Examining the Impacts of Mindfulness Training and Medication on
Reductions in Depressive and Anxious Symptoms in Public School Teachers

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Abstract

School teachers show higher levels of job stress and symptoms of depression and anxiety compared to those in many other professions. In this paper, we examine the impacts of mindfulness training on reductions in depressive and anxious symptoms accounting for the fact that some of these same teachers were already being using medications for such symptoms. Do the benefits of mindfulness training for teachers with regard to internalized distress remain after accounting for medication use for depression and anxiety, and could the use of such medications interaction with mindfulness treatment to, for instance, produce incrementally larger benefits for those taking medication? We explore these research questions using data from two randomized-controlled trials (Study 1 and Study 2). In both studies, teachers were randomized to the same 8-week MT intervention or waitlist control condition, and were assessed for depressive and anxious symptoms at baseline, post-program, and 3-month follow-up. Data on medication use was assessed at baseline and showed ~20% percent of the overall samples reported such use. Overall, exploratory results showed that MT significantly reduced depressive and anxious symptoms at post-program and at 3-month follow-up when controlling for medication use. Furthermore, comparative effects analysis indicated that mindfulness training resulted in more long-term gains for depressive and anxious symptom reduction, while effects of medication remained relatively stable over time (Study 2). These preliminary findings suggest that MT is an effective tool for reducing internalized distress in public school teachers and adds benefit above and beyond the use of medication for such symptoms in this population.

Keywords: mindfulness, mindfulness training, randomized controlled trial, depression, anxiety

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Examining the Impacts of Mindfulness Training and Medication on
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Teaching is a highly stressful profession (Jepson & Forrest, 2006), and teacher stress and burnout is an internationally recognized problem (Bermejo-Toro, Prieto-Ursua, & Hernandez, 2015). In addition to higher levels of job stress, burnout, and job turnover, teachers suffer from higher rates of depressive and anxious symptoms compared to those in other occupations (Stansfeld et al., 2011; Wulsin et al., 2014) and in the general population (Jones-Rinkin & Howard, 2019). To manage these symptoms, teachers may turn to drugs and alcohol (Watts & Short, 1990; Richards, 2012), psychopharmacological treatments (Wulsin et al., 2014), or other coping tactics in which some are clearly more effective than others (Austin, Shah, & Munger, 2005). Mindfulness based interventions (MBIs) have been shown to be effective in reducing depressive and anxious symptoms (Kim et al., 2009; Grossman et al., 2010), and a growing body of work suggests that MBIs can be effectively adapted for the school setting to help teachers reduce levels of internalized distress (Benn et al., 2012; Roeser et al., 2013).

A gap in this literature, however, concerns controlling for other treatments teachers may already be pursuing to manage these symptoms. Given the elevated rates of internalizing symptomatology in this population, as well the widespread usage of antidepressant and anxiolytic medication more generally (Greenblatt et al., 2018), it is likely that many teachers may already be pursuing medication therapies to manage depression and anxiety. Thus, it is imperative to understand what additional benefits mindfulness training may provide over and above medications that teachers may be taking to manage depressive and anxious symptoms. The aim of the present study was to investigate the impacts of mindfulness training on reductions in

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depressive and anxious symptoms while accounting for the fact that some teachers may already be using medications for such symptoms, and to investigate whether mindfulness treatment may add additional benefits for all teachers in the study in this regard, or may even produce incrementally larger benefits for those taking medication.

Internalized Distress in School Teachers

Depression and anxiety have been conceptualized as internalizing problems, meaning that both depression and anxiety can be characterized by a tendency to cope with one's distress through directing negative emotions inwards (Caspi et al., 2014). The teaching profession has been shown to have one of the highest prevalence rates of depression and anxiety when compared with other occupations in the UK (Stansfeld et al., 2011). These results have been replicated in US samples, with an estimated 10.3% prevalence of depression for teachers in the US, even after adjusting for age and gender (Wulsin et al., 2014). Prevalence for anxiety is similarly high. In a study of 3,321 teachers in the US, fully 14% met criteria for generalized anxiety disorder (Jones-Rincon & Howard, 2019). Furthermore, evidence suggests that teachers who experienced burnout were more likely to exhibit symptoms of anxiety and depression (Burke, Greenglass, & Schwarzer, 1996; Mahan et al., 2010), and that teachers with anxious symptoms were more likely to report intent-to-quit (Jones-Rincon & Howard, 2019). Given the costs associated with the alarmingly high turnover rates in the teaching profession (Ingersoll, 2002) finding effective methods of managing internalizing symptomatology is essential.

Studies examining the main causes of poor mental health in the workplace identify factors such as long hours worked, work overload and pressure, lack of control over work, lack of participation in decision making, poor social support and unclear management as key factors associated with psychological ill health and work absences due to sickness (Michie & Williams,

2003). Evidence from longitudinal studies suggests that job demands and social relationships have the biggest impact on mental disorders such as depression (Netterstrøm et al., 2008).

