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A Systematic Review of the Effects of the Body Scan on Stress and Psychopathology

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Abstract

Mindfulness-based practices (MBP) have risen in popularity in research especially as an applied practice to buffer against the deleterious effects of stress and reduce psychopathology (Brown et al., 2012; Khoury et al., 2015). There are significant health problems implicated with stress and psychopathology and as such interventions, such as MBP, are frequently the topic of research to reduce stress and improve health and well-being (Juster et al., 2010; Goldberg et al., 2018). The *body scan* is an intervention component of MBP that involves a systematic allocation of attention through the somatic sensations of different parts of the body. Body scans are a very common MBP that are found in virtually every multi-component MBP curriculum. However, research summarizing the unique effects of the body scan as a stand-alone MBP to mitigate stress and psychopathology has not yet been studied. Examining the isolated effect of the body scan adds to the MBP literature base by parsing and characterizing the component elements of a MBP practice (i.e., the body scan) which has been indicated as a research direction that may further inform future research and provide clinical applications (Cook-Cottone, 2015). Consequently, the purpose of this narrative systematic review was to characterize the body scan practice as a stand-alone practice to reduce stress and psychopathology, relate this outcome literature to existing MBP research, and provide recommendations for future research and clinical work. This narrative systematic review was the first of its kind to respond to this gap in the literature by examining the body scan as a standalone practice outside of multicomponent mindfulness programs.

Keywords: body scan, mindfulness, blood pressure, stress reactivity

A SYSTEMATIC REVIEW OF THE EFFECTS OF THE BODY SCAN ON STRESS AND PSYCHOPATHOLOGY

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Mindfulness has been described as a cultivation of awareness in the present moment with an attitude of openness and non-judgment (Kabat-Zinn, 2001). Mindfulness has gained interest among researchers, particularly in its multicomponent forms such as the Mindfulness-Based Stress Reduction Program (MBSR; Kabat-Zinn, 1990), a structured group intervention which has been empirically examined for the past 30 years (Bishop et al., 2004). Further, in recent years mindfulness-based practices (MBP) have increased in popularity in applied research with a focus on their impact on stress (e.g., Brown et al., 2012; Khoury et al., 2015; Morton et al., 2020). Despite the mounting evidence that multi-component MBP produce reliable and consistent reductions to stress, the existing literature contains notable gaps in understanding basic processes underpinning MBP, such as the effects of basic mindfulness practice components in reducing stress and psychopathology independent of larger multi-component curricula (Goldberg et al., 2018; Lindsay et al., 2018; Nyklíček et al., 2013). One mindfulness practice that is frequently employed in many, if not most MBP is the *body scan* practice.

Body scan practices are often introduced in multi-component MBP early in the curriculum. The body scan procedure consists of systematically and consecutively directing attention to different areas of the body emphasizing teaching attentional control (Mirams et al., 2013). The theoretical underpinnings and exemplified body scan practice will be discussed in greater detail later in this dissertation. The body scan intervention has only recently become evaluated as a stand-alone MBP despite research indicating that the body scan is a preferred stand-alone MBP practice as measured by practice time (i.e., on a minutes/week basis) and reported preference (Analayo, 2020; Drebreen et al., 2013; Jha et al., 2010; Shapiro et al., 2007). As the field of mindfulness research continues to expand, there has been an increased interest in

examining “active ingredients” that comprise these multi-component MBP (e.g., body scan) in order to understand the relative contributions and effects of each subordinate facet to inform intervention and scientific understanding (Cook-Cottone, 2015). Therefore, consolidating the preliminary findings of the effectiveness of the body scan as a standalone practice in reducing stress and psychopathology is a first step in understanding the relative impact of the body-scan as a single contributing element of multi-component MBP. The consolidation of this current research is a contribution in extracting and examining the component elements of a MBP practice (i.e., the individualized effect of the body scan), a direction that has been emphasized as a next step in providing an increase in evidence that can inform mindfulness research and generalize to groups of individuals (Cook-Cottone, 2015). The results of this research may also be extended to inform clinical practice, specifically to determine the evidence-based utility of the body scan practice for patients.

This dissertation will first review the extant research pertaining to (a) the negative effects of stress and psychopathology, (b) the theoretical underpinnings of the Mindfulness-Stress Buffering Account (Creswell & Lindsay, 2014) and its relation to mindfulness, stress, and psychopathology, and (c) an explication of the body scan practice and the limitations in the current body scan literature. Then, a narrative systematic review will characterize the body scan literature to examine the ability of the body scan, as a stand-alone practice, to reduce stress and psychopathology. The discussion will compare the extant body scan intervention literature to the existing MBP research, integrate these findings into recent theoretical understanding of MBP intervention effects, and provide recommendations for future research and clinical practice.

The Impact of Stress on Psychopathology and Wellbeing

Stress is a common experience for many people and is triggered by numerous events, such as work and family demands. Individuals have increasingly reported the problematic nature of stress over the past several decades (Zannas & Chrousos, 2017). Stress can be defined as the experience that occurs via the transaction between an individual and the environment that produces over arousal or under arousal that may be acute or longer-lasting (i.e., chronic) and may contribute to psychological and physiological distress (Aldwin, 2007). Researchers have found that chronic stress can negatively impact individuals and increase the risk of developing mental health disorders (i.e., anxiety) and may elicit a range of undesirable effects such as exhaustion and cognitive decline (Juster et al., 2010). Further, stress during the lifespan can increase the risk for negative health outcomes; for instance, chronic stress in childhood and adolescence can lead to shortened telomere length in midlife which is linked to disease states (Mayer et al., 2019; Puterman & Epel, 2012).

Stress occurs via the interpretation of potentially threatening stimuli exceeding one's perceived resources (Lazarus, 1993). For instance, when individual goals, such as preserving one's reputation, are perceived to be threatened by events like poor work performance, judgment of one's ability can occur, eliciting stress. Stress results in maladaptive behavioral (e.g., avoidance), cardiovascular (e.g., increased heart rate), and hormonal activity (e.g., increased cortisol release) (Juster et al., 2010; Zannas & Chrousos, 2017) which may impact mental health conditions. Stress was designed as a protective feature necessary for survival. However, the ability to internally generate a stress response from imagined situations (e.g., failing an exam) that otherwise would not require the activation of survival instincts, can elicit similar responses.

Psychophysiological and psychological impacts of stress

There are two psychological systems that respond to a perceived threatening stimulus that an individual may face and includes (a) the sympathetic nervous system and, (b) the neuro-endocrine system. When the sympathetic nervous system is stimulated to react in proportion to the threat it perceives it elicits the fight or flight response. First, the hypothalamus activates the fight or flight response via the sympathetic branch of the autonomic nervous system (ANS) culminating in the release of adrenaline and noradrenalin. In addition to this hormonal secretion an increase in heart rate and blood pressure occurs when the sympathetic ANS is activated in response to an acute stressor. The neuro-endocrine system's response to stress involves the activation of the hypothalamic pituitary adrenal (HPA) axis (Chiesa & Serretti, 2011; Khoury et al., 2015). The excessive physical response to stress can lead to a variety of physical illnesses such as cardiovascular disease and bodily inflammation (Dimsdale, 2008; Juster et al., 2010; Schneiderman et al., 2005), and the development or heightening of psychological ailments such as depression, anxiety, and behavioral disorders (e.g., substance use disorders) (Schneiderman et al., 2005). In summary, stress responses may lead to a host of negative outcomes, highlighting the need for greater research and development of tools for reducing stress and subsequent psychopathology (Garfin et al., 2018).

The Mindfulness Stress Buffering Account

Jon Kabat-Zinn, the developer of MBSR (Kabat-Zinn, 2003), provided one of the most widely-used definitions of mindfulness. He suggested that the construct of mindfulness includes the cultivation of awareness by "paying attention, on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment" (Kabat-Zinn, 2003, p. 145). Since the emergence of the secular tradition of mindfulness in the West, researchers have

examined the effectiveness of mindfulness in addressing physical and psychological symptoms in randomized control trials including psychophysiological outcome variables such as blood pressure (Kabat-Zinn, 2003; Shi et al., 2016). Further, multicomponent mindfulness interventions that include the body scan have demonstrated positive effects on physiological and self-report measures of stress and psychopathology (Creswell et al., 2014; Shi et al., 2016). Understanding the underpinnings of how mindfulness may buffer stress has gained empirical interest among researchers and has been coined the Mindfulness Stress Buffering Account (Creswell & Lindsay, 2014).

The term "stress buffering" was initially developed in the social support literature to explain how social support can ameliorate negative health outcomes caused by stress (Cohen & Wills, 1985; Creswell et al., 2014). The Mindfulness Stress Buffering Account was created to describe how the practice of mindfulness can buffer the deleterious effects of stress by modifying both stress appraisals (top-down) and stress reactivity (bottom-up) (Creswell et al., 2014). The first is via a psychological route, which has been referred to as the "top-down" cognitive self-regulatory approach. MBP are hypothesized to improve coping abilities in the midst of a stressor by allowing individuals to develop flexibility in responding to stress (Creswell et al., 2014). The MBP practice may decrease an individual's defensive processing of a threatening experience, enhancing desensitization and tolerance of the unpleasant experience leading to more adaptive responding under social threat, and thereby affecting psychophysiological responses (Brown et al., 2008). The second mechanism is via a "bottom-up" route. From this perspective the MPB would be hypothesized to affect the bottom-up pathway by reducing reactivity in areas of the brain inherent in signaling the peripheral stress response cascades such as the amygdala, anterior

cingulate cortex, ventromedial prefrontal cortex, hypothalamus, and parabrachial pons (Barrett et al., 2012; Rosenkranz et al., 2013).

Research has found that MBP improve measurable symptoms including immune functioning via a reduction in inflammation (Barrett et al., 2012; Rosenkranz et al., 2013), pain reduction, symptoms of distress for patients with hematological malignancies (Compernolle, 2019), and a reduction in hypothalamic-pituitary-adrenal axis markers from the Trier Social Stress Test (TSST; Hoge et al., 2018) lending credence to the bottom-up account. MBP are hypothesized to improve coping abilities when an individual is faced with a stressor (e.g., by decreasing an individual's defensive processing of a threatening experience, enhancing desensitization and tolerance of the unpleasant experience) by enhancing adaptive responding and affecting the cascading psychophysiological response. Studies have not yet examined how the body scan may also lead to similar results (i.e., mindfulness-stress buffering) (Brown et al., 2008). Consequently, it is important to understand the existing evidence base for the body scan's stress-buffering capacity by examining a combination of psychological and physiological variables to build a comprehensive picture of stress-responses in this narrative systematic review. The Mindfulness Stress Buffering Account has been elaborated to evaluate how mindfulness can support health outcomes and is the basis for current inquiries into the mechanisms of mindfulness and may be expanded and specified to the body scan practice.

