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University of Southampton

Faculty of Environmental and Life Sciences

School of Psychology

Exploring the mechanisms in which a digital mindfulness-based intervention can help reduce stress and burnout among teachers

by

Ryan Bull-Beddows

Thesis for the degree of Doctorate in Educational Psychology

June 2019

University of Southampton

Abstract

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Stress among teachers remains a concern for education researchers in the UK. Figures from the Health and Safety Executive indicate that teaching is among the most stressful profession in the UK. Interventions that promote teachers' emotional well-being factors have grown in popularity. Specifically, interventions that develop teacher self-efficacy. Chapter one presents a systematic review of the existing body of literature to examine the effectiveness of such interventions, and their subsequent impact on student achievement. There were examples from the literature that demonstrated teacher self-efficacy and student achievement can be improved by teacher interventions and professional development programmes. However, some studies failed to report improvements to teacher self-efficacy and student achievement. The findings are discussed in relation to their methodological limitations and their conceptual basis.

The empirical paper in chapter two presents a randomised controlled trial that examines the mechanism in which a digital mindfulness-based intervention can reduce stress and burnout among teachers. In-service teachers (N = 125) across England and Wales were randomly allocated to a digital-based mindfulness intervention condition (Headspace) or a wait-list control condition. Headspace is a commercially available mindfulness app that teaches users mindfulness and mediation techniques. Measures of teaching anxiety, burnout, mindfulness, teacher self-efficacy, self-compassion, and positive

and negative affect were collected at baseline, at 1-month follow-up, and 2-month follow-up. There was a significant interaction effect between teachers in the Headspace condition and time for teaching anxiety and teacher burnout. Results demonstrated there was high attrition among participants and considerable variation in intervention engagement.

Mediation path analysis did not identify any significant causal links between changes to mindfulness, teacher well-being factors, and classroom outcomes. These findings address gaps in the literature and extend previous findings. Future directions for research and implications for practice are discussed.

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Research Thesis: Declaration of Authorship

Print name:	Ryan Bull-Beddows
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Title of thesis:	Exploring the mechanisms in which a digital mindfulness-based intervention can help reduce stress and burnout among teachers
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I declare that this thesis and the work presented in it are my own and has been generated by me as the result of my own original research.

I confirm that:

1. This work was done wholly or mainly while in candidature for a research degree at this University;
2. Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
3. Where I have consulted the published work of others, this is always clearly attributed;
4. Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;
5. I have acknowledged all main sources of help;
6. Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;

Signature:		Date:	
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Most importantly, my incredible wife D. Thanks for all of your belief, encouragement, and patience. With words unspoken....

In loving memory of Marge.

Definitions and Abbreviations

ANOVA	Analysis of Variance
d	Cohen's d
M	Mean
MBI-ES	Maslach Burnout Inventory –Educator Survey
N	Number of participants
p	Probability
PANAS	Positive and Negative Affect Scale
PHMLS	Philadelphia Mindfulness Scale
R	Pearson's correlation coefficient
r_s	Spearman's rank correlation coefficient
SCS	Self-compassion Scale
SD	Standard deviation
TCHAS	Teaching Anxiety Scale
TSES	Teachers' Sense of Self-efficacy
α	Cronbach's alpha
β	Beta Regression Coefficient
ε	Epsilon ANOVA value
η^2_p	Partial eta squared

Chapter 1. Can teacher self-efficacy be enhanced and does this impact student attainment?

Teacher self-efficacy (TSE) emerged as an important factor for education research in the 1970s. TSE has evolved conceptually over the past 40 years and research has found that it has been linked with several student and teacher outcomes (Klassen & Chiu, 2011; Ross, 1992; Thoonen, Sleegers, Oort, Peetsma, & Geijsel, 2011).

Self-efficacy is the belief in one's own ability to accomplish desired outcomes (Bandura, 1997). TSE is defined as a teacher's perception of his or her capability to "organize and execute courses of action required to successfully accomplish a specific teaching task in a particular context" (Tschannen-Moran et al., 1998, p. 233). In its conceptual infancy, TSE was understood to be made up of two independent factors (Gibson & Dembo, 1984). However, Tschannen-Moran and Hoy (2001) proposed a more widely accepted three-dimensional construct that reflected instructional practice, classroom management, and student engagement.

The body of TSE research appeared to grow quickly from the 1970s. This rapid increase can be ascribed to the notion that TSE has been linked to a number of positive student and teacher outcomes (Zee & Koomen, 2016). Many studies imply that teachers who have an assured sense of self-efficacy have a positive influence on student achievement (Chacón, 2005; Ross, 1992), student motivation (Thoonen et al., 2011), teacher well-being (Collie, Shapka, & Perry, 2012), teacher job satisfaction (Klassen & Chiu, 2011), classroom management strategies (Aloe, Amo, & Shanahan, 2014), and the management of student behaviour (Woolfolk, Rosoff, & Hoy, 1990).

Several critiques and reviews have explored the potential impact TSE can have on student and teacher outcomes (Zee & Koomen, 2016). The current review will examine the existing TSE literature, with a particular focus on improving teacher self-efficacy beliefs through interventions or professional development programmes and how this affects student achievement.

1.1.1 Conceptualization and Measurement of TSE

When TSE was first studied, Armor et al., (1976) grounded their theory in Rotter's (1966) social learning theory. Rotter's (1966) social learning theory relates to a person's locus of control. An external locus of control refers to teachers who feel that the influence of the environment will overwhelm their ability to have an impact on a student's learning. An internal locus of control refers to teachers who express confidence in their ability to teach difficult or unmotivated students (Tschannen-Moran et al., 1998). These initial studies created an interest in TSE but researchers were concerned about the reliability of the measurement (Tschannen-Moran et al., 1998).

As the concept of TSE developed from the roots of Rotter's social learning theory, a second conceptual strand emerged from Bandura's (1997) conceptualisation of self-efficacy. Bandura (1997) described self-efficacy as person's belief in their own capabilities to take action and attain desired outcomes. He refers to self-efficacy as a "future oriented belief about the level of competence a person expects he or she will display in a given situation" (Tschannen-Moran et al., 1998, p. 210). Referring to a person's belief about their own capabilities is what differentiates these two conceptual strands.

At this stage, self-efficacy was understood as two distinct concepts. Rotter's (1966) internal-external locus of control model and Bandura's (1997) self-efficacy model. Rotter's locus of control model is concerned with beliefs about whether actions affect outcomes and is known sometimes as outcome expectations. Whereas, Bandura's (1997) self-efficacy

model is concerned with beliefs about a person's ability to orchestrate an action or perform a task and is known sometimes as efficacy expectations. Bandura (1997) reported data that indicated there is no empirical relationship between locus of control and self-efficacy beliefs. Bandura (1997) reported that self-efficacy beliefs were a strong predictor of intentions to act, more effort, and persistence in the face of barriers.

Gibson and Dembo (1984) developed a more extensive measure of TSE that was primarily underpinned by Bandura's conceptualisation of self-efficacy. Teacher interviews and the inspection of previous research lead them to start with a 30-item scale. Factor analysis confirmed the existence of two-factors. Gibson and Dembo (1984) conceptualised TSE as personal teacher efficacy (PTE) and general teacher efficacy (GTE). Personal teacher efficacy and general teacher efficacy appeared to resemble efficacy expectations and outcome expectations respectively, as described by Bandura (1977).

The Gibson and Dembo (1984) instrument was widely used but mixed results were found regarding the correlation of the two factors. The extensive research provided evidence that TSE had an influence on student, teacher, and whole-school factors and began to be considered as a powerful construct. However, as the interest in TSE grew within education research the factor structure of TSE began to be discussed and researchers indicated that the two factors had only weak or no correlation (Tschannen-Moran et al., 1998). Bandura (1997) also argued that the GTE factor, known as outcome expectancy, has little influence over a teachers' actions or motivation because the outcome a person will expect comes from their assessment of their capabilities to perform the task.

In light of the confusion surrounding the conceptual understanding of TSE, Tschannen-Moran et al., (1998) proposed an integrated model of teacher self-efficacy (Figure 1) and published the Teachers' Sense of Self-efficacy Scale (TSES).

They proposed that self-efficacy is influenced by the attributional analysis and interpretation of mastery experiences, physiological arousal, vicarious experiences, and verbal persuasion (Bandura, 1986). Mastery experiences refer to the development of self-efficacy through the direct experiences of mastering a skill. The physiological state of an individual will also affect self-efficacy. For example, an individual experiencing stress or depression may face difficulties with their self-belief. Vicarious experiences explain how self-efficacy is developed through the observation of others especially when they are considered to be role models. Seeing people similar to ourselves succeed raises our beliefs that we can achieve. Verbal persuasion explains how influential people, such as parents or coaches, can strengthen personal beliefs.

The model explains that teacher efficacy is context specific. In making a judgement of their efficacy, teachers will analyse the teaching task and consider this alongside their personal teaching competence.

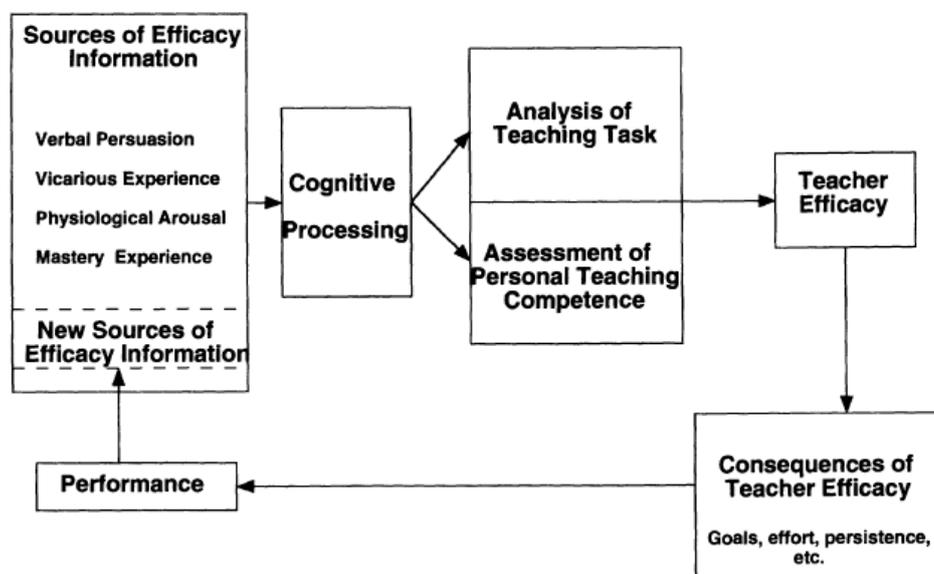


Figure 1 - Framework of teacher self-efficacy formation.

Research consistently reported that TSE is a context-specific construct and that teachers will report different levels of self-efficacy based on the age of their students, the

task they are performing, or the subject they are teaching (Ross et al., 1996; Tschannen-Moran et al., 1998). Tschannen-Moran et al. (1998) felt that their conceptual understanding of TSE improved upon previous models because teachers needed to make a judgement of their “personal competence in light of an analysis of the task and situation” (Tschannen-Moran et al., 1998, p. 228).

The TSES soon became the most widely used measure of teacher self-efficacy and loaded consistently onto three factors; student engagement, instructional practices, and classroom management (Tschannen-Moran & Hoy, 2001). This three-factor structure has been used widely and researchers using the 24-item, and the shortened 12-item version, have reported satisfactory reliability and validity across different contexts (Klassen et al., 2009; Tschannen-Moran & Hoy, 2001) Tschannen-Moran & Hoy (2001) reported high reliability with a Cronbach’s alpha coefficient of .90 for the overall shortened version. Klassen et al. (2009) suggested that the TSES is a reliable and valid measure for secondary school teachers (Cronbach’s $\alpha = .83$) and elementary and middle school teachers (Cronbach’s $\alpha = .89$).

1.1.2 The Influence of TSE

Research has consistently demonstrated that TSE has links with several different outcomes for students and teachers. The following section critically appraises examples from the existing literature that demonstrate these associations. Collie, Shapka, and Perry (2012) examined the interrelationship between teachers’ sense of stress, teaching efficacy, and job satisfaction in a sample of 644 elementary and high school teachers in Canada. Teachers completed online questionnaires on teacher stress, teaching efficacy, job satisfaction, school climate, and social-emotional learning beliefs. The relationship between these factors were examined using structural equation modelling (SEM). Results illustrated that workload stress and teaching efficacy were both directly related to teachers’

sense of job satisfaction. More specifically, the indirect relationship between student behaviour stress and job satisfaction was mediated by teaching efficacy. This indicates that student behaviour stress, on its own, did not negatively impact teachers' job satisfaction. However, student behaviour stress, coupled with a reduced sense of teaching efficacy, did have a negative influence on job satisfaction.

Teachers' occupational commitment and their intention to quit teaching has also been linked to TSE (Klassen & Chiu, 2011; Skaalvik & Skaalvik, 2016). Klassen and Chiu (2011) collected questionnaire data from 434 practising teachers and 379 pre-service teachers. SEM revealed that occupational commitment was directly influenced by classroom stress and teacher efficacy beliefs. Skaalvik and Skaalvik (2016) also identified that low teaching efficacy, lack of supervisory support, and low student motivation was a main route of teachers' motivation to leave the profession.

To determine the influence that TSE has on the instructional practices of special education needs teachers, Allinder (1994) collected questionnaire data from 437 teachers. Results from this study demonstrated that teachers' who had stronger efficacy beliefs were more likely to try different ways of teaching, were confident and enthusiastic about teaching, and more organised with their teaching practices. This is an earlier example of the influence TSE can have on teachers' actions and behaviour. Research has also consistently been linked to several different student outcomes.

One major criticism of this body of research is the cross-sectional design that is commonly used. These cross-sectional studies fail to provide evidence of the causal relationships between TSE and other outcome variables. Longitudinal research designs could provide more nuanced views on the causal mechanism leading to TSE.

Student Outcomes

The TSE literature provides examples of how teachers' efficacy beliefs can influence their actions. A large and growing body of studies have also shown that TSE can have an influence on a variety of student outcomes. Most commonly examined, is the way that teachers' self-efficacy beliefs influence student attainment in a variety of different contexts and subjects. (Caprara, Barbaranelli, Steca, & Malone, 2006; Muijs & Reynolds, 2001; Ross, 1992; Ross, Hogaboam-Gray, & Hannay, 2001).

Ross (1992) directly explored the relationship between teacher self-efficacy and student achievement. This study examined the self-efficacy levels of eighteen history teachers and the achievement levels of their students. Results indicated that student achievement was higher in the classrooms of teachers with higher self-efficacy beliefs.

The relationship between TSE and student achievement has been demonstrated in a number of different subjects. Tella (2008) examined the relationship between teacher self-efficacy, interest, attitude, qualification, experience, and pupil's mathematics achievement. The sample comprised of 254 primary school teachers and 120 primary school pupils. Correlation coefficients indicated that teacher self-efficacy was significantly correlated with pupils' maths attainment ($r [254] = .267; P < .05$).

However, the main weakness of these studies is the failure to explore the reciprocal relationship between student attainment and TSE. The relationship between TSE and student attainment is not one way (Schöber, Schütte, Köller, McElvany, & Gebauer, 2018). It is reasonable to assume that teachers' self-efficacy beliefs may differ when they are teaching high-achieving students and when they are teaching low-achieving students.

Beyond student attainment, TSE can influence a student's motivation and their attitude towards learning (Linnenbrink & Pintrich, 2003). In 1990, Woolfolk and her colleagues demonstrated that a student's interest in school and their perceived importance

of learning was positively correlated with TSE (Woolfolk et al., 1990). The relationship between TSE and student motivation was further explored by Mojavezi and Tamiz in 2012. Eighty high school teachers and 150 high school students were recruited from four cities across Iran. They reported significant positive correlations between teacher self-efficacy and student motivation ($r [180] = .446; P=0.01$) (Mojavezi & Tamiz, 2012). The findings of this study support Gibson and Dembo (1984) earlier notions that teachers with high levels of TSE can teach unmotivated and disengaged students.

Again, these studies fail to identify the causal relationship between TSE and outcome variables. These findings might have been far more convincing if the authors had adopted longitudinal designs in their studies. There is a gap in the literature that needs to understand how TSE influences education outcomes over-time. However, it is evident from the empirical research that there is a relationship between TSE and student achievement. TSE can also have an influence on outcome variables at a whole-school level.

Whole-School Outcomes

TSE has been linked to a number of different whole-school level variables (Tschannen-Moran et al., 1998). Teachers with a stronger sense of TSE have been linked to schools that promote academic success (Hoy & Woolfolk, 1993) and a sense of school community (Lee, Dedrick, & Smith, 1991). Moore and Esselman (1992) collected data from 1,802 teachers to identify the relationships among teacher efficacy, teacher empowerment, and school climate. In this study, teacher empowerment referred to their perceived influence on the decision-making process in their schools and school climate referred to the atmosphere of the school in terms of cooperation and positive feelings, the lack of impediments to effective teachers, and the degree of staff cohesion. Higher levels

of TSE were found among those teachers that reported working in a positive school climate.