One factor that particularly characterizes teaching is the high level of emotional labor that is required

An additional factor that may put teachers at greater risk for internalized distress is teacher gender. The majority of school teachers in the US and Canada are female (87.10% in the US; 74.90% in Canada; OECD, 2017). Women are at greater risk for internalizing disorders overall, prevalence estimates for depression around 5.5% compared to 3.2% in men (Baxter et al., 2014). Prevalence for GAD in women is around 6.6% vs. 3.6% for men (Kessler et al., 1994). Regardless of the causes of greater depressive and anxious symptoms in school teachers, finding effective ways to prevent and manage mental health symptoms in teachers is critical in order to increase teachers' health and wellbeing, foster their retention, and improve their teaching practices and student outcomes.

Costs of Elevated Internalizing Symptoms in School Teachers

The costs of elevated stress and internalizing symptomatology in teachers can have considerable consequences not only for teachers themselves, but for students they teach, their employers, and the communities that they serve. For example, a study of third-grade teachers showed that students in classrooms with teachers who had higher depressive symptoms negatively impacted student math grade and improvement outcomes across two school semesters (McLean & Connor, 2015). Teachers' anxiety has also been linked to detriments in academic outcomes for students (Beilock, Gunderson, Ramirez, & Levine, 2010).

Teacher retention and turnover can also result from poor occupational health and wellbeing among teachers. Research has identified that, in addition to school organizational and

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demographic factors such as poor school climate and teacher age, depressive and anxious symptoms are key individual differences that significantly predict teachers' intent-to-quit (Mack et al., 2019; Jones-Rincon & Howard, 2019). Approximately 40% of teachers in the US leave the profession within the first 5 years of qualifying (Ingersoll, 2002). Excessive turnover within the teaching profession has led to a shortage of teachers creating a crisis in schools (Boe, Cook, & Sunderland, 2008), and teacher turnover costs approximately \$7 billion a year in the United States (Boe et al., 2008; Shen, 1997). These turnover rates create high costs for the school community in terms of recruiting, replacing, and training new faculty.

Finally, the costs of teachers' depression and anxiety can be considered in terms of their impact on local and national economies. Conservative estimates for the economic burden of depression overall at \$12.4 billion per year for direct treatment costs, including doctor visits, hospitalizations, pharmaceutical costs, and \$4 billion per year for the consequences of not treating depression, such as loss of productivity and workplace absenteeism (Birnbaum et al., 2010; Greenberg et al., 2015; Kessler, 2012). Anxiety disorders also carry a significant economic burden. The total annual cost of anxiety disorders has been estimated to be between \$42.3 billion and \$46.6 billion, of which more than 75% can be attributed to morbidity, mortality, lost productivity, and other indirect costs (Dupont et al., 1996; Hoffman et al., 2008; Greenberg et al., 1999).

Breakdowns of cost estimates highlight the significant financial burden of psychopharmacology in the treatment of depression and anxiety, with US spending on antidepressants—which are used to treat both depression and anxiety—estimated at \$9.4 billion in 2013 (Morgan et al., 2018). The long-term use of pharmaceutical treatments for depression are particularly expensive, with some studies showing that maintenance prescriptions are amongst

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the most costly aspects of treatment for depression (Vos et al., 2005). To mitigate the significant and growing burden of mental health, developing cost-effective workplace interventions that reduce and prevent depression and anxiety in high-stress occupations is essential.

Mindfulness based interventions hold particular promise in this respect. Workplace wellness and mental health programs have the potential to save costs for the school system and local communities they serve. In a meta-analysis of workplace wellness programs (Baicker, Cutler, & Song, 2010), such programs were shown to save costs to the healthcare system and to employers. Further, studies on the cost-effectiveness of MBIs in particular suggest that mindfulness based mental health promotion programs can provide benefits for lower mean incremental costs (e.g., Muller et al., 2019), underscoring the advantages of group-based mindfulness training the workplace that could be effectively deployed to help mitigate teachers' internalized distress.

Efficacy of Mindfulness Based Interventions (MBIs) for School Teachers

In addition to RCTs that demonstrate the effectiveness of MBIs for depression and anxiety in clinical samples (Kim et al., 2009; Mackenzie & Kocovski, 2016), a growing body of work suggests that mindfulness training can be effective in reducing depressive and anxious symptoms in school teachers (Benn et al., 2012; Flook et al., 2013; Roeser et al., 2013). For instance, research on the CARE teachers program (Jennings et al., 2017) and an adapted version of MBSR training for school teachers (Flook et al., 2013) found significant reductions in teachers' depressive and anxious symptomatology over time due to mindfulness training.

Several meta-analyses examining the average effects of mindfulness training on teacher outcomes have recently been conducted (Emerson et al., 2017; Hwang et al., 2017; Klingbeil & Renshaw, 2018). Results of these meta-analyses suggest that in addition to MBIs providing

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benefits for reducing teacher stress and burnout, MBIs have medium to large effect sizes in terms of reductions on psychological distress (Hedge's $g = .53$ to 1.74), demonstrating the robustness of mindfulness training's efficacy for reducing teachers internalized distress.

