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Exploring the Factor Structure and Measurement Invariance of the Teacher Subjective Wellbeing Questionnaire Across Four European Countries

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Abstract

Teacher well-being is a psychological asset for educators, often associated with job engagement and retention. However, sophisticated measures to comprehensively assess teacher well-being are still under investigation. This study explores the factor structure and cross-country comparability of the Teacher Subjective Wellbeing Questionnaire (TSWQ) among 393 early childhood education teachers from four European countries. Exploratory and confirmatory factor analyses generally supported the TSWQ's proposed dimensionality, identifying teaching efficacy and school connectedness as two distinct latent factors, along with indications for the existence of a general, higher-order factor. Additionally, measurement equivalence was established at all levels across the four countries. Discriminant validity analyses highlighted culturally specific nuances in the relationship between teacher well-being and burnout. The findings underscore the TSWQ's

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potential to advance theoretical and methodological research on teacher well-being and broaden the instrument's applicability across diverse educational settings.

Keywords
teacher well-being, construct validity, measurement invariance, cross-cultural assessment, early childhood education

Teacher well-being has become a growing concern for policymakers and researchers in recent years, as the teaching profession consistently ranks among the most stressful occupations. Daily rigors, including intense human interactions, heavy workloads, insufficient support, negative relationships, and challenging student behaviors, increase teachers' susceptibility to mental health issues and professional dissatisfaction (McCallum et al., 2017; Skaalvik & Skaalvik, 2017). Failure to address these challenges may lead to job disengagement, reduced effectiveness, and high job turnover rates (Falecki & Mann, 2021; Hall-Kenyon et al., 2014).

The growing body of research on teacher well-being highlights its potential impact on educational outcomes for teachers, students, and the broader classroom and school environments. Educational systems are increasingly interested in teachers' psychological states, such as well-being, resilience, and self-efficacy, as these factors play a proactive role in maintaining teacher retention and reducing job turnover (OECD, 2019a). Beside teacher well-being being associated with job engagement and satisfaction (Falecki & Mann, 2021), compelling evidence suggests that it could enhance instructional practices, thereby contributing to improved student outcomes and an overall enriched educational experience for students (Braun et al., 2020; Mennes et al., 2023). Previous studies also argued that teachers' positive emotional states may foster healthier teacher–student interactions (Virtanen et al., 2019) and more effective management of challenging student behaviors (Jennings & Greenberg, 2009). In fact, the Jennings and Greenberg's (2009) prosocial classroom model views teacher well-being as a main contextual component within the classroom that might indirectly affect students' social, emotional, and academic outcomes through process-related mechanisms, including teacher–student relationships, effective classroom management, and effective SEL implementation. Teachers' negative affect, in contrast, can negatively influence students' social and academic outcomes (Hamre & Pianta, 2001).

Early Childhood Education (ECE) teachers' well-being is often overlooked in policymaking and reforms, despite their particularly stressful working conditions (Hall-Kenyon et al., 2014). For example, ECE professionals are daily called upon to meet young children's emotional demands and manage behavioral challenges. Moreover, the developmental needs of children within the classroom are often highly diverse, while specific guidance or support from school management or specialists is usually insufficient (Heilala et al., 2023). These complex interpersonal demands, along with challenges such as low compensation, low autonomy, and parental expectations, may contribute to increased stress and burnout (Ballantyne & Retell, 2020; Ng et al., 2023), which, as noted in previous studies, can also lead to high turnover rates within the early childhood education and care profession (Cumming et al., 2021; McMullen et al., 2020).

International organizations, such as the European Commission et al. (2021), OECD (2019), have recently stressed the importance of studying, evaluating, and monitoring teacher well-being. However, although teacher well-being is gaining attention internationally, research is long-overdue (Hall-Kenyon et al., 2014). Over the last years, researchers adopted measures from other research fields to evaluate teachers' well-being (e.g., organizational psychology), as instruments explicitly referring to the teaching profession are limited (Hascher & Waber, 2021). Additionally, traditional well-being evaluations mostly focused on the negative psychological

states (e.g., stress) that might have hindered the positive affect of teachers within schools (Van Horn et al., 2004).

Addressing this gap, Renshaw and colleagues (2015) developed the Teacher Subjective Wellbeing Questionnaire (TSWQ) which is a teacher-specific measure for well-being. Specifically, the TSWQ has been designed to capture teachers' positive work-related affective states at school. The few studies that examined the TSWQ's technical adequacy reported valid and reliable measurements mainly among elementary, middle, and higher education teachers (e.g., de Biagi et al., 2018; Mankin et al., 2018; Renshaw et al., 2015; Von Der Embse & Mankin, 2021). Therefore, additional research is required to evaluate the psychometric properties of the TSWQ in various contexts, particularly among ECE teachers. Previous studies that applied the instrument to this population reported limited validity evidence for the TSWQ and its measurements (e.g., Armoza-Levi & Rusu, 2024; Dayne et al., 2023; Walter et al., 2023).

Teacher Well-Being Definitions

A major obstacle in well-being research is the lack of common definitions (Hascher & Waber, 2021). Besides being multifaceted nature (McCallum et al., 2017; Pezirkianidis & Stalikas, 2020), defining the well-being of teachers, in particular, becomes even more complicated because specific professional conditions (e.g., career structure), school characteristics (e.g., leadership style), working environment (e.g., demands and resources), social interactions (e.g., communication with parents), and other situational factors (e.g., students' motivation) are to be considered (McCallum, 2021; Viac & Fraser, 2020).

