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Pain self-efficacy scale for children and adolescents aged 8 to 17 years (SPaSE): Translation, adaptation and psychometric properties into Turkish

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ABSTRACT

Background and purpose: There is a need for measurement tools to determine and evaluate the impact of pain self-efficacy in managing pain problems, which are recognized as a prevalent public health issue among children and adolescents. This study aimed to assess the pain self-efficacy of children and adolescents by translating the Pain Self-Efficacy Scale (SPaSE) into Turkish, alongside its adaptation and psychometric evaluation.
Methods: This descriptive and methodological study was conducted between August 10, 2023, and December 10, 2024, in pediatric clinics of two state hospitals located in the southern region of Türkiye. The study population consisted of children aged 8–17 years who were followed up in these clinics. Data were collected using the "Descriptive Information Form" and the "SPaSE." The psychometric properties of the Turkish version of SPaSE were assessed using explanatory and confirmatory factor analysis, Cronbach's alpha coefficient, and the Intraclass Correlation Coefficient (ICC).
Results: The Turkish version of SPaSE, consisting of 11 items, was found to be structured under a single factor, explaining 61.268 % of the total variance. The Cronbach's alpha coefficient of the Turkish version of SPaSE was determined to be 0.936. The mean item scores of the Turkish version ranged between 2.10 ± 1.30 and 2.86 ± 1.06.
Conclusion: The Turkish adaptation of SPaSE is a reliable and valid instrument for evaluating pain self-efficacy in children and adolescents.
Practice implications: SPaSE can be used to assess pain self-efficacy in the clinical practice for tailoring treatment plans and implementing supportive interventions.

Introduction

According to the International Association for the Study of Pain, pain is defined as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage" (Raja et al., 2020). Pain is a multidimensional experience encompassing sensory/discriminative, motivational/emotional, and cognitive/evaluative dimensions (Cirik et al., 2022). Studies in the literature indicate that 5–35 % of children and adolescents are affected by pain (De la Vega et al., 2018; Grasaas et al., 2020; Haraldstad & Stea, 2021; Myrtveit et al., 2018; Tumin et al., 2018). The dynamic nature of pain, influenced by biological, social, and psychological factors, negatively impacts both the physical and psychological quality of life and well-being of children (Cirik et al., 2022; McKillop & Banez, 2016; Mikkelsen et al., 2021).

In a study by Haraldstad and Stea (2021), it was found that increased pain frequency in adolescents was associated with shorter sleep duration and higher levels of depressive symptoms. Similarly, Groenewald et al. (2019) reported that 30.3 % of 8641 children aged 6–17 years in the United States experienced pain within the previous 12 months. They also found that children with pain missed an average of 1.5 school days, and 6.1 % of children with pain exhibited chronic absenteeism, compared to only 1.3 % of those without pain. Jones et al. (2021) noted that pain in adolescents causes undesired changes in developmental domains such as autonomy, identity, and peer relationships. Given the significant impact of pain on the lives of children and adolescents, effective pain management is critical (Groenewald et al., 2019; Haraldstad & Stea, 2021; Jones et al., 2021; Kahsay & Pitkäjärvi, 2019). Among the key elements of pain management is pain self-efficacy, defined as an individual's belief and confidence in their ability