Given the literature on MBIs for school teachers is still relatively limited (about 10-12 studies; Klingbeil & Renshaw, 2018), and only some of these studies assess depressive and anxious symptoms specifically, as compared to more general stress measures, more research on depressive and anxious symptom reduction in school teachers is needed. Furthermore, one study (Gold et al., 2010) found that teachers' participation in an 8-week MBSR program resulted in statistically significant reductions in depressive, but not anxious, symptoms, leaving open the question of whether mindfulness training may be more effective for particular types of internalizing symptomatology. Furthermore, less work has examined how MBIs perform in relation to other treatment options that teachers may be exploring to manage distress. Understanding the benefits of mindfulness training for teachers with internalized distress remain after accounting for medication use for depression and anxiety is important in order to assess the efficacy of MBIs, and to examine of the incremental and long-term benefits of mindfulness training.

The Present Study

Based on previous research, we hypothesized that teachers participating in the program would experience reductions in anxious and depressive symptoms. In addition, we examine if these effects work in parallel or in interaction with medication use in Study 2. This is the first study in teachers in a community sample, to our knowledge, to examine impacts of mindfulness training on internalizing symptoms in teachers accounting for medication use; as well as the moderation of mindfulness program impacts by medication use. Because neither of the two

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studies reported here blocked randomized teacher participants based on medication use, these analyses are exploratory in nature and fall outside the causal inferences made possible by the RCT designs of these studies.

Mindfulness Training Program

The Mindfulness Training program that was taught and evaluated in both studies was called the Stress Management and Relaxation Training (SMART) Program at the time (see Cullen, Brito-Pons & Roeser, 2019 for history), a fully manualized mindfulness program designed specifically for teachers. This program is based upon Jon Kabat-Zinn's widespread Mindfulness-Based Stress Reduction (MBSR; Grossman et al., 2004) program, and uses approximately 50% of the same mindfulness meditation and movement practices (e.g., body scan, focused-attention, and open-monitoring practices). About 30 % of the program is devoted to emotion theory (e.g., definitions, triggers, imported scripts) and mindful emotion regulation. The remaining 20 % of the program focuses on the theory and practice of compassion and forgiveness (see Cullen, Brito-Pons & Roeser, 2019 for program overview).

Study 1

Method

Sample

Participants were recruited from a Western Canadian school district through distribution of flyers advertising a study of a stress-reduction program. The sample included 59 elementary and secondary school teachers who responded to recruitment materials and volunteered for the study. Participants were 88% female, and had a median age of 47 years (range = 28–63). In terms of race/ethnicity, 67 % of the sample of Euro-Canadian descent, 18% Asian-Canadian, and 15% other races/ethnicities (e.g., French-Canadian, Aboriginal, Filipino, Black-Canadian).

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Forty-two percent of teachers reported having bachelor's degrees, 22% post-bachelor's diplomas, and 35% master's degrees. Thirty-nine of the teachers taught in elementary school, 21 in secondary school. Years of teaching experience ranged from 3 to 35 years ($M = 15.2$ – see Table 1).

Procedures. Recruited teachers were screened for prior exposure to training for The Hawn Foundation's MindUp program, a mindfulness-based program for students that is popular in this Canadian school district. We excluded teachers who had received MindUp training. Participants were allocated to groups based on a simple randomization procedure – flipping a coin (Suresh, 2011).

After randomization to study conditions, participants in the mindfulness condition received the 8-week mindfulness training program from April to May of the school year. Participants in the waitlist control condition had the opportunity to complete the mindfulness training from October to December in the following school year. Teachers in both conditions completed study assessments at three time points: pre-randomization/baseline (T1, February-March), post-program (T2, May-June); and at 3-month follow-up (T3, October). All participants received the mindfulness training for free and were compensated for completing assessments. Those in the control groups were offered the program after the 3-month follow-up was completed.

Measures

Demographic Characteristics. Teachers' gender and years of teaching experience were included as statistical controls in assessing the impacts of mindfulness training on symptom

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change given that prior literature suggests that both factors (e.g., female, less experience) are related to internalizing symptomatology (Ferguson, Frost, & Hall, 2012; Kessler et al., 1994).

Depressive Symptoms. Depressive symptoms were assessed with 13 items from the Bischof Adult Symptom Inventory (BSI; Bischof, personal communication, September 19, 2019). The BSI is 42-item initial screening instrument developed for clinical practice that screens for a number of psychological disorders. It was developed and validated by a team of 7 clinical psychologists, and is based closely on DSM-III criteria (Appendix A, supplementary materials). Participants were asked to rate the difficulty they have been experiencing in each area recently using a 5-point Likert scale from 0 = *No difficulty* to 4 = *Extreme Difficulty*. We took the mean of 13 items that were face-valid for depression and that formed a reliable index at Time 1 ($\alpha = .91$), Time 2 ($\alpha = .90$), and Time 3 ($\alpha = .92$). Further, test-retest reliability was adequate, as indicated by autocorrelations of $r = .81$ from T1-T2, and $r = .71$ from T1-T3.

