Journal of Occupational Health Psychology

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Online First Publication, October 18, 2018. http://dx.doi.org/10.1037/ocp0000132

American Psychological Association

Journal of Occupational Health Psychology

1076-8998/18/$12.00

http://dx.doi.org/10.1037/ocp0000132

Mindfulness Training Improves Employee Well-Being: A Randomized Controlled Trial

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Organizations are turning toward behavioral interventions with the aim of improving employee well-being and job performance. Mindfulness training has been suggested as one type of intervention that can achieve these goals, but few active treatment randomized controlled trials have been conducted. We conducted a randomized controlled trial among employees of a midwestern marketing firm ($n = 60$) that compared the effects of 6-week mindfulness training program with that of a half-day mindfulness training seminar comparison program on employee well-being outcomes. Although both groups improved comparably on job productivity, the 6-week mindfulness training group had significantly greater improvement in attentional focus at work and decreases in work–life conflict, as well as a marginal improvement in job satisfaction compared with the half-day seminar comparison group. These findings suggest that although small doses of mindfulness training may be sufficient to foster increased perceptions of job productivity, longer term mindfulness training programs are needed to improve focus, job satisfaction, and a positive relationship to work.

Keywords: mindfulness, attention, well-being, work, randomized controlled trial

Mindfulness interventions, which aim to foster greater openness to present moment experiences, are being increasingly applied to workplace settings (Good et al., 2016). The widespread adoption of workplace mindfulness programs has outpaced the science testing their efficacy, with only a few methodologically strong randomized controlled trials (RCTs) of workplace mindfulness programs published in the literature (Kiburz, Allen, & French, 2017; Wolever et al., 2012). Moreover, initial studies have focused primarily on negative outcomes such as stress (Wolever et al., 2012) and job burnout (Krasner et al., 2009). There have been comparatively few mindfulness training RCT studies that have measured employee well-being outcomes in the workplace, such as job satisfaction, productivity, work–life conflict, and attentional control at work. These outcomes are important to study because previous research indicates that poor employee well-being is associated with physical and mental health problems, high turnover, and lower job performance (Hämmig, Gutzwiller, & Bauer, 2009; Judge, Thoresen, Bono, & Patton, 2001; Williams & Skinner, 2003). To address this, we conducted a well-controlled RCT of a high-dose mindfulness training program (HDMT; 6-week training) versus a low-dose mindfulness training program (LDMT; half-day training) on employee well-being outcomes in the workplace.

Due to increased workloads, employees are experiencing psychological and physical health problems, which negatively affects organizations in the form of higher turnover and increased sick days (van der Klink, Blonk, Schene, & van Dijk, 2001). Organizations have recently turned to behavioral interventions in hopes of fostering positive well-being outcomes at work (van der Klink et al., 2001). Initial RCTs found positive effects from a variety of interventions, such as acceptance and commitment therapy, an innovation promotion program, and a team-based, problem-solving intervention, on employee well-being outcomes such as employee mental health, work-related variables, and job performance (Bond & Bunce, 2000; Tsutsumi, Nagami, Yoshikawa, Kogi, & Kawakami, 2009). Indeed, a meta-analysis of 48 studies found cognitive–behavioral interventions to be effective for improving perceived quality of work life and enhancing psychological resources (van der Klink et al., 2001).

One especially promising type of cognitive–behavioral intervention is mindfulness-based interventions (Creswell, 2017). Ini-

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We thank Michael Tumminia for his assistance with study recruitment. A previous version of this article was presented at the 33rd Annual Society for Industrial Organizational Psychology Conference, Chicago, Illinois, April, 2018.

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tial studies suggest that mindfulness-based interventions can foster well-being outcomes in nonworkplace settings, such as improvements in psychological well-being, mental and physical health outcomes, and cognitive outcomes (Brown & Ryan, 2003; Hoge et al., 2013; Jha et al., 2015; Morone et al., 2016). By incorporating mindfulness training into the workplace, theorists predict an improvement in employee well-being, among other workplace outcomes (Good et al., 2016). Specifically, it has been posited that mindfulness may cultivate resilience in the workplace by decreasing emotional and physiological reactivity after adverse events, enhancing an employee's ability to recover from toxic events, and through growth following adversity. Initial work suggests that mindfulness training can be beneficial to employee well-being outcomes (Hülsheger, Alberts, Feinholdt, & Lang, 2013; Kiburz et al., 2017; Michel, Bosch, & Rexroth, 2014); however, further well-controlled research is needed.

The present study makes a number of important contributions to the mindfulness intervention and employee well-being literature. First, by rigorously testing two forms of mindfulness interventions (HDMT vs. LDMT) in an RCT design, the present study addresses the question of how much mindfulness training is necessary to improve worker well-being outcomes. Second, the present study investigates the effects of mindfulness training interventions on employee well-being outcomes, an area of research that is relatively understudied. Scholars have called for an increase of research in this area, as many believe mindfulness training has the potential to improve employee well-being outcomes (Good et al., 2016).

Third, the present study measures employee well-being through experience sampling, which consists of brief surveys distributed to participant's smartphones at four quasi-random times during the workday and once regularly in the evening over consecutive days. Experience sampling methods are advantageous because they have been shown to be higher in ecological validity (Anestis et al., 2010), reduce memory biases associated with retrospective reporting (Stone & Broderick, 2007), and are more sensitive for detecting change (Moore, Depp, Wetherell, & Lenze, 2016; Solhan, Trull, Jahng, & Wood, 2009). Global subjective judgments are vulnerable to overweighing extreme or recent experiences. Research has shown that well-being outcomes are influenced by manipulations such as current mood or immediate context (Shiffman, Stone, & Hufford, 2008). Through experience sampling methods, data can be averaged to reflect actual daily experiences. Another notable strength of experience sampling methodology is that it samples individuals in their natural environments. By surveying employees in their natural setting (e.g., at work during the workday), data are collected in real time, which makes them less likely to be biased by mental heuristics compared with data collected in nonnatural environments (e.g., lab setting; Shiffman et al., 2008). To our knowledge, no mindfulness research has used experience sampling methods in the workplace during the workday.

The study of well-being in the organizational behavior literature has taken many forms (Schaufeli, Taris, & Van Rhenen, 2008). The present study operationalized employee well-being to include employee engagement (a combination of cognitive and emotional antecedent variables) as a factor that generates greater positive affect (job satisfaction, commitment, fulfillment, etc.), which relates to improved efficiency of work (Harter, Schmidt, & Keyes, 2003). Because of previously reported cognitive and emotional benefits, mindfulness interventions might be uniquely suited to influence employee well-being. Mindfulness is commonly described as an awareness of the present moment with an open and accepting attitude (Brown, Ryan, & Creswell, 2007). Mindfulness interventions aim to improve one's ability to self-regulate thoughts and emotions, which is believed to influence behavioral and physiological responses (Brown & Ryan, 2003; Creswell & Lindsay, 2014).

