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Measurement Invariance of the Student Personal Perception of Classroom Climate Scale (SPPCC) in the Turkish Context

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Abstract: Among school psycho-social factors with considerable effect on student outcomes are both school and classroom climate. Because how students perceive the classroom climate strongly predicts achievement, measuring classroom climate gains importance and the need for testing the existing results across cultures persists. In this study, we assessed the validity and measurement invariance of the Turkish adaptation of the Student Personal Perception of Classroom Climate Scale (SPPCC) developed in English (US). Confirmatory factor analyses (CFA) and measurement invariance (MI) analyses by sex were performed on 629 students' data. CFA results confirmed the factorial structure of the SPPCC. Results of the MI analyses showed that the SPPCC measures the same construct for females and males in a non-English context. Latent mean comparisons revealed girls perceived the classroom climate more positively than boys. We concluded that this study in the Turkish context is a further step in developing evidence of the extent to which SPCC provides psychometrically sound scores.

Keywords: *Gender invariance; personal perception; elementary education; classroom climate.*

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Introduction

Academic achievement is closely related to how learners perceive the classroom they are in (Baek & Choi, 2002), expressed as the learning environment. The concept of environment in educational settings can be described as the atmosphere, ambience, tone, or climate of a particular setting (Dorman, Aldridge, & Fraser, 2006). Since the early 1960s, researchers have studied the link between achievement and learning environments in the classroom (Vinson, 1977). Student-teacher interactions, classroom social processes, and student engagement have been shown to predict academic achievement (Reyes, Bracket, Rivers, White & Salovey, 2012). Further, gender issues in the classroom have always been under scrutiny as differences in culture, stereotypes, and school context have shaped student outcomes (Wiseman and Baker, 2007, pp. 408-409), and boys and girls may be influenced to different degrees (Hughes, Im, & Allee, 2015; Voyer & Voyer, 2014), which in turn may affect achievement. Hence, because of empirical and theoretical support for the positive effects of classroom climate on student achievement, studies have sought to examine these connections more closely. One component in effectively researching these connections is in the development of measurement instruments that are psychometrically sound. The current study was conducted to explore invariance of a recently developed measure of the class climate in a non-English culture with a particular focus on gender.

Classroom climate is strongly related to student achievement (Goh & Fraser, 1998) as well. Classrooms with safe, warm, supportive, and non-threatening environments encourage engagement and promote achievement (Charles, 2002), and offer better opportunities for learning (Adelman & Taylor, 2005). Fraser and Fisher (1982) suggested that changing the classroom environment in ways favored by students could increase student outcomes. This is important because student initial perceptions of the classroom climate tend to persist (Mainhard, Brekelmans, Brok, & Wubbles, 2011). These and other studies provide satisfactory evidence to conclude that students' perceptions of their classroom environment account for significant variance in their learning outcomes (Fraser, 1998). Overall, the classroom climate plays a major role in shaping perceptions of the quality of school life (Gillen, Wright, & Spink, 2011).

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The Teacher in the Classroom

Studies have shown that the teacher is an important factor in student achievement (Bahar, 2014). Teacher motivation of students, for example, increases engagement in learning and pride in achievement (Brophy, 2004). Research (Rubie-Davies & Peterson, 2010; Rubie-Davies, 2015) has also shown that teachers' beliefs and expectations predict not only learners' achievements but also how classroom affective environments are constructed.

Teachers who emphasize prosocial values and cooperation, and teachers who are supportive, experience improvements in student behavior (Mitchell & Bradshaw, 2013; Solomon, Battistich, Kim, & Watson, 1996) and less disruptive behavior (Ryan & Patrick, 2001). The more interpersonal control and affiliation displayed by teachers, the more effective and favorable classroom social climates tend to be (Brekelmans, Sleegers, & Fraser, 2000; Djigic & Stojiljkovic, 2011).

Peers in the Classroom

A student's life in the classroom is incomplete without peers. A supportive classroom climate promotes peer relationships (Weinstein, 2002) and peer relationships correlate significantly with academic achievement (Coie, Dodge, & Kupersmidt, 1990). Peer support motivates children to cooperate, be socially responsible, and follow classroom rules (Wentzel, 1998). In turn, this leads to higher levels of academic engagement and motivation. On the other hand, Somersalo, Solantaus, and Almquist (2002) have shown associations between negative student perceptions of classroom climate and emotional and behavioral problems, in both boys and girls. Further, subjective health complaints reported by students relate to the social climate in the classroom, highlighting peer acceptance (Almquist, Modin, & Augustine, 2013). Empathy and classroom climate also appear to relate to involvement in bullying. Bullies and victims have the lowest connection to school and poor relationships with their teachers (Raskauskas, Gregory, Harvey, Rifshana, & Evans, 2010).

Gender Differences in Perceptions of Classroom Climate

Classrooms can magnify or diminish gender differences by providing environments that promote within-gender similarity and between-gender differences, or the inverse (Bigler, Hayes, & Hamilton, 2013). Research has shown that teachers attend differentially to boys and girls (Beaman, Wheldall & Kemp, 2006), and the classroom environment influences boys and girls in different ways, under different conditions. For example, boys, but not girls, have been shown to make greater gains in mathematics in well-ordered classrooms (Ponitz, Rimm-Kaufman, Brock, & Nathanson, 2009). Van de Gaer, Pushtjens, Van Damme, and De Munter (2006) found demotivated boys achieved less and were less attentive than girls. After studying school climate, Mitchell and Bradshaw (2013) found that achievement motivation varied significantly with regard to gender. In a longitudinal study of elementary school students, Entwisle, Alexander, and Olson (2007) found that girls performed more teacher-accepted student roles than boys. However, although girls have reported more satisfaction with the classroom climate than boys in some studies (e.g., Cerezo & Ato, 2010; Koth, Bradshaw & Leaf, 2008), in other studies no differences have been found with regard to gender (Chen, 1995). Analyses show considerable variation in classroom culture by gender and there is evidence that classroom gender composition is consequential for student subjective well-being (Reynolds & Bamford, 2016).

