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The revised version of the retracted article: The Development and Preliminary Validation of a Social-Emotional Skills Assessment Instrument for Estonian Lower Secondary School Students[1, 2]

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Given the necessity of existence of comprehensive and psychometrically sound instruments that measure students' social-emotional skills (SE skills) in the school context and on a facet level, this study aims to develop and evaluate an SE skills assessment instrument for lower secondary school students. The initial version of the instrument was developed based on the descriptions of the SE skills from the frameworks by Primi et al. (2017) and the Organisation for Economic Co-operation and Development (OECD; Chernyshenko et al., 2018) and it consisted of 48 items. A confirmatory factor analysis (CFA) was conducted with a sample of 204 students from Estonia, and a nine-factor instrument with 34 items was refined. This model was confirmed with acceptable fitness by CFA with another sample of 521 students.

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2 This article is the final version of the paper previously published in an earlier form in this journal due to administrative error (vol 27, iss. 2, pp. 297-314, 2024). Please see the retraction notice [https://doi.org/10.5937/psistra28-59284].

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Scalar measurement invariance was established between grade groups (grades 6 and 9). In conclusion, while the instrument enables assessing students' SE skills in lower-secondary schools, further research is required.

Key words: social-emotional skills, student evaluation, instrument development, confirmatory factor analysis, measurement invariance

Social-emotional skills (SE skills) have received increasing attention in educational research due to their contribution to students' mental and physical well-being, academic success and employability (e.g. Chernyshenko et al., 2018; Moffitt et al., 2011; Organisation for Economic Co-operation and Development (OECD); 2021). In order to achieve positive outcomes in school, in life and at work, students need both cognitive and SE skills (OECD, 2015). The development of SE skills as an explicit outgrowth in education has become a new important focus, next to supporting students' mastery in sciences, languages, mathematics and arts (Abrahams et al., 2019). In recent years, scholars and policy makers have argued that more attention should be paid to students' SE skills. The need for SE skills such as self-management, collaboration, emotion regulation and stress resistance, among others, has been highlighted (De Fruyt, 2019) for students in order to cope with the challenges of today's volatile, uncertain, complex, and ambiguous world (Primi et al., 2021) and to be able to apply their knowledge in unknown and evolving circumstances (OECD, 2018).

SE skills are commonly defined as individual characteristics that "(a) originate in the reciprocal interaction between biological predispositions and environmental factors; (b) are manifested in consistent patterns of thoughts, feelings, and behaviours; (c) continue to develop through formal and informal learning experiences; and (d) influence well-being as well as important socioeconomic outcomes throughout the individual's life" (De Fruyt et al., 2015; OECD, 2015). This definition states that SE skills can be developed through social relationships in formal education and, consequently, there is a need to define the key skills and design instruments for the assessment and monitoring of the development of students' SE skills.

In their recent integrative model, Soto et al. have argued for the term "social, emotional and behavioral (SEB) skills", which they define as "people's capacities used to maintain social relationships, regulate emotions, and manage goal– and learning-directed behaviours" (2021, p.1). Thus, they have conceptualized the SEB skills as capacities, representing how someone is capable of thinking, feeling and behaving, when the situation calls for it, and not traits (i.e., what someone tends to do) (see Soto et al., 2021, and Napolitano et al., 2021, for details).

However, despite the importance of SE skills, the measurement of those skills is still associated with several conceptual and methodological challenges, e.g. the lack of consensus on the nature and the number of constructs necessary to cover the social-emotional competencies (Abrahams et al., 2019; Kyllonen et al., 2014; Müller et al., 2020; Primi et al., 2016).

Over the past decades, several authors have proposed more than a hundred SE skills taxonomies and frameworks (Berg et al., 2017), which differ by the number and nature of the domains and facets included (Abrahams et al., 2019). Detailed overviews and comparisons of the recent prominent frameworks can be found in Abrahams et al. (2019), Chernyshenko et al. (2018), Primi et al. (2021) and Soto et al. (2021). Among the leading and well-researched comprehensive frameworks of SE skills are, for example, the framework for Social and Emotional Learning by Collaborative for Academic, Social, and Emotional Learning (CASEL) and the OECD's Framework for Social and Emotional Skills (Chernyshenko et al., 2018). The CASEL framework, which is the most influential in the United States, outlines five broad areas of competencies (CASEL, 2020), including self-awareness, self-management, social awareness, relationship skills, and responsible decision-making.

