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Mindfulness and blood pressure across demographics: Analyses from the Serenity Study

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MINDFULNESS AND BLOOD PRESSURE ACROSS DEMOGRAPHICS: ANALYSES FROM THE SERENITY STUDY

by

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Abstract

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Mindfulness, as a state, trait, and training, is linked with myriad positive mental and physical health outcomes. Understanding the individual characteristics potentially influencing links between mindful traits, mindfulness training, and physical health, is therefore important, yet remains under-addressed. Utilizing data from the ongoing Serenity Study (NCT02371317), the current project examines if (1) at baseline, higher trait mindfulness relates to lower BP consistently as a function of demographics, (2) Mindfulness-Based Stress Reduction (MBSR) training lowers BP consistently across demographic subgroups and initial levels of trait mindfulness, and (3) if change in trait mindfulness following MBSR training correlates with change in BP following mindfulness training, consistently across demographic groups. Results show that some trait mindfulness facets relate differently to BP across race and gender, that MBSR training may not be effective at lowering BP in demographics outside of people who are White, that improvement in trait mindfulness may not drive change in BP after MBSR training, and that mindfulness research would benefit from improved sample diversity to explore potential demographic differences in the relationship between mindfulness and health, rather than assuming beneficial effects generalize across populations.

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Chapter One

Introduction

An estimated 85.7 million adults, roughly 34% of Americans, are currently diagnosed as having high blood pressure (BP), or hypertension (HTN): systolic blood pressure (SBP) over 140 mmHg and/or diastolic blood pressure (DBP) over 90 mmHg (Benjamin et al, 2017). HTN is the preeminent risk factor for cardiovascular disease (CVD), causing 54% of stroke and 47% of ischemic heart disease events worldwide (Lawes, Hoorn & Rodgers, 2008). In 2010, HTN was a component in 18% of all deaths (9.4 million globally). The United States alone spends an estimated 46 billion dollars a year treating this ubiquitous condition (Campbell et al, 2015). Typically, HTN treatment includes antihypertensive medications, namely thiazide diuretics, beta blockers, Angiotensin converting enzyme inhibitors (ACE inhibitors), Angiotensin II receptor blockers (ARBs), and calcium channel blockers (CCBs; Chobanian, 2003), but most commonly a combination of thiazide diuretics and ACE inhibitors (Jarari et al., 2015). Both prevalence and severity of HTN differ across race.

Black people experience the highest rates of CVD incidence and CVD morbidity compared with White and Hispanic people (Graham, 2015). An estimated 43.5% of non-Hispanic Blacks, 33.0% of Hispanics, and 27.5% of non-Hispanic Whites fall within adult diagnosable criteria for HTN established by the 7th Report of the JNC on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (Fei et al., 2017). Other demographics have similar disparities-- older age is a primary risk factor for HTN and CVD (North & Sinclair, 2012), men have higher lifetime CVD risk and morbidity than women (Mosca, Barrett-Connor & Wegner, 2011), and people with lower SES have higher HTN and CVD incidence and morbidity compared against higher SES people (Schultz et al., 2018).

In addition, effects of antihypertensive medications vary widely across demographics, particularly race and degree of HTN. A single antihypertensive medication is unlikely to effectively control BP for more than 25-50% of patients. For example, ACE inhibitors are relatively ineffective at lowering BP in Black people (30% response rate) but are more successful in White people (55% response rate; Sever, 1998). Similarly, people with stage-one hypertension report better outcomes when prescribed CCBs, ACE inhibitors or ARBs versus thiazide diuretics or beta-blockers (Gupta, 2010). Most patients seen for HTN are diagnosed with elevated BP (SBP of 120-129 mmHg and DBP of <80 mmHg) or stage one HTN (SBP of 130-139 mmHg or DBP of 80-89 mmHg; Egan & Stevens-Farby, 2015).

Alarmingly, many people with milder forms of HTN are overtreated, and given the same level of medication or the same medications as people with more severe BP levels (Kerr et al., 2012). A recent review by the Cochrane Foundation highlighted this discrepancy, analyzing drug treatment outcomes from 8,912 participants with pre-HTN. Treatment with antihypertensive medications versus placebo did *not* reduce total mortality, even after 4-5 years of medication. Furthermore, antihypertensive medications did not reduce rates of coronary heart disease, stroke or total cardiovascular events in 79% of participants compared with a placebo. Adverse side-effects from antihypertensives caused 9% of participants to cease treatment totally (Diao, Wright, Cundiff & Gueyffier, 2012). Other studies have found specific and substantial adverse effects of antihypertensive overmedication, including angioedema, kidney failure, hastened cognitive decline, and atrophy in the thalamus, putamen and hippocampus as well as decreased gray matter integrity (Gibbs, Lip & Beevers, 1999; Mossello et al., 2015; Foster-Dingley et al., 2015; Foster-Dingley et al., 2015a). Although HTN is controllable via lifestyle modifications paired with antihypertensive medication if behavioral changes are ineffective (Egan & Farby, 2015), ultimately only one in five people with HTN successfully manages their condition with conventional treatments, often due to difficulty adhering to long-term lifestyle modifications and medication regimens (Hamer, 2010). Given the prevalence, disparities, and suboptimal outcomes for treating HTN, alternative approaches to managing high BP are necessary, specifically for people with elevated BP but not full HTN.

Stress is another modifiable risk factor that is both an HTN source and an instigator of other HTN risk factors, like poor diet and physical inactivity. Although stress is largely environmentally driven, the perception of stress is a changeable internal experience, thereby stress reduction may be a favorable treatment target. Stress impacts BP via numerous biobehavioral mechanisms. Harmful chronic stress and cognitive perseveration about stressors trigger biological stress reactions in the autonomic nervous system and adrenocortical systems, cyclically inducing stress-related symptoms and illnesses. Activation of these systems causes adrenal hormones like dopamine, epinephrine and norepinephrine (catecholamines increasing cardiac output) to be released, actuating acute stress responses maintaining short term homeostasis. Paradoxically, effects of these stress-reactivity systems on the body are adverse when activated too often, too strongly, or for extended lengths of time. Observed effects include damaging the immune and sympathetic nervous systems, the hippocampal-pituitary-adrenal axis, the vascular system, and hastening global pathology (McEwen, 2000). Allostatic load is this cumulative 'wear and tear' on bodily systems over time. Normal, adaptive allostatic processes fail, and typical cardiovascular, neuroendocrine and neuroenergetic responses become continuously active, leading to an inadaptability of associated physiological systems. For example, inadaptability of the vascular system increases arterial blood flow and repeatedly elevates BP, spurring development of preclinical vascular pathology including endothelial cell damage and general vascular overload, ultimately resulting in harmful vascular remodeling, in which arteries become narrowed and hardened with plaque, lose elasticity, and this becomes vulnerable to HNT (Peters, McEwen & Friston, 2017). The potency of chronic stress as a dually predictive and developmental factor for many diseases, particularly HTN and CVD, conveys the necessity of non-pharmaceutical, effective and accessible stress-reducing interventions that positively impact physical health, while lessening disease risks and states. (Denollet, Schiffer & Spek, 2010). Teaching people with high BP to better manage stress could help control BP in at least two ways: (1) Directly buffering cardiovascular stress reactivity thereby reducing allostatic load, and indirectly by (2) initiating and maintaining healthy lifestyle changes typically compromised by chronic stress, like diet, exercise, and sleep. An increasingly acknowledged potential intervention addressing this need is mindfulness.

Mindfulness

Mindfulness is commonly defined as nonjudgmental awareness of one's present-moment experience (Kabat-Zinn, 2009). Appearing in secular healthcare settings in the United States 40 years ago, mindfulness practice is heralded as an innovative, nonpharmacologic, and cost-effective method of stress reduction. One recent national survey shows that 12% of Americans report using mindfulness techniques, like meditation, to reduce stress (Herman et al., 2017; Kabat-Zinn, 1979; American Psychological Association, 2017). The surging popularity of mindfulness is unsurprising, given the considerable evidence of its effectiveness in reducing stress and bolstering well-being (Greeson & Chin, 2019), and rising reports of stress and stress-related diseases across the world (Regus, 2014).

Like stress, mindfulness can be conceptualized as a multidimensional concept. On one hand, mindfulness is an inherent *trait;* everyone has some natural ability to be mindful, and this ability varies across individuals. This is termed dispositional or trait mindfulness. In addition, mindfulness can be a momentary *state* of balanced awareness and acceptance, such as during meditation. Finally, mindfulness is also a *training* to develop mindfulness skills through meditation practice such as through the eight-week mindfulness based stress reduction (MBSR) training program (Shapiro & Carlson, 2009; Lindsay, Young Smyth, Brown & Creswell, 2017). In theory, several different mindfulness skills – sometimes called facets – are believed to reduce perceptions of stress and self-regulate physiological responses that, over time, contribute to risk of HTN and CVD (Greeson, 2009; Holzel et al., 2011; Shapiro, Carlson et al. 2005). For example, an observant and present-moment oriented mindset may allow accurate appraisal of a stressor, its context, and of subsequent cognitive, emotional, and bodily reactions. Theoretically, this increased self-awareness, alongside decreased judgment and increased acceptance of reactions to the stressor and related internal events, may reduce physiological reactivity during stress. Cyclically, cultivation of this 'mindful' reappraisal system in acute stress events (including adaptive changes in cognitions, emotions, and physiological responses) could lead to long-term improvements in cognitions and behaviors related to stress (Garland, 2017). A more mindful reappraisal system, formed from high inherent levels of mindfulness as a trait or via mindfulness training, utilizing core qualities of mindfulness like Observing (noticing details of internal and external contexts), Describing (ability to put words to experiences), Nonjudging (accepting and not evaluating experienced cognitions, emotions, and sensations), Nonreactivity (allowing thoughts, feelings and sensations to pass without fixating or reacting to them), and Acting with Awareness (ability to pay attention to current activities; not being on 'autopilot') could buffer acute biological stress reactivity, reduce allostatic load, and thereby promote healthy BP in people at-risk for or with high BP (Creswell & Lindsay, 2014).

Preliminary explorations of the link between trait mindfulness and physical health present mixed findings. A longitudinal study by Murphy, Mermelstein, Edwards and Cidycz (2012) found that high trait mindfulness predicted good self-reported physical health as measured by the Cohen-Hoberman Inventory of Physical Symptoms across a 10-week period. A cross-sectional epidemiologic study by Loucks et al. (2015) found that participants with low levels of self-reported trait mindfulness as measured by the Mindful Attention Awareness Scale who were not obese as children were more likely to become obese in adulthood than participants with higher trait mindfulness scores. A later study by Loucks et al. (2016) demonstrated that some elements of good vascular health, like low fasting glucose, high physical activity, and not smoking, associated with high trait mindfulness, while other elements such as BP, cholesterol level, and fruit or vegetable consumption, were not. Tomfohr, Pung, Mills and Edwards (2015) investigated the relationships between multiple subscales of trait mindfulness, BP, and interleukin-6 (IL-6), resulting in varied findings, whereas higher scores on the Observing subscale of the FFMQ correlated with lower levels of IL-6 when scores on the Nonreactivity subscale were also high, with no other subscales showing associations. BP was not associated with any subscales except among participants with high Nonjudging scores, such that as Acting with Awareness increased, BP decreased. These initial results are inconclusive, but indicate that different facets of trait mindfulness may relate differently to biological markers of stress, including BP. Theoretically, improvements in trait mindfulness can lead to increased mindful states and behaviors, thereby impacting health, so greater understanding of how specific trait mindfulness facets change following mindfulness training may inform possible causal mechanisms by which the training improves health related outcomes (Carmody, Baer, Lykins & Olendzki, 2009). It is unknown if high levels of trait mindfulness prior to mindfulness training improve health related outcomes following mindfulness training, or conversely, if low levels of trait mindfulness allow for more 'room to grow' during mindfulness training, thereby increasing benefit. Given the relative paucity and inconsistency of data linking trait mindfulness and objective biomarkers on cardiovascular health, further investigation of the links between trait mindfulness, mindfulness training, and health in a diverse sample of adults with elevated BP could inform more efficient utilization of mindfulness training as a complementary intervention for stress-related physical conditions and diseases, like HTN and CVD.

While it is still unclear if trait mindfulness affects or relates to BP, early studies indicate that mindfulness-based interventions (MBIs) may be a viable treatment for stress-related physical conditions and diseases, given substantial evidence that MBIs decrease subjective stress both short- and long-term (Martin-Asuero, 2010; Evans et al, 2011; Geary & Rosenthal, 2011; Britton, Shahar, Szepsenwol & Jacobs, 2012; Bergen-Cico, Possemato & Cheon, 2013). One small randomized controlled trial (RCT) compared MBSR training to progressive muscle relaxation (PMR) training in unmedicated adults with pre-HTN and found that MBSR training significantly reduced both clinic SBP (4.9 mmHg) and DBP (1.9 mmHg) versus PMR (Hughes et al., 2013). Although changes in daytime and nighttime ambulatory SBP (3.5 mmHg) and DBP (1.4 mmHg) did not significantly differ from PMR, ambulatory SBP change in the MBSR training group was clinically noteworthy (Hughes et al., 2013). BP changes of the size found in this trial are known to reduce incidence of heart attack, stroke, and CVD-related death, if sustained (Whelton et al., 2002). In contrast, a larger RCT with participants diagnosed with stage 1 hypertension found that MBSR training had no effect on ambulatory SBP (0.4 mmHg) and DBP (0.0 mmHg) compared against a waitlist control group (Blom et al., 2014).