Previous studies in educational settings (e.g., Chan, 2009; Hung et al., 2016) have employed the concept of subjective well-being as defined by Diener and colleagues (1999). This approach encompasses individuals' cognitive and emotional responses, as well as their rational judgments to life circumstances, such as job satisfaction. Other researchers (e.g., Turner et al., 2022) opted for generic approaches such as the PERMA model, which proposes a conceptualization of well-being through five main elements: positive emotions, engagement, relationships, meaning, and accomplishment (Seligman, 2012). Occupational-oriented views seem more promising, as they consider psychological states at work. An exemplary model is the Job Demands-Resources Model (Bakker & Demerouti, 2007), which incorporates both positive (e.g., job engagement or satisfaction) as well as negative components (e.g., burnout and workaholism).

Integrated definitions attempt to frame teacher well-being in a more holistic way. For example, Aelterman and colleagues (2007) proposed a combined definition emphasizing the dynamic interplay of personal (teachers' needs and expectations) and environmental (social support at school) factors. Similarly, Viac and Fraser (2020) developed a comprehensive conceptual framework for teachers' occupational well-being consisting of four dimensions: cognitive (e.g., teacher self-efficacy), subjective (e.g., job satisfaction), physical and mental (e.g., frequency of psychosomatic symptoms), and social (e.g., positive relationships with colleagues).

Van Horn et al. (2004) proposed a multidimensional occupational-oriented definition as well, including affective, cognitive, professional, social, and psychosomatic aspects. Using teacher samples, their analyses suggested that well-being is better reflected only through the professional, social, and affective dimensions. Building on this research, Renshaw and colleagues (2015) presented a positive-oriented conceptualization in which teacher well-being is viewed through *school connectedness* and *teaching efficacy*. Connectedness emphasizes the importance of prosocial relationships at school, as reflected in teachers' perceived support from colleagues, sense of belongingness, and relatedness with teachers and students (García-Moya et al., 2019). Teaching efficacy reflects the cognitive and motivational aspects, related to their perceived capacity to effectively execute their responsibilities and help students attain their learning goals

(Tschannen-Moran & Hoy, 2001). This approach opposes the traditional negative conception of teacher well-being and facilitates the conceptualization of a positive meta-construct that could be efficiently operationalized in practice along with negative aspects (e.g., burnout).

Teacher Well-Being Measures

Based on the theoretical frameworks as briefly presented above, there exist various instruments aiming to capture well-being. However, apparently only a few of them provide comprehensive validity evidence with teacher samples (Hascher & Waber, 2021). Measures constructed for the general population, such as the WHO-Five Well-being Index (WHO, 1998), the PERMA Profiler (Butler & Kern, 2016), and the Warwick-Edinburgh Mental Well-being Scale (Stewart-Brown et al., 2011), may be too generic to capture the specific psychological conditions of the teaching profession. Using a combination of constructs to address aspects of teachers' well-being was also attempted with measures such as the Satisfaction with Life Scale (Diener et al., 1985), the Positive and Negative Affect Scale (Watson et al., 1988), the Perceived Stress Scale (Cohen et al., 1983), and the Maslach Burnout Inventory (Maslach et al., 1996).

Teacher-specific well-being measures remain limited. For example, the Teacher Well-Being Scale (TWBS; Collie, 2014) aims to evaluate teachers' experiences at work addressing their workload, organizational characteristics, and interactions with students. Previous studies provided some validity evidence for measurements obtained with a diverse sample of Canadian teachers and university teachers in Ethiopia (e.g., Collie et al., 2015; Zewude & Hercz, 2022). The Canadian study (Collie et al., 2015) also examined whether the multiple components of the TWBS represent an overarching teacher well-being construct. This issue has received little attention in teacher well-being measures, despite the common practice of using overall scales' scores to explore hypothesized relationships (Hascher & Waber, 2021; Linley et al., 2009).

The Teacher Subjective Wellbeing Questionnaire (TSWQ; Renshaw et al., 2015), which is adopted in the present study, aims to assess teachers' positive psychological functioning at work focusing on school connectedness and teaching efficacy. According to the authors (Renshaw et al., 2015), teachers' positive psychological functioning is considered a conducive affective state that contributes to a healthy and successful work performance. This state can be addressed through subjective well-being indicators, such as positive emotions and cognitions. Besides construct validity, the original study also provided evidence of discriminant validity, due to a negative association between TSWQ scores and teacher stress and burnout (Renshaw et al., 2015). An adapted version of the scale for the Brazilian context was associated with general areas of teachers' quality of life, providing indications of convergent validity (de Biagi et al., 2018). In an attempt to examine the measurement invariance of the TSWQ across Brazilian and American teachers, the same study revealed nuanced differences in measurement. Another study conducted in the United States (Mankin et al., 2018) showed that the scale remained invariant at all levels across elementary, middle, and high school teachers. Moreover, recent results supported concurrent validity of measurements at three time-points (fall, winter, and spring) obtained from U.S. middle school teachers (Von Der Embse & Mankin, 2021).

The above validation studies also reported good internal consistency for both the subscales and the overall composite scale. Specifically, de Biagi et al. (2018) reported H = .81 for teaching efficacy and H = .74 for school connectedness; Renshaw et al. (2015) found $\alpha = .89$ for teaching efficacy, $\alpha = .82$ for school connectedness, and $\alpha = .83$ for the composite scale; Mankin et al. (2018) reported $\alpha = .87$ for both teaching efficacy and school connectedness; and Von Der Embse and Mankin (2021) reported $\alpha > .88$ for teaching efficacy, $\alpha > .84$ for school connectedness, and $\alpha = .90$ for the composite scale.

Among the countries included in this study (i.e., Cyprus, Greece, Portugal, and Romania), we identified only one prior study that employed TSWQ. Specifically, Macovei et al. (2023), using a Romanian university teacher sample, reported high internal consistencies (α = .85 for teaching efficacy; α = .87 for school connectedness; and α = .90 for the overall scale), but no validation methods were conducted. Therefore, the present study paves the way for further using the TSWQ in four additional countries, particularly with the understudied group of ECE professionals.