Having many different SE skills frameworks in use interferes with educators' needs to enhance understanding and measuring of students' SE skills. There have been several initiatives towards a unified framework of SE skills aimed at overcoming this lack of consensus on the key SE skills, supporting the development of reliable assessment instruments of students' SE skills and ensuring comprehensive inclusion of SE skills development in the school curriculum (Abrahams et al., 2019; Kyllonen et al., 2014; Walton et al., 2023). In recent years, there has been growing consensus, as multiple researchers (e.g., Kyllonen et al., 2014; Primi et al., 2016; Soto et al., 2021; Walton, et al., 2023) have provided strong evidence for the empirically supported and cross-culturally validated taxonomy of the Big Five to be used to make conceptual sense of the hundreds of SE skills models and frameworks and for building an integrative model, since SE skills can be organized within the domains of the Big Five in terms of their behavioural referents. An important example of the empirical support for using the Big Five model is a study by Primi, John, Santos, and De Fruyt (2016). Based on the reviews of different SE skills frameworks, and empirical analyses of several SE skills inventories, they proposed an integrative model of SE skills. The model distinguishes among five broad SE skill domains, which are conceptually related to the well-researched Big Five model: *Self-management* (related to Conscientiousness), *Engaging with Others* (related to Extraversion), *Amity* (related to Agreeableness), *Negative-Emotion Regulation* (associated with Neuroticism) and *Open-mindedness* (associated with Openness to experience) (Abrahams et al., 2019). An overview of the domains and definitions of the facets of this model (Primi et al., 2017) can be found in English in a review

article by Abrahams et al. (2019). In line with that, the conceptual framework for the OECD's Survey on Social and Emotional Skills (SSES), a large-scale, international study of SE skills of 10– and 15-year-old students, also draws on the Big Five model and distinguishes five dimensions of SE skills: task performance, emotional regulation, open-mindedness, collaboration, and engaging with others (Kankaraš & Suarez-Alvarez, 2019). Each of these five broad domains is divided into subdomains, which are more descriptive and specific, and thus easier to assess. In addition to more specific SE skills, the SSES framework includes compound skills, enabling the assessment of a total of 15 skills (Chernyshenko et al, 2018).

Since SE skills are seen as the skills that can be developed and stimulated in formal education, schools and teachers play an important role. In educational systems, the learning objectives related to students' SE skills in curricula usually refer to broad descriptions that might merge several skills into multidimensional or "hybrid" constructs, such as "global citizenship", "entrepreneurship", or "leadership" (Abrahams et al., 2019). A similar tendency can also be seen in the Estonian *National Curriculum for Basic Schools* (2011), since, among the general competences that schools are expected to monitor and develop listed in this document, there are, for example, "social competence", "self-management competence" and "entrepreneurship competence" – broad constructs consisting of multiple skills, whose alignment with the comprehensive knowledge of conceptualization and measurement demands further analysis. Using comprehensive frameworks as a basis could help to make reliable and evidence-based decisions on defining, monitoring and supporting the development of SE skills in educational settings (Abrahams et al., 2019). In addition, there is strong empirical support for choosing the facet-level approach in modelling the SE skills, as it offers multiple potential advantages over the domain approach, including not only theory development, but also the development of effective and more precise interventions for the educational context (Guo et al., 2023; Primi et al., 2021).

As stated above, SE skills are important for academic and life success, and schools are considered to be crucial settings for the development of those skills. In order to empower teachers to effectively include SE skills in their school curriculum and to systematically support and monitor the development of students' SE skills at schools, to start with, valid assessment tools are needed (Abrahams et al., 2019). However, on the assessment side, many of the instruments available for children and adolescents have been developed for specific aims and concerns (e.g. conduct problems), and thus do not enable a comprehensive assessment of social and emotional attributes relevant in the educational context and for long-term outcomes in life (Primi et al., 2016). In line with that, a recent systematic literature review of the existing SE skills assessment tools for students and school staff, based on the publications from years 2000-2017, concluded that the majority of instruments evaluating

the social and emotional competencies of students tended to assess student personality or health, and also revealed the need for more comprehensive assessment tools for academic context (Müller et al., 2020). Therefore, in order to better understand and systematically enhance the development of students' SE skills, educators need valid tools enabling them to assess and monitor those skills. Considering that an appropriate assessment tool needs to be relevant to the context in which it is applied, there is a need for the instruments enabling the assessment of SE skills in school context and on a facet level, rather than assessing SE skills in a general, not-specified context and on the broad domains level. As both of these previously mentioned representative frameworks – Primi et al.'s (2017) and OECD's framework (Chernyshenko et al., 2018) – focus on the specific skills of school-aged children and youth (Abrahams et al., 2019) on a facet level rather than the broad skill domains, using those frameworks offers potential for deeper understanding of social and emotional skill development and, in addition, can provide insights for educational settings on developing and monitoring those skills in schools and classrooms. Moreover, given that the OECD's framework focuses on the SE skills that are relevant to school contexts, changeable through interventions, and relevant for the students' future (Chernyshenko et al., 2018; Kankaraš & Suarez-Alvarez, 2019), the framework offers several potential advantages for educational science and practice. The additional value lies in the fact that the OECD's framework was used in an international survey (SSES) for identifying and assessing the aspects and practices that foster or hinder the development of SE skills for 10– and 15-year-old students. Using the same framework and facets as a basis for instrument development might provide the possibility to compare the results and important findings from the international study with our findings and offer insights for future research. Considering the reasons mentioned above, we have chosen these two frameworks as a basis for our SE skills assessment instrument development.

