Mindfulness
https://doi.org/10.1007/s12671-025-02573-0

ORIGINAL PAPER

Temperament and Character Moderate the Effects of Mindfulness Training on Psychological and Professional Well-Being of School Teachers

Alessio Matiz[1,2] · **Stefania Pascut**[3] · **Franco Fabbro**[4] · **Cristiano Crescentini**[1,4]

Accepted: 5 April 2025

Abstract

Objectives The study aimed to investigate the pre-to-post effects of mindfulness training on school teachers' psychological and professional well-being, as well as to explore the moderating role of temperament and character on these effects.

Method An 8-week mindfulness-based intervention was delivered via internet-based group meetings to Italian teachers ($n = 139$), who were assessed within two weeks before and after the intervention with self-report measures of emotional distress (Hospital Anxiety and Depression Scale), interoceptive awareness (Multidimensional Assessment of Interoceptive Awareness), and professional efficacy (Teachers' Sense of Efficacy Scale), as well as with the Temperament and Character Inventory. A control group of teachers ($n = 47$) was tested with the same measures in two temporally-matched sessions.

Results Analysis of variance showed positive intervention effects on anxiety (medium effect size), on six of the eight dimensions of interoceptive awareness (medium-to-large effect size) and on two of the three scales of professional efficacy (small-to-medium effect size). Moderation analysis identified the following effects of temperament and character on outcomes: (1) reduced anxiety only for higher baseline reward dependence, or lower-to-middle baseline self-directedness; (2) improved interoceptive attention regulation specifically for middle-to-higher baseline persistence; (3) improved teacher efficacy for student engagement only for lower baseline self-transcendence.

Conclusions The study shows the positive effects of mindfulness training on teachers' psychological and professional well-being. It also highlights the importance of considering the impact of temperament and character dimensions on these effects, for example for developing effective mindfulness-based interventions for teachers. Future research should explore potential mechanisms of action underlying the observed effects and evaluate them in the long term.

Preregistration This study is not preregistered.

Keywords Mindfulness meditation · Personality · School teachers · Clinical psychology

Teaching is an occupation that generally carries a considerable amount of stress and risk of burnout. Although it is difficult to reliably determine the prevalence of teachers' stress levels and burnout (Agyapong et al., 2022), due to differences in assessment measures and contexts, higher stress levels are usually observed in teachers compared to representative samples of employed adults. For example, Redín and Erro-Garcés (2020) found this difference among European workers ($n = 43{,}228$), where teachers scored 2.95 and other workers scored 3.15 on a scale of perceived stress ranging from 1 = *always stressed* to 5 = *never stressed*. Similar results were obtained in the United States ($n = 1{,}966$), where 58% of teachers compared to 33% of other workers reported being often/always stressed by work (Sy et al., 2023, pp. 14, 37). This difference in perceived stress is due to a combination of profession-specific factors that can be ascribed to ordinary workload (e.g., personal education,

✉ Alessio Matiz
alessio.matiz@uniud.it

1 Department of Languages and Literatures, Communication, Education and Society, University of Udine, Via Margreth, 3, 33100 Udine, Italy

2 Department of Psychology, Sapienza University of Rome, Rome, Italy

3 WHO Healthy Cities Project, Municipality of Udine, 33100 Udine, Italy

4 Institute of Mechanical Intelligence, School of Advanced Studies Sant'Anna, Pisa, Italy

Published online: 23 April 2025

lesson preparation, lesson delivery, administrative work), student behavior (e.g., responsibility for classroom discipline and students' achievement, managing students with different motivational, cognitive and behavioral conditions), as well as the need to coordinate with other school stakeholders (i.e., colleagues, outside professionals, school managers, students' parents) (Harmsen et al., 2018; Mijakoski et al., 2022; OECD, 2020; Ouellette et al., 2018; Travers, 2017). Other forms of psychological suffering such as anxiety, depression and burnout are quite common among teachers (Agyapong et al., 2022; Ferguson et al., 2012; García-Carmona et al., 2019; Kidger et al., 2016). Moreover, the general condition of teachers' mental health may have worsened in recent years as a result of the impact on society of the COVID- 19 pandemic (Gadermann et al., 2023; Ozamiz-Etxebarria et al., 2021; Silva et al., 2021; Westphal et al., 2022), and the rapid technology innovation (Fernández-Batanero et al., 2021; Henderson & Corry, 2021). Importantly, increasing levels of distress in teachers can be generally associated with higher human resource costs, due to teacher illness, absenteeism, and leaving the profession (Carver-Thomas & Darling-Hammond, 2019; von der Embse et al., 2019). Teacher distress can also be associated with a lower quality of their teaching, reflected for example in students' poorer academic performance (Dreer, 2023; Gray et al., 2017; Sorensen & Ladd, 2020; Travers, 2017), in students' poorer mental health (Madigan & Curran, 2021; Madigan & Kim, 2021), and reduced teachers' self-efficacy (Capone & Petrillo, 2020; Skaalvik & Skaalvik, 2016; von Muenchhausen et al., 2021; Zhang et al., 2021a).

Therefore, it seems necessary to invest in interventions that can contribute to reinforcing teachers' capacity to cope with stressful circumstances and improving both their psychological and professional well-being. Among various interventions for teachers well-being (von Beames et al., 2023; Denuwara et al., 2022; Der Embse et al., 2019; Paudel et al., 2022), mindfulness-based interventions (MBIs) have generally proven to be effective in improving teachers' well-being (Emerson et al., 2017; Hwang et al., 2017; Klingbeil & Renshaw, 2018; Zarate et al., 2019). During these interventions, which typically last 4–8 weeks, participants are mainly trained to develop their self-awareness with an attitude of curiosity, openness, and equanimity toward their present-moment experiences regarding bodily sensations and mental contents (e.g., emotions, thoughts) (Bishop, 2004). In general populations, various meta-analyses have highlighted the effects of MBIs on improving psychological well-being, particularly in reducing symptoms of anxiety, depression and stress (Haller et al., 2021; Khoury et al., 2015; Kraines et al., 2022; Zhang et al., 2021b). In similar studies, functional and structural changes in brain regions involved in the regulation of attention, emotion and self-awareness have been observed after MBI participation (Melis et al., 2022; Pernet et al., 2021; Wheeler et al., 2017; Young et al., 2018).

As mentioned, studies on teachers have generally shown consistent effects of MBIs on teachers' well-being, particularly in decreasing stress, anxiety, depression, and burnout (Emerson et al., 2017; Hwang et al., 2017; Klingbeil & Renshaw, 2018; Zarate et al., 2019). The results of studies of MBIs on the more specific teachers' self-efficacy are less uniform. Teachers' self-efficacy, defined as the self-evaluation of one's own ability to "bring about desired outcomes of student engagement and learning, even among those students who may be difficult or unmotivated" (Tschannen-Moran & Woolkfolk Hoy, 2001, p. 783), has almost always been measured in these studies with the Teachers' Sense of Efficacy Questionnaire (TSES; Tschannen-Moran & Woolfolk Hoy, 2001). Some of the studies on teachers' self-efficacy found evidence of a positive impact of mindfulness training (de Carvalho et al., 2021; Jennings et al., 2013; Kuyken et al., 2022; Poulin et al., 2008), while others reported null results (Benn et al., 2012; Jennings et al., 2011, 2017). It therefore seems necessary to further investigate in this area.

A key role for teachers' psychological and professional well-being seems to be played by personality. Various studies and reviews have indeed highlighted the influence of teachers' personality on their effectiveness, well-being, and burnout. Most studies on teachers employed the Five Factor Model of personality (Costa & McCrae, 1992), which includes the traits of openness, conscientiousness, extraversion, agreeableness and neuroticism. With this model, increased teacher stress was found to be associated with lower extraversion and agreeableness, as well as with higher neuroticism (Cramer & Binder, 2015). Increased teacher effectiveness was found to be associated with higher openness, conscientiousness, extraversion and lower neuroticism, and increased burnout with higher neuroticism and lower extraversion and conscientiousness (Kim et al., 2019). Regarding the burnout dimensions (emotional exhaustion, depersonalization, and lack of personal accomplishment), it was observed that they were positively related to teacher neuroticism and negatively related to openness, conscientiousness, extraversion, and agreeableness traits (Liu et al., 2022; Roloff et al., 2022).

Despite the prominent role of personality in the psychological and professional well-being of teachers, the research on the impact of MBIs on teachers' well-being has not yet comprehensively taken into account the role of personality. Yet, it has been proposed that one of the basic mechanisms through which mindfulness works is the change in self-concept or perspective on the self (Hölzel et al., 2011). These changes have been observed through modifications in self-reported personality inventory scores following participation in MBIs (Campanella et al., 2014; Crescentini et al., 2015, 2018; Matiz et al., 2018). Only one such study

focused on teachers and reported improvements in personality traits (i.e., increased conscientiousness and decreased neuroticism), as well as reductions in stress and burnout levels, among those participating in an 8-week MBI, compared to teachers in a wait-list control group (Fabbro et al., 2020). Moreover, the topic of the relationship between MBI and personality has also been recently investigated by analyzing how participants' differences in personality moderated the impact of MBIs on psychological well-being outcomes. Studies on this topic were not conducted with teachers, but they showed that significant MBI improvements were more likely to be observed: (i) in medical students with higher neuroticism scores in terms of mental distress and subjective well-being (De Vibe et al., 2015); (ii) in stressed-out middle-aged adults with higher neuroticism scores in terms of anxiety and depressive mood (Nyklíček & Irrmischer, 2017); (iii) in police officers with higher neuroticism scores in terms of psychological strain and negative affect (Krick & Felfe, 2020); (iv) in breast cancer patients with higher neuroticism and lower conscientiousness scores in terms of general distress (Jagielski et al., 2020); and (v) in Chinese athletes with higher extraversion and lower neuroticism scores in terms of, respectively, anxiety levels and self-confidence levels (Gan et al., 2023).

The results of the study on the moderating effects of personality on MBI outcomes, even in non-teacher samples, are far from definitive. It therefore seems useful to conduct this kind of study also in teacher samples and to complement the aforementioned results by using other personality models. With respect to this, the Temperament and Character Inventory (TCI; Cloninger et al., 1993) model appears to be a valid candidate due to its distinct personality dimensions and well-known relations with the Five Factor Model model of personality (De Fruyt et al., 2000; Ramanaiah et al., 2002). In the TCI, two main personality components are identified based on their genesis and characteristics: temperament, which refers to an early and complex system of automatic responses to environmental stimuli, and character, which encompasses a more "conceptualized" knowledge and evaluation of the self (Cloninger et al., 1994a). In this model, temperament and character are each made up of different dimensions (for temperament: novelty seeking, harm avoidance, reward dependence, and persistence; for character: self-directedness, cooperativeness, and self-transcendence), which have been linked to teachers' well-being. For temperament, higher harm avoidance and novelty seeking were associated with stress, depressive symptoms, and psychiatric morbidity, while higher persistence was associated with sense of efficacy and reduced burnout (Jurado et al., 2005; Mojsa-Kaja et al., 2015; Moreno-Abril et al., 2007; Park et al., 2016). Regarding character, self-directedness and self-transcendence were found to predict sense of efficacy and reduced burnout (Jurado et al., 2005; Mojsa-Kaja et al., 2015; Moreno-Abril et al., 2007; Park et al., 2016). Importantly, some temperament and character individuals' dimensions could potentially influence MBI outcomes both in the general population and among teachers. For example, individuals with higher scores in the temperament dimension of persistence could be facilitated in the task of managing distractions, which is salient during the initial stages of the meditation practice (Brefczynski-Lewis et al., 2007; Tang et al., 2015). In addition, individuals with lower scores in the character trait of self-directedness could benefit more from mindfulness training, as it was observed in a previous study (Matiz et al., 2018). Finally, individuals with higher scores in the character trait of self-transcendence could find easier to develop meta-awareness of self (Vago & Silbersweig, 2012), which is an ability usually developed during mindfulness training to effectively observe and regulate self-related processes (Grabovac et al., 2011; Isbel & Summers, 2017).

In sum, the current study investigated the impact of an MBI on the psychological and professional well-being of school teachers and also aimed at determining whether specific temperament and character traits influenced this process. Teachers' psychological and professional well-being was assessed in terms of emotional distress and sense of efficacy in teaching; for the temperament and character components of personality, the Temperament and Character Inventory was used; participants' self-awareness, which was arguably trained during the MBI, was assessed in terms of interoceptive awareness. Building upon previous research, we expected an improvement in the psychological and professional well-being of teachers. Given the lack of studies on the moderating effects of personality on MBI outcomes using the Temperament and Character Inventory, no specific hypothesis was formulated for these effects.

Method

Participants

Two hundred fifty-seven Italian teachers (237 females and 20 males; age: 48.9 ±9.1 years), working in preschool, primary or secondary schools, participated to the project aimed at improving well-being in schools or were available to serve as control participants to the current study. Among these teachers, those who agreed to participate in the study and completed the two assessment sessions were 186 (172 women and 14 men). Study participants' demographics are presented in Table 1.