Examining Teacher Well-Being Across Countries

Interest in studying teachers' well-being across countries is growing (European Education et al., 2021; OECD, 2019). Cross-country analyses can deepen our understanding of contextual factors that influence teachers' professional affective states, both positively and negatively. National educational policies can leverage this knowledge to address specific conditions and develop programs that promote teacher well-being, in order to maintain teacher retention and make the teaching profession a more attractive career. For such transferability of knowledge to be meaningful across different contexts, the instruments used must demonstrate cross-country equivalence.

Research has highlighted that well-being may be socially and culturally constructed, which suggest variations in how teachers perceive and assess their psychological states across different contexts (Chen et al., 2020). For example, previous findings have indicated that levels of job satisfaction tend to be higher in collectivist cultures than in individualistic cultures (Kirkman & Shapiro, 2001). This difference has been attributed to the greater propensity for collaborative work and focus on ingroup goals in collectivist cultures (e.g., in southern European countries examined in this study), in contrast to greater autonomy at work valued in individualistic cultures (e.g., the United States, where the TSWQ was developed) (Klassen et al., 2010). Accordingly, teacher well-being might be viewed through individualistic aspects, such as professional autonomy and self-efficacy, or collectivistic aspects, such as collegial relationships and school support (Liu et al., 2017). The limited body of comparative studies in teacher well-being has shown notable differences between countries with respect to the perceived meaning of well-being (e.g., de Biagi et al., 2018; Hascher & Waber, 2021; OECD, 2019b). For these reasons, uniform functioning of TSWQ across countries cannot be recklessly assumed.

The establishment of comparable instruments for teacher well-being, especially in view of international studies, is a critical consideration for the present study. Measurement invariance analysis examines whether constructs preserve the same understanding and whether their psychometric properties remain consistent across different groups of people. If measurement invariance is not achieved, comparable results could be equivocal or even invalid. Given the limited availability of teacher well-being instruments that meet the criteria for measurement invariance (Hascher & Waber, 2021; Zhang et al., 2023), the present study aims to establish measurement invariance for a teacher-specific well-being measure across four European countries, using data from ECE teachers.

Research Aims

The present study builds upon the current literature of teacher well-being evaluation and investigates the factorial structure of the Teacher Subjective Wellbeing Questionnaire (TSWQ) with ECE teachers across four European countries: Cyprus, Greece, Portugal, and Romania. To the best of our knowledge, no studies have provided sufficient validity evidence for the TSWQ in these countries, while no validation studies have comprehensively examined the scale's properties specifically with ECE teachers more broadly. Furthermore, our investigation extends to testing a

hierarchical factor structure and the measurement equivalence of the instrument across the participating countries. Three research questions guided this study:

1. What is TSWQ's underlying factor structure in each participating country?
2. Are TSWQ's measurement properties equivalent across the participating countries?
3. How are teacher well-being, teaching efficacy, school connectedness, and teacher burnout related to each other in the participating countries?

Methods

Participants

The participants consisted of 393 ECE teachers from 95 schools across Cyprus, Greece, Portugal, and Romania. Almost all professionals were female with substantial experience in the teaching profession (see Table 1 that summarizes their demographic characteristics). All ECE settings involved in the study were public and represented both urban and rural areas. These settings catered to students aged 3–6 years, with the exception of Greece, where students are served until the age of five. In all countries, attendance in the last year of ECE is compulsory, except in Portugal, where attendance is not mandatory at any age. The average number of teachers at participating schools varied from three to nine, with Greece having the smallest and Romania having the largest settings. Teachers in each participating school were invited to participate in the study; the participation rate was 71% in Cyprus, 100% in Greece, 89% in Portugal, and 70% in Romania. Additional characteristics of the school and teacher samples across the four countries are presented in the Appendix (Table A1).

Schools were recruited through official announcements issued by local educational authorities in each country, inviting all ECE settings of their regions to participate. From the pool of interested candidates, the research teams selected participating settings based on two criteria: school size and

Table 1. Participating Teachers' Demographic Characteristics.

	Cyprus		Greece		Portugal		Romania	
	n	%	*n*	%	*n*	%	*n*	%
Gender								
Male	0	0	4	4.3	0	0	0	0
Female	96	100	89	95.7	95	100	109	100
Education level								
Bachelor	64	68.8	33	34.4	49	51.6	76	69.7
Master	25	26.9	60	62.5	4	4.2	27	24.8
PhD	0	0	2	2.1	0	0	0	0
Other	4	4.3	1	1.0	42	44.2	6	5.5
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Age	42.16	7.88	48.88	7.26	50.22	8.99	39.94	9.71
Teacher experience	17.57	9.48	21.29	7.46	22.90	14.38	16.24	10.91
Years at current school	14.93	10.15	19.91	7.59	9.14	14.17	12.42	9.83
No. of children in classroom	17.41	9.93	18.26	3.70	19.67	3.84	24.63	4.43

Note. Cyprus: $n = 96$, Greece: $n = 93$, Portugal: $n = 95$, Romania: $n = 109$.

location accessibility. Preference was given to settings with larger schools to maximize teacher sample size, as ECE settings in all participating countries tend to be relatively small (see the average school size in Table A1 of the Appendix).