Mindfulness Practice

An illustration of a MBP is demonstrated in the following sitting meditation practice. A sitting meditation practice would begin by an individual adopting an alert, but comfortable physical position on a chair or on the floor. The participant would be instructed to bring his/her attention to the somatic sensations of the body in different areas in succession starting with the

sensation of breathing in the chest, nostrils, and throat (Mirams et al., 2013). This focus on attention would occur while participants nonjudgmentally return their attention to the part of the body observed at that time when they notice that they are attending to another object of awareness (i.e., cognition, feeling, or sensation). Inevitably, the participant's attention will drift from this selected object of attention (e.g., the part of the body), to another object of awareness (i.e., cognition, feeling, or sensation). Once the participant notices the wandering of their attention, they return their focus to the object of attention (e.g., the sensation). When the participant has gained experience with focused attention, they may proceed to learn open monitoring practices (Dahl et al., 2015; Lutz et al., 2008). In open monitoring, the second foundational skill, the meditator becomes aware of their momentary experience as it unfolds. As there is not focus on a specific object or experience, the aim is simply to remain in a state of monitoring (Dahl et al., 2015). These foundational elements are included in many mindfulness protocols. For instance, Mindfulness-Based Stress Reduction (MBSR), one of the most popularized mindfulness training programs founded by Jon Kabat-Zinn (1994), includes a practice that requests participants to focus their attention on their body, known as a body scan.

Body Scan

The body scan is a focused attention practice that involves noticing different areas of the body in the present moment as it unfolds and is regularly taught in multicomponent mindfulness programs (e.g., MBSR). There are two foundational elements for body scan practice. The first is the attentional aspect that involves individuals directing their attention to somatic sensations of various parts of the body. The focused attention that the individual places on their body is continually redirected in a systematic way to different areas of the body and then maintained on the somatic experience on that area of the body. This skill is known as a starting point for novice

meditators of multiple MBP styles (Dahl et al., 2015; Lippelt et al., 2014). The second foundational element of body scan practice is the explicit attitudes that accompany the practice. These attitudes are cultivated throughout practice and include openness, acceptance, and curiosity (Bishop et al., 2004). A commitment to retain an attitude of curiosity enables individuals to notice their thoughts, emotions, or sensations that consist of the mind's wandering experience. Acceptance is a commitment consisting of an experiential openness to the present moment. This openness occurs without striving for a particular goal (e.g., relaxation) or judgement, but simply noticing lapses of attention and entering awareness devoid of interpretation and a redirecting one's attention. Openness enhances receptivity to occurrences in one's awareness without the need to adjust or change the experience. These attitudes may be particularly important when meditators' attention lapses.

Body Scan Practice

The body scan is a focused attention practice that stems from mindfulness-based stress reduction. As previously discussed, focused attention practice requires that the participant place his/her attention on a single focal point (e.g., somatic sensations of breathing). During this process, attention is placed consecutively on noticing somatic sensations in each section of the body prior to disengaging and then placing attention on the next body part (Mirams et al., 2013). Research investigating body scan interventions has demonstrated positive outcomes measured by psychophysiology, self-report, and performance measures (Colgan et al., 2016; Ditto et al., 2006; Ussher et al., 2014). Based on psychophysiological outcome variables, a study found indications of increased cardiovascular functioning via an increase in respiratory sinus arrhythmia (RSA) among participants in the body scan condition compared with an active control of listening to an audio tape of a popular novel (Ditto et al., 2006). In this same study, the authors found that the

body scan led to decreases in blood pressure among women. Furthermore, research has indicated the ability of the body scan technique to decrease depression, post-traumatic stress disorder (Colgan et al., 2016), chronic pain, and distress (Ussher et al., 2014). In addition to alleviating symptoms of mental health disorders, improvements in functioning irrespective of disorders have also been noted (Kropp & Sedlmeier, 2019; Lutz et al., 2008; Mirams et al., 2013). For instance, improvements in concentration, self-compassion, emotional regulation and experience, and life satisfaction when compared to a breathing mindfulness practice have been noted, in part due to cognitive reappraisals (Kropp & Sedlmeier, 2019; Lutz et al., 2008; Mirams et al., 2013).

Limitations in the Mindfulness-Based Practice Literature

There is significant heterogeneity in multicomponent MBP. However, many MBP often include the body scan practice as a central intervention component of the overall program. The results from the extant MBP literature suggests that MBP may reduce stress and disorder specific symptoms (e.g., depression and anxiety) as measured by both self-report and physiological outcome variables (Basso et al., 2019; Goldberg et al., 2018; Hoge et al., 2017; Hoge et al., 2018). Consequently, it is useful to know if the body scan practice is an effective ingredient in multicomponent programs particularly because mindfulness-based programs have been found to reduce stress and psychopathology (Khoury et al., 2015). In an attempt to isolate "key ingredients" researchers have already begun investigating the body scan as a stand-alone intervention component to examine its efficacy in reducing stress and psychopathology. Given that multicomponent MBP are effective at reducing stress and psychopathology, it was important to see if single components had similar effects to determine the active ingredients. While Drebreen and colleagues (2013) did not complete a systematic review, they did address the usefulness of the body scan as a stand-alone practice and emphasized the need to continue

research examining the clinical utility of the body scan. To date, a systematic review has not been conducted in the body scan literature incorporating both psychological and psychophysiological variables.

Narrative Systematic Review

Two types of qualitative research syntheses are available and include the narrative review or meta-synthesis (Siddaway et al., 2019). A narrative review is appropriate to employ when a collection of quantitative studies have been conducted using a wide diversity of methodology or have examined different theoretical conceptualizations, constructs, and relationships. (Baumeister, 2013; Siddaway et al., 2019). Narrative reviews synthesize the results of the individual studies without reference to the statistical significance of the results. Narrative reviews link together studies on different topics to be interpreted and connected together in an attempt to elaborate or develop an overarching theory using methodology that is replicable, transparent, and rigorous (Siddaway et al., 2019).

Aim of the Study

The aim of this study was to characterize the effects of the body scan literature for stress and psychopathology observable in a range of outcome variables via a narrative systematic review. A narrative systematic review is an appropriate approach to organizing the studies included in this review as they use diverse methodologies, heterogeneous outcome variables, and these results may be examined through the lens of an overarching theory. Similar to multicomponent MBP, the a priori hypothesis of this systematic review was that the body scan would reduce stress and psychopathology.

Method

Guiding Methodological Framework

Siddaway et al. (2019) provided best practice suggestions for conducting systematic reviews that this current work will draw from. Specifically, this project will use the process and framework suggested by Siddaway et al. (2019) to conduct a systematic review with a narrative approach. A *narrative review* was considered appropriate due to the desire to examine a collection of studies that have used diverse methodologies or have examined different theoretical conceptualizations, constructs, and/or relationships to reinterpret or interconnect studies in order to help build or evaluate an overarching theory. Siddaway et al. (2019) elaborated the key stages in conducting a systematic review which provided the guiding format for this review. The key stages included *scoping* (e.g., formulating a research question, clarifying whether a review has already been done in this area), *planning* (e.g., inclusion and exclusion criteria), *identification* (e.g., screening, eligibility, consideration of study quality), and adhering to *presentation standards* (e.g., present a flow diagram). Lastly, Siddaway et al. (2019) provided suggestions that are used to inform the *critical evaluation* of the results in this systematic review with the intention of critically examining how the psychological and physiological variables extracted in this review could relate to the Mindfulness Stress Buffering Account.

Scoping the Literature

Prior to the literature review process, a search was conducted to gain initial insight into the study's relevance, and help in the development of an appropriate research question. Preparing the introduction section of this document was a preliminary step in the scoping process and becoming acquainted with the literature. While no other systematic review examining the body scan as a stand-alone practice existed, a previous theoretical article examining the MBSR body

scan in clinical practice was located (Dreeben et al., 2013). Based on their evaluation of the benefits of the body scan (e.g., reduction in stress and psychopathology) they urged for additional research to examine the body scan as an individualized practice to deconstruct the effective components of MBSR and related MBP. Given this clear gap in the literature, the primary aim of this study was to characterize the body scan literature for stress and psychopathology and to conduct a systematic review examining the body scan as a standalone practice in reducing stress and psychopathology.

Planning the Literature Search

The inclusion criteria consisted of peer-reviewed studies, published in English, and inclusion of a body scan intervention and a measure of stress and/or psychopathology (e.g., depression). It was important to define the body scan prior to the literature search for the purpose of study inclusion. The body scan intervention was operationally defined as any repeated practice that systematically allocated attention throughout different somatic experiences in the body without requiring the participant to engage in any specific physical actions (e.g., tightening muscles). To be included in the study, the body scan condition had to be completed independently of any additional contemplative practices (e.g., mindful breathing practice, yoga exercises).

Other constructs which required definitions included stress and psychopathology. Both were also required to be measured by either self-report or psychophysiological outcome measures. *Stress* was characterized by a strain that can affect mental (i.e., as measured by self-report, top-down processes) and physical health (i.e., as measured by physiological outcome variables, bottom-up processes) of individuals (Khoury et al., 2015; Lazarus, 1993). The term *psychopathology* was defined as a mental or behavioral disorder that results in significant

restriction on an individual's ability to engage in deliberate action and equivalently, to participate in social practices in the community (e.g., anxiety, depression, post-traumatic stress disorder) and proximal variables that directly relate to psychopathology (e.g., perseverative cognitions, emotional regulation and/or valence) (Bergner, 1997).

Additional study characterizations were defined and elaborated prior to the literature search based on criteria set by a previous systematic review examining multicomponent mindfulness-based interventions via self-report and psychophysiological variables (Morton et al., 2020). Clinical populations included any population that had been diagnosed with a mental and/or physical disorder. Clinical and non-clinical populations were included in the systematic review. The inclusion of both populations was due to the relatively limited selection of studies examining the body scan as a standalone practice and the need for this research to retain as many relevant studies as possible in order to draw meaningful conclusions consistent with the aims of a narrative review. No exclusion criteria was set based on participant age. Healthy subjects were defined as subjects with no specific mental disorders. Control conditions were coded based on the designations created by Felver and colleagues (2016). To be considered a "full-active control" the study was required to incorporate both a didactic (e.g., presentation of content material) and an experiential (e.g., attention training) component. To be considered a "semi-active control" the study included only one component (i.e., didactic *or* experiential). Both full-active and semi-active control groups were also required to match the length of the control condition in order to be considered in these categories. Studies that had controls with neither an experiential or didactic component were coded as "not-active controls."