Procedure

This study was carried out in the Friuli-Venezia Giulia (FVG) Italian region, within a project aimed at improving

Table 1 Baseline characteristics of study participants

	Total	MBI group	CTR group	*p* MBI vs. CTR
Size, *n*	186	139	47	
Age, mean ± *SD*	48.68 ± 9.45	48.27 ± 8.83	49.91 ± 11.10	0.36
Gender, *n* (%)	F: 172 (92.5%) M: 14 (7.5%)	F: 134 (96.4%) M: 5 (3.6%)	F: 38 (80.9%) M: 9 (19.1%)	< 0.01 **
Educational level, *n* (%)	High school: 55 (29.6%) Bachelor's degree: 16 (8.6%) Master's degree: 80 (43.0%) Doctorate degree: 35 (18.8%)	High school: 47 (33.8%) Bachelor's degree: 13 (9.3%) Master's degree: 54 (38.8%) Doctorate degree: 25 (18.0%)	High school: 8 (17.0%) Bachelor's degree: 3 (6.4%) Master's degree: 26 (55.3%) Doctorate degree: 10 (21.3%)	0.11
Experience in meditation, *n* (%)	null/occasional: 87 (46.8%) continuous: 22 (11.8%)	null/occasional: 122 (87.8%) continuous: 17 (12.2%)	null/occasional: 42 (89.4%) continuous: 5 (10.6%)	0.98
TCI *z*-scores, mean ± *SD*				
Novelty Seeking	0.15 ± 1.03	0.13 ± 1.02	0.21 ± 1.07	0.66
Harm Avoidance	0.31 ± 0.94	0.35 ± 0.89	0.18 ± 1.06	0.31
Reward Dependence	0.30 ± 0.92	0.35 ± 0.88	0.14 ± 1.01	0.22
Persistence	0.13 ± 1.00	0.12 ± 0.98	0.15 ± 1.09	0.88
Self-Directedness	0.06 ± 1.01	0.09 ± 0.95	0.00 ± 1.18	0.63
Cooperativeness	0.50 ± 0.81	0.53 ± 0.75	0.42 ± 0.96	0.49
Self-Transcendence	0.53 ± 1.00	0.55 ± 0.99	0.46 ± 1.04	0.59

CTR, Control; *F*, Female; *M*, Male; *MBI*, Mindfulness-Based Intervention; *TCI*, Temperament and Character Inventory, ** $p < 0.01$

well-being in schools (in teachers and students) by utilizing MBIs. Six runs of an 8-week MBI were delivered online (via internet-based group meetings) to 190 Italian teachers. Three MBI runs were held during the 2020/21 school year (from March to May, 2021), and three during the 2021/22 school year (from October to November, 2021; see Online Resource 1). In this period, the situation related to the COVID- 19 pandemic was stable in this part of Italy: schools had reopened in September 2020, and since then, they have started to operate regularly again. Procedures in schools for containing the pandemic included face masks, social distancing, temporary transition from face-to-face to online lessons in classes with a certain number of COVID- 19 cases, and, for teachers, a certification of vaccination for or recovery from COVID- 19.

Participant teachers were recruited through official communications sent to all schools of the FVG region. They were included in the project based on their willingness to participate and on the availability of places in the MBI courses (40 participants were enrolled at maximum in each course); they were excluded if they had previously participated in the same 8-week MBI course delivered during the project. Teachers participating in the MBI courses and willing to take part in the study (MBI group) were assessed with online self-report questionnaires, within about two weeks before and after their course.

Moreover, the study included a convenience sample of 67 control teachers (CTR group) from five schools where one of the authors (SP) had previous collaborations. These schools were a subgroup of the initial pool of schools involved in the project, where MBI participants were recruited. As done with participants in the MBI group, control teachers were recruited through official communications to their schools. They were included in the study based on their willingness to participate and if they did not participate in previous editions of the 8-week MBI trainings delivered during the project. Thus, teachers of the CTR group did not receive the MBI during the study, but were offered to participate after the study. They were asked to complete the same online self-report questionnaires filled by teachers of the MBI group, over two separate days from March to June 2023, in two sessions that were temporally matched with those of the MBI group.

Informed consent was obtained from all individual participants included in the study prior to study beginning. The study was approved by the Institutional Review Board of the Department of Languages and Literatures, Communication, Education and Society of the University of Udine; all procedures performed in the study were in accordance with the ethical standards of the 1964 Helsinki declaration and its later amendments.

Mindfulness-Based Intervention

The Mindfulness-Oriented Meditation training course (MOM) is an 8-week MBI in which participants attend a 2-h group session once per week (Fabbro & Crescentini, 2016; Fabbro & Muratori, 2012). In its structure it is similar to the most common mindfulness meditation program, the Mindfulness-Based Stress Reduction program (MBSR;

Kabat-Zinn, 1990). In each group-session of the MOM course, participants are first taught some theoretical aspects related to mindfulness, then they practice 30 min of meditation, and finally they have a group discussion on meditation practice. The main theoretical topics proposed during the first part of the meeting are the historical-philosophical roots of mindfulness, attention and awareness, recognizing of mind-wandering, equanimity, cognitive defusion, being in the here and now, deautomatization, and letting-go. During MOM meditation, participants are invited to remain seated keeping their eyes closed. The 30-min MOM meditation includes 10 min of mindfulness of breath, 10 min of body scan meditation, and 10 min of open monitoring of the contents of the mind (such as thoughts, mental images and emotions). During the MOM training, participants are asked to meditate daily at home for 30 min (an audio recording with a 30-min guided meditation) and to record each session on a diary. Participants are also provided with an article, that summarizes the psychological and historical background of the MOM training, the practices and the topics covered during the training, as well as the scientific research on this training program (Fabbro & Crescentini, 2016). The effects of the MOM training have indeed been repeatedly studied in the last decade within school settings (Fabbro et al., 2020; Matiz et al., 2020), in the general population (Campanella et al., 2014; Crescentini et al., 2014; Crescentini et al., 2016; Tomasino et al., 2016a, Tomasino et al., 2016b, Matiz et al., 2018; Matiz et al., 2021), and in clinical contexts (Crescentini et al., 2015, 2018).

In the present study, the MOM course was delivered online using a videoconferencing platform (Zoom) with synchronous group sessions (Feruglio et al., 2023), during which participants were asked to remain connected from the beginning to the end of the online group meetings and to keep their cameras on to be visible to the other participants. No other modifications to the original MOM training were implemented in the current study. The MOM courses were led by one of the authors (AM), a professional socio-health educator, and a psychologist, both of whom with more than five years of experience in practicing and teaching mindfulness meditation.

Measures

Socio-demographic information about age, gender, educational level and experience in mindfulness meditation was obtained from all participants during the first assessment.

Emotional Distress

Emotional distress was assessed with the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983) in its Italian version (Costantini et al., 1999). This instrument is composed of 7 items for assessing anxiety (item example: "Worrying thoughts go through my mind") and 7 items for depression (item example: "I look forward with enjoyment to things", reversed item). It uses a 4-level Likert response scale (from 0 to 3, with different levels for each item). In HADS, higher scores denote higher levels of anxiety or depression (for both scales, scores of less than 8 indicate non-cases, between 8 and 10 a mild level of anxiety/depression, between 11 and 14 a moderate level, between 15 and 21 a severe level; Stern, 2014). Several studies have confirmed the two-factor structure of HADS (Lloyd et al., 2023), showed its high test–retest reliability ($r > 0.80$), and estimated its validity as adequate in comparison to other commonly used depression and anxiety tests (Beekman & Verhagen, 2018). In the original study sample, the HADS showed an acceptable internal-consistency reliability, with McDonald's omegas of 0.83 and 0.71 for Anxiety and Depression, respectively (see in Lloyd et al., 2023). In the present study, McDonald's omegas (averaged over Time T0 and T1) for HADS Anxiety and Depression were 0.82 and 0.70, respectively.

Interoceptive Awareness

Interoceptive awareness was assessed with the Multidimensional Assessment of Interoceptive Awareness (MAIA; Mehling et al., 2012) questionnaire, in its Italian version (Calì et al., 2015). This self-report tool was developed to provide a comprehensive measure of interoceptive awareness that encompasses multiple dimensions: Noticing (the ability to notice and be aware of bodily sensations), Not-Distracting (the ability to avoid being distracted by external stimuli while attending to bodily sensations), Not-Worrying (the ability to not worry or become anxious when experiencing bodily sensations), Attention Regulation (the ability to regulate attention towards or away from bodily sensations), Emotional Awareness (the ability to be aware of and understand emotions associated with bodily sensations), Self-Regulation (the ability to regulate physiological responses associated with bodily sensations), Body Listening (the ability to listen to bodily sensations as a source of information about oneself), and Trusting (the ability to trust and have confidence in one's bodily sensations). The questionnaire consists of 32 items, which are divided into eight subscales, one for each of the aforementioned dimensions. It uses a 6-level Likert response scale (ranging from 0 = *never* to 5 = *always*). In the original study, in terms of convergent and discriminant validity the MAIA subscales showed positive correlations with measures of mindful attention and body awareness, while the MAIA subscale of Not Worrying, Self-Regulation, and Trusting were negatively correlated with a general measure of trait anxiety (Mehling et al., 2012). All MAIA subscales except Not-Distracting and Not-Worrying

were found with confirmatory factor analysis to measure a common general factor of self-reported interoception (Ferentzi et al., 2021). In the original study, the MAIA showed acceptable internal-consistency reliability, with Cronbach's alpha ranging from 0.66 to 0.83 (Mehling et al., 2012). In the present study, McDonald's omegas of internal-consistency reliability (averaged over Time T0 and T1) for these subscales were 0.71, 0.47, 0.72, 0.84, 0.84, 0.83, 0.87, and 0.92, respectively. These values were satisfactory for all subscales except Not-Distracting.

Teachers' Sense of Efficacy

Teachers' sense of efficacy was assessed with the Teachers' Sense of Efficacy Scale (TSES; Tschannen-Moran & Woolfolk Hoy, 2001) in its 24-item Italian version (Biasi et al., 2014). This self-report tool employs a 9-level rating scale (ranging from 1 = *nothing* to 9 = a *lot*) and provides scores for three subscales: Efficacy for Student Engagement (8 items; example item: "How much can you do to help your students value learning?"), Efficacy for Instructional Strategies (8 items; example item: "To what extent can you provide an alternative explanation or example when students are confused?"), and Efficacy for Classroom Management (8 items; example item: "How much can you do to control disruptive behavior in the classroom?"). In the original study, the TSES showed acceptable internal-consistency reliability, with Cronbach's alpha of 0.82, 0.81, and 0.72 (Tschannen-Moran & Woolfolk Hoy, 2001). In the Italian validation study, the three-factor structure of the TSES was confirmed and the internal-consistency reliability of the three subscales was found to be excellent (Biasi et al., 2014). In the present study, McDonald's omegas of internal-consistency reliability (averaged over Time T0 and T1) for the three subscales were 0.92, 0.93, and 0.94, respectively.

Temperament and Character

Temperament and character were assessed with the Temperament and Character Inventory (TCI; Cloninger, 1994b) in its 125-item Italian version (Delvecchio et al., 2016). This instrument is based on Cloninger's personality model (Cloninger, 1994b), and uses true/false items for scoring four temperament scales and three character scales. The temperament scales are (Garcia et al., 2017, pp.2–3): Novelty Seeking (20 items, "the tendency of frequent activation or initiation of behaviors in response to novel stimuli, potential rewards, and punishments expressed as frequent exploration of new unfamiliar places or situations, quick loss of temper, impulsive decision making, and active avoidance of monotony"), Harm Avoidance (20 items, "the tendency to avoid or cease behaviors due to intense response to aversive stimuli expressed as fear of uncertainty, shyness of strangers, quick fatigability, and pessimistic worry of future problems"), Reward Dependence (15 items, "the tendency to respond intensively to reward expressed as sentimentality, social attachment, and dependence of approval of others"), and Persistence (5 items, "the tendency to persevere despite fatigue or frustration, overachieving, and perfectionism"). The character scales are (Garcia et al., 2017, pp. 2–3): Self-Directedness (25 items, referring to "self-determination, being able to control, regulate, and adapt behavior in accordance to own goals and values, to be self-sufficient, self-acceptant, responsible, reliable, and effective"), Cooperativeness (25 items, accounting for "individual differences in acceptance of and identification with other people, tolerance, helpfulness, and empathy"), and self-transcendence (15 items, referring to "individual differences in self-forgetfulness, patience, spirituality, and identification with something bigger than the self that gives meaning to one's existence"). In the Italian validation study, the TCI showed acceptable internal-consistency reliability for all the dimensions of the TCI, with Cronbach's alpha ranging from 0.71 to 0.92, while confirmatory factor analysis provided only partial confirmation of the factor structure (Delvecchio et al., 2016). In the present study, McDonald's omegas (averaged over Time T0 and T1) for the seven TCI scales were 0.70, 0.82, 0.45, 0.65, 0.85, 0.79, and 0.80, respectively. These values were satisfactory for all scales except Reward Dependence.

Data Analyses

Descriptive statistics were obtained for participants' raw scores in the HADS, MAIA and TSES questionnaires (Table 2). For the TCI questionnaire, the individual raw scores were converted to z-scores on the basis of the average scores of an independent Italian normative sample of 1391 healthy individuals that can be considered representative of the Italian population (see Table 1 in Delvecchio et al., 2016). Each TCI raw score (x) was converted to a z-score by subtracting the normative age- and gender-matched average score (μ) of the corresponding TCI scale and dividing the obtained difference by the normative age- and gender-matched standard deviation (σ) of the same TCI scale ($z = (x - \mu)/\sigma$). This conversion was conducted to improve the interpretability of the baseline profiles of study participants and the results of the moderation analysis, as well as to facilitate the application of these results to similar samples of MBI participants. Baseline TCI z-scores are reported in Table 1 and TCI raw scores in Online Resource 2.

