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Psychometric Properties of the Mindfulness in Teaching Scale in a Sample of Portuguese Teachers

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Abstract

Objectives In recent years, there has been an increasing interest in scientific research examining the impact of mindfulness on teacher well-being and its implications for education. Thus, it is vital to have psychometrically robust measures suitable for educational settings. The current study aimed to validate a Portuguese version of the Mindfulness in Teaching Scale (MTS-PT).

Method The MTS-PT was administered to a sample of teachers ($n = 863$), along with self-report measures and indicators of teacher well-being: job satisfaction, positive and negative affect, loneliness and positive solitude, self-compassion, and dispositional mindfulness. We examined the MTS-PT factorial validity, the reliability of its facets, convergent and divergent validity, factorial invariance, and assessed mean differences of its scores across teachers' sociodemographic characteristics.

Results Confirmatory Factor Analysis supported the original 2-related-factor structure of the MTS distinguishing *Teacher Intrapersonal Mindfulness* and *Teacher Interpersonal Mindfulness*. This model was invariant across sex, teaching years and educational levels taught by the participating teachers. Inferential tests revealed that more experienced teachers reported higher levels of *intrapersonal* mindfulness while elementary school teachers reported higher levels of *interpersonal* mindfulness. Reliability values were adequate to good in both dimensions. The MTS-PT subscales correlated positively with teacher well-being indicators, and inversely with negative affect and loneliness.

Conclusions Overall, findings support the psychometric adequacy of the MTS-PT, suggesting that it is a reliable and valid self-report measure of teachers' mindfulness. This instrument can bring relevant insights about teachers' mindfulness facets and provide useful indications for the development and assessment of mindfulness-based interventions for teachers.

Keywords Mindfulness in teaching · Teacher intrapersonal mindfulness · Teacher interpersonal mindfulness · Portuguese teachers

The interest in the scientific study of mindfulness has grown exponentially over the past two decades in several areas, including education (Baminiwatta & Solangaarachchi, 2021). Although multiple definitions can be found (Khoury

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et al., 2017) in Western literature, one of the most quoted describes mindfulness as "the awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment" (Kabat-Zinn, 2003, p. 145). Scientific literature has shown the efficacy of mindfulness-based interventions (MBI) for the general nonclinical adult population to improve health and well-being (Querstret et al., 2020; Singer & Engert, 2019) and in clinical contexts, describing benefits for mental and physical disorders such as anxiety, depression, stress, insomnia, hypertension, weight control, or chronic pain (Zhang et al., 2021).

Similarly, in the field of education, MBIs are showing positive outcomes for children and adolescents, increasing their prosocial behaviors, leading to greater peer acceptance and positive relationships, decreasing anger, stress, anxiety, attention problems or ADHD behaviors, and conduct behaviors, and improving resilience, executive function, concentration, behavior management, and sleep quality (Cheang et al., 2019; McKeering & Hwang, 2019; Phan et al., 2022). At the same time, systematic reviews on MBI for teachers report effectiveness in promoting teacher well-being and job satisfaction by reducing negative outcomes, such as self-perceived stress, burnout, overall perceived distress, and anxiety (Emerson et al., 2017; Hidajat et al., 2023; Hwang et al., 2017; Lomas et al., 2017). These studies are aligned with a recent report from OECD that calls attention to "an urgent need to better understand the well-being of teachers and its implications on the teaching and learning nexus" (Viac & Fraser, 2020, p. 4). Therefore, assessing teachers' mindfulness is an important step in evaluating the efficacy of MBI for teachers and its impact on teacher well-being (Lavelle-Heineberg, 2016).

Until recently, the study on the effects of MBI on teachers was assessed using general mindfulness scales, such as the Mindful Attention and Awareness Scale (MAAS; Brown & Ryan, 2003) or the Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2008); moreover, these measures assess mindfulness as a trait and are focused on the *intrapersonal* dimensions of mindfulness. Thus, they were not designed specifically to measure mindfulness in the educational context (Frank et al., 2016; Lavelle-Heineberg, 2016).

In order to bridge this gap in the educational field, a new measurement tool – the Mindfulness in Teaching Scale (Frank et al., 2016) – was recently developed, assessing teachers' mindfulness in the school setting. It consists of 14 items grouped into 2 factors measuring *Teacher Intrapersonal Mindfulness* and *Teacher Interpersonal Mindfulness*. The first factor relates to present-centered awareness (Kabat-Zinn, 2013), including items that involve teacher awareness, attentiveness, and focus on the present moment in the school context (e.g., classroom). The *interpersonal* factor focuses on the teacher-student relationship within the classroom

setting and includes items that represent the teacher's open disposition, acceptance, and receptiveness during interactions with students. In the original study, validity was supported through confirmatory factor analysis (CFA), 6-month test–retest reliability, concurrent validity, and predictive validity; the reliability of both subscales was good for the *intrapersonal* and *interpersonal* dimensions, 0.87 and 0.71, respectively.