Attentional focus is one form of self-regulation that is related to employee well-being. By resisting distractions and maintaining one's attention directed toward a job task, attentional focus helps employees work more efficiently and provide the resources needed for meeting work demands. Mindfulness practice requires one to bring awareness to and keep attention anchored on the current experience (Bishop et al., 2004). Previous research has found mindfulness training to decrease distractibility (Jha, Krompinger, & Baime, 2007; Tang et al., 2007) as well as mind-wandering (Mrazek, Franklin, Phillips, Baird, & Schooler, 2013). The workplace is full of distractions (e-mails, phone calls, interpersonal issues) that challenge employee's attentional focus, and provides a steep test for any type of intervention; however, to our knowledge, no study has tested the effects of mindfulness training on attentional focus during the workday. Because scholars suggest that longer and more intense interventions lead to more effective adoption and better outcomes (Tannenbaum & Yukl, 1992), we predict that attentional focus will be enhanced in the HDMT group more so than the LDMT group.

Hypothesis 1: HDMT will increase attentional focus at work relative to LDMT.

As noted previously, improvements in cognitive variables are expected to have downstream effects on positive affect in the workplace. If resources adequately match work demands, perceptions of work are increased (Edwards, Caplan, & Van Harrison, 1998). Previous research using a 2-week mindfulness intervention found that job satisfaction, a dimension of positive affect at work, is positively affected by mindfulness training (Hülsheger et al., 2013). The current study looks to add to the literature by uniquely testing how much mindfulness training is sufficient for improving job satisfaction, and if there's added benefit for extending the training to 6 weeks.

Hypothesis 2: HDMT will increase job satisfaction relative to LDMT.

Mindfulness training may also affect other employee well-being outcomes such as work–life and life–work conflict. The literature suggests that employees commonly find it challenging to balance their work and personal lives (Galinsky, Aumann, & Bond, 2013; Houston & Waumsley, 2003). Research suggests that strain in one's personal life makes it difficult to fulfill job requirements and vice versa (Greenhaus & Beutell, 1985), making work–life and life–work conflict an employee well-being issue. Indeed, research has found that mindfulness training reduces work–family conflict (Kiburz et al., 2017; Michel et al., 2014). Scholars propose that mindfulness can help regulate one's work and personal life dynamics by providing resources to more effectively cope with work-related cognitions and emotions (Michel et al., 2014). The

current study answers calls from researchers to test mindfulness training on work–life conflict by using longer daily exercises (greater than 10 min) on employees in mentally demanding jobs (Michel et al., 2014). We also extend previous research on mindfulness and work–family conflict by using a work–life conflict measure with the aim of more accurately measuring conflicts experienced by employees who do not live within a family structure that includes caring for children. We predict that the HDMT group will report significant decreases in work interfering with their personal life (work–life conflict) and their personal life interfering with work life (life–work conflict) relative to the LDMT group.

Hypothesis 3A: HDMT will reduce work–life conflict relative to LDMT.

Hypothesis 3B: HDMT will reduce life–work conflict relative to LDMT.

Method

Study Participants

Enrolled participants were 60 (roughly 50% of the company) adults (M_{age} = 30.52, SD = 7.80) recruited from a digital marketing company based in Ohio via an in-person presentation and internal mass e-mails for a study testing mindfulness training in the workplace. The sample was 66.7% female and 95.0% White (see Tables 1 and 2 for full demographics). Primary study analyses are reported using all available baseline and postintervention data. Of the 60 total participants, 58 completed their allocated intervention, and 54 completed postintervention experience sampling, postintervention diary data, and the postintervention assessment. See Figure 1 for CONSORT flowchart.

Eligible participants were English-speaking smartphone owners (Android or iPhone) above the age of 18 who were available to participate for the duration of the study and had no recent mindfulness experience (daily practice within the previous 3 months). Of those screened, one potential participant was excluded for reporting significant previous mindfulness experience. Written informed consent was obtained from all participants, and all study procedures were approved by the institutional review board. Study data were collected between September 2016 and November 2016.

Procedure

Overview. Briefly, interested participants were prescreened for eligibility via an online questionnaire. Eligible participants signed an online informed consent, completed the baseline assessment, and completed 3 consecutive days of preintervention experience sampling and diary assessments. Then, participants who were still interested in participating in the study attended one of three in-person mindfulness workshops (whichever day was available in their schedule) and were randomly assigned to either the high- or low-dose group at the end of the workshop. After this, participants completed either the 6-week training or wait period, 3 consecutive days of postintervention experience sampling and diary assessments, and the follow-up assessment. Participants in the high-dose group received standardized study reminder texts and e-mails throughout the 6-week training period, and were able to call or text the study hotline or mindfulness instructor to ask questions or schedule individual meetings with the instructor.

Ecological momentary assessment. Ecological momentary assessment (EMA) involves intensive sampling of participant experiences in real time during a typical day. Here we used a two-pronged sampling approach consisting of experience sampling assessments used to collect snapshots of attentional control in real time throughout the workday, and daily diary assessments used to capture participant's overall impressions of job productivity, job satisfaction, work–life and life–work conflict.

Both experience sampling and daily diary assessments were administered via participant's personal smartphones using MetricWire (Kitchener, Ontario). Participants were prompted to complete experience sampling surveys at four quasi-random times throughout the workday (24 experience sampling assessments total across baseline and postintervention periods). Text links were sent during each of four 2-hr blocks distributed between 9:00 a.m. and 5:00 p.m., with links expiring after 45 min. Participants were also prompted to complete daily diary surveys at 8:00 p.m. each day (six daily diary assessments total across baseline and postintervention periods); links were sent at exactly 8:00 p.m. and remained active until 11:30 p.m. that day. The experience sampling periods

Table 1
Baseline Characteristics of Randomized Participants by Condition (N = 60)

Demographics	LDMT (n = 29)	HDMT (n = 31)	Difference statistic
Age	30.14 (6.61)	30.87 (8.87)	$F(1, 58) = 0.130$, $p = .719$
Sex			$\chi^2(1) = 0.534$, $p = .465$
Male	11 (37.9%)	9 (29.0%)	
Female	18 (62.1%)	22 (71.0%)	
Race			$\chi^2(1) = 2.954$, $p = .086$
White	29 (100.0%)	28 (90.3%)	
Non-White	0 (0.0%)	3 (9.7%)	

Note. LDMT = low-dose mindfulness training program; HDMT = high-dose mindfulness training program. For binary or categorical variables (i.e., sex and race), numbers inside parentheses represent percentage of sample. For continuous variables (age), numbers inside parentheses represent standard deviations. Randomization was successful for all demographic variables. Of the 60 participants randomized, six dropped out before postassessment (10.0%). Those who dropped out did not differ in age, $F(1, 134) = 0.112$, $p = .740$, sex, $\chi^2(1) = 0.833$, $p = .361$, or race, $\chi^2(1) = 0.351$, $p = .554$.