Napolitano et al. (2021) have strongly argued for the importance of investigating social, emotional and behavioural skill development during adolescence as a focal period for future research. Their rationale is rooted in evidence from psychological science, indicating that adolescence is a developmental period marked by major biological, cognitive and social transitions, which require development and use of many complex skills. While adolescence can bring several challenges for students, it may also be a time period of significant opportunities to teach and strengthen students' SE skills in order to promote resilience and prevent negative outcomes (Duong & Bradshaw, 2017). To support students and develop practices which would enhance a positive SE skills development, additional research is needed on the way in which SE skills develop through school years (Kankaraš and Suarez-Alvarez, 2019).

In Estonia, basic education is divided into three stages: grades 1-3, grades 4-6 and grades 7-9. Our study aims to assess the SE skills of two groups – students from grade 6 and grade 9. The grade levels were selected to address students before the important transitions during their school years – the transition from the second stage of basic education to the third stage and from lower secondary to upper secondary education.

Based on two prominent frameworks on students' SE skills – Primi et al.'s (2017) and OECD's framework (Chernyshenko et al., 2018), a self-reported instrument was developed to assess nine selected SE skills: self-control, responsibility, persistence, emotional control, stress resistance, empathy, cooperation, trust, and assertiveness. This set of nine skills was selected according to the general competences stated in the Estonian *National Curriculum for Basic Schools* (2011) and the results of previous research on SE skills (Chernyshenko et al., 2018; Kankaraš & Suarez-Alvarez, 2019). For example, considering relatedness with students' academic achievement (i.e., school grades, test scores) and social outcomes (e.g., relationships with peers and teachers, school belonging), we included the following SE skills: self-control, persistence, responsibility, emotional control and stress resistance. As being able to cooperate, having empathy, being assertive and trusting others are highly relevant skills for students (Kankaraš & Suarez-Alvarez, 2019), which are stressed as an important part of the social competencies expected to be developed in schools in the Estonian *National Curriculum for Basic Schools* (2011), we also included those skills. In the first version of the instrument, we did not include the skills from the domain of Open-mindedness (Openness), since the results related to the associations between openness and educational outcomes from most studies so far are not clear (Gatzka, 2021), and there is still a need for deeper understanding of the exact underlying mechanisms.

After comparing the descriptions of SE skills from the two selected frameworks, we decided to include the descriptions from both, as we saw some differences in the content as possibly helpful in connecting the items of our instrument with a variety of aspects of learning and the classroom context. These nine SE skills and their descriptions are presented in Table 1.

Table 1
Social-emotional skills included in the current study

Domain	Skills		Descriptions/definitions		Sample items from the instrument developed (translated for publication)
	OECD	Primi et al.	OECD	Primi et al.	
Task Performance/ Self-management	self-control	focus	Able to avoid distractions and focus attention on the current task in order to achieve personal goals.	Focusing attention on the current task, and avoiding distractions.	*I think before I start doing something*
	responsibility	responsibility	Able to honour commitments, and be punctual and reliable.	Possessing time-management skills, being punctual, honouring commitments.	*I make sure (for myself) that my school assignments get submitted on time*
	persistence	persistence	Persevering in tasks and activities until they get done.	Overcoming obstacles to reach important goals.	*I can continue with the task I started even when some obstacles arise*
Emotional Regulation	stress resistance	stress modulation	Effectiveness in modulating anxiety and able to calmly solve problems (is relaxed, handles stress well).	Modulating anxiety and response to stress.	*I can handle stress well*
	emotional control	frustration tolerance	Effective strategies for regulating temper, anger and irritation in the face of frustrations.	Regulating temper, anger and irritation, maintaining tranquillity and equanimity in the face of frustration.	*I can remain calm even in tense situations*
Collaboration/ Amity	empathy	compassion	Kindness and caring for others and their well-being that leads to valuing and investing in close relationships.	Using empathy and perspective taking skills to understand the needs and feelings of others, acting on this understanding with kindness and consideration of others.	*When my classmate is upset, I offer him/her support*
	trust	trust	Assuming that others generally have good intentions and forgiving those who have done wrong.	Assuming that others generally have good intentions and forgiving those who have done wrong.	*I trust my classmates*
	cooperation	respect	Living in harmony with others and valuing interconnectedness among all people.	Treating others with respect and politeness.	*I help my companions when they need help*
Engaging with others	assertiveness	assertiveness	Able to confidently voice opinions, needs, and feelings, and exert social influence.	Speaking up, voicing opinions, need, and feelings, and exerting social influence.	*I boldly voice my opinion while communicating with my classmates*