Since MTS addressed a very important gap, it has already been adapted and validated in Spain (Moyano et al., 2021), Korea (Kim & Singh, 2018), Turkey (Gördesli et al., 2019), and China (Li et al., 2019; Ma et al., 2022). Overall findings support that the MTS is a valid and reliable measurement tool. All these studies supported the original 2-factor structure of the MTS, with more robust reliability values for the *intrapersonal* subscale (α values between 0.79 and 0.93) in comparison to the *interpersonal* subscale (α-values between 0.61 and 0.74). The Turkish and Chinese versions, as in the original study, also found good test–retest reliability. In terms of validity evidence, the MTS correlated positively with: perceived teaching self-efficacy (Spanish version); dispositional mindfulness (Turkish version); attitudes, self-esteem, self-efficacy, and life satisfaction (Chinese version: Li et al., 2019); teaching efficacy, teaching satisfaction, and dispositional mindfulness, as well as negative correlations with teacher burnout, depression, anxiety, and stress (Chinese version: Ma et al., 2022); whereas, the Korean version (Kim & Singh, 2018) found positive correlations with dispositional mindfulness, teacher efficacy, and job satisfaction, as well as negative correlations with job stress and teacher burnout.

Although there are several self-report measures adapted and validated to assess the construct of mindfulness for the general population in Portugal (e.g., MAAS; Gregório & Pinto-Gouveia, 2013) they are not designed specifically to measure teachers' mindfulness within the school setting. Given the growing importance of mindfulness in the field of education it is essential to have assessment tools with suitable psychometric properties and culturally adapted to the context where they are employed. Therefore, the aim of the present study was to adapt and validate the MTS among Portuguese teachers.

First, we conducted a CFA to examine the adequacy of the MTS-PT's factorial structure as well as its internal consistency. We aimed to test if the 2-factor structure previously proposed by Frank et al. (2016) is also replicated in the Portuguese cultural context. Accordingly, two models were compared: (a) a 1-factor model, and (b) the 2-related-factor model originally proposed by Frank et al. (2016), in which Mindfulness in Teaching comprises 2 factors: *Teacher Intrapersonal Mindfulness* and *Teacher Interpersonal Mindfulness*. Second, a multi-group factor analysis was performed to assess if the best fitting model was

invariant across teachers' sociodemographic characteristics: educational level taught (as recommended by Frank et al., 2016), teachers' sex and teaching years. Third, we examined whether the levels of the MTS-PTs' *intrapersonal* and *interpersonal* dimensions reported by participating teachers were statistically different between groups, considering the abovementioned sociodemographic characteristics. Subsequently, to assess MTS-PT's further evidence of validity, we tested the relationship between its *intrapersonal* and *interpersonal* dimensions with job satisfaction, positive and negative affect, positive solitude and loneliness, self-compassion, and dispositional mindfulness. We expected that the higher the level of *Teacher Intrapersonal Mindfulness* and *Teacher Interpersonal Mindfulness*, the greater the indicators of Subjective Well-being (i.e., higher levels of job satisfaction, positive affect, and lower levels of negative affect), and other indicators of Teacher Well-being (i.e., higher levels of dispositional mindfulness, self-compassion, positive solitude, and lower levels of loneliness), reported by teachers.

Method

Participants

Participants in this study were teachers from the public (83.4%), private (11.8%), and both (4.7%) sectors of the school system in Portugal (*n* = 863). They were mainly women (82.4%) with a mean age of 50.1 years (*SD* = 7.8, range = 22 to 67 years), and with a mean of 24.8 years teaching (*SD* = 8.9, range = 1 to 45 years). They taught in elementary school (21.4%), middle school (38.7%), and high school (39.9%), from all school regions of mainland Portugal, North (31.8%), Center (16.7%), Lisbon region (18.1%), Alentejo (6.8%), Algarve (4.9%), and islands, Azores (14.7%) and Madeira (6%); 1% worked in more than one region. Table 1 shows more details about the sample characteristics.

Procedure

The study protocol, with all the questionnaires, was submitted and approved by the Ethics Committee of the Faculty of Psychology and Educational Sciences of the University of Coimbra (CEDI/FPCEUC:69/R_5). We had the authorization to disseminate the study from the Portuguese General Department of Education, and the Azores and Madeira Regional Education Departments. For inviting teachers' participation, the study was then presented, by email, to the Head of the educational organizations with a link to a data collection website (LimeSurvey). The survey link was also shared on social networks, including teacher forums and Facebook pages. The online protocol presented, on the

Table 1 Sample's socio-demographic characteristics (*n* = 863)

	n	%
Sex		
Men	152	17.6
Women	711	82.4
Age		
M	50.1	–
SD	7.8	–
Marital Status		
Single	152	17.6
Married	572	66.3
Divorced	127	14.7
Widowed	12	1.4
Residence		
Urban	396	45.9
Rural	467	54.1
Education degree		
Bachelor's degree	630	73.0
Master's degree	195	22.6
PhD	18	2.1
Other	20	2.3
Teaching Years		
M	24.8	–
SD	8.9	–
Type of contract		
Temporary	329	30.0
Permanent	767	69.9
Type of School		
Public	916	83.4
Private	130	11.8
Both	52	4.7
School Region		
North	274	31.8
Center	144	16.7
Lisbon region	156	18.1
Alentejo	61	6.8
Algarve	42	4.9
Azores	127	14.7
Madeira	52	6.0
More than 1 region	9	1.0
Education level taught		
Elementary school	185	21.4
Middle school	334	38.7
High school	344	39.9

first page, the research objectives, inclusion criteria, and ethical issues concerning the study. Participants were also informed that their participation was voluntary and anonymous. Only teachers who agreed to the terms and conditions of the study protocol completed the survey comprised of questionnaires measuring job satisfaction, mindfulness in

teaching, loneliness and positive solitude, self-compassion, positive and negative affect, dispositional mindfulness, and a socio-demographic questionnaire.

