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Empirical research

## Mindfulness and self-compassion as tools in health behavior change: An evaluation of a workplace intervention pilot study<sup>☆</sup>

Kristin A. Horan<sup>\*</sup>, Maija B. Taylor<sup>1</sup>

Bowling Green State University, United States

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### ABSTRACT

While interventions teaching general mindfulness and self-compassion have been effective in promoting health and participation in health behaviors, more research is needed to evaluate the effect of targeted interventions that teach participants to apply mindfulness and self-compassion to health behaviors. A sample of 24 university employees participated in a 10-week health behavior change intervention that featured psychoeducation in mindful and self-compassionate nutrition, exercise, and stress management and engagement in guided group exercise. The intervention produced significant improvements in mindfulness, self-compassion, mindful health behaviors, and some health behaviors, well-being measures, and some body composition and physical fitness measures. This program had high satisfaction and low attrition rates. These findings provide initial evidence that targeted mindfulness and self-compassion may be useful components of health behavior change interventions.

### 1. Introduction

Despite the many benefits associated with regular participation in health behaviors (e.g. consumption of a nutritious diet, engagement in physical activity, effective management of stress; Danaei et al., 2009), research on health behaviors of United States citizens indicates that there is room for improvement. A substantial proportion of adults do not meet nutrition or physical activity guidelines (Britten, Marcoe, Yamini, & Davis, 2006; Centers for Disease Control [CDC], 2013; Moore & Thompson, 2015; National Cancer Institute [NCI], 2015) and report managing stress with unhealthy activities (American Psychological Association [APA], 2008). Thus, the promotion of health behaviors is a major priority for federal, community, and organizational entities. The workplace is a popular point of intervention (Mattke et al., 2013) due to the ease of population access, the potential for early intervention, the possibility of healthcare cost containment, and the potential for morale and productivity improvements (Conrad, 1987).

#### 1.1. Current workplace interventions promoting diet and exercise

Despite efforts to promote health behaviors in the workplace, systematic reviews and meta-analyses of worksite interventions have documented primarily small or variable effects on diet (Geaney et al., 2013), physical activity (Conn, Hafdahl, Cooper, Brown, & Lusk, 2009;

Malik, Blake, & Suggs, 2014) and stress management (Richardson & Rothstein, 2008; van der Klink, Blonk, Schene, & van Dijk, 2001). Adherence rates also show room for improvement, as attrition rates reach an average of 18% in health behavior change trials (Crutzen, Viechtbauer, Spigt, & Kotz, 2015). Although the positive effects of workplace health promotion programs are encouraging, more research is needed to improve retention and effectiveness of workplace health behavior interventions. The inclusion of mindfulness and self-compassion in traditional programs could improve outcomes in health behavior change programs.

#### 1.2. Mindfulness and self-compassion

Mindfulness is the ability to bring one's attention to experiences in the present moment in a nonjudgmental way (Kabat-Zinn, 1990). Self-compassion is defined as the process of being open to one's personal failures, inadequacies, and suffering and responding to them with common humanity, mindfulness, and self-kindness (Neff, 2003). Mindfulness and self-compassion are related to positive health behaviors and better physical health (Jordan, Wang, Donatoni, & Meier, 2014; Loucks, Britton, Howe, Eaton, & Buka, 2015; Neff, 2012).

Researchers have theorized that mindfulness training increases attentiveness to one's experiences and acceptance of and willingness to experience uncomfortable internal states (e.g., thoughts, feelings,

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<sup>\*</sup> Correspondence to: Department of Psychology Bowling Green State University Bowling Green, OH 43403-0232, United States.

E-mail addresses: [khoran@bgsu.edu](mailto:khoran@bgsu.edu) (K.A. Horan), [maijat@bgsu.edu](mailto:maijat@bgsu.edu) (M.B. Taylor).

<sup>1</sup> Department of Psychology, Bowling Green State University, Bowling Green, OH 43403-0232, United States.

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physical sensations; Forman & Butryn, 2015; Katterman, Kleinman, Hood, Nackers, & Corsica, 2014; Mantzios & Wilson, 2015; Tapper et al., 2009). These skills are believed to increase individuals' capacity to disengage from internal and external cues that can trigger craving and reduce automatic, impulsive, and emotion-driven patterns of health behavior. This is believed to increase individuals' ability to consciously engage in behaviors that are consistent with personal health goals.

Researchers have proposed that self-compassion, which emphasizes forgiveness and kindness towards the self, buffers individuals against guilt, shame, and rumination after perceived mistakes in health behaviors, which frees up cognitive and emotional resources for self-regulation (Adams & Leary, 2007; Mantzios & Wilson, 2015; Terry & Leary, 2011). This may help individuals quickly reorient to their health goals after a lapse. Self-compassion may also help individuals engage in health behaviors out of a desire to be kind to their bodies and selves more generally, which may increase intrinsic motivation (Neff, 2003).

Mindfulness and self-compassion may be useful tools in interventions designed to increase participation in health behaviors because they will likely help individuals increase awareness of personally-valued or self-compassionate motivations to engage in health behaviors, enhance their self-regulatory capacity, and allow them to reorient to health values and goals more quickly after lapses in health behaviors.