Measures

The Teacher Subjective Wellbeing Questionnaire (TSWQ; Renshaw et al., 2015) is an eight-item self-report measure designed to assess teachers' positive psychological functioning at work. Responses are reported on a 4-point Likert scale (1 = almost never to 4 = almost always) regarding their affective state during the last month. The initial construction and later investigations of the scale suggested that the TSWQ pertains two subscales: *teachers' efficacy* and *school connectedness* (de Biagi et al., 2018; Mankin et al., 2018; Renshaw et al., 2015). Teaching efficacy refers to how effective teachers feel with regards to their profession (e.g., "I am good at helping students learn new things"), while school connectedness concerns their feelings of belongingness in the school (e.g., "I feel like I belong at this school"). Each subscale consists of four items. In this study, reliability, measured using McDonald's omega coefficient, ranged from .88 to .91 for the total scale, from .78 to .90 for teaching efficacy, and from .79 to .89 for school connectedness across the four countries.

The Maslach Burnout Inventory for educators was used to measure teacher burnout for the purpose of examining discriminant validity with the TSWQ (Maslach et al., 1996). The MBI consists of 22 items rated on a 7-point Likert scale. The omega coefficient for the total scale ranged from .70 to .87 across the four countries.

Procedures

Prior to administration, the English version of the TSWQ was translated by experienced researchers into the official language of each participating country (i.e., Greek, Portuguese, and Romanian). For the translation, we adopted the European Social Survey (ESS) translation guidelines (Dorer, 2012) as part of the TRAPD procedures. Qualified native speakers familiar with the educational context of each country reviewed the translation and provided feedback regarding the use of certain terms to suit the ECE context (e.g., school vs. preschool and teacher vs. preprimary teacher). As a step to ensure face validity, the questionnaires were pretested with a small group of ECE teachers in each country who did not participate in the main study, which led to additional minor adaptations in some cases. In Cyprus, Greece, and Romania, the data were collected through online questionnaires administered to schools during October–November 2021. Portuguese teachers completed paper-and-pencil questionnaires during the same period. During data collection, the instruction in the participating schools was face-to-face as usual. In all countries, the required national ethical considerations were applied involving official approval from the national research authority, signed school agreements, consent forms for teachers' participation, or a combination of these. In all cases, completed questionnaires were pseudonymized to maintain anonymity.

Data Analyses

Since the TSWQ had not been previously used in the participating countries, we first conducted Exploratory Factor Analyses (EFA) to investigate whether the nuanced structure of the measure in each country aligned with the proposed framework (Renshaw et al., 2015). Additionally, we explored the instrument's hierarchical structure through higher-order factor analyses using the Schmid–Leiman (1957) procedure. Based on these results, Confirmatory Factor Analysis (CFA)

was performed to compare three models (a) those that emerged from the EFA; (b) the two-correlated factor model of the TSWQ as proposed by its authors; and (c) the single-factor model. Last, a measurement invariance (MI) test was conducted though multigroup CFA to assess the equivalence of TSWQ across countries in three sequential levels: configural, threshold, and threshold and loading invariance. This approach has been described as appropriate for ordered categorical outcomes in invariance testing across groups (Svetina et al., 2019; Wu & Estabrook, 2016). According to the authors, configural invariance is equivalent to the conventional baseline model specification and it is tested by specifying the same factor pattern structure while allowing free parametrization across groups. The next level is threshold invariance in which thresholds are constrained to be equal across groups. Last, the most restricted model is specified by constraining thresholds and factor loadings to be equal for all groups. If all levels of invariance are achieved, it may be concluded that the meaning and interpretation of the constructs are similar across groups. The measurement invariance was assessed using the $\Delta\chi^2$ difference test and the ΔCFI and ΔRMSEA indices (Cheung & Rensvold, 2002; Svetina & Rutkowski, 2017).

Models' characteristics were evaluated based on robust and scaled indices as derived from the weighted least squares estimation method (WLSMV), which is appropriate for ordinal data. A well fitted model was indicated by a non-significant test statistic (p-value of $\chi^2 > .05$), Comparative Fit Index (CFI) and Tucker-Lewis index (TLI) ≥ 0.95 (values ≥ 0.90 suggest an acceptable fit), Root Mean Square Error of Approximation (RMSEA) ≤ 0.06 (values ≤ 0.08 suggest a fair fit), and Standardized Root Mean Square Residual (SRMR) ≤ 0.08. Factor loadings of .40 or higher were considered satisfactory for model adequacy (Stevens, 2002). Modification indices and residual correlations above |>.10| were considered for possible misspecification and assessment of local data-model fit (Kline, 2016). The above analyses were conducted in the R statistical environment (version 4.2.0; R Core Team, 2022), with the support of Roberson and Renshaw's (2022) open resource.

Convergent validity and discriminant validity were examined through the relationships among the TSWQ subscales (*teaching efficacy* and *school connectedness*) and the overall teacher well-being scale, as well as their correlations with teacher burnout. These associations were estimated using Spearman's Rho due to the ordinal nature of the TSWQ data.

Results

Exploratory Factor Analyses

First-Order Factor Analyses. Factor extraction was determined through parallel analysis and inspection of eigenvalue scree plots. For both parallel and subsequent analyses, polychoric correlations were employed, which are more appropriate for ordinal data (Holgado-Tello et al., 2010). The Kaiser–Meyer–Olkin (KMO) tests yielded good values, ranging from .780 to .864, indicating that all samples were suitable for factor analysis. Bartlett's tests of sphericity were acceptable and significant (Cyprus: $\chi^2(28) = 361.83$, $p < .001$; Greece: $\chi^2(28) = 323.04$, $p < .001$; Portugal: $\chi^2(28) = 244.85$, $p < .001$; Romania: $\chi^2(28) = 334.45$, $p < .001$). Scree plots and parallel analyses supported the extraction of two factors in all countries. Accordingly, we conducted a two-factor constrained EFA in each country, utilizing principal axis factoring with Promax rotation, allowing factors to correlate, as anticipated. These solutions explained a satisfactory percentage of the total variance in all countries, ranging from 60% to 80%, with all item communalities exceeding .47 (see Table A2 in the Appendix). An examination of pattern matrix standardized loadings indicated that the TSWQ items formed two dimensions with four items each, in accordance with the theoretically proposed factorial structure of the scale. Only in the case of Portugal did the analysis suggest two factors: one with five items (including all four items related to teaching efficacy) and a

second factor with three items (all related to connectedness). The distinguished item (i.e., *I feel like I belong at this school*) exhibited relatively high loadings in both factors (i.e., .45 on teaching efficacy and .29 on school connectedness). Correlations between factors were modest to large and statistically significant, ranging from .35 (Cyprus) to .70 (Portugal).

