Development and preliminary validation studies of the Mindfulness Skills in Teaching Questionnaire among one-to-one instrumental and vocal teachers

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Abstract

This study presents the development and first validation studies of the Mindfulness Skills in Teaching Questionnaire (MSTQ), a self-report tool assessing teachers' perceived mindfulness during instruction. In the first study, exploratory factor analysis (N=126) supported a two-factor structure: Teacher Intrapersonal Mindfulness and Teacher Interpersonal Mindfulness. In the second study, confirmatory factor analysis (N=259) indicated good model fit. Comparisons with the Cognitive and Affective Mindfulness Scale-Revised adapted for teaching highlight the MSTQ's domain specificity. The MSTQ shows robust psychometric properties for assessing mindfulness skills in one-to-one teaching settings, with implications for research in teacher well-being and professional development.

Keywords: Mindfulness Skills in Teaching; Teacher Well-being; One-to-one teaching; Professional Development; Self-report assessment

1. Introduction

Teachers play a pivotal role in the success of educational systems. However, the high demands placed on teachers today make teaching a highly stressful profession, significantly impacting teachers' well-being (Bottiani et al., 2019). Teacher-student relationships play a complex role in this dynamic, both supporting and challenging teacher well-being (Aldrup et al., 2018). Close relationships with students are associated with increased personal accomplishment, while conflictual relationships contribute to emotional exhaustion (Corbin et al., 2019). Importantly, teachers' occupational well-being is directly linked to the quality of teacher-student interactions (Chan et al., 2024).

The quality of the teacher-student relationship in one-to-one teaching settings plays a key role in student engagement. Research indicates that fostering positive relationships can significantly enhance student outcomes (Patston & Waters, 2015). Moreover, the relationship quality can be influenced by the personality traits and attachment styles of both teachers and students (Serra-Dawa, 2014). However, teachers may lack the necessary skills or support to develop and maintain these positive interpersonal relationships effectively (Gaunt et al., 2021).

Educational research is placing growing importance on fostering teachers' ability to cultivate prosocial qualities for care, recognizing that their well-being is essential for supporting positive learning environments. Enhancing teacher well-being not only benefits teachers but also equips them to create nurturing spaces where students thrive academically, emotionally, and socially (Lavelle-Heineberg 2016). Thus, integrating mindfulness into teachers' lives drives meaningful educational change by serving three key functions: promoting self-care to support personal well-being; fostering mindfulness and reflective practices to enhance teaching effectiveness; and laying the groundwork for mindfulness-informed or mindfulness-based instruction, which contributes to students' social-emotional development and academic success (Shapiro et al. 2016).

Moreover, research highlights the significant impact of teacher mindfulness on teacher-student relationships. Teachers' mindfulness is associated with lower levels of job stress, burnout, and depressive symptoms, as well as improved emotional support for students (Braun et al., 2018). It also directly enhances the quality of teacher-student relationships, with emotional intelligence and empathy playing a mediating role (Wang et al., 2024). Mindfulness contributes to teachers' professional development and well-being, which in turn positively influences students' emotional and learning outcomes (Song & He, 2021). Yet, to effectively implement mindfulness in their lessons, teachers need to embody and practice it in their own lives (Albrecht et al., 2012). These findings underscore the importance of mindfulness in shaping the educational landscape and suggest potential benefits for tailored educational interventions and support strategies (Wang et al., 2024).

There is growing interest in mindfulness-based interventions (MBIs) for teacher professional development, focusing on teacher well-being (Cann et al., 2024), self-care and social-emotional competencies (Hadar & Ergas, 2022). However, to effectively assess the impact of MBIs on teachers, researchers need reliable and context specific measures (Lavelle-Heineberg, 2016). Therefore, the aim of the current study was to develop and psychometrically validate a new, theory-driven, self-report measure of teacher mindfulness – the *Mindfulness Skills in Teaching Questionnaire* (MSTQ) among instrumental and vocal teachers. In this sense, we sought to create and validate a measure containing items that reflect important dimensions of mindfulness, as it might manifest during the lessons of teachers working in this music setting. Such instrument is currently lacking. Additionally, we sought to demonstrate MSTQ' discriminant validity, that is, its distinct place concerning broader measures of mindfulness in teaching.

2. Theoretical framework

2.1. Teacher-student relationships in one-to-one music tuition

One-to-one tuition is a widely practiced method across various educational contexts, especially in fields requiring highly specialized skills, such as music, arts or sports (Bloom & Sosniak, 1985). Other fields include tutorials in higher education – such as the Oxford tutorial system (Cosgrove, 2011), or research supervision, but also private supplementary tutoring, widely known as *shadow education* (Bray, 2013) or private tutoring intervention to promote students' academic achievement (Zhang & Liu, 2022). In these contexts, personalized attention is highly valued, allowing tailored instruction that meets individual student needs, and contributes to more effective learning.

Specifically, in the Western classical music tradition, one-to-one instruction has been rooted in the master-apprentice model (Hallam, 2018). However, there is increasing recognition of the need to shift from this power dynamic traditional approach, "toward a more facilitative model where teachers and students collaborate, reflect, and problem-solve together" (Creech & Gaunt, 2018, p. 155). This teaching context typically involves students working with the same teacher for several years, fostering close, deeply personal relationships that profoundly shape their musical development, learning experiences, and overall well-being (Creech, 2009; Jääskeläinen & López-Íñiguez, 2022). Given the influential role of these teachers, understanding the qualities that define effective instrumental and vocal instruction is crucial for improving student outcomes and enhancing pedagogical practices.

Extensive research on teacher effectiveness in music education has identified successful teachers as possessing a distinguished blend of musical expertise, pedagogical knowledge, and interpersonal skills (Biasutti et al., 2021; Concina, 2023). These educators not only demonstrate technical proficiency in their instrument or voice, but also tailor their lessons to the individual needs of students, encouraging student-centered approaches and fostering their autonomy

(Carey & Grant, 2015). In this context, *transformative pedagogy*, which promotes critical reflection, student agency, and co-constructed learning, presents a valuable alternative to the traditional master-apprentice model (Carey & Grant, 2014).

A key component contributing to the desirable pedagogical shift may be a deeper understanding of the role of teachers' mindfulness in effective music instruction. Mindfulness has been shown to foster emotional regulation (Nakamura et al., 2021), enhancing present-moment awareness and reducing stress (Donald et al., 2016), thus assisting teachers in creating a more collaborative and supportive learning environment (Jennings et al., 2013). Although there is growing interest in MBIs for teacher professional development (Roeser et al., 2012), its specific impact on one-to-one instrumental and vocal teaching remains largely unexplored. Given the intimate and highly relational nature of this teaching setting, measuring mindfulness within this context is crucial to better understanding its influence on both teacher effectiveness and student outcomes.

2.2. Measuring mindfulness skills in one-to-one teaching

Mindfulness has been defined 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). Numerous theoretical and measurement tools have been developed to assess self-reported mindfulness (Medvedev et al., 2022). The first measures were designed for the general population to assess mindfulness without a specific context (e.g. MAAS: Brown & Ryan, 2003). Other measures included meditation-related items, limiting their use to populations with meditation experience (e.g., FMI: Walach et al., 2006). With growing research evidence on the benefits of mindfulness, there has been an increasing attention on studying mindfulness in specific interpersonal contexts. This has led to the

development of various scales, such as the *Interpersonal Mindfulness Scale* (IMS: Pratscher et al., 2019) or the *Interpersonal Mindfulness in Parenting Scale* (IM-P: Duncan, 2023).