Studies of MBIs and BP reactivity to laboratory stressors generally support MBIs as decreasing BP reactivity, but results are not wholly consistent. One RCT found that MBSR training generated small decreases in BP reactivity to a mental arithmetic and speech task (Nyklíček et al., 2013). A 3-armed RCT comparing app-based interventions found that compared with other interventions, mindfulness intervention app reduced SBP reactivity to the Trier Social Stress Test (Lindsay et al., 2018), while another RCT found that brief mindfulness exercises lowered BP reactivity over the duration of a speeded math stressor (Steffen & Larson, 2015). Conversely, one RCT testing a brief mindfulness exercise found no significant effects on BP reactivity to stress (Grant et al., 2013).

Initial research exists investigating the links between mindfulness, stress, and cardiovascular health, is limited, and results are mixed. Yet, when considering mindfulness as either a trait or interventional approach buffering and reducing high BP, several critical issues in the current literature likely contribute to the apparent variation in findings. The bulk of people utilizing MBIs are healthy, middle-age, high-income, college-educated, female & White (Burke, Lam, Stussman & Yang, 2017). This specific population also demographically mirrors most participants studied in mindfulness research (Chin, Anyanso & Greeson, 2019). In contrast, the people most likely to be diagnosed with HTN are older-age, lower SES, male, and non-White. Minimal research has examined if mindfulness, as a trait or a training, influences physical health differently across demographic characteristics like race, age, gender, and SES. This imbalance is especially concerning when considering the substantial disparity of HTN alongside the disparity in consequent negative CVD outcomes, across demographics (Fei et al. 2017; Lackland, 2015). Initial research indicates that the effect of MBIs on BP is potentially moderated by race. Palta et al.'s small pilot study evaluating MBSR training effectiveness with older-adult Black participants (n = 12) produced highly significant results- more than quadruple the reduction in SBP (21.92 mmHg) and over eight times the reduction in DBP (16.7 mmHg) found in Hughes et al.'s largely White sample (Palta et al., 2012). Greater understanding of potential variation in how mindfulness as a trait and training affects people with demographically disparate, stress-related health conditions and diseases like HTN is increasingly important given the rising popularity of MBIs as a component of stress-related disease treatment. Still, diversity in mindfulness research remains under-addressed.

Furthermore, much of the existing research on the relationship between mindfulness and physical health utilizes subjective health measures versus objective health measures. Mindfulness training impacts people's interpretations of and reactions to physical illness and pain, generating improvement on subjective health measures. Although these changes may reflect improved well-being and quality of life, subjective health improvement does not parallel recovery or improvement in objective health measures related to physical disease, like BP (Greeson & Chin, 2019). Additionally, studies utilizing objective measures only sporadically collect data on relevant covariates. Extensive past research has identified covariates of BP, yet few mindfulness trials have controlled for these factors when analyzing BP, even if data on these covariates are collected as part of the trial. Common alternatives include controlling for pre-training BP levels (Hughes et al., 2013; Lindsay et al., 2018), or only collecting and utilizing information on some of the known relevant covariates, often age, sex, BMI or antihypertensive use (Nyklíček et al., 2013; Palta et al., 2013). Methodological improvements, like increased use of objective health measures alongside controlling for all possible relevant covariates, may clarify how mindfulness relates to physical health.

Therefore, the current study used both cross-sectional and longitudinal data from an ongoing multisite clinical trial to address methodological limitations common in the current field of mindfulness and cardiovascular health. Based on a review of the literature, and informed by pertinent theories, we propose three research questions: (1) At baseline, does higher *trait* mindfulness relate to lower BP after controlling for known covariates of BP, and does this relationship differ as a function of demographics? (2) Does MBSR training lower BP, and does it do so across demographic subgroups and initial levels of trait mindfulness? (3) Finally, is change in trait mindfulness correlated with change in BP following MBSR training, and does this association occur across demographic subgroups?

Chapter Two

Methods

The current study proposed to analyze both baseline and pre-post intervention data from the Serenity Study (NCT02371317), an ongoing multi-site RCT comparing the efficacy of MBSR training and stress-management education (SME) in lowering BP among adults with pre-HTN.

Participants

Table 1

Sample Demographics

	All	RCT	OL
N	296	156	140
Race (% Black)	25%	28.1%	20.6%
Race (% White)	69%	69.4%	68.8%
Age	50.7	49.7	51.7
Gender (% Female)	58%	52%	65.2%
SES (% Lower)	47.7%	52.5%	41.9%
BMI	28.7	29.3	28
Smoking History (% Smoked)	22.4%	22.2%	22.7%
Risky Drinking (% Engage)	1.4%	2.5%	0%
Healthy Diet (% Healthy)	40.1%	37.7%	43%
Hours Exercised/Day	2.5	2.6	2.4
Hours Slept/Day	6.9	6.9	6.8
Clinic SBP (mmHg)	123.7	124.4	122.8
Clinic DP (mmHg)	72.9	73.5	72.1
Ambulatory SBP (mmHg)		142.9	
Ambulatory DBP (mmHg)		84.5	
SBP Reactivity (mmHg)		10.9	
DBP Reactivity (mmHg)		9.1	
Observing	26.49	26.64	26.28
Describing	28.03	28.10	27.95
Acting with Awareness	26.71	27.09	26.31
Nonjudging	28.08	28.13	27.97
Nonreactivity	21.04	21.03	20.98
Decentering	42.02	42.23	41.73

Baseline. Participants (N = 296; M_{age} = 50.69, SD = 12.77) include medicated and unmedicated men (42.1%) and women (57.9%) with and without pre-HTN (SBP of 120--139 or DBP of 80--89, consistent across two clinic assessments) as measured by criteria established by the 7th Report of the Joint National Committee (JNC) on Prevention, Detection, Evaluation and Treatment of High Blood Pressure. Regarding race, 206 (69.1%) identified as White, 74 (24.8%) as Black, 19 (6.4%) as Asian, 6 as Native American/Alaskan (2%), and 1 as Pacific Islander (.3%). People were excluded from the RCT if they were morbidly obese (BMI = 40), if they had existing heart disease as evidenced by a pacemaker, atrial fibrillation, myocardial infarction, percutaneous transluminal coronary angioplasty, coronary artery bypass graft within six months of enrollment, persistent tachyarrhythmia, congestive heart failure, uncorrected primary valvular disease, hypertrophic or restrictive cardiomyopathy, or uncorrected thyroid disease, chronic kidney disease, or if they fell within JNC risk category C (including target organ damage and diabetes). In addition, people were excluded if they were pregnant or planning to become pregnant within nine months, lactating, unable to comply with assessment procedures, unable to provide informed consent, or had dementia; and if they had abused alcohol or drugs in previous 12 months, regularly consumed more than 21 alcoholic drinks per week, been current smokers, or if they already had 27 hours of formal, or 56 hours of informal, meditation or yoga training. Baseline data included RCT participants as well as open-label participants. Open-label (OL) participants were excluded from the formal RCT due to not meeting eligibility criteria, but they still opted to take part in the MBSR training or SME interventions in exchange for providing BP and other relevant data. Open-label participants were mainly included to form viable

MBSR training and SME group sizes. Moreover, the larger combined sample size improved statistical power for baseline analyses. And, many of the open-label participants still had relatively high BP and qualified as prehypertensive, given the recently lowered criteria in American Heart Association high BP guidelines (Whelton et al., 2017). See Table 1 for further participant demographic information.

Pre-post intervention. RCT participants in the MBSR training group (N = 44; M_{age} = 49, SD = 13.1) included unmedicated men (48.9%) and women (51.1%) with elevated BP, consistent across two clinic assessments) as measured by criteria established by the 7th Report of the JNC on Prevention, Detection, Evaluation and Treatment of High Blood Pressure. Among these participants, 31 (68.9%) identified as White, 11 (24.4%) as Black, 2 (4.4%) as Asian/Pacific Islander, and 1 as mixed-race (2.2%). People were excluded identically to baseline exclusion criteria. See Table 1 for further participant demographic information.

Procedure

The institutional review boards of Kent State University and University of Pennsylvania reviewed and approved study procedures. All potential participants completed initial eligibility and medical screening over the phone by study staff, or online via REDCap. Potential participants not excluded after the initial screening were then scheduled for the first in-clinic screening session, where clinic BP was determined, following standard American Heart Association (AHA) procedures (Pickering et al., 2005). Potential participants were asked to refrain from vigorous exercise and consuming alcohol and caffeine for at least four hours before their appointment time.

Potential participants with three consistent (within 5 mmHg) pre-hypertensive BP readings during the initial BP screening visit were further considered as eligible. One week later, a second, confirmatory clinic screening of BP determined final eligibility by repeating the BP assessment. Participants were then consented and enrolled, and additional baseline assessments of demographic information and self-report measures, including stress and mindfulness, were completed.

As illustrated in Figure 1, enrolled RCT participants were randomly assigned to one of three conditions: (1) MBSR training, (2) a Stress Management Education (SME) active control group, or (3) a wait-list control (AHA Recommended Self-care). Five total study visits occurred following enrollment: (1) pre- class visit, (2) mid -point visit, (3) post- class visit, (4) at 6-month follow up, and (5) 12-month follow up. Participants randomized to the wait-list (AHA self-care) group also completed pre-, mid- and post-visits over the 8-week intervention period. Clinic BP was measured, and questionnaires were completed at all study visits. Participants randomized to the MBSR training or SME groups completed mental stress testing and ambulatory BP monitoring at the pre-class, post-class, and 12-month follow up visits. Participants randomized to the AHA-Recommended Self-care group completed mental stress testing and ambulatory BP monitoring at pre-self-care, post-self-care phase, and at the 12--month follow up visit after taking part in their stress management program of choice. Clinic BP, ambulatory BP procedures and mental stress testing/BP reactivity are described in the measures section below. OL participants (who were not enrolled in the RCT) did not take part in ambulatory BP or mental stress testing lab visits.

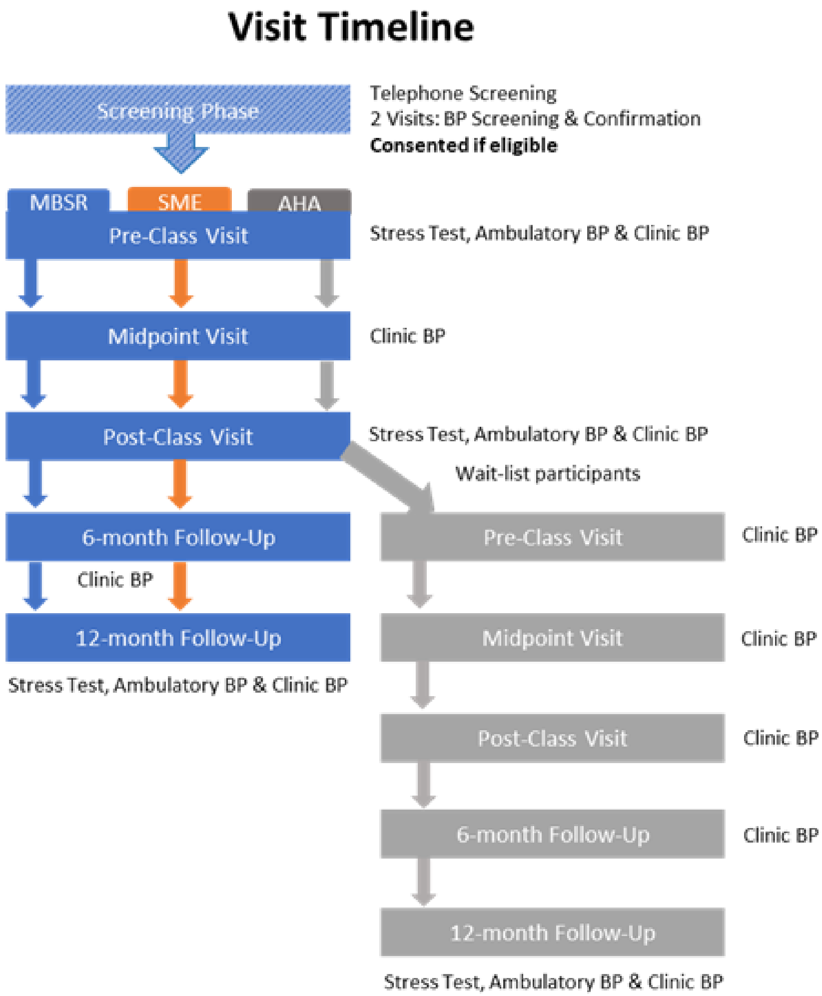

Figure 1. Enrolled participants were randomly assigned to one of three conditions, including MBSR training, an SME active control group, or AHA Recommended Self-care, a wait-list control.

Measures

Clinic BP. Clinic BP, the 'gold standard' measure of BP and the primary trial endpoint, was measured via an automatic oscillometric monitor, the Datascope Accutorr Plus™ (Mawah, NJ, USA). All clinic BP assessments were completed in a quiet and climate-controlled room, following AHA guidelines (Pickering, 2005). Participants had their BP reading taken from their non-dominant arm (supported at heart level) while seated in a chair with feet flat on the floor. The mean of three consistent seated readings of BP on the non-dominant arm was calculated to find clinic BP. If these three readings varied by more than 5 mmHg for SBP or DBP, further readings were taken at five-minute intervals, until either three consecutive readings ranging within 5 mmHg were collected, or until a maximum of six measures were taken. Potential participants whose SBP or DBP varied by more than 5 mmHg after six readings were considered ineligible due to excessive variability in BP.