Higher-Order Factor Analyses

Schmid–Leiman results for the higher-order factor analyses indicated that a higher-order factor accounted for the largest portion of the total (27.5%–48.1%) and common (34.6%–70.0%) variance in all countries (see Table A3 in the Appendix). In three countries, the higher-order factor also explained the largest portion of the items' variance except in Cyprus, where the two first-order factors contributed more significantly to explaining the items' variance. Across countries, the *teaching efficacy* factor explained 9.6%–26.3% of the total variance and 15.8%–33.0% of the common variance, beyond the general factor. Similarly, the *school connectedness* factor accounted for 8.6%–25.7% of the total variance and 14.2%–32.4% of the common variance beyond the general factor. The analyses generally produced acceptable *g*-loadings for the items in all countries (i.e., .47–.59 in Cyprus, .53–.76 in Greece, .61–.68 in Portugal, and .58–.78 in Romania). Moreover, the items were consistently associated with their theoretically defined factors, with the exception of Portugal, where two items (q1 and q2) demonstrated relatively low loadings (<.32) on both factors but exhibited good *g*-loadings.

Confirmatory Factor Analyses

The Two-Correlated and Higher-Order Factor Models. The next step involved evaluating and comparing the models derived from the EFA with the original two-factor models using CFA in each country. The first-order factor analyses supported the original structure of the TSWQ in Cyprus, Greece, and Romania, eliminating the need for further comparisons. In Portugal, the EFA revealed a minor deviation from the original structure, specifically regarding one item with cross-factor loadings. However, based on conceptual considerations, it was deemed more appropriate to specify the item to its theoretically aligned factor. Consequently, the fit of the data to the two-correlated factor structure was tested across all countries. Moreover, the higher-order factor analysis indicated the presence of a general factor alongside meaningful contributions of the first-order factors. Consequently, the suggested hierarchical structure was also considered, and a second-order factor model was tested in each country.

The results of the two-correlated factor models showed acceptable fit in all countries providing sufficient evidence to support the proposed structure (see Table 2). Although a non-statistically significant value for chi-square would favor the model fit, this was not interpreted as a problematic indication given that the χ^2 statistic is sensitive to sample size (Ullman, 2007). For this reason, emphasis was given to the CFI/TLI, SRMR, and RMSEA, which were all within acceptable levels. All item loadings were satisfactory ranging from .72 to 1.00 for *teaching efficacy* and from .66 to .92 for *school connectedness* across countries. Standardized covariances between the two factors were statistically significant in all countries suggesting moderate to strong relationships (i.e., .38 in Cyprus, .71 in Greece, .78 in Portugal, and .63 in Romania). Two minor modifications were applied by correlating errors e4 with e8 in Cyprus, and e1 with e5 in Portugal, while inspection of residual correlations did not reveal any reasonable misspecification to the models in each country. The parameter estimates from the CFA models are presented in the Table A4 of the Appendix.

Next, the correlation between the latent factors was replaced with a second-order factor to test the hierarchical model. Since the second-order factor model included only two indicators, the first-order factors unstandardized loadings were constrained to equality to ensure model identification

Table 2. Model Fit Parameters for the CFA and MI Models.

Country	χ^2(df)	CFI	TLI	RMSEA	RMSEA 90% CI	SRMR
Two-correlated factor and higher-order factor models						
Cyprus	26.96 (18)	.993	.989	.072	.001–.126	.080
Greece	25.36 (19)	.994	.992	.060	.001–.116	.067
Portugal	30.45* (18)	.977	.964	.086	.024–.137	.078
Romania	22.40 (19)	.996	.994	.041	.001–.097	.065
Single-factor models						
Cyprus	203.82* (20)	.860	.804	.311	.273–.350	.280
Greece	66.51* (20)	.959	.942	.159	.118–.202	.119
Portugal	45.46* (20)	.952	.933	.116	.071–.161	.098
Romania	80.93* (20)	.926	.896	.168	.131–.207	.150
Measurement invariance of two-correlated factor model						
Configural/threshold invariance	103.829* (76)	.992	.988	.061	.026–.089	.072
Threshold and loadings invariance	117.759* (94)	.993	.992	.051	.003–.078	.073

Note. *$p < .05$.

(Brown, 2015; Kline, 2016). Still, the upper part of the model was just-identified, essentially representing a reparameterization of the two-correlated factor model (see Brown, 2015, for details). As a result, the higher-order CFA yielded identical goodness-of-fit indices to the two-correlated factor models across all countries (see Table 2). The estimated standardized loadings for the second-order factor ranged from .59 to .89 for *teaching efficacy* and from .65 to .98 for *school connectedness* across countries. With identical model fit parameters and infeasible model comparisons, theoretical considerations guided model selection. Consequently, subsequent analyses focused on the two-correlated factor model (Renshaw et al., 2015).