However, this method of analysis has its limitations. Moore and Essleman (1992), categorised these schools into higher and lower scoring schools. Using categorical data instead of the continuous data loses potential statistical power. Similarly, the authors could have considered the influence of mediating or moderating variables in their analysis. Using such a large sample size ($N = 1,802$) with categorical data might have meant their study was over-powered. There appears to be a lack of methodological rigour in the body of TSE literature. More nuanced views about the complex mechanisms that link TSE and positive school variables are necessary.

1.1.3 Improving TSE

It is evident from the body of literature that TSE has a positive influence on a number of different outcomes for students and teachers. It is widely accepted that students' academic self-efficacy is the cause and the effect of academic achievement (Schöber et al., 2018). Some researchers have reported that there is a reciprocal relationship between student attainment and TSE. Greater teacher efficacy leads to improvements to performance and attainment, which then leads to stronger efficacy in schools (Tschannen-Moran & Hoy, 2001).

Tschannen-Moran et al. (1998) wrote, "Assuming that efficacy and student achievement are reciprocally related, it makes sense to consider how efficacy might be strengthened". (Tschannen-Moran et al., 1998, p. 234). Having increased levels of TSE in schools could have a powerful reciprocal influence. Therefore, exploring if TSE can be developed and identifying ways to improve teachers' efficacy beliefs could be a potentially important way of improving outcomes in education. The aim of the current review is to

examine whether interventions can improve TSE and whether this has an influence on student attainment.

When exploring the impact of intervention research is it important to distinguish between intervention efficacy and intervention effectiveness. Intervention efficacy is the extent to which an intervention can have a positive impact on outcomes under ideal circumstances. Intervention effectiveness is the extent to which an intervention can have a positive impact on outcomes under usual circumstances (Kim & Seo, 2018). The aim of the current review, and the empirical paper in chapter two, is to explore intervention effectiveness.

1.2 Method

1.2.1 Search Strategy

Studies included in the current review were collected through a systematic search of the published literature. Searches were conducted through three electronic databases; Web of Science, PsychINFO via EBSCO, and ERIC. Boolean operators were used and search terms were variations and derivatives of “*teacher self-efficacy*” and “*student attainment, student outcomes, student achievement*”. Search terms were generated using key terms from the research question and taken from key words in studies previously identified in initial scoping searches. More details of the specific search terms used in the current literature review can be found in Appendix A. Additional studies were identified using citation searches in the retrieved articles. The searches were limited to studies that were written in English and studies that came from peer-reviewed journals.

1.2.2 Study Selection

To increase the applicability and generalisability of the findings, only studies that included students that were of school-age were included in the current review. Studies

were only selected for the current review if they explored the impact of an intervention or a professional development programme. Terms related to interventions and professional development were excluded from the final search terms because they appeared to be limiting the scope of the search. Studies that were examining the impact of an intervention or professional development programme were identified at the title and abstract screening stage. The inclusion and exclusion criteria is outlined in Table 1. The systematic search identified twelve studies and the systematic search process is illustrated in Figure 2.

Table 1 *Inclusion and Exclusion Criteria for Current Systematic Literature Review*

Inclusion Criteria	Exclusion Criteria
<ol style="list-style-type: none"> 1. Studies in English. 2. Studies from peer reviewed journal articles. 3. Studies using in-service teachers. 4. Studies that considered the impact of an intervention or professional development programme. 5. Studies that measured teachers' sense of self-efficacy. 6. Studies that obtained student attainment data. 7. Studies that included school aged students. 	<ol style="list-style-type: none"> 1. Studies that only considered collective efficacy. 2. Studies that only used qualitative methods. 3. Studies that included further education or post compulsory education.

Data Extraction

The following data were extracted from the studies: a) teacher characteristics; b) student characteristics; c) intervention method; d) comparison group; and e) significant result. The Data Extraction Table can be found in Appendix C.

1.3 Results

1.3.1 Participants

All studies were conducted using data from teacher and student samples. Although not all of the studies reported the specific ages of the student samples, they all used students that were of school age. Eleven of the studies used samples from across North America and Canada and one study used participants from Nigerian schools.

1.3.2 Design

All of the studies included in this review used a quantitative design. Two studies used a randomised control design, in which teachers were randomly allocated to a professional development condition, delayed treatment control condition, or an active control condition. Two studies used a mixed-method approach and incorporated questionnaire and interview data into their designs.

1.3.3 Intervention

The type of intervention used in the studies varied considerably. Some interventions were specifically designed to promote teachers' self-efficacy. Some interventions were designed to develop teachers' subject specific teaching practices and knowledge. Some studies explored the impact of teacher coaching and one study explored the impact of school-wide positive behaviour support approach.

Two studies used an intervention specifically designed to develop TSE. Both studies based their interventions on developing the four areas of self-efficacy outlined by Bandura (1997) verbal persuasion, vicarious experiences, physiological arousal, and mastery experiences. Interventions varied in the duration and frequency of delivery.

Seven of the studies examined the impact of subject specific professional development programs. Five studies used interventions that were specifically designed to develop mathematics teaching practices. These five interventions differed in the frequency and duration. One intervention was designed to develop teachers' efficacy and practices in reading, one intervention was designed to develop science teaching practices, and one intervention was designed to support Economics teaching.

All of these interventions were supported by the rationale that teaching efficacy is subject specific (Tschannen-Moran et al., 1998). These interventions were developed around the idea that teachers' efficacy judgements are based on analysis of the teaching task with consideration of their own teaching competence. Developing a teachers' subject specific skills, confidence, and efficacy is likely to lead to teachers making more positive judgements of their own efficacy.

Two studies used coaching interventions. Both studies included teachers having regular access to specially trained coaches. In both of the studies, coaches were assigned to teachers based on their subject skills and interests. Both interventions included full-day workshops followed by regular coaching contact either face-to-face or by telephone. The coaching interventions were similar in that they both allowed the teachers to dictate how much they engaged with the coaches.

The study that explored the impact of a school-wide positive behaviour support intervention implemented the approach across a whole-school and collected data from cohorts of students across different school years. The school-wide positive behaviour support intervention refers to an approach used in schools to promote a positive school environment that can facilitate the increase in successful teaching and learning, and decrease instances of problem behaviour (Horner et al., 2004).

1.3.4 Control Condition

Seven of the studies did not use a comparison group and compared pre and post intervention scores. One study reported using an active control group, one study used a delayed treatment condition and three studies used a no treatment condition as a comparison.

1.3.5 Outcome Measures

The outcome measures that were predominantly used in the studies were measures of self-efficacy and measures of student attainment. Measures of self-efficacy were versions, or variations of, Teachers' Sense of Self-efficacy Scale (TSES; Tschannen-Moran & Hoy, 2001) or the Teacher Efficacy Scale (TES; Gibson 1984).

Five studies used the original version of the TSES (Tschannen-Moran & Hoy, 2001) and one study used the original version of the TES (Gibson & Dembo, 1984). Two studies used an adapted measure of TSE that was a combination of items from the TSES (Tschannen-Moran & Hoy, 2001) and the TES (Gibson & Dembo, 1984). One study used the Science Teaching Efficacy Beliefs Inventory (STEBI; Enochs & Riggs, 1990). The STEBI (Enochs & Riggs, 1990) is a measure that has adapted the items from the TES (Gibson & Dembo, 1984) to more closely reflect science teaching efficacy. One further study adapted the STEBI (Enochs & Riggs, 1990) to reflect teaching mathematics and referred to their scale as the Mathematics Teaching Beliefs Inventory (MTBI; Althausen, 2015). Finally, two studies used their own measure of self-efficacy which included specific questions relating to the intervention they delivered.

Student achievement was measured in a variety of ways. The majority of the studies used nationally recognised, norm-reference assessments. One study used a standardised

achievement test in combination with a far-transfer, lateral thinking task. One study used the Peabody Picture Vocabulary Test (PPVT-III).

1.3.6 Summary of Findings

The following section will describe the outcomes of the studies outlined above. These findings relate to how the interventions have affected teachers' self-efficacy beliefs and student attainment. This review will then conclude with a discussion of the methodological variables and participant characteristics that potentially influence the development of TSE.

1.3.6.1 Self-efficacy beliefs.

Several studies reported that teachers' self-efficacy improved post intervention. Bruce and Flynn (2013) measured teachers' self-efficacy beliefs before, during, and after a 3-year period and compared these results to a comparison group. Effect sizes were reported to illustrate changes to self-efficacy means over the intervention period. Cohen's effect sizes for self-efficacy subscales after the first year were small to moderate: student engagement ($d = 0.22$), instructional strategies ($d = 0.41$), and classroom management ($d = 0.18$). Whereas the delayed treatment condition effect sizes were small: student engagement ($d = 0.02$), instructional strategies ($d = 0.13$), and classroom management ($d = 0.04$). Effect sizes appeared to get larger after each year of the intervention. Post intervention the mean effect size appeared to get bigger from year 2 ($d = 0.33$) to year 3 ($d = 0.44$).

Similar intervention effects were reported by Durowoju & Onuka (2015). They demonstrated that teachers' post intervention self-efficacy beliefs were significantly improved following a professional development programme. Kelm and McIntosh (2012) replicated and extended these findings. They demonstrated that teachers who had been part

of a school-wide development programme reported significantly higher ratings of self-efficacy compared to a comparison school, when controlling for extraneous school factors (e.g., number of students, students with SEN, students who speak English as a second language).

A major criticism of these studies is their inability to identify a causal relationship between engagement in teacher interventions and TSE. Although these studies are often adequately powered, they are often cross-sectional in nature.

Ross and Bruce (2007) reported contrary findings. Ross and Bruce (2007) investigated the effects of a professional development intervention for mathematics teachers on self-efficacy beliefs. Their results indicated that there was no statistically significant difference between pre and post intervention means for the instructional strategy and student engagement subscales of the TSES (Tschannen-Moran & Hoy, 2001). However, there was a statistically significant difference between pre and post intervention means for the classroom management subscale.

However, there are several studies that illustrate a different relationship between professional development programmes and teachers' self-efficacy beliefs (Lumpe, Czerniak, Haney, & Beltyukova, 2012; Ross, 1992; K. E. L. Ross, 2014; Rutherford, Long, & Farkas, 2017).

In one study, questionnaire data were collected about teachers' awareness and engagement in professional development opportunities when working with English Language Learners (ELLs). Results of the regression analysis indicated that awareness of professional development opportunities did not significantly predict teachers' self-efficacy beliefs ($p > .05$). Moreover, participation in professional development did not significantly predict teachers' self-efficacy ($p > .05$) (Ross, 2014).

In a further study, it was reported that after participating in a professional development program for 1 year, teachers reported significantly more positive self-efficacy beliefs. However, there was no significant gains in outcome beliefs and a significant drop in context beliefs (Lumpe et al., 2012). Outcome beliefs are related to how much a teacher feels they can influence outcomes for others and is linked to locus of control. Context beliefs indicate a teachers' beliefs about the supportiveness of their professional context.

There are extensive differences in the content of the interventions and the research designs that have been used to explore how professional development programmes impact TSE. Therefore, is it difficult to draw robust conclusions about those research area as a whole. A key consideration when interpreting this findings from this area is how researchers have measured and conceptualised TSE.

1.3.6.2 Student attainment.

The evidence about how teacher interventions and professional development programmes influence student achievement is less contradictory. Despite large variation in the methodology and analyses used, the majority of the studies reported positive intervention effects on student achievement. One study demonstrated that students that were taught by teachers in the intervention condition significantly improved science achievement scores across all of the cohorts tested. (Bruce & Flynn, 2013). Similarly, Bruce (2012) reported that students significantly improved their maths achievement scores following an intervention period, when compared to a no treatment school, whilst accounting for school-level and class-level variables.

In a further study, student achievement significantly improved post intervention (Ross, 1992). Moreover, Lumpe et al. (2012) reported that teachers' efficacy beliefs and number of intervention hours significantly regressed onto student achievement. However,

they also reported that outcome expectancy was not a significant predictor of student achievement.

1.4 Discussion

This review concludes with a discussion of the themes that emerge from this body of literature. The majority of these studies were able to demonstrate some positive intervention effects for a range of different school, teacher, and student outcomes. However, it is important to critically appraise the literature in order to extract meaningful real-world implications and to identify areas for future research.

1.4.1 Comparison Groups

Findings from the current review indicate that there is considerable variation in the methodological approaches used by different researchers. The comparison groups that researchers utilised differs between each study. This make it difficult to draw comparisons between the research findings for each study.

The most common comparison group used in the current review was no treatment conditions or delayed treatment conditions (Bruce, Esmonde, Ross, Dookie, & Beatty, 2010; Bruce & Flynn, 2013; Durowoju & Onuka, 2015; Kelm & McIntosh, 2012). Some of the studies did not use a comparison group and compared the impact of the teacher intervention to pre and post intervention measures (Althausen, 2015; Cantrell & Hughes, 2008; Lumpe et al., 2012; Shidler, 2009).

There are limitations to intervention studies that do not use a comparison group. It is hard to determine if an intervention is more, or less, effective if the researchers do not examine the influence of a comparison group. Only one study in the review demonstrated positive intervention effects for teachers' self-efficacy and student achievement, in

comparison to an active control group (Rutherford et al., 2017). The findings of the current review indicate that there is a gap in the literature for more methodological rigour. Using well-matched and conceptually supported comparison groups will extend the validity of the teacher intervention research.

1.4.2 Intervention Dose Response

There is variation in the frequency and duration of intervention in all of the studies in the current review. Some of the interventions include several full-day workshops spread over a period of 2 or 3 years (Lumpe et al., 2012; Ross, 1992; Ross & Bruce, 2007). Whilst, the both coaching intervention studies both reported that they encourage the coaches not to instigate any contact with the teachers. They allowed the teachers to use the coaches when and how they felt necessary (Ross, 1992; Shidler, 2009).

There is a lack consistency between the studies in the current review and this makes it difficult to draw any direct comparisons between the findings. However, there does not appear to be an obvious difference between intervention effect based on the frequency and duration of interventions. One study demonstrates that the effectiveness of their teacher intervention does increase after each year of implementation. However, the authors also report that they adapted their intervention after each year to reflect the needs of the teachers (Bruce & Flynn, 2013).

The majority of the interventions made additional support and resources available to teachers alongside an initial workshop or training day. Some interventions instructed teachers to work together in training days (Bruce et al., 2010), and some interventions provided teachers with printed instructional manuals to take away (Cantrell & Hughes, 2008). Although this provides teachers a good opportunity to access additional support in their own time, it is hard to determine intervention engagement from an empirical research

perspective. These findings may provide more real-world applications if they included collected data on intervention engagement.

1.4.3 Type of Intervention

There is considerable variation in the type of intervention that is being examined in the current review. There are four main types of interventions. There are interventions that aim to support and develop subject specific skills and efficacy like mathematics, science and reading. There are interventions that are designed to directly develop teachers' self-efficacy beliefs. There are studies that explore the impact of a teacher coaching intervention, and there is one study that explored the influence of a school-wide positive behaviour support approach.

Studies that are designed to develop teachers' subject specific skills and efficacy appear to consistently report positive intervention effects. Althaus (2015) reported improved self-efficacy scores and student achievement following a job-embedded mathematics professional development program. The program consisted of multiple workshops to develop teachers' conceptual understanding of mathematics. Bruce et al. (2010) reported a classroom-embedded maths professional development program significantly improved student attainment post intervention. The program included sessions on supporting teachers to plan lessons, set learning goals, and the facilitation of peer lesson observation. These findings are replicated in the other subject specific intervention research (Cantrell & Hughes, 2008; Lumpe et al., 2012).

In the current review, there were two studies that examined the influence of interventions that were specifically designed to develop teacher self-efficacy (Durowoju & Onuka, 2015; Ross & Bruce, 2007). Both of these interventions designed specific session around building self-efficacy based of the four areas of self-efficacy; verbal persuasion,

mastery experiences, physiological states, and vicarious experiences (Bandura, 1997).

These studies reported mixed results. One study failed to detect a significant difference in teachers' efficacy beliefs and student achievement post intervention (Ross & Bruce, 2007).

The other study did report a positive intervention effect for teaching efficacy, but they did not detect a significant effect on students' achievement scores post intervention (Durowoju & Onuka, 2015).

Two studies explored the influence of coaching interventions. One study ran three half-day workshops and provided teachers with specially trained coaches. This study failed to detect a significant interaction between intervention engagement and teacher efficacy post intervention, but they did find a significant correlation between self-reported intervention engagement and student achievement (Ross, 1992). The other coaching study examined the impact of a coaching intervention on a range of curriculum assessments. They reported a significant correlation between hours spent with coach and letter recognition, but no other curriculum markers (Shidler, 2009).