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to perform specific actions or behaviors despite pain (Bandura, 1977; Bandura, 1986; Bandura, 1997; Schwarzer & Warner, 2013). In Bandura's Social Cognitive Theory, pain self-efficacy is emphasized as being dependent on individuals' cognitive processes, emotional coping strategies, and behavioral responses when faced with pain. According to this theory, a successful response to pain is linked to an individual's self-efficacy in managing pain. Individuals with high self-efficacy are more likely to believe that they can manage their pain, and this belief is associated with more positive pain outcomes (Bandura, 1977; Bandura, 1986; Bandura, 1997). Research shows that pain self-efficacy is a critical mediator in various outcomes related to health-related quality of life in children and adolescents. In a study by Mikkelsen et al. (2021), pain self-efficacy accounted for up to 73.5 % of the variance in physical well-being, psychological well-being, and school functioning in adolescents with pain. Additionally, adolescents with chronic pain exhibited lower self-efficacy levels compared to those with acute pain (Mikkelsen et al., 2021). Kalapurakkel et al. (2015) reported that higher pain self-efficacy in children aged 8–17 years with chronic headaches was associated with improved school performance, reduced functional disability, and fewer depressive symptoms. Grasaas et al. (2020) found that increased self-efficacy in adolescents not only enhanced pain-coping skills but also improved overall quality of life. In another study, children with lower perceived self-efficacy experienced higher levels of gastrointestinal symptoms and disability (DuPen et al., 2016). A systematic review by Stahlschmidt et al. (2019) revealed that increased pain self-efficacy reduced pain intensity, disability related to pain, and depressive and somatic symptoms. They also emphasized that pain self-efficacy acts as a resilience factor in pain management for children and adolescents. However, they noted the lack of a standardized tool to evaluate pain self-efficacy in this population. One of the most appropriate and valid methods for assessing pain self-efficacy in children and adolescents is self-report measures (Stahlschmidt et al., 2019). The use of scales transforms the pain self-efficacy reported by children and adolescents through numbers or words into an objective form, thereby eliminating different interpretations between the child patient and healthcare professionals in pain management (Eti Aslan & Badır, 2005). In the literature, some scales that assess pain self-efficacy (Bursch et al., 2006; Harter, 1985; Muris et al., 2003; Nicholas, 2007; Stone et al., 2016). The Self-Perception Profile for Children (SPPC) scale, developed by Harter in 1985 and retested for reliability and validity by Muris et al. (2003), assessed the self-perception and self-esteem levels of children aged 8 and above. Bursch et al. (2006) the Child Self-Efficacy Scale (parent and child report versions) assessed the self-efficacy of pediatric pain patients aged 9–18 years to function normally when in pain, but they reported that this scale might not be generalizable to children and adolescents with less severe chronic pain, or with less extensive experience with the health care system, and their parents. The Pain Self-Efficacy Questionnaire (PSEQ) was developed by Nicholas (2007) and assessed the pain self-efficacy of adults with chronic pain Stone et al. (2016) found the Pain Beliefs Questionnaire (PBQ) to be a valid and reliable measurement tool for assessing abdominal pain beliefs in children aged 8–18 years with functional abdominal pain. However, there is no information on the usability of the PBQ in other pediatric chronic pain populations (Stone et al., 2016). Stahlschmidt et al. (2023), the Pain Self-Efficacy Scale (SPaSE) addressed a gap in the literature by providing a comprehensive assessment for pain self-efficacy in children and adolescents aged 8–17 years via a thorough development process involving both scientific and clinical experts, pretesting, validation, and cross-validation. The scale is rooted in Bandura's social cognitive theory and self-efficacy concept (Bandura, 1977; Bandura, 1986; Stahlschmidt et al., 2023). Based on Bandura's Social Cognitive Theory, the self-efficacy-based SPaSE measurement tool offers a solution for assessing children's and adolescents' pain management, pain perception, coping strategies, as well as patients' levels of self-efficacy (Stahlschmidt et al., 2023). Since pain experienced during childhood and adolescence can persist into adulthood, evaluating pain self-efficacy is crucial. Healthcare professionals, particularly nurses, play a vital role in addressing pain self-efficacy as part of pain management for children and adolescents, who often face pain as a public health issue (Swain et al., 2014). Nurses can use tools like SPaSE to assess self-efficacy levels, monitor changes over time, and improve the quality of life for children and adolescents. Moreover, utilizing a culturally validated tool like the SPaSE has important public health implications. It can enhance pediatric pain management by enabling healthcare professionals, particularly nurses, to accurately assess pain self-efficacy levels, tailor interventions according to individual needs, and monitor changes over time. In Turkish healthcare settings, where effective pain management strategies are crucial for improving children's quality of life and long-term health outcomes, the availability of a reliable and valid instrument like the Turkish version of the SPaSE can also support clinical decision-making and contribute to more patient-centered care. In the literature, many scales have been found to be effective in measuring and assessing pain self-efficacy (Bursch et al., 2006; Harter, 1985; Muris et al., 2003; Nicholas, 2007; Stone et al., 2016). However, since there is no established gold standard for pain self-efficacy in children and adolescents, it still cannot be clearly assessed (Aldemir, 2007; Stahlschmidt et al., 2019). In Türkiye, the Pain Self-Efficacy Questionnaire (PSEQ) was adapted into Turkish for adult patients by Kaynarci (2016). Nevertheless, due to the differences in language, communication, behavioral characteristics, and developmental levels between children and adults—as well as differences in the way they express pain—there has been a need for a specialized measurement tool to assess pain self-efficacy in children and adolescents (Conlon, 2009). In this context, having valid, reliable, and standardized pain scales for children and adolescents is of great importance, and the need for tools that can accurately measure pain self-efficacy continues. To the best of our knowledge, no measurement instrument specifically developed to assess pain self-efficacy in children and adolescents has been identified in Türkiye.

Aim

In this study, the aim was to translate the Pain Self-Efficacy Scale (SPaSE), originally developed in German and English, into Turkish, to carry out its cultural adaptation, and to determine its psychometric properties by evaluating the validity and reliability of the scale for assessing the pain self-efficacy levels of children and adolescents. In this context, it is expected that a valid, reliable, and culturally adapted Turkish version of the SPaSE will be obtained for use in evaluating the pain self-efficacy levels of children and adolescents aged 8 to 17 in Türkiye.

Method

Study design

This study is descriptive- methodological research.

Sample and setting

The study population consisted of children aged 8–17 years who were being followed in pediatric clinics of state hospitals located in two hospitals in southern Türkiye between August 10, 2023, and December 10, 2024. This study included children who presented with pain to the pediatric inpatient units and outpatient clinics of two hospitals. In one of the hospitals where the study was conducted, the pediatric ward has a capacity of 12 beds and is staffed by nine nurses. In the other hospital, the pediatric ward includes 18 beds and employs 12 nurses. All rooms in the pediatric units of both hospitals are designed as double occupancy.