Testing the Single-Factor Model. The next step involved testing the single-factor model in each country. The global fit indices suggested, at best, mediocre fit in all countries, even when factor loadings were satisfactory (i.e., Cyprus: ΔCFI = −.09, ΔRMSEA = .21, Greece: ΔCFI = −.03, ΔRMSEA = .10, Portugal: ΔCFI = −.02, ΔRMSEA = .03, and Romania: ΔCFI = −.07, ΔRMSEA = .13). Moreover, the residual correlations of the single-factor models were considerably higher than in the two-factor models. In Cyprus, for instance, fit indices were unacceptable even after introducing reasonable modifications (i.e., $\chi^2(17) = 145.87$, $p < .001$, CFI = .90, TLI = .84, RMSEA = .28, SRMR = .23), while 24 out of 57 residual correlations were well above |.10|. Accordingly, the single-factor model was not deemed acceptable for any country.

Bootstrapping. Bootstrapping was employed to assess the robustness of the parameter estimates in the two-factor CFA models, due to the fact that sample size hindered the application of the conventional cross-validation method, which involves testing and training the TSWQ structure with random subsets in each country (Yung & Chan, 1999). Bootstrapping is a nonparametric resampling technique that generates multiple simulated datasets by resampling with replacement from the original data. The analysis is then run multiple times, producing bootstrapped standard errors or confidence intervals for parameter estimates based on the new sampling distribution. This approach enhances the reliability and precision of parameter estimates by reducing the impact of sampling variability, thereby improving the overall robustness of the model (Chernick, 2008; Hancock & Liu, 2012). In this study, the two-correlated factor models were run with 1000 resamplings in each country to obtain more robust confidence intervals for the parameter estimates.

The results showed stability in the fit indices and statistical significance of all factor loadings across countries (see Table A5 in the Appendix), supporting the robustness of the CFA results and the two-factor structure of the TSWQ in the four countries.

Measurement Invariance

Multigroup CFA was conducted to test whether the TSWQ elicits similar response patterns across the four countries. Prior to conducting the analyses, we had to collapse category 1 in four items and category 2 in one item, since they did not appear in all groups (category 1 was identified one time in q1, six times in q5, two times in q6, and one time in q7, and category 2 was identified eight times in q8). The results showed that configural invariance was supported (see Table 2). Consequently, we proceeded to examine threshold invariance by constraining all thresholds to be equal across the four countries. The threshold invariant model was identical to the baseline configural model, which revealed that constraining thresholds made it possible to relax constraints on other parameters for model identification. This phenomenon might be caused from collapsing certain categories as explained by Wu and Estabrook (2016). In such case, the configural/threshold invariant model was used as the baseline model. Subsequently, we proceeded to test threshold and loading invariance by further constraining loadings to be equal across groups. The restricted model showed an equivalently good fit compared to the baseline model ($\Delta\chi^2$(df) = 13.93(18), ΔCFI = −.001, ΔRMSEA = −.010), implying that the TSWQ preserved its conceptual and measurement meaning across the four countries. The standardized parameter estimates for each country are presented in Figure 1.

Monte Carlo Simulation. Following recommendations from the literature, a Monte Carlo simulation was conducted to estimate the required sample size and power for performing a MGCFA in our study (Kline, 2016; Meade & Lautenschlager, 2004; Pendergast et al., 2017). The simulation generated ordinal data across four groups adhering to the specific constrained parameters (i.e., model structure, item loadings, and item thresholds) of the most restricted model in our MGCFA analysis (i.e., the threshold and loading invariant model). The simulation ran with 1000 replications for the indicative sample size of 100 participants per group. The analysis yielded a power estimate of 0.923, surpassing the conventional threshold of 0.80 for adequate power (MacCallum et al., 1996). This suggests a strong likelihood of rejecting the null hypothesis that the model does not fit well and indicates that model fit is not significantly influenced by the sample size used in the study. Additionally, a sensitivity analysis was performed to evaluate whether relaxing the specified restrictions would affect power and model fit. This analysis employed the same number of replications and sample size but without any constraints on the model, reflecting the configural invariant model in the MGCFA. The estimated power from the sensitivity analysis was 0.908, indicating that the analysis remained effective in detecting relationships and differences across the groups and in assessing model fit. Therefore, the results suggest that the sample sizes utilized in this study provided sufficient power to support the findings derived from the MGCFA analysis.

Convergent and Discriminant Validity

The relationships among the TSWQ subscales (*teaching efficacy* and *school connectedness*) and the overall teacher well-being scale were estimated to assess convergent validity, while their relationships with teacher burnout were examined to assess discriminant validity. As presented in Table 3, positive and statistically significant correlations were observed between teaching efficacy and school connectedness in all countries, ranging from moderate to strong relationships. The