Table 2
Additional Baseline Characteristics of Randomized Participants by Condition (N = 60)

Demographics	LDMT (n = 29)	HDMT (n = 31)	Difference statistic
Marital status			$\chi^2(2) = 0.076, p = .963$
Married	14 (48.3%)	14 (45.2%)	
Single	13 (44.8%)	15 (48.4%)	
Divorced	2 (7.9%)	2 (6.5%)	
Education level			$\chi^2(4) = 2.036, p = .729$
Less than bachelor's degree	1 (3.4%)	3 (9.7%)	
Bachelor's degree	22 (75.9%)	21 (67.8%)	
Master's degree	6 (20.7%)	7 (22.6%)	
Managerial role			$\chi^2(1) = 2.336, p = .126$
Manager	15 (51.7%)	10 (32.3%)	
Subordinate	14 (48.3%)	21 (67.7%)	
Works directly with clients			$\chi^2(1) = 0.601, p = .438$
Yes	22 (75.9%)	26 (83.9%)	
No	7 (24.1%)	5 (16.1%)	
Tenure at organization	2.30 (2.56)	1.79 (1.66)	$F(1, 58) = 0.844, p = .362$

Note. LDMT = low-dose mindfulness training program; HDMT = high-dose mindfulness training program. For binary or categorical variables (i.e., marital status and education level), numbers inside parentheses represent percentage of sample. For continuous variables (tenure at organization), numbers inside parentheses represent standard deviations. Randomization was successful for all demographic variables. Of the 60 participants randomized, six dropped out before postassessment (10.0%). Those who dropped out did not differ in marital status, $\chi^2(2) = 1.270$, $p = .530$, education level, $\chi^2(4) = 3.878$, $p = .423$, managerial role, $\chi^2(1) = 0.190$, $p = .663$, working directly with clients, $\chi^2(1) = 0.046$, $p = .830$, or tenure at organization, $F(1, 58) = 1.454$, $p = .233$.

at both baseline and postintervention spanned from Tuesday to Thursday.

Study Intervention

All participants completed one half-day live mindfulness workshop (two participants listened in via video chat) taught by a senior mindfulness trainer with more than 18 years of teaching experience. During this workshop, participants learned the Unified Mindfulness system, and in addition to seated meditation, they were taught how to implement mindfulness techniques during conversations, eating, and while listening to music. Upon completion of the workshop, participants were randomized to one of two conditions: low dose (6 weeks of a waiting period) or high dose (6 weeks of daily mindfulness practice). During the 6-week training period, participants in the high-dose group were expected to complete one 25-min guided mindfulness meditation audio recording each day for 5 days per week. This intervention was developed by one of the coauthors, an experienced (18 years) mindfulness trainer who incorporated principles from the Unified Mindfulness system into the training. In the first week, five techniques were introduced with didactic explanation at the beginning of the guided audio sessions. For the remaining 5 weeks, participants were allowed to choose which technique they would like to practice. Following each guided meditation, participants were asked to complete a brief, 2-min Internet-based questionnaire regarding which technique they chose and a comprehensive list of daily life situations in which participants could indicate when they may have applied mindfulness techniques within the past 24 hr. The questionnaire included the following situations: Golden Times (e.g., exercising, eating), Down Times (e.g., waiting in line, waiting for a meeting to start), Connection Times (e.g., with friends, family), Stress Times (e.g., prepping for an important meeting, facing or thinking about a challenging situation), Physical Times (e.g., brushing teeth, washing dishes), and Mind Times (e.g., analyzing yourself or your life, problem-solving a client issue). Participants completed the postpractice survey 427 times out of 466 total practiced meditations (91.6%). Weekly group phone conferences offered further instruction on practice applications in daily life and enabled participants to receive feedback on their experiences. Between 8 and 16 members of the high-dose group participated in the weekly calls each week (M = 12.33). Additionally, 93.5% of the group completed a 10-video training series at the beginning of the program, which outlined the principles underlying the practice approach. Each video was ~5–10 min in length and included interactive quizzes lasting ~10–15 min each. These were designed to test participants' knowledge and understanding of key principles, with the assumption that having conceptual clarity about how to practice mindfulness increases one's ability to practice effectively. The mindfulness instructor also contacted each participant in the high-dose group during the course of the 6-week training period, inviting them to discuss their experiences in the training program over a 15-min one-to-one call (54.8% of participants accepted this invitation). Guided meditation tracking was done through the website, Wistia; the video series was tracked on the website, Thinkific; and the mindfulness instructor tracked participation in the individual and group meetings.

Measures

Attentional control was assessed via beeped assessments four times daily for 3 days before and 3 days after the intervention. See Table 3 for the specific items used to assess this construct. Due to concerns about participant response fatigue, job satisfaction, job productivity, work–life conflict, and life–work conflict were assessed at the end of the day using daily diaries for 3 days at