Anxious Symptoms. Anxious symptoms were assessed with 4 items from the BSI that were face-valid for anxiety. The items were: “*Fearful or anxious about upcoming situations or events*”, “*Restlessness or feeling keyed-up, on edge*”, “*Episodes of terror or panic*”, and “*Unwanted persistent and intrusive thoughts*”. The mean score of these items was taken to create an index of anxious symptoms. These items formed a reliable index at Time 1 ($\alpha = .83$), Time 2 ($\alpha = .78$), and Time 3 ($\alpha = .81$). Further, autocorrelations indicated modest test-retest reliability, $r = .70$ from T1-T2, and $r = .50$ from T1-T3.

Medication Use. A comprehensive list of medications was also asked of participants. At baseline, 5% of the sample were taking medications for depression, and only 2% were taking medications for anxiety. Further, there were significant differences between groups in medication use in this study following randomization. Specifically, in the mindfulness group, 0%

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were taking medications for depression and 4% for anxiety, compared to 11% and 0% for the control group, respectively (see supplementary materials, Table S1). Because of these group differences in medication use, we could not test the interaction of mindfulness training with medication use in Study 1. Thus, use of these medications were entered as covariates to estimate program impacts above and beyond medication use in Study 1 (e.g., rather than as moderators).

Data Analytic Approach

We undertook three types of analyses in this study. First, we examined study attrition. Second, we examined baseline equivalence of groups following randomization on demographic and outcome variables. Third, we conducted analyses of the impacts mindfulness training and medication use on change in symptoms over time. To assess change in depressive and anxious symptoms at post-program and 3-month follow-up, we ran a series of hierarchical linear regression analyses. In Step 1, we entered teachers' gender, years of teaching experience, and baseline symptoms as covariates; medication use status in Step 2; followed by condition assignment (mindfulness training vs. waitlist control) in Step 3. To examine the unique variance explained by mindfulness training and medications, we include the change in R^2 as a measure of effect size (Cohen, 1988).

Results

Study Attrition. Of the total of 29 participants in the mindfulness condition, 11% dropped out of the study from baseline to post-program, and 14% dropped out from post-program to 3-month follow-up. In the control group, attrition rates were 3% from baseline to post-program, and 6% from post-program to 3-month follow-up (see supplementary materials; Table S2), in line with average dropout rates for mindfulness interventions (Crane & Williams, 2010).

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Baseline Equivalence of Groups. Next, we examined baseline equivalence of groups of relevant variables following randomization. The control group was slightly higher on depressive ($t(49) = -1.98, p = .056$) and anxious ($t(42) = -2.03, p = .047$) symptoms at baseline. Thus, baseline measures of symptoms are included in all analyses to account for these differences.

Impacts Analyses. Finally, to examine the impacts of mindfulness training and medications on depressive and anxious symptoms, a series of hierarchical linear regression models were conducted. Results of the regression impact analyses are presented in Table 3, with comparative effects of mindfulness training and medications, as indicated by unique variance explained (change in R^2) represented in Figure 1. In all models, the strongest predictor of depressive and anxious symptoms was baseline level of these symptoms. Thus, impacts for mindfulness training and medication use represent impacts on change in symptoms over time in these models.

Depressive Symptoms. Results of hierarchical linear regression analyses (Table 3; Fig. 1) revealed that at post-program, mindfulness training had a significant impact on change in depressive symptoms ($\beta = -0.18, p < .05; R^2 \text{ change} = .03$) after controlling for other variables in the model. Medication use had no impact on depressive symptoms at post-program ($\beta = 0.07, p = .42; R^2 \text{ change} = .00$). At the 3-month follow-up, the same pattern of results was found: mindfulness training had an impact on change, but this impact was reduced to non-significance ($\beta = -0.20, p = .09; R^2 \text{ change} = .04$). The impact of medication use on symptom change remained non-significant ($\beta = 0.01, p = .95; R^2 \text{ change} = .00$).

Examination of relative impacts of mindfulness training and medication as indicated by the amount of variance explained (see Fig. 1) indicated that mindfulness training explained 3% of the variance in change in depressive symptoms at post-program, whereas medications

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explained 0% of the variance at post-program. At the 3-month follow-up, mindfulness training uniquely accounted for 4% of the variance in symptom change, while 0% was explained by medications.

Anxious Symptoms. Results of hierarchical linear regression analyses (Table 3; Fig. 1) revealed that at post-program, neither mindfulness training ($\beta = -0.14, p = .24; R^2 \text{ change} = .00$) nor medication use ($\beta = .22, p = .07; R^2 \text{ change} = .03$) had a significant impact on change in anxious symptoms. These results did not change at follow-up—namely, there was no effect of mindfulness training ($\beta = 0.00, p = 1.00; R^2 \text{ change} = .00$) or medication ($\beta = -0.04, p = .81; R^2 \text{ change} = .00$) at the 3-month follow-up.