The study of the impact of MBIs on teachers' well-being has been the focus of recent systematic reviews. The results of these studies have shown that mindfulness practices are effective in reducing teachers' levels of stress and burnout (Hidajat et al., 2023), increasing their resilience, performance and overall well-being (Hwang et al., 2017). Findings from these studies are consistent with an Organization for Economic Cooperation and Development (OECD) report, which underscores the pressing need to deepen our understanding of teacher well-being and its impact on both teaching quality and student learning outcomes (Viac & Fraser, 2020). Thus, the evaluation of mindfulness among teachers is an essential step to effectively assess the efficacy of MBIs (Lavelle-Heineberg, 2016). Within musical contexts, research on MBIs (e.g., Czajkowski et al., 2021, 2022) shows enhancement in musicians' psychological processes, improving practice and performance by promoting goal-directed behavior, disengagement from negative thoughts, and better awareness of physical and emotional states (Diaz, 2022). Thus, mindfulness training for instrumental and vocal teachers can play a key role in helping students improve focus, cope with performance anxiety, and foster artistic development.

Until recently, research on the assessment of the effects of MBIs on teachers predominantly relied on two well-validated mindfulness measures: the *Five Facet Mindfulness Questionnaire* (FFMQ; Baer et al., 2008) and the *Mindful Attention and Awareness Scale* (MAAS; Brown & Ryan, 2003). These instruments assess mindfulness as a trait, emphasizing *intrapersonal* facets, but were not specifically developed for educational settings (Lavelle-Heineberg, 2016). Moreover, the use of various mindfulness scales across MBI studies limits cross-study comparisons and to assemble the results using meta-analyses. This inconsistency makes it harder to draw clear conclusions about the value of mindfulness for educators (Lomas

et al., 2017). Therefore, a robust and specific mindfulness questionnaire for the teaching settings is crucial.

To address this gap in education, Frank and colleagues (2016) developed the *Mindfulness in Teaching Scale* (MTS), a 14-item instrument designed to assess teachers' mindfulness within the K-12 school context. The scale comprises two factors: *Teacher Intrapersonal Mindfulness* (9 items) and *Teacher Interpersonal Mindfulness* (5 items). While the *intrapersonal* dimension of the MTS has demonstrated good reliability within K-12 (e.g., Frank et al., 2016; $\alpha = 0.86$) and one-to-one teaching (Barata-Gonçalves et al., 2025; $\alpha = 0.81$), its *interpersonal* dimension has shown lower reliability in K-12 settings (e.g., Barata-Gonçalves et al., 2024; Kim & Singh, 2018; $\alpha = 0.61$) and unacceptable reliability in one-to-one teaching (Barata-Gonçalves et al., 2025; $\alpha = 0.48$). This exceptionally low reliability in one-to-one teaching suggests a critical limitation of the MTS in assessing *interpersonal* mindfulness within this context. Therefore, the development of a new measure is crucial to ensure a valid and reliable assessment of all dimensions of mindfulness across teaching modalities, particularly the *interpersonal* dynamics inherent in one-to-one settings, such as instrumental and vocal instruction (Barata-Gonçalves et al., 2025). One-to-one teaching involves closer, long-term teacher-student relationships and individualized feedback, both of which are central to effective music instruction (Creech & Gaunt, 2018; Hallam, 1998), and require a more refined approach to assessing mindfulness.

Mindfulness in teaching may be conceptualized as the teacher’s ability to maintain a moment-by-moment, present-centered awareness throughout the lesson, integrating both *intrapersonal* and *interpersonal* dimensions. The *intrapersonal* dimension involves the teacher’s conscious awareness of their own thoughts, emotions, intentions, and experiences, allowing them to remain grounded and focused during instruction. The *interpersonal* dimension includes the teacher’s attentive and open engagement with the student. This

comprises paying attention to the student's verbal and non-verbal cues, being receptive to their ideas and feelings, and responding thoughtfully and compassionately, fostering a supportive and empathetic learning environment (Frank et al., 2016).

Although self-assessment tools are widely used to measure mindfulness and the efficacy of MBIs, concerns have been raised about their accuracy. Specifically, individuals may struggle to objectively assess their mindfulness levels (Grossman, 2011) and responses may be biased by a desire to present a more positive self-image (i.e., social desirability) (Lutz et al., 2015). Despite these limitations, well-designed questionnaires can offer reliable, valid, and valuable insights when tailored to their target populations, significantly advancing the understanding of mindfulness (Baer, 2019).

3. The current study

Several self-report measures have been developed and validated to evaluate mindfulness for the general population (e.g., MAAS: Brown & Ryan, 2003) and the K-12 classroom teaching context (e.g., MTS: Frank et al., 2016). However, these tools do not specifically capture mindfulness as it manifests within the one-to-one teaching settings, such as instrumental and vocal instruction, particularly in its *interpersonal* dimension (Barata-Gonçalves et al., 2025). In view of the increasingly important role of mindfulness in the educational field, namely because of its transformative potential for educational change (Wilensky, 2016) and positive impact on teachers' well-being (e.g., Zarate et al., 2019), it is essential to have valid assessment tools. Therefore, the current study aimed to develop and validate the MSTQ among instrumental and vocal teachers over two separate studies.

In study 1, we detailed the processes of item generation, questionnaire development, and refinement. After face and content validity procedures (i.e., expert consultation for item development and pilot-test with respondents from the targeted population), an experimental

version of the questionnaire (25 items) was developed. Responses to this version of MSTQ were then subjected to an Exploratory Factor Analysis (EFA) to initially explore MSTQ's internal structure.

In study 2, we tested data collected with the final version of the MSTQ (18 items) by conducting a Confirmatory Factor Analysis (CFA) to define MSTQ's internal structure based on the theoretical model (Frank et al., 2016) and the EFA results from study 1. We aimed to assess if the 2-factor structure identified by Frank and colleagues (2016) is also replicated in the one-to-one musical teaching context. The CFA allowed us to test the fit of this model and assess the questionnaire's construct validity, confirming the robustness of the psychometric evaluation. By analyzing how well the proposed factors align with the data, we ensured that the MSTQ effectively measures the intended dimensions of mindfulness within the target population. Two measures of reliability were studied: internal consistency of MSTQ scores and its test-retest reliability. Since mindfulness is a dynamic state that can fluctuate over short periods (Friese & Hofmann, 2016), and is often the focus of intervention programs aimed at improving teachers' mindfulness (e.g., de Carvalho et al., 2021), evaluating its temporal stability was crucial. This helped us determine how consistently the MSTQ measures mindfulness over time, while recognizing that it may change due to the effect of these interventions (Kiken et al., 2015). To further evaluate the construct validity of the MSTQ, we examined the relationships between its facets with teacher job satisfaction, self-efficacy, burnout, mindful teaching, and self-compassion. We hypothesized that higher levels of *Teacher Mindfulness* would correspond with greater *Teacher Well-being* indicators (i.e., increased job satisfaction, self-efficacy, mindful teaching and self-compassion, along with decreased levels of burnout).

4. Study 1

Study 1 aimed to develop items for the experimental version of the questionnaire and initially test its internal consistency and internal structure. Data were collected online between January 17 and February 21, 2024.