### 1.3. Interventions utilizing mindfulness & self-compassion to improve health

#### 1.3.1. General mindfulness and self-compassion interventions

Some randomized control trials demonstrate that interventions teaching general mindfulness techniques produce improvements in diet quality (Timmerman & Brown, 2012), physical activity (Tapper et al., 2009), and weight (Forman et al., 2013; Tapper et al., 2009). Although they restricted their examination to weight loss trials for overweight and obese adults, a recent meta-analysis also demonstrated that mindfulness-based interventions produced large effect sizes for eating behaviors and small effect sizes for BMI (Rogers, Ferrari, Mosely, Lang, & Brennan, 2017). Some randomized control trials teaching self-compassion demonstrate improvements in health behaviors such as smoking cessation (Kelly, Zuroff, Foa, & Gilbert, 2010) and weight (Mantzios & Wilson, 2015).

However, in some interventions teaching broad mindfulness techniques, participants do not show improvements in health behaviors or do not differ from a standard care group (e.g. Chacko, Yeh, Davis, & Wee, 2016; Kearney et al., 2012). One explanation for such differences is that programs may achieve more consistent positive effects when they teach participants how to tailor mindfulness and self-compassion to their health behaviors, rather than teaching the concepts broadly.

#### 1.4. Interventions teaching targeted mindful and self-compassionate health behaviors

Mindful eating is food consumption that is modulated by appropriate eating cues, including hunger and satiety. It involves high levels of eating inhibition, attentiveness to personal eating behavior, and awareness of external cues to eat as well as low emotional responsiveness to eating and low engagement in distracting activities while eating (Framson et al., 2009). Mindful eating is associated with better diet quality and physical health (Beshara, Hutchinson, & Wilson, 2013; Framson et al., 2009; Moor, Scott, & McIntosh, 2013). We define self-compassionate eaters as individuals who are attentive to dietary slips or minor weight gain that is inconsistent with their goals, who respond to these experiences with acceptance that these deviations and changes are an inevitable part of the human condition, and do not experience a decrease in their self-regard as a result. We also propose that when self-compassionate eaters eat healthfully they have a primary goal of improving their health and well-being and they choose to not engage in incredibly restrictive and unsatisfying weight loss strategies that undermine personal preference and dietary balance. Self-compassionate

eaters demonstrate less eating guilt and lower eating disorder psychopathology (Kelly, Vimalakanthan, & Carter, 2014; Wasyliuk, MacKinnon, & MacLellan, 2012).

Mindful exercise is broadly defined as the act of bringing non-judgmental present awareness to any type of physical activity (Salmon, n.d.). Mindful exercise involves purposeful attentiveness to one's physical movement, physiological sensations during movement, and anatomical alignment (Justice, 2013; La Forge, 2005; Salmon, n.d.) and approaching physical activity with an open, non-judgmental attitude. Mindful exercise, both broadly defined as awareness during physical activity and narrowly defined as mind-body exercise such as yoga and tai chi, is associated with positive physical and mental health outcomes (La Forge, 2005), and exercise efficiency and satisfaction (Tsafou, Lacroix, van Ee, Vinkers, & De Ridder, 2016). Self-compassionate exercise can be described as initiating and maintaining exercise for reasons related to self-kindness, such as to increase health and energy (rather than obligatory or compensatory reasons). Although this construct is novel in the literature on exercise, similar constructs such as intrinsic motivation to exercise have been linked to increased well-being (Magnus, Kowalski, & McHugh, 2010) and greater exercise adherence (Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997; Sallis & Hovell, 1990).

Mindful stress management involves approaching distressing thoughts or physiological manifestations of stress with non-judgmental, present-moment awareness (Grossman, Niemann, Schmidt, & Walach, 2004). Self-compassionate stress management can be framed as responding to distressing thoughts or situations with kindness towards oneself and self-soothing (Neff & Germer, 2013). Individuals who are higher in self-compassion report less anxiety when evaluating their weaknesses and increases in self-compassion correspond to decreases in rumination and thought suppression (Neff, Kirkpatrick, & Rude, 2007). More mindful individuals tend to have less intense appraisals of stressors and use less avoidant coping techniques and more approach coping techniques (Weinstein, Brown, & Ryan, 2009). Taken together, self-compassion and mindfulness appear to help people be more open to their weaknesses, improve appraisals of stressors, and use less avoidant and more approach coping techniques, which could all aid in stress management and improve well-being.

Although the concept of targeted mindful and self-compassionate health behavior change interventions is novel, existing evidence does show promise. Pilot studies of mindful eating interventions show improvements in weight, eating disinhibition, binge eating (Dalen et al., 2010) and the management of Type II Diabetes (Miller, Kristeller, Headings, Nagaraja, & Miser, 2014). Interventions teaching mindful or self-compassionate eating demonstrate positive results in clinical samples, producing improvements in binge eating (Dalen et al., 2010; Kristeller & Hallett, 1999; Kristeller, Wolever, & Sheets, 2014; Leahey, Crowther, & Irwin, 2008), sub-clinical disordered eating patterns (Alberts, Thewissen, & Raes, 2012), and eating disorder recovery (Gale, Gilbert, Read, & Goss, 2014).