The inclusion criteria for the study were: (a) children aged 8–17 years experiencing pain, (b) those who, along with their legal

guardians, consented to participate in the study, (c) children who were literate in Turkish, and (d) children capable of reading and comprehending the questionnaire. The exclusion criteria included: (a) children who did not have any pain experience, (b) those who, along with their legal guardians, did not provide consent to participate in the study, (c) individuals who were unable to read or had difficulty comprehending Turkish, and (d) children with cognitive impairments that prevented them from independently reading and responding to the questionnaire.

In scale adaptation studies, it is recommended that the sample size should be approximately 5–20 times the number of items in the scale (DeVellis & Thorpe, 2021; Karagöz, 2019). Another recommendation categorizes sample sizes as inadequate if below 100, low if up to 200, good between 200 and 500, and very good between 500 and 1000 (DeVellis & Thorpe, 2021; Tavşancıl, 2019). A convenience sampling method was employed to recruit participants. Children who met the inclusion criteria and were accessible during the data collection period were invited to participate. In the current study, the goal was to recruit at least 220 children to evaluate the 11-item SPaSE. A total of 229 children aged 8–17 years who were receiving follow-up care in pediatric clinics, hospitalized, had parental consent, and agreed to participate were included in the study.

Data collection tools

The data were collected using the "Descriptive Information Form" and the "Pain Self-Efficacy Scale for Children and Adolescents (SPaSE)."

Descriptive information form

This form includes a total of seven questions related to participants' gender, age, reason for hospital admission, the area of pain, and the duration of the pain (Cirik et al., 2022; Mikkelsen et al., 2021; Stahlschmidt et al., 2023).

Pain self-efficacy scale for children and adolescents (SPaSE)

The Pain Self-Efficacy Scale (SPaSE) was developed by Stahlschmidt et al. (2023) to measure self-efficacy pain in children and adolescents. The scale consists of 11 items in a single dimension. Responses to the items are scored on a 5-point Likert scale: "0-Not true, 1-Not quite true, 2-Undecided, 3-Sort of true, 4-True." Items 4 and 10 are reverse scored. The Cronbach's alpha internal consistency coefficients for the original scale were 0.86 for the German version and 0.88 for the English version (Stahlschmidt et al., 2023). The Turkish version demonstrated a Cronbach's alpha coefficient of 0.936.

Data collection

Prior to the data collection process, nurses working in the pediatric ward, as well as physicians and administrative staff in the outpatient clinic, were informed about the study by the researchers. Children and adolescents who met the inclusion criteria were identified accordingly. These eligible children and their parents were then informed about the study. To minimize parental influence, children were encouraged to complete the questionnaires independently, without the presence of their parents. During the data collection process, researchers conducted face-to-face interviews with the children to collect the data. Completion of the questionnaires took approximately 10–15 min per participant.

Adaptation process

The SPaSE was translated into Turkish with permission from its original author. To ensure linguistic validity, two academics with advanced English proficiency and a linguist independently translated the scale from English to Turkish. The linguistic validity of this scale was ensured by translators who were familiar with the cultures of both languages, understood the construct being assessed, took into account the nuances of the Turkish language, and facilitated the cultural adaptation process (Borsa et al., 2012). The researchers then reviewed all translations and combined them into a single version. The newly developed Turkish version was back-translated into English by a language expert unfamiliar with the original English text (Borsa et al., 2012). Upon, the finalized Turkish version was prepared for expert review.

The first stage of content validity involved the evaluation of the 11-item draft scale by experts to obtain feedback on cultural factors such as cultural values, beliefs, and social norms, as well as on the content, scope, relevance, clarity, and structure of the items. A total of 10 experts were consulted for the scale. Experts were asked to evaluate each item using the following rating scale: "1 = Not appropriate, 2 = Item requires some revision, 3 = Appropriate but needs minor modifications, and 4 = Highly appropriate". The "Item-Level Content Validity Index (I-CVI) and Scale-Level Content Validity Index (S-CVI)" were calculated using the Davis technique to determine content validity indices (Polit & Beck, 2018). To determine the scale's content validity, 10 expert academicians were consulted, as it is suggested in the literature that expert opinions be sought from 3 to 20 individuals (Polit & Beck, 2018). The content validity was assessed by experts in the fields of pediatric nursing ($n = 5$), public health ($n = 2$) and surgical nursing ($n = 3$) who work on pain. The scores obtained from the expert evaluations were analyzed using Davis' method (Davis, 1992). The I-CVI was found to be 0.80 for item 2, 0.90 for item 3, and 1 for all other items (Zamanzadeh et al., 2014). A S-CVI ≥ 0.9 indicates excellent content validity (Davis, 1992), and in this study, the S-CVI was determined to be 0.97. The final draft of the scale, obtained through the back-translation method and adapted to Turkish culture, was compared with the original English version and submitted to the author of the SPaSE for approval.

The literature recommends conducting a pilot study with at least 30–40 participants to evaluate the clarity and reliability of the adapted scale (Bujang et al., 2024). In this study, a pilot test was conducted with 20 children. No issues were identified regarding the comprehensibility of the items, and the data collected during the pilot study were not included in the main dataset.

