak et al. (2000), intensity of exercise has been appropriately defined in the literature as “light”: expending 5 kilocalories per minute, “moderate”: expending 7.5 kilocalories per minute, and “heavy”: expending 10 kilocalories per minute (Paffenbarger, Hyde, Wing, Lee, Jung, & Kampert, 1993). Regarding the measurement of exercise, to increase reliability and validity of findings, pedometers, ergometers, and other types of activity trackers have been used as more objective measures, as opposed to frequently used self-report surveys (Dugdill et al., 2008; Conn et al., 2009; Ryde & Brown, 2017). Other objective methods, such as blood samples, have been utilised by researchers to determine the effects of exercise through biological measures of cholesterol, triglyceride, and glucose levels, which have been shown to be detrimental to an individual if these are too high (Harvey et al., 2010). Researchers should, therefore, employ both subjective and objective methods for obtaining data and appropriately define exercise intensity to ensure consensus.

Poor quality studies and lack of control groups are also very common issues in organisational psychology literature. Research conducted in workplace settings greatly benefit from the use of control groups as they make it easier to compare the actual effects of a workplace intervention. In the present study, some studies did not employ control groups and therefore the comparison of all studies that met the inclusion criteria were not able to be examined in one analysis. A more accurate estimate of the combined effect size could be achieved with a larger number of studies in a single analysis. If control groups cannot be included in a study, researchers can still ensure that the research being conducted has a robust research design. A robust research design will increase the generalizability of findings to the wider population. Other recommendations include selecting a large sample of people from different populations, using objective and unbiased measurement scales with high reliability and validity, and taking measurements

across multiple time points to help determine whether the effects of an intervention change over time.

Unfortunately, levels of perceived stress may not be susceptible to change for certain professionals. When we employ tools to help cope with stressors, unfortunately this does not mean that they do not exist anymore. This is why perceived stress may not appear to decrease after a stress management intervention in certain workplaces. It is important to consider this when evaluating the effectiveness of stress management interventions, as it may not provide an accurate representation of the overall effect. It is also worthy of mention that the professionals that need these kinds of interventions and research the most, often do not have the time or energy to put into these types of studies (Klatt et al., 2009). Often, they are already overworked and struggle to schedule time to take part in an experiment, especially if it requires commitment outside of working hours.

Regarding the measurement of mindfulness, as people become more mindful, they may be more aware that their minds are wandering. This means that changes can look like participants become less mindful as practice time increases, when really, trait mindfulness has significantly increased. For this reason, few studies in this meta-analysis measured mindfulness and, instead, focused on occupational stress and burnout scales. It was still possible to calculate an overall effect size, but this was based on the dependent/outcome variables. This suggests that studies may not reliably measure changes in mindfulness and may need further development by researchers in this area.

The experimental designs chosen by researchers often lack follow-up measures. It is suggested that longitudinal studies allow us to see whether the effects of an intervention last once the intervention is over or whether they are developed over time.

Finally, common in meta-analysis is the need to convert data (Tang, Caudy, & Taxman, 2013). In the present study, many statistics had to be calculated or converted before they could be entered into CMA. These included averages of subscales, Cohen's  $d$  and (partial) eta-squared to Pearson's  $r$ . This

means that the results of this meta-analysis may not be as reliable as if the researchers had provided all the raw data for each study.

### **Future research**

This section summarises issues raised above and recommends five additional areas of future research in mindfulness meta-analysis.

In addition to the suggestions listed above, future research needs to include a mixture of objective and subjective measures for research on mindfulness and occupational stress. Although many studies now include biological measures of stress such as resting heart rate and cortisol collection, the majority still employ only self-report measures such as surveys and questionnaires due to cost and convenience. A mixture of research designs and an increase in objective data may provide more credibility to the empirical findings from previous studies on the topic of mindfulness.

Future research should also examine the same effects on separate groups of men and women. Males and females have different reactions to stress (e.g. the release of stress hormones such as cortisol) and may respond differently to interventions and other likely moderators, such as social support, which have not been considered in this study.

As outlined above, to be able to compare the effects of different exercise forms/intensities on the relationship between mindfulness, job stress, and burnout, more research that employs and accurately measures both low and high intensity exercise needs to be carried out, as research is currently lacking in the academic literature.

It would also be valuable to further examine the possible moderators and mediators of the relationship (e.g. sleep quality and nutrition). The effects of stress on sleep and vice versa have been evidenced in numerous studies. In a study that is yet to be published, researchers reported three main findings: lower levels of perceived stress equated to better sleep; experiencing stressful events during the day were associated with taking a longer time to fall asleep; and less stress can lead to better mood and more alertness upon awakening (Hu, Wang, Sun, Arteta-

Garcia, & Purol, 2018). The relationship between stress and sleep appears to be a reciprocal one whereby better sleep quality is associated with lower perceived stress and lower perceived stress is linked to better sleep. Similarly, stress is also influenced by our diet (e.g. sugar, alcohol, and caffeine intake). Consuming too much caffeine, for example, increases an individual's perceived stress levels by sending a message to the pituitary gland to send a message to the adrenal glands to make adrenalin (Weaver, 2011). Adrenalin is a "short-term, acute stress hormone" (p.83) and is the hormone that is produced when we get a fright (Weaver, 2011). Adrenalin used to be produced by the body when our lives were in danger, but a significant increase in caffeine intake in the last 50 years along with technological advances and work-related pressures has resulted in people experiencing increasingly more stress in their daily lives. For these reasons, mediator variables such as diet and sleep may have affected the results of this meta-analysis. It does, however, provide another opportunity for future research in this area. Organisational psychology research could examine the relationship between mindfulness, job stress, and burnout whilst accounting for physical exercise as a moderator, and, perhaps, diet and sleep as mediating variables.

Finally, since well-being has the ability to also affect an organisation, it is worth considering the triple bottom line (TBL) as a more holistic measure of performance when investigating the effects of mindfulness practice on negative work outcomes in future research. The TBL is an accounting framework that can be useful for businesses and policy-makers, which can be modified to suit different organisations' needs (Slaper & Hall, 2011). The TBL takes environmental and social dimensions into account, along with traditional measures of profits and return on investment (Slaper & Hall, 2011). It is commonly referred to as the three Ps: people, planet, and profits. Mindfulness has been shown to improve individual wellbeing as well as increase a company's competitive advantage due to the importance of human capital and retaining the right people for organisational effectiveness and success. For these reasons, it may be valuable to examine how the TBL could be used in organisational psychology literature to understand the impacts of mindfulness on a wider scale.

## Chapter 5: Conclusion

In conclusion, the present study examined how mindfulness-based interventions impact occupational stress and burnout, whilst accounting for exercise as a moderator. This was accomplished by conducting a meta-analysis of the relevant, extant literature. Consistent with results from previous research, this study found a very large effect size for controlled studies examining the relationship between mindfulness and negative work outcomes ( $g=1.366$ ) as well as for controlled studies that involved an exercise component ( $g=0.992$ ). Additional research, however, is needed to examine other possible mediating and moderating variables.

To increase employee well-being and organisational success, the results of this meta-analysis suggest that mindfulness-based interventions could be accompanied by mindful movement or exercise of a similar intensity to maintain physical health whilst not exacerbating symptoms of job stress. Although the findings were inconclusive, many suggestions for future research are discussed, as there are still issues with study design, methodology, and other variables that need to be taken into consideration.

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