The impact of the MBI training on the psychological and professional well-being of teachers was assessed using a series of two-way mixed analyses of variance (ANOVAs) computed on the HADS, MAIA and TSES scores. In these ANOVAs, the "Group" variable (with levels: MBI, CTR) was used as a between-subject factor, and the "Time"

Table 2 Scores obtained from self-report questionnaires for experimental (MBI) and control (CTR) groups and assessment time point (T0 and T1) with corresponding ANOVAs effects

Subscale	*M (SD)* in the MBI group ($n = 139$)		*M (SD)* in the CTR group ($n = 47$)		Group effect		Time effect		Group:Time effect	
	at Time = T0	at Time = T1	at Time = T0	at Time = T1	*F*	*p*	*F*	*p*	*F*	*p*
Anxiety	8.60 (3.77)	7.44 (3.26)	8.15 (4.28)	8.34 (4.62)	0.16	0.69	4.45	0.04 *	8.64	< 0.01 **
Depression	4.23 (2.69)	3.76 (2.92)	4.79 (3.62)	4.62 (3.70)	2.39	0.12	2.70	0.10	0.60	0.44
Noticing	3.52 (0.66)	3.84 (0.64)	3.76 (0.64)	3.64 (0.67)	0.04	0.83	3.67	0.06	18.60	< 0.01 ***
Not Distracting	1.84 (0.65)	2.03 (0.60)	1.90 (0.61)	1.91 (0.68)	0.17	0.68	3.25	0.07	2.82	0.09
Not Worrying	2.25 (0.75)	2.51 (0.76)	2.32 (0.96)	2.35 (0.84)	0.17	0.68	5.66	0.02 *	3.73	0.06
Attention Regulation	2.57 (0.68)	3.33 (0.64)	2.96 (0.75)	2.99 (0.81)	0.04	0.85	59.32	< 0.01 ***	49.86	< 0.01 ***
Emotional Awareness	3.70 (0.77)	3.90 (0.62)	3.75 (0.73)	3.60 (0.70)	1.40	0.24	0.15	0.70	9.84	< 0.01 **
Self-Regulation	2.82 (0.79)	3.58 (0.68)	2.80 (0.94)	2.87 (0.84)	9.40	< 0.01 **	51.31	< 0.01 ***	35.62	< 0.01 ***
Body Listening	2.57 (0.89)	3.25 (0.77)	2.84 (0.82)	2.88 (0.87)	0.19	0.67	31.70	< 0.01 ***	24.71	< 0.01 ***
Trusting	3.06 (0.92)	3.57 (0.89)	3.47 (0.96)	3.50 (0.92)	1.34	0.25	19.75	< 0.01 ***	15.75	< 0.01 ***
Student Engagement	7.20 (1.04)	7.47 (1.00)	7.31 (0.79)	7.30 (0.76)	0.07	0.79	4.48	0.04 *	4.84	0.03 *
Instructional Strategies	7.19 (1.14)	7.62 (1.00)	7.39 (0.89)	7.49 (0.80)	0.03	0.86	18.11	< 0.01 ***	6.68	0.01 *
Classroom Management	6.91 (1.26)	7.25 (1.15)	6.91 (0.94)	7.01 (0.99)	0.47	0.50	9.93	< 0.01 **	3.27	0.07

CTR, Control; *HADS*, Hospital Anxiety and Depression Scale; *M*, Mean; *MAIA*, Multidimensional Assessment of Interoceptive Awareness; *MBI,* Mindfulness-Based Intervention, *SD*, Standard Deviation; *TSES*, Teachers' Sense of Efficacy Scale, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

variable (with levels: T0, T1) was used as a within-subject factor. Effect sizes for these ANOVAs were computed in terms of generalized eta squared (*ges*): benchmarks for small (*ges* = 0.01), medium (*ges* = 0.06), and large (*ges* = 0.14) effects should be used with caution, in favor of direct comparison of the effect size to others found in the literature (Lakens, 2013). Moreover, between-group effect sizes were calculated in terms of Cohen's *d* by comparing change scores, for which Mean Difference (*MD*) and 95% Confidence Interval for Mean Difference (95% *CI*) were also provided; Cohen's *d* were interpreted as small (*d* = 0.20), medium (*d* = 0.50), and large (*d* = 0.80) effects sizes (Lakens, 2013). A robust two-way mixed ANOVA on trimmed means was employed to confirm higher-order effects (i.e., interactions) obtained in these analyses, when Shapiro–Wilk's test of normality showed that test scores were not normally distributed in any of the groups.

To examine whether baseline temperament and character TCI dimensions would moderate the relationship between experimental group (MBI vs. CTR) and psychological/professional well-being of teachers at study completion (at Time = T1), hierarchical multiple regressions were conducted. These analyses were carried out separately for the HADS, MAIA and TSES subscales where significant Group x Time interactions were found in the ANOVAs. In Step 1 of the regressions, the baseline score in the examined scale, as well as gender (coded as 0 for females, and 1 for males), education level, and experience in meditation were entered. The two latter categorical variables were dichotomized as follows to simplify the presentation of the results: for education level, 0 = *high school/bachelor's degree* and 1 = *master's/doctorate degree*; for experience in meditation, 0 = *null/occasional practice*, 1 = *continuous practice (regular practice for at least two months)*. The interaction effects in the nine regression models remain unchanged when these variables were not dichotomized, except for the effect on TSES Efficacy for Student Engagement, which became non-significant ($p = 0.06$). In Step 2, scores in the seven TCI dimensions and experimental group were added. In Step 3, all TCI dimensions by experimental group interactions were added. Follow-up analyses of all significant interactions in these regressions were performed with Johnson-Neyman analysis (Hayes & Montoya, 2017).

All p-values were considered significant when $p < 0.05$. In post-hoc analysis for interaction effects found in the ANOVAs, the *p*-values were corrected for multiple comparisons using the Bonferroni procedure.

Results

Baseline Characteristics of Study Participants

Regarding emotional distress at baseline (Time = T0), this was the distribution of HADS scores and levels among study participants: for HADS Anxiety ($M = 8.49$, $SD = 3.90$), there were 81 non cases, 50 teachers with mild levels, 41 teachers with moderate levels and 14 teachers with severe levels; for HADS Depression ($M = 4.37$, $SD = 2.95$), there were

157 non cases, 24 teachers with mild levels, 5 teachers with moderate levels, and nobody with severe levels.

The group of teachers who received the MBI and participated to the study (MBI group) was composed of 139 teachers; the control (CTR) group was instead composed of 47 teachers who completed the study (Table 1). At baseline, the two groups were not different in terms of age ($t = -0.93$, $p = 0.36$), educational level ($\chi^2(3) = 6.13$, p = 0.11) and experience in meditation ($\chi^2(1) < 0.01$, $p = 0.98$), but were different in terms of gender ($\chi^2(1) = 10.07$, $p < 0.01$), as in the MBI group there was a lower percentage of men than in the CTR group.

Finally, regarding the personality profiles of the study participants, they were close to the Italian normative sample (Delvecchio et al., 2016). For both groups, the mean scores of study participants on all temperament and character scales remained well within 1 standard deviation of the average scores of the reference population ($z \leq 0.55$). At baseline, the two study groups were similar in all TCI scales (for all, $|t| < 1.24$, $p \geq 0.22$; see Table 1).

Intervention-Associated Changes

Changes in Emotional Distress

As shown in Table 2, the ANOVA on HADS Anxiety scores highlighted a main effect of Time ($F(1,183) = 4.45$, $p = 0.04$, $ges < 0.01$) and a Group x Time interaction effect ($F(1, 183) = 8.64$, $p < 0.01$, $ges < 0.01$): scores did not change over time in the CTR group ($p = 0.63$) and decreased significantly over time in the MBI group ($p < 0.01$); between-group effect size for change score was medium ($d = -0.50$, $MD = -1.36$, 95% *CI* [− 2.26 −0.45]). The ANOVA on HADS Depression score did not reveal any effect. The higher order effect on HADS Anxiety scores was confirmed in the robust ANOVA.

Changes in Interoceptive Awareness

As reported in Table 2, the ANOVA on MAIA Noticing scores highlighted a Group x Time interaction effect ($F(1, 183) = 18.60$, $p < 0.01$, $ges = 0.02$): scores did not change over time in the CTR group ($p = 0.11$) and increased significantly over time in the MBI group ($p < 0.01$); between-group effect size for change score was medium-to-large ($d = 0.73$, $MD = 0.44$, 95% *CI* [0.24 0.64]). The same interaction effect and the same pattern of results were observed in the MAIA subscales of Attention Regulation ($F(1, 183) = 49.86$, $p < 0.01$, $ges = 0.05$), Emotional Awareness ($F(1, 183) = 9.84$, $p < 0.01$, $ges = 0.01$), Self-Regulation ($F(1, 183) = 35.62$, $p < 0.01$, $ges = 0.04$), Body Listening ($F(1, 183) = 24.71$, $p < 0.01$, $ges = 0.03$) and Trusting ($F(1, 183) = 15.75$, $p < 0.01$, $ges = 0.01$): scores did not change over time in the CTR group ($p > 0.05$) and increased significantly over time in the MBI group ($p \leq 0.01$). Between-group effect sizes for change scores in these subscales were from medium to large (for Attention Regulation: $d = 1.19$, $MD = 0.73$, 95% *CI* [0.52 0.93]; for Emotional Awareness: $d = 0.53$, $MD = 0.36$, 95% *CI* [0.13 0.58]; for Self-Regulation: $d = 1.00$, $MD = 0.69$, 95% *CI* [0.46 0.92]; for Body Listening: $d = 0.84$, $MD = 0.63$, 95% *CI* [0.38 0.89]; for Trusting: $d = 0.67$, $MD = 0.48$, 95% *CI* [0.24 0.72]). All these interaction effects, except for the Trusting subscale, were confirmed in the robust ANOVA. Lower-order effect of Time and/or Group were also observed in these subscales: main effects of Time (for all, T0 < T1) in the subscales of Not-Worrying ($F(1, 183) = 5.66$, $p = 0.02$, $ges = 0.01$), Attention Regulation ($F(1, 183) = 59.32$, $p < 0.01$, $ges = 0.06$), Self-Regulation ($F(1, 183) = 51.31$, $p < 0.01$, $ges = 0.05$), Body Listening ($F(1, 183) = 31.70$, $p < 0.01$, $ges = 0.06$) and Trusting ($F(1, 183) = 19.75$, $p < 0.01$, $ges = 0.02$); a main effect of Group in the Self-Regulation subscale (MBI > CTR; $F(1, 183) = 9.40$, $p < 0.01$, $ges = 0.04$). In the subscale of Not-Distracting, no significant effects were observed.

Changes in Teachers' Sense of Efficacy

As shown in Table 2, the ANOVAs on the TSES Efficacy for Student Engagement and Efficacy for Instructional Strategies subscales both highlighted a main effect of Time (T0 < T1; $F(1, 183) = 4.48$, $p = 0.04$, $ges < 0.01$ for Student Engagement; $F(1, 183) = 18.11$, $p < 0.01$, $ges = 0.01$ for Instructional Strategies) and a Group x Time interaction effect ($F(1, 183) = 4.84$, $p = 0.03$, $ges < 0.01$ for Student Engagement; $F(1, 183) = 6.68$, $p = 0.01$, $ges = 0.01$ for Instructional Strategies): scores did not change over time in the CTR group ($p > 0.17$) and increased significantly over time in the MBI group ($p < 0.01$); between-group effect sizes for change scores in these subscales were small-to-medium (for Student Engagement: $d = 0.37$, $MD = 0.28$, 95% *CI* [0.03 0.52]; for Instructional Strategies: $d = 0.43$, $MD = 0.33$, 95% *CI* [0.08 0.58]). In the TSES Efficacy for Classroom Management subscale, a main effect of Time (T0 < T1; $F(1, 183) = 9.93$, $p < 0.01$, $ges = 0.01$) was observed. All the higher-order effects were confirmed in the robust ANOVA.

Moderating Effects of Temperament and Character Dimensions

The moderation analysis was conducted on the scores observed at study completion (T1) in the subscales of HADS Anxiety, MAIA Noticing, MAIA Attention Regulation, MAIA Emotional Awareness, MAIA Self-Regulation, MAIA Body Listening, MAIA Trusting, TSES Efficacy for Student Engagement and TSES Efficacy for Instructional Strategies. After controlling for gender, age, education level, experience in meditation, baseline score in the examined

scale, as well as for main effects of group membership and baseline TCI dimensions, a moderating effect of baseline TCI dimensions on the relationship between experimental group (MBI vs. CTR) and psychological/professional well-being of teachers at study completion was found in three scales: HADS Anxiety, MAIA Attention Regulation, and TSES Efficacy for Student Engagement. Results of these three models are summarized in Tables 3, 4, 5, while results of models without moderation effects can be found in Online Resource 3, Online Resource 4, Online Resource 5, Online Resource 6, Online Resource 7, Online Resource 8.

The first model where moderation effects were observed was that on HADS Anxiety (Table 3). Here, a significant interaction was observed between Group and baseline TCI Reward Dependence (RD) scores ($b = -1.01$, $p = 0.04$): as shown in Fig. 1 (left pane), a between-group difference in HADS Anxiety scores at study completion (MBI < CTR) was significant ($p < 0.05$) only for higher baseline TCI RD scores (specifically, only for TCI RD z-score > 0.19; obtained with the Johnson-Neyman procedure). In the same model, a significant interaction was also observed between Group and baseline TCI Self-Directedness (SD) scores ($b = 1.08$, $p = 0.03$): as shown in Fig. 1 (right pane), a between-group difference in HADS Anxiety scores at study completion (MBI < CTR) was significant only for lower-to-middle baseline TCI SD scores (for TCI SD z-score < 0.16). The second model where a moderation effect was observed was that on MAIA Attention Regulation (Table 4). Here, a significant interaction was observed between Group and baseline TCI Persistence (P) scores ($b = 0.20$, $p = 0.03$): as shown in Fig. 2 (left pane), a between-group difference in MAIA Attention Regulation scores at study completion (MBI > CTR) was significant only for middle-to-higher baseline TCI P scores (for TCI P z-score > − 1.05). The third model where a moderation effect was observed was that on TSES Efficacy for Student Engagement (Table 5). Here, a significant interaction was observed between Group and baseline TCI Self-Transcendence (ST) scores ($b = -0.25$,

Table 3 Regression model for Hospital Anxiety and Depression Scale (HADS) Anxiety scores at study completion

	Multiple regression model for HADS Anxiety scores at study completion (Time = T1)		
	b (SE)	*β*	*p*
Gender	0.29 (0.71)	0.02	0.69
Age	0.02 (0.02)	0.04	0.43
Education level	0.18 (0.40)	0.02	0.66
Experience in meditation	0.34 (0.59)	0.03	0.57
Baseline HADS Anxiety	0.70 (0.05)	0.74	< 0.01 ***
Step 1	$R^2 = 0.54$, $p < 0.01$ ***		
Group	− 0.99 (0.44)	− 0.12	0.03 *
Baseline TCI NS	− 0.50 (0.20)	− 0.14	0.01 *
Baseline TCI HA	− 0.18 (0.27)	− 0.05	0.50
Baseline TCI RD	− 0.04 (0.20)	− 0.01	0.84
Baseline TCI P	0.13 (0.19)	0.04	0.48
Baseline TCI SD	− 0.75 (0.24)	− 0.21	< 0.01 **
Baseline TCI C	− 0.47 (0.25)	− 0.10	0.064
Baseline TCI ST	0.46 (0.20)	0.13	0.02 *
Step 2	$R^2 = 0.60$, $\Delta R^2 = 0.07$, $p < 0.01$ ***		
Baseline TCI NS: Group	− 0.17 (0.42)	− 0.04	0.68
Baseline TCI HA: Group	0.46 (0.56)	0.10	0.42
Baseline TCI RD: Group	− 1.01 (0.48)	− 0.22	0.04 *
Baseline TCI P: Group	− 0.68 (0.43)	− 0.16	0.12
Baseline TCI SD: Group	1.08 (0.49)	0.24	0.03 *
Baseline TCI C: Group	0.67 (0.54)	0.13	0.22
Baseline TCI ST: Group	0.70 (0.44)	0.17	0.12
Step 3	$R^2 = 0.64$, $\Delta R^2 = 0.04$, $p < 0.01$ ***		