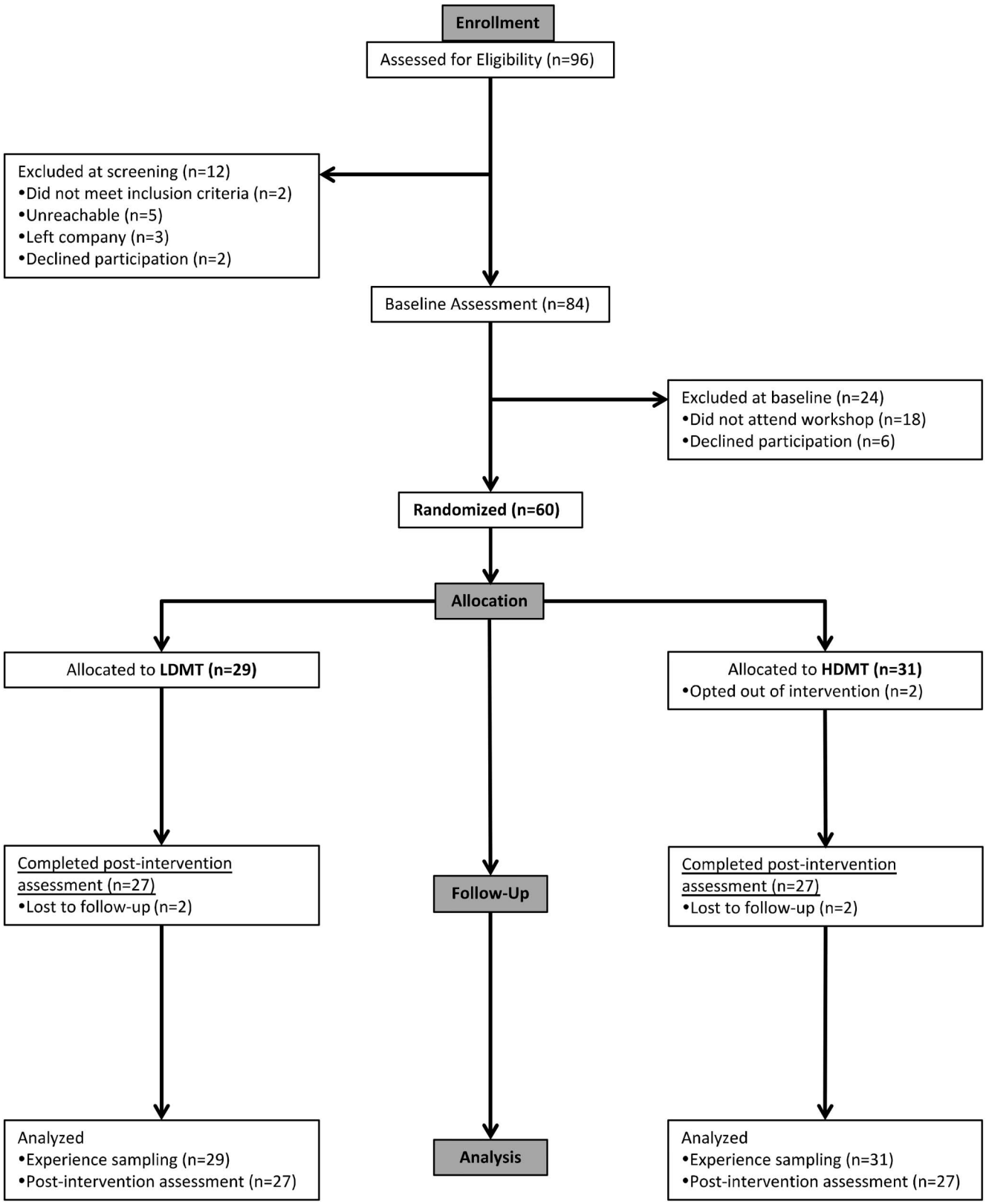

Figure 1. CONSORT flowchart. CONSORT = Consolidated Standards of Reporting Trials.

Table 3
Items Used to Assess Attentional Focus

Constructs	Item
Attentional focus	
1. Concentration	Since the last assessment, when I needed to concentrate and solve a problem, I had trouble focusing my attention.
2. External distraction	Since the last assessment, when I was working hard on something, I still got distracted by events around me.
3. Internal distraction	Since the last assessment, when I was trying to focus my attention on something, I had difficulty blocking out distracting thoughts.

baseline and 3 days postintervention. See Table 4 for the specific items used to assess each construct. Also related to response fatigue, only two to three items with the highest factor loads were assessed from the following measures.

Attentional focus. Three items from the Focusing subscale of the Attentional Control Scale (Derryberry & Reed, 2002) were used to assess attentional focus (the executive ability to direct attention) since the last assessment. Participants were asked to indicate their level of agreement with each item using a 1 (*strongly disagree*) to 7 (*strongly agree*) Likert-type scale. All three items were coded before analysis so that higher scores reflected greater attentional focus. Responses to these items were averaged to create a single index of attentional focus (average reliability across days: $\alpha = .89$).

Job satisfaction. Two items were used to assess daily job satisfaction from Macdonald and McIntyre's (1997) Job Satisfaction Scale. Participants were asked to indicate their agreement with each item on a 5-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*extremely*) with a neutral midpoint at 3 (*neither agree nor disagree*). Higher scores indicated greater work satisfaction. Responses to these items were averaged to create a single index of work satisfaction (average reliability across days: $\alpha = .69$).

Productivity. A single item was used to assess daily productivity. Participants were asked to rate how productive they were that day on a 6-point Likert-type scale ranging from 1 (*not at all*) to 6 (*very much*). Higher scores indicated greater daily productivity.

Work–life conflict. Three items from the Waumsley, Houston, and Marks's (2010) Work–Life Conflict Scale were used to assess daily work–life conflict. Participants were asked to indicate their agreement with each item ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Higher scores indicated greater work–life conflict. Responses to these items were averaged to create single index of work–life conflict (average reliability across all days: $\alpha = .89$).

Life–work conflict. Three items from the Waumsley et al.'s (2010) Life–Work Conflict Scale were used to assess daily life–work conflict. Participants were asked to indicate their agreement on each item ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Higher scores indicated greater life–work conflict. Responses to these items were averaged to create a single index of life–work conflict (average reliability across all days: $\alpha = .85$).

Data Analysis

To test daily diary predictions, two-level multilevel models were used to test for Time (baseline, postintervention) × Condition (HDMT, LDMT) differences using Stata's *mixed* command. In two-level models, observations (Level 1) are nested within individuals (Level 2). To test experience sampling predictions, three-level multilevel models were used to test for Time × Condition differences using Stata's *mixed* command. In three-level models, beeped assessment observations (Level 1) are nested within days (Level 2), which are nested within individuals (Level 3). Restricted maximum likelihood estimation and an identity covariance matrix was used for all multilevel mixed effect linear regressions. The term of interest in all models was the Time × Condition interaction because this term indicates whether changes in each outcome over time differ by condition.

Although multilevel models for longitudinal studies typically include an autoregressive term (ρ) to account for serial autocorre-

Table 4
Items Used to Assess Job Satisfaction, Work–Life Conflict, Life–Work Conflict, and Job Productivity

Constructs	Item
Job satisfaction	
1. Recognition	Today, I received recognition for a job well done.
2. Feeling good	I felt good about my job today.
Work–life conflict	
1. Work interference	Today, the demands of my work interfered with my life away from work.
2. Time demands	Today, the amount of time my job took up made it difficult to fulfill other interests.
3. Job demands	Today, the things I wanted to do at home did not get done because of the demands of my job.
Life–work conflict	
1. Personal interference	Today, the demands of my personal life interfered with work-related duties.
2. Time demands	Today, I had to put off doing things at work because of demands on my time outside work.
3. Job demands	Today, the things I wanted to do at work didn't get done because of the demands of my interests outside work.
Job productivity	
1. Productivity	How productive did you feel at work today?

lation between proximal observations, we were unable to do so here because the continuous term for time since study onset was collinear with the categorical predictor for time (baseline, postintervention). Moreover, because the Time × Condition interaction was the term of interest in all models, it was not possible to omit the main effect of time in the multilevel models. Thus, to account for autocorrelation between consecutive measurements, we nested observations within days in our three-level models and also elected to take a conservative approach by including a fixed-effect term in the model for observation number of the day. The nesting of observations within days in our three-level models accounts for autocorrelation between consecutive measurements. We also elected to take a conservative approach by including a fixed-effect term in the model for observation number of the day in three-level models. For two-level models, we included a fixed-effect term in the model for day number. Examination of the residuals produced from the specified model indicates that these steps were generally successful in detrending the data.