Measures

Mindfulness in Teaching Scale (MTS)

The Mindfulness in Teaching Scale (Frank et al., 2016) is a self-report measure comprised of 14 items organized in 2 dimensions: *Teacher Intrapersonal Mindfulness* (9 items; e.g., "I am often so busy thinking about other things that I am not really listening to my students") and *Teacher Interpersonal Mindfulness* (5 items; e.g., "When I'm upset with my students, I notice how I am feeling before I take action"). Items are rated on a 5-point Likert scale ranging from 1 (*Never true*) to 5 (*Always true*). After reverse coding the items of the *intrapersonal* dimension, the total score of each dimension is obtained by summing the respective items, with higher scores indicating greater levels of *Teacher Intrapersonal Mindfulness* and *Teacher Interpersonal Mindfulness*. The Portuguese version of the MTS was developed after obtaining authorization from the authors of the original version to translate and validate the scale. First, to help improve the content validity, the original English version of the MTS was independently translated by two Portuguese experts on mindfulness, both in research and training and fluent in English. Then, the two translated versions were analyzed and discussed to get a single version that was subsequently translated back into English by an English-native speaker, fluent in Portuguese. Finally, the original and the back-translated versions were analyzed, with all items achieving semantic equivalence with the original ones. This final version was then pilot-tested with 12 teachers with similar characteristics to those of the target population to test face validity and identify possible doubts, both in the comprehensibility of the items and in the way of completion (cognitive debriefing); this final version was used in the study.

Satisfaction with Teachers' Professional Life Scale (SWTPLS)

This instrument is an adaptation of the Portuguese version of the Satisfaction with Life Scale (Diener et al., 1985; Portuguese version: Simões, 1992) for teachers (Albuquerque et al., 2021a, b) and was used to assess teachers' satisfaction with their job (e.g., "I am satisfied with my teacher life"). This 5 items questionnaire is rated on a 5-point Likert scale, ranging from 1 (*I completely disagree*) to 5 (*I completely agree*), with a higher total score indicating greater job satisfaction. Both in the original study and in the present study, the SWTPLS showed good reliability ($\alpha = 0.83$) and ($\alpha = 0.89$), respectively.

Mindful Attention and Awareness Scale (MAAS)

The Portuguese version of the MAASe (Brown & Ryan, 2003; Portuguese version: Gregório & Pinto-Gouveia, 2013) was used to assess teachers' mindfulness in their everyday life. The MAAS contains 15 items addressing cognitive, emotional, physical, interpersonal, and general domains with a single total score, rated on a 6-point Likert scale, ranging from 1 (*Almost always*) to 6 (*Almost never*), with higher scores indicating greater mindfulness (e.g., "I could be experiencing some emotion and not be conscious of it until some time later"). The original MAAS has shown good reliability ($\alpha = 0.87$). Similarly, the Portuguese version of the MAAS has demonstrated excellent internal consistency ($\alpha = 0.90$), and in the current study, was also excellent ($\alpha = 0.92$).

Positive and Negative Affect Schedule (PANAS)

The Positive and Negative Affect Schedule (Watson et al., 1988; Portuguese version: Simões, 1993) was used to measure teachers' positive and negative affect. The version of the PANAS used in this study consists of the original 20 items, divided into two subscales, each with 10 items for positive affect (e.g., "interested", "excited", "active") and 10 items for negative affect (e.g., "distressed", "upset", "irritable"). Items are rated on a 5-point Likert scale, ranging from 1 (*Very slightly or not at all*) to 5 (*Extremely*). The negative affect and the positive affect subscales are considered independent dimensions and rated separately. Higher values indicated higher negative or positive affect. The Portuguese version of the PANAS has shown good reliability in a previous study with teachers (Albuquerque et al., 2012), (PA, $\alpha = 0.82$; NA, $\alpha = 0.85$), and in the present study was good (PA, $\alpha = 0.89$; NA, $\alpha = 0.89$).

Loneliness and Positive Solitude Scale (LPSS)

The Loneliness and Positive Solitude Scale (Chiodelli, 2021) was used to assess teachers' feelings of loneliness or positive solitude when being alone. It is a bi-dimensional self-report measure consisting of 10 items: one 5-item subscale measuring loneliness (e.g., "Spending time with myself is unsatisfactory because I would like to be with other people"), and one 5-item subscale measuring positive solitude (e.g., "Spending time with myself helps me to look at my projects more creatively"). The scale is rated on a 5-point Likert scale, ranging from 1 (*Never*) to 5 (*Always*) with higher scores in the loneliness dimension indicating a greater aversion to being alone, and higher scores in the positive solitude dimension a greater perspective of being alone as something

important and necessary. The LPSS revealed good reliability (loneliness, $\alpha = 0.79$, positive solitude, $\alpha = 0.85$) and construct validity in the original study, and in the present study reliability was good (loneliness, $\alpha = 0.80$; positive solitude, $\alpha = 0.85$).

Self-Compassion Scale – Short Form (SCS-SF)

Teachers' levels of self-compassion were assessed by the Portuguese version of the Self-Compassion Scale – short form (Raes et al., 2011; Portuguese version: Castilho et al., 2015). The SCS-SF has 12 items (e.g., "When I fail at something important to me I become consumed by feelings of inadequacy") measuring six components of self-compassion (i.e., self-kindness, self-judgment, common humanity, isolation, mindfulness, and over-identification), that are rated on a 5-point Likert scale, ranging from 1 (*Almost never*) to 5 (*Almost always*). Self-compassion scores are obtained after reverse coding negative items and estimating the mean of the 12 items, with higher scores indicating higher self-compassion. The original scale of the SCS-SF has shown good psychometric properties, with good reliability ($\alpha = 0.86$) and construct validity. The Portuguese version of the SCS-SF has shown good reliability ($\alpha = 0.89$), temporal stability ($r = 0.78$), and convergent validity. In the present study, reliability was good ($\alpha = 0.89$).