C, Cooperativeness; *CTR*, Control; *HA*, Harm Avoidance; *MBI*, Mindfulness-Based Intervention; *P*, Persistence; *NS*, Novelty Seeking; *RD*, Reward Dependence; *SD*, Self-Directedness; *ST*, Self-Transcendence; *SE*, Standard Error; *TCI*, Temperament and Character Inventory, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Categorical sociodemographic variables were coded as follows. Gender: 0 = *female* and 1 = *male*; Education level: 0 = *high school/bachelor's degree* and 1 = *master's/doctorate degree*; Experience in meditation: 0 = *null/occasional practice*, 1 = *continuous practice*; Group: 0 = *CTR* and 1 = *MBI*

Table 4 Regression model for Multidimensional Assessment of Interoceptive Awareness (MAIA) Attention Regulation scores at study completion

	Multiple regression model for MAIA Attention Regulation scores at study completion (Time = T1)		
	b (SE)	*β*	*p*
Gender	− 0.53 (0.17)	− 0.20	< 0.01 **
Age	− 0.01 (0.00)	− 0.09	0.16
Education level	0.01 (0.09)	0.01	0.89
Experience in meditation	− 0.13 (0.14)	− 0.06	0.34
Baseline MAIA Attention Regulation	0.56 (0.06)	0.57	< 0.01 ***
Step 1	$R^2 = 0.33$, $p < 0.01$ ***		
Group	0.54 (0.10)	0.33	< 0.01 ***
Baseline TCI NS	− 0.07 (0.05)	− 0.11	0.11
Baseline TCI HA	− 0.04 (0.06)	− 0.06	0.46
Baseline TCI RD	− 0.01 (0.04)	− 0.01	0.86
Baseline TCI P	0.07 (0.04)	0.11	0.07
Baseline TCI SD	0.00 (0.05)	0.01	0.92
Baseline TCI C	0.11 (0.05)	0.13	0.04 *
Baseline TCI ST	0.04 (0.05)	0.05	0.41
Step 2	$R^2 = 0.48$, $\Delta R^2 = 0.14$, $p < 0.01$ ***		
Baseline TCI NS: Group	− 0.10 (0.09)	− 0.12	0.31
Baseline TCI HA: Group	− 0.12 (0.13)	− 0.13	0.35
Baseline TCI RD: Group	0.04 (0.11)	0.05	0.71
Baseline TCI P: Group	0.20 (0.09)	0.24	0.03 *
Baseline TCI SD: Group	− 0.19 (0.11)	− 0.23	0.08
Baseline TCI C: Group	− 0.02 (0.12)	− 0.02	0.86
Baseline TCI ST: Group	0.05 (0.10)	0.06	0.65
Step 3	$R^2 = 0.51$, $\Delta R^2 = 0.03$, $p < 0.01$ ***		

Abbreviations: symbols and coding of categorical variables as in Table 3

$p < 0.05$): as shown in Fig. 2 (right panel), a between-group difference in TSES Efficacy for Student Engagement scores at study completion (MBI > CTR) was significant only for lower baseline TCI ST scores (for TCI ST z-score < 0.30). The same pattern of results was found for TSES Efficacy for Instructional Strategies, where, however, the interaction between Group and baseline TCI Self-Transcendence scores was non-significant ($b = -0.22$, $p = 0.06$).

Discussion

The present study showed the positive effects of 8-week an MBI on emotional distress, interoceptive awareness and professional sense of efficacy in a sample of Italian teachers, and also showed which pre-training temperament and character traits moderated the relationship between training participation and study outcomes.

In comparison to a non-active control group, teachers participating in the MBI improved in all the three aspect of psychological and professional well-being that were measured in the present study (i.e. emotional distress, interoceptive awareness and professional sense of efficacy). As expected for the kind of practices generally taught during mindfulness trainings, MBI participants in the present study self-reported improvements in six of the eight subdomains of interoceptive awareness, with effect sizes ranging from medium to large. Traditional and present-day mindfulness practices are indeed based on the observation of bodily signals and sensations (Anālayo, 2020; Gibson, 2019; Kerr et al., 2013). Moreover much research has observed the positive impact of these practices on participants' self-reports of interoception (e.g., De Jong et al., 2016; Fissler et al., 2016; Matiz et al., 2020; D'Antoni et al., 2022; Feruglio et al., 2023), and on brain measurements of interoceptive functioning (Farb et al., 2013; Fox et al., 2012). In the present study, improvements were observed in the following dimensions of interoceptive awareness: in the attitude of listening to the body as a source of information (Body Listening), in the abilities to control focus on bodily sensations (Attention Regulation), to mindfully notice them (Noticing) together with the emotions associated with them (Emotional Awareness), and in the abilities to trust bodily sensations (Trusting) and regulate one's own physiological responses to them (Self-Regulation).

Table 5 Regression models for Teachers' Sense of Efficacy Scale (TSES) Efficacy for Student Engagement scores at study completion

	Multiple regression model for TSES Efficacy for Student Engagement scores at study completion (Time = T1)		
	b (SE)	*β*	*p*
Gender	− 0.44 (0.19)	− 0.12	0.02 *
Age	0.00 (0.01)	0.01	0.84
Education level	− 0.05 (0.11)	− 0.02	0.66
Experience in meditation	− 0.06 (0.16)	− 0.02	0.72
Baseline TSES Efficacy for Student Engagement	0.66 (0.05)	0.69	< 0.01 ***
Step 1	$R^2 = 0.50, p < 0.01$ ***		
Group	0.20 (0.12)	0.09	0.10
Baseline TCI NS	− 0.10 (0.06)	− 0.11	0.07
Baseline TCI HA	− 0.02 (0.07)	− 0.02	0.74
Baseline TCI RD	− 0.08 (0.06)	− 0.08	0.14
Baseline TCI P	− 0.04 (0.05)	− 0.04	0.46
Baseline TCI SD	0.05 (0.06)	0.05	0.47
Baseline TCI C	0.05 (0.07)	0.04	0.49
Baseline TCI ST	− 0.06 (0.06)	− 0.06	0.32
Step 2	$R^2 = 0.54, \Delta R^2 = 0.04, p < 0.01$ ***		
Baseline TCI NS: Group	0.14 (0.12)	0.13	0.25
Baseline TCI HA: Group	− 0.01 (0.16)	− 0.01	0.93
Baseline TCI RD: Group	− 0.06 (0.14)	− 0.05	0.67
Baseline TCI P: Group	− 0.11 (0.12)	− 0.10	0.36
Baseline TCI SD: Group	0.02 (0.14)	0.02	0.86
Baseline TCI C: Group	0.13 (0.16)	0.09	0.42
Baseline TCI ST: Group	− 0.25 (0.13)	− 0.24	< 0.05 *
Step 3	$R^2 = 0.56, \Delta R^2 = 0.02, p < 0.01$ ***		

Abbreviations: symbols and coding of categorical variables as in Table 3

Moreover, MBI participants significantly reduced their self-reported anxiety levels in comparison to the control group (effect size for between-group change score was medium). This result is in line with most of the meta-analyses examining the impact of MBIs on both non-clinical and clinical populations. These studies consistently highlight significant reductions in anxiety symptoms following MBIs in both non-teacher (Goyal et al., 2014; Grossman et al., 2004; Khoury et al., 2015), and teacher samples (Emerson et al., 2017; Hwang et al., 2017; Klingbeil & Renshaw, 2018; Zarate et al., 2019). An effect on depression levels in the intervention group was not observed in our study, but this can be possibly attributed to the relatively low depression levels at study commencement.

The decrease of anxiety and increase in interoceptive abilities of teachers in the intervention group was accompanied in the present study by an improvement in their sense of professional efficacy. This was observed, in particular, in the subdomains of efficacy for student engagement and efficacy for instructional strategies (with small-to-medium effect sizes). Following the training, teachers therefore experienced an increased sense of efficacy in motivating and engaging their students in the learning process, as well as in adapting their teaching methods to suit the given circumstances. This result supports the findings of that part of the literature which found a significant impact of MBIs on teachers' self-efficacy (de Carvalho et al., 2021; Jennings et al., 2013; Kuyken et al., 2022; Poulin et al., 2008). This seems particularly important for teachers' mental health, meta-analyses including studies on clinical as their professional self-efficacy can generally be regarded as a factor that protects against the negative impacts of professional stress and burnout (Beltman et al., 2011; Caprara et al., 2006). As teachers' mental health and wellbeing seem to be associated with their students' mental health and academic achievement (Harding et al., 2019; Madigan & Curran, 2021; Madigan & Kim, 2021), the impact of MBIs can therefore be relevant also for students.

Two further observations can be drawn from the overall findings on the effects of the MBI trainings on teachers' wellbeing. The first observation is about the online (via videoconferencing) delivery of the trainings. This is one of the first studies examining online MBIs for teachers (Mendelson et al., 2023). In comparison to the effects of online MBIs reported in meta-analyses including studies on clinical and

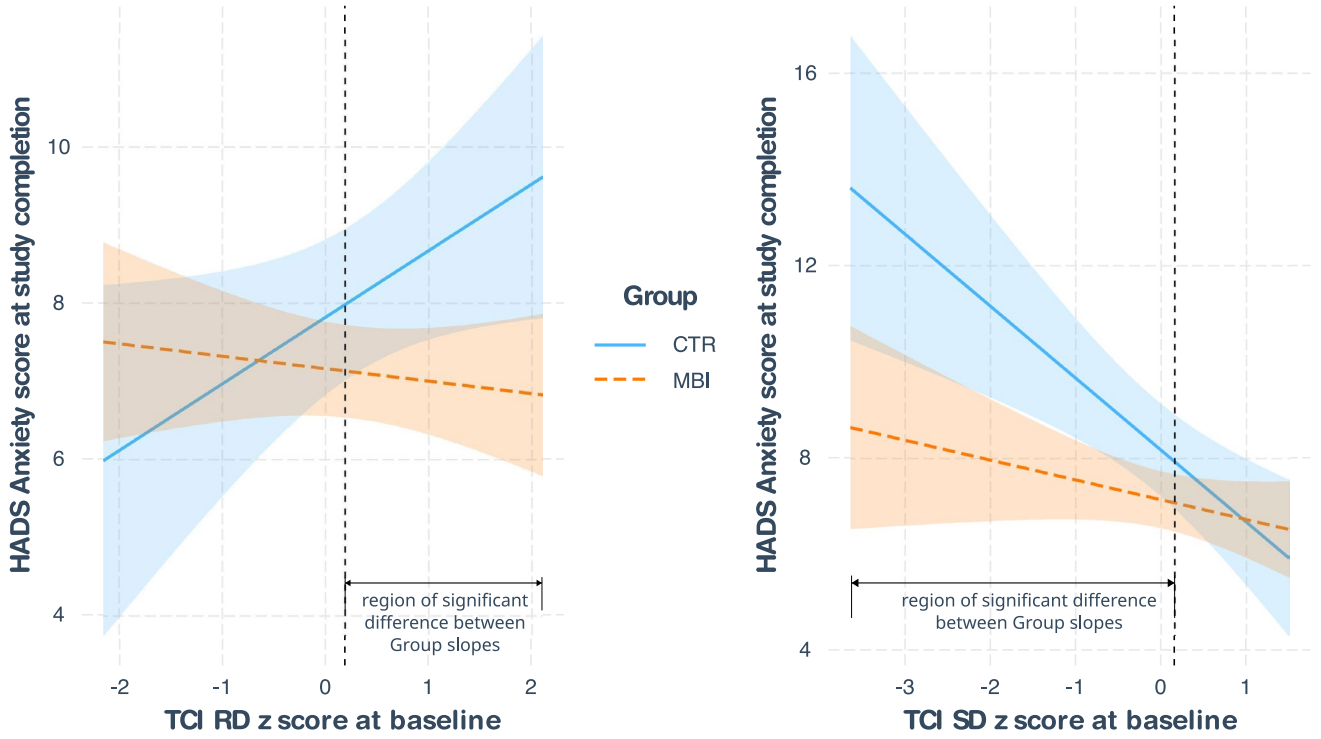

Fig. 1 Regression slopes for Group variable with 95% confidence interval from the model of HADS Anxiety as a function of baseline TCI Reward Dependence (left pane) and baseline TCI Self-Directedness (right pane). CTR = Control, HADS = Hospital Anxiety and Depression Scale, MBI = Mindfulness-Based Intervention, RD = Reward Dependence, SD = Self-Directedness, TCI = Temperament and Character Inventory, * $p < 0.05$. The vertical dotted line distinguishes TCI *z*-scores for which difference between Group slopes is significant or non-significant

nonclinical populations (Sommers-Spijkerman et al., 2021; Witarto et al., 2022), in the present study larger effects of MBI were found for anxiety and lower effects were found for depression. For anxiety, Witarto et al. (2022) observed that larger effects of online MBIs emerged in studies that, similar to the present one, employed inactive rather than active control groups and delivered MBIs via videoconferencing rather than using websites or mobile applications. Moreover, Sommers-Spijkerman et al. (2021) observed that participants with anxiety symptoms at baseline had larger effects of online MBIs on such symptoms, and in the present study mild-to-severe anxiety levels were indeed observed at baseline in more than half of the sample. By contrast, regarding symptoms of depression, the baseline levels in the current sample were much less severe than anxiety symptoms. Thus, as already discussed, the non-significant MBI effect on depression observed in the present study could be attributed to floor effects. Regarding interoceptive awareness, effect sizes obtained in the present study were comparable to those observed in other online MBIs, for example delivered for university students (Fagioli et al., 2023; Feruglio et al., 2023).

As a second general observation, it is possible to situate the current study within the broader literature on MBIs and teacher professional development (Hadar & Ergas, 2022). In the growing field of teacher professional development programs, MBIs are indeed considered important for improving teaching, as they can promote teachers' professional dispositions, such as openness to obtain multimodal information (from bodily signals, emotions, thoughts) in present-moment situations, observe experiences in a detached and non-reactive way, improve flexibility in problem solving, and develop emotion regulation, resilience and empathy (Roeser et al., 2012). The current study's results on teachers' mental health, interoceptive abilities and professional efficacy therefore support the general use of MBIs, and of the MOM training program in particular (see also Fabbro et al., 2020; Matiz et al., 2020), as an effective tool for teachers' professional development, in particular for teacher outcomes (Roeser et al., 2012). This result complements similar ones reported on the classroom or student outcomes (e.g., Braun et al., 2019; de Carvalho et al., 2021).