It appears there is a consistent finding in the current review. Subject specific teacher development interventions appear to have a more positive effect on teachers' self-efficacy beliefs and student achievement. This notion is also supported theoretically. Tschannen-Moran and Hoy, (2001) conceptualise teacher self-efficacy as a context specific factor. They espouse that teachers' self-efficacy beliefs are made through an analysis of the teaching task in-hand and an assessment of their teaching competence. As the evidence from the current review highlights, it is reasonable to assume that developing teachers' subject specific skills and confidence will, in turn, develop their self-efficacy beliefs about these certain teaching tasks.

1.4.4 Conceptualisation of TSE

There are a number of different measures that have been used to capture teachers' self-efficacy beliefs. However, there are only two conceptually different ways that TSE is being explored in the current review. The TSES (Tschannen-Moran & Hoy, 2001) measures teachers' self-efficacy on three subscales instructional strategies, student engagement, and classroom management. This measure considers Tschannen-Moran and Hoy (2001) integrated model of teacher self-efficacy. Central to this model is that TSE is a context specific factor. Whereas, the TES (Gibson & Dembo, 1984) and the STEBI (Enochs & Riggs, 1990), measure TSE on a two factor structure. The two factors are known as personal efficacy and general efficacy.

The results of the studies in the current review appear to differ depending on how the researcher has conceptualised and measured TSE. A number of studies used the TSES and reported positive associations between interventions, changes to self-efficacy and student achievement (Bruce & Flynn, 2013; Durowoju & Onuka, 2015). However, studies that conceptualise teacher self-efficacy using the two-factor structure of the TES (Gibson & Dembo, 1984), appear to be unable to confidently link efficacy scores to student achievement (Althausser, 2015; Lumpe et al., 2012; Ross, 1992).

1.5 Conclusion

Teacher self-efficacy is an important education factor that has been empirically explored in a variety of ways in the last few decades. This review aimed to critically appraise the available literature to identify if teacher efficacy can be developed using teacher interventions or professional development programmes, and whether this can influence student achievement.

This review identifies a number of limitations within the current evidence base. Findings from the current review indicate that there is considerable variation in the methodology used to explore the development of teacher self-efficacy and identifies a potential gap in the literature. Future research should consider adopting methodologically rigorous study designs with careful consideration of the measurement of self-efficacy, appropriately matched comparison groups, and the type of intervention delivered. TSE development research is in its infancy, replication studies might begin to confirm previous findings and may also identify avenues for future research. Future researcher should also ensure that aims and research questions are conceptually and theoretically supported.

Chapter 2. Exploring the Mechanisms in Which a Digital Mindfulness-Based Intervention Can Reduce Stress and Burnout Among Teachers?

Studies have indicated that teaching is a high stress profession (Kyriacou, 2001). Figures from the Health and Safety Executive show that teaching is among the most stressful professions in the UK. Over a three-year period between 2014 and 2017, teachers were twice as likely to suffer from work-related stress than those from other industries (Buckley, 2017). Teaching is attentionally, socially, and emotionally demanding work (Roeser, Skinner, Beers, & Jennings, 2012). Work-related stress and burnout has been reported as one of the major reasons for teachers leaving the profession (Montgomery & Rupp, 2005).

Education researchers continue to explore novel ways of reducing stress and burnout among teachers, and mindfulness has grown in popularity over the last few years (Roeser et al., 2012; Sharp & Jennings, 2016). Mindfulness is a meditation-based therapy that involves purposeful, non-judgemental acceptance of experiences (Kabat-Zinn, 1990). Kabat-Zinn (1994) defined mindfulness as “paying attention in a particular way: on

purpose, in the present moment, and non-judgementally” (p.4). Mindfulness involves three associated skills or ideas: concentrating attention intentionally on the here and now, perceiving the present moment in a calm and clear way, and experiencing each moment as it is without judgements.

There is a growing body of evidence that suggests mindfulness can reduce stress (Jung et al., 2010), chronic worry (Delgado et al., 2010), and ruminative thoughts (Jain et al., 2007) among adult populations. More specifically, research on mindfulness-based interventions for teachers is starting to demonstrate it can reduce work-related stress, teacher burnout, and improve feelings of emotional well-being (Benn, Akiva, Arel, & Roeser, 2012; Jennings, Frank, Snowberg, Coccia, & Greenberg, 2013). Further research also demonstrated that mindfulness training for teachers can improve psychological symptoms of burnout, self-compassion, and class organisation skills (Flook, Goldberg, Pinger, Bonus, & Davidson, 2013).

1.5.1 Teacher Mindfulness Training Logic Model

Roeser et al. (2013) proposed a logic model that describes the effects of mindfulness training on outcomes for teachers and students (Figure 3). The model proposes that teacher mindfulness training cultivates teachers’ mindfulness and their habits of mind, which in turn, improves teachers’ occupational health and emotional well-being. Improvements to emotional well-being leads to greater occupational engagement, lower rates of absenteeism, and reduction of work-related stress and burnout. Teachers’ mindful habits, in conjunction with their improved emotional well-being and occupational engagement, leads to the formation of positive dyadic relationships between students and teachers.

Mendelson, 2014; Beshai, McAlpine, Weare, & Kuyken, 2016; Roeser et al., 2012). Research has demonstrated that MBIs can reduce teacher stress and teacher burnout (Benn et al., 2012). Further research has also demonstrated that MBIs can improve emotional well-being factors for teachers (Miller & Brooker, 2017).

Beshai et al. (2016) demonstrated how MBIs show promise with reducing self-reported stress and increases in well-being among a sample of eighty-six secondary school staff. Individuals in the intervention group reported significant reductions in psychological symptoms and significant improvements to well-being after the mindfulness intervention.

Benn, Akiva, Arel and Roeser (2012) examined whether mindfulness training could help to reduce stress among teachers (N = 35) and parents (N = 25) of children with special needs. This randomized control study assessed the efficacy of a five-week mindfulness-training program and a waitlist comparison group. Adults in the mindfulness-teaching group showed reduced stress measured on the Perceived Stress Scale with a Cohen's d value of 0.52 post intervention, and 0.57 at 2-month follow up. Adults in the mindfulness-teaching group also showed reductions of anxiety measured on the State-Trait Anxiety Scale with a Cohen's d value of 0.52 post intervention and 0.75 at 2-month follow up.

A limitation of this body of literature is related to the research methodology that is often utilised. The recruitment process of these studies could be inflating the observed intervention effect. Benn et al. (2012) paid their participants a fee for completion of the intervention process. This may have incentivised participants to engage in the MBI and might not reflect how the wider population might engage with the same intervention. Beshai et al. (2016) allowed participants to self-select their place in either the experimental or wait-list control condition. This approach could bias the differences between the group pre-intervention.

Another limitation of this literature is related to the number of participants used in the studies. Researchers have reported that their studies were underpowered and that their sample did not represent their target population (Ancona & Mendelson, 2014; Roeser et al., 2012). These studies could have wider implications to the field if the authors had considered conducting a power analysis prior to recruitment and testing.

Another criticism of this body of literature is the variation in the outcome measures that researchers have used. Ancona and Mendelson (2014) reported that the MBI groups showed significant improvements to measures of stress and burnout, when compared to control groups. However, they failed to explore any potential mechanisms that might be influencing the intervention effect. The study could have been more persuasive if it measured and reported levels of mindfulness or self-compassion among the participants. Hypothesising, measuring, and examining potential mechanisms alongside intervention research provides more real-world implications.

Perhaps the most significant limitation of this research is the considerable resources needed to implement these MBIs. MBI research often requires participants to engage in multiple full-day sessions, daily homework activities, and weekly group sessions (Ancona & Mendelson, 2014; Benn et al., 2012; Beshai et al., 2016; Jennings et al., 2013). Teachers often have limited time away from their class and this type of intervention is only made possible through considerable commitment to professional development from school leaders. The interventions are often time consuming, intensive, and expensive.

1.5.3 Digital-Based Mindfulness Interventions (DBMIs)

The interest in MBIs has become increasingly popular in the past two decades (Keng, Smoski, & Robins, 2011). The rapid development of information technology has led to more MBIs being delivered through the internet (Spijkerman, Pots, & Bohlmeijer, 2016). A review of the mindfulness-based mobile applications literature in 2016 reported that

although a wide range of mindfulness-based mobile applications are available, there is a lack of evidence supporting the usefulness of those applications (Spijkerman et al., 2016). Anderson and Titov (2014) reported that online interventions have a number of advantages:

1. They are easily accessible and individuals can access support without long waiting lists.
2. They are available 24/7 to people in their own environment, which saves traveling time and enables people to work at their own pace.
3. They permit users to remain anonymous throughout the process without needing individuals to adopt a patient role.
4. They do not always necessarily require involvement of a therapist.

Further research has indicated that online interventions are less costly than face-to-face interventions (Cuijpers et al., 2009). Moreover, a survey among 500 adults in the United States showed that many people prefer individual and online formats for mindfulness interventions above group interventions (Wahbeh, Svalina, & Oken, 2014).

There have been a number of randomised control trials that have reported strong intervention effects for DMBIs on a range of psychological outcomes (Boettcher et al., 2014; Mani, Kavanagh, Hides, & Stoyanov, 2015). Cavanagh et al. (2013) explored if a brief, online, mindfulness-based intervention could increase mindfulness and reduce stress, anxiety, and depression within a student population. University students ($N = 104$) from the South of England were randomly allocated to start a two-week, self-guided, online, mindfulness-based intervention or a waitlist control condition. Measures of mindfulness, perceived stress, anxiety, and depression were taken pre and post intervention. Results indicated that there was significant interaction for mindfulness, perceived stress, and

anxiety and depression symptoms for group and time. Engagement with the online DBMI was associated with significant improvements on the psychological outcomes measures, compared to no changes with the participants in the waitlist control condition.

However, this growing body of literature has a number of limitations. Many of the researchers that report positive DBMI effects ran interventions that were supported or guided by therapists or mindfulness specialists (Aikens et al., 2014; Buhrman et al., 2013) (Trompetter, Bohlmeijer, Veehof, & Schreurs, 2014). Similarly, other researchers that reported significant positive intervention effects for DMBIs stipulated that users accessed the app up to 3.5 hours a week (Aikens et al., 2014). Attrition rates for online interventions are often high among individuals with anxiety and mood symptoms (Yeager & Benight, 2018). Individuals may engage differently with an online intervention when they are allowed to independently use the app as they wish. Allowing participants to engage with a DMBI in a way that suits their lifestyle and needs might provide more insight into how effective DMBIs might be in a real-world setting.

DMBI research has reported positive intervention effects for chronic pain sufferers (Trompetter et al., 2014), non-clinical patients (Aikens et al., 2014), and patients with anxiety and mood disorders (Spadaro & Hunker, 2016). However, there has been very little empirical exploration on DMBIs for teachers and education professionals.

1.5.4 Intervention Outcome Measures

The current study measures a number of psychological and emotional well-being outcomes. The teacher mindfulness training logic model (Roeser et al., 2013) provides the framework for the mechanisms explored in the current study.

Teacher skills and mindsets are examined through measures of Mindfulness and Self-compassion. Mindfulness was measured using the Philadelphia Mindfulness Scale

(PHMLS; Cardaciotto, Herbert, Forman, Moitra, & Farrow, 2008) and self-compassion was measured using the Self-compassion Scale (SCS; Neff, 2003).

Teachers' coping and resilience factors are measured using teaching anxiety (TCHAS; Parsons, 1973), and teacher burnout (MBI-ES; (Maslach, Jackson, & Schwab, 1996). In-line with previous research (Jennings et al., 2013), measures of teachers' positive and negative affect (PANAS; (Watson, Clark, & Tellegen, 1988) were collected in order to identify any potential mediating mechanisms. Classroom outcomes were measured using the Teachers' Sense of Self-efficacy (TSES; Tschannen-Moran et al., 1998). The TSES consistently loads onto three factors; student engagement, classroom management, and instructional practices. These three factors are closely linked to the classroom outcome factors identified by Roeser et al. (2013), Positive Dyadic Teacher-Student Relationships, Emotionally Supportive Climate, and Effective Classroom Management.

1.5.5 The Current Study

The purpose of the current study is to explore the mechanisms in which a mindfulness intervention can improve psychological and emotional well-being outcomes for teachers. The current study will build on previous research (Benn et al., 2012) in a unique way by examining the impact of a digital-based mindfulness intervention in a school context. This research is novel and could provide practical implications for teachers, school leaders, and students.

The current study also addresses methodological concerns from the body of literature. The randomised control design aims to provide robust methodology to explore the specific impact of the DBMI. Furthermore, the current study should be adequately powered to detect a significant effect, something that previous mindfulness-based research has failed to do (Ancona & Mendelson, 2014; Beshai et al., 2016).

Another aim of the current study is to address a gap in the literature relating to the lack of causal research. Previous research is predominantly cross-sectional in nature and fails to identify the causal mechanisms that link mindfulness and positive classroom outcomes. Figure 4 illustrates the proposed mediation path explored in this research. The purpose of examining the mechanisms of change is an attempt to explore phenomena that has wider-world practice implications beyond this study.

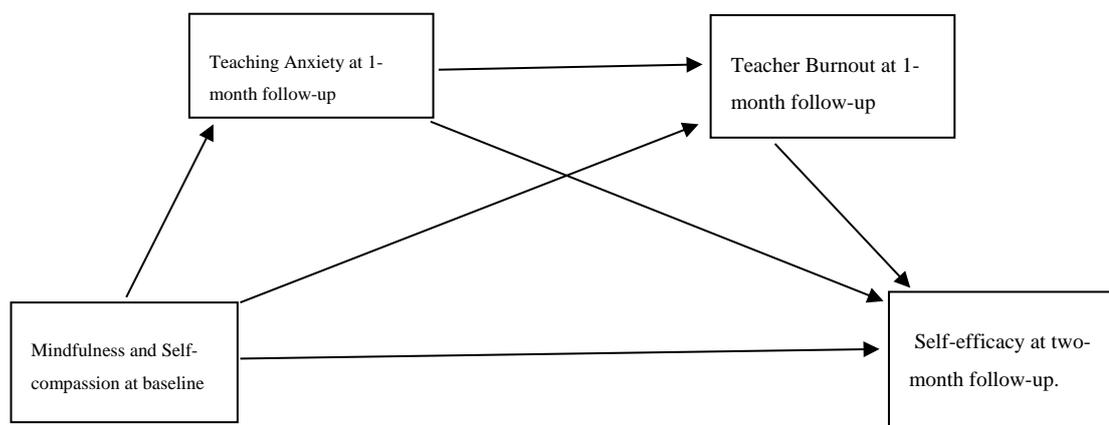


Figure 3 - Proposed mediation path model

1.6 Method

1.6.1 Participants

Participants were recruited online and worked in schools across England and Wales. Recruitment consisted of three different strategies. Invitation emails were sent to head teachers (Appendix L), the study poster (Appendix M) was posted on a teaching Facebook group, and the study poster was circulated via an Educational Psychologist email community thread. Directly emailing head teachers and the social media posts provided little recruitment opportunities. The emails sent through the email thread appeared to be the more successful recruitment strategy.

Inclusion in the study required participants to work full-time in a primary, secondary, or special school. All potential participants completed the Teaching Anxiety Scale and were excluded from the study if they reported low levels of teaching anxiety. Some of the individuals that initially signed up to the study ($N = 198$) were ineligible and did not continue to participate in the study ($N = 73$). Of the participants that provided data at baseline ($N = 125$), this sample was made up of 111 females and 14 males. The average age of participants at baseline was 34.50 years ($SD = 9.31$). The average years of teaching experience was 8.54 years ($SD = 7.47$). The 125 participants were either allocated to the experimental condition ($N = 63$) or the wait-list control conditions ($N = 62$). Of the 125 participants that signed up at baseline 85 worked in primary schools, 36 in secondary schools, and four in special schools. Attrition rates throughout the study resulted in 31 participants included at the final stage of the study. Attrition is discussed in more detail in the results section and is illustrated in Figure 6.

1.6.2 Design

A randomized control trial was employed to determine the effect of a digital mindfulness-based intervention on levels of teaching anxiety and burnout. In-line with Roeser et al. (2013) teacher mindfulness training logic model, measures of self-compassion, positive and negative affect, and teacher self-efficacy were collected. Measures were completed at baseline, a 1-month and 2-month follow-up. Table 2 displays the hypotheses tested in the current study.

To identify the necessary sample size required for the mixed-model ANOVA used to test the primary hypotheses, an a priori power analysis was conducted using G*Power Version 3. Eighty-eight participants was the minimum required to detect medium effect

size ($\eta_p^2 = 0.06$) with 95% power, $p = 0.01$ corrected for three outcome measures ($p = .0033$) at 80%, with repeated measures correlation.