Data Analyses

All analyses were performed with the software program JASP (v. 0.18.1.0) (https://jasp-stats.org). First, descriptive statistics (e.g., frequencies, mean, standard deviation) were used to characterize participants' demographics and all variables assessed in this study, namely of the MTS-PT items. Skewness (*Sk*) and Kurtosis (*Ku*) for all ordinal and quantitative variables revealed an adequate approximation to the normality assumption ($Sk < |3|$ and $Ku < |8|$, cf. Kline (2016)).

Subsequently, a CFA was conducted to test the original MTS factorial structure: Factor 1: *Teacher Intrapersonal Mindfulness* (Items 1, 2, 3, 4, 5, 6, 7, 8, 9) and Factor 2: *Teacher Interpersonal Mindfulness* (Items 10, 11, 12, 13, 14). CFA models were fit using the Robust Diagonally Weighted Least Squares (RDWLS) estimator, which accounts for polychoric correlation matrices of Likert-type scales (Li, 2016). To determine model adjustment, multiple fit indices were used as indicated by Byrne (2016) and Kline (2016): the Chi-Square test (χ^2; ideally non-significant); the Chi-Square Critical Ratio ($\chi^2/df < 5$, ideally < 3); the Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI), both above 0.95; and the Root Mean Square Error of Approximation (RMSEA < 0.09). The reliability values were computed by Cronbach's alpha and McDonald's omega, following the recommendations of Murphy and Davidshofer (1988). The two competing models

(Model 1 and Model 2) were compared using the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC), with preference being given to the model with the lowest AIC and BIC value (Kline, 2016).

We then conducted multiple-group CFA to determine whether the best fitting model was invariant across teachers' sex (men versus women), teaching years (until 25 years versus more than 25 years) and educational levels taught (elementary school versus middle school versus high school). Both configural, metric and scalar invariance were tested. The existence of invariance was stablished by comparing the CFI and RMSEA indexes between the models, where differences less than 0.01 in CFI (ΔCFI ≥ 0.010) or less than 0.015 in RMSEA (ΔRMSEA ≤ 0.015), indicate invariance compared to the less-restrictive model (Chen, 2007).

Further, inferential statistical tests (*t*-tests, ANOVAs) were performed to determine whether the levels of the total scores of MTS-PT dimensions (*intrapersonal* and *interpersonal* mindfulness in teaching) were statistically different between groups, considering participating teachers' sex, teaching years and education level taught. Independent sample *t*-tests were used between men and women teachers and between teachers with less experience (until 25 teaching years) and the ones with more experience (more than 25 teaching years). Cohen's *d* was used to assess effect size, with values of 0.20, 0.50, and 0.80 representing small, medium, and large effects, respectively (Cohen, 1988). A one-way ANOVA was conducted to compare differences on the MTS-PT scores considering three educational levels taught by the participating teachers: elementary school, middle school, and high school. Eta squared was used as a measure of effect size, following Cohen's (1988) criteria: small effect ($\eta^2 < 0.01$), medium effect (η^2 between 0.02 and 0.06) and large effect ($\eta^2 > 0.14$).

Finally, to examine the convergent and divergent validity of MTS-PT and external correlates, we computed Pearson's correlation coefficients between the total scores obtained with the dimensions of the MTS-PT scale with teachers' job satisfaction, self-compassion, positive and negative affect, loneliness and positive solitude, and dispositional mindfulness. Pearson's correlation coefficients were interpreted according to Cohen's (1988) criteria, with $0.10 \leq r < 0.30$, $0.30 \leq r < 0.50$, and $r \geq 0.50$, being considered small, medium, and large correlation, respectively.

Results

Item Analysis

In Table 2, we present the descriptive statistics of the MTS-PT items, with mean values between 3.42 (Item 14) and 4.32 (Item 11). Since the response range was between 1 and 5,

mean values were above the theoretical center of the scale. The lowest means were observed in items 13 and 14, whose values came close to 3.5. Items 10 and 11 revealed a slight trend to skewness (−1.072 and −1.064, respectively) and kurtosis (1.174 and 1.719, respectively).

Confirmatory Factor Analysis

We conducted a CFA to examine the factor structure of the MTS-PT using the scores from both *intrapersonal* and *interpersonal* dimensions. Considering the original and previous validation studies of the MTS, two factor models for the internal structure of the MTS-PT were tested and compared: (a) Model 1 (1-factor model), and (b) Model 2 (2-related-factor model). As shown in Table 3, Model 1 reveals a less-than-desired fit: χ^2/df value of 6.76, which is higher than 5, indicates a poor fit; the CFI and the TLI with values of 0.92 and 0.93, respectively, both below the cut-off of 0.95; only the RMSEA value of 0.075, which is lower than 0.09, presented an adequate fit. The next step was to test Model 2. This model achieved a good fit: χ^2/df of 3.28, which is lower than 5, but still not achieving the ideal value below 3; the CFI and TLI values of 0.96 and 0.97, respectively, both above 0.95; and the RMSEA value of 0.051.