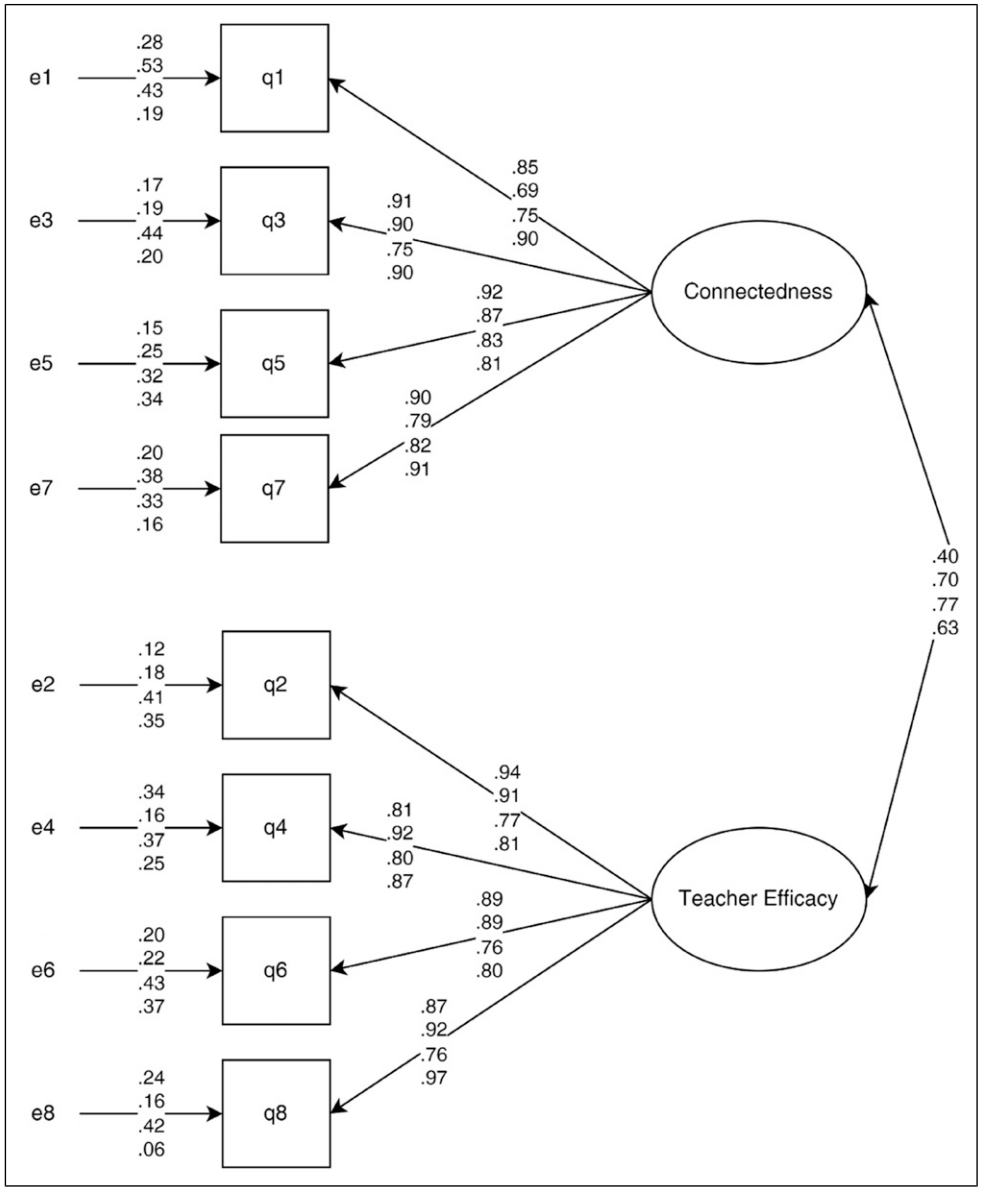

Figure 1. The threshold and loadings invariance model with standardized factor parameter estimates. *Note.* The values are presented in the following sequence from top to bottom: Cyprus, Greece, Romania, and Portugal.

subscales were also highly correlated with the overall teacher well-being scale. Regarding the associations with teacher burnout, negative correlations were found with *school connectedness* in three countries and with *teaching efficacy* in two countries. When present, these relationships were mostly moderate. Similarly, in three countries (Cyprus, Greece, and Portugal), the overall teacher well-being scale was negatively correlated with burnout, with weak to moderate relationships, indicating that higher burnout was associated to lower well-being levels. In Portugal, teaching

Table 3. Descriptive Statistics and Correlations Among Teacher Well-Being, Teaching Efficacy, School Connectedness, and Teacher Burnout.

	M	SD	TE	SC	TSW
Cyprus					
Teaching efficacy	3.29	0.52	—		
School connectedness	3.52	0.57	.38*	—	
Teacher subjective well-being	3.41	0.43	.78*	.85*	—
Teacher burnout	1.33	0.58	−.29*	−.34*	−.38*
Greece					
Teaching efficacy	3.44	0.49	—		
School connectedness	3.62	0.43	.53*	—	
Teacher subjective well-being	3.53	0.41	.89*	.85*	—
Teacher burnout	1.14	0.56	−.44*	−.43*	−.48*
Portugal					
Teaching efficacy	3.42	0.48	—		
School connectedness	3.43	0.57	.50*	—	
Teacher subjective well-being	3.43	0.47	.81*	.91*	—
Teacher burnout	1.11	0.81	−.08	−.46*	−.27*
Romania					
Teaching efficacy	3.71	0.46	—		
School connectedness	3.65	0.54	.66*	—	
Teacher subjective well-being	3.68	0.46	.87*	.92*	—
Teacher burnout	0.81	0.68	−.04	−.16	−.19

Note. TE: teaching efficacy, SC: school connectedness, TSWQ: Teacher Subjective Wellbeing Questionnaire, TB: teacher burnout, *$p < .01$.

efficacy was not related to burnout, and in Romania, none of the well-being-related constructs (teacher well-being, teaching efficacy, and school connectedness) were associated with burnout.

Discussion

The present study aimed to evaluate evidence of validity of the Teacher Subjective Wellbeing Questionnaire (TSWQ; Renshaw et al., 2015) across four European countries. Specifically, it examined the instrument's factorial structure and cross-country comparability among ECE teachers in Cyprus, Greece, Portugal, and Romania. Using a series of validation techniques, the findings provided evidence that the proposed two-correlated factor structure operated consistently across the four sample groups. These results align with previous studies conducted with teacher samples from other countries and educational levels (de Biagi et al., 2018; Mankin et al., 2018; Renshaw et al., 2015), supporting the broader applicability of the instrument. Moreover, the Schmid–Leiman results also indicated the presence of a higher-order factor that effectively explained the underlying relationships between *teaching efficacy* and *school connectedness*. In fact, the higher-order factor accounted for the largest portion of the total and common variance across all countries, while the first-order factors still made meaningful contributions. Similar findings have been reported by Collie et al. (2015), who, using a different instrument to measure teacher well-being (i.e., TWBS), found that both the first- and higher-order structures performed equally well. Therefore, although it is recognized that the TSWQ was not originally conceptualized with a hierarchical structure, the present study's exploratory results suggest the need for

further theoretical and empirical exploration on the potential presence of an overarching construct, which may reflect the overall teacher well-being.