Physical activity-focused Acceptance and Commitment Therapy (a therapy that features mindfulness-based components) interventions have produced significant improvements in exercise (Butryn, Forman, Hoffman, Shaw, & Juarascio, 2011) and weight loss (Fletcher, 2011). Mindfulness-based stress reduction has been shown to be effective in the reduction of stress in non-clinical populations (Chiesa & Serretti, 2009) and in encouraging improvements in markers of physical and mental health (Grossman et al., 2004). Although interventions promoting self-compassion for stress-management are less common, existing studies demonstrate positive outcomes for mental health and support the pairing of mindfulness and self-compassion-based instruction in a single intervention (e.g. Neff & Germer, 2013).

Most targeted interventions feature a narrow focus, applying mindfulness and self-compassion to one health behavior. In one exception, Daubenmier et al. (2016) tested whether an intervention featuring basic mindfulness, mindfulness for stress management,

meditation, mindful eating, and mindful walking, could add incremental value to a diet and exercise program. Findings showed that the diet, exercise, and mindfulness program group showed significantly greater improvements in metabolic outcomes and weight loss. This study provides support for the metabolic benefits of mindfulness interventions that directly teach how to weave mindfulness into eating, exercise, and stress management.

1.5. The present study

We investigated whether training adults in mindful and self-compassionate health behaviors can promote health behavior engagement. Based on previous research, we expect to observe the following changes from pre-test to post-test:

**Hypothesis 1:** The intervention will improve mindfulness and self-compassion.

**Hypothesis 2:** The intervention will improve participation in health behaviors and mindful health behaviors.

**Hypothesis 3:** The intervention will improve indicators of well-being.

**Hypothesis 4:** The intervention will improve objective indicators of health status and physical fitness.

1.5.1. Nonequivalent dependent variable

The setting of intervention delivery necessitated the use of a single-group pre-test post-test design. We utilized a non-equivalent dependent variable, a variable that should be unaffected by the intervention, to increase confidence that observed effects are not simply due to novelty (Shadish, Cook, & Campbell, 2002).

**Hypothesis 5:** The intervention will not produce significant changes in job design characteristics from pre-test to post-test.

2. Material and methods

All research activities were approved by the university's Human Subject Review Board and all participants signed informed consent documents. The health behavior change program was offered through the wellness programming office of a Midwestern university. University faculty and staff were the targeted sample. The intervention was designed to be delivered in the workplace such that it was offered in the university recreation center at a convenient time for employees. Participants were recruited through the wellness office's newsletters and website banner, as well as an informational email sent by the researcher to all active faculty and staff. The intervention was described in recruitment materials as a program aiming to increase health behaviors through mindfulness and self-compassion.

Participants were 24 university faculty and staff ( $M_{age} = 51.8$ ,  $SD_{age} = 12.2$ , 79% female). Most participants were non-Hispanic white ( $n = 18$ , 78%). Minority group members included two African Americans, one Hispanic white, one Asian American, and one multi-racial individual. A large portion of the sample (44%) reported that their household income was between \$50,000 and \$74,999 per year, 17% reported an income of \$75,000 to \$99,999, 22% reported an income of \$100,000 to \$149,000, and few participants reported an income below \$50,000 (8%) or above \$150,000 (9%). In terms of participants' highest educational attainment, 44% of the sample had a Master's degree and 44% of the sample had a doctoral degree.

Participants completed a ten-week health behavior change program that followed the format outlined in Table 1. Participants completed a baseline survey and a fitness assessment conducted by a certified personal trainer employed by the university recreation center. Following baseline testing, participants attended weekly meetings, which featured thirty minutes of didactic psychoeducation and thirty minutes of guided

Table 1  
Intervention description.

Week	Psychoeducation Component	Guided Group Exercise
1	<i>Introduction to Mindfulness, Self-compassion, and Health</i>	
2	<i>Mindful Physical Activity I:</i> Exercise 101 Principles of mindful movement Applying mindfulness to exercise	Strength Training
3	<i>Mindful Nutrition I:</i> Nutrition 101 Mindfulness of wholesome food choices Mindfulness of consequences of food choices	Dance-based Aerobics
4	<i>Mindful Stress Management I:</i> Evolutionary perspective on stress Negative health feedback loop Practices for distressing emotions part one	Yoga
5	<i>Mindful Physical Activity II:</i> Mental soundtrack during exercise Thought traps during exercise Sharpening attention to inner cues during exercise	Circuit Training
6	<i>Mindful Nutrition II:</i> Principles of mindful eating Triggers of mindless eating Types of hunger	Kickboxing
7	<i>Mindful Stress Management II:</i> Stress reaction vs. stress response Common mind traps Practices for distressing emotions part two	Strength Training
8	<i>Mindful Physical Activity III:</i> Sharpening intention to exercise Sharpening attention to inner cues before and after exercise Mindfulness and motivation to exercise	Dance-based Aerobics
9	<i>Mindful Nutrition III:</i> Self-compassion and food choices Self-compassion and body image	Yoga
10	<i>Mindful Stress Management III:</i> Mindful interpersonal relationships Concluding reflection and long-term maintenance of health behaviors	Circuit Training

group exercise. Participants completed weekly workbook activities, including guided experiential activities and reflection, goal setting and implementing goals, planning activities, and information about nutrition and physical activity guidelines. Participants were also offered optional individual health coaching sessions.<sup>2</sup>