4.1. Method

4.1.1. *Participants*

Participants (N = 126) had a mean age of 40.4 years (SD = 10.6 years, range = 23 to 76 years), and reported a mean of 16.1 years of teaching experience (SD = 10). Table 1 shows more details about the sample characteristics.

Table 1 Socio-demographic characteristics of the sample (N = 126)

	N	%
Gender		
Males	67	53.2
Females	59	46.8
Education degree		
Bachelor	44	34.9
Master	79	62.7
PhD	3	2.4
Type of School		
Public	13	83.4
Private	113	11.8
Musical Instrument/Voice		
Voice	8	6.3
Plucked Strings	13	10.3
Bowed Strings	32	25.4
Woods	32	25.4
Brass	13	10.3
Percussion	6	4.8
Keyboards	22	17.5

4.1.2. Measures

4.1.2.1. MSTQ – Item development and pilot version. Firstly, existing mindfulness questionnaires designed for the teaching setting (i.e., MTS: Frank et al., 2016; Portuguese version: Barata-Gonçalves et al., 2024) and for the one-to-one interpersonal contexts (i.e., IM-P: Duncan, 2023; Portuguese version: Moreira & Canavarro, 2017; IMS: Pratscher et al., 2019; Portuguese version: Pereira et al., 2023) were reviewed. We obtained authorization from the authors of the original questionnaires and the Portuguese validated versions to examine and adapt its items. A pool of 25 items was developed to capture aspects of mindfulness considered most relevant to mindful teaching, based on two sources: (1) the construct of mindfulness in teaching by Frank et al. (2016), which includes two factors – Teacher Intrapersonal Mindfulness (11 items) and Teacher Interpersonal Mindfulness (14 items), and (2) an adaptation of the mindful parenting construct by Duncan (2023) for teaching, which encompasses five factors – "Present-centered Attention in Teaching", "Emotional Awareness in Teaching", "Self-regulation in Teaching", "Nonjudgmental Acceptance in Teaching", and "Compassion in Teaching", with 5 items for each dimension. These items were evaluated and refined by a panel of 5 experts in mindfulness, music, or both research fields. Experts were recruited through the first authors' professional networks and were selected based on their significant contributions to the fields of mindfulness and music education. The final pool consisted of a unique combination of the 25 items from the abovementioned reviewed mindfulness questionnaires. Further, to assess face validity and identify any potential issues regarding item clarity and the completion process (cognitive debriefing), the final pool was pilot-tested with 8 teachers who shared similar characteristics with the target population. Minor adjustments were made (e.g., "When students do something that upsets me, I try to keep my emotions in balance" was refined to "When students do something that upsets me, I try to keep my emotional stability". This experimental version of the MSTQ was subsequently used in the

pilot study. These items addressed aspects such as teacher regulation of attention during instruction, emotional awareness, self-regulation, and responsiveness and sensitivity during teacher-student interactions. Teachers were instructed to rate the frequency of each statement as it applied to them over the past month using a Likert scale ranging from 1 (*Almost Never*) to 5 (*Almost Always*).

4.1.2.2. Sociodemographic and professional questionnaire. Participants were asked about their age, gender, education degree, type of school, teaching experience, and voice or musical instrument taught.

4.1.3. Sampling and Procedures

The assessment protocol was approved by the Ethics Committee of the Faculty of Psychology and Educational Sciences – University of Coimbra. Additionally, authorization for the dissemination of the study was granted by the Directorate-General for Education of the Portuguese Ministry of Education. Then, to recruit music teacher participants, an email was sent to the heads of Portuguese music schools and conservatoires. The email introduced the study and included a link to the data collection platform (LimeSurvey). This survey link was also disseminated through social networks (i.e., Facebook and WhatsApp). The first page of the survey provided information regarding eligibility criteria (i.e., instrumental or vocal teachers working in public or private music schools from the Portuguese educational system), the study aims and procedures, as well as the voluntary and anonymous nature of the investigation. Participants had to provide informed consent to participate in the study, by clicking on the option “I understand and accept the conditions of the study”. Forced answering was used to decrease the amount of missing data from the survey. They completed the

Portuguese validated versions of the self-report instruments, using the abovementioned web-based platform.

4.1.4. Data Analysis

The analyses were performed using the open-source statistics program JASP (v. 0.19.0) (https://jasp-stats.org). First, to characterize the demographics of the participants and study variables, descriptive statistics were performed. Values of skewness (*Sk*) and kurtosis (*Ku*) for ordinal and quantitative variables displayed a suitable approximation to the assumption of normality ($Sk < |3|$ and $Ku < |8|$), see Kline (2016). The reliability values of the questionnaire were estimated by computing both Cronbach's alpha and McDonald's omega, following Nunnally's (1978) criteria of a minimum level of $\alpha \geq 0.7$, although depending on the nature and purpose of the questionnaire. Inter-item correlations were also reported, a value between 0.2 and 0.4 was recommended.

The responses of the 126 participants (minimum sample-to-item ratio of 5-to-1) to the initial pool of 25 items were submitted to an Exploratory Factor Analysis (EFA). We aimed to examine if the 2-factor model proposed for the teaching context by Frank and colleagues (2016) was supported by the data collected, and whether the questionnaire's total score is reliable. Thus, a 2-factor solution was extracted using Robust Weighted Least Squares (RWLS) method together with a direct oblimin rotation. This method is advised when the univariate distributions of ordinal items are asymmetric or with an excess of kurtosis (see Muthén & Kaplan, 1985; 1992). Before analyses, Kaiser–Meyer–Olkin (KMO) values were verified for sampling adequacy, and inspection of all KMO values on the diagonal of the anti-image correlation matrix for KMO values less than the acceptable limit of 0.5 (see Field, 2009). Bartlett's test of sphericity was examined to inspect if correlations between items were sufficiently large enough to warrant EFA.

4.2. Results

4.2.1. Reliability analysis

Internal Consistency. Good levels of internal consistency were observed (ω = 0.867, α = 0.869), with a mean inter-items correlation of 0.30. Table 2 presents the Item Reliability Statistics. Examining McDonald's omega values after individual item removal revealed that dropping items 11, 17, 21, and 25 results in a slight improvement in omega (ranging from a 0.001 to 0.006 increase). These items also exhibit the lowest item-total correlations on the questionnaire (ranging from 0.184 to 0.364), all of which fall below the recommended threshold of 0.4 for multidimensional questionnaires. Additionally, items 1 and 10 also have item-total correlations below the recommended value.

Table 2. Item Reliability Statistics.