1.6.3 Hypotheses

There were two primary hypotheses

- Teachers in the experimental condition will show improved scores on the Teaching Anxiety Scale at 2-month follow-up, compared to teachers in the wait-list control condition.
- Teachers in the experimental condition will show improved scores on the Burnout Measure Inventory at 2-month follow-up, compared to teachers in the wait-list control condition.

1.6.4 Additional Research Questions

There were three exploratory research questions

- Is there an association between intervention engagement, teaching anxiety, teacher burnout, and work absenteeism?
- Is teachers' sense of self-efficacy mediated by teaching anxiety and burnout?
- Is teachers' sense of self-efficacy, mediated by mindfulness, positive affect, and self-compassion?

1.6.5 Measures

1.6.5.1 Teaching Anxiety Scale (TCHAS)

The TCHAS (Parsons, 1973) is a self-report questionnaire that is designed to measure situation specific teaching anxiety. Although the scale was designed in 1973, the

TCHAS (Parsons, 1973) is considered the most effective tool for measuring teaching anxiety (Bilali, 2014). The TCHAS was initially designed to be used with pre-service teachers and several altered version were published to improve the appropriateness of the measure. The current study uses the TCHAS (1) – 24, this was a shortened version designed for in-service teachers. The TCHAS (1) – 24 is a 24-item measure that loads reliably and consistently onto a single factor of teaching anxiety. Alpha coefficients indicated that the TCHAS has high internal consistency from .87 to .94. Research has also indicated that the validity of the TCHAS is good and that it correlates well with other self-report measures of anxiety with correlations between .30 and .45 $p < .05$, $N = 55$ (Bilali, 2014).

1.6.5.2 Philadelphia Mindfulness Scale (PHLMS)

The PHLMS (Cardaciotto et al., 2008) is a 20-item measure consisting of two subscales known as present-moment awareness and acceptance. Participants are required to indicate how often they experience certain phenomena on a scale of one (never) to five (very often). Cardaciotto et al. (2008) reported high internal consistency for each subscale. The awareness subscale had a Cronbach's alpha of .81 and the acceptance subscale had a Cronbach's alpha of .85 suggesting good internal consistency.

1.6.5.3 Positive and Negative Affect Schedule (PANAS)

The PANAS (Watson, Clark, & Tellegan, 1988) comprises of two separate mood scales. One scale measures a person's positive emotions (e.g., excited, proud) and another scale that measures a person's negative emotions (e.g., upset, hostile). Each scale consists of ten items rated on a five-point scale used to indicate the perceived amount of time participants spent experiencing each emotion. In the current study, participants were asked to rate their responses based on how they have felt in the past week. Research has indicated

high internal consistencies (Cronbach's alpha above .85) between the two scales (David Watson et al., 1988). Watson et al. (1988) also reported moderately good reliability for the individual mood scales. The positive affect scale had a Cronbach alpha coefficient between .86 and .90 and the negative affect scale between .84 to .87 (Watson et al., 1988).

1.6.5.4 Self-Compassion Scale (SCS)

The SCS (Neff, 2003) is a 26-item self-report measure that requires participants to indicate on a five-point scale (1 = Almost never, 5 = Almost always) how often they behave in the stated manner. Neff (2003) found that the SCS loads onto a six-factor structure. The subscale are known as self-kindness, self-judgement, common humanity, isolation items, mindfulness items, and over-identified. The scores from the subscales can be combined into an overall self-compassion score. In the current study, the overall self-compassion score was used. Internal consistency for the 26-item SCS was .92. To test construct validity, Pearson's correlation coefficients were calculated between the SCS and other scales measuring similar constructs. The SCS was found to have a significant negative correlation with the Self-Criticism subscale of the DEQ, $r = .65, p < .01$. A significant positive correlation with the Social Connectedness scale, $r = .41, p < .01$, and significant positive correlations with all three subscales of the Trait-Meta Mood Scale: Attention, $r = .11, p < .05$, Clarity, $r = .43, p < .01$, and Repair, $r = .55, p < .01$ (Neff, 2003).

1.6.5.5 Maslach Burnout Inventory - Educator Survey (MBI-ES)

The MBI-ES (Maslach et al., 1996) is an adaptation of the Maslach Burnout Inventory (MBI, Maslach & Jackson, 1981) and is recognised as the leading measure of burnout for people working in human services (Hawrot & Koniewski, 2018). The MBI-ES is a 22-item questionnaire that is divided into three subscales: emotional exhaustion, depersonalisation, and personal accomplishment. The items describe feelings and situations about work (e.g., I feel depressed at work) and asks recipients to rate how often

they feel them on a seven-point scale ranging from zero (Never) to six (Every day).

Research has indicated moderate reliability for the three-factor structure of the MBI-ES with Cronbach's alpha values of .89 for emotional exhaustion, .82 for depersonalisation, and .81 for personal accomplishment (Van Droogenbroeck, Spruyt, & Vanroelen, 2014).

1.6.5.6 Teachers' Sense of Efficacy Scale (TSES) – Short Form

The TSES is designed to see what creates the most difficulties for teachers in daily school activities. The TSES short-form (Tschannen-Moran & Woolfolk Hoy, 2001) comprises of 12 items relating to student engagement, instructional practices, and classroom management. Participants rate each item on scale from one (nothing) to nine (a great deal). The TSES is considered to be a reliable and valid instrument and research has indicated the TSES short form has adequate reliability with Cronbach's alpha coefficients of .90 (Tschannen-Moran & Hoy, 2001) and Wolters and Daugherty (2007) reported high reliability with a Cronbach's alpha coefficient above .80.

1.6.6 Procedure

Ethical approval was obtained from the University of Southampton School of Psychology Ethics Committee (ref. 32030.A2). The recruitment and testing was conducted online. Email addresses of head teachers were obtained through internet searches and using the primary researcher's school contacts. Head teachers were initially sent an email containing a letter that described the aims and objectives of the study (Appendix L) and a poster for the study (Appendix M). Head teachers were asked to send the information to the teachers in their schools.

During the first phase of recruitment, emails were sent to schools across West Berkshire in the South of England. Further emails were later sent to primary, secondary,

and special schools across Bristol, Monmouthshire, and Southampton. To capture a wider geographical area the study poster was also shared on Facebook groups and circulated via an Educational Psychologist email community.

The study website was created using the University of Southampton LifeGuide platform (Hare et al., 2009) . The study website allowed participants to read the Participant Information Sheet (Appendix D) before they gave informed consent (Appendix E). After consenting to take part in the study, participants answered a series of demographic questions (age, number of years of teaching experience, number of sick days taken in the last month, and type of school) to determine if they were eligible to participate in the study. If participants' answers to these demographic questions indicated that they were not eligible to take part in the study, they were shown a message thanking them for their interest and informing them that they were not eligible to continue with the study.

Eligible participants then began to complete the first series of questionnaires. One of the eligibility criteria for the current study was that teachers reported medium to high levels of teaching anxiety. The study website automatically calculated the scores of the TCHAS and if participants' scores did not meet the predetermined threshold they were not eligible to take part in the study. Parson's (1973) original TCHAS paper reported an extensive number of mean scores for a variety of different demographic groups. This paper was consulted to determine the appropriate threshold for low teaching anxiety. If participants reported a score that was less than 50 they were shown a message thanking them for their participation and informing them that they were not eligible to continue with the study. Eligible participants then completed the remaining questionnaires at baseline.

1.6.7 Randomisation

The study website automatically randomly allocated participants to the waitlist control condition or the experimental condition after completing measures at baseline. The

study website was designed to send a prompt email to the primary researcher when a participant had been allocated to either condition. Participants in the experimental condition were sent an email containing an access code to Headspace for two months and detailed instructions on how to access the website and the mobile application. For the purpose of ease and fluency for the reader, the term app will be used in reference to the Headspace mobile application.

The study website was designed to automatically email participants prompts to log back into the study website and complete the next set of questionnaires at 1-month and 2-month follow up. Participants that did not complete measures after the first email prompt were subsequently sent daily reminders for the next three days. Participants that did not complete follow-up measures after these three days had passed were excluded from the study.

Participants allocated to the waitlist control condition were sent an email containing instructions on how to log into the study website and their Headspace access code after completing the final set of questionnaires at 2-month follow-up. Participants were also given the opportunity to request to extend their access to Headspace beyond the 2 month testing period.

1.6.8 Intervention

Headspace is an English-American online healthcare company that specializes in mindfulness and meditation. Headspace is a commercially available service that teaches its users how to live mindfully and meditate. It has a large range of themed sessions supporting areas like stress, sleep, focus, and anxiety.

Participants were given access to all of the features of Headspace for two months. After participants registered and redeemed their access codes, they answered a series of short questions to determine their previous experience of mindfulness and what their desired areas of development might be. Headspace then suggests sessions and activities for individuals based on these questions. However, users had the option to access the full library of sessions and activities.

1.6.9 Analysis

Descriptive statistics will be used to examine the attrition rates and intervention engagement for participants in the experimental and wait-list control condition. A mixed-model ANOVA will be used to examine the primary hypotheses. That being, teachers in the experimental condition will show improved scores on the Teaching Anxiety Scale and Burnout measures at 2-month follow-up, compared to teachers in the wait-list control condition. The mixed model ANOVA will follow a 2 x 3 design. The between-subject factor will be group (experimental or wait-list) and the within-subject factor will be time (baseline, 1-month follow-up, and 2-month follow-up).

Correlation coefficients will be calculated to check the association between intervention engagement, teaching anxiety, teacher burnout, and work absenteeism. This is the first of the exploratory research question. In-line with previous research (Pham et al., 2019), intervention engagement will be examined using the average number of logins the participants recorded on the app, and the average minutes spent using the app.

Hayes (2017) PROCESS mediational analysis will be used to examine the final two exploratory research questions. These hypotheses explore if teachers' sense of self-efficacy, at 2-month follow-up, is mediated by teaching anxiety and burnout at 1-month follow-up. Similarly, is teachers' sense of self-efficacy at 2-month follow-up, mediated by

mindfulness, positive affect, and self-compassion at 1-month follow-up. Figure 5 illustrates the mediation path model examined.

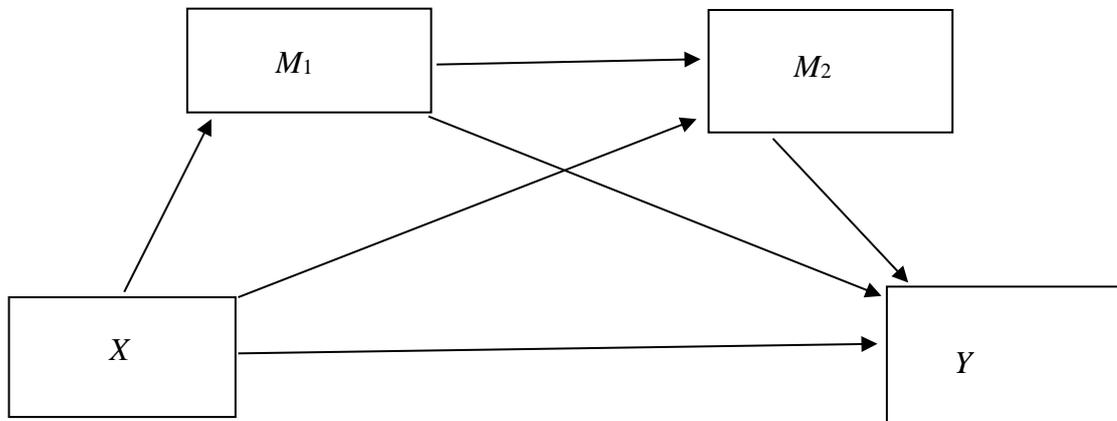


Figure 4 - Proposed mediation path model

1.7 Results

1.7.1 Intervention Feasibility and Attrition

Among the 125 participants at baseline, 111 were women and 14 were men. The average age was 34.5 years (SD =9.31) and the average years of teaching experience was 8.54 years (SD = 7.50). The means and standard deviations of the all outcome measures are presented in Table 3.

Despite 125 participants completing measures at baseline, there was a considerable drop-off of participants at 2-month follow-up, as illustrated by the participant flow diagram in Figure 6. It is common to expect large attrition rates in digital-based interventions (Yeager & Benight, 2018b). However, there appears to be a larger attrition rate for participants in the experimental condition compared to those in the wait-list control condition. This may have been because participants in the waitlist control condition received their access code to the app after the testing period. They may have been

incentivised by the free access to Headspace, which meant they stayed engaged in the study until the end of the testing period.

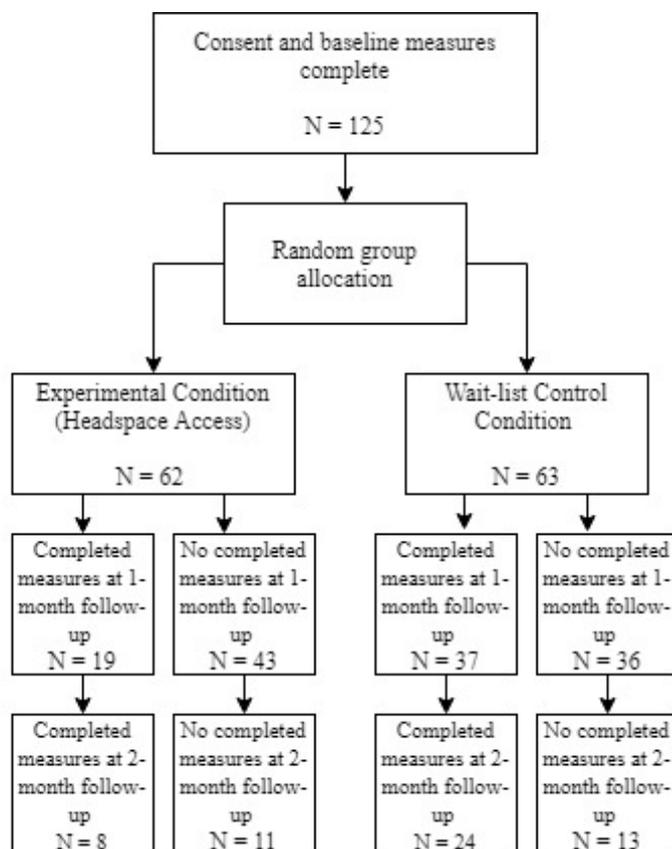


Figure 5 - Participant Flow

Participants’ usage data were analysed to explore intervention engagement. Of the 62 participants allocated to the experimental condition, only 27 logged on and registered to use their Headspace access code. Participants who had been allocated to the experimental condition who had not started to use their access code were sent prompt emails about how to log in. All 27 participants used the app despite having the option of accessing the web-based version. Intervention engagement varied between the 27 participants that used the app.

The number of logins the participants recorded ranged from one to 117 and the median was eight. The average number of logins was 17.96 (SD = 27.41). The amount of time spent using the intervention also varied largely between the participants. The minutes

spent using the intervention ranged from three to 742 and the median was 40. The average number of minutes spent using the intervention was 127.85 (SD = 186.21).

Table 2 - Means and standard deviations for outcomes in experimental and wait-list control condition at baseline, 1-month, and 2-month follow-up.

Outcome	Headspace Access			Wait-list Control		
	Baseline	1-month	2-month	Baseline	1-month	2-month
	Mean (SD)					
Positive Affect	27.45 (7.94)	31.65 (7.30)	32.00 (7.19)	26.97 (6.27)	29.46 (6.80)	29.25 (6.05)
Negative Affect	27.97 (8.09)	21.55 (5.93)	24.88 (11.62)	27.24 (7.57)	25.70 (8.18)	26.25 (7.93)
PMLS (Total)	55.61 (7.77)	56.20 (7.94)	58.63 (8.00)	57.00 (7.69)	54.60 (7.88)	51.80 (13.77)
PMLS (Aw)	32.53 (5.73)	33.65 (5.76)	34.75 (3.54)	35.29 (5.66)	34.03 (5.98)	31.29 (7.19)
PMLS (Ac)	23.08 (5.82)	22.55 (5.46)	23.88 (6.51)	21.71 (7.34)	20.57 (6.13)	20.51 (8.46)
Self-Compassion	2.72 (0.51)	2.95 (0.52)	3.21 (0.39)	2.70 (0.38)	2.80 (0.37)	2.93 (0.56)
MBI (EE)	4.11 (0.97)	3.99 (1.15)	3.53 (1.29)	4.17 (0.99)	4.10 (0.99)	3.64 (1.33)
MBI (DP)	1.86 (1.28)	1.77 (1.64)	1.44 (1.20)	1.58 (1.13)	2.01 (1.40)	1.93 (1.40)
MBI (PA)	4.10 (0.91)	4.26 (0.940)	4.46 (0.89)	4.20 (0.72)	4.42 (0.58)	4.46 (0.84)
Teacher Anxiety	72.44 (11.90)	70.41 (15.23)	62.70 (14.53)	71.24 (9.86)	68.46 (10.53)	65.17 (11.64)
TSES (Total)	6.23 (1.06)	6.66 (1.90)	6.75 (1.27)	6.64 (1.03)	6.93 (1.40)	6.75 (1.27)
TSES (SE)	5.96 (1.30)	6.24 (1.36)	6.44 (1.49)	6.28 (1.15)	6.41 (1.10)	6.50 (1.81)
TSES (IS)	6.35 (1.09)	7.03 (1.09)	6.88 (1.20)	6.75 (1.08)	6.82 (1.24)	7.20 (1.66)
TSES (CM)	6.52 (1.35)	6.71 (0.90)	6.94 (1.41)	6.52 (1.35)	7.57 (3.46)	7.08 (1.80)

PMLS = Philadelphia Mindfulness Scale; Aw = Awareness; Ac = Acceptance; MBI = Maslach Burnout Inventory; EE = Emotional Exhaustion; DP = Depersonalisation; PA = Personal Accomplishment; TSES = Teachers' Sense of Self-efficacy scale; SE = Student Engagement; IS = Instructional Strategies; CM = Classroom Management

1.7.2 Primary Hypotheses

A mixed model ANOVA was used to test the hypotheses that teachers in the experimental condition will show improved scores on the teaching anxiety scale, and burnout measures, at 2-month follow up, compared to teachers in the wait-list control condition. The mixed model ANOVA followed a 2 x 3 design. The between-subject factor was the group the participants were allocated to, either the Headspace condition or the

wait-list control condition. The within-subject factor was time, either baseline, 1-month, or 2-month follow-up.