The authors served as instructional and exercise leaders for all sessions. The first author is a doctoral student who researches Occupational Health Psychology, with content expertise in areas of stress management. She also had three years of experience teaching a variety of formats of group fitness classes, was certified as a Group Fitness Instructor through the Aerobics and Fitness Association of America, and was certified in CPR, AED, and first aid through the American Red Cross at the time of intervention delivery. The second author is a doctoral student who researches Health Psychology, with content expertise in mindful and self-compassionate eating and experience co-leading three weight loss groups and contributing to one health promotion program.

At the program conclusion, participants completed a follow-up survey and fitness assessment. At the beginning of the program, participants submitted a \$100 deposit, which was returned based on participation and completion of program requirements. Participants

<sup>2</sup> Utilization of the optional health coaching sessions was low. Three participants attended health coaching sessions to learn the material that they missed during an absence and one participant attended a health coaching session to discuss a difficulty with health behavior change. This low utilization prohibits an analysis examining whether participation in the health coaching component was associated with enhanced outcomes.

**Table 2**  
Internal consistencies of survey measures.

Measure	Pre-test $\alpha$	Post-test $\alpha$
<b>Survey Measures</b>		
Five Facet Mindfulness Questionnaire – Short Form		
Non-reactivity Subscale	0.62	0.62
Observing Subscale	0.85	0.73
Acting with Awareness Subscale	0.79	0.84
Describing Subscale	0.89	0.84
Non-judging Subscale	0.87	0.85
Self-Compassion Scale – Short Form	0.88	0.91
<b>Participation in Health Behaviors</b>		
PACE+ Dietary Fat Screening Measure	0.73	0.58
<b>Participation in Mindful Health Behaviors</b>		
Mindful Eating Questionnaire	0.85	0.86
Mindful Exercise Measure	0.74	0.76
<b>Well-being Variables</b>		
Satisfaction with Life Scale	0.91	0.87
Fuel tank component of the State Energy Measure	0.77	0.82
Physical Symptoms Inventory	0.77	0.74

Note. N = 19.

received 50% of the deposit back if they attended at least five meetings, and received 100% of the deposit back if they attended at least eight meetings and completed all pre-test and post-test components. While the use of a deposit returned based on participation does limit generalizability of findings related to adherence when comparing the current program to non-incentivized programs, it is unlikely to hinder generalizability when comparing the program to the 69% of workplace health promotion programs that feature participation-based incentives (Mattke et al., 2013).

## 2.1. Measures

All measures outlined below were used at pre-test and post-test. Internal consistencies observed at both time points can be found in Table 2.

## 2.2. Fitness assessment measures

### 2.2.1. Anthropomorphic measurements

The personal trainer recorded the participant's weight, body mass index, body fat percentage using an OMRON fat loss monitor handheld electrical conductance device (model HBF-306C),<sup>3</sup> and body circumference measured in inches at the abdomen, natural waist, hips, thigh, calf, and arm.

### 2.2.2. Physical fitness measurements

The personal trainer measured the participant's resting heart rate by taking the pulse along the carotid artery. Cardiovascular endurance was measured using a three-minute step test, in which participants stepped up onto a platform elevated at 12 in. to the beat of a metronome set at 96 beats per minute for three minutes. Pulse was taken for one minute following the step test, with a lower pulse indicating better cardiovascular endurance. Muscular endurance was measured with a one-minute abdominal crunch and a push-up or modified push-up test to exhaustion. Flexibility was measured using maximal reach obtained during a standard three-trial sit and reach test.

### 2.2.3. Survey measures

The pre-test and post-test surveys contained all measures outlined below. Unless stated otherwise, a standard five-point response scale

<sup>3</sup> If the body fat percentage could not be measured using the handheld device due to elevated body fat percentage (> 47.5% in the present study), an estimate of body fat percentage was calculated using the girth formula (McArdle, Katch, & Katch, 2006), which utilizes circumference measurements at the abdomen, thigh, and calf sites.

(1 = never and 5 = always for frequency scales; 1 = strongly disagree and 5 = strongly agree for agreement scales) was used.

### 2.2.4. Mindfulness

The 24-item Five Facet Mindfulness Questionnaire – Short Form (FFMQ-SF; Bohlmeijer, ten Klooster, Fledderus, Veehof, & Baer, 2011) questionnaire was used to measure respondents' level of general mindfulness. An example item includes "Usually when I have distressing thoughts or images I can just notice them without reacting." This measure has five subscales corresponding to each of the five facets of mindfulness: observing, describing, acting with awareness, non-judging of inner experience, and non-reactivity to inner experience.