Ambulatory BP. Ambulatory BP was measured via an automatic oscillometric monitor, the Oscar 2™ (SunTech Medical, Morrisville, NC). Participants were asked to wear the monitor for 24 hours following their pre-class visit, and to keep the monitor on while sleeping. The monitor collected BP readings every 20 minutes during the day (6 AM to 11 PM; 51 measures) then every 30 minutes during the night (11 PM to 6 AM; 14 measures). During each reading, participants were instructed to drop their arms to their sides as soon as they sense the cuff inflating, and to keep it relaxed and still until a few seconds after the deflation has finished.

BP reactivity. BP reactivity to stress was measured via an automatic oscillometric monitor, the Datascope Accutorr Plus™ (Mawah, NJ, USA). BP reactivity was calculated as a change score, by subtracting mean BP scores during the baseline rest period from mean BP scores during the anger recall task (ART), a brief (5-min) emotional stressor in which subjects were instructed to first recall, visualize and then verbally describe "a time that made you angry and when you think about it today, *still* makes you angry." (Greeson et al., 2009). The ART has been shown to reliably increase BP and HR (Schwartz et al., 2000).

Demographics and self-report questionnaires. Assessments included collection of demographic information, such as age, gender, race and SES/household income, as well as a battery of widely-used self-report measures of stress-related psychological symptoms and health behaviors. Self-report measures included the DASH diet diary (Appendix A), the Stanford 7-Day Physical Activity Recall Scale (Appendix B), and an assessment of health behaviors including smoking and alcohol intake, among others.

Trait mindfulness. Trait mindfulness was assessed via two scales. The first measure, the Five Facet Mindfulness Questionnaire (FFMQ; Appendix C), is a widely utilized 39-item gauge of trait mindfulness with questions distributed amongst five core facets including: Observing (8 items; $\alpha = .810$), Describing (8 items; $\alpha = .874$), Non-Judgment (8 items; $\alpha = .934$), Non-Reactivity (7 items; $\alpha = .881$), and Acting with Awareness (8 items; $\alpha = .902$). Questions on the FFMQ lie on a five-point Likert scale, ranging from one (*never or very rarely true*) to five (*very often or always true*). The FFMQ can be scored as a single total or by subscales, examining each facet individually (Gu et al., 2016). The second measure was the Decentering subscale of the Experiences Questionnaire (EQ; Appendix D), an 11-question self-report measure of another core feature of mindfulness- Decentering, or viewing experiences and perceptions objectively without over-identifying with them (α = .792). Higher scores on the FFMQ and the Decentering subscale of the EQ indicate higher trait mindfulness (Baer, Smith, Hopkins, Krietemeyer & Toney, 2006; Fresco et al., 2007). Both measures have adequate construct validity in adult samples (Goldberg et al., 2016; Fresco et al., 2007).

Interventions

Intervention descriptions were adapted from the Serenity Study grant application (NCT02371317).

Lifestyle modification. All eligible study participants received lifestyle modification advice consistent with JNC-7 recommendations for prehypertension, via an American Heart Association brochure (titled *"Understanding and Controlling Your High Blood Pressure"*) handed out to participants and briefly reviewed by a study staff member (American Heart Association, 2003). Specifically, patients were advised to lose weight if they were overweight, eat a healthy diet high in fruits and vegetables and low in saturated fat, cholesterol and salt, increase physical activity, and limit alcohol to no more than one drink each day for women and no more than two drinks a day for men.

Mindfulness based stress reduction (MBSR). The traditional MBSR training was based on the current curriculum developed by Drs. Saki Santorelli and Jon Kabat-Zinn (Santorelli & Kabat-Zinn, 2009). MBSR instructors (trained by Drs. Kabat-Zinn and Santorelli) followed the standard 8-week program, session-by-session. The MBSR program includes eight 2.5-hour weekly group sessions, in which participants were instructed in three core mindfulness meditation exercises: sitting meditation, body scan, and gentle mindful yoga. All meditation practices were designed to cultivate a decentered perspective, by paying attention to one's present-moment experience in a non-judging, non-reactive, allowing way. For example, in all mindfulness exercises, participants focus their attention on the target of observation and remain aware of it in each moment. When thoughts, emotions, or sensations arise, they were observed nonjudgmentally, without having to change anything. With practice, MBSR training participants come to see that most sensations, thoughts, and emotions are transient and do not require a deliberate attempt to suppress them or change them. Outside of the weekly class sessions, MBSR training participants were expected to practice formal mindfulness meditation exercises at home at least 45 minutes per day, six days per week. They were also encouraged bring mindfulness to everyday activities (e.g., eating, walking, driving, communicating with others). In Week 6, the class met for a Day of Mindfulness silent retreat, guided by the MBSR instructor. The full-day (9am-4pm) retreat provided a unique opportunity to practice being mindful continuously, as a community devoted to living more mindfully. MBSR instructors encouraged class participants to apply what they learn through practicing mindfulness to their everyday life and behavior, with the common goal of lowering BP by better controlling reactions acute stress and making conscious decisions to maintain healthy lifestyle behaviors in the face of chronic stress. MBSR training participants were also invited to attend subsequent Days of Mindfulness during the study. Finally, to maximize relevance and engagement for study patients with prehypertension, didactic material on emotions, stress physiology, coping, communication styles, and everyday examples of mindless "autopilot" behavior, such as overeating, overworking, having too much "screen time", avoiding exercise, and cutting back on sleep, were presented in the context of high BP.

Stress management education (SME). SME is an 8-week, group-based psychoeducational program designed to serve as an active control intervention for MBSR training (Hodge et al., 2013). SME is intended to provide equipoise for the non-specific elements of MBSR training without any of the putative active ingredients (e.g., mindfulness, yoga, etc.). Like MBSR training, SME patients learn about how stress affects health, participate in a supportive social environment, receive attention from a course instructor, hold a positive expectancy for healthy change, and engage in light physical exercise. SME also has the same in-class and home exercise time as the MBSR program, including a “Day of Stress Management” in the 6th week of SME, paralleling the “Day of Mindfulness” meditation retreat in MBSR training. SME also matches MBSR training for core elements of didactic content on how stress relates to eating patterns and nutrition, exercise, sleep, and time management. Time devoted to in-session educational activities and group discussion is also matched.

Wait-list control (WLC). Pre-hypertensive patients randomly assigned to the WLC condition engaged in BP and laboratory stress assessments concomitant with patients in the MBSR training or SME arms. After the post-intervention assessment, WLC participants were invited to participate in their choice of MBSR training or SME, based on their personal preference. Mid-treatment, post-intervention, and 6- and 12-month follow-up assessments were then conducted for WLC participants during their active interventions.

Data Analyses

Outcome measures included clinic SBP and DBP, ambulatory SBP and DBP, as well as SBP and DBP reactivity to stress. Clinic BP was calculated by averaging three BP readings following standard AHA protocol (Pickering et al., 2005). Ambulatory BP was calculated by averaging all valid readings obtained during daytime and nighttime, to compute separate daytime and nighttime means (Hughes, 2013). BP reactivity to stress was calculated by subtracting a participant's mean BP score (derived across five BP readings) during the baseline rest period from their mean BP score (derived across five BP readings) during the anger recall task. Descriptive statistics were performed via SPSS 23 software. The variables of interest and their residuals were screened for violations of relevant statistical assumptions, as well as outliers and missing data, prior to formal analyses. Missing data were imputed via multiple imputation in both SPSS 23 and R. Internal consistency of measures utilized were examined via Cronbach's alphas. To correct for multiple comparisons, a familywise alpha adjustment was applied to the alpha level for traditional statistical significance tests ($p = .05$ divided by a family of six primary outcome measures [clinic SBP and DBP; ambulatory SBP and DBP; reactivity SBP and DBP], resulting in $\alpha=.008$; Holland & Copenhaver, 1987).

Aim 1 data analyses. At baseline, does higher trait mindfulness relate to lower BP after controlling for known covariates of BP, and does this relationship differ as a function of demographics (race, age, gender and SES)? We predict that higher trait mindfulness relates to lower BP, and that this relationship remains consistent across demographics, as trait mindfulness emphasizes skills that are theoretically inherently accessible to all people. To answer this research question, we used baseline data (n=296) from the ongoing RCT, the Serenity Study (NCT02371317), including participants in the RCT and OL groups (n=296). First, we tested if higher trait mindfulness related to lower BP after controlling for known covariates of BP via hierarchical multiple regression. The first step of the model included known covariates of BP collected during the trial, including BMI, smoking history, risky alcohol use, healthy diet, hours exercised weekly, and hours slept daily, as well as dummy-coded demographic characteristics with known CVD and BP disparities-- race, age, gender and SES. The second step of the model had a trait mindfulness variable (Observing, Describing, Acting with Awareness, Nonjudging, Nonreactivity, or Describing). All continuous predictor variables were centered. This model was repeated across SBP and DBP in clinic BP, ambulatory BP, and BP reactivity, for each trait mindfulness facet, for a total of 36 models, each showing how a trait mindfulness facet predicted a form of BP. However, the ambulatory BP and BP reactivity analyses included fewer BP covariates due to smaller sample size and less statistical power. BP covariates used for these analyses included BMI, alongside the demographic categories linked with BP (see Tables 2-3). These relationships were interpreted via unstandardized regression coefficients (B) and associated p-values.

To answer if the relationship between trait mindfulness and BP differs as a function of demographics, we ran moderation analyses predicting the different forms of BP (clinic BP, ambulatory BP, BP reactivity) within the same sample. Model comparisons between a full model, including covariates of BP and demographic characteristics linked with BP, a single trait mindfulness variable (for example, Observing), and interaction terms between that trait mindfulness variable and demographic characteristics (for example, including the interaction terms between Observing and Race, Observing and Gender, Observing and Age, Observing and SES, etc.) and a reduced model, which dropped the trait mindfulness/demographic interaction terms, elucidated if the relationship between individual trait mindfulness facets and BP differed as a function of demographics. R^2 difference significance was measured via p-values, and model selection validity was evaluated via BIC and BF. If the R^2 difference between the full and reduced models reached alpha adjusted significance, it was interpreted as the relationship between that specific trait mindfulness facet and BP differing as a function of demographics, as the interactions would explain an increased proportion of variance in BP compared against the reduced model without interactions. BIC and BF were included as metrics to identify occurrence of model overfitting potentially causing the appearance of demographic differences in the relationship between trait mindfulness facets and BP with even small increases in variance explained (Kass & Raftery, 1995). The R package 'dustinfife/fifer', and function 'impute.model.comparison', were used to complete the multiple imputation and model comparisons, including R^2 p-value, Bayesian Information Criterion (BIC) and Bayes Factor (BF) as metrics, using the imputed data.

Power analyses were completed with G*Power 3.1 software. For a multiple regression assuming an alpha level of .05 and power of .95, the necessary sample size was 292 participants. The final sample size used in the clinic BP analyses was 296 participants, including RCT and OL participants. However, the final sample for ambulatory BP and BP reactivity to stress were underpowered to detect smaller effects, with sample sizes of 94 and 152, respectively, including only RCT participants.

Aim 2 data analyses. Does MBSR training lower BP, and does it do so across subgroups and initial levels of trait mindfulness? Due to low sample size (n=44), we treated this aim as a 'pilot' analysis, using pre-post data from the Serenity Study (NCT02371317). Specifically, we included RCT participants randomized to the MBSR training group across sites, and calculated the clinic BP pre-post mean difference in the whole sample and within each subgroup. Effect size (ES) calculated using Hedges' G for paired samples was the primary metric of choice, as Hedges' G natively corrects for errors generated by small sample sizes (Borenstein, Hedges, Higgins & Rothstein, 2011). One prior meta-analysis of 8,500 participants with high BP found that an ES of .235 equaled a SBP change of 3 mmHg (Conn, Ruppar & Chase, 2016). A small negative (-.235) ES of MBSR training on BP was therefore understood as potentially clinically relevant, if the confidence intervals (CIs) did not contain zero (Hagins, States, Selfe & Innes, 2013; Appel et al., 2006). Although the predicted changes were modest, they are similar in scale to other health behavior modifying therapies for high blood pressure, and are considered clinically relevant for people with prehypertension (Whelton et al., 2002). Differences in intervention ES between demographic subgroups were compared by calculating 95% CIs for each subgroup ES. If the 1) the CIs of the relevant ES did not contain zero, and 2) the CIs had at or under a quarter of overlap across demographic subgroups, the CI differences were interpreted as significant between the two ESs (Belia, Fidler, Williams & Cumming, 2005; McGough & Faraone, 2009).

Aim 3 data analyses. Finally, are changes in trait mindfulness facets and BP following MBSR training correlated, and do these correlations occur across different subgroups (age, gender, race, SES) and different initial levels of trait mindfulness? Due to low sample size, we treated this as a 'pilot' analysis, and using pre-post data from the Serenity Study (NCT02371317), calculated correlations between change in trait mindfulness facets after MBSR training and change in mean clinic BP after MBSR training for each subgroup. Correlation coefficient ES was the primary metric of choice, and moderate (-.3) ESs with CIs not containing zero were understood as a potentially meaningful link between changes in specific trait mindfulness facets and changes in BP following MBSR training. Again, differences in correlation coefficient ES between demographic subgroups were compared by calculating 95% CIs for each subgroup ES. If the 1) the Cis of the relevant ES did not contain zero, and 2) the CIs had at or under a quarter of overlap across demographic subgroups, the CI differences were interpreted as significant between the two ESs.

Chapter Three

Results

Results

Aim 1. At baseline, does higher trait mindfulness relate to lower BP after controlling for known covariates of BP, and does this relationship differ as a function of demographics (race, age, gender and SES)?