Then, the two competing models (Model 1 and Model 2) were compared. Based on the AIC and BIC values, Model 2 presents a better fit than Model 1 ($AIC_{Model2} = 27{,}776.467 < AIC_{Model1} = 28{,}092.403$) and ($BIC_{Model2} = 27{,}981.165 < BIC_{Model1} = 28{,}292.340$).

In Fig. 1, we present the path diagram of the 2-factor structure with a positive and moderate correlation between the 2 factors of 0.42, which suggests that despite their relationship, these 2 dimensions are relatively independent of each other. As demonstrated in Table 4, standardized weights ranged from 0.08 (Item 12) to 0.80 (Item 11), both from the *interpersonal* dimension. Item 12 was explained by the *interpersonal* dimension, but with a very low percentage of explained variance (0.08). We provide, in Supplementary Material, the fit of a model and the loadings of all items, if Item 12 is omitted from the scale.

Model Invariance

We conducted multiple group CFA to examine whether the best fitting model for MTS-PT internal structure, the 2-related-factor model, was invariant across teachers' sex (two levels: men and women), teaching years (two levels: until 25 years and more than 25 years) and educational levels taught (three levels: elementary school, middle school, and high school).

Goodness-of-fit indexes supported configural invariance of the model across sex (Table 5). Then, metric invariance or weak invariance was also tested and showed a good fit to the data and a minimal change on fit indices (ΔCFI = −0.005; ΔRMSEA = 0.003) in comparison with the configural invariance model. Scalar invariance or strong invariance was also supported, with a good model fit and a minimal change on fit indices (ΔCFI = 0; ΔRMSEA = −0.003) in comparison to the metric invariance model.

Concerning teaching years and education level taught by the participating teachers (Table 5), goodness-of-fit indexes also supported configural, metric and scalar invariance of the model.

Group Comparison

We conducted an independent sample *t*-tests to examine whether the levels of the total scores of MTS-PT *intrapersonal* and *interpersonal* dimensions were statistically different between men (n = 152) and women (n = 711) teachers, and between teachers with up to 25 years of teaching

Table 2 Descriptive statistics of the MTS-PT items

Items	M (SD)	Range	Skewness	Kurtosis
1	4.05 (0.87)	1–5	−0.678	0.009
2	4.17 (0.77)	1–5	−0.744	0.545
3	4.15 (0.76)	2–5	−0.600	−0.064
4	3.94 (0.84)	1–5	−0.575	0.108
5	3.71 (0.99)	1–5	−0.436	−0.422
6	4.11 (0.84)	2–5	−0.630	−0.328
7	4.07 (0.87)	1–5	−0.733	0.106
8	4.16 (0.79)	1–5	−0.668	0.019
9	4.01 (0.94)	1–5	−0.688	−0.139
10	3.99 (0.95)	1–5	−1.072	1.174
11	4.32 (0.73)	1–5	−1.064	1.719
12	4.02 (1.02)	1–5	−0.888	0.137
13	3.65 (0.83)	1–5	−0.331	0.097
14	3.42 (0.99)	1–5	−0.285	−0.281

Table 3 Goodness-of-fit indices for CFA alternative factorial models

	χ^2	df	p	χ^2/df	TLI	CFI	RMSEA (90% CI)
Model 1 (1-factor model)	520.228	77	<0.001	6.756	0.921	0.933	0.075 (0.068–0.081)
Model 2 (2-related-factor model)	249.217	76	<0.001	3.279	0.963	0.969	0.051 (0.044–0.059)
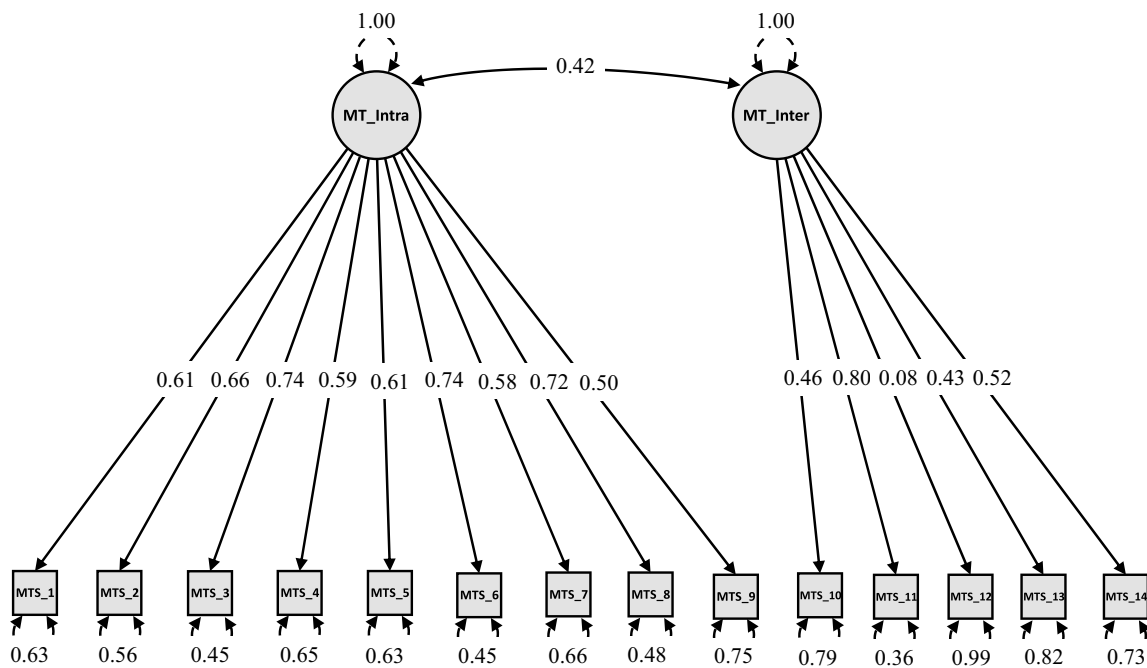
Fig. 1 Flowchart of the 2-factor model with standardized weights of the MTS-PT items. Note. MT_Intra – *Teacher Intrapersonal Mindfulness*, MT_Inter – *Teacher Interpersonal Mindfulness*