Data analysis

The data were analyzed using IBM SPSS 26.0 software and AMOS 23.0 statistical programs. Descriptive statistics, including mean, standard deviation, frequency, and percentage values, were calculated.

Validty analysis

For linguistic validity, the translation-retranslation method was employed using the Davis technique. The evaluation of each item of the SPaSE by translators who were well-versed in Turkish culture ensured cultural adaptation during the process of adapting the Turkish version (Borsa et al., 2012). This method ensures that the translated version of the scale maintains the original meaning, accounting for both linguistic and conceptual accuracy (Davis, 1992). The construct validity of the SPaSE was evaluated through Explanatory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). To determine the suitability of the data for factor analysis, the correlation matrix, Kaiser-Meyer-Olkin (KMO) measure, and Bartlett's Test of Sphericity (BTS) were examined. The KMO measure was used to assess the sampling adequacy, with values closer to 1 indicating a stronger factor structure (Pituch & Stevens, 2015). Bartlett's Test of Sphericity was applied to test the hypothesis that the correlation matrix is an identity matrix, where a significant result suggests that factor analysis is appropriate for the data (DeVellis & Thorpe, 2021).

Before the analysis, the suitability of the data for CFA was tested. Mahalanobis distance values were created to identify outliers, and no outliers were found that would negatively affect the analysis. In addition, the relationships between the test items were examined, and since there was no value above 0.80 (the highest value was 0.63), no multicollinearity problem was found (Büyüköztürk, 2011). Item-total

score and item-factor total score correlation coefficients were used to test the item validity of the scale. In the CFA process, data normality was assessed to determine the suitability of the dataset for parametric analysis. The selection of the CFA model was guided by the theoretical structure established in the EFA. Model parameters were estimated using Maximum Likelihood, and the covariance matrix was used in the analysis. Model quality was evaluated through fit indices such as χ^2 (Chi-square), df (Degrees of Freedom), RMSEA (Root Mean Square Error of Approximation), NFI (Normed Fit Index), SRMR (Standardized Root Mean Square Residual), CFI (Comparative Fit Index), IFI (Incremental Fit Index), TLI (Trucker-Lewis Index), GFI (Goodness of Fit Index), and RFI (Relative Fit Index). The results were interpreted in line with established criteria to assess the model's goodness of fit (Barrett, 2007; Kaynarci, 2016; Marsh et al., 2020; Perry et al., 2015).

Reliability analysis

Reliability analyses included calculations for Cronbach's alpha, Guttman split-half coefficient, Spearman-Brown coefficient, Intraclass Correlation Coefficient (ICC), item-total score correlations, and test-retest analysis (Barbera et al., 2020; DeVellis & Thorpe, 2021; Marsh et al., 2020; Streiner et al., 2015;). Cronbach's alpha was calculated to assess internal consistency, with a value above 0.70 typically indicating acceptable reliability (DeVellis & Thorpe, 2021). The Guttman split-half coefficient and Spearman-Brown coefficient were used to evaluate the homogeneity of the test and its consistency across different halves of the items (Streiner et al., 2015). Intraclass Correlation Coefficient (ICC) was calculated for test-retest reliability, indicating the degree to which the same results could be expected over time (Barbera et al., 2020). Item-total score correlations were examined to determine the degree to which individual items correlated with the overall score, contributing to the scale's construct validity (Marsh et al., 2020). A confidence interval of 95 % and a significance level of $p < 0.05$ were used as the criteria in the analyses.

Ethical considerations

Permission to adapt the scale into Turkish was obtained via email from one of the scale's authors, Dr. Julia Wager. Following this, approval to initiate the study was obtained from the University Faculty of Medicine Clinical Research Ethics Committee (Date: 23.05.2023, Decision No: 70904504/367) and authorization from the Provincial Health Directorate for conducting the research in hospitals (Date: 09.08.2023, Decision No: E-98360293-604.02.02-221,793,686). After completing the necessary approval processes, children and their families were informed about the study. It was emphasized that participation was voluntary and that they could withdraw from the study at any time. Verbal consent was obtained from the children, and written consent was secured from their parents.

Results

Demographic characteristics

A total of 229 children aged 8–17 years participated in the study, with a mean age of 12.86 ± 3.04 years. Among the participants, 54.1 % were female. The most reported pain locations were the abdominal region (32.8 %) and the hand-arm regions (14.4 %), while 25.7 % of the children reported experiencing pain in multiple areas. The average duration of pain was 2.86 ± 2.36 days, and the most frequently reported pain types were sharp pain (42.4 %) and aching pain (33.8 %) (Table 1).

Table 1
Sociodemographic Characteristics ($n = 229$).

Characteristics	Median (Minimum-Maximum)	Mean ± SD
Age	13 (8–17)	12.86 ± 3.04
Duration of pain (Days)	2 (1−21)	2.86 ± 2.36
	n	**%**
Gender		
Girl	124	54.1
Boy	105	45.9
Pain Location		
Head/Face/Jaw	23	10.0
Neck/Shoulder	22	9.6
Chest	25	10.9
Hand-Arm	34	14.8
Abdomen	75	32.8
Back	3	1.3
Leg-Knee-Foot	28	12.2
Other*	19	8.3
Number of Pain-Experienced Regions		
1	170	74.2
2	50	21.8
3 or more	9	3.9
Description of Pain		
Sharp	97	42.4
Aching	77	33.6
Throbbing	34	14.8
Stabbing	16	7.0
Burning	5	2.2

Notes: Teeth, ear, joint etc.