Results

Preliminary Analysis

First, success of randomization on major demographic characteristics was evaluated using the full randomized sample ($n = 60$). There were no baseline differences between groups in age, sex, or race, indicating that randomization was successful (see Table 1). Next, we assessed participant compliance with the EMA and daily diary sampling procedures. The maximum possible number of completed beeped assessment responses was 1,440 (60 participants × 6 days of assessments × 4 beeped assessments daily). The actual number of beeped assessments completed was 830 (57.6% of all possible assessments). The median number of beeped assessments completed across participants was 14. Using a median split of experience sampling compliance, there were no age, race, or sex differences between those who were high or low in EMA sampling adherence (all $ps > .61$). The maximum possible number of completed daily diaries was 360 (60 participants × 6 days of assessment). The actual number of daily diaries completed was 230 (63.9% of all possible diaries). The median number of diaries completed across participants was 4. Using a median split of daily diary compliance, there were no age, sex, or race differences between those high and low in daily diary sampling adherence (all $ps > .27$). We also assessed adherence to the study intervention among HDMT participants (LDMT participants were not assigned home practice). HDMT participants were asked to complete a total of 750 min of mindfulness meditation home practice during the intervention period (25 min daily × 5 days per week × 6 weeks) and completed 303.07 min ($SD = 236.11$; median = 247) on average. There were no demographic differences between those high and low in home practice compliance (all $ps > .10$). Finally, we checked whether the intervention improved job perceptions in addition to our primary analyses on employee well-being outcomes. We used two-level multilevel models to test if HDMT participants would increase in daily productivity from baseline to postintervention relative to LDMT participants. There was no main effect of condition across time points, $\chi^2(1) = 0.01$, $p = .94$, but there was a marginally significant main effect of time across conditions, $\chi^2(1) = 3.49$, $p = .0617$, such that all participants increased in self-reported daily productivity from baseline to postintervention. However, there was no interaction between time and condition, $\chi^2(1) = 0.09$, $p = .76$.

Attentional Focus

We predicted that high-dose participants would increase in momentary attentional focus from baseline to postintervention relative to LDMT participants. To test this, we used three-level multilevel models to evaluate the Study Condition × Time interaction. There was no main effect of condition across time points, $\chi^2(1) = 0.37$, $p = .54$, but there was a main effect of time across conditions, $\chi^2(1) = 7.20$, $p = .0073$. This was qualified by an interaction between time and condition, $\chi^2(1) = 30.28$, $p < .0001$, such that HDMT participants increased in momentary attentional focus from baseline ($M = 3.94$, $SE = .19$) to postintervention ($M = 4.63$, $SE = .20$), whereas LDMT participants decreased in attentional focus from baseline ($M = 4.24$, $SE = .20$) to postintervention ($M = 4.01$, $SE = .21$; see Figure 2).

Job Satisfaction

We predicted that HDMT participants would increase in daily job satisfaction from baseline to postintervention relative to LDMT participants. To test this, we used two-level multilevel models to evaluate the Study Condition × Time interaction. There was no main effect of condition across time points, $\chi^2(1) = 0.19$, $p = .67$, and no main effect of time across conditions, $\chi^2(1) = 0.60$, $p = .44$. There was a marginally significant interaction between time and condition, $\chi^2(1) = 2.75$, $p = .0972$, such that HDMT participants experienced an increase in daily job satisfaction from baseline ($M = 3.35$, $SE = .15$) to postintervention ($M = 3.59$, $SE = .16$), whereas LDMT participants experienced a decrease in satisfaction from baseline ($M = 3.42$, $SE = .15$) to postintervention ($M = 3.34$, $SE = .17$; see Figure 3).

Work–Life Conflict

We predicted that HDMT participants would decrease in work–life conflict from baseline to postintervention relative to LDMT participants. To test this, we used two-level multilevel models to evaluate the Study Condition × Time interaction. There was no main effect of condition across time points, $\chi^2(1) = 2.59$, $p = .11$, and no main effect of time across conditions, $\chi^2(1) = 0.27$, $p = .60$. However, there was an interaction between time and condition, $\chi^2(1) = 6.00$, $p = .0143$, such that HDMT participants decreased in work–life conflict from baseline ($M = 2.06$, $SE = .28$) to postintervention ($M = 1.71$, $SE = .30$), whereas LDMT participants increased in work–life conflict from baseline ($M = 2.21$, $SE = .28$) to postintervention ($M = 2.76$, $SE = .31$; see Figure 4).

The other direction of the work–life conflict measure evaluates life–work conflict. We used two-level multilevel models to evaluate the Study Condition × Time interaction on the effects of mindfulness training on life–work conflict. There was no main effect of study condition across time points, no main effect of time across conditions, and no interaction between time and condition (all $ps > .37$).

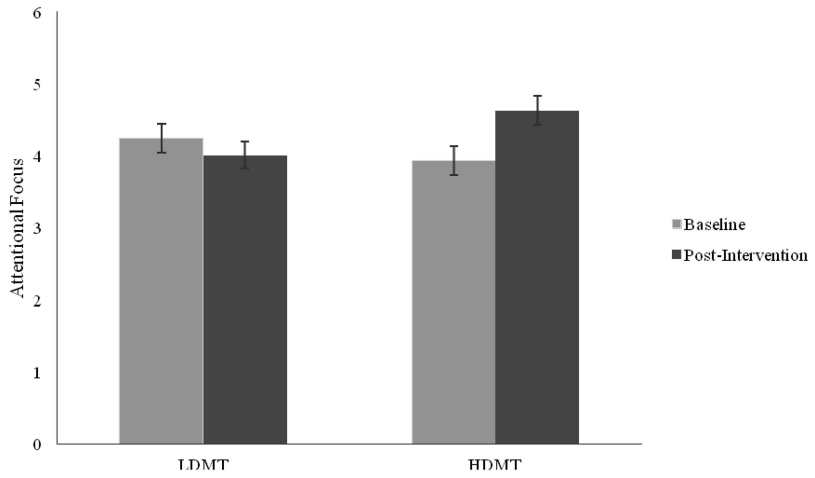

Figure 2. Experience-sampled attentional focus at baseline and postintervention by study condition. LDMT = low-dose mindfulness training program; HDMT = high-dose mindfulness training program.

Discussion

This study makes a significant contribution to the field by testing the efficacy of a mindfulness training intervention on employee well-being outcomes. Furthermore, this study is the first mindfulness intervention RCT to report well-controlled, experience sampling data collected during the workday. Consistent with predictions, HDMT participants increased attentional focus and job satisfaction, and reduced work–life conflict relative to LDMT. Overall, these findings indicate that 6-week mindfulness training carries significant benefits over a brief mindfulness seminar for fostering multiple measures of employee well-being.