Table 4 Unstandardized, standardized, and significance levels for CFA model ($n = 863$)

Items	Unstandardized (*SE*)	Standardized	*p*
1. When I am teaching it seems I am running on automatic, without much awareness of what I am doing	0.525 (0.029)	0.605	<0.001
2. When I am in the classroom I have difficulty staying focused on what is happening in the present	0.509 (0.025)	0.662	<0.001
3. When I am teaching I find myself doing things without paying attention	0.562 (0.023)	0.741	<0.001
4 When I am teaching I get so focused on the goal I want to achieve that I lose touch with what I'm doing right now to get there	0.498 (0.028)	0.594	<0.001
5. At school I tend to walk quickly to get where I'm going without paying attention to what I experience along the way	0.598 (0.032)	0.606	<0.001
6. I rush through activities with my class without being really attentive to them	0.622 (0.024)	0.739	<0.001
7. When something painful happens at school I tend to blow the incident out of proportion	0.507 (0.030)	0.583	<0.001
8. I am often so busy thinking about other things that I am not really listening to my students	0.569 (0.025)	0.723	<0.001
9. When I'm really struggling with teaching, I tend to feel like other teachers must be having an easier time of it	0.464 (0.030)	0.496	<0.001
10. Even when it makes me uncomfortable, I allow my students to express their feelings	0.432 (0.042)	0.455	<0.001
11. I listen carefully to my student's ideas, even when I disagree with them	0.580 (0.038)	0.799	<0.001
12. I am aware of how my moods affect the way I treat my students	0.086 (0.054)	0.083	0.113
13. When I'm upset with my students, I notice how I am feeling before I take action	0.353 (0.040)	0.426	<0.001
14. When I am upset with my class, I calmly tell them how I am feeling	0.510 (0.049)	0.518	<0.001

Note. *Intrapersonal* dimension: Items 1 to 9 (reverse scored). *Interpersonal* dimension: Items 10 to 14. *SE* standard errors

experience ($n = 459$) and the ones with more than 25 years of teaching experience ($n = 402$). Results revealed no statistically significant differences between men and women teachers regarding both levels of *intrapersonal* and *interpersonal* mindfulness in teaching.

Concerning differences in levels of mindfulness in teaching between teachers with up to 25 years and teachers with more than 25 years teaching, results revealed a statistically significant but small difference ($t[859] = -4.21$, $p < 0.05$, Cohen's $d = -0.29$) in the *intrapersonal* dimension, with

Table 5 Measurement invariance of MTS-PT across sex, teaching years and educational levels taught by the participating teachers

| | Sex | | | | | | | | Teaching years | | | | | | | | Educational level taught | | | | | | | |
| | Model fit | | | | | Model comparison | | | Model fit | | | | | Model comparison | | | Model fit | | | | | Model comparison | |
	CFI	RMSEA (90% CI)	χ^2	df	p	ΔCFI	ΔRMSEA		CFI	RMSEA (90% CI)	χ^2	df	p	ΔCFI	ΔRMSEA		CFI	RMSEA (90% CI)	χ^2	df	p	ΔCFI	ΔRMSEA
Configural	0.976	0.046 (0.038–0.054)	286.168	1150	<0.001	–	–		0.972	0.048 (0.040–0.056)	299.924	150	<0.001	–	–		0.980	0.042 (0.032–0.051)	336.415	224	<0.001	–	–
Metric	0.971	0.049 (0.041–0.056)	326.109	1162	<0.001	–0.005	0.003		0.969	0.049 (0.042–0.057)	330.251	162	<0.001	–0.003	0.001		0.975	0.045 (0.036–0.053)	390.004	248	<0.001	–0.005	0.003
Scalar	0.971	0.046 (0.039–0.054)	339.123	1176	<0.001	0	–0.003		0.968	0.048 (0.040–0.055)	348.978	176	<0.001	–0.001	–0.001		0.971	0.046 (0.039–0.054)	427.478	276	<0.001	–0.004	0.001

higher values for more experienced teachers ($M = 37.17$, $SD = 4.95$) in comparison with less experienced ones ($M = 35.67$, $SD = 5.42$). No differences were found regarding the *interpersonal* dimension.

Finally, regarding levels of *intrapersonal* and *interpersonal* mindfulness in teaching across teacher's educational levels taught (elementary school, $n = 185$; middle school, $n = 334$; and high school, $n = 344$), results revealed no statistically significant differences for the *intrapersonal* dimension. Regarding the *interpersonal* dimension, statistical significant but small differences were found ($F_{(2, 860)} = 5.081$, $p < 0.05$, $\eta^2 = 0.01$). Post hoc comparisons using Tukey HSD test indicated that the mean score for the *interpersonal* dimension of the elementary school teachers ($M = 19.96$, $SD = 2.77$) was higher than the mean score found both for middle school teachers ($M = 19.33$, $SD = 2.83$) and for high school teachers ($M = 19.16$, $SD = 2.86$). No differences were found between middle school teachers and high school teachers in respect to the *interpersonal* dimension.