Examination of relative impacts of mindfulness training and medication as indicated by the unique amount of variance explained (see Fig. 1) indicated that mindfulness training accounted for less than 1% of the variance in change in anxious symptoms at post-program, whereas medications explained 3% of the variance at post-program. At the 3-month follow-up, mindfulness training and medications both had a negligible contribution to anxious symptoms (0% of variance explained for both variables).

Study 2

Method

Sample

Participants in Study 2 were recruited from the western region of the U.S. Participants were recruited through distribution of flyers advertising the study as a stress-reduction program, in a similar procedure to that used in Study 1. The final sample consisted of 59 public school teachers (87% women; 51% elementary level). Participants identified their race/ethnicity as 93%

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European American, 5% mixed (e.g., Japanese and American), and 2% Asian American. In terms of educational attainment, 20% reported having a bachelor's degree, 73% reported having a master's degree, and 7% reported having a JD or PhD. Participants had an average of 14.88 years of teaching experience (range 1-33; $SD = 7.86$) and had a median age of 50 (range 27-64 – see Table 1).

Procedures

The same procedures for randomization, assessments, and incentives as described above were employed in this study. For all participants, data collection included a take-home survey on mindfulness, subjective well-being, and health collected at baseline, post-program, and 3-month follow-up. The survey measures of depressive and anxious symptoms were new and are reported below. The mindfulness program was identical to Study 1 and was also delivered by the same instructor.

Measures

Beck Depression Inventory–II. Depressive symptoms were assessed with the Beck Depression Inventory, Second Edition (BDI-II). The BDI-II (Beck et al., 1996; Beck et al., 1988) is a 21-item self-report instrument used to assess the severity of depressive symptoms on a 4-point scale (0–3), with a total score ranging from 0 to 63. Cutoff scores are: 0–13, minimal depression; 14–19, mild depression; 20–28, moderate depression; and 29–63, severe depression (Beck et al., 1988). The BDI-II has a coefficient alpha of 0.92 with depressed outpatients and 0.93 with nonclinical samples, and a test–retest reliability coefficient across the period of 1 week of 0.93 (Beck et al., 1988; Dozois, Dobson, & Ahnberg, 1998). Scale reliabilities in this sample were high, $\alpha = 0.84$ to 0.90.

State-Trait Anxiety Inventory-State Version. Anxious symptoms were assessed with the state anxiety scale of the Spielberger State-Trait Anxiety Inventory (STAI-S; Spielberger et al., 1970). The STAI-S a 20-item self-report instrument developed to assess levels of situation-related (state) anxiety. Items are rated on a 4-point Likert-type scale to produce a summative score ranging from 20 to 80 with higher scores indicating higher levels of anxiety. The STAI-S has demonstrated reliability and validity (Spielberger et al., 1983) and is frequently used in clinical research (Julian, 2011). In this study, Cronbach's alpha was high at all timepoints, $\alpha = .94$ to $.96$.

Medication Use. As part of a more comprehensive health assessment administered by nurse practitioners (see Roeser et al., 2013 for full details), participants reported on their prescription drug use for depression and anxiety. Specifically, they were provided with a list of common physical and mental health diagnoses, and were asked to indicate whether they were taking prescription drugs for these conditions by checking the relevant box. At baseline, 21.7% of the sample were taking medications for depression, and 16.7% were taking medications for anxiety (see supplementary materials; Table S1). There were no significant differences between groups on these medication use variables after randomization.

Data Analytic Approach

We undertook same three analytic approaches as in Study 1 – examining study attrition, baseline equivalence of groups following randomization, and impacts analyses of mindfulness training and medication use on symptoms. In this study, to the distribution of medication use more equally across treatment and control groups, we were able to examine both main effects of mindfulness and medication, as well as the moderated impacts of mindfulness training due to medication use. To examine comparative effects of mindfulness training and medication use, we

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included change in R^2 as a measure of effect size in order to examine the unique contribution of each of these treatment variables to teacher symptoms at each time point.

Results

Study Attrition. From baseline to post-program, there was no attrition; however, from post-program to 3-month follow-up, 7% of the treatment group and 15% of the control group dropped out of the study (see supplementary materials; Table S2).

Baseline Equivalence of Groups. Results of t-tests revealed that there were no differences at baseline between groups in levels of depressive or anxious symptoms, or demographic characteristics (e.g., gender, years of teaching experience). Nonetheless, to allow from comparability of models across studies, these variables were included in our impacts analyses.

Impacts Analyses. Finally, to examine the impacts of mindfulness training, medications, and their interactions on depressive and anxious symptoms, a series of hierarchical linear regression analyses were conducted. Results of these impact analyses are presented in Table 5 and Figure 2. In all models, the strongest predictor of depressive and anxious symptoms was baseline level of these symptoms.