In addition to the effects of the MBI trainings on teachers' psychological and professional well-being discussed above, the present study also showed the moderating role of some pre-training temperament and character dimensions of personality on these effects. After controlling for gender, age, education level, and experience in meditation, moderating effects of temperament and character were observed for anxiety, interoceptive attention regulation

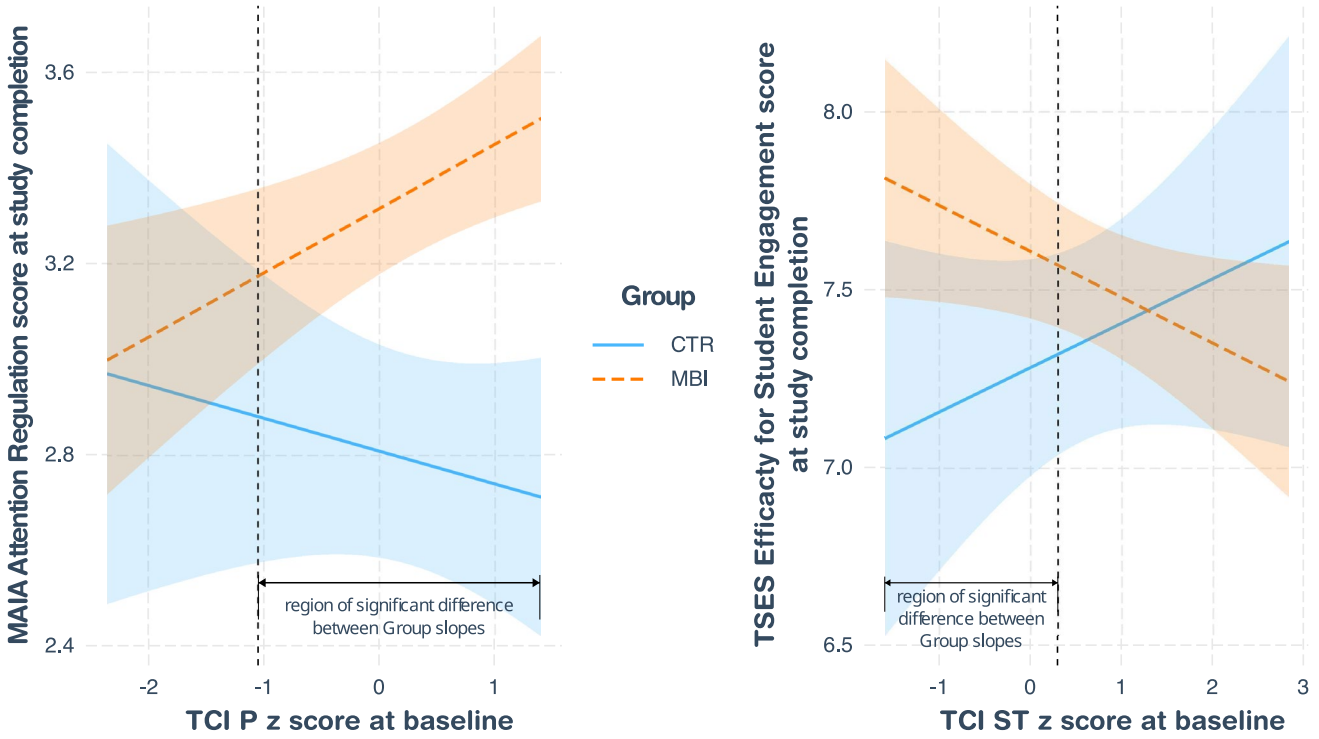

Fig. 2 Regression slopes for Group variable with 95% confidence interval from the model of MAIA Attention regulation as a function of baseline TCI Persistence (left panel) and from the model of TSES Efficacy for Student Engagement as a function of baseline TCI Self-Transcendence (right panel). CTR = Control, MBI = Mindfulness-Based Intervention, MAIA = Multidimensional Assessment of Interoceptive Awareness, P = Persistence, ST = Self-Transcendence, TCI = Temperament and Character Inventory, TSES = Teachers' Sense of Efficacy Scale, * $p < 0.05$. The vertical dotted line distinguishes TCI *z*-scores for which difference between Group slopes is significant or non-significant

and efficacy for student engagement scores. In particular, it emerged that teachers with lower-to-middle baseline scores in the character trait of self-directedness were more likely to benefit from MBI in terms of anxiety than teachers with higher self-directedness. These results are in line with those of four of the previous five studies that employed the Five Factor Model for the investigation of the moderating role of personality on the effects of MBIs, where it was found that significant MBI improvements were more likely to be observed for higher neuroticism and lower conscientiousness (De Vibe et al., 2015; Nyklíček & Irrmischer, 2017; Krick & Felfe, 2020; Jagielski et al., 2020). Past research has indeed shown that self-directedness is negatively correlated with neuroticism and positively correlated with conscientiousness (De Fruyt et al., 2000; Ramanaiah et al., 2002). The result obtained in the present study can also be explained by observing that lower self-directedness is usually associated with higher anxiety levels (Cloninger et al., 2012; Jiang et al., 2003; Matsudaira & Kitamura, 2006; Tanaka et al., 1998). Individuals with lower self-directedness could thus benefit more from mindfulness training, which usually produces medium-size effects on anxiety (Grossman et al., 2004; Hofmann et al., 2010; Goyal et al., 2014; Khoury et al., 2015). Regarding the mechanisms of action underlying such effects in relation to personality, it has repeatedly shown that an 8-week MBI such as the MOM training can improve character traits measured with the Temperament and Character Inventory (Campanella et al., 2014; Crescentini et al., 2015; Matiz et al., 2018, 2020), and self-directedness in particular (Crescentini et al., 2018; Matiz et al., 2020).

In the present study, in the same model regarding anxiety levels, it also emerged that teachers with higher baseline scores in the temperament dimension of reward dependence, i.e. generally more in need of social approval, were more likely to benefit from MBI in terms of anxiety than teachers with lower baseline scores in reward dependence. This result must be interpreted with great caution for the low value of reliability of the reward dependence scale obtained in the present study. Reward dependence has been linked to the Five Factor Model personality trait of agreeableness (De Fruyt et al., 2000; Ramanaiah et al., 2002). Notably, agreeableness has not been identified as a moderator of the effects of MBIs in previous research (De Vibe et al., 2015; Nyklíček & Irrmischer, 2017; Krick & Felfe, 2020; Jagielski et al., 2020; Gan et al., 2023). Moreover, the temperament

dimension of reward dependence does not apparently have a univocal relationship with anxiety (Ball et al., 2002; Cloninger, 1986).

From the moderation analysis, it also emerged that teachers with middle-to-higher baseline scores in the temperament dimension of persistence were more likely than teachers with lower baseline persistence to benefit from MBI in terms of interoceptive attention regulation, i.e. the ability to control focus on the bodily sensations. A similar result was found in another study with the MOM training that involved primary school children participating in a 24-session training: students with more persistent and cooperative personality profiles showed a greater preference for the program, perceived it as more beneficial, and displayed higher levels of engagement compared to children with opposite personality characteristics (Matiz et al., 2024). This result seems to be coherent with the physical (to remain still and maintain a dignified posture during the meditation practice) and attentional effort that participants usually need to exert during the initial weeks of an 8-week MBI, such as the training employed in the present study (Tang et al., 2015). For more persistent individuals, the initial stage of mindfulness practice, which demands the employment of effortful attentional resources, could be therefore comparatively easier than for individuals who are less persistent; a sustained mindfulness practice, in turn, can progressively contribute strengthening the attentional control capabilities of practitioners (Hölzel et al., 2011; Posner et al., 2015).

Finally, it was found that teachers with lower baseline scores in the character dimension of self-transcendence were more likely to benefit from the MBI in terms of efficacy for student engagement than teachers with higher baseline self-transcendence. This result should be taken with caution, as it became non-significant when teachers'education level and meditation experience were not dichotomized. Past research focused on the role of MBIs in increasing self-transcendence (Crescentini et al., 2014; Hanley & Garland, 2019; Hanley et al., 2020; Vago & Silbersweig, 2012), while more recent studies explored the link between baseline self-transcendence and MBIs outcomes. For example, in two randomized clinical trials, Hanley and Garland (2022) reported that self-transcendence (which was measured with an instrument different from the Temperament and Character Inventory) predicted better outcomes of anxiety, pain intensity/unpleasantness and postoperative physical functioning in surgical patients undergoing a single preoperative 15/20-min mindfulness meditation. Moreover, correlational research with path analysis indicated that self-transcendence could be one of the mechanisms through which the effects of self-awareness alleviate negative emotional states such as stress, depression, and anxiety (Verhaeghen, 2018). It is worth noting that previous research on the moderating role of personality on MBI effects did not recognize a role for the Five Factor Model personality trait of openness to experience (De Vibe et al., 2015; Nyklíček & Irrmischer, 2017; Krick & Felfe, 2020; Jagielski et al., 2020; Gan et al., 2023), which appeared positively related to the self-transcendence dimension within the Temperament and Character Inventory (De Fruyt et al., 2000, 2006; Ramanaiah et al., 2002). A possibility emerging from our study (in which average baseline self-transcendence scores of MBI participants were 0.55 standard deviations higher than those of the normative population) may be that those teachers initially lacking in the aptitude to connect themselves with others and their environment at a transpersonal level, were more likely to self-report more benefit in feeling effective to engage their students in school activities at the end of the training.

Importantly, these moderation analyses showed that in none of the three models (on anxiety, attention regulation and professional efficacy) an adverse reaction from MBI was observed (see an example of training adverse effects in Layous et al., 2022). For all temperament and character traits that moderated the relationship between experimental group and psychological/professional well-being, no interval of scores was found for which the teachers' well-being was lower in the MBI than in the control group.

In conclusion, this research showed the positive impact of an 8-week MBI on the psychological and professional well-being of teachers. This results supports the use of these interventions for teachers' self-efficacy and mental health. Moreover, this research suggests which pre-training temperament and character traits should be taken into particular account—at least for teachers—when proposing and assessing these interventions (the temperament trait of reward dependence and the character trait of self-directedness for anxiety, the temperament trait of persistence for interoceptive attention regulation, and the character trait of self-transcendence for the sense of efficacy for student engagement). Providing to teachers information about likely results in these outcomes based on their temperament and character profiles could be important both for participants with personality profiles less conducive of significant MBI effects, since this information could help them to make sense of an effect that is absent or not as strong as they expected, and for participants with more advantageous personality profiles, since it could further motivate and support their efforts during the training.

Limitations and Future Directions

The present research shows some strengths and some limitations. Among the strengths, it can be included the relatively large sample size of the intervention group and the solidness of the program in the context where it was delivered (school). The main limitations are: (1) the study design, which is quasi-experimental, as participants were

not randomized to the intervention or the control group, and includes a non-concurrent control group, as well as slight differences in the periods of the year dedicated to the assessment of the different MBI groups; (2) the fact that the control group was a non-active one; (3) the lack of a follow-up assessment; (4) that participants' reports of home practice were not collected; (5) that the data collection was carried out during different stages of the COVID-19 pandemic. The first limitation can be generally associated with baseline between-group differences, which were indeed observed in terms of participants' gender. The higher percentage of women in the MBI group may have magnified the effects of the MBI; however, the influence of gender on MBI outcomes has not yet been confirmed (Galante et al., 2023). The presence of a non-active control group (second limitation) restrict the possibility to clearly attribute the observed changes to MBI participation. The third limitation did not allow to explore the long-term effects of the MOM training, which is a topic of particular interest in the context of MBIs (Solhaug et al., 2019). The fourth limitation hinders the possibility to correlate the observed effects on teachers' well-being with the amount of mindfulness practice, as previous studies on non-teacher samples did (e.g., Campanella et al., 2014; Carmody & Baer, 2008). The fifth limitation may be associated with differences in working conditions and, consequently, in teachers' well-being. Although these differences are reduced due to the pre-post nature of the present study, future studies performed outside pandemic conditions should confirm the present results. Further studies should also confirm and extend the results of the current research by employing a randomized controlled design, an active and concurrent control group, collecting home meditation practice and including follow-up assessments. Of particular interest for future research seems the investigation of how temperament and character moderate the effects of mindfulness training on well-being in the long term, a topic which has never been explored in teachers or in other samples. Unrelated to the limitations of the present study, it seems important for future research to consider extending the present results to educators in different educational contexts, where different levels of educators' well-being or professional beliefs can interact with mindfulness training (Rubie-Davies et al., 2012; Van Droogenbroeck et al., 2021).

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s12671-025-02573-0.

Author Contributions Alessio Matiz: Software, Formal analysis, Investigation, Data Curation, Writing—Original Draft, Visualization. Stefania Pascut: Investigation, Writing—Original Draft. Franco Fabbro: Conceptualization, Funding acquisition, Supervision, Project administration. Cristiano Crescentini: Methodology, Resources, Writing—Review & Editing, Funding acquisition, Supervision, Project administration, Validation.

Funding Open access funding provided by Università degli Studi di Udine within the CRUI-CARE Agreement. This study was funded by the Health and Prevention Department of the Italian autonomous region Friuli-Venezia Giulia.

Data Availability The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Conflict of interest The authors declare no competing interests.

Ethics Approval The study was approved by the Institutional Review Board of the Department of Languages and Literatures, Communication, Education and Society (DILL) of the University of Udine. All procedures performed in the study were in accordance with the ethical standards of the 1964 Helsinki declaration and its later amendments.

Consent Informed consent was obtained from all individual participants included in the study prior to study beginning.

Use of Artificial Intelligence AI was not used.