### 2.2.5. Self-compassion

The 12-item Self-Compassion Scale – Short Form (SCS-SF; Raes, Pommier, Neff, & Van Gucht, pp. 702, 2011) was used to measure self-compassion. The measure is comprised of self-compassion items that assess self-kindness, common humanity, and mindfulness and reverse scored self-critical judgment items that assess self-judgment, isolation, and over-identification. An example item is "I try to see my failings as part of the human condition."

### 2.2.6. Participation in health behaviors

Diet quality was measured using the Dietary Screener Questionnaire [DSQ] and the PACE+ Dietary Fat Screening Measure (NCI, 2013; Prochaska, Sallis, & Rupp, 2001). The DSQ features 26 items assessing the frequency of consuming a variety of foods and drinks in the past month. This measure provides estimations of daily consumption of fruits and vegetables, whole grains (ounces), total added sugar (teaspoons), added sugar from sugar-sweetened beverages (teaspoons), fiber (grams), dairy (cups), and calcium (milligrams). Most items were measured on a Likert scale, ranging from 0 (Never) to 9 (2 or more times per day). A sample item is "During the past month, how often did you eat cookies, cake, pie or brownies? (Do not include sugar-free kinds)?"

The PACE+ Dietary Fat Screening measure (Prochaska, Sallis, & Rupp, 2001) features 21 items assessing the frequency of consuming a variety of high-fat foods during the previous week. Scores of 16 or above have good sensitivity (81%) in terms of detecting high fat intake (30% or more calories from fat over three days). Items are measured on a Likert scale, ranging from 0 (Did not eat this week) to 5 (More than twice each day). A sample item is "In the past 7 days, how often did you eat bacon, sausage, or chorizo?"

Self-reported physical activity was measured using the Short Questionnaire to Assess Health Enhancing Physical Activity (SQUASH; Wendel-Vos, Schuit, Saris, & Kromhout, 2003). The scale asks participants to recall the frequency, duration, and effort of any physical activity performed for the purposes of commuting, leisure activities, household chores, and work activities. Higher scores are assigned to individuals that report more frequent and vigorous physical activity. Total physical activity and the leisure subscale scores were analyzed, given that programming targeted an increase in leisure time physical activity.

### 2.2.7. Participation in mindful health behaviors

The 28-item Mindful Eating Questionnaire (MEQ; Framson et al., 2009) was used to assess the frequency with which participants engage in five aspects of mindful eating. An example item is "I recognize when I'm eating and not hungry." Because no scale currently exists to measure mindful exercise, a scale was created for this study. The five-item scale was constructed such that each item reflected a principle of mindful movement, as defined by Salmon, (n.d.): Moving with awareness, beginner's mind, letting go of preconceptions, non-judgmental awareness, and sharpening attention and intention. An example item is "I listen to the cues that my body is sending me during exercise or physical activity."

### 2.2.8. Well-being measures

Well-being measures have an established presence in research on occupational stress (Danna & Griffin, 1999) and stress management interventions (DeFrank & Cooper, 1987). We chose to measure changes in well-being, rather than changes in stress, due to the roots of mindfulness in acceptance-based approaches. Acceptance-based approaches are oriented to increase engagement in functional and value-driven behavioral responses to difficult internal experiences (e.g., stress) and improve well-being and quality of life rather than reduce the frequency or intensity of difficult internal experiences (Hayes, Follette, & Linehan, 2004). The Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985) was used to measure subjective well-being, as conceptualized as global life satisfaction. This five-item scale asks participants to rate their level of agreement with statements such as “In most ways, my life is close to ideal.”

Physical well-being, as conceptualized as energy, was measured with the fuel tank component of the State Energy Measure (Britt, McKibben, McFadden, & Kelley, 2013). Participants were asked to describe how “full” their physical, mental, and emotional energy tanks are as if their personal energy tank is like a gas gauge in a car. The instructions were modified to feature a recall period referring to energy over the past month, rather than state energy. The 13-item Physical Symptoms Inventory (PSI; Spector & Jex, 1998) was used to measure physical well-being, as conceptualized as strain. Participants were presented with a list of commonly reported physical symptoms, such as a headache or a backache, and asked how often they had experienced each symptom in the previous month.

### 2.2.9. Nonequivalent dependent variable

The authors chose a variable that was unlikely to change in response to the intervention for the nonequivalent dependent variable analysis: job design characteristics. The following subscales of the Job Diagnostic Survey (Hackman & Oldham, 1975) were used: task interdependence, autonomy, completion, variety, task significance, feedback, and results. An example item is “My job requires me to work closely with other people (clients or other people in my organization).” One participant who indicated that they experienced a major job change since taking the pre-test was excluded from the nonequivalent dependent variable analysis.

## 3. Results and discussion

All data cleaning and analyses were performed using IBM SPSS Statistics Version 23.0 (IBM Corp, 2015), except for the DSQ data. This data was entered into an excel file and cleaned and then variable summary scores were calculated using a SAS software scoring syntax that is available online (NCI, 2016), which we ran in SAS Version 9.3 (SAS, 2011). Then the variable summary scores were transferred to SPSS for analysis.