As predicted, attentional focus significantly increased in the HDMT group relative to the LDMT group. Although mindfulness has been found to enhance attention in previous lab experiments (Jha et al., 2007; Mrazek et al., 2013; Tang et al., 2007), this study is the first to find beneficial effects of mindfulness training on attentional focus in the workplace. Perhaps due to the attention monitoring mechanism of mindfulness training (Lindsay & Creswell, 2017), employees in the HDMT were better able to focus on a job task, detach from distractors, and redirect their focus back to the job task. One interesting question raised by this finding is whether these improved attentional focus effects at work reflect a more general improvement in sustained and executive attention networks following mindfulness training, as has been shown in previous research studies (Jha et al., 2007; Tang et al., 2007).

The current study also contributes to the literature by demonstrating a positive marginal effect of a longer mindfulness training program on job satisfaction. Previous research has not investigated dosing on job satisfaction outcomes. Our findings add to the literature by highlighting the value of an extended mindfulness training on job satisfaction above and beyond a brief mindfulness training. Previous work suggests that the effect of mindfulness training on job satisfaction may be due to reducing emotional labor (Hülsheger et al., 2013). It may also

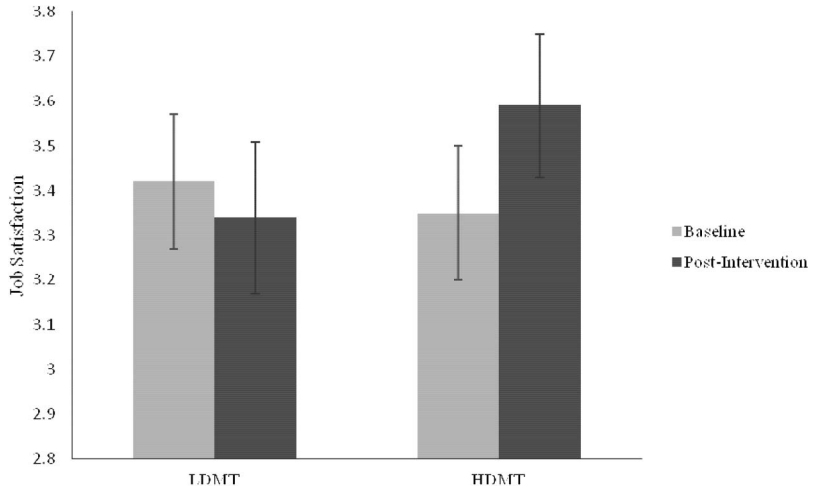

Figure 3. Experience-sampled job satisfaction at baseline and postintervention by study condition. LDMT = low-dose mindfulness training program; HDMT = high-dose mindfulness training program.

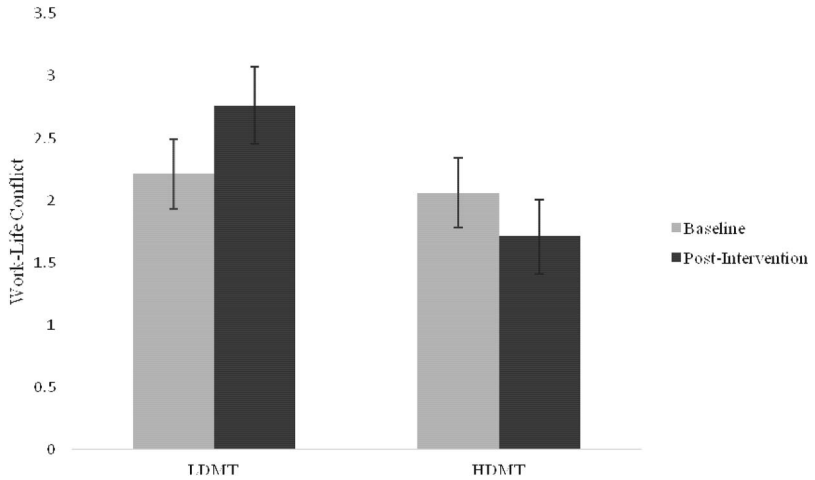

Figure 4. Experience-sampled work–life conflict at baseline and postintervention by study condition. LDMT = low-dose mindfulness training program; HDMT = high-dose mindfulness training program.

be the case that the effect of mindfulness training on job satisfaction is related to reducing cognitive load. Theorists suggest that the attention monitoring component of mindfulness improves cognitive functioning (in affectively neutral contexts) and enhances positive experiences (Lindsay & Creswell, 2017). By regulating one's thoughts through extended mindfulness training, employees may work more deliberately and experience less strain, which may improve perceptions of work.

Our results suggest that mindfulness training reduces work–life conflict but not life–work conflict. This pattern of directionality is consistent with previous research (Kiburz et al., 2017) but extends the literature by including the measurement of employees who do not live within a family structure that includes caring for children. By bringing awareness to the present-moment experiences, mindfulness training can help employees reduce work-related mind-wandering during off-work hours, which may strengthen the segmentation between one's work and personal life. The lack of significant changes in life–work conflict may be due to life–work conflict being less prevalent (Eagle, Miles, & Icenogle, 1997). Our data found that only 13.33% of total daily diary responses had a life–work conflict score worse than the scale midpoint. Furthermore, this organization allows for employees to work from home 2 days/week and there is no set time to report to the office; thus, this organization may be unusually accommodating for personal life conflicts. Further research is needed to explore the relationship between mindfulness training and mechanisms involved with life-to-work conflict in an organization that doesn't utilize flex-space and flex-time.

One surprising result of this study is that job productivity improved over time for both HDMT and LDMT participants. These findings suggest that both low and high doses of mindfulness training may improve perceptions of productivity; however, an extended amount of mindfulness training may be necessary for improving employee well-being outcomes. In sum, our findings contribute to previous theory speculating how mindfulness training affects employee well-being. Through improvements in cognitive and affective variables, we suggest that mindfulness training may contribute to daily levels of improvement in employee well-being.

Some key limitations of the present study must be noted. We conducted this RCT in a small digital marketing firm, which constrained this study to a relatively small sample size. However, it is important to note that the use of experience sampling and multilevel analyses allows for the use of all available data and thus provides greater statistical power compared with more traditional pre- and posttreatment assessments (Raudenbush & Bryk, 2002). Future research should include a nonactive control group to compare the effects of the brief mindfulness training with that of no mindfulness training at all to provide confidence that the intervention did have an impact versus changes that may occur due to time. The organization was experiencing a transition period during the duration of the study, which may have contributed to the directionality of change in the low-dose group, and a nonactive control group would have helped clarify the impacts of the transition period on employee well-being. One intriguing possibility is that the nonsignificant improvements in the high-dose group could be viewed as intervention buffering effects on well-being from the transition period. Similarly, we conducted a dosing study that has benefits in terms of evaluating whether higher doses of mindfulness training produce larger effects relative to smaller doses but has limitations in that the low-dose control group does not effectively control for factors such as placebo expectancies or instruction time (by design). Thus, future research would benefit from including a well-matched active 6-week treatment control program (e.g., relaxation training; cf. Creswell et al., 2016). Future research involving dosing studies should also include a follow-up assessment measuring mindfulness training in the low-dose group during the waiting period.