Prior to the analysis, the data were examined to see if it met the necessary parametric assumptions needed for the mixed model ANOVA. There were no outliers in the data, as assessed by examination of studentized residuals for values greater than ± 3 . The teaching anxiety scale and teacher burnout data were normally distributed, as assessed by visual inspection of Normal Q-Q Plots. There was homogeneity of variances, as assessed by Levene's test of homogeneity of variance ($p > .05$), for teaching anxiety at baseline, 1-month and 2-month follow-up. There was homogeneity of variances, as assessed by Levene's test of homogeneity of variance ($p > .05$), for teacher burnout - emotional exhaustion and teacher burnout - depersonalisation. However, there was no homogeneity of variance for teacher burnout - personal accomplishment.

Mauchly's test of sphericity indicated the assumption of sphericity was met for teacher burnout - depersonalisation, $\chi^2(2) = .38$, $p = .83$, and teacher burnout - personal accomplishment $\chi^2(2) = 4.19$, $p = .12$. However, the assumption of sphericity was violated for teaching anxiety, $\chi^2(2) = 7.73$, $p = .02$, and teacher burnout - emotional exhaustion, $\chi^2(2) = 6.26$, $p = .04$. As the assumption of sphericity was violated for some of the dependent variables, a Huyn-Feldt correction was used. This correction was used as it is the most appropriate when the ϵ value is greater than 0.75 (Field, 2013).)

1.7.2.1 Teaching Anxiety

Results of the main and interaction effect from the 3 (time) x 2 (group) mixed model ANOVA are presented in Table 4. There was a statistically significant main effect on time for teaching anxiety, $F(1.76, 52.72) = 15.86$, $p < .001$, partial $\eta^2 = 0.35$, suggesting that teaching anxiety reduced over time for participants in both conditions.

There was a statistically significant interaction effect between the intervention group and time for teacher anxiety, $F(1.76, 52.72) = 5.43, p = .01, \text{partial } \eta^2 = .153, \epsilon = 0.88$ (Figure 7).

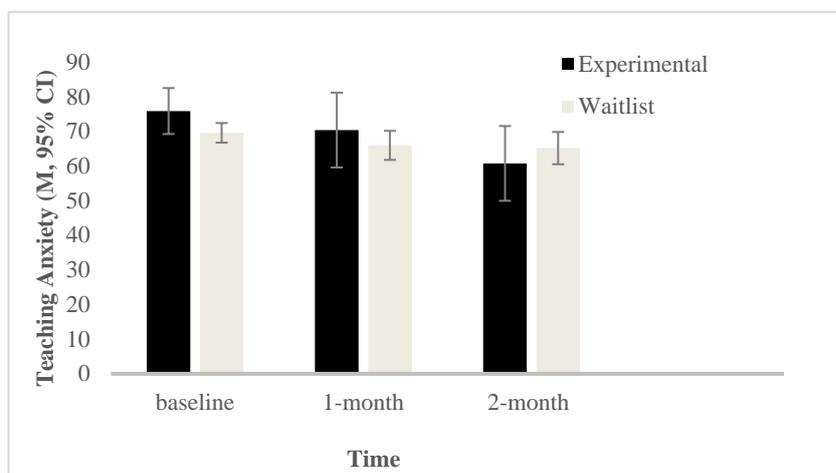


Figure 6 - Significant interaction between experimental and waitlist control for teaching anxiety at Time 1 (baseline), Time 2 (1-month follow-up), and Time 3 (two-month follow-up)

A series of two way mixed model ANOVAs (2 x 2) were conducted to identify the time period in which the interaction occurred. The two independent variables were group and time and they were both measured at two levels. Time was the within subject factor and group was a between subject factor.

The first 2 x 2 ANOVA compared the effect of group (experimental or waitlist) and time (baseline and 1-month follow-up) on teaching anxiety and there was no significant effect of group on teaching anxiety $F(1, 57) = 2.37, p = .13$. The second 2 x 2 ANOVA compared the effect of group (experimental or waitlist) and time (baseline and 2-month follow-up) and there was no significant effect of group on teaching anxiety $F(1, 32) = 2.75, p = .11$. A final 2 x 2 ANOVA compared the effect of group (experimental or waitlist condition) and time (1-month follow-up and 2-month follow-up) and there was a significant effect in teaching anxiety scores from 1-month follow-up and 2-month follow-up $F(1, 31) = 9.60, p = .01$.

Table 3 - Main and Interaction Effect for Time and Group for Teacher Anxiety and Teacher Burnout measures.

		<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>p</i>
	Outcome					
Time	TCHAS	1147.30	1.76	652.90	15.86	.00
	MBI – EE	2.54	1.83	1.39	2.01	.15
	MBI – DP	1.22	2.00	0.61	1.00	.37
	MBI - PA	1.82	1.93	0.94	2.82	.07
Time*Group	TCHAS	392.43	1.76	223.32	5.42	.01
	MBI – EE	0.33	1.82	0.18	0.26	.75
	MBI – DP	1.62	2.00	0.81	1.33	.27
	MBI - PA	2.08	1.93	1.08	3.23	.04

TCHAS = teacher anxiety; MBI-EE = Maslach Burnout Inventory – Emotional Exhaustion; MBI – DP = Maslach Burnout Inventory – Depersonalisation; MBI – PA = Maslach Burnout Inventory – Personal Accomplishment.

1.7.2.2 Personal Accomplishment

Results of the main and interaction effect from the 3 (time) x 2 (group) mixed model ANOVA for personal accomplishment are presented in Table 4. These findings illustrated there was no statistically significant main effect on time for the teacher burnout measures: MBI-EE $F(1.82, 53.45) = 2.02, p = .15, \text{partial } \eta^2 = 0.06$; MBI-DP $F(2, 52.16) = 1.01, p = .37, \text{partial } \eta^2 = 0.03$; and MBI-PA $F(1.93, 49.16) = .94, p = .07, \text{partial } \eta^2 = 0.09$. There was, however, a statistically significant interaction between the intervention group and time for teacher burnout - personal accomplishment, $F(1.927, 57.82) = 3.23, p = .04, \text{partial } \eta^2 = .09, \epsilon = .96$. Figure 8 illustrates this significant interaction effect.

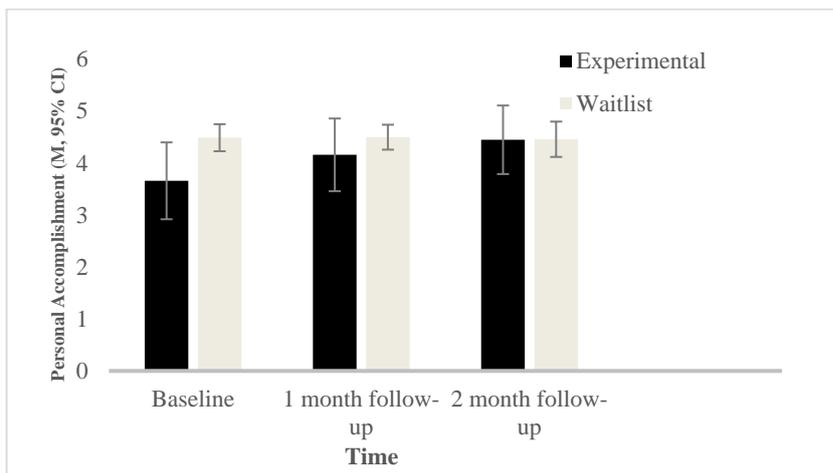


Figure 8 - Significant interaction between experimental and waitlist control for Personal accomplishment burnout at Time 1 (baseline), Time 2 (1-month follow-up), and Time 3 (two-month follow-up)

A series of two way mixed model ANOVAs (2 x 2) were conducted to identify the time period in which the interaction occurred. The two independent variables were group and time and they were both measured at two levels. Time was the within subjects factor and group was the between subject factor.

The first 2 x 2 ANOVA compared the effect of group (experimental or waitlist) and time (baseline and 1-month follow-up) on personal accomplishment and there was no significant effect of group on personal accomplishment $F(1, 56) = 1.60, p = .21$. The second 2 x 2 ANOVA compared the effect of group (experimental and waitlist condition) and time (baseline and 2-month follow-up) and there was, however, a significant effect for personal accomplishment $F(1, 31) = 5.12, p = .03$. The final 2 x 2 ANOVA compared the effect of group (experimental and waitlist condition) and time (1-month follow-up and 2-month follow-up) and there was no interaction on personal accomplishment $F(1, 30) = 1.60, p = .22$.

1.7.3 Exploratory Research Questions

The purpose of the exploratory research questions were to identify the mechanisms in which a mindfulness intervention can improve emotional well-being outcomes for teachers as outlined by Roeser and colleagues in their teacher mindfulness training logic model (Roeser et al., 2013). The following section outlines each exploratory research questions and the results of the analyses.

1.7.3.1 Is there an association between intervention engagement, teaching anxiety, teacher burnout, and work absenteeism?

A Spearman's correlation analysis was run to check the association between intervention engagement, teaching anxiety, teacher burnout, and work absenteeism. A non-parametric correlation used because the assumption of linearity was violated. Preliminary analyses showed the relationship between these variables to be monotonic, as assessed by visual inspection of a scatterplot.

Results of the correlation are presented in Table 5. There were no statistically significant correlations detected between intervention engagement and teacher psychological symptoms at all three time points. There was also no significant correlation between work absenteeism and teaching anxiety or teacher burnout. Attrition rates throughout the study meant the number of participants included in the analysis at two-month follow-up was reduced ($N = 31$).

There was a significant positive correlation found between work absenteeism and teaching anxiety at baseline. An increase in teaching anxiety scores was moderately associated with work absenteeism at baseline $r_s(123) = .31, p < .001$. This suggests that teachers who reported higher teaching anxiety scores also reported taking more sick days from work.

Table 5 - Correlation Coefficients for Teaching Anxiety, Teacher Burnout, Intervention Engagement, and work absenteeism at baseline, 1-month, and 2-month follow-up

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Headspace Minutes	-															
Headspace Logins	.945**	-														
T1 - EE	-0.121	-0.113	-													
T1 - DP	-0.100	-0.160	.404**	-												
T1 - PA	-0.080	-0.067	-.264**	-.313**	-											
T1 - TCHAS	0.286	0.274	.366**	.222*	-.471**	-										
T2 - EE	0.396	0.338	.660**	.264*	-0.155	.412**	-									
T2 - DP	0.152	-0.036	.425**	.730**	-0.237	.519**	.567**	-								
T2 - PA	0.094	0.160	-.409**	-.364**	.488**	-.550**	-.532**	-.658**	-							
T2 - TCHAS	-0.002	-0.009	.316*	.325*	-.345**	.727**	.568**	.560**	-.600**	-						
T3 - EE	-0.143	-0.234	.358*	-0.112	-0.037	-0.063	.708**	0.136	-0.156	0.280	-					
T3 - DP	0.071	-0.198	0.339	.632**	-0.216	0.248	.397*	.738**	-.403*	0.338	0.102	-				
T3 - PA	0.054	-0.027	-0.258	-0.322	0.326	-0.196	-0.274	-0.304	.528**	-0.218	-.378*	-0.339	-			
T3 - TCHAS	-0.179	-0.234	0.176	0.145	-0.127	.424*	.639**	.432*	-.387*	.798**	.585**	.419*	-.390*	-		
T1 Sickdays	0.321	0.235	.209*	-0.063	-.221*	.309**	0.211	.297*	-0.233	.262*	0.077	0.242	-0.077	-0.079	-	
T3 Sickdays	0.345	0.250	0.034	-0.014	0.028	-0.046	0.250	-0.011	-0.157	0.059	0.047	0.105	-0.017	0.303	-0.118	-

Note T1 = baseline; T2 = 1-month follow-up; T3 = 2-month follow-up; EE = Teacher Burnout Emotional Exhaustion; DP = Teacher Burnout Depersonalisation; PA = Teacher Burnout Personal Accomplishment; TCHAS = Teaching Anxiety.

** $p < .001$ * $p < .05$

1.7.3.2 Is teachers' sense of self-efficacy at two-month follow-up, mediated by emotional well-being factors at one-month follow-up?

To analyse the mechanisms proposed by Roeser et al. (2013) in their teacher mindfulness training logic model, cross-sectional path analyses were performed on data from baseline only and these are illustrated in Figures 10 and 11. The number of participants at baseline ($N = 125$) provides enough power to detect any statistically significant effect.

Mediation analysis was used to examine the hypothesis that teachers' emotional well-being factors mediate the effect of mindfulness and self-compassion on teacher's sense of self-efficacy. Analyses were conducted using Hayes (2017) PROCESS mediation macro add-on for SPSS (v.24). Two separate mediation models were tested. The first mediation model (Figure 9) examines the extent to which the relationship between mindfulness and sense of self-efficacy is mediated by emotional well-being factors. The second model (Figure 10) explores to what extent to which the relationship between self-compassion and sense of self-efficacy is mediated by emotional well-being factors.

Baron and Kenny (1986), recommended that mediators have to be significantly correlated with both the predictors and outcome variables. Hayes (2017), however, indicates that this relationship is not necessary and that mediators should be theoretically linked to outcome and predictor variables. Outcomes were analysed to establish their significance and to assess whether they were suitable to be included in the path model. The analysis found that teaching anxiety and personal accomplishment were suitably correlated to be included as mediators in the path model. In addition, these two factors are key components of the teacher mindfulness training logic model (Roeser et al., 2012). This illustrates that this mediation model is supported statistically and theoretically.

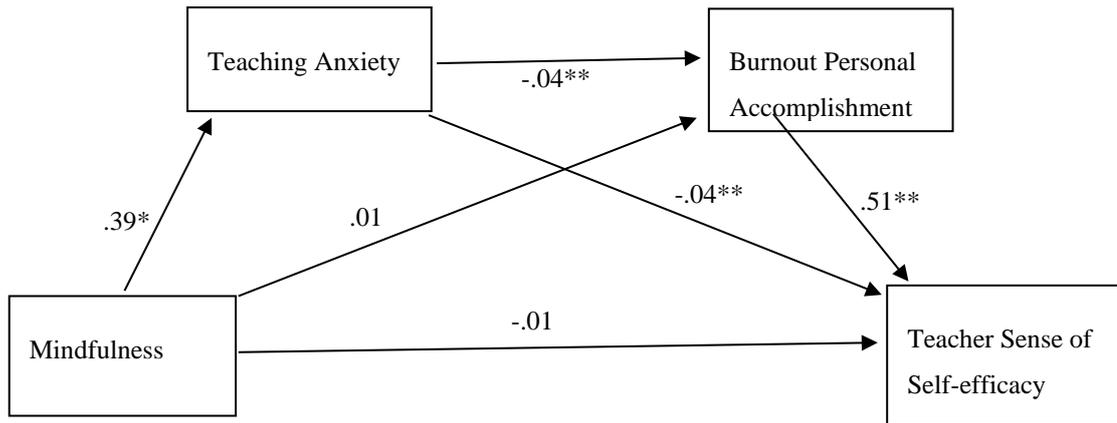


Figure 7 - Regression coefficients for the relationship between teacher mindfulness and teacher sense of self-efficacy as mediated by teacher anxiety and personal accomplishment teacher burnout measured at baseline.
 $*p < .05$, $** p < .001$.