However, although there are scales that measure student perceptions of the classroom climate, there is a paucity of research with respect to gender differences in this field. Researchers who developed the My Class Inventory (Fraser, Anderson & Walberg, 1982; Sink & Spencer, 2005) and the Student Personal Perception of Classroom Climate Scale (SPPCC) (Rowe et al. 2010), for example, did not analyze gender differences in response to the instruments. Yet, there is evidence from studies cited above that boys and girls may perceive classrooms differently, which implies that there is a need for invariant measurement of achievement, perceptions, and attitudes in the classroom.

Cultural Differences in Perceptions of Classroom Climate

In order to measure student perceptions of the class climate, various scales have been developed. However, there is evidence (e.g., Zusho & Clayton, 2011) to suggest that scales developed in a Western culture may give different results in other cultures. Therefore, cross-cultural testing for measurement invariance is needed. In relation to student motivation, studies have shown western students responding in ways reflecting their more individualistic culture and Asian students' responses reflecting a sense of duty, familial responsibility, and humility, mirroring their collectivist culture (Meissel & Rubie-Davies, 2015). Villasana and Alonso Tapia (2015) studied French and Spanish students and found differences in responses in relation to motivational roles in the classroom. French students were found to endorse autonomy more positively than Spanish students.

Nevertheless, although a number of studies have examined differing cross-cultural responses to motivation questionnaires, few studies have investigated the applicability of class climate questionnaires in contexts other than where they were developed. It is important to test the measurement invariance of class climate instruments before they are employed in cultures that differ from the US to ensure that students respond in ways that might be expected. One class climate instrument, the SPPCC, was developed recently in the US following a thorough review of what was available at the time (Rowe, Kim, Baker, Kamphaus, & Horne, 2010). In a recent study (Rubie-Davies, Asil & Teo, 2015),

the researchers tested the measurement invariance of the SPPCC in the New Zealand context and across four different ethnic groups: New Zealand European, indigenous Māori, Pacific Island and Asian students. Therefore, the researchers measured the responses of three collectivist groups and one Western group. Their sample consisted of 1,924 students, aged 7 to 12, enrolled at New Zealand primary (elementary) schools. The study provided evidence that the SPPCC could be used in a culture other than the US context. Results of the invariance tests (partial scalar invariance) also demonstrated the generalizability of the SPPCC to different cultural groups within the New Zealand multicultural setting.

Measurement of Classroom Climate

For the past 40 years, researchers have developed various scales to assess the psychosocial climate of the classroom (LaRocque, 2008; Sriklaub, Wongwanich, & Wiratchai, 2015). Students' perceptions of their classroom provide core information about their classroom experiences (Delpit, 1988; Fraser, 1998) because children's perceptions are based on their knowledge of the learning environment rather than observational measurements of the environment (LaRocque, 2008).

Measures of the classroom climate have included direct observations (Brophy, Lee, Nievar & Stollak, 2007), interviews (Mucherah, 2003), and student perceptions (Fraser, 1998), and the history of efforts to measure classroom climate dates back to the 1920s (Chavez, 1984).

A number of instruments (e.g., the Classroom Climate Questionnaire (CCQ); Moos, 1979, Individualized Classroom Environment Questionnaire (ICEQ); Fraser, 1981, Classroom Environment Index (CEI); Walker, 1971) have been developed to measure student perceptions of the classroom climate. However, only three have been specifically designed for use in the elementary school setting: the My Class Instrument (MCI; Fraser, Anderson and Walberg (1982), the Elementary School Environment Survey (ESES, Sadker, 1973), and latterly the Student Personal Perception of Classroom Climate Scale (SPPCC; Rowe et al., 2010). Because both the LEI and MCI have increasingly been shown to be reliable, flexible, and consistent, they have been used frequently in a number of settings. However, the LEI has been used with junior and senior high school students. The MCI developed by Fraser, Anderson and Walberg (1982) was intended to be used with students 8–12 years old. It included five psychosocial dimensions: cohesiveness, competitiveness, friction, difficulty, and satisfaction (Arter, 1987). Nevertheless, Sink and Spencer (2005), after carrying out a confirmatory factor analysis, found that with the MCI, the original five-factor model did not represent the data adequately and offered a four-factor model (Cohesion, Competitiveness, Friction and Satisfaction) with 18 items, unlike the earlier scale. The ESES (Sadker, 1973) focused on six school-level factors (alienation, humanism, autonomy, morale, opportunism and resources) and therefore has not been utilized in classroom climate studies. Rowe et al. (2010) identified factors of classroom climate that had empirical support from earlier studies: student perceptions of teacher andpeer support, and student perceptions of personal competence. Fraser (1998) distinguished between class and personal orientation, but the MCI measures students' perceptions of their whole class, rather than focusing on personal perceptions.