References

Agyapong, B., Obuobi-Donkor, G., Burback, L., & Wei, Y. (2022). Stress, burnout, anxiety and depression among teachers: A scoping review. *International Journal of Environmental Research and Public Health, 19*(17), 10706. https://doi.org/10.3390/ijerph191710706

Anālayo, B. (2020). Somatics of early Buddhist mindfulness and how to face anxiety. *Mindfulness, 11*(6), 1520–1526. https://doi.org/10.1007/s12671-020-01382-x

Ball, S., Smolin, J., & Shekhar, A. (2002). A psychobiological approach to personality: Examination within anxious outpatients. *Journal of Psychiatric Research, 36*(2), 97–103. https://doi.org/10.1016/s0022-3956(01)00054-1

Beames, J. R., Spanos, S., Roberts, A., McGillivray, L., Li, S., Newby, J. M., O'Dea, B., & Werner-Seidler, A. (2023). Intervention programs targeting the mental health, professional burnout, and/or wellbeing of school teachers: Systematic review and meta-analyses. *Educational Psychology Review, 35*(1), 26. https://doi.org/10.1007/s10648-023-09720-w

Beekman, E., & Verhagen, A. (2018). Clinimetrics: Hospital anxiety and depression scale. *Journal of Physiotherapy, 64*(3), 198. https://doi.org/10.1016/j.jphys.2018.04.003

Beltman, S., Mansfield, C., & Price, A. (2011). Thriving not just surviving: A review of research on teacher resilience. *Educational Research Review, 6*(3), 185–207. https://doi.org/10.1016/j.edurev.2011.09.001

Benn, R., Akiva, T., Arel, S., & Roeser, R. W. (2012). Mindfulness training effects for parents and educators of children with special needs. *Developmental Psychology, 48*(5), 1476–1487. https://doi.org/10.1037/a0027537

Biasi, V., Domenici, G., Patrizi, N., & Capobianco, R. (2014). Teacher self-efficacy scale (Scala sull'auto-efficacia del docente – SAED: Adattamento e validazione in Italia). *Journal of Educational, Cultural and Psychological Studies, 10*, 485–509. https://doi.org/10.7358/ecps-2014-010-bias

Bishop, S. M. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology - Science and Practice, 11*(3), 230–241. https://doi.org/10.1093/clipsy/bph077

Braun, S. S., Roeser, R. W., Mashburn, A. J., & Skinner, E. (2019). Middle school teachers' mindfulness, occupational health and well-being, and the quality of teacher-student interactions. *Mindfulness, 10*(2), 245–255. https://doi.org/10.1007/s12671-018-0968-2

Brefczynski-Lewis, J. A., Lutz, A., Schaefer, H. S., Levinson, D. B., & Davidson, R. J. (2007). Neural correlates of attentional expertise in long-term meditation practitioners. *Proceedings of the National Academy of Sciences of the United States of America, 104*(27), 11483–11488. https://doi.org/10.1073/pnas.0606552104

Calì, G., Ambrosini, E., Picconi, L., Mehling, W., & Committeri, G. (2015). Investigating the relationship between interoceptive accuracy, interoceptive awareness, and emotional susceptibility. *Frontiers in Psychology, 6*, 1202. https://doi.org/10.3389/fpsyg.2015.01202

Campanella, F., Crescentini, C., Urgesi, C., & Fabbro, F. (2014). Mindfulness-oriented meditation improves self-related character scales in healthy individuals. *Comprehensive Psychiatry, 55*(5), 1269–1278. https://doi.org/10.1016/j.comppsych.2014.03.009

Capone, V., & Petrillo, G. (2020). Mental health in teachers: Relationships with job satisfaction, efficacy beliefs, burnout and depression. *Current Psychology, 39*, 1757–1766. https://doi.org/10.1007/s12144-018-9878-7

Caprara, G. V., Barbaranelli, C., Steca, P., & Malone, P. S. (2006). Teachers' self-efficacy beliefs as determinants of job satisfaction and students' academic achievement: A study at the school level. *Journal of School Psychology, 44*(6), 473–490. https://doi.org/10.1016/j.jsp.2006.09.001

Carmody, J., & Baer, R. A. (2008). Relationships between mindfulness practice and levels of mindfulness, medical and psychological symptoms and well-being in a mindfulness-based stress reduction program. *Journal of Behavioral Medicine, 31*(1), 23–33. https://doi.org/10.1007/s10865-007-9130-7

Carver-Thomas, D., & Darling-Hammond, L. (2019). The trouble with teacher turnover: How teacher attrition affects students and schools. *Education Policy Analysis Archives*, *27*, 36. https://doi.org/10.14507/epaa.27.3699

Cloninger, C. R. (1986). A unified biosocial theory of personality and its role in the development of anxiety states. *Psychiatric Developments, 3*(2), 167–226.

Cloninger, C. R. (1994a). Temperament and personality. *Current Opinion in Neurobiology, 4*(2), 266–273. https://doi.org/10.1016/0959-4388(94)90083-3

Cloninger, C. R. (1994b). *The Temperament and Character Inventory (TCI): A guide to its development and use*. Washington University.

Cloninger, C. R., Svrakic, D. M., & Przybeck, T. R. (1993). A psychobiological model of temperament and character. *Archives of General Psychiatry, 50*(12), 975–990. https://doi.org/10.1001/archpsyc.1993.01820240059008

Cloninger, C. R., Zohar, A. H., Hirschmann, S., & Dahan, D. (2012). The psychological costs and benefits of being highly persistent: Personality profiles distinguish mood disorders from anxiety disorders. *Journal of Affective Disorders, 136*(3), 758–766. https://doi.org/10.1016/j.jad.2011.09.046

Costa, P. T., & McCrae, R. R. (1992). *Professional manual: Revised NEO Personality Inventory (NEO PI-R) and NEO Five-Factor-Inventory (NEO-FFI)*. Psychological Assessment Resources.

Costantini, M., Musso, M., Viterbori, P., Bonci, F., Del Mastro, L., Garrone, O., Venturini, M., & Morasso, G. (1999). Detecting psychological distress in cancer patients: Validity of the Italian version of the hospital anxiety and depression scale. *Supportive Care in Cancer, 7*(3), 121–127. https://doi.org/10.1007/s005200050241

Cramer, C., & Binder, K. (2015). Zusammenhänge von Persönlichkeitsmerkmalen und Beanspruchungserleben im Lehramt. Ein internationales systematisches Review [The relationship between personality traits and burnout among teachers. An international systematic review]. *Zeitschrift für Erziehungswissenschaft, 18*(1), 101–123. https://doi.org/10.1007/s11618-014-0605-3

Crescentini, C., Chittaro, L., Capurso, V., Sioni, R., & Fabbro, F. (2016). Psychological and physiological responses to stressful situations in immersive virtual reality: Differences between users who practice mindfulness meditation and controls. *Computers in Human Behavior, 59*, 304–316. https://doi.org/10.1016/j.chb.2016.02.031

Crescentini, C., Matiz, A., & Fabbro, F. (2015). Improving personality/character traits in individuals with alcohol dependence: The influence of mindfulness-oriented meditation. *Journal of Addictive Diseases, 34*(1), 75–87. https://doi.org/10.1080/10550887.2014.991657

Crescentini, C., Matiz, A., Cimenti, M., Pascoli, E., Eleopra, R., & Fabbro, F. (2018). Effect of mindfulness meditation on personality and psychological well-being in patients with multiple sclerosis. *International Journal of MS Care, 20*(3), 101–108. https://doi.org/10.7224/1537-2073.2016-093

Crescentini, C., Urgesi, C., Campanella, F., Eleopra, R., & Fabbro, F. (2014). Effects of an 8-week meditation program on the implicit and explicit attitudes toward religious/spiritual self-representations. *Consciousness and Cognition, 30*, 266–280. https://doi.org/10.1016/j.concog.2014.09.013

D'Antoni, F., Feruglio, S., Matiz, A., Cantone, D., & Crescentini, C. (2022). Mindfulness meditation leads to increased dispositional mindfulness and interoceptive awareness linked to a reduced dissociative tendency. *Journal of Trauma & Dissociation, 23*(1), 8–23. https://doi.org/10.1080/15299732.2021.1934935

de Carvalho, J. S., Oliveira, S., Roberto, M. S., Gonçalves, C., Bárbara, J. M., de Castro, A. F., Pereira, R., De Oliveira Franco, M. G., Cadima, J., Leal, T., de Lemos, M. S., & Pinto, A. M. (2021). Effects of a mindfulness-based intervention for teachers: A study on teacher and student outcomes. *Mindfulness, 12*(7), 1719–1732. https://doi.org/10.1007/s12671-021-01635-3

De Fruyt, F., De Clercq, B. J., van de Wiele, L., & Van Heeringen, K. (2006). The validity of Cloninger's psychobiological model versus the five-factor model to predict DSM-IV personality disorders in a heterogeneous psychiatric sample: Domain facet and residualized facet descriptions. *Journal of Personality, 74*(2), 479–510. https://doi.org/10.1111/j.1467-6494.2006.00382.x

De Fruyt, F., Van De Wiele, L., & Van Heeringen, C. (2000). Cloninger's psychobiological model of temperament and character and the five-factor model of personality. *Personality and Individual Differences, 29*(3), 441–452. https://doi.org/10.1016/s0191-8869(99)00204-4

De Jong, M., Lazar, S. W., Hug, K., Mehling, W., Hölzel, B. K., Sack, A. T., Peeters, F., Ashih, H., Mischoulon, D., & Gard, T. (2016). Effects of mindfulness-based cognitive therapy on body awareness in patients with chronic pain and comorbid depression. *Frontiers in Psychology, 7*, 967. https://doi.org/10.3389/fpsyg.2016.00967

De Vibe, M., Solhaug, I., Tyssen, R., Friborg, O., Rosenvinge, J. H., Sørlie, T., Halland, E., & Bjørndal, A. (2015). Does Personality moderate the effects of mindfulness training for medical and psychology students? *Mindfulness, 6*(2), 281–289. https://doi.org/10.1007/s12671-013-0258-y

Delvecchio, G., Garzitto, M., Fagnani, C., Fornasari, L., Stazi, M. A., Picardi, A., Ciappolino, V., Fabbro, F., Altamura, A., & Brambilla, P. (2016). Normative data and effects of age and gender on temperament and character dimensions across the lifespan in an Italian population: A cross-sectional validation study. *Journal of Affective Disorders, 204*, 83–91. https://doi.org/10.1016/j.jad.2016.06.014

Denuwara, B., Gunawardena, N., Dayabandara, M., & Samaranayake, D. (2022). A systematic review and meta-analysis of the effectiveness of individual-level interventions to reduce occupational stress perceptions among teachers. *Archives of Environmental & Occupational Health, 77*(7), 530–544. https://doi.org/10.1080/19338244.2021.1958738

Dreer, B. (2023). On the outcomes of teacher wellbeing: A systematic review of research. *Frontiers in Psychology, 14*, 1205179. https://doi.org/10.3389/fpsyg.2023.1205179

Emerson, L., Leyland, A., Hudson, K., Rowse, G., Hanley, P., & Hugh-Jones, S. (2017). Teaching mindfulness to teachers: A systematic review and narrative synthesis. *Mindfulness, 8*(5), 1136–1149. https://doi.org/10.1007/s12671-017-0691-4

Fabbro, A., Fabbro, F., Capurso, V., D'Antoni, F., & Crescentini, C. (2020). Effects of mindfulness training on school teachers' self-reported personality traits as well as stress and burnout levels. *Perceptual and Motor Skills, 127*(3), 515–532. https://doi.org/10.1177/0031512520908708

Fabbro, F., & Crescentini, C. (2016). La meditazione orientata alla mindfulness (MOM) nella ricerca psicologica (Mindfulness-oriented meditation in psychological research). *Ricerche di Psicologia, 4*, 457–472. https://doi.org/10.3280/rip2016-004001

Fabbro, F., & Muratori, F. (2012). La mindfulness: Un nuovo approccio psicoterapeutico in età evolutiva (Mindfulness: A new psychotherapeutic approach for children). *Italian Journal of Developmental Neuropsychiatry, 32*, 248–259.

Fagioli, S., Pallini, S., Mastandrea, S., & Barcaccia, B. (2023). Effectiveness of a brief online mindfulness-based intervention for university students. *Mindfulness, 14*(5), 1234–1245. https://doi.org/10.1007/s12671-023-02128-1

Farb, N. A. S., Segal, Z. V., & Anderson, A. K. (2013). Mindfulness meditation training alters cortical representations of interoceptive attention. *Social Cognitive and Affective Neuroscience, 8*(1), 15–26. https://doi.org/10.1093/scan/nss066

Ferentzi, E., Olaru, G., Geiger, M., Vig, L., Köteles, F., & Wilhelm, O. (2021). Examining the factor structure and validity of the multidimensional assessment of interoceptive awareness. *Journal of Personality Assessment, 103*(5), 675–684. https://doi.org/10.1080/00223891.2020.1813147

Ferguson, K., Frost, L., & Hall, D. (2012). Predicting teacher anxiety, depression, and job satisfaction. *Journal of Teaching and Learning*, *8*(1). https://doi.org/10.22329/jtl.v8i1.2896

Fernández-Batanero, J. M., Román-Graván, P., Reyes-Rebollo, M. M., & Montenegro-Rueda, M. (2021). Impact of educational technology on teacher stress and anxiety: A literature review. *International Journal of Environmental Research and Public Health, 18*(2), 548. https://doi.org/10.3390/ijerph18020548

Feruglio, S., Panasiti, M. S., Crescentini, C., Aglioti, S. M., & Ponsi, G. (2023). Training the moral self: An 8-week mindfulness meditation program leads to reduced dishonest behavior and increased regulation of interoceptive awareness. *Mindfulness, 14*(11), 2757–2779. https://doi.org/10.1007/s12671-023-02233-1

Fissler, M., Winnebeck, E., Schroeter, T., Gummersbach, M., Huntenburg, J. M., Gaertner, M., & Barnhofer, T. (2016). An investigation of the effects of brief mindfulness training on self-reported interoceptive awareness, the ability to decenter, and their role in the reduction of depressive symptoms. *Mindfulness, 7*(5), 1170–1181. https://doi.org/10.1007/s12671-016-0559-z

Fox, K. C. R., Zakarauskas, P., Dixon, M. L., Ellamil, M., Thompson, E., & Christoff, K. (2012). Meditation experience predicts introspective accuracy. *PLoS ONE, 7*(9), e45370. https://doi.org/10.1371/journal.pone.0045370