Identification

A literature identification search was conducted using electronic databases PsycINFO and PubMed. The following search terms were used as keyword or heading searches. The search followed a three-component strategy, as follows: Component 1: {"Body Scan" or Body Scan}; Component 2: {Mindfulness and "Body Scan"}; and Component 3: {Stress or Anxiety or Depression or Psychosocial or Psychopathology and "Body Scan"}. Reference lists of relevant articles were also screened to locate additional articles. Papers were gathered and considered for inclusion in this review until June 2020.

The search results were identified, duplicates were removed in addition to articles that were not written in English. The PRISMA flow model was used in the identification process to screen individual papers based on the following steps. Figure 1 includes the results of the PRISMA flow model and the number of papers which were identified, screened, found to be eligible, and included in the final article selection during each of the following steps discussed below. After the selection process was completed, the next step included screening for records that did not meet criteria. Specifically, papers were excluded based on abstract reviews if they did not include a measure of stress or psychopathology or if the paper was theoretical instead of empirical. Papers were also excluded if they did not include the body scan as an individualized practice, or if they did not include a waitlist or control condition. The papers that remained (n = 12) were uploaded into an Excel sheet and were coded for the following characteristics: population/demographic elements (i.e., age, gender, clinical characteristics), participant sample sizes, dependent variables, and study results. The data analysis section elucidates the process of how the characterization of the literature and the organization of dependent outcome variables were conducted, specifically the outcome measures of stress and psychopathology.

Presentation Standards

The final step of the Siddaway et al. (2019) best practice process for completing a systematic review included adhering to presentation standards. These standards included a flow diagram to summarize the literature searching and sifting process (i.e., PRISMA flow diagram). The diagram is separated into the following features: identification, screening, eligibility, and inclusion stages. Figure 1 includes each of the above sections in addition to a succinct enumeration of the number of studies included and excluded throughout these stages.

Data Analysis

Literature characterization

Participants were coded as either clinical populations and/or healthy participants by the aforementioned definition included in the planning section of this document. Populations were also characterized by gender, age, and sample size. Studies were also evaluated based on the inclusion of a control condition. Articles were characterized by the inclusion of a full-active control, semi-active control, not active control, or wait-list control. The first author coded all the papers and a secondary coder coded 83% of the papers to calculate interrater reliability (IRR) of the coding procedure. The secondary coder was a psychology undergraduate student who was a trained member of Dr. Felver's research laboratory. The research assistant was trained in coding by the primary author and an additional graduate student in Dr. Felver's laboratory without the use of a coding manual. The secondary coder extracted all the population characteristics included in Table 1 (i.e., population, conditions, dependent variables, results). Results were coded qualitatively in the excel sheet. The IRR was calculated by dividing the number of agreements by the total number of all potential agreements and disagreements in each category. The categories (e.g., population, conditions) were all combined together for the purpose of the IRR. The IRR

was 83%. The IRR ranged from no areas of disagreements on four papers to two areas of disagreements on three papers. The papers that had the greatest numbers of disagreements were also papers that were more methodologically technical (e.g., publications with multiple studies and including measurement neurophysiological performance) compared with the papers with fewer or no disagreements. Areas of disagreement were reviewed and resolved by the primary author. The results of each study were also characterized and included in Table 1. Table 1 is separated into the previously discussed sections (i.e., population, conditions, dependent variables, and results summary). The following table includes a succinct summary of the results grouped together by variable (i.e., Table 2). Lastly, the study design features were coded using the Jadad scale for reporting randomized controlled trials (Halpern & Douglas, 2005). The items which were coded included randomization, blinding, and an account of all patients and were completed by the first author. The results of the design features that were coded for the selection of these studies is included in Table 3.

Stress characterization

Any significant reductions in stress and psychopathology were summarized to characterize the body scan's ability to reduce stress and psychopathology as measured by a range of outcome variables. Primary outcome variables were grouped according to the type of investigated outcomes in two main sections, namely stress symptoms, and symptoms of psychopathology. The measures of stress were split according into self-report or psychophysiological outcomes.

Psychopathology characterization

The results of the search for psychopathological outcome variables yielded five main outcome variable categories. These categories included anxiety, depression, post-traumatic stress

disorder (PTSD), perseverative cognitions, and emotional regulation and/or valence. The first two categories to emerge from the literature search were anxiety and depression. Anxiety and depression have been widely studied as common and debilitating multifaceted stress-related psychopathological disorders and were measured by self-reports (Kalueff et al., 2004). Post-traumatic stress disorder (PTSD) was identified as another category. PTSD is a diagnosis which can occur in individuals who have experienced and witnessed a traumatic event (e.g., war/combat) and evaluated via clinical diagnoses. Perseverative cognitions also emerged in the literature search. Perseverative cognitions (e.g., rumination and worry) contribute to the onset and maintenance of disorders such as anxiety and depression (Watkins, 2008). Due to the psychopathological contribution of perseverative cognitions they were included as one of the five variable categories. The last category which emerged was emotional regulation and/or valence. Emotional valence refers to the positive or negative charge an emotion can carry and is a dimension of emotion. The definition of emotional regulation encompasses the impact of emotional valence and arousal in an individual's ability to control (e.g., employ strategies) emotional experiences and reduce negative emotions (Gratz & Roemer, 2004; Gross, 2013; as cited in Zhang et al., 2017). Research has found that dysfunctional strategies for dealing with emotions can enhance the risk of psychopathology (Kropp & Sedlmeier, 2019). For instance, avoidance of emotions relates to higher levels of anxiety and an overidentification can lead to rumination, worries, and obsessions. Further, activities which increase frontal cortex activity (e.g., mindfulness) can help regulate emotional processing, valence, and emotional regulation and aid in reducing psychopathology (e.g., PTSD symptoms; Wahbeh et al., 2016). The ability to process and regulate emotions are important for wellbeing and mental health (Kropp &

Sedlmeier, 2019; Gross, 2000; Kiecolt-Glasser et al., 2002). These categories were used for examining the results of the systematic review.

Data analysis summary

Studies were analyzed based on the body scan's ability to elicit significant decreases in outcome variables in the category of stress and symptoms of psychopathology. Outcomes were evaluated for statistical significance between pre- and post-differences and/or between group within time differences. Due to the preliminary nature of this narrative systematic review, it was important to report transparently to the reader all potential statistical results to ensure researchers were provided with detailed findings from which they may conduct additional research. The extracted data allowed for an interpretation of the effects of the body scan on stress and symptoms of psychopathology and included recommendation for future research.

Results

Literature Review Consolidation

Figure 1 details the flowchart for article inclusion. The literature identification search strategy initially generated 71 articles. After a review of these abstracts, a total of 52 articles were found to potentially fulfill the eligibility criteria. After a closer examination of these publications 40 papers were subsequently excluded for the following reasons: (1) the study did not include an isolated body scan intervention (n = 28) or; (2) no measure of stress, and or psychopathology were included (n = 11); or (3) a control condition was not included (n = 1). Therefore, a total of 12 were eligible for review with study details included in Table 1. Several studies examined more than one type of outcome variable (e.g., psychological and physiological variables) in addition to several of the same category (e.g., anxiety and depression). Out of 12 articles, a total of two studies examined stress only, six studies examined outcome variables

related to psychopathology only (i.e., anxiety, depression, perseverative cognitions, PTSD symptoms, and emotional regulation and or valence) and a total of four studies overlapped to examine both stress and psychopathology outcome variables.

Demographic and Methodological Characteristics

A summary of the coded data from the selected studies (N = 12) is provided in Table 1. In regard to gender, most studies examined mixed-gender subjects and two studies experimented with women-only subjects (16.7%). Out of the selected studies, none of the researchers discussed the inclusion, exclusion, or any mention of individuals who did not report to fall into binary definitions of genders. All studies included demographic details including the mean age of participants. Out of the 12 studies, the results indicated that the participants ages ranged from 18 years old (e.g., O'Leary & Dockray, 2015) to 65 years old (e.g., Colgan et al., 2016) with an average age of 32.4 (SD = 13.96) across the studies. The studies also reported sample sizes. The participant samples sizes included a wide variety of range from 30 at the lowest to 141 at the highest with a mean of 75.31 (SD = 35. 81). Lastly, all of the studies included a control condition. It was noteworthy that four out of the 12 studies included an additional waitlist control group in addition to a full-active control condition. All but one study (Dambrun, 2016) included at least one full-active control group consisting of a didactic and experiential component. The methodological rigor of including several control groups comes into contrast with previous findings in a recent literature review which indicated that few studies examining mindfulness-based interventions included full-active control conditions (Morton et al., 2020).

Study Design

The studies were individually coded for their adherence for implementing and reporting randomized controlled trial standards (Halpern & Douglas, 2005). These included

randomization, blinding, and an account of all patients. Randomization and blinding items included a maximum of two potential points. For randomization, studies had to mention randomization to receive the first point. The studies received an additional point if the method of randomization was appropriate. A point was deducted if the randomization was inappropriate. On the item of blinding, the term "blinding" needed to be mentioned and an additional point was provided if the method of blinding was conducted appropriately. Similarly, a point was deducted if blinding was not completed appropriately. Lastly, a point was provided for authors providing information regarding the fate of all patients in the trial.

In the category of randomization, together the studies scored a total of 17 out of 24 potential points (70%). For items pertaining to blinding, the studies received a score of 6 out of 24 total points (25%). In regards to accounting for all patients, the studies scored a total of four out of 12 potential points (33%). When all the categories were combined, the grand total of all the papers were 27 out of 60 points (45%).

Selected Outcome Variables

In total, three studies examined psychophysiological variables (25%) (Ditto et al., 2006; Schultchen et al., 2019; Wahbeh et al., 2016). A range of different outcome variables were employed in these studies with some overlap. Specifically, one study (i.e., Ditto et al., 2006) focused solely on cardiovascular measures (e.g., blood pressure, heart rate variability, and respiratory sinus arrhythmia) while Schultchen et al. (2019) examined endocrine markers of stress reactivity (i.e., cortisol and DHEA). Wahbeh et al. (2016) examined a combination of cardiovascular measures (e.g., heart rate variability) and an endocrine measure (i.e., cortisol). Only one of the 12 studies (Ditto et al., 2006) did not include self-report measures. Otherwise, self-report measures were used to examine all outcome variables (i.e., stress and

psychopathology). The following section summarizes the literature on the body scan to reduce stress and psychopathology, organized by outcome variables.