Rowe et al. (2010) considered that young students could more accurately provide information about the classroom climate from an individual perspective and that these individual perspectives when aggregated would give student perceptions of the whole class. Young students are likely to understand more easily assessments at an individual level (how items relate to them) rather than at a class level (items that relate to the class as a whole). Accordingly, Rowe et al. (2010) devised the Student Personal Perception of Classroom Climate Scale (SPPCC), which consisted of four factors (teacher support, with eight items, peer support with eight items, academic competence with four items, and satisfaction with school six items). The study was carried out in two phases; first an exploratory factor analysis (n = 267), and second, a confirmatory factor analysis (n = 322). Because the scale took into account existing instruments and depended on comprehensive background literature, there was justification for using it to examine classroom climate.

Nevertheless, as outlined earlier, measurements of a trait in one culture may not apply in others (King & McInerney, 2014; Zusho & Clayton, 2011). There often appears to be an assumption that measures developed in a western context can be employed in quite different cultural contexts (King & McInerney, 2014), despite contradictory evidence (Bernardo, 2008). Put simply, scales developed with samples from only one country should be interpreted cautiously unless tested in other cultures. Educational practices, beliefs, and attitudes are not necessarily invariant when measured in different international contexts (Fraser, 1998). Hence, there is a need to examine the psychometric properties of scales developed originally in a western or eastern context, within other cultural settings. Exploration of variables of interest drawn from different countries and evaluation of measurement invariance in different contexts promises a deeper understanding of social and psychological processes. The Standards for Educational and Psychological Testing (2014) advise the reexamination of measurement quality when an instrument is used in a new context or with new samples, in line with accumulated research. Evaluation of measurement invariance is also important because if the psychometric properties of items are different across groups, comparisons may not be valid. Establishing measurement invariance is considered a prerequisite to comparing group means.

The SPPCC has been developed relatively recently and is the only class climate measure available for elementary school students that measures their personal perceptions (Rubie-Davies, Asil, and Teo, 2016); yet to date no studies have examined its psychometric properties in a non-English culture. Considering that there are few available scales that measure student perceptions of the class climate at the elementary level, and that the SPPCC has been shown to have good reliability and validity by its authors (Rowe et al., 2010), it would seem opportune to examine the measurement properties of the SPPCC across different contexts. The scale in its final form consisted of 26 items with four factors: Teacher support, peer support, academic competence, and satisfaction with school. The scale has also been used with a multicultural sample (n = 1,924) by Rubie-Davies et al. (2016) whereby the CFA results showed fit for all ethnic groups and the whole sample, as well as configural and metric invariance but not scalar invariance.

Recent Individualistic-Collectivist studies have demonstrated that the Turkish culture cannot be placed on either side of the I-C dichotomy (Ozdikmenli-Demir, & Sayil, 2009), showing characteristics of both individualism and collectivism (Goregenli, 1997). Hence, Turkey is unique in being classified as a culture that is considered neither individualistic nor collectivist, standing somewhere between the two. In Turkey, only a few studies have investigated classroom climate and these were at middle school (Canpolat, Kazak Cetinkalp, & Ozsaker, 2012), high school (Cengel & Turkoglu, 2015; Karsi, 2012) and university level (Sagkal, Kabasakal, & Turnuklu, 2015). One study used with elementary school students (n = 157) a school climate survey that was developed for middle school students, but no validity study was carried out (Bilgic & Yurtal, 2009). Only a couple of studies (Kunkul, 2008; Seker, 2000) have investigated the classroom climate at the primary level in Turkey, using the classroom atmosphere scale developed by Sendur (1999). The scale lacked in total variance and the three dimensions had internal consistencies of 0.62 (classroom size), 0.56 (classroom order), and 0.69 (teacher effect). Overall, the internal consistency coefficient was 0.69, and, therefore, unacceptable. Hence, there is no sound measurement tool available to test classroom climate at the primary level in the Turkish language. It is important to conduct such research because of the close association shown in other studies between class climate and student social and academic outcomes. In the current study, we aimed to (a) assess the factorial validity of the SPPCC with a sample of Turkish students and b) investigate classroom climate perceptions of Turkish male and female students to see if there were differences in responses from the validation study that might be explained by context. Our research questions were:

- To what extent is there evidence to support factorial validity of the SPPCC for use in the Turkish context?
- Are there any differences in student perceptions of the classroom climate with regard to gender?

Method

Participants

Participants in this study were 629 3rd, 4th (elementary school) and 5th (secondary school) grade students from three Turkish elementary and secondary schools. Student ages ranged from 8 to 12 years with a mean of 10 years (SD = .91). This is the age range (8-12 years) for which the SPPCC was developed. Of the students, 290 (46.1%) were female and 322 (51.2%) were male (17 students, .03%, did not provide their gender). Students whose gender information was missing were included in the Confirmatory Factor Analyses (CFA) but not in the Measurement Invariance (MI) analyses across gender groups.

Instrument

The 26-item SPPCC (Rowe et al., 2010) scale measures elementary students' personal perceptions of their classroom climate, and was originally comprised of six factors: Teacher Academic Support (TAS), Teacher Personal Support (TPS), Peer Academic Support (PAS), Peer Personal Support (PPS), Academic Competence (AC), and Satisfaction with School (SA). Rowe et al. (2010) developed this measure after reviewing existing models, and scale items were adapted from several earlier studies (Fraser et al, 1982; Harter, 1985; Huebner, 1994; Johnson, Johnson, & Anderson, 1983). Rowe et al.'s validation study (2010) showed that a four-factor model was more parsimonious and demonstrated good measurement properties. They showed that young students did not adequately distinguish between teacher (or peer) personal and academic support suggesting that these originally separate factors should be combined to form two factors (Teacher Support, TS, and Peer Support, PS). Hence, the four-factor model (teacher support, peer support, academic competence, and satisfaction with school) was tested in the current paper.