### 3.1. Exclusions, missing data, outliers, and analysis

One individual participated in a similar health behavior change program during the same time frame as the current study and was excluded from all analyses. When a participant was missing an item on a scale, we imputed their mean response on other items of that scale (prior to calculating scaled scores), if the participant had completed at least 70% of the scale (or  $N - 1$  items for scales with fewer than five items; Roth, Switzer, & Switzer, 1999). In other cases of missing data, conservative methods such as pairwise or list-wise deletion were used, rather than no-change analyses or group-mean imputations (e.g. Goetzl et al., 2016).

We imputed four outlier scores with the closest non-outlier values (Winsorize; Ghosh & Vogt, 2012) from the sample for the respective scales. The individual with the four outlier scores had estimated added sugar consumption and added sugar from sugar-sweetened beverage

**Table 3**  
Program satisfaction and perceived effectiveness.

	M	SD
Global Program Satisfaction	4.58	0.77
Satisfaction with Didactic Component	4.32	1.00
Satisfaction with Workbook Activities	4.21	0.92
Satisfaction with Group Exercise Component	4.89	0.32
Perceived Program Effectiveness – Nutrition	3.74	1.33
Perceived Program Effectiveness - Physical Activity	4.26	1.15
Perceived Program Effectiveness - Stress Management	4.21	1.03
Perceived Program Effectiveness - Mindfulness	4.37	1.12
Perceived Program Effectiveness - Self-compassion	4.42	1.12

Note.  $N = 19$ ;  $M =$  mean;  $SD =$  standard deviation.

consumption at pre-test and post-test that exceeded 40 teaspoons per day. This method allowed data from this participant to be retained in the analyses.

Pre-test and post-test data were compared using paired samples  $t$ -tests. For significant comparisons, effect sizes were calculated using the standard deviations formula for Cohen's  $d$ . This method is recommended by Dunlap, Cortina, Vaslow, and Burke (1996), who argue that this method is most appropriate for correlated designs (paired samples) because other methods that depend on pooled standard deviations overestimate the effect size. Effect sizes are interpreted based on rules of thumb summarized by Lakens (2013).

### 3.2. Process variables

Three participants dropped out of the program prior to completion, meaning that the attrition rate was 12.5%, which is more favorable than the average attrition rate of 18% observed in treatment conditions of health behavior change interventions (Crutzen et al., 2015). The average attendance among those who completed the program was 8.2 sessions ( $SD = 1.6$ ), meaning that most participants missed between one and two of the weekly meetings.

In the post-test survey, participants were asked to rate their satisfaction with various components of the interventions and their perceived effectiveness of the program on a scale from 1 to 5 (“not at all satisfied” to “very satisfied;” “not at all effective” to “very effective”). For descriptive statistics on program satisfaction and perceptions of program effectiveness, refer to Table 3. These indices revealed that program satisfaction perceptions of effectiveness tended to be high.

### 3.3. Fitness assessment findings

Findings from the fitness assessment analysis can be found in Table 4. There was a significant reduction in abdominal circumference,  $t(15) = 2.94$ ,  $p = 0.010$ ,  $d = 0.15$ , and a significant increase in thigh circumference from pre-test to post-test,  $t(15) = -5.15$ ,  $p < 0.001$ ,  $d = 0.49$ . Muscular endurance significantly increased, as measured by both abdominal crunches,  $t(14) = -2.76$ ,  $p = 0.015$ ,  $d = 0.38$ , and push-ups,  $t(14) = -3.08$ ,  $p = 0.008$ ,  $d = 0.57$ .

### 3.4. Survey findings<sup>4</sup>

Results of the analysis of survey variables can be found in Table 5. Participants significantly increased scores on all subscales of the Five

<sup>4</sup> Although family-wise error may be a concern, a modified alpha level based on the number of comparisons ( $p = 0.001$ ) is likely too conservative based on the small sample size. The following findings were still significant based on the modified  $p$  value: the increase in thigh circumference, the increase in the observing and non-reactivity facets of mindfulness, the increase in self-compassion, the increase in mindful eating, and the increase in mindful exercise. Therefore, we can be more confident that these findings are not attributable to family-wise error, but the small sample size prohibits using this modified alpha level as the criteria for significance.