Separate regressions were conducted for SBP and DBP for each type of BP (Clinic BP, ambulatory BP, and BP reactivity to stress), predicting SBP or DBP from one of six facets of trait mindfulness at a time in separate regression models: Observing, Describing, Acting with Awareness, Nonjudging, Nonreactivity, and Decentering. Within clinic BP, ambulatory BP, and BP reactivity to stress, after controlling for covariates of BP, no mindfulness facets significantly related to BP, overall indicating a null relationship between BP and trait mindfulness.

Model comparisons showed that the relationship between trait mindfulness and BP did appear to differ as a function of demographics in some but not all facets. Within clinic BP, the reduced models accounted for relatively small amounts of variance in BP. However, the full models, with interaction terms added to account for potential demographic differences, showed small but significant increases in variance explained for SBP for Observing and Nonjudging, and for DBP for Acting with Awareness and Nonjudging, based on R^2 difference p-values, as shown in Table 2. Yet, when taken together with the BIC and BF favoring the reduced models—an indication that they may be more efficient— a plausible interpretation is that overfitting may have generated the appearance of demographic differences in the relationship between trait mindfulness facets and clinic BP.

Table 2

Results of the Clinic BP Model Comparisons For Each Trait Mindfulness Facet (n=296)

Model	*R2*	*BIC*	*BF*	*P*	*R2*	*BIC*	*BF*	*P*
	DV=SBP; Observing Facet				DV=DBP; Observing Facet			
Full	0.097	-31345.060	6.95E+26	<.001	0.035	-17385.400	3.63E+26	0.986
Reduced	0.088	-31468.670			0.035	-17507.710		
	DV=SBP; Describing Facet				DV=DBP; Describing Facet			
Full	0.093	-31526.030	1.23E-107	1.000	0.045	-17173.450	9.59E+48	0.070
Reduced	0.092	-31033.700			0.040	-17399.020		
	DV=SBP; Acting with Awareness Facet				DV=DBP; Acting with Awareness Facet			
Full	0.091	-31578.050	4.96E+38	0.119	0.055	-17044.740	1.99E+98	<.001
Reduced	0.085	-31756.250			0.036	-17497.420		
	DV=SBP; Nonjudging Facet				DV=DBP; Nonjudging Facet			
Full	0.116	-30279.430	3.63E+151	<.001	0.059	-17053.210	1.02E+29	<.001
Reduced	0.107	-30977.390			0.047	-17186.790		
	DV=SBP; Nonreactivity Facet				DV=DBP; Nonreactivity Facet			
Full	0.082	-31721.550	634281.6	0.660	0.035	-17493.790	3.98E-29	1.000
Reduced	0.080	-31748.270			0.035	-17363.000		
	DV=SBP; Decentering				DV=DBP; Decentering			
Full	0.089	-31330.290	2.36E+37	0.087	0.042	-17551.810	5.62E-10	0.019
Reduced	0.081	-31502.390			0.033	-17509.210		

Within Ambulatory BP, the reduced models again accounted for small amounts of variance in BP. In comparison, the full models showed small but significant increases in variance explained for both SBP and DBP in Observing, Describing, Acting with Awareness and Nonjudging, and for just DBP in Decentering, as shown in Table 3. Again, when considering the metrics altogether, it is plausible that the appearance of demographic differences in the relationship between trait mindfulness facets and clinic

BP based on R^2 difference p-values resulted from overfitting, as the BIC and BF metrics favored the reduced models.

Table 3

Results of the Ambulatory BP Model Comparisons For Each Trait Mindfulness Facet (n=96)

Model	*R2*	*BIC*	*BF*	*P*	*R2*	*BIC*	*BF*	*P*
	DV=SBP; Observing Facet				DV=DBP; Observing Facet			
Full	0.065	-11386.800	3.75E+67	<.001	0.145	-7196.167	8.31E+78	<.001
Reduced	0.036	-11698.000			0.097	-7559.605		
	DV=SBP; Describing Facet				DV=DBP; Describing Facet			
Full	0.107	-10089.610	1.00E+210	<.001	0.158	-7193.794	5.20E+142	<.001
Reduced	0.035	-11056.710			0.084	-7851.026		
	DV=SBP; Acting with Awareness Facet				DV=DBP; Acting with Awareness Facet			
Full	0.066	-10955.560	1.04E+62	<.001	0.145	-7345.234	3.05E+123	<.001
Reduced	0.037	-11241.160			0.108	-7913.900		
	DV=SBP; Nonjudging Facet				DV=DBP; Nonjudging Facet			
Full	0.152	-10108.610	3.08E+237	<.001	0.159	-7079.928	2.08E+210	<.001
Reduced	0.034	-11202.280			0.089	-8048.475		
	DV=SBP; Nonreactivity Facet				DV=DBP; Nonreactivity Facet			
Full	0.053	-10818.520	8.93E+93	1.000	0.098	-7812.671	4.50E+32	1.000
Reduced	0.052	-11251.180			0.096	-7963.044		
	DV=SBP; Decentering				DV=DBP; Decentering			
Full	0.052	-11021.470	2.05E+109	0.061	0.146	-7204.571	2.93E+127	<.001
Reduced	0.044	-11524.870			0.100	-7791.575		

Within BP reactivity, the reduced models similarly accounted for a small amount of variance in BP reactivity to stress. In comparison, the full models accounting for demographic differences again showed small but significant increases in variance explained for SBP and DBP for Acting with Awareness and Nonjudging, for just SBP in Nonreactivity and Decentering, and for just DBP in Observing and Describing, as shown in Table 4. Still, with all metrics taken together, as the BIC and BF favored the reduced models, it is plausible that the appearance of demographic differences in the relationship between trait mindfulness facets and BP reactivity based on R^2 difference p-values resulted from overfitting.

Table 4

Results of the BP Reactivity Model Comparisons For Each Trait Mindfulness Facet (n=152)

Model	*R2*	*BIC*	*BF*	*P*	*R2*	*BIC*	*BF*	*P*
	DV=SBP; Observing Facet				DV=DBP; Observing Facet			
Full	0.066	-11537.530	1650.897	0.983	0.040	-5294.515	1.99E+45	<.001
Reduced	0.063	-11552.350			0.016	-5503.121		
	DV=SBP; Describing Facet				DV=DBP; Describing Facet			
Full	0.075	-11586.120	2.66E-20	0.014	0.040	-5406.505	5.42E+21	<.001
Reduced	0.061	-11495.970			0.015	-5506.594		
	DV=SBP; Acting with Awareness Facet				DV=DBP; Acting with Awareness Facet			
Full	0.129	-10970.900	3.92E+73	<.001	0.055	-5213.006	5.50E+52	<.001
Reduced	0.079	-11309.810			0.014	-5455.886		
	DV=SBP; Nonjudging Facet				DV=DBP; Nonjudging Facet			
Full	0.124	-11007.930	1.33E+28	<.001	0.142	-4627.348	1.41E+119	<.001
Reduced	0.093	-11137.450			0.060	-5176.047		
	DV=SBP; Nonreactivity Facet				DV=DBP; Nonreactivity Facet			
Full	0.088	-11162.860	1.55E+64	<.001	0.022	-5369.602	6.20E+28	0.162
Reduced	0.076	-11458.460			0.017	-5502.195		
	DV=SBP; Decentering				DV=DBP; Decentering			
Full	0.098	-11232.620	1.64E+15	<.001	0.026	-5407.251	5.88E+16	0.290
Reduced	0.079	-11302.690			0.018	-5484.477		

In summary, although trait mindfulness and BP do not seem to relate before accounting for potential demographic differences, a small but significantly increased amount of variance in BP was explained by some trait mindfulness facets when the interactions between trait mindfulness and demographic variables were added as the third step of the model. Still, as shown in Tables 2-4 the BIC and BF metrics overwhelmingly favored the reduced models, indicating that although accounting for potential demographic differences generated small improvements to model fit, said improvements may result from model overfitting inflating the R^2 metric (Kass & Raftery, 1995). These results imply that the relationship between some trait mindfulness facets and BP may differ slightly but significantly across demographic groups. However, 1) due to the number of predictors and the BIC and BF favoring the reduced models, it was unclear if overfitting generated these results, and 2) it was indeterminable if specific demographics were driving these possible moderating effects as all four demographic interactions being included simultaneously.

Aim 1 exploratory analyses. Therefore, to determine if specific demographics drove observed significant differences within the model comparisons described as the main results of Aim 1, we tested a single demographic at a time. To do so, we utilized exploratory model comparisons between full models, in this case including covariates of BP, the relevant trait mindfulness variable and a *single* interaction term between that trait mindfulness variable and one demographic at a time, and reduced models, excluding the interaction term. Within each trait mindfulness facet that was previously found to vary in its relationship with BP as a function of demographics, the alpha adjusted p-values (α=.008) were used to determine if the full model accounted for significantly more variance than the reduced. BIC and BF were again utilized to identify occurrence of model overfitting causing the appearance of demographic differences in the relationship between trait mindfulness facets and BP with even small increases in variance explained (Kass & Raftery, 1995). If a full model with a single demographic both reached statistical significance via R^2 difference p-value, *and* was favored by the BIC and BF compared against a reduced model, it was interpreted as responsible for the earlier observed demographic differences in the relationship between that trait mindfulness facet and BP.

Table 5

Results of the Clinic BP Model Comparisons For Observing (n=296)

Model	*R2*	*BIC*	*BF*	*P*	*R2*	*BIC*	*BF*	*P*
DV=SBP; Race								
Full	0.094	-30787.660	3.67E+163	**<.001**				
Reduced	0.085	-31540.900						
DV=SBP; Age								
Full	0.091	-31417.460	8.46E+02	1.000				
Reduced	0.089	-31430.940						
DV=SBP; Gender								
Full	0.086	-31877.910	4.85E-82	0.477				
Reduced	0.087	-31503.450						
DV=SBP; SES								
Full	0.091	-31269.340	8.20E-44	0.016				
Reduced	0.089	-31070.920						

Note: Blackened sections denote that the relationship between the trait mindfulness facet and BP did NOT differ across demographics. ***Bold*** *denotes significance, α=.008*

In clinic BP, the relationship between the Observing facet and SBP seemed to vary significantly as a function of race based on the R^2 difference p-values though the BIC and BF favored the reduced model as more efficient, shown in Table 5. The relationship between Observing and DBP did not appear to differ across demographics. The relationship between Describing and BP did not differ across demographics.

Table 6

Results of the Clinic BP Model Comparisons For Acting with Awareness (n=296)

Model	*R2*	*BIC*	*BF*	*P*	*R2*	*BIC*	*BF*	*P*
	[redacted]				DV=DBP; Race			
Full					0.038	-17445.580	7.97E-08	1.000
Reduced					0.037	-17412.890		
					DV=DBP; Age			
Full					0.045	-17367.720	1.04E+26	**0.004**
Reduced					0.036	-17487.530		
					DV=DBP; Gender			
Full					0.045	-17280.930	1.13E+49	**<.001**
Reduced					0.037	-17506.830		
					DV=DBP; SES			
Full					0.042	-17249.850	8.23805E+60	0.073
Reduced					0.037	-17530.380		

Note: Blackened sections denote that the relationship between the trait mindfulness facet and BP did NOT differ across demographics. ***Bold*** *denotes significance, α=.008*

The relationship between Acting with Awareness and SBP did not differ across demographics. Based on the R^2 difference p-values, the relationship between Acting with Awareness and DBP seemed to differ as a function of both age and gender, though the BIC and BF indicated the reduced models as more efficient, shown in Table 6.

Table 7

Results of the Clinic BP Model Comparisons For Nonjudging (n=296)

Model	*R2*	*BIC*	*BF*	*P*	*R2*	*BIC*	*BF*	*P*
		DV=SBP; Race				DV=DBP; Race		
Full	0.110	-30734.150	6.14E-11	**<.001**	0.052	-17078.820	9.35E+48	0.043
Reduced	0.107	-30687.120			0.048	-17304.340		
		DV=SBP; Age				DV=DBP; Age		
Full	0.107	-30607.620	1.17E-42	1.000	0.050	-17295.930	3.95E+09	**0.001**
Reduced	0.105	-30414.520			0.048	-17340.130		
		DV=SBP; Gender				DV=DBP; Gender		
Full	0.107	-30578.690	5.08E+35	0.258	0.050	-17268.040	5.33E+09	1.000
Reduced	0.105	-30743.120			0.050	-17312.840		
		DV=SBP; SES				DV=DBP; SES		
Full	0.110	-30456.000	9.34E+55	0.054	0.051	-17189.900	1.69192E-16	0.057
Reduced	0.106	-30713.750			0.049	-17117.270		

Note: Blackened sections denote that the relationship between the trait mindfulness facet and BP did NOT differ across demographics. ***Bold*** *denotes significance, α=.008*

Based on the R^2 difference p-values, the relationship between Nonjudging and BP appeared to differ as a function of race across SBP and age across DBP, and the BIC and BF concurrently slightly favored the full model in race across SBP, but not in age across DBP, shown in Table 7. The relationship between Nonreactivity and BP, or Decentering and BP, did not differ across demographics.