We asked the low-dose group to refrain from further mindfulness training until after the conclusion of the study, and it is worth noting that although not tracking home practice is a limitation, any home practice done in the low-dose group more conservatively tests the hypothesis that high-dose training is superior to low-dose training in this study. An additional consideration is that instructing the low-dose group to refrain from practicing until the end of the intervention period may have also changed participant behavior. Future investigations should carefully evaluate the relative

trade-offs of instructing low-dose participants not to practice during the intervention period. Also, our data were based on self-reports, which prevents us from concluding whether our findings are based on actual or perceived change. In future studies, it would be useful to include peer and supervisor ratings to capture behavior and performance change, so as to reduce leniency bias (Levy & Williams, 2004). Another limitation of this study is its generalizability due the predominately White sample. Future research should investigate whether the effects from the high-dose training are similar with a diverse sample.

Conclusion

This study answers the call for mindfulness training research investigating employee well-being outcomes (Good et al., 2016). Through demonstrating that high-dose mindfulness training can be useful for improving attentional focus, job satisfaction, and work–life conflict, and both high- and low-dose mindfulness training may be beneficial for job productivity, our study underscores the salutary effects of implementing mindfulness training into the workplace. Based on these promising findings, future research on how mindfulness-based training can help employees and improve the workplace is warranted.

References

Anestis, M. D., Selby, E. A., Crosby, R. D., Wonderlich, S. A., Engel, S. G., & Joiner, T. E. (2010). A comparison of retrospective self-report versus ecological momentary assessment measures of affective lability in the examination of its relationship with bulimic symptomatology. *Behaviour Research and Therapy, 48,* 607–613. http://dx.doi.org/10.1016/j.brat.2010.03.012

Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N. D., Carmody, J., . . . Devins, G. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice, 11,* 230–241. http://dx.doi.org/10.1093/clipsy.bph077

Bond, F. W., & Bunce, D. (2000). Mediators of change in emotion-focused and problem-focused worksite stress management interventions. *Journal of Occupational Health Psychology, 5,* 156–163. http://dx.doi.org/10.1037/1076-8998.5.1.156

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology, 84,* 822–848. http://dx.doi.org/10.1037/0022-3514.84.4.822

Brown, K. W., Ryan, R. M., & Creswell, J. D. (2007). Mindfulness: Theoretical foundations and evidence for its salutary effects. *Psychological Inquiry, 18,* 211–237. http://dx.doi.org/10.1080/1047840701598298

Creswell, J. D. (2017). Mindfulness interventions. *Annual Review of Psychology, 68,* 491–516. http://dx.doi.org/10.1146/annurev-psych-042716-051139

Creswell, J. D., & Lindsay, E. K. (2014). How does mindfulness training affect health? A mindfulness stress buffering account. *Current Directions in Psychological Science, 23,* 401–407. http://dx.doi.org/10.1177/0963721414547415

Creswell, J. D., Taren, A. A., Lindsay, E. K., Greco, C. M., Gianaros, P. J., Fairgrieve, A., . . . Ferris, J. L. (2016). Alterations in resting-state functional connectivity link mindfulness meditation with reduced interleukin-6: A randomized controlled trial. *Biological Psychiatry, 80,* 53–61. http://dx.doi.org/10.1016/j.biopsych.2016.01.008

Derryberry, D., & Reed, M. A. (2002). Anxiety-related attentional biases and their regulation by attentional control. *Journal of Abnormal Psychology, 111,* 225–236. http://dx.doi.org/10.1037/0021-843X.111.2.225

Eagle, B. W., Miles, E. W., & Icenogle, M. L. (1997). Interrole conflicts and the permeability of work and family domains: Are there gender differences? *Journal of Vocational Behavior, 50,* 168–184. http://dx.doi.org/10.1006/jvbe.1996.1569

Edwards, J. R., Caplan, R. D., & Van Harrison, R. (1998). Person-environment fit theory: Conceptual foundations, empirical evidence and directions for future research. In C. L. Cooper (Ed.), *Theories of organizational stress* (pp. 28–67). Oxford, United Kingdom: Oxford University Press.

Galinsky, E., Aumann, K., & Bond, J. T. (2013). Times are changing: Gender and generation at work and at home. In S. Poelmans, J. H. Greenhaus, & M. L. H. Maestro (Eds.), *Expanding the boundaries of work-family research* (pp. 279–296). London, United Kingdom: Palgrave Macmillan. http://dx.doi.org/10.1057/9781137006004_13

Good, D. J., Lyddy, C. J., Glomb, T. M., Bono, J. E., Brown, K. W., Duffy, M. K., . . . Lazar, S. W. (2016). Contemplating mindfulness at work: An integrative review. *Journal of Management, 42,* 114–142. http://dx.doi.org/10.1177/0149206315617003

Greenhaus, J. H., & Beutell, N. J. (1985). Sources of conflict between work and family roles. *The Academy of Management Review, 10,* 76–88. http://dx.doi.org/10.5465/amr.1985.4277352

Hämmig, O., Gutzwiller, F., & Bauer, G. (2009). Work-life conflict and associations with work- and nonwork-related factors and with physical and mental health outcomes: A nationally representative cross-sectional study in Switzerland. *BMC Public Health, 9,* 435–450. http://dx.doi.org/10.1186/1471-2458-9-435

Harter, J. K., Schmidt, F. L., & Keyes, C. L. (2003). Well-being in the workplace and its relationship to business outcomes: A review of the Gallup studies. *Flourishing: Positive Psychology and the Life Well-Lived, 2,* 205–224.

Hoge, E. A., Bui, E., Marques, L., Metcalf, C. A., Morris, L. K., Robinaugh, D. J., . . . Simon, N. M. (2013). Randomized controlled trial of mindfulness meditation for generalized anxiety disorder: Effects on anxiety and stress reactivity. *The Journal of Clinical Psychiatry, 74,* 786–792. http://dx.doi.org/10.4088/JCP.12m08083

Houston, D. M., & Waumsley, J. A. (2003). *Attitudes to flexible working and family life*. Bristol, United Kingdom: Policy Press.