**Table 4**  
Results of dependent samples t tests for fitness assessment analyses.

Variable	Mean (SD) at Pre-test	Mean (SD) at Post-test	T-test Results
Weight	176.09 (45.32)	175.57 (44.65)	$t(16) = 0.57, p = .574$
Body Mass Index	29.05 (8.24)	28.74 (8.12)	$t(16) = 0.82, p = .423$
Body Fat Percentage	35.23 (9.37)	34.92 (9.07)	$t(16) = 0.49, p = .633$
Resting Heart Rate	82.27 (15.06)	83.60 (13.05)	$t(14) = -0.47, p = .644$
Body Circumference			
Abdomen	38.26 (7.82)	37.11 (7.68)	$t(15) = 2.94, p = .010$
Waist	35.44 (7.13)	34.92 (6.51)	$t(15) = 1.47, p = .163$
Hip	43.57 (6.27)	43.75 (5.60)	$t(15) = -0.57, p = .575$
Thigh	23.31 (3.51)	24.94 (3.10)	$t(15) = -5.15, p < .001$
Calf	15.26 (1.67)	15.02 (1.47)	$t(15) = 2.33, p = .034$
Arm	11.98 (2.20)	11.70 (1.67)	$t(15) = 1.01, p = .327$
Cardiovascular Endurance	115.50 (27.38)	117.57 (13.16)	$t(13) = -0.44, p = .670$
Muscular Endurance			
Abdominal Crunches	37.00 (13.62)	42.00 (13.02)	$t(14) = -2.76, p = .015$
Push-ups	16.87 (8.09)	22.53 (11.45)	$t(14) = -3.08, p = .008$
Flexibility	17.83 (3.20)	18.03 (2.55)	$t(14) = -0.43, p = .671$

**Table 5**  
Results of dependent samples t-tests of survey analyses.

Variable	Mean (SD) at Pre-test	Mean (SD) at Post-test	T-test Results
Mindfulness			
Non-reactivity	12.80 (2.59)	16.32 (2.67)	$t(18) = -6.43, p < .001$
Observing	13.26 (3.40)	15.79 (2.25)	$t(18) = -4.75, p < .001$
Acting with Awareness	14.84 (3.52)	17.51 (2.70)	$t(18) = -3.19, p = .005$
Describing	17.74 (4.09)	19.42 (2.95)	$t(18) = -2.48, p = .023$
Non-judging	14.84 (4.32)	16.95 (3.75)	$t(18) = -2.28, p = .035$
Self-compassion	2.92 (0.76)	3.64 (0.71)	$t(18) = -4.68, p < .001$
<b>Participation in Health Behaviors</b>			
Dietary Quality			
Added Sugar (tsp)	11.52 (8.03)	9.56 (7.88)	$t(18) = 1.84, p = .082$
Added Sugar from Sugar-Sweetened Beverages (tsp)	4.72 (7.58)	5.54 (11.71)	$t(18) = -0.57, p = .577$
Fruits and Vegetables (excluding fried potatoes; cups)	2.70 (0.69)	2.87 (0.97)	$t(18) = -0.90, p = .380$
Fiber (g)	15.11 (4.39)	15.64 (4.35)	$t(18) = -0.58, p = .571$
Whole Grains (cups)	1.06 (0.99)	1.20 (1.00)	$t(18) = -0.49, p = .632$
Calcium (mg)	665.36 (148.11)	633.10 (146.76)	$t(18) = 0.86, p = .401$
Dairy (cups)	1.12 (0.48)	0.99 (0.53)	$t(18) = 1.08, p = .295$
Dietary Fat	17.37 (8.20)	14.63 (5.60)	$t(18) = 2.58, p = .019$
Physical Activity			
Total Score	6695.72 (2802.96)	9443.06 (9751.19)	$t(17) = -1.25, p = .230$
Leisure Activity Score	897.39 (688.11)	1326.94 (851.57)	$t(17) = -2.31, p = .034$
<b>Participation in Mindful Health Behaviors</b>			
Mindful Eating	2.62 (0.39)	3.00 (0.34)	$t(18) = -4.08, p = .001$
Mindful Exercise	3.42 (0.66)	4.07 (0.59)	$t(18) = -4.63, p < .001$
<b>Well-being Variables</b>			
Life Satisfaction	4.39 (1.32)	5.09 (1.02)	$t(18) = -3.46, p = .003$
Energy	4.02 (1.13)	4.89 (1.17)	$t(18) = -3.23, p = .005$
Strain	1.67 (0.39)	1.64 (0.35)	$t(18) = 0.51, p = .619$
<b>Nonequivalent Dependent Variable</b>			
Job Characteristics			
Task Interdependence	4.53 (0.62)	4.59 (0.51)	$t(16) = -0.57, p = .579$
Autonomy	4.24 (0.56)	4.53 (0.51)	$t(16) = -2.06, p = .056$
Task Completion	4.24 (0.90)	3.94 (1.25)	$t(16) = 0.93, p = .369$
Task Variety	4.53 (0.72)	4.53 (0.80)	$t(16) = 0.00, p = 1.00$
Task Significance	4.24 (0.90)	4.24 (0.83)	$t(16) = 0.00, p = 1.00$
Feedback	3.65 (1.22)	3.53 (1.07)	$t(16) = 0.70, p = .496$
Results	3.94 (0.83)	4.12 (0.86)	$t(16) = -0.77, p = .455$

Note.  $N = 19$ .

Facet Mindfulness Questionnaire- Short Form (FFMQ-SF), with Cohen's  $d$  effect sizes ranging from 0.47 for the "describe" subscale to 1.34 for the "non-reactivity" subscale. Self-compassion significantly increased from pre-test to post-test,  $t(18) = -4.68, p < .001, d = 0.98$ .