The CFAs provided additional support for the two-correlated-factor model in all countries, while they rejected the hypothesis of a single-dimensional instrument. However, it was not possible to assess whether the higher-order factor models had a better fit, leaving this as an unresolved question. Concerning the measurement invariance analyses, threshold and loading invariance were supported, indicating that teachers' response patterns were similar across the four samples (Brown et al., 2015). This suggests that potential group differences in the mean scores of the observed indicators can be attributed to true differences in the latent variables (i.e., *teaching efficacy* and *school connectedness*), rather than variations in the functioning of the TSWQ. However, it should be noted that comparisons involving a larger number of countries or countries with discernible cultural differences should still be made with caution (Klassen et al., 2010; Liu et al., 2017; OECD, 2019b). For example, previous findings on TSWQ functioning among Brazilian and U.S. teachers (de Biagi et al., 2018), two groups with pronounced cultural differences, reported configural but not metric invariance between them.

These contextual differences were merely expressed in the assessment of convergent and discriminant validity across the four examined countries. Although the relationships between the TSWQ subscales and overall teacher well-being were significant across all countries, the observed negative correlations between teacher burnout and well-being-related constructs were present only in certain countries. These distinct dynamics within these contexts highlight the importance of context influences when considering such relationships. For example, one could reasonably argue that promoting teaching efficacy and school connectedness could reduce burnout, or vice versa (Braun et al., 2020; Zhang et al., 2023). However, the distinct patterns observed across countries suggest that such hypotheses should be further explored within each context to better understand how they operate for the examined populations. Accordingly, interventions should aim to be context-specific in order to produce meaningful and more effective results (Ballantyne & Retell, 2020; Hascher & Waber, 2021).

Given the increasing demand for instruments that demonstrate technical adequacy in measuring teacher well-being, particularly for ECE teachers who often receive less attention at the policy level (Cumming et al., 2021; Hall-Kenyon et al., 2014), researchers and schools in the contexts examined in this study could utilize the TSWQ to obtain insights into ECE teachers' affective states. This may help inform the development of targeted interventions aimed at enhancing teachers' sense of self-efficacy and relatedness at school, as addressing professional challenges is essential for improving the overall quality of educational systems.

Limitations and Constraints on Generality

The findings of this study underscore the need for caution in making broad generalizations and highlight the importance of considering contextual factors when interpreting the cross-cultural applicability of the TSWQ. First, the limited sample of ECE teachers in each country restricts the representativeness and generalizability of the results to the broader teacher populations. Second, this limitation also prevented us from conducting advanced methodological techniques, such as cross-validation by randomly splitting the dataset into training and testing subsets (Kline, 2016) or specifying a bifactor model for each country since the sample sizes did not allow for proper identification and estimation of standard errors on such complex model. To address related concerns, we performed (a) bootstrapping on the CFA models that demonstrated stability in fit indices and statistical significance for all saturations across all countries and (b) power analysis for the MGCFA using Monte Carlo simulation which indicated that the provided sample size had sufficient power to support measurement invariance across the countries. These strategies enhance

the robustness of the study's findings and corroborate the factorial structure of the TSWQ, consistent with previous studies that utilized teacher samples across different educational levels and countries (de Biagi et al., 2018; Mankin et al., 2018; Renshaw et al., 2015). Future studies could utilize larger samples to further establish the validity of the TSWQ scores obtained from ECE teachers, employ more advanced validation techniques and test alternative models. Third, it is recognized that this study is confined to responses from ECE teachers in four European countries. Also, the sample's age ranges and years of experience were high in all countries, which indicate that the results are based on responses of well-established professionals. Even though they broadly reflect the characteristics of their national and even European teaching population (OECD, 2023), it is of interest to assess the affective state of early career individuals, who might be more susceptible to burnout and resignation from the profession (Ballantyne & Retell, 2020). Future research is recommended to explore the functioning and invariance of the instrument in other countries and across various educational levels. Additionally, considering relevant covariates, such as school climate and teachers' experience (novice vs in-service teachers), could enhance the understanding of response patterns on ECE teachers' well-being (Jennings & Greenberg, 2009). Moreover, the subjective well-being of teachers may change throughout a school year, potentially influencing their response patterns. Thus, exploring changes in teachers' well-being over time through longitudinal designs and investigating concurrent validity beyond cross-sectional approaches could provide additional insights into the dynamics of teacher well-being (Zhang et al., 2023). Last, the TSWQ responses were self-reported introducing the possibility of social desirability and common method bias. Future studies might consider incorporating additional measures or methodological approaches to mitigate these potential biases and enhance the robustness of the findings.

Conclusion

The study of teacher well-being is currently undergoing theoretical and methodological developments aiming at building a shared conceptualization across countries (Hascher & Waber, 2021). In this respect, teacher well-being measurements that exhibit validity and consistent functioning across countries are essential. In line with prior research, the present study provides preliminary evidence of the technical adequacy of the TSWQ (Renshaw et al., 2015) with ECE teachers across Cyprus, Greece, Portugal, and Romania. Nevertheless, policy developments and practical interventions should thoroughly analyze situational factors associated with teacher well-being, given its dynamic dispositional nature, shaped by social and cultural influences (Aelterman et al., 2007; Chen et al., 2020; Viac & Fraser, 2020).

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Ethical Statement

Ethical Approval

All procedures involving human participants in this study were performed following the ethical standards of the Department of the Early Childhood Education and Care and with the 1964 Helsinki Declaration. In addition, all research teams acquired the necessary ethical approval from the national/university competent authorities.

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Supplemental Material

Supplemental material for this article is available online.

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