	If item dropped		
Item	McDonald's ω	Cronbach's α	Item-rest correlation
1	0.863	0.866	0.381
2	0.861	0.863	0.484
3	0.861	0.864	0.464
4	0.862	0.864	0.438
5	0.857	0.860	0.587
6	0.861	0.863	0.505
7	0.859	0.861	0.543
8	0.863	0.864	0.476
9	0.863	0.864	0.452
10	0.866	0.869	**0.299**
11	**0.872**	**0.873**	**0.213**
12	0.859	0.861	0.527

	If item dropped		
Item	McDonald's ω	Cronbach's α	Item-rest correlation
13	0.862	0.863	0.522
14	0.859	0.861	0.531
15	0.855	0.859	0.637
16	0.863	0.865	0.409
17	**0.868**	0.868	0.364
18	0.860	0.862	0.502
19	0.863	0.865	0.401
20	0.857	0.860	0.563
21	**0.871**	**0.871**	**0.288**
22	0.862	0.863	0.550
23	0.859	0.862	0.541
24	0.861	0.863	0.473
25	**0.873**	**0.874**	**0.184**

4.2.2. Item Analysis

Table 3 shows the descriptive statistics of the MSTQ items. Given that the items were answered using a 5-point Likert scale, and mean values ranged from 3.39 (Item 11) to 4.71 (Items 13 and 22), these scores were above the midpoint of the scale. Items 11, 17, and 25 had the lowest means, each close to 3.5. In contrast, items 6, 8, 9, 13, 19, and 22 showed the highest means, all exceeding 4.5. Items 1, 6, 8, 9, 13, 15, 19, 22 and 24, showed a slight trend to skewness (–1.290, –1.532, –2.039, –1.074, –1.747, –1.107, –1.378, –1.519, and –1.010, respectively) and to kurtosis (1.797, 2.339, 3.801, 2.139, 2.156, 1.076, 1.296, and 1.404, respectively); item 18 revealed a slight trend to kurtosis (1.076). In supplemental material, we present a table (Table S1) with further item analysis and response frequencies.

Table 3 Descriptive statistics of the MSTQ items (EFA)

Items	*M (SD)*	Range	Skewness	Kurtosis
1	4.49 (0.67)	2 – 5	–1.290	1.797
2	4.50 (0.62)	3 – 5	–0.833	–0.291
3	4.37 (0.69)	2 – 5	–0.922	0.833
4	4.06 (0.97)	1 – 5	–0.851	0.230
5	3.97 (0.79)	1 – 5	–0.638	0.833
6	4.61 (0.61)	2 – 5	–1.532	2.339
7	4.32 (0.70)	2 – 5	–0.673	–0.151
8	4.69 (0.61)	2 – 5	–2.039	3.801
9	4.57 (0.60)	3 – 5	–1.074	0.160
10	3.99 (0.94)	1 – 5	–0.742	–0.002
11	3.39 (1.04)	1 – 5	–0.181	–0.566
12	4.29 (0.80)	2 – 5	–0.850	–0.040
13	4.71 (0.55)	3 – 5	–1.747	2.139
14	3.90 (0.80)	2 – 5	–0.387	–0.223
15	4.29 (0.75)	1 – 5	–1.107	2.156
16	4.14 (0.80)	2 – 5	–0.745	0.226
17	3.40 (1.17)	1 – 5	–0.330	–0.644
18	3.85 (0.76)	1 – 5	–0.629	1.076
19	4.51 (0.72)	2 – 5	–1.378	1.296
20	3.71 (0.95)	1 – 5	–0.689	0.287
21	4.01 (1.11)	1 – 5	–0.880	–0.173
22	4.71 (0.50)	3 – 5	–1.519	1.404
23	4.46 (0.58)	3 – 5	–0.485	–0.714
24	4.35 (0.78)	2 – 5	–1.010	0.352
25	3.48 (1.02)	1 – 5	–0.442	–0.186

4.2.3. Exploratory Factor Analysis

Results from the Kaiser–Meyer–Olkin measure of sampling adequacy (KMO = 0.835) and the Bartlett test of sphericity statistic (χ^2 (300) = 1333.6, $p < 0.001$) supported the suitability of the data for conducting EFA. A 2-related factors model was fit to the data. The pattern matrix for this 2-factor structure is presented in Table 4. The overall model accounted for 43.97% of the variance. Specifically, the first factor (*Teacher Interpersonal Mindfulness*, items: 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 18, 20, 22, 25) had an eigenvalue of 8.84 and explained 35.34% of the variance, and the second factor (*Teacher Intrapersonal Mindfulness*, items: 2, 12, 16, 17, 19, 21, 23, 24) had an eigenvalue of 2.15 and explained 8.63% of the variance. The correlation between the two factors was positive and strong ($r = 0.510$, $p < .001$).

The items within each factor, in general, appeared to correspond with the theoretical categories upon which they were based, with a good local fit (most of the items' loadings above 0.4). After inspection, three items (Item 1, 11 and 25) did not load onto a factor and six items displayed cross-loadings (< 0.2) in another factor (Items 2, 4, 10, 12, 23 and 24); items 4 and 24 loading level in the main factor was the lowest among these items.

Table 4. Items and factor loadings for the Exploratory Factor Analysis two-related factors model ($N = 126$)

Items		Factor	
		F1	F2
1.	When I'm teaching, I am aware of my mood and emotions.	**0.307**	0.257
2.	During lessons, I am fully engaged in what I'm doing.	0.239	**0.503**
3.	I try to understand students' point of view, even when their opinions do not make sense to me.	**0.639**	–0.117
4.	In tense moments with students, I am aware of my feelings but do not get taken over by them.	**0.429**	0.191
5.	When I'm teaching, I get a sense of how students are feeling.	**0.608**	0.146
6.	I accept each student's individuality without wanting them to behave in the same way.	**0.586**	0.088
7.	Before I speak, I think about the impact my words might have on students.	**0.666**	–0.013
8.	When students are going through a difficult time, I give them the nurturing and caring they need.	**0.638**	0.052
9.	I listen carefully to students' ideas, even when I disagree with them.	**0.678**	–0.036
10.	During lessons, I am aware of how my mood affects the way I interact with students.	**0.556**	–0.238
11.	When I do something as a teacher that I regret, I am understanding with myself.	**0.299**	–0.130
12.	When I am teaching, it's easy for me to be in the present moment rather than being distracted.	0.309	**0.447**
13.	I am kind to students when they are upset.	**0.664**	0.097
14.	When students do something that upsets me, I keep my emotional stability.	**0.645**	–0.066
15.	I am aware of students' mood and tone of voice as I listen to them.	**0.778**	0.003
16.	When I am teaching it seems I am on autopilot, not paying attention to what is happening in the moment.	0.116	**0.537**
17.	I criticize myself for not being the teacher I'd like to be.	–0.106	**0.653**
18.	When I am talking to students, I try pick up on the intentions behind what they are saying.	**0.685**	–0.106
19.	During lessons, I am so busy thinking about other things that I am not really listening to students.	–0.040	**0.791**
20.	When I am upset with students, I notice how I am feeling before I take action.	**0.570**	0.120
21.	When I am having a hard time teaching, I feel like other teachers must have an easier time of it.	–0.030	**0.408**
22.	I am understanding and patient with students when they are having a hard time.	**0.690**	0.099
23.	Before I speak to students, I am aware of what I want to convey to them (my intentions).	0.359	**0.446**
24.	I rush through activities with students without being really attentive to them.	0.259	**0.424**
25.	When things I do as a teacher don't work, I can accept them and move on.	**0.269**	–0.127
	Eigenvalue	8.84	2.15
	% of Variance Explained	35.34	8.63

Note. F1 – Factor 1 (*Teacher Interpersonal Mindfulness*), Items 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 18, 20, 22, 25. F2 – Factor 2 (*Teacher Interpersonal Mindfulness*), Items 2, 12, 16*, 17*, 19*, 21*, 23, 24* (*reverse scored).