Note: The SE skills' descriptions of the OECD's SSES framework were derived from Chernyshenko et al. (2018) and Kankaraš & Suarez-Alvarez (2019). The definitions of SE skills (in English) of Primi et al.'s (2017) framework were derived from Abrahams et al. (2019).

Our aim in this study is to develop an instrument for assessing lower secondary school students' SE skills in school context and on a facet level, as well as to evaluate the psychometric properties of the instrument, focusing on its internal validation. To accomplish this aim, we formulated the following three research questions:

1. Which factors can be empirically specified in characterizing students' SE skills according to the frameworks and skills chosen for the developed SE skills instrument?
2. Does the instrument enable invariant measurement of SE skills in two grades (grade 6 and grade 9)?
3. Are there any differences between the self-reported levels of SE skills of the 6th and 9th grade students?

Method

Sample and procedure

In this article, we use the data collected from the 6th and 9th grade Estonian students, from January to April 2022, as a part of a larger research project, namely *DigiEfekt*.

The Estonian education system consists of a single structure system with basic education from years 1 to 9 (age 7 to 15) and integrated primary and lower secondary education is the mandatory minimum of general education requirement. Students attend either basic schools (grades 1–9), primary schools (grades 1-6) or upper secondary schools that also teach basic school curricula.

Participants were from 12 schools in different regions of Estonia. Based on the research design of a larger research project, the schools were purposively selected to cover a wide variety of students according to three criteria: 1) students' results in national academic tests (mathematics, language, science); 2) data of digital readiness evaluation and national digital competence assessment; 3) the results of the national well-being survey (assessment by students, teachers and parents). Based on each of the three criteria (academic achievement, digital readiness, perceived well-being), schools were divided either into the high-level, middle-level or low-level group by their performance patterns (e.g., high, low, high); only the schools from the high-level or low-level group were selected for the sample. As a result, each school was categorized into one of eight groups based on its pattern: 1) high, high, high, 2) high, high, low, 3) high, low, high, 4) low, high, high, 5) high, low, low, 6) low, low, high, 7) low, high, low, 8) low, low, low. At least one school was selected from each of the eight groups and two schools were selected from the extreme groups (1 and 8). After that, a call was sent to schools from

various groups to have a larger sample to meet the needs specified in the research project. Informed consent was obtained from students and their parents. Ethics committee approval was obtained for the study.

The questionnaire was completed in Estonian. Data were collected electronically, using the LimeSurvey software. The link to the questionnaire was sent to the teachers of the participating schools. Participants responded to the questionnaire voluntarily. They were allowed to take the survey at school or at home, and there was no time limit. Most students completed the scale in about 12 to 20 minutes.

Initially, 542 students filled out the scale online. The data file was then cleaned to exclude the unqualified cases (e.g., selecting the same answer for every item of the instrument; and, in one case, marking the grade other than 6 or 9).

The final sample for the study consisted of 521 students (281 female and 240 male students). Of these, 272 were 6th-grade students (143 female and 129 male students) and 249 were 9th-grade students (138 female and 111 male students). In regard to the number of classes, there were 18 classes of 6-graders and 17 classes of 9-graders. The number of participating students per class varied from 5 to 30. The typical age of the Estonian 6th grade students is 12-13 years, while, for 9th graders, it is 15-16 years.

Instrument

A self-report instrument was developed to assess students' SE skills across nine selected dimensions: self-control, responsibility, persistence, emotional control, stress resistance, empathy, cooperation, trust, and assertiveness. The instrument is based on two comprehensive frameworks of SE skills – Primi's et al. framework (2017, as described in detail in Abrahams et al., 2019) and the OECD's SSES framework (Chernyshenko et al., 2018 and OECD, 2021). The development of the SE skills instrument consisted of two phases: 1) the selection of frameworks and skills and the development of items, and 2) a pilot study.