TS measures the degree to which teachers support students in their academic learning as well as personally. PS measures the extent to which students perceive that they are supported in their learning and personally by their peers. AC measures the degree to which students feel efficacious about their learning and, finally, SA measures student liking of, and satisfaction with, school.

As in the original SPPCC scale, items in the current study were measured on a four-point Likert scale, 1 = *never*, 2 = *sometimes*, 3 = *often* and 4 = *always*. TS, PS, AC and SA factors are comprised of 8, 8, 4, and 6 items respectively. The internal consistency values (based on CFA analyses) reported by Rowe et al. (2010) were .87, .91, .79 and .86 for TS, PS, AC and SA factors respectively. Factor correlations between .27 and .60 indicated that distinct aspects of the classroom climate were being measured by the SPPCC.

Procedures

To ensure comparability of the Turkish and English versions of the SPPCC, items were initially translated by five different faculty members at the first author's university and at two other Turkish universities. Faculty members were approached based on their competency and experience in English, and based on The Standards for Educational and Psychological Testing (AERA, APA, & NCME, 1999) and International Test Commission (ITC, 2001) test adaptation guidelines. Of these faculty members, three had a PhD in the English language and two of them in measurement and assessment. After independent translations, all five met, discussed any differences, and agreed on the final form. Although the translation was forward, one academic not involved in the forward translation made a backward translation once agreement had been reached on the Turkish version. The backward translation accurately mirrored the original English version. The form was later discussed with elementary school teachers to ensure teachers understood the items in the way they were intended.

The scale was completed on a voluntary basis. Before completing the SPPCC scale, students were informed about the purpose of this study, that completion was voluntary, and that they could withdraw from the study any time up until completion of the questionnaire (because the questionnaires were anonymous). Permission was requested from the district administration because districts provide authorization when working with student participants in school (parent permission is not required in school studies as part of the ethical procedures in Turkey). Twelve forms were excluded as students completed the questionnaire in the form of a pattern.

Data Analysis

Data analyses were conducted in three stages. Initially, data were checked for univariate outliers and missing cases. Then, the factorial structure of the SPPCC scale was investigated in the Turkish sample. Finally, measurement invariance (MI), in other terms, "measurement equivalence", of the SPPCC was examined by gender to see if the same construct was being measured in the same way for the gender groups. If so, then it could be concluded that responses to the SPPCC depended only on the latent trait being measured, not on group membership. Otherwise, mean comparisons across individuals or groups could not be meaningfully interpreted (Horn & McArdle, 1992). All the analyses in this study were conducted in Mplus 7.

Confirmatory Factor Analysis (CFA), which indicates how the construct is theoretically operationalized, is required before conducting MI analyses (Byrne, Shavelson, & Muthén, 1989). Hence, we conducted separate CFA's for the total sample and for each gender. Although there is no absolute consensus in the literature about which indices and cut-off values to rely on, there is agreement that multiple indices should be reported (Byrne, 1998; Fan & Sivo, 2005) because different indices assess a different aspect of model fit and not all fit indices are stable under various model conditions. Due to the drawbacks of using χ^2 to assess model fit, researchers have used alternative indices.

In this study, goodness-of-fit of the tested models was assessed using the following indices, with greater emphasis given to those shown to be resistant to model complexity, sample size, and model misspecification (Fan & Sivo, 2007): χ^2, the root mean square error of approximation (RMSEA), Tucker-Lewis index (TLI), gamma-hat, comparative fit index (CFI), and the Weighted Root Mean Square Residual (WRMR). Acceptable/good model fit is assessed by a non-significant χ^2, RMSEA having values less than .08/.05, CFI, gamma-hat and TLI with values greater than .90/.95 and WRMR with values close to 1 (Brown, 2006; Marsh, Hau, & Wen, 2004; Yu, 2002).

After confirming the fit of the measurement model, we utilized multi-group confirmatory factor analyses (MG-CFA) within the framework of a means and covariance structure analysis (MACS) in testing MI of the SPPCC measure. The sequence of hierarchically nested MI models (Vandenberg & Lance, 2000) we tested in this study was as follows:

1. Configural invariance: same factor structure across groups
2. Metric (weak) invariance: invariant factor loadings across groups
3. Scalar (strong) invariance: invariant factor loadings and intercepts (thresholds) across groups

There appears to be a consensus in the MI literature that, scalar invariance is required to compare (latent) means meaningfully across groups (Schmitt & Kuljanin, 2008). After establishing scalar invariance, effect sizes (Hancock, 2001) for latent mean differences were calculated and interpreted using Cohen's (1988) guidelines whereby 0.2, 0.5, and 0.8 are the thresholds for small, moderate, and large effects respectively.

The Weighted Least Squares Mean and Variance Adjusted (WLSMV) estimator with theta parameterization was used both for CFA and MI analyses since the SPPCC scale was based on ordinal measures. WLSMV which does not assume normality, is a robust estimation method recommended especially for categorical or ordered data (Brown, 2006; Sass, Schmitt, & Marsh, 2014).