Depressive Symptoms. At post-program, both mindfulness training ($\beta = -0.21, p < .05$; R^2 change = .11) and medication use ($\beta = .47, p < .01$; R^2 change = .06) had a significant impact on change in depressive symptoms over time after controlling for the other variables in the model. These main effects were qualified by an interaction between mindfulness training and medication on symptom change ($\beta = -0.37, p < .001$). Analysis of simple effects (Table 6) showed that the while effects of mindfulness training were significant in both medicated ($\beta = -0.75, p < .05$) and unmedicated participants ($\beta = -0.23, p < .05$), the effects of mindfulness training were stronger for medicated participants. However, further examination of change

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trajectories in the four groups (Fig.3) suggests that these effects are primarily driven by increases in depressive symptoms at Time 2 for control group participants on medications, who showed a relative increase in symptoms over time. Examination of relative impacts of mindfulness training and medication as indicated by the amount of variance explained (see Figure 2) indicated that mindfulness training explained 11% of the variance in change in depressive symptoms over time, whereas medication explained 6% of the variance in depressive symptom change.

At 3-month follow-up, mindfulness training showed a significant impact on change in depressive symptoms over time ($\beta = -0.42, p < .001; R^2 \text{ change} = .14$) whereas the impact for medication use was non-significant ($\beta = .15, p = .30; R^2 \text{ change} = .01$). At follow-up, was there no longer a significant interaction between training and medication on symptom change. Examination of relative impacts of mindfulness training and medication as indicated by the unique amount of variance explained (Fig. 2) indicated that mindfulness training explained 14% of the variance in change in depressive symptoms over time, whereas medication explained only 1% of the variance in depressive symptom change at the 3-month follow-up.

Anxious Symptoms. Figure 4 depicts the change trajectories in anxious symptoms across the four groups. At post-program, mindfulness training had a significant impact on change in anxious symptoms after controlling for other variables in the model ($\beta = -0.32, p < .05; R^2 \text{ change} = .08$), whereas medication use did not ($\beta = -0.18, p = .16; R^2 \text{ change} = .04$). The interaction between mindfulness training and medication on symptom change was not significant. While mindfulness training explained 8% of the variance in anxious symptom change, medication use explained half of that amount (4%; Fig. 2).

At 3-month follow-up, mindfulness training showed a significant on change in anxious symptoms ($\beta = -0.30, p < .05; R^2 \text{ change} = .12$), as did medication use, ($\beta = .47, p < .01; R^2$

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change = .06). The interaction between mindfulness training and medication on symptom change was not significant. At follow-up, mindfulness training explained fully 12% of the variance in anxious symptom change, while medication use explained 6%.

Discussion

The aim of the present study was to investigate the impacts of mindfulness training on reductions in depressive and anxious symptoms in public school teachers while accounting for medication use, and to investigate the comparative effects of medications and mindfulness training as indicated by effect size. Findings across two randomized controlled trials suggest that randomization to mindfulness training resulted in significant consistent reductions in depressive symptoms across both studies, even while controlling for medication use. Furthermore, the effects of mindfulness training on depression were generally larger than those of medication in these samples and studies.

The effects of randomization to mindfulness training on anxiety were somewhat less consistent, with no significant reductions in anxious symptoms in Study 1, while in Study 2, mindfulness training did have a significant effect on anxious symptom reduction when controlling for medication use, and this effect held at the three-month follow-up. The amount of variance explained by mindfulness training in change anxious symptoms (i.e., symptom reduction over time) showed a similar pattern—namely effects of mindfulness training were smaller than that of medications in Study 1, but mindfulness training explained a larger proportion of unique variance than medications in Study 2.

Findings dovetail prior literature on the efficacy of mindfulness based interventions for teachers (Klingbeil & Renshaw, 2018), and add to the literature by studying the effects of MBIs on symptom reduction while accounting for medication use. Examination of effect sizes (change

in R^2_3) in Study 2 showed the pattern that mindfulness training explained more of the variance in symptom reductions in depressive and anxious symptoms at post-program, and that the proportion of variance explained increased at the three-month follow-up compared to that of medications. Furthermore, the changes in variance explained from post-program to follow-up suggests that the effects of mindfulness training accrued over time, such that effects were generally larger at the 3-month follow-up compared to effects of medication. This pattern of results may suggest that mindfulness training could have a greater long-term impact on reducing internalizing symptoms than do medications, and that individuals may build upon their skills as they continue to practice mindfulness.

These results are in line with conceptualizations of mindfulness training as *participatory medicine*—the idea that mindfulness empowers individuals take an active role in treatment (Kabat-Zinn, 2000). By participating in skills-based mindfulness training that provides tools for managing internalized distress, teachers can continue to improve and deepen their experience of mindfulness over time, resulting in additional long-term benefits. By contrast, medications commonly prescribed for depression and anxiety, such as SSRIs and benzodiazapines, have a host of negative side effects, and do not have long-term effects on symptom reduction without continuous use (Morgan et al., 2015). Furthermore, the use of medication as therapy is costly (Vos et al., 2005), while group-based workplace interventions have the potential to save costs for employers and communities (Baicker, Cutler, & Song, 2010). Our results suggest that mindfulness training could provide an alternative for teachers suffering from internalizing problems, which may provide added value in terms of preventing more serious mental health problems.