Internal Consistency

We estimated scale reliability by computing both Cronbach's α and McDonald's ω, and inter-item correlations. The reliability for the *intrapersonal* subscale was good ($\alpha = 0.86$, $\omega = 0.86$), with an inter-item correlation of 0.409, and for the *interpersonal* subscale was acceptable ($\alpha = 0.61$, $\omega = 0.61$), with an inter-item correlation of 0.251. The elimination of Item 12 would marginally improve the internal consistency of the *interpersonal* subscale ($\alpha = 0.64$, $\omega = 0.64$).

Correlation Analyses

The associations between MTS-PT dimensions and external correlates are presented in Table 6. Overall, we found that *Teacher Intrapersonal Mindfulness* subscale correlations were all statistically highly significant and in the small to large strength range. Specifically, results revealed a strong positive correlation between *Teacher Intrapersonal Mindfulness* and dispositional mindfulness ($r = 0.54$, $p < 0.001$), and moderate positive correlations with self-compassion ($r = 0.43$, $p < 0.001$) and positive affect ($r = 0.33$, $p < 0.001$), and a moderate negative correlation with negative affect ($r = -0.39$, $p < 0.001$); other correlations were weak. In contrast, *Teacher Interpersonal Mindfulness* correlations were weak, except for a moderate positive correlation with positive solitude ($r = 0.30$, $p < 0.001$).

Table 6 Descriptive statistics and correlations between MTS-PT facets and indicators of teacher well-being

Variable	M	SD	1	2	3	4	5	6	7	8
Mindfulness in Teaching										
1. Intrapersonal	36.37	5.25	–							
2. Interpersonal	19.40	2.84	–	–						
Subjective Well-Being										
3. Satisfaction with Teacher Professional Life	14.05	4.97	0.18	0.05*	–					
4. Positive Affect	36.84	6.24	0.33	0.17**	0.33	–				
5. Negative Affect	21.69	7.50	−0.39	−0.11**	−0.27	−0.30	–			
Other Well-Being Indicators										
6. Dispositional Mindfulness	62.10	14.51	0.54	0.11**	0.26	0.34	−0.51	–		
7. Self-Compassion	40.06	7.94	0.43	0.19	0.30	0.45	−0.64	0.53	–	
8. Positive Solitude	19.78	3.57	0.17	0.30	0.08**	0.29	−0.22	0.21	0.33	–
9. Loneliness	9.98	3.24	−0.29	−0.20	−0.07**	−0.20	0.36	−0.30	−0.41	−0.57

$^*p < 0.05$; $^{**}p < 0.01$

Discussion

Despite the increasing interest in studying mindfulness in the educational setting, valid and reliable measures specific to this context are scarce (Lavelle-Heineberg, 2016), especially in Portuguese. Therefore, the present study aimed to adapt and validate the Portuguese version of the Mindfulness in Teaching Scale (MTS-PT) and examine its suitability for the population of Portuguese teachers. Specifically, we examined the factorial validity of the MTS-PT by testing the original 2-dimension structure, the reliability of its facets, the convergent and divergent validity, the factorial invariance, and the mean differences of its scores across teachers' sociodemographic characteristics (sex, teaching years, and educational level taught). Overall, the results showed that the MTS-PT is a valid and reliable measure.

As proposed in our first hypothesis, results from CFA confirmed the 2-related-factor structure of the original scale (Frank et al., 2016), distinguishing *Teacher Intrapersonal Mindfulness* and *Teacher Interpersonal Mindfulness*. These findings are consistent with previous validation studies of the MTS in countries like China (Li et al., 2019; Ma et al., 2022), Turkey (Gördesli et al., 2019), South Korea (Kim & Singh, 2018), and Spain (Moyano et al., 2021). This 2-related-factor model was invariant across teachers' sex, teaching years and educational levels taught by the participating teachers, allowing future comparisons in MTS-PT scores across these samples and contexts. To our knowledge this was the first validation study of the MTS to test invariance across educational levels taught, something that was suggested as a future study by the original MTS' authors (Frank et al., 2016).

The *Teacher Intrapersonal Mindfulness* dimension is related to teachers' ability to pay attention to the present moment and includes the capacity to be receptive and non-judgmental while teaching. We compared groups of less experienced and more experienced teachers in relation to this *intrapersonal* dimension and found that teachers with more teaching experience seem to have higher ability to remain mindful of their *intrapersonal* processes in the classroom. The *Teacher Interpersonal Mindfulness* dimension explores the teacher's capacity of listening and staying open and receptive during interactions with students. Our findings suggest that elementary school teachers have higher levels of *interpersonal* mindfulness in teaching compared to their colleagues in middle school and high school settings. Indeed, elementary school context, with smaller classroom classes, a single teacher delivering the majority of subjects across a wider timespan (4 years in the Portuguese context), may facilitate the cultivation of a deeper teacher-student relationship. Thus, this finding suggests that contextual factors across different teaching levels (e.g., classroom dynamics, developmental stage of school students) may impact teachers' levels of *interpersonal* mindfulness. The MTS-PT subscales had an adequate internal consistency, with values similar to the original MTS and previous validations: the *intrapersonal* dimension score was similar to the original scale, and the *interpersonal* dimension score was slightly lower than in the original study, with the same value found in the Korean validation study.