Given numerous and sometimes confusing scaling approaches available in the literature, we adopted the procedure suggested by Millsap (2012) and Muthén and Muthén (2013). Parameter specifications for scalar setting in this procedure are: i) factor loadings and thresholds are constrained to be equal across groups, ii) residual variances are fixed to 1 in the first group and freed in other groups, iii) factor means on the other hand are fixed at 0 in the first group

and allowed to be freely estimated in other groups, and iv) factor variances are freely estimated in all groups (if scaling is set by using a referent item).

It is well established in the literature that the selection of a referent item may play an important role in MI analyses and can influence the parameter estimates since there is an underlying assumption that the referent (marker or anchor) item is invariant across comparison groups (Vandenberg & Lance, 2000). In this study, we used a constrained-baseline approach as described by Stark, Chernyshenko, and Drasgow (2006) to identify the referent items. With this approach, the baseline model was the one in which the parameters (thresholds and loadings) for all items were constrained to be equal across groups. Next, for each item, constrained models were specified where the respective parameters only for the studied item were freely estimated across groups. The baseline and constrained models were then compared using the chi-square goodness-of-fit statistic.

When WLSMV is employed for MI analyses, conventional χ^2 difference testing is not appropriate for comparing nested models since WLSMV chi-square values are not distributed as chi-square. Therefore, difference testing for model comparisons in this study was made using the DIFFTEST option available in Mplus. DIFFTEST is the Mplus command to compute a chi-squared test for nested models with the MLMV or WLSMV estimators.

Results

Descriptive Statistics

No univariate outliers were found. Missing data were imputed using the Expectation Maximization (EM) algorithm because, overall, missing data were less than 1%. None of the variables had more than 3% missing cases. The percentage of missing data for each variable ranged from 0% to 3% for both gender groups. Separate EM's were applied for each factor. The order of items in the administered version and the descriptive statistics are presented in Table 1. A few of the items, in particular TS4, showed departures from normality, but this was not a concern for the analyses because the estimator (WLSMV) that we utilized adjusts for non-normality.

Table 1. Descriptive Statistics for SPPCC Scale Items

		Total		Female		Male				
Code	Item	*M*	*SD*	*M*	*SD*	*M*	*SD*	*Median*	Skewness	Kurtosis
TS1	My teacher cares about how much I learn (Ogretmenim ne kadar ogrendigime onem verir.)	3.663	.692	3.745	.626	3.593	.736	4.00	-2.133	3.942
TS2	My teacher likes to see my work (Ogretmenim calismalarimi gormekten hoslanir.)	3.509	.783	3.579	.750	3.447	.800	4.00	-1.446	1.089
TS3	My teacher likes to help me learn (Ogretmenim, ogrenmeme yardim etmekten hoslanir.)	3.633	.729	3.721	.640	3.556	.784	4.00	-2.073	3.647
TS4	My teacher wants me to do my best schoolwork (Ogretmenim, derslerimi en iyi sekilde yapmami ister.)	3.847	.471	3.893	.447	3.804	.495	4.00	-3.484	12.887
TS5	My teacher really cares about me (Ogretmenim beni gercekten onemser.)	3.580	.686	3.645	.645	3.534	.697	4.00	-1.555	1.727
TS6	My teacher thinks it is important to be my friend (Ogretmenim, benimle arkadas olmanin onemli oldugunu dusunur.)	3.289	.932	3.372	.899	3.227	.938	4.00	-1.044	-.082
TS7	My teacher likes me as much as he/she likes other students (Ogretmenim, beni diger ogrencileri sevdigi kadar sever.)	3.676	.723	3.776	.635	3.584	.794	4.00	-2.344	4.784
TS8	My teacher cares about my feelings (Ogretmenim duygularima onem verir.)	3.539	.802	3.641	.703	3.447	.875	4.00	-1.723	2.100
PS1	The kids in my class want me to do my best schoolwork (Sinifimdaki ogrenciler derslerimi en iyi sekilde yapmami isterler.)	2.913	1.086	3.024	1.070	2.832	1.089	3.00	-.462	-1.161
PS2	The kids in my class like to help me learn (Sinifimdaki ogrenciler ogrenmeme yardim etmekten hoslanirlar.)	2.943	1.085	2.979	1.081	2.910	1.086	3.00	-.523	-1.102
PS3	The kids in this class care about how much I learn (Sinifimdaki ogrenciler ne kadar ogrendigimi onemserler.)	2.785	1.116	2.848	1.112	2.730	1.121	3.00	-.356	-1.256
PS4	The kids in this class want me to come to class everyday (Sinifimdaki ogrenciler her gun okula gelmemi isterler.)	3.110	1.022	3.186	.995	3.040	1.045	3.00	-.787	-.650