Results indicated that there was no significant direct effect between Mindfulness and Teachers' Sense of Self-efficacy, $\beta = .01$, $t(120) = -0.55$, $p = .58$. There was also no significant total effect for the model $\beta = .02$, $t(120) = 1.90$, $p = .06$. However, the total indirect effect for the path model was significant, $B = .28$, $SE = .01$, $95\% CI = .01, .05$. This indicates that teaching anxiety and personal accomplishments were significant mediators of the effect between mindfulness and teacher's sense of self-efficacy. This is in-line with Roeser et al. (2013) model and indicates that teaching anxiety and teacher burnout are mediating mechanisms that link mindfulness and teachers' sense of self-efficacy. Table 6 illustrates the regression coefficients for this mediation model.

Table 4 - Path Coefficients, indirect effects, and 95% confidence intervals, predicting teachers' sense of self-efficacy (N = 125)

Path	B	BootCILL	BootCIUL	SE	t	p
Total	.02	-.01	.04	.01	1.90	.06
Direct	-.01	-.03	.01	.01	-.55	.58
MFN*TCHAS	-.40	-.64	-.15	.12	-3.22	.01
MFN*PA	.01	-.01	.03	.01	1.03	.30
TCHAS*PA	-.04	-.05	-.02	.01	-6.10	.00
TCHAS*TSES	-.04	-.05	-.03	.01	-5.51	.00
PA*TSES	.51	.31	.70	.09	5.22	.00
Indirect						
Total Indirect	.03	.0094	.0467	.01		
Indirect 1	.02	.0046	.0285	.01		
Indirect 2	.04	-.0043	.0158	.01		
Indirect 3	.01	.0020	.0134	.01		

Note * = regression path; MFN = mindfulness; PA = personal accomplishment; TCHAS = teaching anxiety; TSES = teacher's sense of self-efficacy;

Indirect 1 = Mindfulness – Teaching anxiety – Teachers' sense of self-efficacy

Indirect 2 = Mindfulness – Personal accomplishment - Teachers' sense of self-efficacy

Indirect 3 = Mindfulness – Teaching Anxiety – Personal accomplishment - Teachers' sense of self-efficacy

The second mediational model uses self-compassion as the predictor variable and is illustrated in Figure 10. The regression coefficients are presented in Table 6. Step 1 of the model illustrated the regression of teaching anxiety on self-compassion was significant, $\beta = .82$, $t(123) = -4.04$, $p < .001$ and the regression of personal accomplishment on teaching anxiety was also significant, $\beta = -.03$, $t(122) = -5.65$, $p < .001$. The regression of teachers' sense of self-efficacy on personal accomplishment teacher burnout was significant, $\beta = .55$, $t(121) = 5.65$, $p < .001$, and that the regression of teacher' sense of self-efficacy on teacher anxiety was significant, $\beta = -.04$, $t(121) = -5.51$, $p < .001$. However, the regression of

personal accomplishment teacher burnout on self-compassion was not significant, $\beta = .25$, $t(122) = 1.69$, $p = .09$.

The direct regression of teachers' sense of self-efficacy on self-compassion was not significant, $\beta = .05$, $t(121) = .32$, $p = .75$. The total model effect was also non-significant, $\beta = .02$, $t(121) = 1.90$, $p = .06$. However, the total indirect effect of the model was significant, $B = .61$, $SE = .17$, $95\% \text{ CI} = .30, .95$. This suggests that teaching anxiety and teacher burnout are mediating the relationship between self-compassion and TSE. This is further evidence to support the mechanisms of the Roeser et al. (2013) mindfulness training logic model.

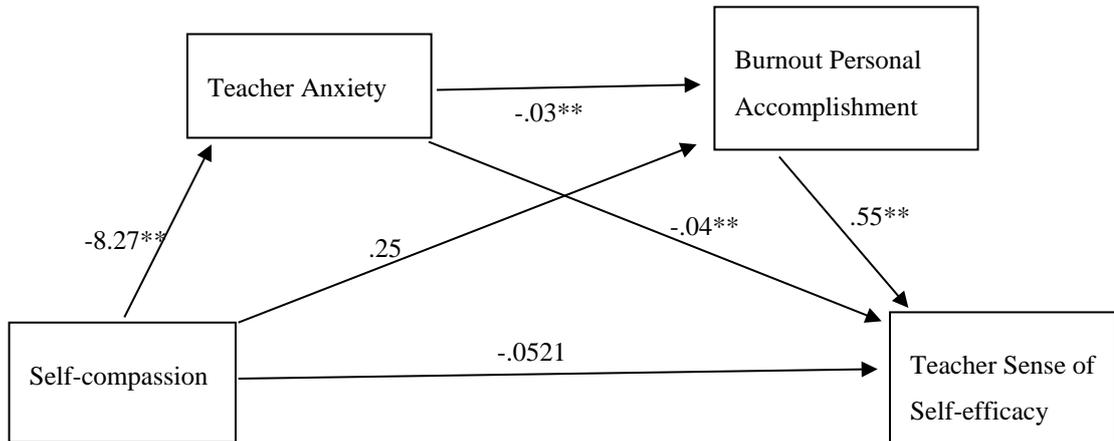


Figure 8 - Regression coefficients for the relationship between teacher mindfulness and teacher sense of self-efficacy as mediated by teacher anxiety and personal accomplishment teacher burnout measured at baseline.

* $p < .05$,

Table 5 - Path Coefficients, indirect effects, and 95% confidence intervals, predicting teachers' sense of self-efficacy (N = 125)

Path	Effect	BootCILL	BootCIUL	SE	<i>t</i>	<i>p</i>
Total	.56	.16	.96	.21	2.74	.01
Direct	-.05	.37	.27	.16	-.32	.75
SC*TCHAS	-8.27	-12.32	-4.2	2.05	-4.04	.00
SC*PA	.25	-.04	.54	.15	1.70	.09
TCHAS*PA	-.03	-.05	-.02	.01	-5.64	.00
TCHAS*TSES	-.04	-.05	-.02	.01	-5.15	.00
PA*TSES	.55	.36	.74	.10	5.70	.00
Indirect						
Total Indirect	.61	.29	.95	.17		
Indirect 1	.32	.13	.53	.10		
Indirect 2	.14	-.05	.37	.11		
Indirect 3	.16	.07	.30	.06		

Note * = regression path; SC = Self-compassion; PA = personal accomplishment; TCHAS = teaching anxiety; TSES = teacher's sense of self-efficacy;

Indirect 1 = Self-compassion – Teaching anxiety – Teachers' sense of self-efficacy

Indirect 2 = Self-compassion – Personal accomplishment - Teachers' sense of self-efficacy

Indirect 3 = Self-compassion – Teaching Anxiety – Personal accomplishment - Teachers' sense of self-efficacy

1.8 Discussion

1.8.1 Main Findings

The primary aim of the current study was to evaluate the effectiveness of a digital-based mindfulness intervention on teaching anxiety and teacher burnout symptoms. The secondary aims of the study were to examine the potential mechanisms that link the use of mindfulness intervention, teachers' psychological well-being factors and classroom

outcomes. Results indicated that Headspace was effective in reducing teaching anxiety and teacher burnout symptoms over time.

A significant interaction effect was found between group and time for teaching anxiety. Meaning that teachers that had access to Headspace, reported more improvements to their levels of teaching anxiety over time when compared to teachers in a wait-list control condition. There was also a significant interaction between group and time for personal accomplishment teacher burnout. Meaning that teachers that had access to Headspace, reported more improvements to their levels of personal accomplishment over time, when compared to teachers in the waitlist control.

Post-hoc analysis indicated that there was no significant effect between baseline and 1-month follow-up or between baseline and 2-month follow-up for teaching anxiety. There was, however, a significant effect between 1-month and 2-month follow-up for teaching anxiety. This interaction could be explained by two reasons. Firstly, this effect could be spurious as a result of the sample size being too small. It is common for spurious effects being detected when sample size is small relative to the number of variables and an analysis is underpowered (Anderson, Burnham, Gould, & Cherry, 2001).

Another possible explanation might be linked to the wait-list control design of the study. The results of the current study indicate that the mean teaching anxiety scores for the waitlist control group remained relatively stable throughout the study whereas the mean teaching anxiety score for the intervention group dropped overtime. Using an active control group as a comparison might have provided a more accurate representation of the effect of a digital-mindfulness intervention.

Previous research has identified that mindfulness training can improve anxiety and burnout among teachers in the past (Benn et al., 2012; Schussler, Jennings, Sharp, &

Frank, 2016), and this in-line with findings from the current study. However, the current study extends previous findings because it demonstrates that a digital-mindfulness intervention can improve anxiety and burnout symptoms among teachers.

Teachers in the Headspace condition reported reduced levels of burnout on the personal accomplishment subscale but not on the emotional exhaustion or depersonalisation subscales. Jennings et al. (2013) also found a teacher mindfulness intervention effect on the personal accomplishment subscale. The personal accomplishment subscale includes items like, “I have accomplished many worthwhile things in my job”. It is argued that mindfulness interventions reduce anxiety and rumination (Jaine et al., 2007) which then means that teachers spend less time ruminating about the things they need to do and more time accomplishing things in work (Jennings et al., 2013).

Post-hoc analysis of this interaction indicated that there was an effect between baseline and 2-month follow-up for personal accomplishment. Again, this effect could be spurious and be as a result of an underpowered analysis as the sample size was too small. Another potential explanation might have been due to the impact of a waitlist control design. The personal accomplishment scores for the waitlist control group appeared to remain stable relative to the intervention group scores, which increased over time.

Another key finding from the current study was related to the intervention engagement and study attrition rates. There was a considerable number of participants that disengaged from the study after signing up. Intervention engagement varied between teachers in the Headspace condition. There were a large number of participants that did not login to use the app and some teachers only used the app for a short amount of time. This may indicate that DMBIs are not feasible for a teacher population.

Another key finding from the current study was related to the intervention engagement and study attrition rates. There was a considerable number of participants that disengaged from the study after signing up. Intervention engagement varied between teachers in the Headspace condition. There were a large number of participants that did not login to use the app and some teachers only used the app for a short amount of time. This may indicate that DMBIs are not feasible for a teacher population.

Previous teacher mindfulness intervention feasibility research has indicated that face-to-face mindfulness interventions were acceptable and feasible for teachers (Ancona & Mendelson, 2014; Benn et al., 2012). These interventions have large associated costs and can be time consuming for teachers. It was expected that teachers would be more engaged in the intervention if they could access the app in their own time and around their own busy schedules. However, intervention engagement data from the current study indicates that this might not be the case. There are a number of theoretical and methodological explanations that need to be considered here.

Firstly, it is common to expect large drop-off rates for online interventions (Yeager & Benight, 2018). Digital intervention research continues to explore the difficulties with engaging individuals with online health and well-being apps (Carolan, Harris, Greenwood, & Cavanagh, 2016; Todkill & Powell, 2013). A potential explanation of the attrition in the current study could be related to the inherent nature of mindfulness. Crane et al. (2013) identified one of the important elements of mindfulness intervention is the relational skills of a mindfulness teacher. They argue that mindfulness practice engages individuals in developing a new relationship with themselves and their experiences and the relationship skills of a mindfulness teacher is important for this process. It could be argued that DMBIs are missing the relational skills of an experienced mindfulness teacher.

However, one of the benefits of the current study is the flexibility that teachers had in how they accessed the app. Research has identified that flexibility is important for online interventions because it allows individuals to use the support as much, or as little, as they please (Doherty, Coyle, & Sharry, 2012).

A nuanced view on effective engagement promotes the idea that it may be more valuable to establish “effective engagement”, rather than more engagement. In this instance, “effective engagement” refers to sufficient engagement with an app to achieve its intended outcome (Yardley et al., 2016). The current study detected an intervention effect for teaching anxiety and burnout which might suggest that teachers engaged effectively with Headspace.

The secondary aims of the current study were to explore the mechanistic relationships between the mindfulness intervention, teacher well-being factors, and classroom outcomes. It was hypothesised that teaching anxiety and teacher burnout scores at 1-month follow-up would mediate the relationship between mindfulness and teachers’ sense of self-efficacy at 2-month follow-up. Results from the current study did not support this hypothesis. There were no significant total, direct, or indirect effects for these variables. Teaching anxiety and teacher burnout measures at 1-month follow-up did not mediate the relationship between mindfulness and self-compassion at baseline and teacher’s sense of self-efficacy at 2-month follow-up.

This contrary finding may have been a result of methodological weaknesses of the current study. The number of participants included in the initial analysis at 2-month follow-up was low ($N = 31$). This may not have been an adequate number of participants to have the power to detect an effect (Hayes, 2017).

A mediation path analysis using the data from baseline alone did support some elements of Roeser et al. (2012) model. The teacher mindfulness training logic model

(Roeser et al., 2013) proposes that teachers' mindful habits lead to improved emotional well-being for teachers. This improved mind-set then leads to positive classroom outcomes e.g., effective classroom management, emotionally supportive climate, and positive dyadic teacher-student relationships.

There was no significant direct effect between mindfulness and teachers' sense of self-efficacy. There was, however, a significant indirect effect between mindfulness and teachers' sense of self-efficacy when accounting for teaching anxiety and teacher burnout.. The relationship between teacher mindfulness and teachers' sense of self-efficacy was explained by teaching anxiety and personal accomplishment. Results indicated that at baseline, changes to scores on mindfulness measures did not directly effect changes to scores on sense of self-efficacy measures. This relationship was dependent on changes to scores on teaching anxiety and teacher burnout measures. It is reasonable to conclude that teacher mindfulness influences teaching anxiety and burnout symptoms, which in turn, impacts their sense of self-efficacy as a teacher.

In addition, indirect path analysis indicated that teaching anxiety explained more of the relationship between teacher mindfulness and teachers' sense of self-efficacy, when compared with personal accomplishment. The indirect path from teacher mindfulness to personal accomplishment and teachers' sense of self-efficacy was not significant. This suggests that teaching anxiety is a key mediator between mindfulness and sense of self-efficacy.

Similar findings were reported for the relationship between self-compassion and teachers' sense of self-efficacy. The relationship between self-compassion and self-efficacy was fully explained by teaching anxiety and personal accomplishment. Indirect path analysis indicated that teaching anxiety explains more of the relationship between

self-compassion and self-efficacy compared to personal accomplishment. Teachers that were more self-compassionate experienced less teaching anxiety and less burnout and subsequently reported having a stronger sense of self-efficacy.

Although this finding does not provide evidence for the intervention effect on the teacher mindfulness training logic model, it does provide modest cross-sectional evidence for the way that teachers experience mindfulness, self-compassion, anxiety, burnout, and sense of self-efficacy. More robust methodological designs are necessary to ensure that future research has adequate power at follow-up periods to detect an intervention effect and identify causal links.

1.8.2 Strengths

The current study possesses a number of strengths. This research is novel and appears to be one of the first to explore the impact of a digital-based mindfulness intervention among the teaching population. The study was also longitudinal in nature and collecting data at multiple time points allowed the exploration of change over time. A number of controls were used to ensure the study had a robust design. The inclusion and exclusion criteria for participation in the study attempts to reduce any additional effects from extraneous variables.

While adopting a randomised-controlled trial design adds another level of methodological rigour. Randomisation reduces bias and provides a rigorous tool to examine cause-effect between an intervention and outcomes. Any differences caused by potentially confounding participant characteristics are equally distributed across the two groups. The use of randomised-controlled trials in treatment research has been criticised because it is important to understand the mechanisms through which change has occurred (Deaton & Cartwright, 2018). One of the key features of the current study was to explore the mechanisms through which the intervention worked so that it could provide findings that could extend the scope of the current study.

The current study also attempts to try and make the intervention as ecologically valid as possible. This was primarily an intervention effectiveness study and attempted to understand what impact the intervention would have when used under normal circumstances. Teachers in the intervention group were instructed to use the app as they pleased to try and replicate how it may be used by the wider target population. Effectiveness studies are designed to provide a more pragmatic naturalistic element to rigorous randomised-controlled trials.

Another strength of the current study is that the findings are supported by previous research. Research in the past has identified that mindfulness training is an effective way of improving anxiety and burnout symptoms for teachers (Benn et al., 2012; Schussler et al., 2016). More specifically, the findings from the current study link mindfulness interventions with personal accomplishment, as reported in previous literature (Jennings et al., 2013). Continuing to find evidence that links mindfulness with personal accomplishment confirms previous findings whilst creating wider conceptual application for the current study. Although this section identifies some clear strengths, there are ways that this research can be improved.