Stress

A total of six studies examined stress in the body scan literature and all of the studies found that the body scan reduced stress as measured by self-report and/or psychophysiological outcome variables. Five studies included self-report measures of stress and three studies examined psychophysiological outcome variables. Two of the three studies that examined psychophysiological outcome variables also included self-report measures.

Self-report studies

A total of five studies included self-report measures of stress (Call et al., 2014; Colgan et al., 2017; O'Leary & Dockray, 2015; Schultchen et al., 2019; Wahbeh et al., 2016). There was a great heterogeneity in the self-report measures employed to examine reductions in stress with a total of three different self-report measures used among the four of the five studies. The fifth study used conventional content analysis to examine emergent themes and recoded the data to indicate the proportion of participants who reporting benefits from the body scan practice (Colgan et al., 2017).

Four of the studies that examined stress conducted their intervention with specialized populations (Call et al., 2014; Colgan et al., 2017; O'Leary & Dockray, 2015; Wahbeh et al., 2016). Call et al. (2014) and O'Leary & Dockray (2015) recruited only women. Wahbeh et al. (2016) and Colgan et al. (2017) examined veterans with a diagnosis of post-traumatic stress disorder (PTSD).

Call et al. (2014) included a sample of women which consisted of clinical and non-clinical undergraduate students. The differentiation of their clinical status was based on their

Penn State Worry Questionnaire results (PSWQ; Meyer et al., 1990). Scores on the PSWQ that fell within either the moderate (i.e., 45-57; 38%) or clinical range (58 and above; 62%) indicated a positive screen for worry. The students were randomly assigned to three conditions: a body scan, yoga, or a waitlist control group. The authors included three sessions of intervention instruction and practice of 45 minutes for each session and group (i.e., body scan or yoga) without the inclusion of homework. The authors found a significant effect of group membership on post-test stress; both the body scan and yoga groups experienced greater stress reductions compared to the wait-list control group as measured by the Depression Anxiety and Stress Scales-21 (DASS-21; Lovibond et al., 1995).

O'Leary and Dockray (2015) included a gratitude intervention and waitlist control group in addition to the body scan group while Wahbeh et al. (2016) compared the body scan group to a slow breathing group, a combined body scan and a slow breathing group, and a sitting quietly group. While these studies included different populations (i.e., women and combat veterans with a diagnosis of PTSD), both studies used the Perceived Stress Scale (PSS; Cohen, 1988) to measure reductions in stress and both found reductions in perceived stress for the body scan intervention. While Wahbeh et al. (2016) did not report body scan as conferring statistically significant benefits relative to other treatments explored in their study, post-hoc tests suggested that there was a significant reduction in stress before and after body scans. O'Leary and Dockray (2015) found similar results, in which the body scan group demonstrated significant reductions in stress compared with the wait-list control condition.

Colgan et al. (2017) exclusively used qualitative data which were gathered by semi-structured interviews after the body scan intervention. The authors compared the body scan group to a mindful breathing group, a slow breathing group, and a quietly sitting group among

veterans diagnosed with PTSD. The data were derived from text data and coded into categories for conventional content analysis. The data were then recoded into whether a participant benefited from the treatment to examine whether the proportion of participants reporting benefits was significantly different from the proportion of people reporting no benefits. The body scan group evidenced significant reductions in physiological arousal and stress reactivity and greater relaxation compared with the other groups.

Schultchen et al. (2019) used the Trier Inventory for the Assessment of Chronic Stress-Screening Subscale of Chronic Stress (TICS-SCSS) to identify if an 8-week body scan intervention would reduce stress compared with a full-active control (i.e., receiving instruction and listening to an audio book). The authors found that the intervention was not sufficient in evidencing reductions in stress via the TICS-SCSS, as both the intervention and full-active control led to identical decreases in stress. However, in a pre-post assessment of stress, the body scan intervention significantly reduced stress.

Taken together, out of the self-report studies, five out of five studies, evidenced reductions in stress following a body scan intervention.

Psychophysiology studies

Only three of the 12 studies (25%) employed psychophysiological outcome variables to examine stress (Ditto et al., 2006; Schultchen et al., 2019; Wahbeh et al., 2016). Ditto and colleagues (2006) included two studies, both examining the cardiovascular effects of the body scan practice. The first study featured a between group design whereas the second study included a within-subject design. In the first study, the authors compared the body scan group with a full-active control progressive muscle relaxation group, and a waitlist control group. First, the body scan group experienced decreased heart rate, an indicator of reduced stress levels. The body scan

group evidenced a significantly improved Respiratory Sinus Arrhythmia (RSA) compared with the full-active control condition and the waitlist control over the course of the 4-week daily practice. The body scan practice was associated with an increase in RSA and had the largest most significant change amongst the study groups. In the second study, the authors used a within-subject design which compared the body scan practice with a group that listened to an audio recording. Each participants received both intervention (i.e., body scan) and full-active control condition (i.e., listening group) in a counterbalanced order to examine differences between conditions. This design was unique to this study and may impact comparability. Participants exhibited greater increases in RSA, high-frequency heart rate variability, and low-frequency heart rate variability when they were engaged in the body scan intervention and not when they were listening to an audio recording. The cardiac pre-ejection period (PEP), a measurement of cardiac sympathetic activity was also evaluated. Participants demonstrated a significant greater decrease in PEP when completing the body scan compared with the listening group, which is in the opposite direction than expected.

The other two studies that examined physiological outcome variables did so in specific populations. Wahbeh et al. (2016) examined combat veterans, of whom 94% were men who received a confirmed diagnosis of PTSD and Schultchen and colleagues (2019) included individuals with a range of previous meditation experience. In Wahbeh et al.'s (2016) study, the authors included a body scan group, a slow breathing group (using RESPeRATE), a body scan and a slow breathing group, and a sitting quietly control group. The authors found that both the body scan group and the combined body scan and slow breathing groups exhibited changes in resting respiration from baseline to the endpoint. The authors also found that the body scan group had lower awakening cortisol values after the intervention, relative to before the intervention

(Wahbeh et al., 2016). The authors also indicated no significant between-group differences on heart rate variability. Schultchen et al. (2019) included individuals with a range of meditation experience including participants with weekly experience to participants with no meditation experience. The authors compared a body scan group with a full-active control, audiobook condition. The study was unique in its examination of dehydroepiandrosterone DHEA, the highest circulating and most abundant steroid in the human body, produced in the adrenal glands, the gonads, and the brain, as an outcome variable. Ultimately, the authors found that individuals who practiced the body scan demonstrated a greater reduction in cortisol and DHEA over eight weeks compared with the audiobook control group.

Taken together, all three of these studies examining psychophysiological outcome variables reported some reductions in physiological stress among participants practicing the body scan when compared with a full-active control condition. However, stress reduction was not evidenced in the body scan groups on all physiological outcome variables measured in these studies.

Psychopathology

Anxiety

Among the 12 studies identified in this review, a total of four studies (33%) examined measures of anxiety (Call et al., 2014; Dambrun, 2016; Josefsson et al., 2014; Mirams et al., 2013). Firstly, Call et al. (2014) measured anxiety via the Depression Anxiety Stress Scales – 21 (Lovibond, & Lovibond, 1995) using a women-only sample of undergraduate students. They included clinical and healthy students based on their Penn State Worry Questionnaire (PSWQ; Meyer et al., 1990). The authors included three sessions of intervention instruction and practice

of 45 minutes for each group (i.e., body scan and yoga) without the inclusion of homework. The authors reported that there was not a significant reduction in anxiety for the body scan group.

Three out of four studies examining anxiety recruited healthy-only populations, operationally defined as lacking a psychiatric diagnosis and assessment (Dambrun, 2016; Josefsson et al., 2014; Mirams et al., 2013). Dambrun (2016) recruited a sample of psychology students comparing a body scan and semi-active control condition that consisted of lying on a mat (in parallel with the intervention condition) and resting without falling asleep, without following a guided audio script, unlike the intervention group. While the body scan and control condition evidenced significant decreases in anxiety as measured by the Spielberger State Anxiety Inventory, the body scan group demonstrated a marginally greater reduction in anxiety ($p = 0.063$) relative to the sitting quietly control condition. Josefsson et al. (2014) compared a four-week, 8 session, 45 minute body scan, mindfulness, and waitlist control condition among individuals with no experience in mindfulness. The authors used the Hospital Anxiety and Depression Scale Experience Questionnaire (HAD; Zigmond & Snaith, 1983) to measure anxiety before and after the intervention. For the group of participants assigned to the body scan condition, there was no significant difference in self-reported anxiety before and after the intervention. They suggested that previous research (e.g., Hofmann et al., 2010) had found that the effects of multicomponent mindfulness programs on anxiety were larger in clinical populations, of which their sample was not. The authors also questioned if a 4-week program that lasted for 360 minutes may be too brief to evidence reductions in anxiety. Similarly, Mirams et al. (2013) indicated no significant group differences in anxiety among undergraduates in the body scan condition compared to an audio recorded group as measured by the Spielberger State

Anxiety Inventory, state measure (STAI-S). Unexpectedly, the body scan practice did not reduce state anxiety (from time 1 to time 2).

Taken together, only one of the studies discussed evidenced a reduction in anxiety.

Depression

Four of the 12 studies (33%) used outcome variables to measure depression (Colgan et al., 2016; Josefsson et al., 2014; O'Leary & Dockray, 2015; Wahbeh et al., 2016). There was little overlap in measures employed in the studies. Two of the four studies recruited healthy populations (Josefsson et al., 2014; O'Leary & Dockray, 2015) and the others recruited individuals diagnosed with a psychiatric disorder (Colgan et al., 2016; Wahbeh et al., 2016).

Josefsson et al. (2014) employed the Hospital Anxiety and Depression Scale to compare a body scan, a mindfulness group, and wait-list control condition on the dependent outcome variable of depression. The authors did not find any significant differences across the different treatment groups, nor did they find any significant differences in pre-post intervention levels of depression. O'Leary and Dockray (2015) compared a body scan intervention with a gratitude and waitlist group for healthy women and found that both the body scan group and the gratitude conditions evidenced reductions in depression from baseline to the fifth week of practice, however the decrease was not statistically significant.