Table 8

Results of the Ambulatory BP Model Comparisons For Observing (n=94)

Model	*R2*	*BIC*	*BF*	*P*	*R2*	*BIC*	*BF*	*P*
		DV=SBP; Race				DV=DBP; Race		
Full	0.034	-11222.770	5.63E-13	1.000	0.102	-7792.974	1.55E-38	1.000
Reduced	0.035	-11166.360			0.107	-7618.861		
		DV=SBP; Age				DV=DBP; Age		
Full	0.036	-11578.070	2.26E+18	1.000	0.112	-7837.483	2.61E-01	1.000
Reduced	0.034	-11662.590			0.099	-7834.794		
		DV=SBP; Gender				DV=DBP; Gender		
Full	0.055	-11385.810	5.84E-51	**<.001**	0.118	-7687.497	5.32E+37	**<.001**
Reduced	0.035	-11154.470			0.094	-7861.230		
		DV=SBP; SES				DV=DBP; SES		
Full	0.037	-11725.370	3.14E-127	1.000	0.100	-7924.594	2.4355E-74	0.294
Reduced	0.034	-11142.800			0.098	-7585.592		

Note: Blackened sections denote that the relationship between the trait mindfulness facet and BP did NOT differ across demographics. ***Bold*** *denotes significance, α=.008*

In ambulatory BP, the relationship between the Observing facet and BP appeared to differ as a function of gender across both SBP and DBP based on the R^2 difference p-values, and the BIC and BF concurrently slightly favored the full model in SBP but not DBP, shown in Table 8.

Table 9

Results of the Ambulatory BP Model Comparisons For Describing (n=94)

Model	*R2*	*BIC*	*BF*	*P*	*R2*	*BIC*	*BF*	*P*
	DV=SBP; Race				DV=DBP; Race			
Full	0.043	-11523.620	2.47E-88	1.000	0.092	-7781.495	2.34E+25	**0.003**
Reduced	0.037	-11120.180			0.091	-7898.321		
	DV=SBP; Age				DV=DBP; Age			
Full	0.035	-11696.420	1.51E-102	1.000	0.126	-7529.617	6.02E+77	**<.001**
Reduced	0.036	-11227.510			0.087	-7887.805		
	DV=SBP; Gender				DV=DBP; Gender			
Full	0.085	-11144.210	8.16E-23	**0.001**	0.093	-7974.978	1.41E-84	0.403
Reduced	0.034	-11042.490			0.092	-7588.824		
	DV=SBP; SES				DV=DBP; SES			
Full	0.042	-11038.580	3.34E+25	1.000	0.126	-7673.483	39.92609	**0.006**
Reduced	0.037	-11156.120			0.086	-7680.857		

Note: Blackened sections denote that the relationship between the trait mindfulness facet and BP did NOT differ across demographics. ***Bold*** *denotes significance, α=.008*

Based on the R^2 difference p-values, the relationship between the Describing facet and SBP differed again as a function of gender, and the BIC and BF concurrently slightly favored the full model, while in DBP, it differed as a function of race, age, and SES, though the BIC and BF favored the reduced models, shown in Table 9.

Table 10

Results of the Ambulatory BP Model Comparisons For Acting with Awareness (n=94)

Model	*R2*	*BIC*	*BF*	*P*	*R2*	*BIC*	*BF*	*P*
	DV=SBP; Race				DV=DBP; Race			
Full	0.041	-11227.630	7.45E-44	**0.003**	0.111	-7802.959	1.06E-08	**0.003**
Reduced	0.037	-11029.020			0.105	-7766.229		
	DV=SBP; Age				DV=DBP; Age			
Full	0.037	-11068.170	9.90E+133	1.000	0.107	-7716.173	1.17E+13	0.256
Reduced	0.037	-11685.240			0.106	-7776.348		
	DV=SBP; Gender				DV=DBP; Gender			
Full	0.042	-11015.400	6.82E+24	1.000	0.104	-7641.384	2.55E+18	1.000
Reduced	0.037	-11129.770			0.102	-7726.147		
	DV=SBP; SES				DV=DBP; SES			
Full	0.046	-11722.160	2.90E-54	**0.001**	0.134	-7446.191	1.47632E+67	**0.001**
Reduced	0.036	-11475.610			0.101	-7755.516		

Note: Blackened sections denote that the relationship between the trait mindfulness facet and BP did NOT differ across demographics. ***Bold*** *denotes significance, α=.008*

Based on the R^2 difference p-values, the relationship between Acting with Awareness and BP differed as a function of Race and SES across both SBP and DBP, and the BIC and BF concurrently slightly favored the full models in each of these potential demographic differences except for in SES across DBP, shown in Table 10.

Table 11
Results of the Ambulatory BP Model Comparisons For Nonjudging (n=94)

Model	*R2*	*BIC*	*BF*	*P*	*R2*	*BIC*	*BF*	*P*
		DV=SBP; Race				DV=DBP; Race		
Full	0.063	-10742.120	2.70E+67	**<.001**	0.105	-7698.167	3.06E+25	1.000
Reduced	0.034	-11052.650			0.096	-7815.535		
		DV=SBP; Age				DV=DBP; Age		
Full	0.035	-11717.100	8.82E-117	1.000	0.105	-7714.419	1.98E+44	1.000
Reduced	0.033	-11182.650			0.095	-7918.408		
		DV=SBP; Gender				DV=DBP; Gender		
Full	0.070	-10833.320	1.13E+214	**<.001**	0.096	-7907.680	8.45E-13	0.014
Reduced	0.034	-11819.070			0.090	-7852.081		
		DV=SBP; SES				DV=DBP; SES		
Full	0.093	-11084.280	1.68E+66	**<.001**	0.149	-7146.706	1.4664E+159	**<.001**
Reduced	0.035	-11389.260			0.093	-7879.694		

Note: Blackened sections denote that the relationship between the trait mindfulness facet and BP did NOT differ across demographics. ***Bold*** *denotes significance, α=.008*

Based on the R^2 difference p-values, the relationship between Nonjudging and BP differed as a function of SES across both SBP and DBP, and additionally differed across race and gender in only SBP, while the BIC favored the reduced models, shown in Table 11. The relationship between Nonreactivity and BP did not differ as a function of demographics.

Table 12

Results of the Ambulatory BP Model Comparisons For Decentering (n=94)

Model	*R2*	*BIC*	*BF*	*P*	*R2*	*BIC*	*BF*	*P*
[redacted]					DV=DBP; Race			
					0.108	-7739.156	6.38E+08	1.000
					0.097	-7779.703		
					DV=DBP; Age			
					0.149	-7398.757	1.25E+136	1.000
					0.099	-8025.509		
					DV=DBP; Gender			
					0.103	-7664.356	4.30E+34	0.129
					0.096	-7823.848		
					DV=DBP; SES			
					0.109	-7829.468	3.0365E-06	0.328
					0.101	-7804.058		

Note: Blackened sections denote that the relationship between the trait mindfulness facet and BP did NOT differ across demographics. ***Bold*** *denotes significance, α=.008*

The relationship between Decentering and SBP did not differ as a function of demographics, and although earlier analyses indicated that the relationship between Decentering and DBP may differ as a function of demographics, no individual demographic interactions significantly explained more variance in BP when comparing the full and reduced model R^2. Furthermore, the BIC and BF favored the reduced models in all cases but SES, shown in Table 12.

Table 13

Results of the BP Reactivity Model Comparisons For Observing (n=152)

Model	*R2*	*BIC*	*BF*	*P*	*R2*	*BIC*	*BF*	*P*
	[redacted]				DV=DBP; Race			
Full	[redacted]				0.022	-5439.088	7.04E+16	**<.001**
Reduced	[redacted]				0.017	-5516.675		
	[redacted]				DV=DBP; Age			
Full	[redacted]				0.022	-5445.172	4.93E+17	**<.001**
Reduced	[redacted]				0.015	-5526.653		
	[redacted]				DV=DBP; Gender			
Full	[redacted]				0.020	-5453.444	1.52E+24	**<.001**
Reduced	[redacted]				0.016	-5564.809		
	[redacted]				DV=DBP; SES			
Full	[redacted]				0.027	-5426.326	1.41942E+18	0.086
Reduced	[redacted]				0.015	-5509.919		

Note: Blackened sections denote that the relationship between the trait mindfulness facet and BP did NOT differ across demographics. ***Bold*** *denotes significance, α=.008*

In BP reactivity to stress, the relationship between the Observing facet and SBP reactivity did not differ across demographics, while the relationship between Observing and DBP reactivity appeared to differ as a function of race, age, and gender based on the R^2 difference p-values, though the BIC and BF still favored the reduced models, shown in Table 13.

Table 14

Results of the BP Reactivity Model Comparisons For Describing (n=152)

Model	*R2*	*BIC*	*BF*	*P*	*R2*	*BIC*	*BF*	*P*
	[redacted]					DV=DBP; Race		
Full					0.022	-5545.621	4.66E-07	**0.002**
Reduced					0.015	-5516.461		
						DV=DBP; Age		
Full					0.028	-5390.455	1.02E+22	1.000
Reduced					0.017	-5491.810		
						DV=DBP; Gender		
Full					0.017	-5479.768	6.62E+13	0.425
Reduced					0.017	-5543.416		
						DV=DBP; SES		
Full					0.023	-5469.174	5.73089E-07	0.267
Reduced					0.017	-5440.429		

Note: Blackened sections denote that the relationship between the trait mindfulness facet and BP did NOT differ across demographics. ***Bold*** *denotes significance, α=.008*

Based on the R^2 difference p-values, the relationship between Describing and SBP reactivity appeared to differ as a function of race, and the BIC and BF concurrently slightly favored the full model, shown in Table 14.

Table 15

Results of the BP Reactivity Model Comparisons For Acting with Awareness (n=152)

Model	*R2*	*BIC*	*BF*	*P*	*R2*	*BIC*	*BF*	*P*
		DV=SBP; Race				DV=DBP; Race		
Full	0.080	-11422.060	3.01E+06	**0.005**	0.034	-5421.057	2.84E+15	1.000
Reduced	0.079	-11451.900			0.015	-5492.221		
		DV=SBP; Age				DV=DBP; Age		
Full	0.092	-11109.210	9.16E+26	**<.001**	0.015	-5425.685	3.40E+02	1.000
Reduced	0.081	-11233.370			0.015	-5437.342		
		DV=SBP; Gender				DV=DBP; Gender		
Full	0.094	-10953.920	3.06E+64	**<.001**	0.014	-5485.268	1.63E+07	0.542
Reduced	0.080	-11250.890			0.014	-5518.477		
		DV=SBP; SES				DV=DBP; SES		
Full	0.095	-11099.750	1.31E+39	0.011	0.042	-5229.218	4.37151E+57	0.029
Reduced	0.081	-11279.890			0.015	-5494.663		

Note: Blackened sections denote that the relationship between the trait mindfulness facet and BP did NOT differ across demographics. ***Bold*** *denotes significance, α=.008*

Based on the R^2 difference p-values, the relationship between Acting with Awareness and BP reactivity appeared to differ as a function of race, age, and gender across SBP, though the BIC and BF still favored the reduced models. Although earlier analyses indicated that the relationship between Acting with Awareness and DBP may differ as a function of demographics, no individual demographic interactions significantly explained more variance in BP when comparing the full and reduced model R2, shown in Table 15.

Table 16

Results of the BP Reactivity Model Comparisons For Nonjudging (n=152)

Model	*R2*	*BIC*	*BF*	*P*	*R2*	*BIC*	*BF*	*P*
		DV=SBP; Race				DV=DBP; Race		
Full	0.113	-10789.620	3.36E+85	**<.001**	0.084	-5215.008	6.63E-08	**<.001**
Reduced	0.092	-11183.480			0.056	-5181.950		
		DV=SBP; Age				DV=DBP; Age		
Full	0.094	-11116.120	2.02E+37	0.047	0.068	-5163.083	1.19E+03	**<.001**
Reduced	0.092	-11287.920			0.062	-5177.250		
		DV=SBP; Gender				DV=DBP; Gender		
Full	0.101	-11043.310	1.63E+22	**<.001**	0.062	-5221.836	1.48E+02	0.009
Reduced	0.094	-11145.600			0.056	-5231.824		
		DV=SBP; SES				DV=DBP; SES		
Full	0.107	-10952.480	2.78E+43	**<.001**	0.098	-5056.884	1.08073E+21	**<.001**
Reduced	0.091	-11152.550			0.058	-5153.748		

Note: Blackened sections denote that the relationship between the trait mindfulness facet and BP did NOT differ across demographics. ***Bold*** *denotes significance, α=.008*

Based on the R^2 difference p-values, the relationship between Nonjudging and BP reactivity appeared to differ as a function of race and SES across both SBP and DBP, gender in only SBP, and age in only DBP, though the BIC and BF favored the full model for only race across DBP, and favored the reduced model for all other comparisons, shown in Table 16.

Table 17

Results of the BP Reactivity Model Comparisons For Nonreactivity (n=152)

Model	*R2*	*BIC*	*BF*	*P*	*R2*	*BIC*	*BF*	*P*
		DV=SBP; Race						
Full	0.081	-11353.120	1.96E+12	0.019				
Reduced	0.075	-11409.720						
		DV=SBP; Age						
Full	0.080	-11373.640	1.19E+14	0.069				
Reduced	0.075	-11438.450						
		DV=SBP; Gender						
Full	0.080	-11402.270	5.78E-23	**<.001**				
Reduced	0.078	-11299.860						
		DV=SBP; SES						
Full	0.077	-11415.460	9.06E-27	1.000				
Reduced	0.076	-11295.530						

Note: Blackened sections denote that the relationship between the trait mindfulness facet and BP did NOT differ across demographics. ***Bold*** *denotes significance, α=.008*

Based on the R^2 difference p-values, the relationship between Nonreactivity and SBP reactivity appeared to differ as a function of gender, and the BIC and BF concurrently favored the full model, shown in Table 17. The relationship between Nonreactivity and DBP reactivity did not differ across demographics.