In the first phase, an expert group of three researchers from the SE skills workgroup of the *DigiEfekt* project decided on the SE skills frameworks and the specific skills to include. The initial set of items was created by the same expert group. The need for developing the items based on the SE skills descriptions rather than adapting the already formed items from the existing assessment tools was rooted in the timeline of the study. As a part of a larger research project, the instrument development process started in spring 2020. We aimed to develop an instrument for assessing the SE skills in school context and on a facet level, based on the selected frameworks. To the best of our knowledge, the instruments meeting these criteria were not yet available at the time.

Each expert independently developed a list of items to assess SE skills (at least 3-4 items per each skill), based on the frameworks' key aspects and skill descriptions, and considering situations from the school context (e.g., collaboration with classmates, setting goals for learning, coping with distractions while learning). After each expert had finished the item development separately, they compared and discussed the content and wordings of the items together to resolve disagreements and finalized 48 items for the initial instrument, consisting of self-control (4 items), persistence (5 items), responsibility (7 items), emotional control (7 items), stress resistance (4 items), empathy (8 items), cooperation (4 items), trust (3 items), and assertiveness (6 items). The differences in the initial number of items were related to the lengths of skill descriptions of the frameworks selected, as more detailed descriptions allowed to generate more items. The items had a 5-point Likert type agree/disagree response scale, with the answers ranging from 1 (*completely disagree*) to 5 (*completely agree*). The option *don't know/ can't answer* was also offered. As a part of this phase, the initial set of items was tested with 4 teachers and 5 students (two 6th grade and three 9th grade students) to ensure that all items were understandable. Teachers and students were asked to evaluate the clarity of the items. As none of the items were reported as "difficult to understand" or "meaning not clear", no changes were made. Most students completed the scale in less than 10 minutes.

In the second phase, the initial version of the students' SE skills instrument was used in a pilot study (N=204), with a purpose to test (1) the factor structure and psychometric properties of the items of the initial version of the developed instrument, and (2) the procedure of the survey in preparation for the main study. We used a convenience sample, which was formed by inviting the schools from the purposive sample, described in the sample section above, to participate in the piloting phase of the research project. The participating schools had the possibility to choose between several constructs evaluated for the aims of the larger research project, SE skills among others. The data collection of the larger research project was organised in two waves – from May to June 2021 and in September 2021, as, for unforeseen reasons, some of the schools from the sample were not able to participate during spring. Considering the aim of piloting (testing the factor structure and validity), we included the data from both waves in our analysis. The sample of the pilot study consisted of 204 students from Estonian schools – 6th grade students (77) and 9th grade students (127).

From the results of the pilot study, we used the correlations between the items and CFA results to revise the questionnaire for the main study. Modification indices and standardized residuals were used to locate the items that caused misfits, and, after that, the content of these items was reviewed. The decisions to include or exclude certain items during the revision of the questionnaire were made on both the empirical and theoretical

grounds. The revised version of the SE skills instrument used in the current study consists of 34 items and 9 factors, mostly 4 items per factor.

Data analysis

The theoretical model of SE skills was tested using confirmatory factor analysis (CFA), serving to verify whether it was possible to support the structure of the nine factors defined for the instrument. The nested structure of the data (individual students nested within classes) was taken into account. Analyses were conducted using the statistical programme Mplus version 8.8 (Muthén & Muthén, 2022). The Mplus software uses a Full Information Maximum Likelihood (FIML) estimation approach to handling missing values (Enders, 2010).

The goodness-of-fit of models was evaluated by using the chi-squared statistic (χ^2), the Tucker-Lewis index (TLI), the comparative fit index (CFI) and the root mean square error of approximation (RMSEA). According to Hair et al. (2006), the model is acceptable when RMSEA <0.05, CFI and TLI> 0.9. We also used the normed chi-square index with an acceptable value below 3 and a good value below 2 (Ullman, 2006). Composite reliability was used to measure reliability of the scales.

Multiple-group CFA was conducted in the samples of grades 6 and 9, testing the invariance of the measurement model parameters across those two groups. We tested for configural, metric and scalar invariance. All models were estimated in the statistical software package Mplus version 8.8. Student answers were treated as the categorical data. With respect to this the Weighted Least Squares Means and Variance adjusted (WLSMV) were used as the estimator. The resulting invariance models were compared with respect to their chi-square statistics, CFI and RMSEA, following the recommendations by Chen (2007), who suggested a criterion of a 0.01 change in CFI to be sufficient to show invariance, paired with the changes in RMSEA of up to 0.015.

All descriptive analyses and *t*-tests were performed in SPSS.

Results

The first research question focused on testing whether the nine SE skills assessed via the developed and revised SE skills instrument could be empirically differentiated as latent variables. CFA was used to test the factor structure of the instrument. The nested structure of the data (individual students nested within classes) was considered by using multi-group cluster analyses. CFA with all 34 items – the 9-factor model – showed acceptable fit indices ($\chi 2/df = 2.02$, RMSEA = .044, CFI = .937, TLI = .928).