Validity analysis

Content validity

To assess content validity, the draft Turkish version of the SPaSE was evaluated by 10 experts. Using the Davis technique, the item-level content validity indices (I-CVI) were found to range between 0.80 and 1.00, and the scale-level content validity index (S-CVI) was calculated as 0.97. The results indicated a high level of agreement among the experts.

Construct validity

Exploratory factor analysis. KMO value of the Turkish version of SPaSE was 0.872, and Bartlett's test of sphericity was significant ($p < 0.001$). These results demonstrate that the sample size was adequate, and the data collected from the Turkish sample were suitable for factor analysis. EFA revealed that the 11-item Turkish version of SPaSE was unidimensional, explaining 61.268 % of the total variance. The factor loadings for the items ranged between 0.671 and 0.856 (Table 2). The communalities for the SPaSE ranged from 0.450 to 0.733, indicating that the

Table 2
Exploratory Factor Loadings for the Turkish Version of the SPaSE.

Items	Factor 1	Communalities
Item 1: If I have pain, I can deal with it.	0.849	0.721
Item 2: I can attend school normally, even if I have pain.	0.770	0.592
Item 3: I can look forward to being with my friends, even if I have pain.	0.809	0.655
Item 4: My pain makes it difficult to achieve my goals.	0.842	0.709
Item 5: I can cope with the pain in most situations.	0.800	0.641
Item 6: Even if I have pain, I can do the things I like to doing.	0.835	0.697
Item 7: Even if I have pain, I can be in a good mood.	0.856	0.733
Item 8: I get my pain under control.	0.724	0.524
Item 9: I can cope with pain even if I am bored.	0.729	0.532
Item 10: I feel helpless when I have pain.	0.671	0.450
Item 11: Even if I have pain, I can live my life the way I want to.	0.696	0.485
Eigenvalues	6.740	
Explained total variance (%)	61.268	
KMO coefficient	0.872	
Barlett test	2363.035 ($p < 0.001$)	

Table 3
Goodness of Fit Indices for Confirmatory Factor Analysis.

Models/Data-model fit indices	One- factor model
χ^2	62.053
df	34
χ^2/df	1.825
RMSEA	0.060
sRMR	0.033
NFI	0.974
CFI	0.988
IFI	0.987
GFI	0.957
RFI	0.958

Notes: χ2, Chi-square; df, Degrees of Freedom; RMSEA, Root Mean Standard Error Approximation; NFI, Normed Fit Index; SRMR, Standardized Root Mean Square Residual; CFI, Comparative Fit Index; IFI, Incremental Fit Index; TLI (NNFI), GFI, Goodness of Fit; Index Normed Fit Index: Trucker-Lewis Index; RFI, Relative Fit Index.

items were well explained by the extracted factors. Items 1, 4, 6, and 7 had high communalities (≥0.70), demonstrating that a large portion of their variance was explained by the factors. Items 10 and 11 had lower communalities (≤0.50), suggesting that these items may require further evaluation or refinement (Table 2).

Confirmatory factor analysis. To confirm the unidimensional construct validity of the Turkish version of SPaSE, the fit indices obtained from CFA were as follows: $\chi^2 = 62.053$, χ^2 / df = 1.825, RMSEA = 0.060, NFI = 0.974, sRMR = 0.033, CFI = 0.988, IFI = 0.987, TLI = 0.981, GFI = 0.957, and RFI = 0.958, indicating acceptable fit index standards (Table 3).

Fig. 1 presents the item-structure parameters of the single-factor model resulting from CFA. The standardized factor loadings of the items range between 0.36 and 0.79, and the t-value test confirmed that the factor loadings were significant. The standardized factor loadings for the items ranged from 0.36 to 0.79, indicating moderate to strong relationships between the items and the underlying factor (F1). While items with loadings above 0.70 showed strong associations with the factor, some items shad weaker relationships with the factor. Despite this, all factors were found to be statistically significant, with t-values confirming the strength of the relationships ($p < 0.001$ for all).

Reliability analysis

Internal consistency analysis. The Cronbach's alpha coefficient of the SPaSE was found to be 0.936 (95 % CI: 0.928–0.944), indicating high internal consistency reliability. Additionally, split-half analysis revealed that Cronbach's alpha value for the first half of the scale was 0.920, and for the second half, it was 0.853. The Spearman-Brown coefficient was calculated as 0.888, the Guttman split-half coefficient as 0.866, and the correlation coefficient between the two halves as 0.798. These results demonstrate that the Turkish version of SPaSE has a high level of internal consistency reliability (Table 4).