		Total		Female		Male				
Code	Item	*M*	*SD*	*M*	*SD*	*M*	*SD*	*Median*	Skewness	Kurtosis
PS5	In this class, other students think it is important to be my friend (Sinifimdaki diger ogrenciler benimle arkadas olmanin onemli oldugunu dusunurler.)	3.040	1.010	3.031	1.017	3.031	1.004	3.00	-.639	-.816
PS6	In this class, other students like me the way I am (Sinifimdaki diger ogrenciler beni oldugum gibi severler.)	3.382	.938	3.469	.861	3.314	.988	4.00	-1.292	.406
PS7	In this class, other students care about my feelings (Sinifimdaki diger ogrenciler duygularima onem verirler.)	3.067	1.032	3.134	.994	3.019	1.068	3.00	-.665	-.879
PS8	In this class other students really care about me (Sinifimdaki diger ogrenciler beni gercekten onemser.)	3.134	.991	3.166	.998	3.106	.993	3.00	-.802	-.563
AC1	I am very good at my school work (Derslerimde oldukca iyiyim.)	3.334	.746	3.376	.744	3.304	.741	3.00	-.675	-.751
AC2	I am smart enough to do my school work (Derslerimi yapmak icin yeterince akilliyim.)	3.545	.679	3.579	.672	3.506	.689	4.00	-1.249	.479
AC3	I do very well at my school work (Derslerimi cok iyi yaparim.)	3.421	.742	3.479	.731	3.370	.738	4.00	-.974	-.100
AC4	I can figure out the answers to school work (Derslerle ilgili sorularin cevaplarini bulabilirim.)	3.312	.741	3.283	.764	3.335	.714	3.00	-.642	-.676
SA1	I look forward to going to school (Okula gitmek icin sabirsizlanirim.)	3.450	.863	3.531	.807	3.370	.912	4.00	-1.366	.691
SA2	I like being in school (Okulda olmayi severim.)	3.676	.660	3.693	.649	3.668	.664	4.00	-1.998	3.116
SA3	School is interesting (Okul ilgi cekicidir.)	3.393	.889	3.407	.900	3.385	.869	4.00	-1.264	.469
SA4	I wish I didn't have to go to school (Keske okula gitmek zorunda olmasam.)	3.580	.809	3.669	.740	3.500	.855	4.00	-2.007	3.174
SA5	There are many things about school that I like (Okulla ilgili sevdigim cok sey var.)	3.544	.727	3.572	.723	3.509	.737	4.00	-1.424	1.031
SA6	I enjoy school activities (Okul etkinliklerinden keyif alirim.)	3.655	.687	3.700	.652	3.615	.720	4.00	-1.977	3.100

Note: Turkish translations are presented in parentheses. Median, skewness and kurtosis values relate to the whole sample. TS; Teacher Support, PS; Peer Support, AC; Academic Competence, SA; Satisfaction.

The means and standard deviations of the SPPCC items ranged from 2.785 to 3.847 and .471 to 1.116 respectively, implying that most students indicated either "often" or "always".

Confirmatory Factor Analysis (CFA)

Before comparing the groups, it was important to establish that the factorial structure of SPPCC provided good fit. Thus, separate CFA's were conducted for the total sample and for each gender. As is evident from Table 2, the SPPCC factor structure provided a good fit with RMSEA's < .05, CFI's, Gamma Hat's and TLI's > .95, WRMR's close to 1 for the whole sample and for each gender indicating that the four-factor model of the measure was supported in the Turkish sample.

Table 2. *CFA Results for Total Sample and Gender Groups*

Models	χ^2	*Df*	p	RMSEA (90 % CI)	CFI	Gamma Hat	TLI	WRMR
Total	604.980	293	.000	041 (.036, .046)	.973	.963	970	1.047
Female	431.979	293	.000	040 (.032, .048)	.978	.965	.975	0.898
Male	529.413	293	.000	050 (.043, .057)	.959	.947	.954	1.011

Note. RMSEA, Root Mean Square Error of Approximation; CFI, Comparative Fit Index; TLI, Tucker-Lewis Index; WRMR, Weighted Root Mean Square Residual.

Factor correlations and reliability estimates are presented in Table 3. Reliabilities (Cronbach's alpha) were all satisfactory ranging from .794 to .882. Factor correlations were moderate ranging from .431 to .762. The highest correlation was observed between Teacher Support and Peer Support factors consistent with the findings of Rowe et al. (2010). Our analyses, however, resulted in higher factor correlations than were found in their original study. The reliability estimates for the Peer Support and Satisfaction scales in our study were lower than the values reported by Rowe et al. (2010).

Table 3.Factor Correlations and Reliabilities for Total Sample

	TS	PS	AC	SA
Teacher Support (TS)	-			
Peer Support (PS)	.762	-		
Academic Competence (AC)	.601	.523	-	
Satisfaction (SA)	.618	.609	.431	-
Reliability	.859	.882	.809	.794

Note. TS; Teacher Support, PS; Peer Support, AC; Academic Competence, SA; Satisfaction

Table 4 displays the standardized and unstandardized factor loadings and corresponding standard errors for each item with the latter in parentheses. The standardized factor loadings, all of which were significant, ranged from .628 to .868 for the total sample. Factor loadings for items SA4 and SA6 were noticeably lower than the others.