1.8.3 Limitations

The current study provides evidence of a positive intervention effect among teachers for an online mindfulness based intervention. However, there are a number of limitations that need to be considered alongside these results. The current study compared the effects of the experimental group on a wait-list control condition. Using a wait-list might have inflated the effects of the Headspace condition. When individuals experience mild psychological symptoms in the real world they might find ways to reduce these symptoms by themselves, or they may subside over time. However, when a participant is placed on a

wait-list for a psychological treatment they may be more passive in treating themselves and might not try to improve their symptoms. Research has indicated that wait-list conditions may generate bigger effect sizes for the treatment of depression with cognitive-behavioural therapy compared to no treatment and a placebo (Furukawa et al., 2014). Using an active control condition might have given a more accurate intervention effect. Previous research has used a group online discussion forum as a comparison group (Boettcher et al., 2014; Buhrman et al., 2013). Using a comparison condition that is a realistic reflection of the type of support that is available to the target population will provide more real-world implications.

Another consideration is the nature of the outcome measures that were collected. All of the measures used in the current study were self-reported. Teachers in the current study might not report honestly on items if they fear they might be criticised or judged about what they report. Some teachers were invited to take part in the study via emails from their head teachers. These teachers may be more inclined to give socially desirable answers as opposed to being honest. Similarly, teachers in the current study might not have the necessary reflection and self-awareness skills to give an accurate judgement of their own emotional well-being and teaching skills. However, self-reported measures were a useful strategy to collect the large sample size at baseline necessary to account for the expected attrition rates.

The current study used self-reported measures of sense of self-efficacy to explore classroom outcomes. Theoretically, subscales of the TSES (Tschannen-Moran et al., 1998) (classroom management, instructional practices, and student engagement) are in-line with the classroom outcomes outlined by Roeser et al. (2013) in the teacher mindfulness training logic model (effective classroom management, emotionally supportive climate, and student-teacher relationships). However, teachers that are experiencing work-related stress and burnout might not have the psychological awareness to accurately reflect on

their own self-efficacy. Measuring classroom outcomes using first-hand objective measures (e.g., observations, student report measures) may give a more accurate reflection of how teacher well-being factors are influencing classroom outcomes.

The sample size of the current study reduced considerably over time and this limited the opportunity to identify causal links between the mindfulness intervention, teacher well-being factors, and positive classroom outcomes. Attrition was expected across the time period. However, certain methodological features could have influenced this high attrition rate. Teachers in the experimental condition dropped out more than teachers in the waitlist control condition. Teachers may have been incentivised by the free access to Headspace which meant that those in the waitlist control condition were keen to complete measures at all three time points so they received the free access. Staggering the teachers' access to the intervention and giving them one month at a time as they complete each stage might have kept more participants in the study. Extending the recruitment and testing period would have also widened the scope of the study and may have ensured larger numbers at the end of the study.

Another methodological consideration that needs to be considered is the impact of school holidays. The testing period of the current study went over three school holidays. Many teachers signed up to the study using their work emails. These teachers might not have access to these emails over the holidays and would have missed out on the opportunity to complete the measures. The school holidays may have also impacted emotional well-being scores of teachers. It is reasonable to assume that teaching anxiety and work-related burnout might be reduced during a school holiday. However, the randomisation of each condition, meant that participants potentially affected by this variable will be equally distributed across both conditions.

1.8.4 Real-world Implications

A number of implications for teachers and school leaders appear to be relevant when considering the results of the current study. One of the aims of the current study was to examine intervention effectiveness. Understanding how teachers would engage with a DMBI and examining this impact under usual circumstances enables researchers and practitioners to identify potentially helpful real-world implications.

Firstly, the study indicated that a digital mindfulness intervention can improve emotional well-being factors for teachers, despite a considerable variation in the engagement in the app. School leaders that consider rolling out a digital intervention in their schools should allow teachers to engage in the app in their own way and at their own pace. Results from the current study, and previous research (Yardley et al., 2016), indicates that users will engage with digital interventions in unique ways.

Previous research has indicated that face-to-face mindfulness interventions can improve emotional well-being factors for teachers (Benn et al., 2012; Schussler et al., 2016). These interventions require considerable commitment and resources. Although the current study has demonstrated initial positive results for a DMBI in reducing anxiety and burnout for teachers. The mindfulness journey still remains a relational based experience (Crane et al., 2013). School leaders should continue to engage with specialist services to provide bespoke advice and guidance on ways to support teachers' emotional well-being factors.

Another key implication for school leaders is the relevance of teacher personal accomplishment. In-line with previous research (Jennings et al., 2013), the current study identified that a link between teachers' personal accomplishment, anxiety, mindfulness, and sense of self-efficacy. School leaders could provide better outcomes for teachers and students by improving teachers' sense of personal accomplishment. Critically appraising

teachers' performance with a specific focus on their accomplishments and achievements may improve long-term well-being outcomes for their teachers and students (Roeser et al., 2013).

1.8.5 Directions for Future Research

Future research could build upon the current findings and provide potentially helpful outcomes for students and teachers. A replication study that utilises a more robust methodology could capture a wider sample size at follow-up. This could provide important information about the mechanisms that influence mindfulness training, teacher well-being factors, and classroom outcomes that the current study failed to do. Adequately powered mediation analysis could provide useful findings about the mechanistic relationships espoused by Roeser et al. (2013).

The current study found the most effective recruitment strategies involved Educational Psychologists inviting teachers to engage in the study. Future research should consider this influence and find ways to build collaborative relationships between applied Educational Psychologists and research teams. In addition, previous research has identified that users are more likely to engage in digital interventions if it is associated with well-known brands (Yardley et al., 2016). Headspace is a commercially popular platform. Research that explores the effect of digital interventions should consider the extensive number of variable that influences how users engage online.

The current study did not directly examine the student outcomes of the Roeser et al. (2013) logic model. Future research could collect data from students, or conduct observations of classroom practices to determine if mindfulness interventions influence outcomes for students. Similarly, examining the feedback loops outlined by Roeser et al. (2013) could also provide useful and novel findings.

Appendix A Search Terms

The following search terms and limiters were applied in addition to the inclusion and exclusion criteria.

1. PsychINFO via EBSCO

Search Terms:

(TX “teacher* self-efficacy” OR “teacher* self efficacy” OR “teach* efficacy” OR “teach* sense of (self-) efficacy.”) AND (TX “student* outcome**” OR “student* achievement*” OR “student* attainment*” OR “pupil* outcome*” OR “pupil* achievement*” OR “pupil* attainment*” OR “pupil* outcome*” OR “academic attainment” OR “academic progress” OR “academic achievement”)

Limiters:

Language: English

Source Type: Academic Journals

2. ERIC

Search Terms:

(TI “teacher* self-efficacy” OR “teacher* self efficacy” OR “teach* efficacy” OR “teach* sense of (self-) efficacy.”) AND (TI “student* outcome**” OR “student* achievement*” OR “student* attainment*” OR “pupil* outcome*” OR “pupil* achievement*” OR “pupil* attainment*” OR “pupil* outcome*” OR “academic attainment” OR “academic progress” OR “academic achievement”)

Limiters:

Document Type: Journal Article

Language: English

3. Web of Science

Search Terms:

Appendix A

(ALL=("teacher* self-efficacy" OR "teacher* self efficacy" OR "teach* sense of self-efficacy")) AND (ALL=("student* attainment" OR "student* outcome" OR "student* achievement" OR "pupil* outcome*" OR "pupil* achievement" OR "pupil* attainment" OR "pupil* outcome*" OR "academic attainment" OR "academic progress" OR "academic achievement"))

Limiters:

Document Type: Journal Article

Language: English

Appendix B Inclusion and Exclusion Criteria

Inclusion Criteria

8. Studies in English.
9. Studies from peer reviewed journal articles.
10. Studies using in-service teachers.
11. Studies that considered the impact of an intervention or professional development programme.
12. Studies that measured teachers' sense of self-efficacy.
13. Studies that obtained student attainment data.
14. Studies that include school aged students.

Exclusion Criteria

4. Studies that only considered collective efficacy.
5. Studies that only used qualitative methods.
6. Studies that included further education or post compulsory education.

Appendix C Data Extraction Table

Authors/Study	Teacher characteristics	Student Characteristics	Intervention	Comparison Group	Outcome Measures	Significant Results
Althausen (2015)	Third grade teachers (N = 35), years of teaching range from 1 to 27 years.	Not reported	Job-embedded mathematics professional developmental program, aimed at improving conceptual understanding of maths. 4 full-day meetings, over 2 years.	No comparison group.	<p>Maths Teaching Efficacy Beliefs Inventory (MTEBI) Constructed using the STEBI (Riggs & Enoch, 1990). 25-item scale that is comprised on two subscales personal and general efficacy beliefs. Based on Gibson & Dembo's conceptualisation of TSE.</p> <p>State-wide annual Mathematics assessment.</p>	<p>Significant increase in GTE following intervention ($p < .05$).</p> <p>Significant increase in PTE following intervention ($p < .05$)</p> <p>GTE correlated with student achievement but PTE did not. SES was found to be a greater predictor of student achievement.</p>

Bruce & Flynn (2013)	Canadian middle school teachers (N = 196)	Canadian middle school students. (N = 1000)	Collaborative inquiry for Learning in Mathematics (CIL-M) professional development intervention. Includes, peer coaching, content learning, classroom-embedded mathematics practice, development of school and district level networks, and increase leadership capacity in mathematics education. A annual full-day training ran by collaborative inquiry facilitators over three years.	No treatment control	Adapted version of the TSES (Tschannen-Moran et al., 1998)	CIL-M improved teacher efficacy over three years. Small to moderate mean effect sizes for teacher efficacy subscales were reported, ranging from $d = .30$ & $.44$. Compared to control. ($d = .08$). CIL-M program became more effective over-time as it was refined each year.
					Standardised Mathematics assessment.	Students improved from pre- to post- intervention all grade in all years.
Bruce, Esmonde, Ross, Dookie, & Beatty, (2010)	Canadian Grade 6 teachers (N = 88).	English and French Canadian students (N = 524)	Classroom embedded teaching professional-learning. 6 x 2-day sessions throughout the school year. Activities included setting learning goals, co-planning lessons, teaching observations.	No treatment control.	TSES (Tschannen-Moran & Hoy, 2001)	No statistical difference in self-efficacy scores pre and post intervention.
					Mathematics assessment	Intervention students improved maths attainment ($p < .001$). Post intervention effect sizes were small to moderate for intervention group.

Cantrell, Almasi, Carter, & Rintamaa (2013)	Middle and high schools (N = 20, mean years teaching experience 11.3)	Sixth-grade students, N = 109 (58% male, 91% white, 53% free school meals, 23% SEN) & Ninth-grade students, N = 141, (61% male, 89% white, 56% free school meals, 24% SEN).	Striving Reader Project – teachers received specialised training six Learning Strategies. Two half-days in summer prior to school term, 6 half-day sessions across the school year. Teachers were supported by external coaches that made monthly visits. Teachers had access to detailed instructional manuals.	No control	Personal Efficacy An adapted measure using items from the TSES (Tschannen-Moran & Hoy, 2001) and TES (Gibson & Dembo, 1984).	Descriptive statistics showed that high intervention implementation was associated with high reading attainment, and high efficacy. No inferential statistics reported.
					Norm-referenced reading assessment. (GRADE)	Regression demonstrated that teacher efficacy and personal efficacy had a strong relationship to reading scores ($\beta = 10.22$, $t(9) = 2.60$, $p < .05$). However, small sample size limits the applicability of these findings.
Durowoju & Onuka, (2015)	Secondary school teachers N = 60	N = 541 students	Teacher self-efficacy Enhancement Package. Two-day course specifically designed to boost teachers' self efficacy.	No comparison group.	TSES (Tschannen-Moran & Hoy, 2001)	Significant difference for intervention group post intervention $p < .05$.
					Economics Achievement Test	No significant interaction or main effect on Economics achievement results post intervention.

Kelm & McIntosh (2012)	22 teachers in experimental group (48 female and 14 male, average teaching 13.90 years)	Not reported	School-wide Positive Behaviour Support intervention.	No treatment comparison school N = 40	TSES (Tschannen-Moran & Hoy, 2001)	Teachers that implemented SMPBS reported significantly higher levels of self-efficacy than teachers from schools not implementing SWPBS, reporting large effect size ($d = .80$).
Lumpe, Czerniak, Haney, & Beltyukova (2012)	Elementary school teachers (N = 450)	Fourth-grade (N = 580) Sixth-grade (N = 1369)	Large scale science teacher professional development programme. 10 days full contact days, fortnightly contact with a support teacher.	No comparison group.	STEBI (Riggs & Enochs, 1990) & CBATS (Lumpe, Haney, & Czerniak, 2000) State-wide standardised science proficiency test.	Following intervention teachers reported significantly more positive self-efficacy beliefs ($p < .001$). No significant difference for outcome expectancy following intervention ($p > .05$). Efficacy beliefs, and number of intervention hours were significant predictors of their students' achievement $P < .001$. Outcome expectancy did not predict attainment.
Ross (1992)	History teachers (N = 18)	N = 429	Three half-day curriculum workshops & Teacher Coaching. Face-to-face, telephone,	No comparison group.	TES (Gibson and Dembo, 1984)	No significant interaction between efficacy and coaching was found post intervention.

					Standardised Assessment & near-transfer comparative assessment.	Student achievement significantly increased from pre to post intervention. Achievement was correlated with self-reported intervention engagement.
Ross & Bruce (2007)	Sixth-grade teachers (N = 106)	Sixth grade students	Teacher Professional Development. 1 full-day and 3 x 2 hour after school sessions. Instructors modelled maths teaching and communicated maths ideas. Teachers practice the content from the lesson and shared back with the group on the next session. The PD session was directly aimed at the four sources of TSE; mastery experiences, vicarious experiences, social persuasion, and physiological states.	Delayed treatment group.	TSES (Tschannen-Moran & Hoy, 2001)	Experimental condition did not have a significant effect on pre and post test self-efficacy scores. Experimental condition did report higher classroom management efficacy beliefs post intervention.
Ross (2014)	Mathematics teachers (N = 181, 90% white, 80% female)	Not reported	Previous teacher professional development opportunities, measured through a self-reported survey.	Delayed treatment group	TSES (Tschannen-Moran & Hoy, 2001)	No significant correlation between TSE and professional development.

Rutherford, Long, & Farkas, (2017)	N = 395 teachers	Elementary school students (N = 10, 765)	Maths Professional Development Program – ST Math. 4 hours of ST-Math professional development. Technical support, theoretical basis.	Active control group.	Adapted ST-Math efficacy measure. State-wide standardised maths assessment – California Assessment.	Teachers’ self-efficacy did predict student achievement, accounting for school and classroom variables. Small positive association between high self-efficacy and maths achievement.
Shidler (2009)	N = 26 teachers	Florida elementary student (N = 360)	Teacher Coaching – full-day program, each class assigned a teaching coach, over 3 years.	No control condition	Not reported PPVT-III and Alphabet Letter Recognition assessment	Not reported Correlation in Year one between time spent with coach and letter recognition.

Appendix D Participant Information Sheet

Giving Teachers Some Headspace

A study of whether using an app/website for mindfulness can reduce stress and burnout among teachers – can you help?

A quick summary of the study:

This study is testing Headspace, an app that teaches you techniques based on mindfulness, can help reduce stress and burnout among teachers. Traditional mindfulness training programmes have previously been used to reduce stress among teachers, and we want to see if a mindfulness app can do the same thing.

Everyone in the study will complete some questionnaires to find out about you, whether you are eligible to take part in the study, and your levels of stress, and. People in the study will then be randomly put into one of two groups

- One group will have free access to the Headspace app and website immediately, for 3 months.
- One group have free access to the Headspace app for 3 months after completing some questionnaires in 2 months time.

The study is being run by the University of Southampton and it has received ethics approval from the University of Southampton (Ref: 32030).

We invite you to take part in this study.

Before you decide whether to take part, it is important that you understand why the study is being done and what it will involve. Please read this information carefully. Discuss it with others if you wish, and take time to decide whether or not you want to take part.

Please contact me if anything is unclear or you would like to ask any questions.

What do I do next?

After reading this information: If you are interested in taking part, please visit this website to sign up:

<https://headspace2.lifeguidewebsites.org/>

When you sign up, you will be asked to confirm that you have read the information in this leaflet thoroughly. If you have any questions, you can ask the research team using the contact details at the end before signing up.

1. Why are we doing this study?

This study is testing Headspace, an app and website designed to improve the lives of those using it by practicing techniques based in mindfulness. We want to see if Headspace can benefit stress and burnout for teachers.

2. What will happen to me if I take part and what do I have to do?

1. The first step is to visit this website to sign up: <https://headspace2.lifeguidewebsites.org/> The website is run by the research team at the University of Southampton, and will ask you to answer some questions about you and your levels of stress. If you are able to take part in the study, you will be given free access to 'Headspace'.
2. You can then use Headspace on your computer or smartphone (if you have one).
3. The website will then put you in a group by chance (the same as flipping a coin).

You will be:

- In the group using Headspace for the first 3 months.

OR

- In the group that answers some questionnaires then uses Headspace after 3 months.