As some of the latent factors from the same higher-order domains were highly correlated with each other – for example, responsibility with persistence (0.924), stress resistance with emotional control (0.986), and self-control with persistence (0.860) – we also tried to combine the high-correlated factors, but the results of CFA became worse, leading us to choose the 9-factor model.

As the nine facet-level SE skills chosen for the instrument could be organised in the broad domains according to the theoretical frameworks, we then tested the second-order model (task management, emotional regulation, cooperation, engaging with others), the general dimensions (4-factor) model and, finally, the assumption that all factors loaded into one general factor (the unidimensional factor) model, but all of them provided worse fit. The fit indices of different CFA models are presented in Table 2.

Table 2
Goodness-of-Fit Information for Confirmatory Factor analyses of the SE skills instrument

Factor model	χ^2	df	χ^2/df	RMSEA	CFI	TLI
9-factor model	989.4	491	2.02	.044	.937	.928
Second-order model	1073.5	513	2.09	.046	.929	.922
4-factor model	1128.9	521	2.17	.047	.923	.917
Unidimensional model	1700.6	527	3.22	.065	.851	.842

The results indicate that the correlated factor model with 9 factors is the one with the best fit (see fit indices in Figure 1).

Then, composite reliability (CR) was calculated for all 9 factors of the instrument. The CR values for seven of the nine factors varied from 0.7 to 0.86, ensuring adequate internal consistency. The CR values for two factors – *Trust* and *Assertiveness* – were lower than the recommended threshold 0.7 (0.60 and 0.64, respectively). Both of these two factors consisted of a smaller number of items (three items) and need further development.

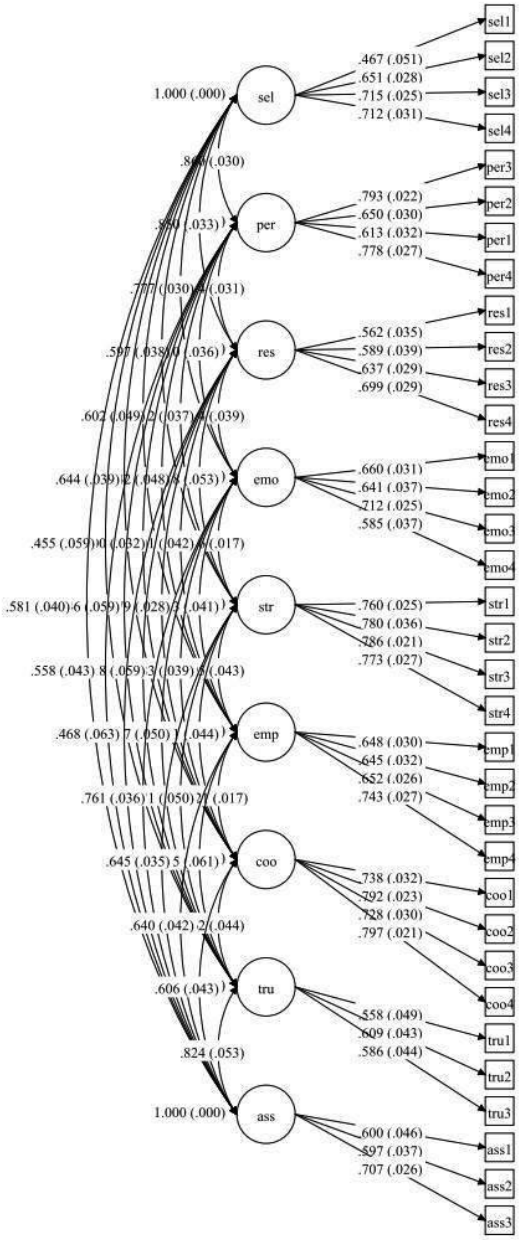

Figure 1

The 9-factor model of students' social-emotional skills

Note. $\chi 2/df = 2.01$, RMSEA = .044, CFI = .937, TLI = .928), WRMR = 1.449; sel = self-control, per = persistence, res = responsibility, emo = emotional control, str = stress resistance, emp = empathy, coo = cooperation, tru = trust, ass = assertiveness.