5. Study 2

Study 2 aimed to validate the factor structure identified in the previous study (EFA), using a new, larger, and more diverse sample. Derived from the results obtained in study 1, participants in study 2 responded to a new version of the questionnaire comprised of items theoretically and statistically more robust. To compare the two models for the theoretical construct of mindfulness skills in teaching – Frank and colleagues' (2016) 2-factor model and Duncan's (2023) 5-factor model – we aimed to retain a minimum number of theoretically and statistically robust items across the questionnaire's expected dimensions. To enhance the questionnaire's usability by reducing redundancy and balancing the number of items in the dimensions, we removed items that were either less statistically sound or already represented by other items. Specifically, items 1, 4, 10, 11, 13, 20, and 25 were dropped. Items 1, 11, and 25 did not meet the minimum saturation threshold of 0.4 in any factor, item 4 had the lowest loading on its factor, and item 10 exhibited cross-loadings. Additionally, items 13 and 20 were redundant, as they were already represented by items 14 and 22, respectively, which had higher loadings. Items 12 and 23 were refined for clarity (e.g., Item 12: "When I'm teaching, it's easy for me to be in the present moment, rather than being distracted" was reworded as "When I'm teaching it's easy for me to be in the present moment"). The resulting 18-item questionnaire is theoretically consistent with the working definition of *mindful teaching* and balances the questionnaire's expected dimensions more effectively.

This study also aimed to assess MSTQ construct validity by exploring its relationships with teacher well-being variables (i.e., job satisfaction, self-efficacy, self-compassion, mindful teaching), and burnout. Additionally, item response analysis and response frequencies from Study 1 (Table S1) indicated that teachers tend to report high mindfulness levels during lessons, potentially reflecting a trend to social desirability. To address this, a social desirability measure

was included. Finally, three-week test-retest reliability was assessed. Data were collected online between April 10 and June 5, 2024.

5.1. Method

5.1.1. Participants

Participants (N = 259) had a mean age of 45.3 years (SD = 10.3 years, range = 22 to 69 years), and 50.6% were male. They reported a mean of 20.2 years of teaching experience (SD = 9.4), and taught in public (52.9%), private (31.3%) and both (15.8%) music schools. Table 5 shows more details about the sample characteristics.

Table 5. Socio-demographic characteristics of the sample (N = 259)

	n	%
Gender		
Males	131	50.6
Females	126	48.6
Other	2	0.8
Nationality		
Portuguese	231	89.2
Other	15	5.8
Both	13	5.0
Education degree		
Bachelor	96	37.1
Master	140	54.1
PhD	23	8.9
Type of contract		
Permanent	182	70.3
Temporary	35	13.5
Both	42	16.2
Musical Instrument/Voice		
Voice	23	8.9
Plucked Strings	34	13.1
Bowed Strings	68	26.3
Woods	47	18.1
Brass	21	8.1
Percussion	11	4.3
Keyboards	55	21.2

5.1.2. Measures

5.1.2.1. MSTQ. This 18-item self-report measure assesses the frequency of teachers to be mindful during instruction (e.g., "During lessons, I am fully engaged in what I am doing"). Items are rated on a 5-point Likert scale, ranging from 1 (*Almost Never*) to 5 (*Almost Always*). The total score ranges from 18 to 90 and, after reverse-coding negative items, higher scores indicate greater mindfulness during instruction.

5.1.2.2. Teacher Job Satisfaction. A single-item measure from the Portuguese TALIS 2008 questionnaire (OECD, 2010) was used to assess teacher job satisfaction ("All in all, I am satisfied with my job"). This item is rated on a 4-point Likert scale, ranging from 1 (*Strongly Disagree*) to 4 (*Strongly Agree*), with higher scores indicating greater job satisfaction.

5.1.2.3. Teacher Self-Efficacy. A 4-item scale from the Portuguese TALIS 2008 questionnaire (OECD, 2010) was used to assess teacher self-efficacy (e.g., "I am successful with my students"). These items are rated on a 4-point Likert scale, ranging from 1 (*Strongly Disagree*) to 4 (*Strongly Agree*), with higher scores indicating greater self-efficacy. Both in the Portuguese TALIS study and in the current study, the self-efficacy measure showed acceptable reliability considering the reduced number of items: $\alpha = 0.67$ and $\alpha = 0.69$ ($\omega = 0.69$), respectively.

5.1.2.4. Copenhagen Burnout Inventory – subscale "burnout related to client". The CBI subscale "burnout related to client" (CBI: Kristensen et al., 2005; Portuguese version: Campos et al., 2013) was adapted to the teaching context and used to assess teachers' burnout related to working with students (e.g., "Are you tired of working with your students?"). This subscale

is comprised of six items and rated on a 5-point Likert scale, ranging from 1 (*Never*) to 5 (*Always*), with a higher total score indicating greater teachers' burnout. In the original study reliability was good ($\alpha = 0.85$) and, similarly in the current study, was also good ($\alpha = 0.85$, $\omega = 0.85$).

5.1.2.5. Cognitive and Affective Mindfulness Scale-Revised. The CAMS-R (CAMS-R: Feldman et al., 2007; Portuguese version: Teixeira et al., 2017) was adapted to the teaching context and used to assess teachers' mindfulness during instruction (e.g., "When I'm teaching, I am easily distracted."). Items are rated on a 4-point Likert scale ranging from 1 (*Not at all*) to 4 (*Almost Always*). After reverse-coding negative items higher scores indicate greater mindfulness qualities. In the original study, the CAMS-R showed acceptable internal consistency ($\alpha = 0.77$). In the current study, it was good ($\alpha = 0.85$, $\omega = 0.85$).

5.1.2.6. *Self-Compassion Scale – Short Form.* The SCS-SF (SCS-SF: Raes et al., 2011; Portuguese version: Castilho et al., 2015) was used to assess teachers' levels of self-compassion (e.g., "I'm disapproving and judgmental about my own flaws and inadequacies."), measuring six components of self-compassion (i.e., self-kindness, self-judgment, common humanity, isolation, mindfulness, and over-identification), rated on a 5-point Likert scale, ranging from 1 (*Almost never*) to 5 (*Almost always*). After reverse-coding negative items higher scores indicate higher self-compassion. The original scale of the SCS-SF showed good reliability in the original study ($\alpha = 0.86$). In the current study, reliability was also good ($\alpha = 0.86$, $\omega = 0.87$).

5.1.2.7. Social Desirability Response Set – 5. The SDRS–5 (SDRS-5: Hays et al., 1989; Portuguese version: Pechorro et al., 2016) was adapted for the school context to assess teacher tendency to give socially desirable responses (e.g. "At school, I am always courteous even to

people who are disagreeable"). Items are rated on a 5-point Likert scale ranging from 1 (*Definitely True*) to 5 (*Definitely False*), with a higher total score indicating greater teacher social desirability. Internal consistency reliability in the original study was acceptable (α = 0.68) and in the current study, it was also acceptable (α = 0.61).

5.1.2.8. Sociodemographic and professional questionnaire. Participants were asked about their age, gender, nationality, education degree, type of school, type of contract, teaching experience, weekly teaching hours, education level taught, and voice or musical instrument taught.

5.1.3. Procedures

Most procedures in Study 1 are common in Study 2. However, due to test-retest analysis, participants were asked to generate anonymous identification codes to match their responses over a three-week interval.