Table 4. Standardized and Unstandardized (in parentheses) Factor Loadings and Standard Errors of SPPCC

Items	Factor	Total (λ; *SE*)	Female (λ; *SE*)	Male (λ; *SE*)
TS1		.759; .033 (1.000; .000)	.806; .039 (1.000; .000)	.718; .051 (1.000; .000)
TS2		.804; .023 (1.160; .129)	.865; .028 (1.267; .195)	.769; .034 (1.166; .183)
TS3		.752; .031 (.979; .114)	.776; .043 (.903; .148)	.725; .046 (1.021; .166)
TS4		.721; .046 (.891; .127)	.712; .077 (.745; .158)	.753; .053 (1.108; .207)
TS5	TS	.831; .022 (1.278; .142)	.877; .031 (1.337; .211)	.796; .032 (1.273; .213)
TS6		.811; .022 (1.188; .145)	.808; .032 (1.007; .175)	.825; .028 (1.417; .244)
TS7		.795; .029 (1.122; .138)	.873; .039 (1.313; .265)	.747; .043 (1.088; .187)
TS8		.780; .027 (1.068; .128)	.798; .034 (.972; .147)	.762; .037 (1.139; .198)
PS1		.726; .021 (.784; .000)	.789; .031 (.911; .000)	.667; .026 (.646; .000)
PS2		.703; .027 (.736; .079)	.713; .031 (.720; .133)	.706; .040 (.719; .083)
PS3		.802; .027 (1.000; .074)	.816; .038 (1.000; .110)	.811; .037 (1.000; .091)
PS4	PS	.763; .024 (.879; .078)	.804; .033 (.958; .132)	.744; .033 (.803; .091)
PS5		.779; .023 (.925; .091)	.815; .030 (.998; .147)	.786; .031 (.916; .122)
PS6		.771; .025 (.901; .096)	.801; .033 (.948; .152)	.757; .036 (.835; .115)
PS7		.797; .021 (.982; .082)	.704; .041 (.702; .085)	.873; .020 (1.292; .148)
PS8		.811; .021 (1.032; .105)	.858; .025 (1.185; .180)	.773; .031 (.879; .115)
AC1		.846; .022 (1.000; .000)	.857; .028 (1.000; .000)	.834; .029 (1.000; .000)
AC2	AC	.757; .028 (.731; .098)	.823; .035 (.869; .157)	.712; .042 (.670; .128)
AC3		.868; .025 (1.101; .167)	.851; .037 (.972; .227)	.886; .029 (1.263; .232)
AC4		.742; .030 (.700; .089)	.731; .042 (.643; .110)	.754; .043 (.759; .128)
SA1		.759; .031 (.930; .000)	.772; .049 (1.075; .000)	.733; .037 (.718; .000)
SA2		.773; .033 (.971; .127)	.855; .043 (1.458; .198)	.706; .047 (.664; .139)
SA3	SA	.782; .034 (1.000; .146)	.749; .042 (1.000; .356)	.832; .052 (1.000; .135)
SA4		.689; .042 (.758; .117)	.759; .058 (1.032; .250)	.635; .058 (.548; .115)
SA5		.798; .032 (1.056; .160)	.841; .038 (1.375; .293)	.764; .048 (.790; .167)
SA6		.629; .046 (.644; .102)	.679; .069 (.818; .191)	.571; .062 (.464; .103)

Note. λ*:* Factor Loading, SE; Standard Error, TS; Teacher Support, PS; Peer Support, AC; Academic Competence, SA; Satisfaction

After establishing good model fit, we proceeded with MI analyses in order to cross-validate the four-factor SPPCC scale across the two genders.

Measurement Invariance (MI) Analysis

By employing MG-CFA, we tested configural, metric, and scalar invariance using the WLSMV estimator with theta parameterisation. As mentioned earlier, we first conducted a constrained-baseline approach to select the referent items. Using this approach, we began with the scalar model and then compared this with models in which loadings and thresholds were freed for each item across groups. The results showed that items TS1, PS3, AC1 and SA3 were the most

invariant (least biased). Hence, these items were selected as the referent items. Then, we conducted MI analyses and the results are summarized in Table 5.

Table 5. Measurement Invariance Results

	χ^2	*df*	RMSEA (90% CI)	CFI	TLI	WRMR	$\Delta\chi^2$ (DIFFTEST)	Δdf	p
Configural	955.489	586	.045 (.040, .051)	.969	.966	1.352	-	-	-
Metric	952.504	608	.043 (.038, .048)	.971	.969	1.372	20.690	22	.540
Scalar	992.404	656	.041 (.036, .046)	.972	.972	1.412	58.683	48	.135

Note. RMSEA, Root Mean Square Error of Approximation; CFI, Comparative Fit Index; WRMR, Weighted Root Mean Square Residual.

As can be seen from Table 5, the configural model provided good fit to the data, indicating that the factorial structure of SPPCC was equal across groups. The metric invariance test results showed that the factor loadings were equivalent (DIFFTEST (22) = 20.690, p = .540) across the genders. The scalar invariance model was also supported (DIFFTEST (48) = 58.683, p = .135). Support for scalar invariance indicated that the latent means could be meaningfully compared across male and female students. Overall, the analyses supported the measurement invariance of the four-factor SPPCC measure for both genders in the Turkish sample.

We also computed the latent means to see if male and female students perceived the classroom climate equivalently in Turkey. The results indicated that on average, male students scored .499, .210, .252 and .282 units lower than females on Teacher Support, Peer Support, Academic Competence, and Satisfaction factors respectively based on the metric of the referent indicators. Corresponding effect sizes for these latent mean differences were .391, .152, .161, and .266 respectively, all of which can be considered small effects.

Discussion

Elementary school education is the root of later achievement for any student, which makes it crucial to focus research at that level. Considering the influence of the classroom climate on achievement, there is a need to measure student perceptions and the relation of these with student outcomes. Despite the importance of classroom climate for students' outcomes and attainment, there is still a lack of measurement instruments and empirical evidence, particularly among younger students and especially in the Turkish literature. The present study, therefore, primarily aimed at assessing the measurement invariance of the Turkish version of the Student Personal Perception of Classroom Climate (SPPCC) scale and provided additional empirical evidence for the use of the scale across different groups and cultural settings.