The remaining studies examined clinical populations; Colgan et al. (2016) and Wahbeh et al. (2016) both recruited veterans with a diagnosis of PTSD. Colgan and colleagues (2016) measured depression levels using the Beck Depression Inventory-II (BDI-II; Beck et al., 1996) among veterans across four conditions: a body scan, mindful breathing, slow breathing, and sitting quietly in 60-minute sessions for six consecutive weeks with 20-minutes of practice each session. After individuals completed the body scan, they reported significantly less depression on

the BDI-II. Wahbeh et al. (2016) also found a significant decrease in depression pre- and post-intervention in the body scan condition, as measured with the BDI-II.

Taken together, two out of the four studies evidenced reductions in depressive symptoms.

Perseverative cognitions

Perseverative cognitions such as rumination and worry contribute to the onset and maintenance of disorders such as anxiety and depression (Watkins, 2008). Sauer-Zavala et al. (2013) compared how components of multicomponent mindfulness practices (e.g., the body scan, yoga, and sitting meditation) affected perseverative cognitions. On the measure of rumination, the body scan evidenced significant reductions in ruminations levels as indicated by the rumination subscale of the Rumination-Reflection Questionnaire (RRQ; Trapnell & Campbell, 1999).

Post-traumatic stress

A total of three studies (25%) examined PTSD (Colgan et al., 2016; Colgan et al., 2017; Wahbeh et al., 2016). Two of out the three studies measured PTSD symptoms using the same but different version of the self-report measure, the PTSD Checklist (Colgan et al., 2016; Wahbeh et al., 2016). Specifically, Colgan et al. (2016) used the civilian version of the PTSD checklist. Colgan et al. (2016) found that the participants in the body scan group demonstrated a significant decrease in PTSD symptoms. In Wahbeh et al. (2016), the authors found that the body scan condition demonstrated an improvement of PTSD symptoms with the difference in PTSD scores trending on significance ($p = 0.05$). The third study, Colgan et al., (2017) also compared an intervention of four different conditions: body scan, mindful breathing, slow breathing, and an active control of sitting quietly and listing to an audio book. The authors obtained qualitative data by asking semi-structured interview questions such as, “Did your PTSD symptoms

improve?" The data were subsequently recoded. The authors indicated that more participants in the body scan group (70%) and mindful breathing group (69%) reported improvements in PTSD symptoms compared with the slow breathing group (42%) and the sitting quietly group (42%).

Taken together, the body scan intervention was demonstrated to be effective in reducing PTSD symptoms across two of the three studies.

Emotional regulation and/or valence

A total of three studies (25%) examined measures of emotional regulation and/or valence (Kropp & Sedlmeier, 2019; Sauer-Zavala et al., 2013; Wahbeh et al., 2016). All three studies employed different outcome measurements to examine emotional regulation and/or valence. Only one study examined a specific population that had already received a diagnosis (i.e., PTSD) (Wahbeh et al., 2016).

Kropp & Sedlmeier, 2019 employed the Scales for Experiencing Emotion (SEE; Behr & Becker, 2004) and focused on the subscale of emotional regulation and experience (Kropp & Sedlmeier, 2019). The authors examined a sample of students comparing a body scan, breathing, and loving-kindness group and found that the body scan group had self-reported significant improvements in emotional regulation on the SEE. Sauer-Zavala et al. (2013) examined a healthy population of undergraduate students and compared a body scan group to a sitting meditation and yoga group on the measure of emotional regulation using the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2008). The authors found that the body scan was not effective in improving emotional regulation when comparing pre- and post- intervention scores on the DERS. Wahbeh et al. (2016) was the only study that examined emotional valence among veterans who were diagnosed with PTSD. The authors employed the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988) to examine emotional valence and

found that the individuals in the body scan group experienced significant reductions in negative valence when pre- and post- intervention PANAS scores were compared.

In summary, two out of three studies (66%) found that the body scan was effective in improving a measure of emotional regulation and/or negative emotional valence.

Discussion

Review of Aims

Multicomponent MBP typically include the body scan as a cornerstone intervention component. One of the primary aims of this systematic review has been to evaluate the effectiveness of the body scan as an "active ingredient" in eliciting the reductions in stress and psychopathology as indicated in the multicomponent mindfulness literature (e.g., Goldberg et al., 2018; Khoury et al., 2015). Specifically, the results of the review allow for the examination of how the Mindfulness Stress Buffering Account framework may apply to the body scan literature to explain the reduction in stress and psychopathology following a body scan practice to better understand these intervention effects. Secondly, the review aimed to examine if reductions in stress and psychopathology could be reconceptualized within a stress buffering framework as first elaborated by Creswell and Lindsay (2014).

Comparing MBP to Body Scan Intervention

This review synthesizes and considers how the body scan may reduce stress and/or psychopathology as measured by a range of outcome variables. The literature identification search resulted in 12 studies, half of which have been published since 2015, and the rest were all conducted no later than 2013 except for Ditto and colleagues (2006). In fact, in 2013, Drebreen and colleagues examined the body scan in clinical practice and research. They found that, despite the body scan's prevalence in many clinical intervention (e.g., MBSR) the practice received little

stand-alone attention. Consequently, in the years following 2013, there has been an expansion of the research suggesting that the body scan may be a stand-alone practice that can reduce stress and psychopathology. The results of this study emphasize the need for researchers and practitioners to examine the contribution of the body scan due to the results of this review. As indicated by the results, the reported outcomes of body scan practice suggest that it may be effective in buffering stress and psychopathology which will be discussed in the following section.

These results obtained through this systematic review yielded similar findings found in research examining multicomponent MBP. Specifically, an earlier review examining the ability of multicomponent mindfulness interventions found that these practices buffer stress when measured by self-report and less robustly when examining psychophysiological variables (Morton et al., 2020). The reduced robustness of the MBP capacity to buffer stress, as measured by psychophysiological variables, was explained in part by methodological concerns (Morton et al., 2020). The studies examined in this review, although heterogenous did not suffer from equivalent methodological problems (e.g., omitting a full-active control condition). Given that stress was buffered by the body scan, these results suggest that the body scan is similarly effective for stress reduction as are MBP. Similarly, the MBP literature has also demonstrated that MBPs may reduce symptoms of psychopathology (e.g., anxiety, depression) (Khoury et al., 2013). The results of this systematic review echoed similar findings regarding certain symptoms of psychopathology (e.g., depression) which will be discussed in further detail. Methodological considerations will also be discussed in more detail in the following sections. In summary, the results of this review echoed the results found in the greater MBP research.

The 12 studies in this review also included both physiological and self-report measures, although the psychophysiological outcome variables used were limited (n = 3). The majority of the studies in this review measured stress or psychopathology with multiple variables and the results of this systematic review are promising. The following section consolidates and interprets the findings in the result section to examine the effects of the body scan on stress and psychopathology. Table 2 provides a detailed summary of the body scan practice in reducing stress and psychopathology.

Stress

The results of this systematic review indicate that the body scan practice appears to reduce stress, both in self-report and physiological outcome variables. All of the self-report studies found that stress was reduced following the body scan practice. Similarly, although limited in sample size, all of the studies examining physiological outcome variables also found reductions in stress, on at least one psychophysiological outcome variable, for groups assigned to the body scan practice. As previously discussed, stress may elicit a range of deleterious effects (e.g., exhaustion, cognitive decline, cardiovascular disease, increased cortisol release). Consequently, practices that reduce stress are welcome.

Research has found that mindfulness reduces stress appraisals and stress reactivity (Creswell et al., 2014). In a similar vein, results of this review indicate that the body scan alone elicits similar results to mindfulness-based programs (e.g., MBSR), specifically, in reducing stress in both self-report and psychophysiological measures. The body scan's isolated ability to reduce the negative effects of stress are meaningful as they may inform clinical considerations. For instance, the body scan may be a suitable practice among clients who report experiencing stress to mental health practitioners. As previously discussed, the body scan is typically

introduced in the first MBSR classes and is subsequently included in the participant's first encounter with mindfulness as a formal home practice. As such, the body scan is foundational for on-going mindfulness practice within MBSR (Drebreen et al., 2013). The implications of the potential simplicity of the body scan practice lends itself to clinical practice. The results of this systematic review indicate that the body scan, as an individualized practice, may indeed reduce stress, which provides a compelling rationale for its use. Many of the other studies included did not measure stress directly, however, in these studies researchers were interested in outcomes variables which are empirically shown to be related to stress, such as anxiety, depression, and PTSD (Smoller, 2015).

Psychopathology

In regards to outcome variables measuring psychopathology (e.g., depression) following the body scan, half of the studies examining measures of depression found a reduction of these symptoms among body scan practitioners. While only one study examined perseverative cognitions, this study also found that symptoms were reduced. In contrast, for anxiety, one of the studies found that anxiety was reduced post-body scan. As suggested by Josefsson et al. (2014), the effects of multicomponent mindfulness programs on anxiety were larger among clinical populations. It is noteworthy that aside from the study examining perseverative cognitions (Sauer-Zavala et al., 2013) which included a healthy population, all other outcome variables (e.g., stress, depression) included a greater number of studies with clinical population (e.g., PTSD) than healthy individuals. These findings provide preliminary support that the effect of the body scan may be greater among clinical populations. Lastly, over half of the small number of studies examining emotional regulation and/or valence found that the body scan was effective in improving measures of emotional regulation and/or valence.

Taken together, the body scan literature suggests that this intervention may be effective in reducing depression, perseverative cognitions, PTSD symptoms, and increasing emotional regulation and/or valence. Furthermore, the pattern of these results are consistent with the general MBP literature (Creswell et al., 2014; Shi et al., 2016) and thus suggest that the body scan may indeed be a key ingredient of MBP in reducing stress and psychopathology. The body scan appears to be a transdiagnostic factor or "transtherapeutic" insofar that the practice may reduce a range of psychopathology such as depression and cognitive perseveration while increasing emotional regulation and/or valence. Mindfulness and emotion regulation and valence (i.e., attending and responding to negative emotions characterized by focused attention and open awareness) have been proposed to be a transtherapeutic manner to decrease transdiagnostic mental processes. For instance, researchers have found that in a study of 213 participants the stress-reducing effects of MBSR were found to be in part due to improvements in perseverative cognition and emotion regulation/valence (Greeson et al., 2018). Similar to this study, the results of this review suggest that the body scan, as an isolated practice, could work as a transdiagnostic factor and may be a useful practice for practitioners to implement when working with clients who present with depression, perseverative cognitions, and PTSD symptoms.