Table 18

Results of the BP Reactivity Model Comparisons For Decentering (n=152)

Model	*R2*	*BIC*	*BF*	*P*	*R2*	*BIC*	*BF*	*P*
		DV=SBP; Race			[redacted]			
Full	0.077	-11339.720	1.56E+06	1.000				
Reduced	0.080	-11368.250						
		DV=SBP; Age						
Full	0.088	-11236.650	2.09E+31	**<.001**				
Reduced	0.080	-11380.890						
		DV=SBP; Gender						
Full	0.089	-11195.420	2.61E+22	0.011				
Reduced	0.079	-11298.660						
		DV=SBP; SES						
Full	0.084	-11340.430	6.48E-06	0.153				
Reduced	0.078	-11316.540						

Note: Blackened sections denote that the relationship between the trait mindfulness facet and BP did NOT differ across demographics. ***Bold*** *denotes significance, α=.008*

Based on R^2 difference p-values, the relationship between Decentering and SBP reactivity seemed to differ as a function of age, though the BIC and BF still favored the reduced model, shown in Table 18. The relationship between Nonreactivity and DBP reactivity did not differ across demographics.

Aim 2. Does MBSR training lower clinic BP, the AHA 'gold standard' BP measurement (Chobanian et al., 2003), and does it do so across different subgroups (age, gender, race, SES) and different initial levels of trait mindfulness?

	Effect Sizes	CI	Effect Sizes
	All MBSR Participants (n=44)		Male Participants (n=24)
ΔSBP	0.00	-.33, .34	-0.11
ΔDBP	-0.18	-.46, .09	-0.07
	Black Participants (n=11)		Female Participants (n=23)
ΔSBP	0.82	.03, 1.7	0.10
ΔDBP	0.14	-.46, .82	-0.35
	White Participants (n=31)		Lower SES Participants (n=24)
ΔSBP	-0.18	-.58, .22	0.24
ΔDBP	-0.35	-.67, -.04	-0.25
	Younger Age Participants (n=11)		Higher SES Participants (n=17)
ΔSBP	0.65	.05, 1.34	-0.30
ΔDBP	0.01	-.45, .47	-0.08
	Middle Age Participants (n=21)		Lower Initial Trait Mindfulness (n=16)
ΔSBP	-0.32	-.84, .17	-0.18
ΔDBP	-0.32	-.74, .08	-0.16
	Older Age Participants (n=13)		Higher Initial Trait Mindfulness (n=29)
ΔSBP	-0.06	-.74, .61	0.21
ΔDBP	-0.20	-.93, .49	-0.19

Figure 2. Heatmap of Hedges' G effect size (ES) following the intervention. Brighter green indicates decreases in blood pressure (BP) following MBSR training, whereas brighter red indicates increases in BP.

As the group sample sizes are particularly small, the following results should be viewed as preliminary and interpreted with caution. Among all participants randomized to MBSR training (n=44), change in SBP following MBSR training was negligible (.26 mmHg, [-2.96, 3.02]; g = .00, [-.33, .34]). Change in DBP was in the direction anticipated but did not reach designated clinical relevance (-1.27 mmHg, [-3.19, .65]; g = -.18, [-.45, .09]). Among White participants (n=31), there was no effect on SBP, as the CI of the ES contained zero (-1.7 mmHg, [-5.63, 2.16]; g = -.179, [-.58, .215]), while the decrease in DBP reached designated clinically relevant ES (-2.38 mmHg, [-4.44, -.316]; g = -.35, [-.67, -.04]). Among Black participants (n=11), SBP increased, against our prediction (5.02 mmHg, [.25, 9.81]; g = .82, [.034, 1.7]), though there was no effect in DBP, as the CI of the ES contained zero (1.45 mmHg, [-4.26, 7.16]; g = .14, [-.46, .83]).

The differences in intervention ES between Black and White race participants reached significance in SBP but not DBP, as the CIs of each group's ES overlapped.

In younger age participants (n=11), SBP increased, against our prediction (6.12 mmHg, [.548, 11.7]; *g* = .65, [.05, 1.34]), while change in DBP was negligible (.09 mmHg, [-4.98, 5.16]; *g* = .00, [-.45, .47]). In middle age participants (n=21), there was no effect in either SBP (-2.83 mmHg, [-7.27, 1.26]; *g* = -.32, [-.84, .17]) or DBP, (-2.1 mmHg, [-4.78, .59]; *g* = -.32, [-.74, .08]), as the CI of the ES contained zero. Similar null results occurred in older age participants (n=13) across SBP (-.53 mmHg, [-6.55, 5.5]; *g* = -.06, [-.738, .609]), and DBP (-1.09 mmHg, [-5, 2.83]; *g* = -.2, [-.33, .34]). The differences in intervention ES between participants of younger, middle, and older age did not reach significance.

Among male participants (n=22), there was no effect in either SBP (-.95 mmHg, [-5.44, 3.53]; *g* = -.11, [-.63, .4]) or DBP (-.59 mmHg, [-3.6, 2.42]; *g* = .07, [-.41, .27]). Similar null effects occurred among female participants (n=23), with no effect in either SBP (.96 mmHg, [-3.34, 5.27]; *g* = .1, [-.34, .55]), or DBP (-1.92 mmHg, [-4.55, .71]; *g* = -.354, [-.852, .124]), as the CIs of the ESs contained zero. Differences in ES across male and female gender participants did not reach significance.

In lower SES participants (n=24, household income < $75,000) there was no effect in SBP (2.27 mmHg, [-2.2, 6.74]; *g* = .239, [-.22, .717]), or DBP (-1.92 mmHg, [-4.8, .95]; *g* = -.25, [-.63, .118]), as the CIs of the ESs contained zero. In higher SES participants (n=17, household income > $75,000), there was no effect of SBP (-2.67 mmHg, [-7.35, 2.03]; *g* = -.297, [-.83, .21]) or DBP (-.51 mmHg, [-3.57, 2.55]; *g* = -.08, [-.56, .387]), as the CIs of the ESs contained zero. Differences in intervention ES across lower and higher SES did not reach significance. Among participants with lower initial trait mindfulness (n=16, trait mindfulness at or below meditation-naive population mean), there were no effects of SBP (-1.95 mmHg, [-7.26, 3.34]; *g* = -.18, [-.67, .29]), or DBP (-1.4 mmHg, [-5.28, 2.49]; *g* = -.16, [-.62, .28]), as the CIs of the ESs contained zero.

Similar null results were found among participants with higher initial trait mindfulness (n=29, trait mindfulness above meditation-naive population mean) in SBP (1.12 mmHg, [-2.68, 4.92]; *g* = .211, [-.27, .738]) and DBP (-1.2 mmHg, [-3.49, 1.08]; *g* = -.19, [-.54, .162]). Differences in intervention ES in participants with lower and higher initial levels of trait mindfulness did not reach significance.

Aim 3. Are changes in trait mindfulness facets and BP following MBSR training correlated, and do these correlations occur across different subgroups (age, gender, race, SES) and different initial levels of trait mindfulness?

	ΔObserving	ΔDescribing	ΔActing with Awareness	ΔNonjudging	ΔNonreactivity	ΔDecentering
All MBSR Participants (n=44)						
ΔSBP	-0.05	-0.28	0.02	0.05	0.01	-0.08
ΔDBP	0.06	-0.17	0.08	0.22	0.17	0.14
Black Participants (n=11)						
ΔSBP	0.17	-0.10	0.31	0.39	0.34	0.37
ΔDBP	0.57	0.12	0.40	0.61	0.53	0.54
White Participants (n=31)						
ΔSBP	-0.01	**-0.44**	-0.03	0.03	0.03	-0.09
ΔDBP	-0.14	**-0.45**	-0.02	0.16	0.07	-0.02
Younger Age Participants (n=11)						
ΔSBP	-0.62	-0.15	0.34	0.20	0.09	-0.09
ΔDBP	0.13	0.35	0.54	0.39	0.49	0.46
Middle Age Participants (n=21)						
ΔSBP	-0.12	-0.30	0.09	0.13	-0.17	-0.23
ΔDBP	-0.08	-0.34	-0.11	0.31	-0.09	-0.12
Older Age Participants (n=13)						
ΔSBP	0.13	-0.39	-0.30	-0.35	0.06	-0.08
ΔDBP	0.06	-0.47	-0.34	-0.16	0.14	0.11
Male Participants (n=22)						
ΔSBP	-0.15	-0.34	-0.02	0.27	0.01	-0.17
ΔDBP	0.05	-0.15	0.19	0.38	0.27	0.17
Female Participants (n=23)						
ΔSBP	0.03	-0.19	0.00	-0.20	0.01	0.05
ΔDBP	0.07	-0.23	0.00	0.06	0.08	0.09
Lower SES Participants (n=23)						
ΔSBP	-0.01	-0.33	-0.20	0.02	0.04	-0.21
ΔDBP	0.17	**-0.58**	-0.10	0.36	0.06	0.00
Higher SES Participants (n=17)						
ΔSBP	0.13	-0.26	-0.01	0.04	-0.03	0.20
ΔDBP	0.01	0.01	0.00	0.01	0.11	0.19
Lower Initial Trait Mindfulness (n=16)						
ΔSBP	0.03	-0.24	0.31	0.26	0.10	0.04
ΔDBP	-0.12	0.18	0.26	0.29	0.37	0.22
Higher Initial Trait Mindfulness (n=28)						
ΔSBP	-0.01	-0.28	-0.15	-0.04	0.05	-0.11
ΔDBP	0.14	**-0.54**	-0.10	0.16	0.02	0.07

Figure 3. Heatmap of correlations between change (increases) in trait mindfulness and change in BP following the intervention. Green indicates that as the trait mindfulness facet increased, BP decreased, while red indicates that as the facet increased, so did BP.

To ease interpretation, most participants (82%) had increased trait mindfulness following the intervention (x̄ increase across all participants = 14.86 points, or 13%). Furthermore, each demographic included in this analysis showed increases in mean trait mindfulness. Overall, correlations with change values are likely operating as an *increase in mindfulness* correlated with an *increase or decrease in BP*. Still, as the group sample sizes are particularly small, increasing the possibility of apparent findings being noise, these results should be viewed as pilot data to avoid over-interpretation.

Among all MBSR training group completers (n=44), no correlations between change in trait mindfulness facets and change in BP reached clinically relevant ESs. Among Black participants (n=11), correlations of change in trait mindfulness facets and change in BP were null, as the CIs of the correlation ES contained zero, as shown in Appendix E. Among White participants (n=31), correlations reached clinically relevant, medium ES in the predicted direction between Describing, SBP (r = -.44, [-.69, -.1]) and DBP (r = -.45, [-.69, -.1]), as shown in Figure 3. Correlational differences between change in trait mindfulness and change in BP did not reach significance across race, as the CIs of each group's ES overlapped.

In younger age participants (n=11), correlations reached clinically relevant, large ES in the predicted direction in Observing and SBP (r = -.62, [-.89, -.03]), but not DBP, as shown in Figure 3. All other correlations between change in trait mindfulness facets and change in BP were null, as the CIs of the correlation ESs contained zero, as shown in Appendix E. In middle age participants (n=21), all correlations between change in trait mindfulness and change in BP were null, as the CIs of the correlation ESs contained zero.

Similar null results occurred in older age participants (n=13), as shown in Appendix E. Correlational differences between change in trait mindfulness and change in BP did not reach significance across age.

Among both male (n=22) and female (n=23) participants, all correlations between change in trait mindfulness and change in BP were null, as the confidence of the correlation ESs contained zero. Similar null results occurred across both lower SES participants (n=23, household income < $75,000), and higher SES participants (n=17, household income > $75,000). Correlational differences between change in trait mindfulness and change in BP did not reach significance across SES. Again, among both participants with lower initial trait mindfulness (n=16) and participants with higher initial trait mindfulness (n=28), all correlations between change in trait mindfulness and change in BP were null, as shown in Appendix E. Correlational differences between change in trait mindfulness and change in BP did not reach significance across initial level of trait mindfulness.

Chapter Four

Discussion

The current study aimed to answer three questions about mindfulness, diversity, and health. First, at baseline, does higher trait mindfulness relate to lower BP after controlling for known covariates of BP, and does this relationship differ as a function of demographics (race, age, gender and SES)? No trait mindfulness facets related to BP after controlling for covariates of BP. Still, the combination of small but significant improvements to R^2, alongside the BIC and BF metrics favoring some models accounting for demographic interactions over models without said interactions, implies that the relationship between some trait mindfulness facets and BP may differ as a function of some demographics, potentially driving the appearance of null effects when analyzing the sample in its entirety. These significant demographic differences most often occurred across race and gender, and in the relationship between Acting with Awareness and ambulatory BP, although they appeared across every trait mindfulness facet except Decentering, and in each form of BP. The current findings support a null relationship between trait mindfulness and BP, that may vary in strength across demographics, particularly race and gender.

Second, does MBSR training lower clinic BP, and does it do so across different subgroups and different initial levels of trait mindfulness? Looking at the entire sample, MBSR training did *not* lower clinic BP at clinically relevant levels. However, the current findings indicate that MBSR training lowers clinic BP at clinically relevant ES in White but not Black people, for whom MBSR training increased BP at clinically relevant ES.

While the SBP differences between White and Black participants reached significance, no other differences across demographic groups reached significance, likely due to small sample size. Regardless, these differences across race may have caused the appearance of null effects when the sample was viewed in its entirety.