Gadermann, A. M., Petteni, M. G., Molyneux, T., Warren, M. T., Thomson, K., Schonert-Reichl, K. A., Guhn, M., & Oberle, E. (2023). Teacher mental health and workplace well-being in a global crisis: Learning from the challenges and supports identified by teachers one year into the COVID-19 pandemic in British Columbia Canada. *Plos ONE, 18*(8), e0290230. https://doi.org/10.1371/journal.pone.0290230

Galante, J., Friedrich, C., Collaboration of Mindfulness Trials (CoMinT), Dalgleish, T., Jones, P. B., & White, I. R. (2023). Individual participant data systematic review and meta-analysis of randomised controlled trials assessing adult mindfulness-based programmes for mental health promotion in non-clinical settings. *Nature Mental Health*, *1*(7), 462–476https://doi.org/10.1038/s44220-023-00081-5

Gan, Y., Wang, R., Wang, X., Li, J., & Fan, H. (2023). Who benefits more from mindfulness? A preliminary study exploring moderating effect of personality traits on competition anxiety in athletes. *International Journal of Sports Science & Coaching, 19*(1), 390–400. https://doi.org/10.1177/17479541231159171

García-Carmona, M., Marín, M. D. M., & Aguayo, R. (2019). Burnout syndrome in secondary school teachers: A systematic review and meta-analysis. *Social Psychology of Education, 22*(1), 189–208. https://doi.org/10.1007/s11218-018-9471-9

Garcia, D., Lester, N., Cloninger, K.M., & Cloninger, R. C. (2017). Temperament and Character Inventory (TCI). In V. Zeigler-Hill & T. Shackelford (Eds.), *Encyclopedia of Personality and Individual Differences*. Springer. https://doi.org/10.1007/978-3-319-28099-8_91-1

Gibson, J. (2019). Mindfulness, interoception, and the body: A contemporary perspective. *Frontiers in Psychology, 10*, 2012. https://doi.org/10.3389/fpsyg.2019.02012

Goyal, M., Singh, S., Sibinga, E. M., Gould, N. F., Rowland-Seymour, A., Sharma, R., Berger, Z., Sleicher, D., Maron, D. D., Shihab, H. M., Ranasinghe, P. D., Linn, S., Saha, S., Bass, E. B., & Haythornthwaite, J. A. (2014). Meditation programs for psychological stress and well-being: A systematic review and meta-analysis. *JAMA Internal Medicine, 174*(3), 357–368. https://doi.org/10.1001/jamainternmed.2013.13018

Grabovac, A. D., Lau, M. A., & Willett, B. R. (2011). Mechanisms of mindfulness: A Buddhist psychological model. *Mindfulness, 2*(3), 154–166. https://doi.org/10.1007/s12671-011-0054-5

Gray, C., Wilcox, G., & Nordstokke, D. (2017). Teacher mental health, school climate, inclusive education and student learning: A review. *Canadian Psychology, 58*(3), 203–210. https://doi.org/10.1037/cap0000117

Grossman, P., Niemann, L., Schmidt, S., & Walach, H. (2004). Mindfulness-based stress reduction and health benefits A Meta-Analysis. *Journal of Psychosomatic Research, 57*(1), 35–43. https://doi.org/10.1016/S0022-3999(03)00573-7

Hadar, L. L., & Ergas, O. (2022). Mindfulness for in-service and pre-service teachers: An empirical map of the discourse from 2000 to 2020. *European Journal of Teacher Education, 48*(2), 208–227. https://doi.org/10.1080/02619768.2022.2153669

Haller, H., Breilmann, P., Schröter, M., Dobos, G., & Cramer, H. (2021). A systematic review and meta-analysis of acceptance- and mindfulness-based interventions for DSM-5 anxiety disorders. *Scientific Reports, 11*(1), 20385. https://doi.org/10.1038/s41598-021-99882-w

Hanley, A. W., & Garland, E. L. (2019). Spatial frame of reference as a phenomenological feature of self-transcendence:

Measurement and manipulation through mindfulness meditation. *Psychology of Consciousness, 6*(4), 329–345. https://doi.org/10.1037/cns0000204

Hanley, A. W., & Garland, E. L. (2022). Self-transcendence predicts better pre- and post-operative outcomes in two randomized clinical trials of brief mindfulness-based interventions. *Mindfulness, 13*(6), 1532–1543. https://doi.org/10.1007/s12671-022-01896-6

Hanley, A. W., Dambrun, M., & Garland, E. L. (2020). Effects of mindfulness meditation on self-transcendent states: Perceived body boundaries and spatial frames of reference. *Mindfulness, 11*(5), 1194–1203. https://doi.org/10.1007/s12671-020-01330-9

Harding, S., Morris, R. W., Gunnell, D., Ford, T., Hollingworth, W., Tilling, K., Evans, R., Bell, S., Grey, J., Brockman, R., Campbell, R., Araya, R., Murphy, S., & Kidger, J. (2019). Is teachers' mental health and wellbeing associated with students' mental health and wellbeing? *Journal of Affective Disorders, 242*, 180–187. https://doi.org/10.1016/j.jad.2018.08.080

Harmsen, R., Helms-Lorenz, M., Maulana, R., & Van Veen, K. (2018). The relationship between beginning teachers' stress causes, stress responses, teaching behaviour and attrition. *Teachers and Teaching: Theory and Practice, 24*(6), 626–643. https://doi.org/10.1080/13540602.2018.1465404

Hayes, A. F., & Montoya, A. K. (2017). A tutorial on testing, visualizing, and probing an interaction involving a multicategorical variable in linear regression analysis. *Communication Methods and Measures, 11*(1), 1–30. https://doi.org/10.1080/19312458.2016.1271116

Henderson, J., & Corry, M. (2021). Teacher anxiety and technology change: A review of the literature. *Technology, Pedagogy and Education, 30*(4), 573–587. https://doi.org/10.1080/1475939x.2021.1931426

Hofmann, S. G., Sawyer, A. T., Witt, A. A., & Oh, D. (2010). The effect of mindfulness-based therapy on anxiety and depression: A meta-analytic review. *Journal of Consulting and Clinical Psychology, 78*(2),169–183.https://doi.org/10.1037/a0018555

Hölzel, B. K., Lazar, S. W., Gard, T., Schuman-Olivier, Z., Vago, D. R., & Ott, U. (2011). How does mindfulness meditation work? Proposing mechanisms of action from a conceptual and neural perspective. *Perspectives on Psychological Science, 6*(6), 537–559. https://doi.org/10.1177/1745691611419671

Hwang, Y. S., Bartlett, B., Greben, M., & Hand, K. (2017). A systematic review of mindfulness interventions for in-service teachers: A tool to enhance teacher wellbeing and performance. *Teaching and Teacher Education, 64*, 26–42. https://doi.org/10.1016/j.tate.2017.01.015

Isbel, B., & Summers, M. J. (2017). Distinguishing the cognitive processes of mindfulness: Developing a standardised mindfulness technique for use in longitudinal randomised control trials. *Consciousness and Cognition, 52*, 75–92. https://doi.org/10.1016/j.concog.2017.04.019

Jagielski, C. H., Tucker, D. C., Dalton, S. O., Mrug, S., Würtzen, H., & Johansen, C. (2020). Personality as a predictor of well-being in a randomized trial of a mindfulness-based stress reduction of Danish women with breast cancer. *Journal of Psychosocial Oncology, 38*(1), 4–19. https://doi.org/10.1080/07347332.2019.1626524

Jennings, P. A., Brown, J. L., Frank, J., Doyle, S. L., Oh, Y., Davis, R., Rasheed, D., DeWeese, A., DeMauro, A. A., Cham, H., & Greenberg, M. T. (2017). Impacts of the CARE for teachers program on teachers' social and emotional competence and classroom interactions. *Journal of Educational Psychology, 109*(7), 1010–1028. https://doi.org/10.1037/edu0000187

Jennings, P. A., Frank, J. L., Snowberg, K. E., Coccia, M. A., & Greenberg, M. T. (2013). Improving classroom learning environments by Cultivating Awareness and Resilience in Education (CARE): Results of a randomized controlled trial. *School Psychology Quarterly, 28*(4), 374–390. https://doi.org/10.1037/spq0000035

Jennings, P. A., Snowberg, K. E., Coccia, M. A., & Greenberg, M. T. (2011). Improving classroom learning environments by cultivating awareness and resilience in education (CARE): Results of two pilot studies. *The Journal of Classroom Interaction, 28*(4), 374–390. https://doi.org/10.1037/spq0000035

Jiang, N., Sato, T., Hara, T., Takedomi, Y., Ozaki, I., & Yamada, S. (2003). Correlations between trait anxiety, personality and fatigue: Study based on the temperament and character inventory. *Journal of Psychosomatic Research, 55*(6), 493–500. https://doi.org/10.1016/s0022-3999(03)00021-7

Jurado, D., Gurpegui, M., Moreno, O., Fernández, M. C., Luna, J. D., & Gálvez, R. (2005). Association of personality and work conditions with depressive symptoms. *European Psychiatry, 20*(3), 213–222. https://doi.org/10.1016/j.eurpsy.2004.12.009

Kabat-Zinn, J. (1990). *Full catastrophe living*. Delacorte.

Kerr, C. E., Sacchet, M. D., Lazar, S. W., Moore, C. I., & Jones, S. R. (2013). Mindfulness starts with the body: Somatosensory attention and top-down modulation of cortical alpha rhythms in mindfulness meditation. *Frontiers in Human Neuroscience, 7*, 12. https://doi.org/10.3389/fnhum.2013.00012

Khoury, B., Sharma, M., Rush, S. E., & Fournier, C. (2015). Mindfulness-based stress reduction for healthy individuals: A meta-analysis. *Journal of Psychosomatic Research, 78*(6), 519–528. https://doi.org/10.1016/j.jpsychores.2015.03.009

Kidger, J., Brockman, R., Tilling, K., Campbell, R., Ford, T., Araya, R., ... & Gunnell, D. (2016). Teachers' wellbeing and depressive symptoms, and associated risk factors: A large cross-sectional study in English secondary schools. *Journal of Affective Disorders*, *192*, 76–82. https://doi.org/10.1016/j.jad.2015.11.054

Kim, L., Jörg, V., & Klassen, R. M. (2019). A meta-analysis of the effects of teacher personality on teacher effectiveness and burnout. *Educational Psychology Review, 31*(1), 163–195. https://doi.org/10.1007/s10648-018-9458-2

Klingbeil, D. A., & Renshaw, T. L. (2018). Mindfulness-based interventions for teachers: A meta-analysis of the emerging evidence base. *School Psychology Quarterly, 33*(4), 501–511. https://doi.org/10.1037/spq0000291

Kraines, M. A., Peterson, S. K., Tremont, G. N., Beard, C., Brewer, J. A., & Uebelacker, L. A. (2022). Mindfulness-based stress reduction and mindfulness-based cognitive therapy for depression: A systematic review of cognitive outcomes. *Mindfulness, 13*(5), 1126–1135. https://doi.org/10.1007/s12671-022-01841-7

Krick, A., & Felfe, J. (2020). Who benefits from mindfulness? The moderating role of personality and social norms for the effectiveness on psychological and physiological outcomes among police officers. *Journal of Occupational Health Psychology, 25*(2), 99–112. https://doi.org/10.1037/ocp0000159

Kuyken, W., Ball, S., Crane, C., Ganguli, P., Jones, B., Montero-Marin, J., Nuthall, E., Raja, A., Taylor, L., Tudor, K., Viner, R. M., Allwood, M., Aukland, L., Dunning, D., Casey, T., Dalrymple, N., De Wilde, K., Farley, E. R., Harper, J., … Williams, J. M. G. (2022). Effectiveness of universal school-based mindfulness training compared with normal school provision on teacher mental health and school climate: Results of the MYRIAD cluster randomised controlled trial. *Evidence-Based Mental Health*, *25*(3), 125–134. https://doi.org/10.1136/ebmental-2022-300424

Lakens, D. (2013). Calculating and reporting effect sizes to facilitate cumulative science: A practical primer for t-tests and ANOVAs. *Frontiers in Psychology, 4*, 863. https://doi.org/10.3389/fpsyg.2013.00863

Layous, K., Kurtz, J. L., Wildschut, T., & Sedikides, C. (2022). The effect of a multi-week nostalgia intervention on well-being: Mechanisms and moderation. *Emotion*, *22*(8), 1952–1968. https://doi.org/10.1037/emo0000817

Liu, Z., Li, Y., Zhu, W., He, Y., & Dong-Bin, L. (2022). A meta-analysis of teachers' job burnout and big five personality traits.