The mean item scores of the scale ranged between 2.10 ± 1.30 and 2.86 ± 1.06, indicating moderate levels. The item-total correlation coefficients of the scale ranged between 0.683 and 0.852, and the corrected item-total correlation coefficients ranged between 0.611 and 0.812, all of which were statistically significant ($p < 0.001$) (Table 5).

Furthermore, the scalability of the scale was assessed using Tukey's test of additivity, and the scale was found to be scalable ($F = 17.352$, $p < 0.001$). To test for response bias, Hotelling's T^2 test was used, yielding a Hotelling's T^2 value of 149.267 with $p < 0.001$.Test-retest reliability

To evaluate the test-retest reliability of the Turkish version of SPaSE, the scale was re-administered to a sample of 30 children four weeks after the initial application. The mean scores from the first

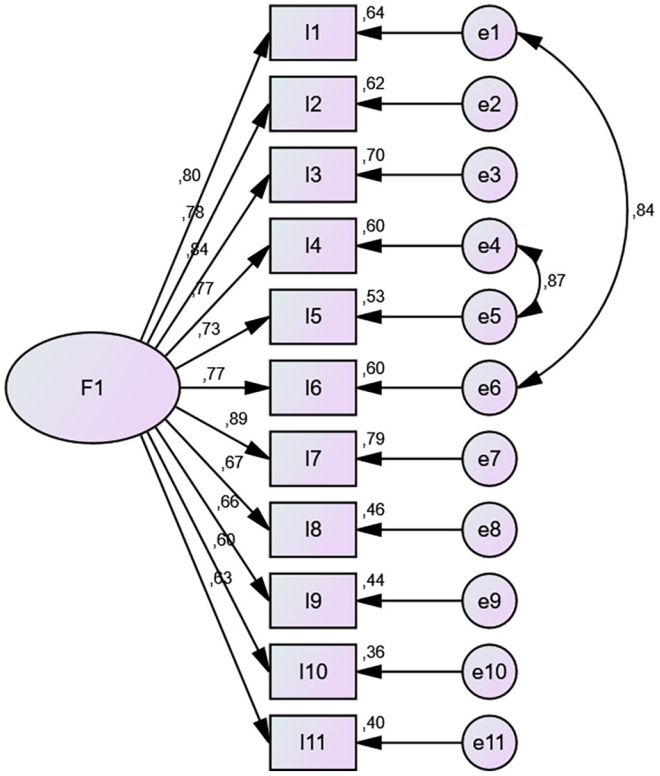

Fig. 1. Confirmatory Factor Analysis.

administration (32.73 ± 8.07) and the second administration (32.50 ± 7.46) showed no statistically significant difference ($p > 0.05$).

Furthermore, a strong positive correlation was observed between the test-retest scores of the scale items ($r = 0.980$, $p < 0.001$). The Intraclass Correlation Coefficient (ICC) was calculated to be 0.990 (95 % CI: 0.985–0.995), indicating excellent reliability.

Discussion

The ability of children to cope with pain is a critical factor in enhancing their resilience against adverse situations and has been identified as an individual resilience mechanism within the pain resilience-risk model (Bandura, 1997; Jones et al., 2021; Tomlinson et al., 2017). Inadequate pain management during childhood can result in greater pain intensity during painful events in adulthood (Cirik et al., 2022; Swain et al., 2014). Assessing and improving pain self-efficacy in children and adolescents positively contributes to their ability to manage pain more effectively (Tomlinson et al., 2017). The SPaSE is a measurement tool specifically designed to evaluate pain management and self-efficacy perceptions among children and adolescents aged 8–17. Adapting the SPaSE for the Turkish population represents a significant step toward evaluating and supporting children's and adolescents' abilities to cope with pain. The scale offers a framework to mitigate the negative impacts of pain on both physical and emotional health by

Table 4
Reliability Analyses (Cronbach's alpha, split-half, ICC).

Scale Total	
Cronbach's α	0.936
First half of Cronbach's α	0.920
Second half of Cronbach's α	0.853
Spearman-Brown	0.888
Guttman split half	0.866
Correlation between two halves	0.798

Table 5
Item-Level Correlations and Test–Retest Reliability for SPaSE Items.

	Items	Mean ± SD	Item total score correlation (r)* ($n = 229$)	Corrected item total score correlation (r)* ($n = 229$)	Test-retest correlation of items (r)* ($n = 30$)
Factor 1	**Item 1:** If I have pain, I can deal with it.	2.19 ± 1.26	0.852	0.809	0.600
	Item 2: I can attend school normally, even if I have pain.	2.49 ± 1.10	0.768	0.714	0.979
	Item 3: I can look forward to being with my friends, even if I have pain.	2.64 ± 1.07	0.804	0.758	0.981
	Item 4: My pain makes it difficult to achieve my goals.	2.71 ± 1.09	0.834	0.794	0.887
	Item 5: I can cope with the pain in most situations.	2.62 ± 1.01	0.790	0.745	0.999
	Item 6: Even if I have pain, I can do the things I like to doing.	2.10 ± 1.30	0.839	0.791	0.928
	Item 7: Even if I have pain, I can be in a good mood.	2.69 ± 1.16	0.851	0.812	0.970
	Item 8: I get my pain under control.	2.86 ± 1.06	0.726	0.667	0.971
	Item 9: I can cope with pain even if I am bored.	2.45 ± 0.99	0.733	0.679	0.953
	Item 10: I feel helpless when I have pain.	2.69 ± 1.14	0.683	0.611	0.945
	Item 11: Even if I have pain, I can live my life the way I want to.	2.33 ± 1.04	0.702	0.640	0.990

Abbreviations: SD, standard deviation. * $p < 0.001$.

determining pain self-efficacy levels. To the best of our knowledge, SPaSE is the first tool in Türkiye designed to assess pain self-efficacy in children and adolescents aged 8–17.