Regarding our second hypothesis, as expected for convergent and divergent validity, the MTS-PT subscales showed significant correlations with external constructs; overall, findings showed larger relationships between the *Teacher Intrapersonal Mindfulness* subscale and other variables than for the *Teacher Interpersonal Mindfulness* subscale. Specifically, we explored correlations between mindfulness in teaching and the indicators of teacher subjective well-being

(Diener & Ryan, 2009), positive and negative affect and cognitions, and other indicators of well-being, such as dispositional mindfulness, self-compassion, and positive solitude. The study of correlations between mindfulness in teaching and these well-being indicators is aligned with recent investigations that moved beyond stress and burnout factors targeting "threats or barriers to well-being while overlooking the heart of the construct itself: healthy and successful functioning at work." (Renshaw et al., 2015, p. 290).

The *Teacher Intrapersonal Mindfulness* subscale displayed the largest positive correlation with teacher dispositional mindfulness as measured by the MAAS. This result was expected due to the closeness of the constructs measured – given that the MAAS emphasizes the *intrapersonal* dimension of mindfulness, and some of its items were adapted for the *intrapersonal* subscale of the MTS (e.g., "I get so focused on the goal I want to achieve that I lose touch with what I'm doing right now to get there" was adapted to "When I am teaching I get so focused on the goal I want to achieve that I lose touch with what I'm doing right now to get there"). Moreover, it also reveals that teachers' self-reported levels of dispositional mindfulness in everyday life were *transferred* to the teaching context. Similar results of this large correlation were found in the studies from China (Ma et al., 2022) and Turkey (Gördesli et al., 2019). Following, medium positive correlations were found between the *intrapersonal* dimension and self-compassion and positive affect, and a medium negative correlation with negative affect; other correlations were still significant but in a small range. Overall, these findings support previous studies that reported an increase in teachers' well-being following a mindfulness-based intervention (Lomas et al., 2017). In fact, teachers participating in mindfulness training report gains in mindfulness and self-compassion leading to more effective emotion regulation and increased self-efficacy, thus reducing their levels of stress and risk of burnout (Emerson et al., 2017).

Concerning the correlations of the *Teacher Interpersonal Mindfulness* subscale with the same constructs, results are in a smaller range, except for a medium positive correlation with positive solitude. This is an interesting finding, meaning that teachers that have a positive perspective of being alone report being more mindful of their relationship with students. Thus, nurturing positive solitude (e.g., a contemplative practice, such as mindfulness meditation) is likely to increase teachers' interpersonal mindfulness. However, to our knowledge, literature exploring the mechanisms underlying this relationship is nonexistent.

Finally, the present study is the first validation of a self-report measure to assess mindfulness among Portuguese teachers. It was carried out using a large and diverse sample of elementary school, middle school, and high school teachers working across all school regions in Portugal.

Sample distribution is very similar to the distribution of the population of Portuguese teachers (Francisco Manuel dos Santos Foundation, 2022), except for the Azores, where the Regional Education Department took the initiative to disseminate the study through the schools, which led to a more significant adhesion of teachers. Thus, the results from the present study indicate a representativeness approximation to the population of Portuguese teachers.

Limitations and Future Research

This study has some limitations that should be addressed. First, the test-retest reliability of the MTS-PT was not carried out since the assessment protocol was only administered once. Examining the test-retest reliability of the MTS-PT should be considered in future studies. Second, since our study explored correlations between the MTS-PT and a unidimensional measure of dispositional mindfulness (MAAS; Brown & Ryan, 2003), upcoming studies could include measures capturing different facets of mindfulness (e.g., observing, describing, acting with awareness, non-judging, and non-reactivity – the Five Facet Mindfulness Questionnaire; Baer et al., 2008). These investigations may help to identify which specific facets of mindfulness are particularly relevant in the teaching context and provide pertinent information for the development of targeted MBI for teachers. Third, further investigations could examine the MTS-PT suitability among teachers working in Portuguese-speaking countries like Brazil and African countries. Fourth, given that Item 12 obtained poor statistical results, we suggest that future research investigates further this item statistics by reformulating or improving its translation. Fifth, longitudinal research designs linking mindfulness in teaching with teachers' and their students' pedagogical and developmental outcomes are warranted. In such studies, the differential analysis of the *intrapersonal* and *interpersonal* dimensions of mindfulness in teaching will be valuable to ascertain the specific effects of each dimension. Finally, we would like to recommend for future research to review and improve the construct of mindfulness in teaching from a theoretical point of view as well as the operationalization of the *interpersonal* dimension, for which it is very important to obtain qualitative data on the experience of these processes (Bergomi et al., 2013).

To conclude, the results of this study revealed that the MTS-PT is a psychometrically adequate self-report measure to evaluate mindfulness among Portuguese teachers. We hope that our research will lead to a widespread of the MTS-PT in the assessment of teachers' mindfulness and contribute to future studies on mindfulness in education.

Declarations

Ethics Approval This study was performed in line with the principles of the Declaration of Helsinki. Ethical approval was obtained from the Ethical Committee of the Faculty of Psychology and Educational Sciences – University of Coimbra (approval reference CEDI/FPCEUC:69/R_5).

Informed Consent All participants were asked to read an information sheet with the details of the study, followed by an informed consent. Only participants who provided informed consent could proceed with the study. The research participants provided informed consent in accordance with the ethical standards outlined by the Declaration of Helsinki (2013) Ethical Principles for Medical Research involving Human Subjects and its later amendments.

Conflict of Interest The authors declare that they have no conflict of interest.

Use of Artificial Intelligence The authors did not use any artificial intelligence tool to write the manuscript.

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