Frontiers in Education, 7, 822659. https://doi.org/10.3389/feduc.2022.822659

Lloyd, M., Sugden, N., Thomas, M., McGrath, A., & Skilbeck, C. (2023). The structure of the hospital anxiety and depression scale: Theoretical and methodological considerations. *British Journal of Psychology, 114*(2), 457–475. https://doi.org/10.1111/bjop.12637

Madigan, D. J., & Curran, T. (2021). Does burnout affect academic achievement? A meta-analysis of over 100,000 students. *Educational Psychology Review, 33*(2), 387–405. https://doi.org/10.1007/s10648-020-09533-1

Madigan, D. J., & Kim, L. (2021). Does teacher burnout affect students? A systematic review of its association with academic achievement and student-reported outcomes. *International Journal of Educational Research, 105*, 101714. https://doi.org/10.1016/j.ijer.2020.101714

Matiz, A., Crescentini, C., Bergamasco, M., Budai, R., & Fabbro, F. (2021). Inter-brain co-activations during mindfulness meditation. Implications for devotional and clinical settings. *Consciousness and Cognition, 95*, 103210. https://doi.org/10.1016/j.concog.2021.103210

Matiz, A., Fabbro, F., & Crescentini, C. (2018). Single vs. group mindfulness meditation: Effects on personality, religiousness/spirituality, and mindfulness skills. *Mindfulness, 9*(4), 1236–1244. https://doi.org/10.1007/s12671-017-0865-0

Matiz, A., Fabbro, F., & Crescentini, C. (2024). Mindfulness through storytelling for mental health of primary school children: Impact on acceptability and its associations with personality. *Psychology Research and Behavior Management, 17*, 1757–1774. https://doi.org/10.2147/PRBM.S441494

Matiz, A., Fabbro, F., Paschetto, A., Cantone, D., Paolone, A. R., & Crescentini, C. (2020). Positive impact of mindfulness meditation on mental health of female teachers during the COVID-19 outbreak in italy. *International Journal of Environmental Research and Public Health, 17*(18), 6450. https://doi.org/10.3390/ijerph17186450

Matsudaira, T., & Kitamura, T. (2006). Personality traits as risk factors of depression and anxiety among Japanese students. *Journal of Clinical Psychology, 62*(1), 97–109. https://doi.org/10.1002/jclp.20215

Mehling, W., Price, C., Daubenmier, J., Acree, M., Bartmess, E., & Stewart, A. L. (2012). The Multidimensional Assessment of Interoceptive Awareness (MAIA). *PLoS ONE, 7*(11), e48230. https://doi.org/10.1371/journal.pone.0048230

Melis, M., Schroyen, G., Pollefeyt, J., Raes, F., Smeets, A., Sunaert, S., Deprez, S., & Van Der Gucht, K. (2022). The impact of mindfulness-based interventions on brain functional connectivity: A systematic review. *Mindfulness, 13*(8), 1857–1875. https://doi.org/10.1007/s12671-022-01919-2

Mendelson, T., Webb, L., Artola, A., Molinaro, M., & Sibinga, E. (2023). An online mindfulness program for teachers: A feasibility study of the DeStress Monday at School program. *Mindfulness, 14*(6), 1419–1434. https://doi.org/10.1007/s12671-023-02142-3

Mijakoski, D., Cheptea, D., Marca, S. C., Shoman, Y., Caglayan, C., Bugge, M. D., Gnesi, M., Godderis, L., Kiran, S., McElvenny, D. M., Mediouni, Z., Mesot, O., Minov, J., Nena, E., Otelea, M., Pranjic, N., Mehlum, I. S., van der Molen, H. F., & Canu, I. G. (2022). Determinants of burnout among teachers: A systematic review of longitudinal studies. *International Journal of Environmental Research and Public Health, 19*(9), 5776. https://doi.org/10.3390/ijerph19095776

Mojsa-Kaja, J., Golonka, K., & Marek, T. (2015). Job burnout and engagement among teachers - Worklife areas and personality traits as predictors of relationships with work. *International Journal of Occupational Medicine and Environmental Health, 28*(1), 102–119. https://doi.org/10.13075/ijomeh.1896.00238

Moreno-Abril, O., Luna-del-Castillo, J.deD., Fernández-Molina, C., Jurado, D., Gurpegui, M., Lardelli-Claret, P., & Gálvez-Vargas, R. (2007). Factors associated with psychiatric morbidity in Spanish schoolteachers. *Occupational Medicine, 57*(3), 194–202https://doi.org/10.1093/occmed/kqm013

Myers B., & McCaulley M. (1985). *Manual: A guide to the development and use of the Myers-Briggs Type Indicator.* Consulting Psychologist Press, Inc.

Nyklíček, I., & Irrmischer, M. (2017). For whom does mindfulness-based stress reduction work? Moderating effects of personality. *Mindfulness*, *8*(4), 1106–1116. https://doi.org/10.1007/s12671-017-0687-0

OECD (2020). *TALIS (The Teaching and Learning International Survey) 2018 Results (Volume II): Teachers and School Leaders as Valued Professionals.* OECD Publishing.

Ouellette, R. R., Frazier, S. L., Shernoff, E. S., Cappella, E., Mehta, T., Maríñez-Lora, A. M., Cua, G., & Atkins, M. S. (2018). Teacher job stress and satisfaction in urban schools: Disentangling individual-, classroom-, and organizational-level influences. *Behavior Therapy, 49*(4), 494–508. https://doi.org/10.1016/j.beth.2017.11.011

Ozamiz-Etxebarria, N., Idoiaga Mondragon, N., Bueno-Notivol, J., Pérez-Moreno, M., & Santabárbara, J. (2021). Prevalence of anxiety, depression, and stress among teachers during the covid-19 pandemic: A rapid systematic review with meta-analysis. *Brain Sciences, 11*(9), 1172. https://doi.org/10.3390/brainsci11091172

Park, S., Song, Y. M., Ko, G. N., Jhung, K., Ha, K., Lee, Y. R., & Kim, Y. (2016). The relationship between personality, sense of efficacy, and stress in Korean teachers. *Psychiatry Investigation, 13*(5), 566–570. https://doi.org/10.4306/pi.2016.13.5.566

Paudel, N. R., Adhikari, B. A., Prakash, K. C., Kyrönlahti, S., Nygård, C. H., & Neupane, S. (2022). Effectiveness of interventions on the stress management of schoolteachers: A systematic review and meta-analysis. *Occupational and Environmental Medicine, 79*(7), 477–485. https://doi.org/10.1136/oemed-2021-108019

Pernet, C. R., Belov, N., Delorme, A., & Zammit, A. (2021). Mindfulness related changes in grey matter: A systematic review and meta-analysis. *Brain Imaging and Behavior, 15*(5), 2720–2730. https://doi.org/10.1007/s11682-021-00453-4

Posner, M. I., Rothbart, M. K., & Tang, Y. (2015). Enhancing attention through training. *Current Opinion in Behavioral Sciences, 4*, 1–5. https://doi.org/10.1016/j.cobeha.2014.12.008

Poulin, P. A., Mackenzie, C. S., Soloway, G. B., & Karayolas, E. (2008). Mindfulness training as an evidenced-based approach to reducing stress and promoting well-being among human services professionals. *International Journal of Health Promotion and Education, 46*(2), 72–80. https://doi.org/10.1080/14635240.2008.10708132

Ramanaiah, N. V., Rielage, J. K., & Cheng, Y. (2002). Cloninger's Temperament and Character Inventory and the NEO Five-Factor Inventory. *Psychological Reports, 90*(3_suppl), 1059–1063. https://doi.org/10.2466/pr0.2002.90.3c.1059

Redín, C. I., & Erro-Garcés, A. (2020). Stress in teaching professionals across Europe. *International Journal of Educational Research, 103*, 101623. https://doi.org/10.1016/j.ijer.2020.101623

Roeser, R. W., Skinner, E., Beers, J., & Jennings, P. A. (2012). Mindfulness training and teachers' professional development: An emerging area of research and practice. *Child Development Perspectives, 6*(2), 167–173. https://doi.org/10.1111/j.1750-8606.2012.00238.x

Roloff, J., Kirstges, J., Grund, S., & Klusmann, U. (2022). How strongly is personality associated with burnout among teachers?

A Meta-Analysis. *Educational Psychology Review, 34*(3), 1613–1650. https://doi.org/10.1007/s10648-022-09672-7

Rubie-Davies, C. M., Flint, A., & McDonald, L. G. (2012). Teacher beliefs, teacher characteristics, and school contextual factors: What are the relationships? *The British Journal of Educational Psychology, 82*(2), 270–288. https://doi.org/10.1111/j.2044-8279.2011.02025.x

Silva, D. F. O., Cobucci, R. N., Lima, S. C. V. C., & de Andrade, F. B. (2021). Prevalence of anxiety, depression, and stress among teachers during the COVID-19 pandemic: A PRISMA-compliant systematic review. *Medicine, 100*(44), e27684. https://doi.org/10.1097/MD.0000000000027684

Skaalvik, E. M., & Skaalvik, S. (2016). Teacher stress and teacher self-efficacy as predictors of engagement, emotional exhaustion, and motivation to leave the teaching profession. *Creative Education, 07*(13), 1785–1799. https://doi.org/10.4236/ce.2016.713182

Solhaug, I., de Vibe, M., Friborg, O., Sørlie, T., Tyssen, R., Bjørndal, A., & Rosenvinge, J. H. (2019). Long-term mental health effects of mindfulness training: A 4-year follow-up study. *Mindfulness, 10*(8), 1661–1672. https://doi.org/10.1007/s12671-019-01100-2

Sommers-Spijkerman, M., Austin, J., Bohlmeijer, E., & Pots, W. (2021). New evidence in the booming field of online mindfulness: An updated meta-analysis of randomized controlled trials. *JMIR Mental Health, 8*(7), e28168. https://doi.org/10.2196/28168

Sorensen, L. C., & Ladd, H. F. (2020). The hidden costs of teacher turnover. *AERA Open, 6*(1), 233285842090581. https://doi.org/10.1177/2332858420905812

Stern, A. F. (2014). The hospital anxiety and depression scale. *Occupational Medicine, 64*(5), 393–394. https://doi.org/10.1093/occmed/kqu024

Sy, D., Steiner, E. D., & Woo, A. (2023). *State of the American teacher survey: 2023 technical documentation and survey results*. RAND Corporation. 10.7249/RRA1108-7

Tanaka, E., Sakamoto, S., Kijima, N., & Kitamura, T. (1998). Different personalities between depression and anxiety. *Journal of Clinical Psychology, 54*(8), 1043–1051. https://doi.org/10.1002/(sici)1097-4679(199812)54:8/3C1043::aid-jclp4/3E3.0.co;2-a

Tang, Y. Y., Hölzel, B. K., & Posner, M. I. (2015). The neuroscience of mindfulness meditation. *Nature Reviews. Neuroscience, 16*(4), 213–225. https://doi.org/10.1038/nrn3916

Tomasino, B., & Fabbro, F. (2016). Increases in the right dorsolateral prefrontal cortex and decreases the rostral prefrontal cortex activation after-8 weeks of focused attention-based mindfulness meditation. *Brain and Cognition, 102*, 46–54. https://doi.org/10.1016/j.bandc.2015.12.004

Tomasino, B., Campanella, F., & Fabbro, F. (2016). Medial orbital gyrus modulation during spatial perspective changes: Pre- vs. post-8 weeks mindfulness meditation. *Consciousness and Cognition, 40*, 147–158. https://doi.org/10.1016/j.concog.2016.01.006

Travers, C. (2017). Current knowledge on the nature, prevalence, sources and potential impact of teacher stress. In T. M. McIntyre, S. E. McIntyre, & D. J. Francis (Eds.), *Educator stress: An occupational health perspective* (pp. 23–54). Springer International Publishing. https://doi.org/10.1007/978-3-319-53053-6_2

Tschannen-Moran, M., & Woolfolk Hoy, A. W. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and Teacher Education, 17*(7), 783–805. https://doi.org/10.1016/s0742-051x(01)00036-1

Vago, D. R., & Silbersweig, D. A. (2012). Self-awareness, self-regulation, and self-transcendence (S-ART): A framework for understanding the neurobiological mechanisms of mindfulness. *Frontiers in Human Neuroscience, 6*, 296. https://doi.org/10.3389/fnhum.2012.00296

Van Droogenbroeck, F., Spruyt, B., Quittre, V., & Lafontaine, D. (2021). Does the school context really matter for teacher burnout? Review of existing multilevel teacher burnout research and results from the teaching and learning international survey 2018 in the Flemish-and French-speaking communities of Belgium. *Educational Researcher, 50*(5), 290–305. https://doi.org/10.3102/0013189X21992361

Verhaeghen, P. (2018). The mindfulness manifold: Exploring how self-preoccupation, self-compassion, and self-transcendence translate mindfulness into positive psychological outcomes. *Mindfulness, 10*(1), 131–145. https://doi.org/10.1007/s12671-018-0959-3

Von Der Embse, N. P., Ryan, S. V., Gibbs, T., & Mankin, A. (2019). Teacher stress interventions: A systematic review. *Psychology in the Schools, 56*(8), 1328–1343. https://doi.org/10.1002/pits.22279

Von Muenchhausen, S., Braeunig, M., Pfeifer, R., Göritz, A. S., Bauer, J., Lahmann, C., & Wuensch, A. (2021). Teacher self-efficacy and mental health-their intricate relation to professional resources and attitudes in an established manual-based psychological group program. *Frontiers in Psychiatry, 12*, 510183. https://doi.org/10.3389/fpsyt.2021.510183

Westphal, A., Kalinowski, E., Hoferichter, C. J., & Vock, M. (2022). K−12 teachers' stress and burnout during the COVID-19 pandemic: A systematic review. *Frontiers in Psychology, 13*, 920326. https://doi.org/10.3389/fpsyg.2022.920326

Wheeler, M. S., Arnkoff, D. B., & Glass, C. R. (2017). The neuroscience of mindfulness: How mindfulness alters the brain and facilitates emotion regulation. *Mindfulness, 8*(6), 1471–1487. https://doi.org/10.1007/s12671-017-0742-x

Witarto, B. S., Visuddho, V., Witarto, A. P., Bestari, D., Sawitri, B., Melapi, T. A. S., & Wungu, C. D. K. (2022). Effectiveness of online mindfulness-based interventions in improving mental health during the COVID-19 pandemic: A systematic review and meta-analysis of randomized controlled trials. *PLoS ONE, 17*(9), e0274177. https://doi.org/10.1371/journal.pone.0274177

Wong, Y. P., & Zhang, L. (2014). Perceived school culture, personality types, and wellbeing among kindergarten teachers in Hong Kong. *Australasian Journal of Early Childhood, 39*(2), 100–108. https://doi.org/10.1177/183693911403900213

Young, K. S., Van Der Velden, A. M., Craske, M. G., Pallesen, K. J., Fjorback, L. O., Roepstorff, A., & Parsons, C. E. (2018). The impact of mindfulness-based interventions on brain activity: A systematic review of functional magnetic resonance imaging studies. *Neuroscience & Biobehavioral Reviews, 84*, 424–433. https://doi.org/10.1016/j.neubiorev.2017.08.003

Zarate, K., Maggin, D. M., & Passmore, A. (2019). Meta-analysis of mindfulness training on teacher well-being. *Psychology in the Schools, 56*(10), 1700–1715. https://doi.org/10.1002/pits.22308

Zhang, D., Lee, E. K., Mak, E. C., Ho, C. Y., & Wong, S. Y. (2021a). Mindfulness-based interventions: An overall review. *British Medical Bulletin, 138*(1), 41–57. https://doi.org/10.1093/bmb/ldab005

Zhang, X., Zhao, C., Xu, Y., Liu, S., & Wu, Z. (2021b). Kernel causality among teacher self-efficacy, job satisfaction, school climate, and workplace well-being and stress in TALIS. *Frontiers in Psychology, 12*, 694961. https://doi.org/10.3389/fpsyg.2021.694961

Zigmond, A. S., & Snaith, R. P. (1983). The Hospital Anxiety and Depression Scale. *Acta Psychiatrica Scandinavica, 67*(6), 361–370. https://doi.org/10.1111/j.1600-0447.1983.tb09716.x