5.1.4. Data Analyses

Besides the data analyses described in study 1, a Confirmatory Factor Analysis (CFA) was performed to evaluate internal structure of the MSTQ, comparing two models. Model 1 consists of two factors: Factor 1, *Teacher Interpersonal Mindfulness* (Items 2, 3, 4, 5, 6, 7, 9, 10, 13, 16), and Factor 2, *Teacher Intrapersonal Mindfulness* (Items 1, 8, 11, 12, 14, 15, 17, 18). Model 2 comprises five factors: Factor 1, "Present-centered attention in teaching" (Items 1, 8, 11, 14, 18); Factor 2, "Emotional awareness in teaching" (Items 3, 10, 13); Factor 3, "Self-regulation in teaching" (Items 5, 9, 17); Factor 4, "Nonjudgmental acceptance in teaching" (Items 2, 4, 7, 12); Factor 5, "Compassion in teaching" (Items 6, 15, 16). The CFA models were fit using the Robust Diagonally Weighted Least Squares (RDWLS) estimator, which is appropriate for polychoric correlation matrices of Likert-type scales (Li, 2016). Model fit was assessed using

multiple indices as recommended 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 0.90, ideally > 0.95; and the Root Mean Square Error of Approximation (RMSEA < 0.09). The competing models (Model 1 and Model 2) were compared using χ^2 difference, and then the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) were used to decide the best-fit model, with the model having the lowest AIC and BIC values being preferred (Kline, 2016).

Finally, to assess the convergent and discriminant validity of MSTQ with external correlates, Pearson's correlation coefficients were computed between the MSTQ dimensions and the variables of teachers' job satisfaction, self-efficacy, burnout, mindful teaching, and self-compassion. Pearson's correlation coefficients were evaluated following Cohen's (1988) guidelines to classify their strength: $0.10 \leq r < 0.30$ (weak); $0.30 \leq r < 0.50$ (moderate); and $r \geq 0.50$ (strong).

5.2. Results

5.2.1. Item Analysis

Table 6 provides descriptive statistics of the final version of the MSTQ items. Mean values ranged from 3.56 (Item 13) to 4.70 (Item 9). As in study 1, these values are above the central point of the response scale. Items 10, 13 and 16 showed the lowest means, each around 4. Conversely, items 4, 6, 9 and 15 had the highest means, all above 4.60. A slight trend to skewness and kurtosis was observed in items 1, 4, 7, 8 and 11, with skewness values over −1 and kurtosis values above 2. Items 5, 6, 9, 12, 15, 16 and 18, displayed a trend to skewness with values over −1. For additional item analysis and response frequencies, see Table S2 (supplemental material).

Table 6 Descriptive statistics of the MSTQ items

Items	*M* (*SD*)	Range	Skewness	Kurtosis
1	4.60 (0.63)	1 – 5	– 1.767	4.452
2	4.39 (0.66)	3 – 5	– 0.629	– 0.626
3	4.39 (0.68)	2 – 5	– 0.964	0.977
4	4.63 (0.64)	1 – 5	– 2.022	5.434
5	4.29 (0.82)	1 – 5	– 1.184	1.489
6	4.66 (0.56)	3 – 5	– 1.462	1.175
7	4.47 (0.69)	1 – 5	– 1.279	2.076
8	4.41 (0.76)	1 – 5	– 1.539	3.198
9	4.70 (0.51)	3 – 5	– 1.422	1.059
10	4.01 (0.90)	1 – 5	– 0.593	– 0.187
11	4.48 (0.68)	1 – 5	– 1.302	2.214
12	4.31 (0.83)	1 – 5	– 1.272	1.868
13	3.56 (1.17)	1 – 5	– 0.307	– 0.740
14	4.17 (0.79)	1 – 5	– 0.741	0.400
15	4.61 (0.66)	2 – 5	– 1.595	1.801
16	4.07 (1.09)	1 – 5	– 1.066	0.470
17	4.27 (0.83)	1 – 5	– 0.987	0.579
18	4.37 (0.80)	1 – 5	– 1.259	1.390

5.2.2. Confirmatory Factor Analysis

We conducted a CFA to explore the factor structure of the MSTQ by testing and comparing two models: (a) Model 1 (2-related-factors model), and (b) Model 2 (5-related-factors model). As shown in Table 7, both models demonstrated a good fit, with $\chi 2/df$ values below 3 (2.989 and 1.931, respectively); TLI and CFI values above the 0.95 threshold (TLI: 0.959 and 0.996; CFI: 0.964 and 0.997, respectively); and RMSEA values below 0.09 (0.043 and 0.014, respectively).

Table 7 Goodness-of-fit indices for CFA alternative factorial models

	χ^2	*df*	*p*	$\chi^{2/df}$	*TLI*	*CFI*	*RMSEA (90% CI)*
Model 1 (2-factor-model)	400.490	134	< 0.001	2.989	0.959	0.964	0.043 (0.030–0.056)
Model 2 (5-factor-model)	241.455	125	< 0.001	1.931	0.996	0.997	0.014 (0.000–0.034)

Following, we compared the two competing models (Model 1 and Model 2). Considering the significant Chi-square difference test ($\Delta\chi2$ (9) = 159.035, $p < 0.001$), and the AIC and BIC values, Model 2 showed a marginally better fit than Model 1 (AIC_{Model2} = 9337.796 < AIC_{Model1} = 9478.831) and (BIC_{Model2} = 9565.433 < BIC_{Model1} = 9674.457). Given the small number of items and the fact that Model 1 and 2 both fit the data well, a parcimonious solution was adopted, choosing the first model because it has less and more robust factors, represented by a greater number of items.

In Fig. 1, we present the path diagram of the 2-factor structure with a positive and strong correlation between the two factors of 0.64. Concerning local fit, as shown in Table 8, loadings ranged from a minimum of 0.23 (Item 12) to 0.73 (Item 1).

Table 8 Unstandardized, standardized, and significance levels for CFA model ($N = 259$)

Items	Unstandardized (*SE*)	Standardized	*P*
1. During lessons, I am fully engaged in what I am doing.	0.458 (0.060)	0.727	< 0.001
2. I try to understand student's point of view, even when their opinions do not make sense to me.	0.424 (0.038)	0.643	< 0.001
3. When I am teaching, I get a sense of how students are feeling.	0.434 (0.052)	0.642	< 0.001
4. I accept each student's individuality without wanting them to behave in the same way.	0.269 (0.047)	0.423	< 0.001
5. Before I speak, I think about the impact my words may have on students.	0.481 (0.050)	0.586	< 0.001
6. When students are going through a difficult time, I give them the nurturing and caring they need.	0.317 (0.038)	0.563	< 0.001
7. I listen carefully to student's ideas, even when I disagree with them.	0.388 (0.043)	0.563	< 0.001
8. When I am teaching, it's easy for me to be in the present moment.	0.514 (0.054)	0.677	< 0.001
9. When students do something that upsets me, I try to keep my emotional stability.	0.364 (0.059)	0.402	< 0.001
10. I am aware of students' mood and tone of voice as I listen to them.	0.378 (0.051)	0.553	< 0.001
11. When I am teaching it seems I am on autopilot, not paying attention to what is happening in the moment.	0.418 (0.072)	0.502	< 0.001
12. I criticize myself for not being the teacher I'd like to be.	0.268 (0.082)	0.230	0.001
13. When I am talking to students, I try to pick up on the intentions behind what they are saying.	0.418 (0.047)	0.530	< 0.001
14. During lessons, I am so busy thinking about other things that I am not really listening to students.	0.375 (0.060)	0.565	< 0.001
15. When I am having a hard time teaching, I feel like other teachers must have an easier time of it.	0.329 (0.068)	0.302	< 0.001
16. I am understanding and patient with students when they are having a hard time.	0.215 (0.031)	0.476	< 0.001
17. Before I speak to students, I am aware of what I want to tell them.	0.492 (0.051)	0.594	< 0.001
18. I rush through activities with students without being really attentive to them.	0.462 (0.060)	0.575	< 0.001

Note. *Interpersonal* dimension: Items 2, 3, 4, 5, 6, 7, 9, 10, 11, 14. *Intrapersonal* dimension: Items 1, 8, 11*, 12*, 14*, 15*, 17, 18* (*reverse scored).