It was determined in this study that the translation-retranslation process undertaken to ensure linguistic validity demonstrated that the scale is consistent with the original version in terms of meaning and content. During the adaptation process of the SPaSE, experts took into consideration the relevance of the concepts of pain self-efficacy, pain perception, and coping within Turkish culture, as well as the appropriateness of these concepts in terms of the ability of children and adolescents aged 8 to 17 to represent them.

Expert evaluations for content validity, conducted using the Davis technique, resulted in Content Validity Index values (I-CVI: 0.80–1.00; S-CVI: 0.97), exceeding the 0.80 threshold. These findings confirm that the scale aligns with Turkish culture and adequately represents the intended domain, consistent with content validity criteria in the literature (Tavşancıl, 2019). Construct validity evaluates whether a measurement tool accurately reflects the characteristics it intends to measure and scientifically assesses the targeted concept (Çarkçı, 2020; Tavşancıl, 2019).

Exploratory (EFA) and confirmatory factor analyses (CFA) are standard methods for establishing construct validity (Balcı, 2022). Factor analysis prerequisites include a Kaiser-Meyer-Olkin (KMO) coefficient above 0.60 and a significant Bartlett's test result (Esin, 2018). In this study, the KMO value of 0.872 indicated the adequacy of the sample size for factor analysis, while Bartlett's test result ($\chi^2 = 2363.035$, $p < 0.001$) confirmed the suitability of the data for analysis. According to the literature, a total variance explained between 40 % and 60 %, combined with factor loadings above 0.30, is acceptable (DeVellis & Thorpe, 2021). This study reported a total variance explained of 61.268 %, with factor loadings ranging from 0.671 to 0.856, confirming the unidimensional structure of the scale and its construct validity. CFA results further validated the Turkish SPaSE's construct validity. The χ^2/df (chi-square/degrees of freedom) value of 1.825 indicated an excellent model fit, as values below 5 are acceptable and values below 2 signify perfect fit (DeVellis & Thorpe, 2021). The RMSEA value of 0.060 supported excellent model fit, as values below 0.08 are considered excellent (Çapık, 2014; Esin, 2018). Additional fit indices confirmed these findings: the sRMR value of 0.033 indicated excellent fit (values below 0.05), while the GFI value of 0.957 fell within the "good fit" range (values above 0.90 are excellent). Similarly, the TLI value of 0.981, along with the CFI and IFI values of 0.988 and 0.987, demonstrated excellent fit (values above 0.95 are considered excellent; İlhan & Çetin, 2014).

Common reliability assessment methods include Cronbach's alpha, split-half reliability, parallel form reliability, and test-retest reliability (Çarkçı, 2020; Seçer, 2018; Yıldırım & Şen, 2021). This study employed internal consistency and split-half reliability analyses. Cronbach's alpha coefficient, calculated as 0.936, reflects high reliability. According to established criteria, alpha values between 0.80 and 1.00 indicate high reliability (Tavşancıl, 2019). Item-total correlation values exceeded 0.30 for all items, demonstrating their appropriateness and confirming that no items were removed from the scale (Can, 2017). Factor loadings ranged between 0.36 and 0.79, confirming that all items were consistent and adequately measured the intended concept. Split-half reliability analysis revealed a correlation coefficient of 0.798, a Spearman-Brown coefficient of 0.888, and a Guttman split-half coefficient of 0.866, all indicating strong reliability. Response bias, defined as a tendency of participants to respond based on social expectations rather than personal views, was evaluated using Hotelling's T^2 test. The results showed no evidence of response bias. These findings confirm that the Turkish adaptation of SPaSE retains the characteristics of the original scale, ensuring high reliability and validity. This adaptation provides a robust tool for assessing pain self-efficacy in Turkish children and adolescents.