Body Scan and Mindfulness Stress Buffering Account

In this systematic review, it has been suggested that the reductions in stress and psychopathology could be examined within a stress buffering framework by which mindfulness practice buffers stress. The model entails two primary mechanisms by which mindfulness practices have been postulated to reduce stress. The first mechanism is the psychological route, known as the "top-down" cognitive self-regulatory approach. The second is via the changes in one's physiological stress-reactivity known as the "bottom-up" approach. In a parallel vein, it is

posited that the body scan may confer similar stress buffering pathways (i.e., top-down, bottom-up) of which this systematic review will elaborate. Consequently, it was important for this systematic review to collect information regarding the body scan's stress-buffering capacity by collecting data on a combination of psychological (i.e., top down) and physiological (bottom-up) variables to examine if the effects of the Mindfulness Stress Buffering Account are echoed for a standalone body scan.

Top-down stress buffering

The results of the systematic review evidenced a top-down stress buffering effect of the body scan by demonstrating decreases in all of the self-report studies examining stress. These results can be re-interpreted as improving top-down stress regulatory abilities, as indicated via the self-report measures. Improving top-down stress occurs by modifying stress appraisal known as a cognitive self-regulatory approach. Specifically, mindfulness enhances the recruitment of prefrontal brain regions responsible for cognitive appraisals that in turn inhibit activity in the stress processing regions. For instance, one study found that mindfulness training can increase activation in prefrontal cortical activity during an affect labeling exercise that then predicted reductions in clinical symptoms (Creswell & Lindsay, 2014; Holzel et al., 2013). Taken together, these top-down stress improvements were demonstrated via self-report measures and may relate to an individual's cognitive appraisals of stress.

As previously discussed, and similar to measures of stress, outcome variables related to psychopathology such as depression, perseverative cognitions, PTSD symptoms, and emotional regulation and/or valence were impacted by the body scan practice. These results also indicate that reductions in worry, perseverative cognition, and increased emotional regulation and/or valence could occur through the use of strategies deploying attentional control and cognitive

reappraisal, which may be developed during the body scan instruction and practice. There is an established direct relation between stress and common internalizing mental health concerns such as PTSD symptoms, depression, and anxiety (Smoller, 2015). Given this relation, it is possible that the observed heterogeneous intervention effects of the body scan would be parsimoniously described in using the Mindfulness Stress Buffering Account framework. Specifically, that the body scan practice may have reduced stress in these populations who then evidenced reductions in mental health problems. Additional research is needed to examine the mechanism by which this practice yields reductions in top-down stress buffering effects.

Bottom-up stress buffering

The results of the studies that examined physiological variables can be interpreted through a bottom-up lens, in which the body scan practice allowed for enhanced activation of the parasympathetic nervous system in the face of heightened activity in all the physiological studies which found reductions in stress. For example, Schultchen et al. (2019) found that individuals who practiced the body scan demonstrated greater reductions in cortisol and DHEA compared with their control group. Although the sample size was low (i.e., $n = 3$) for studies examining psychological outcome variables, this review also lends support to the bottom-up element of the Mindfulness Stress Buffering Account as the body scan reduced negative psychophysiological responding. The health implications of the stress-buffering capacity of the body scan as a stand-alone practice are great. Research has indicated that there are maladaptive health effects related to stress including cardiovascular (e.g., increased heart rate) and hormonal activity (e.g., increased cortisol release) which may also, in turn, affect an individuals' mental health (Juster et al., 2010; Zannas & Chrousos, 2017). The clinical utility of these results is twofold; as previously discussed, the body scan may be a practical practice for a practitioner to employ with

clients with a range of stress-related psychopathology, however, the technique may also be beneficial in reducing the physical ramifications of stress. This two prong approach of how the body scan practice may be beneficial to clients is theoretically framed by the Mindfulness Stress Buffering Account. However, due to the limited sample size, additional research is required to corroborate these preliminary findings.

The Mindfulness Stress Buffering Account limitations and further research

Situating these results within the framework of the stress buffering effects of mindfulness practices (Creswell & Lindsay, 2014), these results may suggest that the body scan practice can benefit individuals who exhibit a range of stress and psychological concerns by conferring stress buffering properties. Although much work remains (e.g., increasing the volume of high quality research examining the isolated body scan) in order to increase confidence in the benefits of the body scan, the existing evidence on the stress buffering effects of this practice is promising.

Most of the stress reduction findings in this review were demonstrated by self-report measures as fewer physiological variables were available to support these results. It is important to note the limitations of considering subjective, self-report measures. The limitations of self-report measures alone has long been discussed by psychological researchers (Furnham, 1986). The inherent limitations of subjective reporting has led the field to move toward obtaining more objective physiological evidence for the stress buffering effects of multicomponent mindfulness programs (Morton et al., 2020). Indeed, it appears that these trends are echoed in the body scan intervention research. Future research should expand measurement to additional methodologies, such as, physiological or performance measures. Examining physiological measurements would allow for extended hypothesis testing of the bottom-up account of stress buffering. Physiological and performance measures allow for increased objectivity that do not rely solely on measuring

psychological mechanisms indirectly as constructs. Increasing the number of studies that examine an expanded inventory of measurement procedures may allow for innovative studies that may answer questions on the stress buffering capacity of the body scan practice. More rigorous evaluations of the body scan is encouraged.

Narrative Systematic Review

As previously discussed, a narrative systematic review is used when synthesizing a collection of quantitative studies that have used diverse methodology or have examined different theoretical conceptualizations, constructs, and relationships. This type of systematic review was appropriate for the purposes of linking together studies on different topics to be examined in an attempt to elaborate or develop an overarching theory (Siddaway et al., 2019). Specifically, as discussed in the last section, this narrative systematic review situated these results within the framework of the Mindfulness Stress Buffering Account. However, there are limitations associated with using a narrative systematic review. Specifically, in this review, effect sizes were not reported which could be have also been helpful for the interpretation of the results of this literature. As the literature mounts, it will be useful for the field to conduct a meta-analysis with a larger number of papers that consist of similar outcome variables and overlapping methodology. A meta-analysis will be enable the reader to establish firmer conclusions regarding the systematic review of the literature.

Research Design

The selection of studies varied on their reporting of features associated with standards in randomized controlled trial design. As previously indicated, the features included randomization, blinding, and an account of all patients. Cumulatively, the studies received a score of 17 out of 24 points representing a category total score 70%. The studies best adhered to the standards of

implementing and reporting randomization, and only one of the twelve studies failed to include randomization at all. Five additional studies failed to include the method of randomization, which is important to consider for future research. Specifically, it would improve design rigor for researchers to mention the randomization method implemented for further transparency. In the category of blinding, the studies received a score of 6 out of 24 total points which translates to a total category score of 25%. This category was the least reported in the research papers and would be necessary to include for improved research design rigor. In this category, it would be useful to report if and how the subjects, interventionists, and researchers providing questionnaires or taking the psychophysiological measurements in the study are blinded. Lastly, in regards to accounting for all patients, the studies scored a total of four out of 12 potential points which translates to a total score of 33%. Indeed, a large number of studies did not account for all their participants which would be important to report in future studies. On the whole, when all the categories were combined, the grand total of all the papers were 27 out of 60 points, a percentage of 45%. This indicates that there is an area of improvement for future research is to improve the methodological rigor of future study designs. Further, as indicated in Table 3, if one evaluates each study independently, only three of the studies (Josefsson et al., 2014; Kropp & Sedlmeir, 2019; Wahbeh et al., 2016) received a score of 50% or above in terms of their adherence to the previously discussed standards.

Body Scan Research Methodological Considerations

All but one study included a full-active control condition. One study included a semi-active control (e.g., lying on a mat quietly) in addition to the body scan intervention group. Compared with previous systematic reviews examining mindfulness interventions (e.g., Morton et al., 2020) the inclusion of a full-active control is a positive improvement. Perhaps, this rigor is

due to nature of these studies in examining an isolated component of a mindfulness-based program insofar that researchers would like to compare this practice with other components (e.g., yoga). It is also possible that the recent nature of this inquiry (i.e., half of the studies were conducted from 2015) is responsible for increased rigor.

In terms of participant numbers, the studies examined included a significant number of participants for their studies. Only three studies included fewer than 50 participants, per study (i.e., Ditto et al., 2006; Schultchen et al., 2019). However, it is important to note that participant heterogeneity existed across the studies in terms of subgroups (e.g., women-only), age variance (e.g., college students, older adults), and some examining specific population (e.g., individuals diagnosed with PTSD). The results across studies should be considered in light of participant heterogeneity. While, the heterogeneity renders the comparability of the research challenging, it does indicate that the usefulness of the body scan may be comparable across heterogeneous age, subgroup membership, and population characteristics. Due to the limited sample size and heterogeneity, it is difficult to parse apart differences depending on developmental ages. Further, none of these studies included samples of children or adolescents under the age of 18 years old. Due to the lack of differences among developmental ages in the systematic review, it is possible that similar results extend to children and adolescents who are able to understand and practice the body scan practice. With an increase in study numbers, it would be interesting to question how the body scan may impact individuals at different developmental stages. With further research and continued reporting of participant characteristics, future research may be able to examine more fully how such variables (e.g., diagnoses) may contribute, for instance as a moderator, to understand how variability in population characteristics may impact results.

Above and beyond the heterogeneity among participants, these studies also contained significant variations in dosage. The heterogeneity in dosage ranged from single sessions, to a series of daily, 20 minute sessions lasting 8-weeks (e.g., Schultchen et al., 2019). Further, the duration of the practices ranged from merely 20 minutes (e.g., Ditto et al., 2006) to an hour (e.g., Sauer-Zavala et al., 2013). All of these differences in dosage (i.e., session frequency, session length, and program duration) significantly impacted the total amount of time spent in practice, particularly when assigned homework is taken into account. Further, approximately half of the protocols did not elaborate on the details of assigned homework length and frequency. It was also common to fail to account for homework completion in studies. Despite the heterogeneity which exists among the limited literature base, the body scan continued to emerge as a key ingredient in reducing stress and psychopathology along a variety of populations (e.g., healthy and specific population) and dosages (e.g., session length).

Methodological limitations

It is important for research to continue to isolate the body scan as an independent practice, which will provide substantiation of the early results found in this review. Consequently, despite the promising findings of the effects of the body scan on stress, this review has consolidated a limited number of studies and has examined a great range of outcome variables. The small number of studies examined in this review (i.e., 12) is a significant limitation in this review. Previous research has indicated that multi-component mindfulness interventions have demonstrated the stress reductions via self-reported outcome variables. However, the effects have been less clear when measured by psychophysiological outcome variables (Morton et al., 2020). Although few studies included psychophysiological outcome variables, the studies that did examine psychophysiological outcome variables found that they

measured stress reductions at a similar rate as the self-report variables. Further, the heterogeneity in populations and dosage echo the trends in the literature as a whole. The heterogeneity, as discussed in the previous section, continues to be a limitation in regards to the inherent comparability of the studies and our ability draw firm conclusions. Although there are promising results to be gleaned from this review, there are a host of potential avenues to strengthen the research in relation to the body scan, stress, and psychopathology reductions. Based on the findings of this review, recommendations for future body scan intervention which are included in the following section.