Hülsheger, U. R., Alberts, H. J., Feinholdt, A., & Lang, J. W. (2013). Benefits of mindfulness at work: The role of mindfulness in emotion regulation, emotional exhaustion, and job satisfaction. *Journal of Applied Psychology, 98,* 310–325. http://dx.doi.org/10.1037/a0031313

Jha, A. P., Krompinger, J., & Baime, M. J. (2007). Mindfulness training modifies subsystems of attention. *Cognitive, Affective and Behavioral Neuroscience, 7,* 109–119. http://dx.doi.org/10.3758/CABN.7.2.109

Jha, A. P., Morrison, A. B., Dainer-Best, J., Parker, S., Rostrup, N., & Stanley, E. A. (2015). Minds "at attention": Mindfulness training curbs attentional lapses in military cohorts. *PLoS ONE, 10,* e0116889. http://dx.doi.org/10.1371/journal.pone.0116889

Judge, T. A., Thoresen, C. J., Bono, J. E., & Patton, G. K. (2001). The job satisfaction-job performance relationship: A qualitative and quantitative review. *Psychological Bulletin, 127,* 376–407. http://dx.doi.org/10.1037/0033-2909.127.3.376

Kiburz, K. M., Allen, T. D., & French, K. A. (2017). Work–family conflict and mindfulness: Investigating the effectiveness of a brief training intervention. *Journal of Organizational Behavior, 38,* 1016–1037. http://dx.doi.org/10.1002/job.2181

Krasner, M. S., Epstein, R. M., Beckman, H., Suchman, A. L., Chapman, B., Mooney, C. J., & Quill, T. E. (2009). Association of an educational program in mindful communication with burnout, empathy, and attitudes among primary care physicians. *Journal of the American Medical Association, 302,* 1284–1293. http://dx.doi.org/10.1001/jama.2009.1384

Levy, P. E., & Williams, J. R. (2004). The social context of performance appraisal: A review and framework for the future. *Journal of Management, 30,* 881–905. http://dx.doi.org/10.1016/j.jm.2004.06.005

Lindsay, E. K., & Creswell, J. D. (2017). Mechanisms of mindfulness training: Monitor and Acceptance Theory (MAT). *Clinical Psychology Review, 51,* 48–59. http://dx.doi.org/10.1016/j.cpr.2016.10.011

Macdonald, S., & MacIntyre, P. (1997). The generic Job Satisfaction Scale: Scale development and its correlates. *Employee Assistance Quarterly, 13,* 1–16. http://dx.doi.org/10.1300/J022v13n02_01

Michel, A., Bosch, C., & Rexroth, M. (2014). Mindfulness as a cognitive–emotional segmentation strategy: An intervention promoting work–life balance. *Journal of Occupational and Organizational Psychology, 87,* 733–754. http://dx.doi.org/10.1111/joop.12072

Moore, R. C., Depp, C. A., Wetherell, J. L., & Lenze, E. J. (2016). Ecological momentary assessment versus standard assessment instruments for measuring mindfulness, depressed mood, and anxiety among older adults. *Journal of Psychiatric Research, 75,* 116–123. http://dx.doi.org/10.1016/j.jpsychires.2016.01.011

Morone, N. E., Greco, C. M., Moore, C. G., Rollman, B. L., Lane, B., Morrow, L. A., . . . Weiner, D. K. (2016). A mind-body program for older adults with chronic low back pain: A randomized clinical trial. *Journal of the American Medical Association Internal Medicine, 176,* 329–337. http://dx.doi.org/10.1001/jamainternmed.2015.8033

Mrazek, M. D., Franklin, M. S., Phillips, D. T., Baird, B., & Schooler, J. W. (2013). Mindfulness training improves working memory capacity and GRE performance while reducing mind wandering. *Psychological Science, 24,* 776–781. http://dx.doi.org/10.1177/0956797612459659

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (Vol. 1). Thousand Oaks, CA: Sage.

Schaufeli, W. B., Taris, T. W., & Van Rhenen, W. (2008). Workaholism, burnout, and work engagement: Three of a kind or three different kinds of employee well-being? *Applied Psychology, 57,* 173–203. http://dx.doi.org/10.1111/j.1464-0597.2007.00285.x

Shiffman, S., Stone, A. A., & Hufford, M. R. (2008). Ecological momentary assessment. *Annual Review of Clinical Psychology, 4,* 1–32. http://dx.doi.org/10.1146/annurev.clinpsy.3.022806.091415

Solhan, M. B., Trull, T. J., Jahng, S., & Wood, P. K. (2009). Clinical assessment of affective instability: Comparing EMA indices, questionnaire reports, and retrospective recall. *Psychological Assessment, 21,* 425–436. http://dx.doi.org/10.1037/a0016869

Stone, A. A., & Broderick, J. E. (2007). Real-time data collection for pain: Appraisal and current status. *Pain Medicine, 8,* S85–S93. http://dx.doi.org/10.1111/j.1526-4637.2007.00372.x

Tang, Y. Y., Ma, Y., Wang, J., Fan, Y., Feng, S., Lu, Q., . . . Posner, M. I. (2007). Short-term meditation training improves attention and self-regulation. *Proceedings of the National Academy of Sciences of the United States of America, 104,* 17152–17156. http://dx.doi.org/10.1073/pnas.0707678104

Tannenbaum, S. I., & Yukl, G. (1992). Training and development in work organizations. *Annual Review of Psychology, 43,* 399–441. http://dx.doi.org/10.1146/annurev.ps.43.020192.002151

Tsutsumi, A., Nagami, M., Yoshikawa, T., Kogi, K., & Kawakami, N. (2009). Participatory intervention for workplace improvements on mental health and job performance among blue-collar workers: A cluster randomized controlled trial. *Journal of Occupational and Environmental Medicine, 51,* 554–563. http://dx.doi.org/10.1097/JOM.0b013e3181a24d28

van der Klink, J. J., Blonk, R. W., Schene, A. H., & van Dijk, F. J. (2001). The benefits of interventions for work-related stress. *American Journal of Public Health, 91,* 270–276. http://dx.doi.org/10.2105/AJPH.91.2.270

Waumsley, J. A., Houston, D. M., & Marks, G. (2010). What about us? Measuring the work-life balance of people who do not have children. *Review of European Studies, 2,* 3–17. http://dx.doi.org/10.5539/res.v2n2p3

Williams, E. S., & Skinner, A. C. (2003). Outcomes of physician job satisfaction: A narrative review, implications, and directions for future research. *Health Care Management Review, 28,* 119–139. http://dx.doi.org/10.1097/00004010-200304000-00004

Wolever, R. Q., Bobinet, K. J., McCabe, K., Mackenzie, E. R., Fekete, E., Kusnick, C. A., & Baime, M. (2012). Effective and viable mind-body stress reduction in the workplace: A randomized controlled trial. *Journal of Occupational Health Psychology, 17,* 246–258. http://dx.doi.org/10.1037/a0027278

Received February 1, 2018
Revision received July 20, 2018
Accepted July 26, 2018 ■