For checking invariance across grades 6 and 9, we examined three levels of invariance. First, we tested for configural invariance, estimating all model parameters freely for grade 6 and grade 9 students. This model resulted in a reasonable fit – χ^2 *[982] = 1437.46*, CFI = 0.944, TLI = 0.937, RMSEA = 0.042. Given the reasonable fit of this model to the data, in the second step, we further examined metric invariance across grades. The resultant model showed a reasonable model fit – χ^2 *[1007] = 1442.80*, CFI = 0.944, TLI = 0.937, RMSEA = 0.041. Third, we tested for scalar invariance, and this model resulted in an acceptable fit – χ^2 *[1100] = 1516.04*, CFI = 0.946, TLI = 0.945, RMSEA = 0.038. Considering the differences in the goodness-of-fit statistics between invariance models (Table 3), we accepted the scalar invariance model, which showed an acceptable fit.

Table 3

Goodness-of-fit statistics and comparisons among multi-group invariance models

Type of invariance	χ^2	df	χ^2/df	CFI	⊗CFI	TLI	RMSEA	⊗RMSEA
Configural	1437.46	982	1.46	0.941	-	0.933	0.042	-
Metric	1442.80	1007	1.43	0.944	-0.003	0.937	0.041	0.001
Scalar	1516.04	1100	1.37	0.946	-0.002	0.945	0.038	0.003

Note. df = Degrees of freedom; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation.

In summary, these results provide evidence for measurement invariance, suggesting that the instrument is psychometrically equivalent across grades 6 and 9.

Regarding the comparison of the 6th-grade and 9th-grade students, the independent samples *t*-tests were conducted to examine the mean differences between grade groups. The scores of SE skills were calculated based on the average scores of the corresponding items. The descriptive statistics and *t*-test results are presented in Table 4.

Table 4

Descriptive statistics and t-test of grade

	Grade 6 (n= 272)		Grade 9 (n= 249)				
	Mean	SD	Mean	SD	t	df	p
Self-control	3.53	.697	3.28	.668	4.155	507	<.001
Persistence	3.89	.672	3.81	.689	1.215	505	.112
Responsibility	4.11	.628	4.06	.626	.980	506	.164
Emotional control	3.73	.791	3.64	.788	1.365	493	.086
Stress resistance	3.57	.813	3.49	.875	1.628	501	.052
Empathy	4.18	.647	4.16	.615	.490	501	.312
Cooperation	4.25	.624	4.27	.626	.100	507	.460
Trust	3.79	.775	3.80	.756	-.241	507	.405
Assertiveness	3.47	.805	3.39	.841	.828	486	.204

Note. Scale scores ranged from 1 to 5.

The results of the independent samples *t*-test showed that a significant difference between grade 6 and grade 9 students ($t = 4.155$, $p < 0.01$) existed in the *Self-control* facet, indicating that the students from the younger cohort ($M = 3.53$, $SD = 0.697$) reported higher self-control levels than the students from the older cohort ($M = 3.28$, $SD = 0.668$). There were no significant differences between the grade groups regarding the other eight SE skills factors.

Discussion

This article has described the development and preliminary psychometric evaluation of a self-assessment instrument that could be used to measure SE skills of lower secondary school students. Nine SE skills, namely, self-control, responsibility, persistence, emotional control, stress resistance, empathy, cooperation, trust, and assertiveness, were selected to develop the instrument and form the items, based on two prominent frameworks proposed by Primi et al. (2017) and OECD (Chernyshenko et al., 2018). The first version of the instrument was examined using CFA with 204 participants from the pilot study, showing an acceptable fit. However, to improve the instrument, some changes in the items were made both on empirical and theoretical grounds; thus, for the main study, a 9-factor and 34-item instrument was established.

The revised version of the instrument was further examined by CFA with 521 participants, showing an acceptable fit. The results of the CFA supported the 9-factor structure of the instrument, and therefore confirmed the construct validity of the proposed model. This instrument utilizes the facet-level assessment approach and allows to provide specific information about different SE skills. Therefore, it can be used by educators for monitoring students' SE skills, as well as for developing and targeting interventions in schools.

Similarly to some previous studies using the same frameworks of SE skills, the current study revealed some high correlations between students' self-reported skills from the same domains, for example, self-control and persistence, responsibility and persistence, and emotional control and stress resistance. These findings are in accordance with the results from the Finnish sample of the OECD Study on Social and Emotional Skills (Guo et al., 2023). These relatively high correlations between some SE skills (e.g. responsibility and persistence, emotional control and stress resistance) in our study can be explained by belonging to the same higher-order domain, as the skills are conceptually and empirically related to one another. Still, there is also a possibility that some correlations might be related to students' perceptions of those skills, and the results might indicate that students could not differentiate between those SE skills. A possible explanation might be that students may not have had enough opportunities to develop clear understanding of the

distinct characteristics of the assessed SE skills, resulting in high correlations in their self-ratings of some skills. If this hypothesis were proved in following studies, it would mean that students need to be supported through formal education to develop better understanding of different SE skills, by providing more specific and targeted approaches. Therefore, further analyses should be performed to better understand and support students' perceptions of those skills.