Third, are changes in trait mindfulness facets and BP following MBSR training correlated, and do these correlations occur across different subgroups and different initial levels of trait mindfulness? In the entire sample, change in specific trait mindfulness facets did not appear to correlate with change in BP at clinically relevant ES. This is most likely due null effects of MBSR training on BP across most demographic groups in the current study. However, in White participants, increased Describing correlated with decreased BP, and in younger age participants, increased Observing correlated with decreased SBP specifically. It is possible that the correlation in younger age participants is noise, as BP did not significantly change in younger age participants following MBSR training. Other demographic subgroups, namely gender, SES, and the different initial levels of trait mindfulness, similarly displayed null results due to the correlation ES CIs containing zero. And, differences across demographic subgroups in *all* the correlations between change in trait mindfulness and change in BP did not reach clinical significance, likely due to small sample size.

Overall, these findings tentatively imply that for most demographic groups, we cannot assume changes in trait mindfulness drive changes in health resulting from MBSR training, or that for *some* demographic groups, MBSR training will improve health at all. The current literature on mindfulness, whether as a state, trait, or training, de-emphasizes potential demographic differences in the effects of mindfulness on health and well-being

(Chin, Anyanso & Greeson, 2019). While theoretically MBSR training emphasizes skills inherent to all people, the assumption that beneficial health-related effects of mindfulness are *consistent* across demographics does not account for significant demographic health disparities, including differing rates of disease at a purely biological level, different levels of access to healthcare and to other resources necessary for health and well-being, as well as disparities in stress, which likely changes in type and intensity in relation to demographic subgroup, for example. The current preliminary findings emphasize this disparity, illustrating that trait mindfulness might not relate to BP equally across demographics, and moreover that MBSR training as an intervention may be effective in improving cardiovascular health for one specific racial demographic--people who are White—but could conceivably increase BP in other racial demographics, particularly people who are Black. In our sample, eight of the eleven Black participants who completed MBSR experienced elevated BP, while the remaining three decreased. Although these findings are preliminary, they tentatively imply that the relationships between mindfulness and other health domains may similarly vary. Future mindfulness studies should aim to improve diversity in samples to further explore potential demographic differences in the relationship between mindfulness and health, rather than assuming beneficial effects generalize across different populations.

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Appendix A

Confidential

Please answer the following questions about what you ate yesterday.	
Breakfast	
Did you eat breakfast yesterday?	◯ Yes ◯ No
How many servings of grains did you consume for breakfast? (0 if none)	____________________________________ (A serving of grains is about: 1 cup of white rice, 3 cups of popcorn, 1 slice of whole wheat bread, or 1 cup of cornflakes, etc.)
How many servings of vegetables did you consume for breakfast? (0 if none)	____________________________________ (A serving of vegetables is about: .5 cups of broccoli, 1 cup of romaine lettuce, 1 cup of baby carrots, or 1 medium baked potato, etc.)
How many servings of fruit did you consume for breakfast? (0 if none)	____________________________________ (A serving of fruit is about: 1 small gala apple, 1 large banana, 1 medium bunch of grapes, or 1 small orange, etc.)
How many servings of meat, fish, or poultry did you consume for breakfast? (0 if none)	____________________________________ (A serving of meat/fish/poultry is about: 5 oz. of cooked beef strip steak, 1 small chicken breast, 8 oz. of cooked salmon, or 7 medium shrimp, etc.)
How many servings of dairy did you consume for breakfast? (0 if none)	____________________________________ (A serving of dairy is about: 1 cup of milk, 1 cup of yogurt, 1/3 cup of shredded cheese, or 2 slices of Swiss cheese, etc.)
How many servings of nuts, seeds, or legumes did you consume for breakfast? (0 if none)	____________________________________ (A serving of nuts/seeds/legumes is about: 25 almonds or 1/2 cup of cooked black beans, etc.)
How many servings of fats and/or oils did you consume for breakfast? (0 if none)	____________________________________ (A serving of fats/oils is about: 1 teaspoon of vegetable oil or 1 tablespoon of mayonnaise, etc.)
How many servings of sweets or added sugars did you consume for breakfast? (0 if none)	____________________________________ (A serving of sweets/added sugars is about: 1 tablespoon of sugar, or 1 tablespoon of jelly or jam, etc.)
Lunch	
Did you eat lunch yesterday?	◯ Yes ◯ No

How many servings of grains did you consume for lunch? (0 if none)	__________________________________ (A serving of grains is about: 1 cup of white rice, 3 cups of popcorn, 1 slice of whole wheat bread, or 1 cup of cornflakes, etc.)
How many servings of vegetables did you consume for lunch? (0 if none)	__________________________________ (A serving of vegetables is about: .5 cups of broccoli, 1 cup of romaine lettuce, 1 cup of baby carrots, or 1 medium baked potato, etc.)
How many servings of fruit did you consume for lunch? (0 if none)	__________________________________ (A serving of fruit is about: 1 small gala apple, 1 large banana, 1 medium bunch of grapes, or 1 small orange, etc.)
How many servings of dairy did you consume for lunch? (0 if none)	__________________________________ (A serving of dairy is about: 1 cup of milk, 1 cup of yogurt, 1/3 cup of shredded cheese, or 2 slices of Swiss cheese, etc.)
How many servings of meat, fish, or poultry did you consume for lunch? (0 if none)	__________________________________ (A serving of meat/fish/poultry is about: 5 oz. of cooked beef strip steak, 1 small chicken breast, 8 oz. of cooked salmon, or 7 medium shrimp, etc.)
How many servings of nuts, seeds, or legumes did you consume for lunch? (0 if none)	__________________________________ (A serving of nuts/seeds/legumes is about: 25 almonds or 1/2 cup of cooked black beans, etc.)
How many servings of fats and/or oils did you consume for lunch? (0 if none)	__________________________________ (A serving of fats/oils is about: 1 teaspoon of vegetable oil or 1 tablespoon of mayonnaise, etc.)
How many servings of sweets or added sugars did you consume for lunch? (0 if none)	__________________________________ (A serving of sweets/added sugars is about: 1 tablespoon of sugar, or 1 tablespoon of jelly or jam, etc.)
Dinner	
Did you eat dinner yesterday?	◯ Yes ◯ No
How many servings of grains did you consume for dinner? (0 if none)	__________________________________ (A serving of grains is about: 1 cup of white rice, 3 cups of popcorn, 1 slice of whole wheat bread, or 1 cup of cornflakes, etc.)

How many servings of vegetables did you consume for dinner? (0 if none)	__________________________________ (A serving of vegetables is about: .5 cups of broccoli, 1 cup of romaine lettuce, 1 cup of baby carrots, or 1 medium baked potato, etc.)
How many servings of fruit did you consume for dinner? (0 if none)	__________________________________ (A serving of fruit is about: 1 small gala apple, 1 large banana, 1 medium bunch of grapes, or 1 small orange, etc.)
How many servings of dairy did you consume for dinner? (0 if none)	__________________________________ (A serving of dairy is about: 1 cup of milk, 1 cup of yogurt, 1/3 cup of shredded cheese, or 2 slices of Swiss cheese, etc.)
How many servings of meat, fish, or poultry did you consume for dinner? (0 if none)	__________________________________ (A serving of meat/fish/poultry is about: 5 oz. of cooked beef strip steak, 1 small chicken breast, 8 oz. of cooked salmon, or 7 medium shrimp, etc.)
How many servings of nuts, seeds, or legumes did you consume for dinner? (0 if none)	__________________________________ (A serving of nuts/seeds/legumes is about: 25 almonds or 1/2 cup of cooked black beans, etc.)
How many servings of fats and/or oils did you consume for dinner? (0 if none)	__________________________________ (A serving of fats/oils is about: 1 teaspoon of vegetable oil or 1 tablespoon of mayonnaise, etc.)
How many servings of sweets or added sugars did you consume for dinner? (0 if none)	__________________________________ (A serving of sweets/added sugars is about: 1 tablespoon of sugar, or 1 tablespoon of jelly or jam, etc.)
Snacks	
Did you eat any snacks yesterday?	◯ Yes ◯ No
How many servings of grains did you consume for snacks? (0 if none)	__________________________________ (A serving of grains is about: 1 cup of white rice, 3 cups of popcorn, 1 slice of whole wheat bread, or 1 cup of cornflakes, etc.)
How many servings of vegetables did you consume for snacks? (0 if none)	__________________________________ (A serving of vegetables is about: .5 cups of broccoli, 1 cup of romaine lettuce, 1 cup of baby carrots, or 1 medium baked potato, etc.)

How many servings of fruit did you consume for snacks? (0 if none)	__________________________________ (A serving of fruit is about: 1 small gala apple, 1 large banana, 1 medium bunch of grapes, or 1 small orange, etc.)
How many servings of dairy did you consume for snacks? (0 if none)	__________________________________ (A serving of dairy is about: 1 cup of milk, 1 cup of yogurt, 1/3 cup of shredded cheese, or 2 slices of Swiss cheese, etc.)
How many servings of meat, fish, or poultry did you consume for snacks? (0 if none)	__________________________________ (A serving of meat/fish/poultry is about: 5 oz. of cooked beef strip steak, 1 small chicken breast, 8 oz. of cooked salmon, or 7 medium shrimp, etc.)
How many servings of nuts, seeds, or legumes did you consume for snacks? (0 if none)	__________________________________ (A serving of nuts/seeds/legumes is about: 25 almonds or 1/2 cup of cooked black beans, etc.)
How many servings of fats and/or oils did you consume for snacks? (0 if none)	__________________________________ (A serving of fats/oils is about: 1 teaspoon of vegetable oil or 1 tablespoon of mayonnaise, etc.)
How many servings of sweets or added sugars did you consume for snacks? (0 if none)	__________________________________ (A serving of sweets/added sugars is about: 1 tablespoon of sugar, or 1 tablespoon of jelly or jam, etc.)

Appendix B

Confidential

Please respond to the following questions.

On the average, how many hours did you sleep each night during the last five weekday nights, Sunday through Thursday? ______________________________

On the average, how many hours did you sleep each night last Friday and Saturday nights? ______________________________

Moderate Activities

How many hours did you spend during the last five weekdays doing moderate activities or others like them? (refer to table below with a list of moderate activities) ______________________________

How many hours did you spend last Saturday and Sunday doing these moderate activities? (refer to table below with a list of moderate activities) ______________________________

Moderate Activites

Moderate Activities (3-5 METS)

These activities involve modest increases in heart rate & breathing—e.g., many household & home repair tasks.

- Bowling
- Calisthenics without weights
- Carpentry
- Childcare
- Cleaning, heavy (such as vacuuming, sweeping)
- Croquet
- Cycling—leisure, 5.5 mph mild
- Electrical work
- Feeding farm animals, manual milking
- Fencing
- Forestry—slow ax chopping, power sawing, stacking firewood, weeding
- Frisbee playing
- Gardening—hedging, raking, planting, mowing
- Golf—no power cart
- Grocery shopping
- Gymnastics
- Heavy cooking
- Horseback riding
- Horse Shoes
- Laundry—heavy
- Locksmith
- Machine tooling—lath, punch press, tapping & drilling, welding
- Mopping floor
- Motor-cross
- Mowing lawn—push & power mower
- Music—playing drums
- Painting—outside
- Planting seedlings
- Plastering
- Sailing & board sailing
- Scraping paint
- Stock & Clerking
- Surfing
- Sweeping
- Swimming—mild
- Table tennis
- Tai-chi
- Walking on firm level surface, 3-4mph—average to fairly brisk
- Window cleaning
- Yoga

Hard Activities

How many hours did you spend during the last five weekdays doing hard activities or others like them? (refer to table below with a list of hard activities) ________________________________

How many hours did you spend last Saturday and Sunday doing these hard activities? (refer to table below with a list of hard activities) ________________________________

Hard Activities

Hard Activities (5.1-6.9 METS)

Most people will have noticeable increases in breathing and will likely perspire—e.g., vigorous household chores, home repair and gardening tasks, heavy industrial work, and some construction and vigorous sports.

- Aerobic Dance
- Badminton
- Climbing hills with no load
- Coal Shoveling
- Cycling—leisure, 9.4 mph (moderate)
- Farming—shoveling grain
- Fast Walking
- Folk Dancing
- Forestry—hoeing, planting by hand
- Karate or Judo
- Roller Skating
- Scrubbing floors
- Skiing, water or downhill
- Tennis, doubles
- Walking on level surface, Brisk or striding (Firm surface @ 4.5 mph)
- Weight lifting or training (count only lifting time)
- Swimming—moderate

Very Hard Activities

How many hours did you spend during the last five weekdays doing very hard activities or others like them? (refer to table below with a list of very hard activities) ________________________________

How many hours did you spend last Saturday and Sunday doing these very hard activities? (refer to table below with a list of very hard activities) ________________________________

Very Hard Activities

Very Hard Activities ($\geq$7.0 METS)

These include strenuous sports involving a lot of movement and running. Very few household or occupational tasks are included, except carrying heavy loads, digging or chopping with heavy tools, or other similar physical labor.

- Boxing—in ring, sparring
- Circuit training
- Climbing hills with 5-20 kg (11-44 lbs) load
- Cycling, racing (intensive)
- Digging Ditches
- Farming—barn cleaning
- Field hockey
- Football
- Forestry—fast ax chopping, barking trees, carrying logs, sawing by hand
- Gardening, digging
- Marching, rapid
- Racquetball
- Rope jumping
- Running, jogging—cross country, 6-10 min/mile
- Skiing, cross country
- Skin-diving as frogman, moderate motion
- Soccer
- Squash
- Swimming, continuous-intensive
- Tennis, singles

Were you employed outside of the home during the last seven days?	◯ Yes ◯ No
For how many days were you employed?	______________________________
For how many hours per day were you employed?	______________________________
How many of these hours were spent doing moderate activities? refer to the table below for a list of moderate activities)	______________________________

Moderate Activites

Moderate Activities (3-5 METS)

These activities involve modest increases in heart rate & breathing—e.g., many household & home repair tasks.