Recommendations for Future Research

In order to expand on the findings of this review and to further the examination of the benefits of the body scan as stand-alone practice, below is an outline of recommendations for future research in this area:

1. **Expand the psychophysiological outcome variables examined in relation to the body scan intervention**. The results of this review indicate that the body scan practice, as isolated from multicomponent programs, was found to buffer stress as measured by psychophysiological outcome variables. However, due to the limited number of studies that included these variables (n = 3) it is difficult to draw firm conclusion. Completing psychophysiological research can include greater resource and time investment, particularly compared with self-report. Despite these greater demands, the use of psychophysiological research is needed to corroborate the bottom-up aspect of the Mindfulness Stress Buffering Account and the limited research in this review has indicated that the body scan is effective in buffering stress. Consequently, it is recommended that future research incorporate psychophysiological outcome variables as

a means to test and specify the physiological measures that may add to the literature base. It is also recommended that research include physiological measurements that examine specific brain regions (e.g., amygdala, anterior cingulate cortex, hypothalamus) inherent in signaling the peripheral stress response of the bottom-up pathway of the mindfulness stress buffering account.

2. **Report aspects of body scan protocols in detail.** The results of this systematic review found that authors detailed the processes of both intervention protocols (i.e., body scan practice) and control conditions (e.g., listening to an audiobook, Harry Potter, for the duration of the practice session). However, there were areas of the review that would have required further elucidation. In particular, more than half of the studies did not formally state whether they included daily practice and/or failed to include the instructed practice time, and collected this data at the end of the study. Further, many studies did not indicate a clear distinction, in time, between the didactic component and practice aspects of each training session/homework practice. In summary, it is recommended that authors report time spent completing mindfulness practice at home and adherence to the assigned home practice (e.g., ecological momentary assessment; Felver et al., 2018). These limitations are similar to those that have been previously been assessed among multicomponent mindfulness-based programs. The body scan literature would benefit from clearly detailing all aspects of protocols.
3. **Report design elements.** It is recommended that studies report the study design features associated with standards in randomized controlled trial design. These include randomization, blinding, and accounting for all study participants. Researchers may

benefit from using the Jadad scale as described in Halpern & Douglas (2005) as a reference when reporting these categories.

4. **Increase research for specific subgroups.** Research on the benefits of the body scan, as an isolated practice, has already begun to include a heterogenous population (e.g., different ages, subgroups, and specific populations). The results of the systematic review indicate that the practice may be beneficial for a range of psychopathology symptoms (e.g., depression, PTSD) in addition to heterogenous participant characteristics. While it is important to continue mounting research to draw firm conclusions among homogenous groups (e.g., individuals that share the same age and diagnosis) such as healthy populations, it may also add to the literature to continue to examine specific groups for which the body scan provides the greatest benefits. It will be important that research continues to accumulate data and continue to ask these questions. Once there is a greater range of methods and outcome variables that enhance comparability, is recommended that a meta-analysis be completed with the mounting data.
5. **Theoretical implications.** The Mindfulness Stress Buffering Account captures how mindfulness, and in the case of this review, how the body scan practice may affect health via stress-related psychopathology. It is important to note the results are preliminary in nature due to the paucity of research examining physiological outcome variables via a direct effects approach. However, the reduction in stress as measured by physiological variables align with a bottom-up approach that can have direct results on disease processes (e.g., cardiovascular disease). The results simultaneously endorsed the potential for buffering initial threat appraisals and increases in secondary appraisals of coping resources as evidenced by improvements on self-reported variables (e.g., depression).

Overall, these results indicate that (a) the body scan is effective in reducing stress and psychopathology as a standalone practice and, (b) the Mindfulness Stress Buffering Account may be extended to include, not only multi-component programs but may also be evaluated in the context of stand-alone practices. Consequently, it is recommended that researchers continue to evaluate the Mindfulness Stress Buffering Account and to expand the inquiry to examine "active ingredients" which may inform the mechanism of the account. For instance, if perhaps the body scan practice is a main driver in the stress-buffering process compared with other isolated practices (e.g., yoga). Lastly, additional research is required to continue to examine the mechanism by which the body scan yields reductions in top-down and bottom-up stress and psychopathology buffering effects.

6. **Clinical implications.** Within the context of MBSR and other multicomponent mindfulness-based programs, the body scan has been widely practiced clinically for over 30 years (Drebreen et al., 2013). There are several benefits of extending the current results of this study to clinical practice. The first is the consistent finding within the MBSR literature that the body scan in a preferred method as a stand-alone practice as measured by practice time (Analayo, 2020; Drebreen et al., 2013) and is effective in improving a range of psychological (e.g., depression) and physiological variables (e.g., DHEA). Due to its transdiagnostic capacity of reducing stress and psychopathology coupled with its preferred status as a stand-alone practice and relative ease of use in a clinical setting, compared with other practices (e.g., yoga), it may be an ideal practice to apply among clients presenting for services. The results of this systematic review involved a wide range of demographics (e.g., participants aged between 18-65) with a range of diagnoses. Consequently, this practice may be useful in many therapy settings

(e.g., college campuses, veterans affairs) based on the heterogeneity of these demographics. It is recommended that research continue to develop examining the usefulness of the body scan as a stand-alone practice in clinical settings for a range of populations and presenting concerns. Similar to a previous review examining the body scan in clinical practice (i.e., Drebreen et al., 2013) the results of this systematic review also characterizes the body scan as clinically useful. The body scan requires additional research as a stand-alone practice to deconstruct the effective components of MBSR and benefit a range of populations with clinically diverse presenting concerns.

Conclusion

The body scan encourages participants to notice with awareness and acceptance of one's inner states (i.e., positive, negative, neutral) while emphasizing the present moment (Drebreen et al., 2013). While limited research on the body scan exists, the practice has been central to multicomponent practices for many years (e.g., MBSR) and the results of this study compel researchers and practitioners to consider the contribution of the body scan to research and clinical landscapes. The ability of the body scan to buffer stress reactivity and psychopathology appears to be more robust when measured via self-report due to the increased number of studies including self-report measures. However, while the research is promising, the stress-buffering effects of the body scan are still emerging for psychophysiological variables. At this time, the lack of research renders the results less clear for physiological measures. The results of this review echo similar results found in research examining multicomponent mindfulness-based practices. Specifically, results indicating the ability of mindfulness interventions to buffer stress reactivity when measured by self-report (Morton et al., 2020). The same review found that results of the physiological variables were not as robust, however, methodological concerns were

posited to impact this lack of clarity (Morton et al., 2020). Taken together, the similarity of results between this review and a previous systematic review that examined multicomponent mindfulness programs exemplifies that the body scan is effective as a stand-alone practice and is perhaps an “active ingredient” in the effectiveness of more comprehensive programs. These results, although preliminary due to the limited number of publications to date, lend credence to the usefulness of applying the body scan practice to several clinical environments