Limitations and Future Directions

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Our paper presents with several strengths, including the use of randomization to test the effects of mindfulness, the use of a community sample from the target population for the intervention, and the use of a well-validated mindfulness training program. However, there are several limitations to our study that should be kept in mind when interpreting the results.

First, we did not block-randomize participants to receive medications—rather, we conducted our analyses in an exploratory manner based on the available data on participants self-reported medication use. As such, we could not examine comparative effects of medications in Study 1. However, the interaction between mindfulness training and medication on depressive symptoms was significant in Study 2, revealing that medications were only effective for those in the control group. These findings may suggest that medications may only be useful for those not receiving adjuvant treatments. However, given the lack of randomization to medications, results should be interpreted cautiously as preliminary exploratory analyses that can be further validated in block-randomized trials in the future. At the same time, due to the naturalistic nature of our approach, it is likely that our results may be more generalizable to real-world settings (Leichsenring, 2004).

Second, the effects of mindfulness training and medications were more inconsistent for anxious than for depressive symptoms. Namely, in Study 1, there were no effects of mindfulness training or medications on anxious symptom reduction, while Study 2 showed significant impacts for both mindfulness training and medication at the three-month follow up. These findings mirror inconsistencies in the literature on the efficacy of mindfulness training for anxiety. While some studies show that mindfulness training is effective for anxious symptom reduction, and can provide additive effects when used as an adjuvant to medications (Kim et al., 2009), prior meta-analyses provide support for the effects of mindfulness training on anxious symptoms

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being smaller than that of medications (Bandelow et al., 2015), and at least one prior study of mindfulness training in teachers found that mindfulness training was less effective for reducing anxious as compared to depressive symptoms (Gold et al., 2010). There are several reasons why these inconsistencies may be present. Anxiety and depression, while highly comorbid and generally conceptualized under the umbrella of internalizing disorders, have somewhat distinct cognitive pathways (Hong, 2007). While depression is characterized by ruminative thought (Nolen-Hoeksema, Wisco, & Lyubimirsky, 2008), worry is the cardinal symptom of generalized anxiety disorder (Borkovec et al., 1983). Rumination is characterized by a focus on the past, hopelessness, and failure that encourages maintenance of depression by shifting attention away from potentially adaptive coping responses (Nolen-Hoeksema et al., 2008), while worry is future-focused, and serves as an avoidance response that interferes with functional emotional processing, thereby maintaining fear (Borkovec, 1994). While mindfulness training encourages a present-moment awareness, which is an important component of cognitive behavioral therapy (CBT) for both depression and anxiety (Brewin, 1996), CBT for anxiety disorders has a greater focus on behavioral components of exposure to feared stimuli and situations in order to break the avoidance patterns that maintain anxiety (Borkovec & Sharpless, 2004). It is possible that greater effects could be achieved for anxious symptom reduction with the addition of behavioral components of CBT interventions to mindfulness training, such as assigning teachers exposure exercises to limit behavioral avoidance of feared situations. Such possibilities could be tested in future research.

An alternative interpretation could be that our measures of anxiety in Study 1 did not adequately capture the breadth of anxious symptomatology that might be present in public school teachers. For example, it is possible the nature of teacher worry may be specific to the school

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setting, whereas we used general measures of anxious distress. Future studies should use context-specific measures of worry and anxiety to assess the effects of mindfulness training on anxiety reduction.

Limitations notwithstanding, our study presents the first analysis of the effects of mindfulness training on internalizing symptoms while accounting for medication use, providing important preliminary findings that can be expanded upon in future research to better serve teachers and school districts ameliorate the burden of teacher distress.

Conclusion

The present study examined the impacts of mindfulness training on reductions in depressive and anxious symptoms in public school teachers, while accounting for the fact that these same teachers may already be using medications for such symptoms. Overall, exploratory results showed that mindfulness training significantly reduced depressive and anxious symptoms at post-program and at three-month follow-up when controlling for medication use. Furthermore, comparative effects indicated that mindfulness training resulted in more long-term gains for depressive and anxious symptom reduction, while effects of medication remained relatively stable over time (Study 2). These preliminary findings suggest that mindfulness training is an effective tool for reducing internalized distress in public school teachers and adds benefit above and beyond the use of medication for such symptoms in this population. If replicated in future block-randomized trials for medication vs. mindfulness training, these results hold promise for ameliorating teacher distress and providing cost savings to schools and the healthcare system.

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Table 1. *Descriptive Information by Sample and Condition.*

	Study 1 Canada		Study 2 USA	
	Treatment Group	Control Group	Treatment Group	Control Group
Demographic Characteristics				

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Number of Teachers (Total N = 113)	26	32	28	27
Sex	92%	88%	82%	93%
School Level (%)				
Elementary Teachers)	46%	54%	49%	51%
Age in Years (Median, Range)	50 (28-59)	46 (29-63)	52 (35-63)	48 (27-64)
Years of Teaching Experience (Median, Range)	12 (3-35)	10 (4-32)	16 (2-33)	11 (1-28)

Table 2. Means and standard deviations for depressive and anxious symptoms at each timepoint in Study 1.