- Bowling
- Calisthenics without weights
- Carpentry
- Childcare
- Cleaning, heavy (such as vacuuming, sweeping)
- Croquet
- Cycling—leisure, 5.5 mph mild
- Electrical work
- Feeding farm animals, manual milking
- Fencing
- Forestry—slow ax chopping, power sawing, stacking firewood, weeding
- Frisbee playing
- Gardening—hedging, raking, planting, mowing
- Golf—no power cart
- Grocery shopping
- Gymnastics
- Heavy cooking
- Horseback riding
- Horse Shoes
- Laundry—heavy
- Locksmith
- Machine tooling—lath, punch press, tapping & drilling, welding
- Mopping floor
- Motor-cross
- Mowing lawn—push & power mower
- Music—playing drums
- Painting—outside
- Planting seedlings
- Plastering
- Sailing & board sailing
- Scraping paint
- Stock & Clerking
- Surfing
- Sweeping
- Swimming—mild
- Table tennis
- Tai-chi
- Walking on firm level surface, 3-4mph—average to fairly brisk
- Window cleaning
- Yoga

How many of these hours were spent doing hard activities? refer to the table below for a list of hard activities) ________________________________

Hard Activities

Hard Activities (5.1-6.9 METS)

Most people will have noticeable increases in breathing and will likely perspire—e.g., vigorous household chores, home repair and gardening tasks, heavy industrial work, and some construction and vigorous sports.

- Aerobic Dance
- Badminton
- Climbing hills with no load
- Coal Shoveling
- Cycling—leisure, 9.4 mph (moderate)
- Farming—shoveling grain
- Fast Walking
- Folk Dancing
- Forestry—hoeing, planting by hand
- Karate or Judo
- Roller Skating
- Scrubbing floors
- Skiing, water or downhill
- Tennis, doubles
- Walking on level surface, Brisk or striding (Firm surface @ 4.5 mph)
- Weight lifting or training (count only lifting time)
- Swimming—moderate

How many of these hours were spent doing very hard activities? refer to the table below for a list of very hard activities) __________________________________

Very Hard Activities

Very Hard Activities (≥7.0 METS)

These include strenuous sports involving a lot of movement and running. Very few household or occupational tasks are included, except carrying heavy loads, digging or chopping with heavy tools, or other similar physical labor.

- Boxing—in ring, sparring
- Circuit training
- Climbing hills with 5-20 kg (11-44 lbs) load
- Cycling, racing (intensive)
- Digging Ditches
- Farming—barn cleaning
- Field hockey
- Football
- Forestry—fast ax chopping, barking trees, carrying logs, sawing by hand
- Gardening, digging
- Marching, rapid
- Racquetball
- Rope jumping
- Running, jogging—cross country, 6-10 min/mile
- Skiing, cross country
- Skin-diving as frogman, moderate motion
- Soccer
- Squash
- Swimming, continuous-intensive
- Tennis, singles

Appendix C

Directions: Please rate each of the following statements using the scale provided. Fill in the option that best describes your own opinion of what is generally true for you.

	Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
1. When I'm walking, I deliberately notice the sensations of my body moving.	○	○	○	○	○
2. I'm good at finding words to describe my feelings.	○	○	○	○	○
3. I criticize myself for having irrational or inappropriate emotions.	○	○	○	○	○
4. I perceive my feelings and emotions without having to react to them.	○	○	○	○	○
5. When I do things, my mind wanders off and I'm easily distracted.	○	○	○	○	○
6. When I take a shower or bath, I stay alert to the sensations of water on my body.	○	○	○	○	○
7. I can easily put my beliefs, opinions, and expectations into words.	○	○	○	○	○
8. I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.	○	○	○	○	○
9. I watch my feelings without getting lost in them.	○	○	○	○	○
10. I tell myself I shouldn't be feeling the way I'm feeling.	○	○	○	○	○
11. I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.	○	○	○	○	○
12. It's hard for me to find the words to describe what I'm thinking.	○	○	○	○	○
13. I am easily distracted.	○	○	○	○	○
14. I believe some of my thoughts are abnormal or bad and I shouldn't think that way.	○	○	○	○	○

15. I pay attention to sensations, such as the wind in my hair or sun on my face.	○	○	○	○	○
16. I have trouble thinking of the right words to express how I feel about things.	○	○	○	○	○
17. I make judgments about whether my thoughts are good or bad.	○	○	○	○	○
18. I find it difficult to stay focused on what's happening in the present.	○	○	○	○	○
19. When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it.	○	○	○	○	○
20. I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.	○	○	○	○	○

	Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
21. In difficult situations, I can pause without immediately reacting.	○	○	○	○	○
22. When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words.	○	○	○	○	○
23. It seems I am "running on automatic" without much awareness of what I'm doing.	○	○	○	○	○
24. When I have distressing thoughts or images, I feel calm soon after.	○	○	○	○	○
25. I tell myself that I shouldn't be thinking the way I'm thinking.	○	○	○	○	○
26. I notice the smells and aromas of things.	○	○	○	○	○
27. Even when I'm feeling terribly upset, I can find a way to put it into words.	○	○	○	○	○
28. I rush through activities without being really attentive to them.	○	○	○	○	○
29. When I have distressing thoughts or images I am able just to notice them without reacting.	○	○	○	○	○
30. I think some of my emotions are bad or inappropriate and I shouldn't feel them.	○	○	○	○	○
31. I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.	○	○	○	○	○
32. My natural tendency is to put my experiences into words.	○	○	○	○	○
33. When I have distressing thoughts or images, I just notice them and let them go.	○	○	○	○	○
34. I do jobs or tasks automatically without being aware of what I'm doing.	○	○	○	○	○

35. When I have distressing thoughts or images, I judge myself as good or bad, depending what the thought/image is about.	◯	◯	◯	◯	◯
36. I pay attention to how my emotions affect my thoughts and behavior.	◯	◯	◯	◯	◯
37. I can usually describe how I feel at the moment in considerable detail.	◯	◯	◯	◯	◯
38. I find myself doing things without paying attention.	◯	◯	◯	◯	◯
39. I disapprove of myself when I have irrational ideas.	◯	◯	◯	◯	◯

Appendix D

Confidential

We are interested in your recent experiences. Below is a list of things that people sometimes experience. Next to each item are 5 choices: "never", "rarely", "sometimes", "often", "all the time". Please select one of those to indicate how much you currently have experiences similar to those described.

Please do not spend too long on each item- it is your first response that we are interested in.

	1: Never	2: Rarely	3: Sometimes	4: Often	5: All the Time
1. I think about what will happen in the future.	○	○	○	○	○
2. I reminded myself that thoughts aren't facts.	○	○	○	○	○
3. I am better able to accept myself as I am.	○	○	○	○	○
4. I notice all sorts of little things and details in the world around me.	○	○	○	○	○
5. I am kinder to myself when things go wrong.	○	○	○	○	○
6. I can slow my thinking in times of stress.	○	○	○	○	○
7. I wonder what kind of person I really am.	○	○	○	○	○
8. I am not so easily carried away by thoughts and feelings.	○	○	○	○	○
9. I notice that I don't take difficulties too seriously.	○	○	○	○	○
10. I can separate myself from my thoughts and feelings.	○	○	○	○	○

	1: Never	2: Rarely	3: Sometimes	4: Often	5: All the Time
11. I analyze why things turn out the way they do.	○	○	○	○	○
12. I can take time to respond to difficulties.	○	○	○	○	○
13. I think over and over again about what others have said to me.	○	○	○	○	○
14. I can treat myself kindly.	○	○	○	○	○
15. I can observe unpleasant feelings without being drawn into them.	○	○	○	○	○
16. I have the sense that I am fully aware of what is going on around me and inside me.	○	○	○	○	○
17. I can actually see that I am not my thoughts.	○	○	○	○	○
18. I am consciously aware of a sense of my body as a whole.	○	○	○	○	○
19. I think about the ways in which I am different from other people.	○	○	○	○	○
20. I view things from a wider perspective.	○	○	○	○	○

Appendix E

	ΔObserving	ΔDescribing	ΔActing with Awareness	ΔNonjudging	ΔNonreactivity	ΔDecentering	ΔObserving	ΔDescribing	ΔActing with Awareness	ΔNonjudging	ΔNonreactivity	ΔDecentering
All Participants (n=44)												
ΔSBP	-0.05	-0.28	0.02	0.05	0.01	-0.08	-.34, .251	-.529, .014	-.273, .313	-.249, .336	-.279, .307	-.364, .218
ΔDBP	0.06	-0.17	0.08	0.22	0.17	0.14	-.244, .347	-.443, 134	-.44, .131	-.082, .479	-.129, .442	-.16, .416
Black Participants (n=11)												
ΔSBP	0.17	-0.10	0.31	0.39	0.34	0.37	-.478, .698	-.66, .531	-.354, .768	-.271, .803	-.276, .801	-.297, .792
ΔDBP	0.57	0.12	0.40	0.61	0.53	0.54	-.043, .872	-.518, .67	-.26, .807	.015, .885	-.107, .855	-.082, .862
White Participants (n=31)												
ΔSBP	-0.01	**-0.44**	-0.03	0.03	0.03	-0.09	-.364, .355	-.688, -.09	-.388, .331	-.33, .389	-.336, 383	-.436, .279
ΔDBP	-0.14	**-0.45**	-0.02	0.16	0.07	-0.02	-.473, .234	-.696, -.106	-.377, .342	-.21, .493	-.295, .421	-.373, .347
Younger Age Participants (n=11)												
ΔSBP	-0.62	-0.15	0.34	0.20	0.09	-0.09	-.889, -.034	-.686, .496	-.325, .781	-.451, .716	-.54, .653	-.656, .536
ΔDBP	0.13	0.35	0.54	0.39	0.49	0.46	-.51, .676	-.314, .785	-.082, .862	-.277, .8	-.158, .841	-.191, .831
Middle Age Participants (n=21)												
ΔSBP	-0.12	-0.30	0.09	0.13	-0.17	-0.23	-.523, .329	-.645, .155	-.356, .501	-.322, .529	-.56, .282	-.601, .223
ΔDBP	-0.08	-0.34	-0.11	0.31	-0.09	-0.12	-.497, .36	-.673, .106	-.52, .334	-.141, .653	-.505, .351	-.523, .33
Older Age Participants (n=13)												
ΔSBP	0.13	-0.39	-0.30	-0.35	0.06	-0.08	-.456, .633	-.775, .202	-.731, .298	-.755, .249	-.507, .591	-.604, .491
ΔDBP	0.06	-0.47	-0.34	-0.16	0.14	0.11	-.507, .592	-.809, .113	-.75, .258	-.655, .426	-.442, .643	-.466, .625
Male Participants (n=22)												
ΔSBP	-0.15	-0.34	-0.02	0.27	0.01	-0.17	-.536, .29	-.667, .093	-.44, .402	-.167, .622	-.416, .426	-.553, .269
ΔDBP	0.05	-0.15	0.19	0.38	0.27	0.17	-.382, .459	-.533, .294	-.255, .563	-.053, .689	-.172, .62	-.274, .549
Female Participants (n=23)												
ΔSBP	0.03	-0.19	0.00	-0.20	0.01	0.05	-.389, .434	-.556, .244	-.41, .413	-.566, .299	-.402, .422	-.366, .456
ΔDBP	0.07	-0.23	0.00	0.06	0.08	0.09	-.347, .472	-.588, .198	-.413, .41	-.457, .364	-.343, 476	-.332, .485
Lower SES Participants (n=23)												
ΔSBP	-0.01	-0.33	-0.20	0.02	0.04	-0.21	-.424, .399	-.655, .09	-.563, .234	-.395, .428	-.379, .444	-.571, .222
ΔDBP	0.17	**-0.58**	-0.10	0.36	0.06	0.00	-.262, .542	-.799, -.217	-.49, .327	-.06, .673	-.362, .46	-.416, .408
Higher SES Participants (n=17)												
ΔSBP	0.13	-0.26	-0.01	0.04	-0.03	0.20	-.371, .576	-.655, .256	-.486, .474	-.466, .513	-.504, .456	-.311 to .62
ΔDBP	0.01	0.01	0.00	0.01	0.11	0.19	-.473, .487	-.47, .49	-.479, .482	-.473, .487	-.388, .563	-.321, .613
Lower Initial Trait Mindfulness (n=16)												
ΔSBP	0.03	-0.24	0.31	0.26	0.10	0.04	-.471, .519	-.654, .295	-.216, .7	-.275, .66	-.413, .569	-.463, 526
ΔDBP	-0.12	0.18	0.26	0.29	0.37	0.22	-.581, .399	-.342, .622	-.271, .668	-.238, .688	-.151, .732	-.317, .639
Higher Initial Trait Mindfulness (n=28)												
ΔSBP	-0.01	-0.28	-0.15	-0.04	0.05	-0.11	-.379, .367	-.589, .107	-.497, .233	-.41, .334	-.325, .418	-.46, .278
ΔDBP	0.14	**-0.54**	-0.10	0.16	0.02	0.07	-.245, .487	-.757, -.204	-.457, .281	-.227, .502	-.352, .393	-.313, .43