Figure 1

PRISMA Literature Search

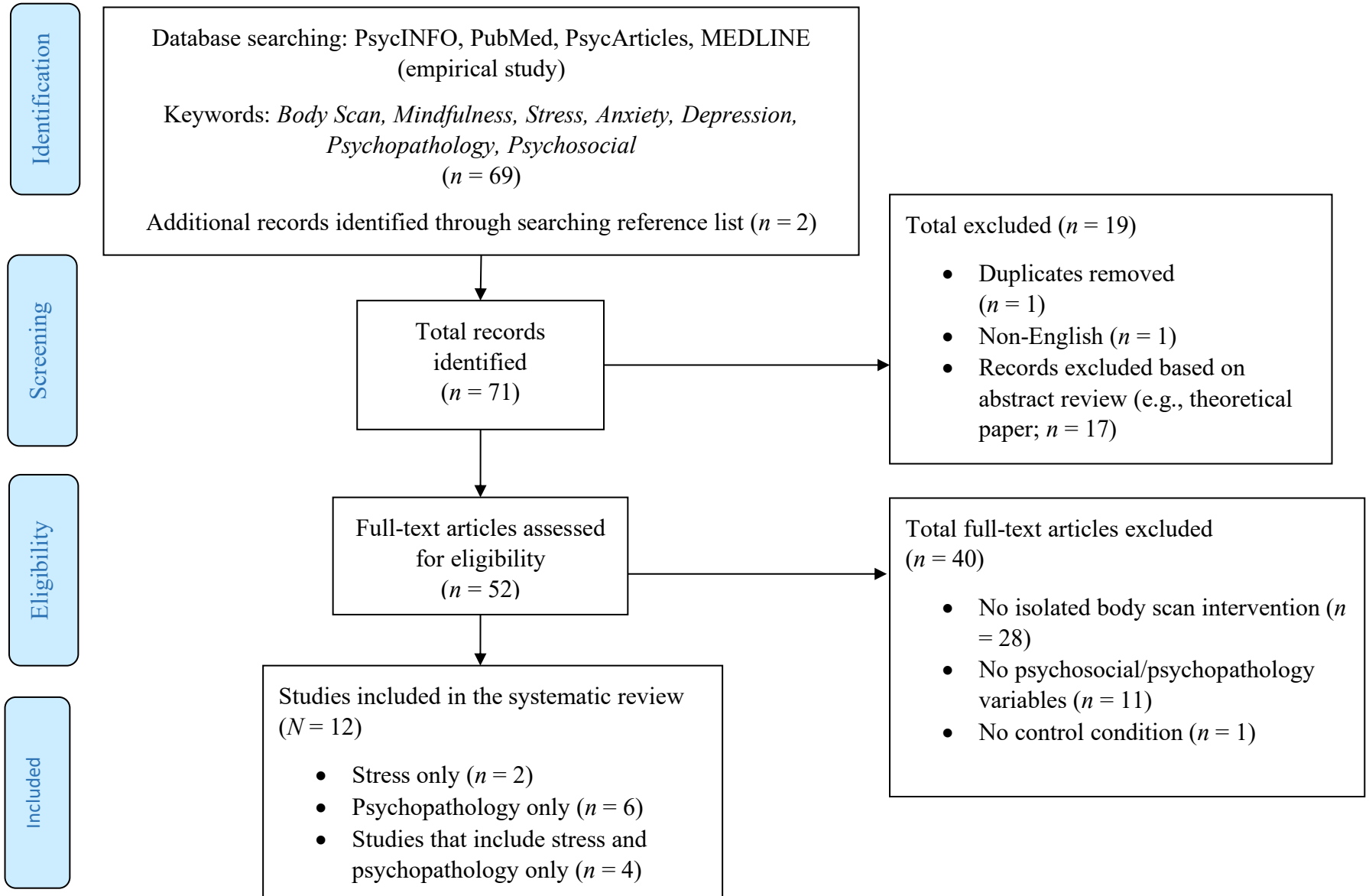

Table 1

Body Scan Literature Search Consolidation

Authors	Population	Body Scan and Control	Dependent variables	Result Summary
Call et al. (2014)	Women undergraduate students recruited from introductory and advanced psychology courses over the course of two semesters at a large Midwestern university *N* = 91; Mean age: 22.7 years	Waitlist Control: *n* = 35; MBSR Hatha Yoga Group: *n* = 29; Body Scan: *n* = 27	**Self-Report** Penn State Worry Questionnaire; Depression Anxiety Scales-21 **Psychophysiology** None	BS ↓ stress and ↔ anxiety
Colgan et al. (2016)	Veterans with PTSD *N* = 102 Mean age: 52 years	Body Scan: n = 27; Mindful Breathing: *n* = 25; Slow Breathing: *n* = 25; Sitting Quietly: *n* = 25	**Self-Report** Beck Depression Inventory- II; PTSD Checklist **Psychophysiology** None	BS ↓ in PTSD BS ↓ in depression
Colgan et al. (2017)	Veterans with PTSD *N* = 102 Mean age: 52 years	Body Scan: *n* = 27; Mindful Breathing: *n* = 25; Slow Breathing: *n* = 25; Sitting Quietly: *n* = 25	**Self-Report** Participants were asked open-ended interview questions regarding the effects of the training **Psychophysiology** None	BS ↓ in stress BS ↓ PTSD symptoms

Dambrun (2016)	Healthy students *N* = 53 Mean age: 19.2 years	Body Scan: *n* = 27; Control Condition (lying quietly on mat): *n* = 26	**Self-Report** State Anxiety – Spielberger State Anxiety Inventory **Psychophysiology** None	BS ↓ anxiety
Ditto et al. (2006)	Healthy young adults Study 1: *N* = 32 Mean age: 21.6 years Study 2: *N* = 30 Mean age: 19.2	Study 1 Body scan: *n* = 10; Progressive Muscle Relaxation: *n* = 10; Wait List Control: *n* = 12 Study 2: Body Scan: *n* = 15; Audio tape of Harry Potter: *n = 15*	**Study 1:** **Psychophysiology** Blood pressure Heart Rate Heart Rate Variability Respiratory Sinus Arrhythmia **Study 2:** **Psychophysiology** Respiratory Sinus Arrhythmia High-frequency heart rate variability (.12 to.40Hz) Low -frequency heart rate variability (.06 to .10 Hz)	**Study 1** BS ↓ heart rate BS ↑ RSA **Study 2** BS ↑ RSA BS ↓ respiration rate BS ↑ Higher/Lower frequency HRV BS ↓ pre-ejection period changes
Josefsson et al. (2014)	Halmstad Municipality employees without mindfulness experience *N* = 126 Mean age of mindfulness group: 48.9 years Mean age of relaxation group: 50.4 years	Body Scan: *n* = 40; Mindfulness Condition: *n* = 46; Wait-List Control: *n* = 40	**Self-Report** The Hospital Anxiety and Depression Scale Experience Questionnaire **Psychophysiology** None	BS ↔ anxiety BS ↔ depression

	Mean age of waitlist control: 45.1 years			
Kropp & Sedlmeier (2019)	Students *N* = 56 Mean age: 24	Breathing: *n* = 18; Body scan: *n* = 14; Loving-kindness: *n* = 24	**Self-Report** Emotional regulation (Scales for Experiencing Emotion) and experience **Psychophysiology** None	Body scan ↑ emotional regulation and experience
Mirams et al. (2013)	Mostly women undergraduate students (6 males) *N* = 62 Mean age: 19.2 years	Body Scan Audio Recording	**Self-Report** State-Trait Anxiety Inventory (STAI-S) **Psychophysiology** None	BS ↔ on anxiety
O'Leary & Dockray (2015)	Women aged 18–46 years *N* = 35 Mean age: 28.4 years	Body Scan: *n* = 13; Gratitude: *n* = 15; Wait-list: *n* = 7	**Self-Report** Perceived Stress Scale Edinburg Depression Scale **Psychophysiology** None	BS ↓ in stress and ↔ depression
Sauer-Zavala et al. (2013)	Undergraduate students *N* = 141 Mean age: 18.9 years	Body Scan Sitting Meditation Mindful Yoga	**Self-Report** The Difficulties in Emotion Regulation Scale: problems in emotion regulation. - The rumination subscale of the Rumination Reflection	BS ↔ emotion regulation BS ↓ rumination

			Questionnaire: tendency to engage in rumination **Psychophysiology** None	
Schultchen et al. (2019)	People with experience in meditation ranging from regular weekly experience to no experience *N* = 47 Mean age of body scan: 22.2 years Mean age of control condition: 22.5 years	Body Scan: *n* = 24; Audio Book Condition *n* = 23	**Self-Report** Trier Inventory for the Assessment of Chronic Stress-Screening Subscale of Chronic Stress (TICS-SCSS) **Psychophysiology** Cortisol, DHEA as biological stress markers	BS ↓ cortisol, DHEA BS ↓ stress
Wahbeh et al. (2016)	Combat veterans diagnosed with PTSD confirmed through clinician interview who also are in good general medical health and were on stable doses of medications and therapy for duration of the study *N* = 102 Mean age = 52.1 years	Body Scan: *n* = 27; Slow Breathing (RESPeRATE) *n* = 25; Body Scan + Slow Breathing (RESPeRATE) *n* = 25; Sitting Quietly *n* = 25	**Self-Report** PTSD checklist; Perceived stress scale; Beck Depression Inventory-II; Positive and Negative Affect Schedule **Psychophysiology** Cortisol ECG Blood pressure Respiration	BS ↓ respiration BS ↔ HRV BS ↓ cortisol BS ↓ stress BS ↓ depression BS ↔ post-traumatic stress checklist (PCL) BS ↓ negative emotional valence

Table 2

Summary of the Body Scan Practice Empirical Literature for Reducing Stress and Psychopathology

Category (number of publications)	Description of major findings
Stress (*n* = 6)	
Psychophysiology (*n* = 3)	
Cardiovascular measures (*n* = 2)	
HR (*n* = 1)	▪ The only study that examined this variable (*n* = 1) indicated reduced heart rate.
RSA/HRV (*n* = 2)	▪ The sole study that examined RSA found that the body scan improved this outcome variable (*n* = 1), the same study also found evidence of increased HRV. Another study found no significant difference in HRV (*n* = 2, 50%).
Respiration (*n* = 2)	▪ Two studies examining respiration found stress-buffering effects of BS on RSA/respiration.
PEP (*n* = 1)	▪ One study did not find that the body scan intervention improved PEP functioning.
Neuroendocrine measures (*n* = 2)	
Cortisol (*n* = 2)	▪ All of the studies (*n* = 2, 100%) found that the body scan reduced stress.
Dehydroepiandrosterone (*n* = 1)	▪ The only study that examined DHEA, (*n* = 1, 100%) found that the body scan reduced stress.
Self-Report (*n* = 5)	▪ All of the studies (*n* = 5; 100%) of the studies that employed self-report measures of stress found that the body scan reduced stress.
Psychopathology (*n* = 10)	
Anxiety (*n* = 4)	▪ One of the studies (25%) looking at anxiety found significant reductions in anxiety following the body scan practice.
Depression (*n* = 4)	▪ Half of the studies found that the body scan reduced depression.
Perseverative cognitions (*n* = 1)	▪ The only study that examined perseverative cognitions found that the body scan reduced these perseverative cognitions.
Post-traumatic stress disorder (*n* = 3)	▪ Two thirds of the studies indicated that the body scan reduced symptoms of PTSD.
Emotional regulation and valence (*n* = 3)	▪ Over half (*n* = 2; 66%) of the studies found that the body scan improved measures of emotional regulation and/or valence.

Note: HR = heart rate; RSA = respiratory sinus arrhythmia; HRV = heart rate variability; Dehydroepiandrosterone = DHA; PTSD = Post-traumatic stress disorder

Table 3

Summary of the results from the Jadad scale for reporting randomized controlled trial

Authors	Randomization (2)	Blinding (2)	An account of all patients (1)	Article total score (%)
Call et al. (2014)	Randomization is mentioned (1)	Not mentioned (0)	Account of all patients is included (1)	2/5 (40%)
Colgan et al. (2016)	Randomization is mentioned and included an appropriate method (2)	Unblinded intervention (0)	Account of patients is not included (0)	2/5 (40%)
Colgan et al. (2017)	Randomization is mentioned and included an appropriate method (2)	Not mentioned (0)	Account of patients is not included (0)	2/5 (40%)
Dambrun (2016)	Randomization is mentioned (1)	Not mentioned (0)	Account of patients is not included (0)	1/5 (20%)
Ditto et al. (2006)	Randomization is mentioned (1)	Not mentioned (0)	Account of patients is not included (0)	1/5 (20%)
Josefsson et al. (2014)	Randomization is mentioned and included an appropriate method (2)	Not mentioned (0)	Account of all patients is included (1)	3/5 (60%)
Kropp & Sedlmeier (2019)	Randomization is mentioned and included an appropriate method (2)	Blinding is mentioned (1)	Account of all patients is included (1)	4/5(80%)
Mirams et al. (2013)	Randomization is mentioned and included an appropriate method (2)	Blinding and method is appropriate (2)	Account of all patients is not included (0)	4/5 (80%)
O'Leary & Dockray (2015)	Randomization is mentioned (1)	Not mentioned (0)	Account of all patients is not included (0)	1/5 (20%)
Sauer-Zavala et al. (2013)	Randomization is mentioned but completed inappropriately (0)	Blinding and method is appropriate (2)	Account of all patients is not included (0)	2/5 (40%)
Schultchen et al. (2019)	Randomization is mentioned (1)	Not mentioned (0)	Account of all patients is included (1)	2/5 (40%)
Wahbeh et al. (2016)	Randomization is mentioned with appropriate method (2)	Blinding is mentioned (1)	Account of all patients is not included (0)	3/5 (60%)
Category total score (%)	17/24 (71%)	6/24 (25%)	4/12 (33%)	**Grand total: 27/60 (45%)**

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