Moreover, the present study used multiple group CFA to investigate measurement invariance of the developed SE skills instrument in 6th grade and 9th grade students. The previously established 9-factor structure of the instrument showed an acceptable fit in both samples. The results suggest that the instrument measured the same skills across different grades and the scores of the 6th grade and 9th grade students were directly comparable. Therefore, the developed instrument can be used for students in both grades, and enables the comparison of results for both groups of students. This is an important result, considering that adolescent years are claimed to be the focal period for supporting and monitoring the development of SE skills (Napolitano et al., 2021) and our instrument enables measuring and comparing the SE skills ratings for lower secondary school students.

The results in this study demonstrated that the self-ratings of SE skills were mostly similar in grade 6 and grade 9 students. For one facet – self-control – the students from the younger cohort reported significantly higher levels than the students from the older cohort. This finding is partially consistent with the previous studies by Soto et al. (2011), which indicated that self-control showed decrease during adolescence, and this decrease was much sharper than in the other facets within the same domain.

In light of the statistical results in this study, we can conclude that the developed instrument shows acceptable internal validity, which represents an important foundation for further development. Considering the recent rapid developments in the field of assessing students' SE skills, comparative analyses of the facets and items from recently proposed comprehensive assessment instruments could be a valuable possibility for further improvements. The instrument could be enhanced by adding specific SE skill scales, for example, curiosity. Regarding the role of students' SE skills in the achieved educational outcomes, there is recent evidence that curiosity appears to be among the three most beneficial skills, in addition to self-control and persistence (Goa et al., 2023). Additionally, this instrument can be even further improved by cross-validation with teacher ratings for students' skills.

Even though the present study supported the psychometric properties of the developed SE skills instrument, we would like to pinpoint and discuss some potential limitations. First, the current analysis focused on self-reports of students, which is a common methodological weakness of many SE skills

evaluation studies. Therefore, additional analyses with several informant ratings are needed to examine whether the psychometric properties evaluated based on students' self-reports will be replicated by additional measures. Secondly, due to evidence on low composite reliability for two of the scales – Trust and Assertiveness, it is recommended to analyse and revise the items in order to improve the psychometric characteristics of those two factors. Thirdly, as there was no other instrument used to measure the students' SE skills in the current study, no analyses on concurrent or convergent validity were conducted. This represents an important limitation and a strong recommendation for future research.

Despite its limitations, our study has proposed an assessment instrument for SE skills with acceptable psychometric properties. From a practical point of view, the current study has offered an initial version of the SE skills instrument for lower secondary schools, which is easy to administer and can be used for the assessment and educational monitoring of students' SE skills. The 9-factor structure of the instrument was confirmed and the instrument enables comparisons across grades 6 and 9.

Future studies should focus on exploring students' understanding and their perceptions of different SE skills and the distinctive aspects, as well as the possibilities for supporting the development of those skills to achieve more nuanced understanding of different facets.

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DATUM SLANJA: 2025/06/03 DATUM PRIHVATANJA: 2025/06/09

REVIDIRANA VERZIJA OPOZVANOG RADA: Razvoj i preliminarna validacija instrumenta za procenu socijalno-emocionalnih veština za učenike iz Estonije viših razreda osnovnog obrazovanja[4]

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Imajući u vidu potrebu za sveobuhvatnim i psihometrijski proverenim instrumentima za procenu učeničkih socijalno-emocionalnih veština (SE veštine) u školskom kontekstu, cilj ove studije je da razvije i testira instrument za procenu socijalno-emocionanih veština učenika viših razreda osnovnog obrazovanja. Početna verzija instrumenta razvijena je na osnovu opisa veština iz SE okvira (Primi i sar, 2017) i na osnovu okvira Organizacije za ekonomsku saradnju i razvoj (OECD; Chernyshenko i sar, 2018) i sastojala se iz 48 stavke. Nakon konfirmatorne faktorske analize (CFA) na uzorku od 204 učenika iz Estonije, unapređen je instrument sa 9 faktora i 34 stavke. CFA analiza ukazala je da predviđeni model ima prihvatljive fit parametre na alternativnom uzorku koji se sastojao od 521 učenika. Utvrđena je striktna invarijantnost merenja između razreda (6. i 9. razred). Može se zaključiti da, iako instrument omogućava procenu učeničkih SE veština na višim razredima osnovnog obazovanja, potrebno je sprovesti dodatna istraživanja.

Ključne reči socio-emocionalne veštine, procena učenika, konstruisanje instrumenta, konfirmatorna faktorska analiza, invarijantnost merenja

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