In terms of participation in health behaviors, participants reported significantly reducing their consumption of dietary fat,  $t(18) = 2.58, p = 0.019, d = 0.39$  and increasing their leisure time physical activity,  $t(17) = -2.31, p = 0.034, d = 0.55$ . Other dietary variables and total physical activity did not significantly change from pre-test to post-test. Mindful eating,  $t(18) = -4.08, p = 0.001, d = 1.04$ , and mindful

exercise,  $t(18) = -4.63, p < 0.001, d = 1.04$ , significantly increased.

Affective well-being as measured by life satisfaction,  $t(18) = -3.46, p = 0.003, d = 0.59$ , and physical well-being as measured by energy,  $t(18) = -3.23, p = 0.005, d = 0.76$ , significantly improved. Finally, results of the nonequivalent dependent variable check revealed that job characteristics did not significantly change.

#### 4. Discussion

This study investigated whether training adults in mindful and self-

compassionate health behaviors could improve effectiveness and retention of workplace health behavior interventions. Effect sizes for significant comparisons revealed that the program participation was associated with small positive effects for objective indicators of health and fitness, small to medium effects sizes for participation in health behaviors, medium effect sizes for well-being, medium to large effect sizes in mindfulness and self-compassion, and large effect sizes for participation in mindful health behaviors. This study provides preliminary evidence to support a pilot worksite program that combines psychoeducation on how to apply mindfulness and self-compassion to health behavior routines and health behavior change.

Consumption of dietary fat significantly decreased, but there were no significant changes in other dietary variables. It is possible that participants decided to change dietary behaviors in a sequential fashion, initially focusing on changing dietary fat (Prochaska, Spring, & Nigg, 2008). This may have been due to a desire to reduce unmanageable change burden. High circumference increased, which seems counterintuitive to program goals, but could indicate positive changes in ratios of lean muscles to adipose tissue following the introduction of strength training. Our results revealed no significant changes in weight, body mass index, body fat percentage, cardiovascular fitness, resting heart rate, flexibility, some body circumference variables (e.g., waist, hip, and calf circumference), and most dietary variables. These variables may be characterized by longer change processes than the other outcome variables in this study and may take longer than 10 weeks to manifest.

#### 4.1. Strengths

This study contributes to the small body of research on interventions designed to help participants apply mindfulness and self-compassion to their health behavior routines. The process variables also indicate that participants tended to be satisfied and rate the program as effective and that the attrition rate was low. Although the survey measures may have been subject to various biases, such as social desirability and recall biases, a strength of this study was that the fitness assessment contained objective measurement of markers for health. The study is also strengthened by using a nonequivalent dependent measure, which adds confidence to interpretations when the presence of a control group is not possible (Shadish et al., 2002).

#### 4.2. Limitations and future directions

A primary limitation of this study was the small sample size. Our study likely had insufficient power to detect small changes in outcome variables. Another notable shortcoming of our study was the lack of a control group and random assignment. To make strong conclusions about the effectiveness of this intervention, future researchers would need to test this intervention against a control group. The researchers were also directly involved in program instruction each week. Future research could be strengthened by the incorporation of instructors who are blind to the study hypotheses.

This study was 10 weeks in duration, which is shorter than many health interventions. Additionally, the outcome assessment occurred immediately following the intervention period and there were no follow-ups. Follow-up assessments several months after the intervention period would have allowed us to determine if changes in self-reported and objective physical outcome variables were sustained over time. Follow-up assessments would be more likely to capture gradual or sequential changes in diet, physical fitness, weight, and body fat percentage. Social desirability bias is a limitation that applies to the self-report measures used in the study, and future research could incorporate a social desirability measure to ensure that effects are not due to demand characteristics.

Generalizability may be limited by the fact that participants self-selected into this intervention and their own level of motivation may

have been high. These results may not extend to individuals who are not interested in and willing to develop their mindfulness, self-compassion, or health behavior skill sets. The sample was primarily female and non-Hispanic Caucasian. Females and racial and ethnic minorities may be influenced by different social and cultural norms than males and majority group members and may therefore respond differently to certain aspects of mindfulness-based health behavior change programs. The sample was also characterized by a higher level of educational attainment and household income than national averages, which would likely result in lower barriers to health behaviors and health maintenance for individuals in our sample. Future research should test the intervention on a more diverse sample to evaluate the program's effectiveness across gender, racial and ethnic groups, and socioeconomic statuses. Finally, although the stress management component aimed to improve well-being rather than reduce stress, future research could include self-reports of perceived stress or physiological indicators of stress as outcome variables.

#### 4.3. Conclusion

This study was the first logical step in proof of concept and feasibility in examining the incorporation of targeted mindfulness and self-compassion instruction into health behavior change interventions. It provides initial evidence that this type of intervention can produce improvement in mindfulness, self-compassion, mindful health behaviors, and some health behaviors, measures of well-being, and objective health indicators. Additionally, the process data indicate that such an intervention is perceived as satisfactory and effective, and featured a low attrition rate. In this study, we provide an intervention template upon which future research can build, ultimately expanding the literature on mindfulness and self-compassion applied to health behaviors.

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