The CFA results confirmed the existence of four separate factors: teacher support (TS), peer support (PS), academic competence (AC), and satisfaction (SA). The results revealed good model fit and all parameter estimates were statistically significant, showing reliability of the item-factor relationship. Supporting full scalar invariance, the results of the MI analyses showed that the SPPCC was measuring the same construct in the same way for females and males within the Turkish context.

Unlike the original study there were no univariate outliers in this study. Reliability estimates ranged from .71 to .91 in the original study, whereas, in our study, reliabilities ranged from .79 to .88. In both studies, PS had the highest reliability but Rubie-Davies et al. (2016) provided the highest reliability for SA.

In the original study (Rowe, et al., 2010), factor correlations ranged from .27 (AC - PS) to .60 (PS - TS) and in the study by Rubie-Davies et al. (2016) factor correlations ranged from .45 (AC - PS) to .61 (PS - TS) where the factors showed that they were measuring distinct constructs. In our study, the factor correlations ranged from .43 (SA - AC) to .76 (PS - TS); only Peer and Teacher Support (.76) had a high correlation, indicating the testing of a similar construct in the Turkish sample. In Rowe et al. (2010) and Rubie-Davies et al. (2016) AC-PS had the lowest factor correlations, unlike the Turkish sample. In all three studies PS–TS had the highest factor correlations, implying both factors were testing a similar construct.

The previous two studies with SPPCC did not compare perceptions with respect to gender. In the current study, the latent mean comparisons across gender on all four factors indicated that student perceptions of their classroom climate were more positive for females than males. This finding was also consistent with that of previous research (Cerezo & Ato, 2010; Goh & Fraser, 1998; Koth, Bradshaw, & Leaf, 2008). The gender difference was more salient for the teacher support factor than for the other three factors. Female students perceived their teachers to be more supportive than did males, which may be comparable to Entwisle, Alexander and Olson's (2007) finding that girls enacted more teacher-

accepted roles than boys. The results of this study have provided psychometric and statistical evidence that the Turkish version of the SPPCC could be used for measuring young students' perceptions of the classroom climate in a gender invariant way. The previous two studies (Rowe et al., 2010; Rubie-Davies, et al., 2016) provided no effect sizes but this study found small effect sizes when comparing responses by gender to the constructs.

The Program for International Student Achievement (PISA) results found a strong association between classroom climate and achievement indicating that students performed better in more supportive learning environments (OECD, 2010). Therefore, the measurement of students' perceptions of classroom climate is of practical significance to educators, researchers, and policy makers. This study contributes to the literature by a) verifying the generalizability of the SPPCC to a culturally and socially distinct society such as Turkey, and b) supporting cross-cultural and cross-gender use of the scale with young students to assess the classroom climate.

Limitations of the Study and Suggestions for Future Research

We should note several limitations, however. First, data were collected from students using a non-probability sampling technique and thus may not be considered representative of the whole population. Second, the validity of the results depends on students' self-report data which might have been influenced by the presence of their peers at the time of data collection. Students may have responded in socially desirable ways. Considering the evidence for positive associations between student perceptions of class climate and achievement reported in the literature, it would seem worthwhile in future studies to explore relations between SPPCC and student academic outcomes.

In line with previous findings (Rowe et al., 2010; Rubie-Davies et al., 2016), we found that responses to many items indicated ceiling effects as students frequently endorsed 'often' or 'always'. The estimation method that we employed does not assume a normal distribution. However, these responses at the high end of the scale probably reduced our ability to discriminate students at that level and thus may have reduced power.

Future research on the SPPCC could also include additional validation involving participants across different school types, ethnicities, time points, and socioeconomic backgrounds. This would contribute to our broader understanding of perceptions of classroom climate in terms of its measurement invariance over time and interaction with other variables. Researchers may also be interested in examining the extent to which females' more positive perceptions of the classroom climate translate into better performance in different subject areas. Because SPPCC has been shown to be gender invariant, it can provide a means for assessing classrooms with regard to differential treatment related to male and female students. Differences in teacher treatment could be explored in relation to teacher beliefs, stereotyping of male and female roles, teaching experience, or teacher gender.

Little attention has been given to psychosocial factors that relate to student academic outcomes and yet many of these factors (e.g., teacher-student relationships, peer support, teacher expectations, student self-belief) have much greater effects on student achievement than the pedagogical factors commonly explored (Hattie, 2009). The development of instruments like the SPPCC provides a means for both teachers and researchers to assess the classroom climate, which has known associations with positive student attitudes and achievement (Rubie-Davies, 2015). The SPPCC appears to provide a useful tool for researchers wishing to assess the classroom climate, and, potentially, it could be employed easily by teachers or school administrators. Information on classroom climate could provide educators with additional data that may help explain lower or higher achievement levels. For example, as this study has shown, boys seem to have more negative perceptions of the classroom climate than girls, and, in several contexts (e.g., Australia and the United Kingdom), boys achieve at lower levels than girls (McInerney, 2008). Further in-depth exploration of what could be done to improve the perceptions of boys could also result in increased achievement. Because girls perceived more teacher support in this study and because girls perform more teacher-accepted roles (Entwisle, Alexander and Olson, 2007), these two may by connected. Therefore, a focus on the class climate and other psychosocial variables within classrooms has the potential to raise achievement for all students and is therefore worthy of concentrated energies from both researchers and educators.

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