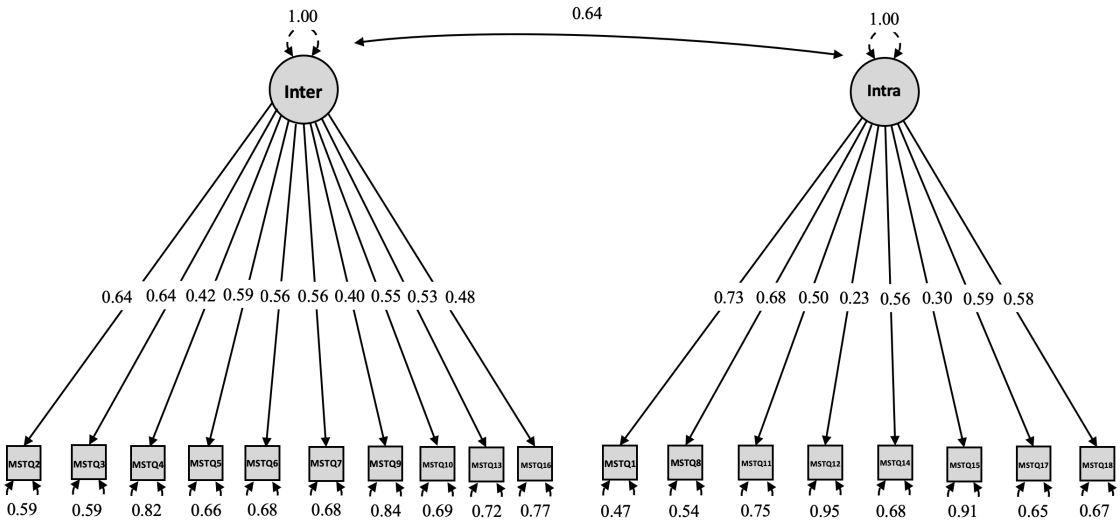

Fig. 1 Flowchart of the 2-factor model with standardized weights of the MSTQ 18 items.

Note. Inter – *Teacher Interpersonal Mindfulness*, Intra – *Teacher Intrapersonal Mindfulness*

5.2.1. Reliability

5.2.1.1. Internal Consistency. Adequate to good levels of internal consistency were observed respectively for the total questionnaire (α = 0.83, ω = 0.83), with a mean inter-items correlation of 0.24, and for each dimension, the *interpersonal* dimension (α = 0.80, ω = 0.80), with a mean inter-items correlation of 0.30 and the *intrapersonal* dimension (α = 0.73, ω = 0.72), with a mean inter-items correlation of 0.29.

5.2.1.2. Test-Retest. A three-week test-retest stability was performed with adequate test-retest stability for the *interpersonal* ($r = 0.73$, $p < 0.001$) and the *intrapersonal* ($r = 0.70$, $p < 0.001$) dimensions. No significant differences were found among individuals across repeated assessments on the *interpersonal* $t(42) = 1.73$, $p > 0.09$ and *intrapersonal* dimensions $t(42) = -1.72$, $p > 0.09$. This indicates that the MSTQ provides consistent results over this period of time.

5.2.4. Relationship of MSTQ scores with other measures

The associations between MSTQ scores and external correlates are presented in Table 9. Overall, results are significant and in the expected direction. Specifically, we found that *Teacher Interpersonal Mindfulness* dimension displayed a strong positive correlation with mindful teaching ($r = 0.50$, $p < 0.001$), moderate positive correlations with self-compassion ($r = 0.42$, $p < 0.001$) and self-efficacy ($r = 0.35$, $p < 0.001$), and a weak positive correlation with job satisfaction ($r = 0.14$, $p < 0.05$); a weak negative correlation was found with burnout ($r = –0.27$, $p < 0.001$). *Teacher Intrapersonal Mindfulness* dimension revealed a strong positive correlation with mindful teaching ($r = 0.59$, $p < 0.001$), moderate positive correlations with self-compassion ($r = 0.49$, $p < 0.001$) and self-efficacy ($r = 0.32$, $p < 0.001$), and a weak positive correlation with job satisfaction ($r = 0.25$, $p < 0.001$); a moderate negative correlation was found with burnout ($r = –0.41$, $p < 0.001$).

Table 9 *Descriptive Statistics and Correlations between MSTQ Facets and Indicators of Teacher Well-Being*

Variable	*M*	*SD*	*1*	*2*	*3*	*4*	*5*	*6*	*7*
Mindfulness Skills in Teaching									
1. MSTQ-Inter	*44.24*	*4.15*	—						
2. MSTQ-Intra	*34.17*	*4.07*	*0.50***	—					
Teacher Well-Being									
3. JobSat	*3.28*	*0.59*	*0.14**	*0.25***	—				
4. SelfEff	*13.12*	*1.58*	*0.35***	*0.32***	*0.56***	—			
5. BOut	*14.15*	*4.41*	*–0.27***	*–0.41***	*–0.47***	*–0.43***	—		
6. MindTeach	*28.82*	*4.36*	*0.50***	*0.59***	*0.24***	*0.33***	*–0.32***	—	
7. SelfComp	*41.95*	*7.97*	*0.42***	*0.49***	*0.16**	*0.30***	*–0.35***	*0.61***	—

**p < 0.05, **p < 0.01, ***p < 0.001.*

Note. MSTQ-Inter – Interpersonal dimension; MSTQ-Intra – Intrapersonal dimension; JobSat – Job Satisfaction; SelfEff – Self-Efficacy; BOut – Burnout; M.T. – Mindful Teaching (CAMS-R adapt.); SelfComp – Self-Compassion.

5.2.5. MSTQ scores and social desirability

We identified moderate positive correlations between MSTQ scores and social desirability. Specifically, the *Teacher Interpersonal Mindfulness* dimension showed a correlation of r = 0.39 ($p < 0.001$), while the *Teacher Intrapersonal Mindfulness* dimension showed a correlation of $r = 0.38$ ($p < 0.001$). These correlations indicate that the MSTQ scores are somewhat influenced by social desirability bias (i.e., participants may be responding in a way they perceive as favorable or socially acceptable rather than providing entirely accurate self-assessments of their mindfulness).

6. Discussion

Whilst there is growing interest in the study of mindfulness in education, a scarcity of valid and reliable measures specifically tailored to these settings has been noted (Lavelle-Heineberg, 2016). This gap is particularly evident in assessing mindfulness among one-to-one instrumental and vocal teachers (Barata-Gonçalves et al., 2025). Thus, the current research aimed to develop and validate a new measure – the *Mindfulness Skills in Teaching Questionnaire*, and examine its suitability in this teaching context. The research was conducted over two studies. In study 1, we developed and pilot-tested an experimental version of the MSTQ (25 items), subjected to an EFA to initially explore its factor structure. In study 2, with the final version of the MSTQ (18 items), we conducted a CFA to test whether the 2-factor structure initially suggested by Frank and colleagues (2016) is also replicated in the context of one-to-one music teaching. Our results support the use of the MSTQ as a valid and reliable assessment tool for measuring mindfulness among instrumental and vocal teachers. While the MSTQ is grounded in the same two-dimensional framework as the MTS (Frank et al., 2016), its development was informed by more recent interpersonal mindfulness research (e.g., Pratscher et al., 2019; Duncan et al., 2023), leading to enhanced psychometric performance in individualized teaching settings.