Outcome	Time	Mindfulness Group		Control Group	
		Mean	SD	Mean	SD
Depressive Symptoms	T1	3.11	1.02	3.76	1.3
	T2	2.53	0.84	3.23	1.23
	T3	2.71	1.19	3.27	1.13
Anxious symptoms	T1	2.9	1.15	3.68	1.53
	T2	2.27	0.93	2.76	1.21
	T3	2.38	1.31	2.38	1.24

Note. T1 = baseline; T2 = post-program; T3 = 3-month follow-up.

Table 3. Summary of regression analyses predicting symptoms at post-program and 3-month follow-up in Study 1.

Variable	Depressive Symptoms						Anxious Symptoms					
	Post-program			3-month Follow-up			Post-program			3-month Follow-up		
	β	t	p	β	t	p	β	t	p	β	t	p

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Sex	0.02	0.26	0.8	0.03	0.28	0.78	-0.04	-0.38	0.70	-0.02	-0.14	0.89
Years Experience	0.13	1.37	0.18	0.05	0.46	0.65	-0.01	-0.08	0.94	-0.1	-0.6	0.55
Baseline Symptoms	0.77*	8.60*	0.00	0.67*	5.81	0.00	0.65**	5.39**	0.00	0.43*	2.75*	0.01
Medication	0.07	0.82	0.42	0.01	0.06	0.95	0.22	1.85	0.07	-0.04	-0.24	0.81
Condition	0.18*	2.11*	0.04	0.20	-1.75	0.09	-0.14	-1.18	0.24	0.00	0.00	1.00

Note. * $p < .05$. ** $p < .01$.

Table 4. Means and standard deviations for depressive and anxious symptoms at each timepoint in Study 2.

Outcome	Time	Mindfulness Group		Control Group	
		Mean	SD	Mean	SD
Depressive symptoms	T1	27.46	7.15	30.57	5.22
	T2	22.93	5.21	29.22	6.77
	T3	21.09	4.32	28.43	5.28
Anxious symptoms	T1	2.25	0.68	2.39	0.52
	T2	1.94	0.64	2.36	0.54
	T3	1.74	0.44	2.34	0.66

Note. T1 = baseline; T2 = post-program; T3 = 3-month follow-up.

Table 5. Summary of regression analyses predicting symptoms at post-program and 3-month follow-up in Study 2.

Depressive Symptoms		Anxious Symptoms	
Post-program	3-month Follow-up	Post-program	3-month Follow-up

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Variable	β	t	p	β	t	p	β	t	p	β	t	p
Sex	0.03	0.39	0.70	-0.08	-0.79	0.44	-0.11	-1.14	0.26	-0.09	-0.77	0.44
Years Experience	0.14	1.70	0.10	0.13	1.18	0.25	0.14	1.35	0.18	-0.03	-0.29	0.78
Baseline Symptoms	0.68**	7.80**	0.00	0.61**	5.24**	0.00	0.63**	5.81**	0.00	0.41**	3.32**	0.00
Medication	0.47**	4.57**	0.00	0.15	1.05	0.30	0.18	1.44	0.16	0.46**	3.19**	0.00
Condition	-0.21*	-2.34*	0.02	0.42**	3.66**	0.00	-0.32	-2.97*	0.01	-0.30*	2.43**	0.02
Condition* Medication	0.37**	3.30**	0.00	-0.03	-0.20	0.84	0.06	0.40	0.69	-0.30	-2.03	0.05

Note. * $p < .05$. ** $p < .01$.

Table 6. Simple effects of mindfulness training on depressive symptoms within each medication group at post-program (T2) in Study 2

	Depressive Symptoms T2					
	<i>Medicated</i>			<i>Unmedicated</i>		
	β	t	p	β	t	p
Sex	0.20	0.90	0.40	0.01	0.06	0.96
Years Experience	-0.04	-0.13	0.90	0.17	1.71	0.10
Baseline Symptoms	0.49	1.79	0.12	0.77	7.26	0.00
Condition	-0.75	-3.26	0.02	-0.23	-2.29	0.03

IMPACTS OF MINDFULNESS AND MEDICATION ON TEACHERS' SYMPTOM REDUCTION

Figure 1. R^2 change for mindfulness training and medications in Study 1.

Figure 2. R^2 change for mindfulness training and medications in Study 2.

IMPACTS OF MINDFULNESS AND MEDICATION ON TEACHERS' SYMPTOM REDUCTION

Figure 3. Depressive symptom change in each subgroup. Although mean levels of depressive symptoms were used in impacts analyses, the sum score is used here to aid in interpretation.

Figure 4. Anxious symptom change in each subgroup. Although mean levels of anxious symptoms were used in impacts analyses, the sum score is used here to aid in interpretation.