Strengths and limitations

The primary strengths of this study is its methodological rigor, demonstrated by a careful and systematic translation and cultural adaptation process. Additionally, the comprehensive psychometric evaluation, including both exploratory and confirmatory factor analyses, supports the scale's validity and reliability. These rigorous procedures enhance the credibility and applicability of the SPaSE in clinical and research settings. Also, this study is the first scale designed to was assessed pain self-efficacy in children and adolescents aged 8–17. However, several limitations should be noted. First, as the study was conducted within a single district, both the EFA and CFA analyses were performed on a single sample group, limiting the generalizability of the findings. Second, the study focused exclusively on children and adolescents aged 8–17 in two Turkish state hospitals with pain, restricting its applicability to other age groups or populations without pain. Third, the specific characteristics of the study sample limit the extent to which the findings can be generalized to broader populations. Additionally, as the SPaSE relies on self-reported data, there is a potential for response bias or social desirability bias, where participants may overestimate their pain self-efficacy to align with perceived expectations. Another limitation is the lack of comparison with other validated pain self-efficacy scales, which could have provided further evidence of the scale's external validity. Future research should consider testing the Turkish version of the SPaSE across different age groups, particularly those outside the 8–17-year-old range, to assess its applicability across the pediatric population. Additionally, studies in various geographic regions within Türkiye and internationally could help examine potential cultural differences in pain self-efficacy. Research comparing children experiencing chronic pain versus acute pain would provide insights into the tool's sensitivity and validity across different pain contexts. Furthermore, examining the scale's use in diverse healthcare settings, such

as outpatient clinics and emergency departments, will broaden its clinical utility and enhance its application in pain management. Future research should prioritize conducting multigroup CFA to examine measurement invariance across diverse demographic groups and validating the scale in different healthcare settings to enhance its generalizability and clinical utility. Comparative studies with existing pain self-efficacy measures would also help establish concurrent validity and strengthen the scale's applicability across contexts.

Practice implications

Given the critical role of self-efficacy in pain management for children and adolescents, evaluating pain self-efficacy is essential. The SPaSE provides valuable insights into pain management self-efficacy in these age groups (Stahlschmidt et al., 2023). Self-efficacy empowers individuals to actively participate in their treatment process, enhancing their ability to cope with pain and manage their treatment effectively (Stahlschmidt et al., 2019; Stahlschmidt et al., 2023). Healthcare professionals play a crucial role in recognizing, assessing, and effectively managing pain to ensure safe and high-quality patient care for children. SPaSE can be used as a valuable tool in healthcare institutions to address challenges and inadequacies in pain management. Especially for nurses, the fact that the scale is easy to administer and can be completed in a short time makes it a practical measure for guiding the treatment process. The SPaSE sensitivity to changes in children and adolescents' pain self-efficacy levels after pain treatment, including pain coping strategies and relaxation techniques in the presence of pain, makes it an indispensable tool for developing effective approaches to pain management. By assessing children's pain self-efficacy levels, SPaSE serves as a crucial tool in clinical practice for tailoring treatment plans and implementing supportive interventions. In this regard, this scale can help healthcare providers make pain management processes more effective and patient-centered. SPaSE is evaluated children's confidence in pain management, their ability to overcome the challenges associated with pain, and their engagement in treatment. Also, serves as a valuable resource for healthcare professionals in designing individualized intervention and support programs. Although SPaSE is a promising tool in clinical practice, it needs to be tested in different clinical settings, populations, and regions before widespread clinical adoption. Future studies should explore the application of the scale to diverse socio-cultural groups and larger sample populations to further validate its findings. Additionally, employing the SPaSE in intervention studies could provide deeper insights into the effectiveness of pain management programs for children and adolescents.

Conclusion

Pain self-efficacy in children and adolescents is a key determinant of their ability to cope with pain and their psychological resilience. According to Bandura's self-efficacy theory framework, the high level of internal consistency, strong positive test-retest correlation, scale additivity, and the absence of response bias in the SPaSE Turkish version demonstrate that the scale reliably captures the self-efficacy perceptions that are critical in pain management among children aged 8–17 years. These findings underscore the scale's robustness and highlight its capacity to provide consistent and accurate assessments over time. Additionally, the validation process confirms that the SPaSE maintains its psychometric strength in a Turkish context, reinforcing its cross-cultural applicability. This study demonstrates that the Turkish version of the SPaSE is a valid and reliable tool for assessing pain self-efficacy in children and adolescents, offering clinicians a standardized measure to identify patients with lower self-efficacy and tailor interventions accordingly. From a theoretical perspective, the results align with Bandura's self-efficacy theory, supporting the idea that self-efficacy beliefs play a crucial role in shaping pain coping mechanisms and resilience in young populations. The implementation of the scale in clinical settings may contribute significantly to improving children's pain management strategies by guiding personalized care plans and fostering more effective coping mechanisms. Future research should prioritize testing the scale across diverse socio-cultural contexts and larger sample groups to evaluate its cultural adaptability and generalizability. Furthermore, using the SPaSE to assess the impact of interventions aimed at enhancing pain self-efficacy could provide valuable insights into the development of effective, theory-driven pain management strategies for children and adolescents. These efforts could ultimately lead to more comprehensive and culturally sensitive approaches to pediatric pain management, further supporting the foundational principles of Bandura's self-efficacy theory in healthcare contexts.

CRediT authorship contribution statement

Bahar Aksoy: Writing – review & editing, Writing – original draft, Validation, Supervision, Software, Resources, Methodology, Investigation, Conceptualization. **Seda Cansu Yeniğün:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Resources, Methodology, Conceptualization. **Adem Sümen:** Writing – review & editing, Validation, Supervision, Resources, Methodology, Data curation, Conceptualization.

Declaration of competing interest

The author(s) declare that they have no conflict of interests.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.pedn.2025.05.031.

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