6.1. MSTQ psychometric properties

Our findings suggest that the MSTQ has robust psychometric properties, shown by adequate to good internal consistency, adequate test-retest reliability, and satisfactory construct validity. A 2-factor structure of mindfulness in teaching emerged, encompassing *Teacher Interpersonal Mindfulness* – reflecting openness, composure, compassion, and sensitivity in teacher-student interactions – and *Teacher Intrapersonal Mindfulness*, which pertains to teachers' *present-moment awareness* (Kabat-Zinn, 2013), involving their capacity to remain attentive, receptive and nonjudgmental during instruction.

The CFA results supported our first hypothesis, confirming the 2-factor structure previously identified in mindfulness in teaching research (cf. Frank et al., 2016). These findings are consistent with prior validation studies of mindfulness questionnaires in educational contexts (e.g., Barata-Gonçalves et al., 2024). Supporting our second hypothesis, the MSTQ and its dimensions showed significant correlations with external constructs, aligning with expectations for convergent and discriminant validity. Notably, the questionnaire demonstrated meaningful associations with teacher well-being indicators.

The *Teacher Intrapersonal Mindfulness* dimension showed the strongest positive correlation with the CAMS-R adaptation for the teaching context. This outcome aligns with our expectations, as both measures target the *intrapersonal* aspect *of mindful teaching*; similar results were found in previous studies (e.g., Kim & Singh, 2018). Moderate positive correlations were found between teacher mindfulness (*interpersonal* and *intrapersonal* dimensions) with self-efficacy and self-compassion, and weak to moderate negative correlations with burnout. This suggests that higher teachers' mindfulness is linked to greater emotional resilience and a stronger sense of competence in teaching. These findings are aligned with previous studies showing that teachers who engage in mindfulness training report heightened mindfulness and self-compassion, which in turn improves emotion regulation and

boosts self-efficacy, ultimately reducing stress and the risk of burnout (Emerson et al., 2017). Finally, weak positive correlations were found between teacher mindfulness dimensions with job satisfaction. This finding may be explained by the complexity of this variable, as it results from the interplay of numerous factors such as school environment, workload, and administrative support (Nápoles, 2022; Skaalvik & Skaalvik, 2020). Moreover, although research suggests that trait and state mindfulness are positively related to job satisfaction, trait mindfulness bore a stronger relation (Good et al., 2016). Overall, these results are in line with previous research that has reported improvements in teachers' well-being following MBIs (Lomas et al., 2017). To the best of our knowledge, this is the first study to explore the specific interplay of job satisfaction, self-efficacy, self-compassion, mindful teaching, and burnout, among instrumental and vocal teachers. The findings underscore the crucial role of mindfulness in fostering teacher well-being, echoing results from broader educational research. These insights suggest that integrating mindfulness practices into one-to-one music education may enhance teacher well-being with an expected positive outcome for students.

6.2. Mindfulness measurement and social desirability

Regarding the relationship between mindfulness measurement and social desirability, research reveals conflicting positions. On the one hand, previous research suggests that individuals with high levels of mindfulness tend to act honestly, modestly, and without harm, implying they are less likely to engage in socially desirable responses (Guo et al., 2023). Moreover, mindfulness practice is believed to enhance self-awareness, allowing individuals to see different aspects of themselves more clearly and become less preoccupied with self-image or social standing (Shapiro et al., 2018). This aligns with findings that higher mindfulness and authenticity are associated with a greater tendency to engage with self-relevant information in a non-defensive manner (Lakey et al., 2008). However, as in our study, moderate correlations have been found

between self-report measures of mindfulness and social desirability (e.g., Pratscher et al., 2019), indicating that the questionnaire may be susceptible to social demand biases. This raises concerns about the accuracy of self-reported mindfulness, as individuals might struggle to accurately reflect their mindfulness, particularly in relation to the frequency of their attentional lapses (Grossman, 2011).

6.3. Practical implications

This study suggests that the MSTQ is a robust self-report measure for evaluating mindfulness among one-to-one instrumental and vocal teachers. By providing a reliable tool to assess mindfulness skills in teaching, this questionnaire can help educators gain insights into their teaching practices, promoting greater self-awareness and reflective teaching (McCaw, 2023). Moreover, the questionnaire might serve as a valuable tool for evaluating the effectiveness of MBIs. Music institutions and training programs can use the MSTQ to support professional development initiatives, focusing on mindfulness practices aimed at improving teaching quality and fostering positive learning environments in music education, ultimately contributing to better student outcomes and a more supportive educational climate.

6.4. Strengths, Limitations and Directions for Future Research

The current studies were conducted using a large and diverse sample of conservatory and higher education instrumental and vocal teachers. To our knowledge, this is the first research to validate a self-report measure for assessing mindfulness among these music educators. This validation was conducted using a broad range of participants with regards to gender, school-level taught, and voice or musical instrument taught from Portugal. These educators are an ideal group for testing the scale, as individualized music instruction occurs worldwide, across various settings (i.e., public and private schools), and spans students of different ages, from

compulsory schooling and tertiary education to the old age. The long-term close teacher-student relationships create a rich and multifaceted environment particularly suitable for testing mindfulness teaching in individualized tuition. Thus, these sample characteristics allow for future comparisons with one-to-one music teachers from other countries and educational contexts. Moreover, future research is suggested to examine whether our results replicate with a larger sample of higher education music teachers.

Although the MSTQ was validated with one-to-one instrumental and vocal teachers, the item wording was intentionally designed to be broadly applicable and not limited to music-specific terminology. This allows for potential use across a range of educational contexts. Future research is strongly encouraged to explore the MSTQ's validity and reliability in other one-to-one instruction settings where teacher-student interaction plays a central role, such as special education or higher education supervision. Moreover, studies in K–12 environments could provide valuable insights into the scale's applicability among classroom teachers, helping to determine whether the MSTQ can effectively capture mindfulness skills across diverse instructional formats.

Additionally, although our results suggested the MSTQ is reliable for use with instrumental and vocal teachers without extensive training in mindfulness and scores are moderately stable over a three weeks' time period, the measure's sensitivity to mindfulness intervention effects remains largely unexplored. Future research is recommended to explore how systematic mindfulness-based training may influence how respondents interpret the items and ultimately affect their self-assessments.

Furthermore, the MSTQ showed a significant and moderate correlation with social desirability, indicating potential vulnerability to social demand biases. To address these presumed biases and strengthen the construct validity of the MSTQ, future research should consider incorporating additional methodologies, such as daily teaching diaries, experience

sampling during lessons, and peer or student reports, as well as testing the scale's alignment with teaching behaviors and student outcomes in experimental and longitudinal studies. These studies could also assess the scale's temporal stability over longer periods, providing insights into how mindfulness skills in teaching evolve and how they correlate with long-term teaching effectiveness, job satisfaction, and burnout. To conclude, we hope our research will encourages the widespread use of the MSTQ in evaluating mindfulness among teachers, thereby supporting future studies of mindfulness in teaching.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the first author used *DeepL* and *ChatGPT* in order to improve language and readability. After using these tools, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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