(If you are in the group using the Headspace programme you will be able to use the website and app as much or as little as you like)

For all groups:

4. The study will last for 2 months
5. 1 months after joining the study you will be asked to answer some questions about yourself and your stress levels.
6. 2 months after joining the study, you will be asked to answer some more questions about yourself and your stress levels.

We may also ask some people to take part in a short phone interview (lasting around 15 minutes). You do not have to take part in this interview and you can complete the rest of the study without doing it.

3. What are the possible advantages and disadvantages of taking part?

It is possible that taking part in the study may benefit you in a number of different ways, mostly by reducing your stress levels. Previous studies have found group sessions of mindfulness can reduce levels of teacher stress, and we want to see if a mobile version can offer similar benefits.

We think there is very little risk of harm in taking part, and previous studies have found no negative events.

4. What will happen if I don't want to carry on with the study?

If you do decide to take part but change your mind later, you are free to withdraw at any time by contacting the researcher. You do not need to give us a reason.

If you decide to withdraw or cannot complete the study for some other reason any information you have given up to that point would still be used in the study results.

5. What is Headspace?

Headspace is an online platform that provides guided mediation and mindfulness sessions. You can access Headspace on a smartphone, or a computer, or both. Headspace is independent of the University of Southampton, and you will need to make a Headspace account using the free access code provided. Your answers to any questionnaires will not be passed on to Headspace (see part 7 ‘What will happen to my data?’).

6. Will my taking part in this study be kept confidential?

All information that we collect about you during the study will be kept strictly confidential. The information collected will be encrypted and stored securely on a password-protected database. Only the research team or responsible persons from the University of Southampton will see your data from the online questionnaires and interviews. The University of Southampton is responsible for this study. We will be using information from you in order to undertake this study and will act as data controller for this study. This means we are responsible for looking after your information and using it properly in a fair, lawful, and secure manner. The University of Southampton will securely store your information for up to 10 years after the study has finished, after which time any link between you and your information will be removed. Headspace are responsible for managing the data held on their website and for ensuring the security of the information it holds.

7. What will happen to my data during the study?

At the end of the study, the information from the questionnaires will be looked at by the research team to see if the programme has made a difference. All of the information you provide will be stored securely.

The research team will hold your name and email address, which will be used to stay in touch with you during the study. We will not link your contact details to the Headspace access code that will be allocated to you. When you use your free access code to sign up to Headspace, you will be asked to complete the standard registration for Headspace (including creating a username, and some demographic information).

Headspace will send the research team data about that code’s use (for example, when it was used to sign in, and what part of Headspace was used). The research team will be able to link the use of Headspace to the online questionnaire responses using the code. The research team will NOT have access to any other information from Headspace, and Headspace will NOT have any access to information from the online questionnaires.

If you take part in a short interview at the end of the study (see item 8) the interview will be recorded, then transcribed. During transcription any identifying details will be removed, then the original audio file will be destroyed.

8. What will happen to the results of the research study?

The anonymised results will be shared as widely as possible with everyone who wants to improve the lives of teachers. We will send you a summary of the findings if you would like one.

9. Who has reviewed the study?

The study has been reviewed and given ethics approval by Southampton University Research Ethics Committee (Ref: 32030).

10. Who is paying for and running the study?

The research study is being run by the University of Southampton, by a team that includes psychologists and research scientists. Headspace are giving participants free use of their digital website.

11. What if there is a problem?

If there is a problem or you have any concerns, you can contact the research team at mind@soton.ac.uk

If you wish to make a complaint regarding the study, please contact the Research Governance office at the University of Southampton on 02380 595058 or by email: rgoinfo@soton.ac.uk.

12. What do I do now?

If you are interested in taking part, please visit this website to sign up:

<https://headspace2.lifeguidewebsites.org/>

THANK YOU FOR YOUR TIME IN READING THIS INFORMATION SHEET

Contact details:

For more information about this study, please contact the lead researcher:

Ryan Bull-Beddows

Trainee Educational Psychologist

Email: mind@soton.ac.uk

Appendix E Consent Form



Southampton University Educational Psychology Research

Thanks for helping out! Before you go any further, it's important that you give your permission to be involved in the study.

Please make sure you have read the information sheet, click [here](#) if you want to check it. If you have any questions that you still want to ask, you can contact the research team [here](#).

Please choose 'I agree' using the boxes on the right, to confirm that you understand and agree with each statement.

I have read and understood the participation information sheet (4, 06/11/2018) and that any questions I had have been answered.

I understand that all my details will be kept confidential and my name will not appear on any reports or documents.

I consent to be contacted by the research team as is required for the study, and I understand that my name and email address will be stored securely and used by the research team to keep in touch with me during the study.

I understand that data collected during the study may be looked at by researchers from the University of Southampton and will not be used for any other purpose.

I consent for data about my use of the Headspace intervention to be collected by Headspace and passed on to the research team. Any personal or financial information will not be passed on.

I consent to being contacted by the research team via email to discuss whether I will take part in an optional phone interview at the end of the study.

I understand I can withdraw at any time without giving reasons and that I will not be penalised for withdrawing nor will I be questioned on why I have withdrawn.

I agree to take part in this study.

When you are happy that you have agreed with each statement, click next.

Back

Next

Appendix F Positive and Negative Affect Scale PANAS

Indicate the extent you have felt this way over the past week.	Very Slightly or Not at all	A little	Moderately	Quite a bit	Extremely
Interested					
Distressed					
Excited					
Upset					
Strong					
Guilty					
Scared					
Hostile					
Enthusiastic					
Proud					
Irritable					
Alert					
Ashamed					
Inspired					
Nervous					
Determined					
Attentive					
Jittery					
Active					
Afraid					

Appendix G Maslach Burnout Inventory

Maslach Burnout Inventory – Educator Survey (MBI-ES)

Please read each statement carefully and decide if you ever feel this way about your job. If you have never had this feeling, select “0” (zero). If you have had this feeling, indicate how often you feel it by selecting the number (from 1 to 6) that best describes how frequently you feel that way.

Never	A few times a year or less	Once a month or less	A few times a month	Once a week	A few times a week	Every day
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I feel emotionally drained from my work.

I feel used up at the end of the workday.

I feel fatigued when I get up in the morning and have to face another day on the job.

I can easily understand how my students feel about things.

I feel I treat some students as if they were impersonal objects.

Working with people all day is really a strain for me.

I deal very effectively with the problems of my students.

I feel burned out from my work.

I feel I'm positively influencing other people's lives through my work.

I've become more callous toward people since I took this job.

I worry that this job is hardening me emotionally.

I feel very energetic.

I feel frustrated by my job.

I feel I'm working too hard on my job.

I don't really care what happens to some students.

Working with people directly puts too much stress on me.

I can easily create a relaxed atmosphere with my students.

I feel exhilarated after working closely with my students.

I have accomplished many worthwhile things in this job.

I feel like I'm at the end of my rope.

In my work, I deal with emotional problems very calmly.

I feel students blame me for some of their problems.

Appendix H Philadelphia Mindfulness Scale - PHMLS

Instructions: Please circle how often you experienced each of the following statements *within the past week*.

Never Rarely Sometimes Often Very often

I am aware of what thoughts are passing through my mind.

I try to distract myself when I feel unpleasant emotions.

When talking with other people, I am aware of their facial and body expressions.

There are aspects of myself I don't want to think about.

When I shower, I am aware of how the water is running over my body.

I try to stay busy to keep thoughts or feelings from coming to mind.

When I am startled, I notice what is going on inside my body.

I wish I could control my emotions more easily.

When I walk outside, I am aware of smells or how the air feels against my face.

I tell myself that I shouldn't have certain thoughts

When someone asks how I am feeling, I can identify my emotions easily.

There are things I try not to think about.

I am aware of thoughts I'm having when my mood changes.

I tell myself that I shouldn't feel sad.

I notice changes inside my body, like my heart beating faster or my muscles getting tense.

If there is something I don't want to think about, I'll try many things to get it out of my mind.

Whenever my emotions change, I am conscious of them immediately.

I try to put my problems out of mind.

When talking with other people, I am aware of the emotions I am experiencing.

When I have a bad memory, I try to distract myself to make it go away.

Appendix I Self-compassion Scale

Please read each statement carefully before answering. Indicate how often you behave in the stated manner, using the following scale.

	Almost Never					Almost Always
	1	2	3	4		5
I'm disapproving and judgmental about my own flaws and inadequacies.						
When I'm feeling down I tend to obsess and fixate on everything that's wrong.						
When things are going badly for me, I see the difficulties as part of life that everyone goes through.						
When I think about my inadequacies, it tends to make me feel more separate and cut off from the rest of the world.						
I try to be loving towards myself when I'm feeling emotional pain.						
When I fail at something important to me I become consumed by feelings of inadequacy.						
When I'm down and out, I remind myself that there are lots of other people in the world feeling like I am						
When times are really difficult, I tend to be tough on myself.						
When something upsets me I try to keep my emotions in balance.						
When I feel inadequate in some way, I try to remind myself that feelings of inadequacy are shared by most people.						

I'm intolerant and impatient towards those aspects of my personality I don't like.

When I'm going through a very hard time, I give myself the caring and tenderness I need.

When I'm feeling down, I tend to feel like most other people are probably happier than I am.

When something painful happens I try to take a balanced view of the situation.

I try to see my failings as part of the human condition.

When I see aspects of myself that I don't like, I get down on myself

When I fail at something important to me I try to keep things in perspective.

When I'm really struggling, I tend to feel like other people must be having an easier time of it.

I'm kind to myself when I'm experiencing suffering

When something upsets me I get carried away with my feelings.

I can be a bit cold-hearted towards myself when I'm experiencing suffering.

When I'm feeling down I try to approach my feelings with curiosity and openness.

I'm tolerant of my own flaws and inadequacies.

When something painful happens I tend to blow the incident out of proportion.

When I fail at something that's important to me, I tend to feel alone in my failure.

I try to be understanding and patient towards those aspects of my personality I don't like.

Appendix J Teaching Anxiety Scale - TCHAS

Please read each question carefully. Answer every question, even it seems vague to you or difficult to answer.

	Never	Infrequently	Occasionally	Frequently	Always
I feel calm and collected when I think about holding parent-teacher conferences.					
If I have trouble answering a student's question I find it difficult to concentrate on questions that follow.					
I feel uncomfortable when I speak before a group.					
I feel calm when I am preparing lessons.					
I'm worried whether I can be a good teacher.					
I feel sure I will find teaching a satisfying profession.					
I would feel calm and collected if a student's parent observed in my classroom.					
I feel inferior to other teachers in my school.					
I feel that students will follow my instructions.					
I feel secure with regard to my ability to keep a class under control.					
I'm less happy teaching than I thought I'd be.					
I feel nervous when I am being observed by my line manager.					

I feel confident about my ability
to improvise in the classroom.

I feel other teachers think I'm
very competent.

I feel panicky when a student
asks me a question I can't
answer.

I feel better prepared for
teaching than other teachers in
my school.

Lack of rapport with my
students is one of my biggest
worries.

I would feel anxious if the head
teacher informed me they were
coming to my class to observe.

I find it easy to speak up in the
staff room.

I worry about being able to keep
the students interested in what I
teach them.

I find it easy to admit to the
class that I don't know the
answer to a question a student
asks.

Deciding how to present
information in the classroom
makes me feel uncertain.

I feel I will have good recall of
the things I know when I am in
front of the class.

I feel I am as competent in the
classroom as other teachers in
my school.

Appendix K Teachers' Sense of Self-efficacy Scale - TSES

Please indicate your opinion about each of the questions below by selecting any one of the nine responses, ranging from (1) "None at all" to (9) "A Great Deal". Please respond to each of the questions by considering the combination of your current ability, resources, and opportunity to do each of the following in your present position.

	None at all		Very Little		Some Degree		Quite a Bit		A Great Deal
	1	2	3	4	5	6	7	8	9

How much can you do to control disruptive behaviour in the classroom?

How much can you do to motivate students who show low interest in school work?

How much can you do to calm a student who is disruptive or noisy?

How much can you do to help your students value learning?

To what extent can you craft good questions for your students?

How much can you do to get children to follow classroom rules?

How much can you do to get students to believe they can do well in school work?

How well can you establish a classroom management system with each group of students?

To what extent can you use a variety of assessment strategies?

To what extent can you provide an alternative explanation or

example when students are
confused?

How much can you assist
families in helping their children
do well in school?

How well can you implement
alternative teaching strategies in
your classroom?

Appendix L Headteacher Email



Educational Psychology Research - Can "Headspace" Reduce Stress Among Teachers?

Dear

I am writing to ask if you would like your teachers to have the opportunity take part in a research study. The study aims find out whether Headspace, an app which teaches techniques about mindfulness and meditation, can help reduce stress and burnout among teachers. The app is simple and easy to use - if you would like to see an example of what Headspace looks like, you can click this link to have a look: <https://www.headspace.com>. The study has been cleared by the University of Southampton ethics committee (ergo number: 32030)

Not everyone is eligible to take part in the study. We are looking for full time teachers working in primary, secondary, or special schools and they will also complete two screening questionnaires. Teachers who sign up to the study and are eligible to take part will be given 3-months free access to Headspace. The app is designed to be used at teachers' convenience, as much or as little as they like, and the study will not require participants to use the app at any particular time. We will ask teachers to complete brief online questionnaires (taking about 10 minutes) at three time points: when they sign up, after one month and after two months.

If you any further questions, please get in contact. I will be very happy to talk with you about the study. If you would prefer, you can contact my supervisor, Dr Ben Ainsworth (mind@soton.ac.uk).

If you think your teachers might like to take part, please forward the attached Participant Information Sheet and Teacher Invitation Letter to your teachers. Alternatively, you can print out the Study Poster attached and put it up somewhere the teachers can see. Please let me know that you have done so via email.

Thank you very much for taking the time to read this.

Yours sincerely

Ryan Bull-Beddows

Trainee Educational Psychologist

University of Southampton

mind@soton.ac.uk

Appendix M Study Poster



UNIVERSITY OF
Southampton

Teachers Are Stressed

So, what can be done about it?

We are looking for teachers to take part in a research study aimed to see if using a mindfulness mobile phone application can reduce stress among teachers.

We want to see if Headspace, an app which teaches techniques about mindfulness and meditation, can help reduce stress and burnout among teachers. The website is simple and easy to use - if you would like to see an example of what Headspace looks like, you can visit: <https://www.headspace.com>. You will be given three months free access to Headspace if you choose to take part in the study. This study has been cleared by the University of Southampton ethics committee (ergo number: 32030).

"What will I have to do?" If you take part in the study, we will get you to complete some questionnaires at three timepoints: when you sign up, after 1 month and after 2 months. Each time it will take around 5-10 minutes. You will get free access to the Headspace intervention during the study.

"This sounds good, but I really don't have the time". We understand that teachers have limited time, and this will be something we are looking at in our study. Please use the app as much or as little as you feel is necessary.

If you have any questions, please contact me and I will be very happy to talk with you about the study. This does not commit you to taking part in the study at this stage and you can make up your mind after we have spoken.

If you think you might like to take part, please visit this website to sign up: <https://headspace2.lifeguidewebsites.org/>
Not everyone is eligible to take part in the study. We are looking for full time teachers working in primary, secondary, or special schools. You will also be asked to complete two short screening questionnaires to check that you are eligible. If you are eligible, you will then be given information about how to access your free Headspace account.

Ryan Bull-Beddows

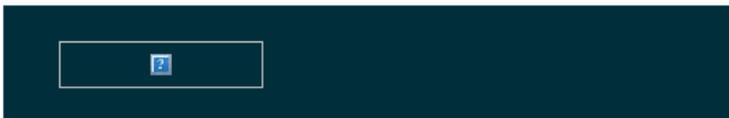
University of Southampton

mind@soton.ac.uk

Appendix N Ethics Approval

From: [ERGOII](#)
To: [Rui-Beidows B.](#)
Subject: Approved by Faculty Ethics Committee - ERGO II 32030.A2
Date: 27 March 2019 11:55:52

Approved by Faculty Ethics Committee - ERGO II 32030.A2



ERGO II – Ethics and Research Governance Online <https://www.ergo2.soton.ac.uk>

Submission ID: 32030.A2
Submission Title: Exploring the Mechanisms in which a Digital Mindfulness-Based Intervention Can Reduce Stress and Burnout Among Teachers. (Amendment 2)
Submitter Name: Ben Ainsworth

Your submission has now been approved by the Faculty Ethics Committee. You can begin your research unless you are still awaiting any other reviews or conditions of your approval.

Comments:

-
-

[Click here to view the submission](#)

Tid: 23011_Email_to_submitter__Approval_from_Faculty_Ethics_committee__cat_B__C__id: 124293
R_Bull-Beidows@soton.ac.uk coordinator

Please do not reply to this message as it has been automatically generated by the system. This email address is not monitored.

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