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Translation and validation of the Canadian assessment of physical literacy-2 in A Turkish Sample

Traducción y validación de la evaluación canadiense de la alfabetización física-2 en una muestra turca

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Conflict of interest: of the co-authors report any conflict of interest related to any aspect of this research.

Ethical aspects: The study was approved by the Eskisehir Technical University Social and Human Sciences Scientific Research and Ethics Committee (Protocol No: 2200018498) and the Eskisehir Provincial Directorate of the Ministry of National Education. The administrators of the schools, physical education teachers and parents of the students were informed by the research staff about the aims and procedures of the study and their consent was obtained. All children were able to withdraw from the tests at any time.

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Abstract
The concept of physical literacy (PL) requires further empirical validation on a global scale. In Turkey, PL is a relatively novel concept, and standardized tools for its comprehensive assessment are lacking. This study aimed to culturally adapt the Canadian Assessment of Physical Literacy – 2 (CAPL-2) and evaluate its construct validity among Turkish children aged 9–12 years. The adapted version was tested on a sample of 240 Turkish school children from 12 classes across three schools. Confirmatory factor analysis, based on the four-factor model proposed by the original CAPL-2 developers, demonstrated acceptable model fit for the Turkish version (CFI=.832, NNFI=.785, GFI=.937, AGFI=.907, RMSEA=0.054 [90% CI 0.038-0.070], and SRMR=0.060). Significant positive correlations between the domains were observed. Boys demonstrated higher levels of physical competence and daily physical activity (PA) behaviors compared to girls. Conversely, both boys and girls achieved high scores in the Motivation and Confidence domain, suggesting that Turkish children place a strong emphasis on participating in PA. The lowest scores were recorded in the Knowledge and Understanding domain, which did not correlate with the other domains, indicating potential misunderstandings in responses, likely due to the specific context of Turkish Physical Education practices. Overall, the translated and culturally adapted Turkish version of the CAPL-2 has been validated as a reliable tool for assessing PL in Turkish children and ready to use in Turkish research studies.
Keywords: physical literacy assessment; children; cultural adaptation; physical education; validity.

Resumen
La alfabetización física (AF) requiere una mayor validación empírica a escala mundial. En Turquía, la AF es un concepto relativamente nuevo y carece de herramientas estandarizadas para su evaluación completa. Este estudio tuvo como objetivo adaptar culturalmente la Evaluación Canadiense de la Alfabetización Física–2 (CAPL-2) y evaluar su validez de constructo entre niños turcos de 9 a 12 años. La versión adaptada se administró a una muestra de 240 escolares de 12 aulas en tres escuelas. El análisis factorial confirmatorio, basado en el modelo de cuatro factores propuesto por los desarrolladores originales del CAPL-2, mostró un ajuste aceptable para la versión turca (CFI = .832, NNFI = .785, GFI = .937, AGFI = .907, RMSEA = 0.054 [IC del 90%: 0.038–0.070] y SRMR = 0.060). Se observaron correlaciones positivas significativas entre los dominios. Los niños presentaron mayores niveles de competencia física y comportamientos diarios relacionados con la AF en comparación con las niñas. Por su parte, ambos sexos obtuvieron puntuaciones altas en Motivación y Confianza, lo que sugiere que los niños turcos valoran la participación en actividades físicas. Las puntuaciones más bajas se registraron en Conocimiento y Comprensión, dominio que no mostró correlaciones significativas con los demás, lo que podría reflejar malentendidos derivados del contexto específico de la Educación Física en Turquía. En general, la versión turca traducida y adaptada culturalmente del CAPL-2 se validó como una herramienta válida y fiable para evaluar la AF en niños turcos, lista para su aplicación en investigaciones futuras.
Palabras clave: evaluación de la alfabetización física; niños; adaptación cultural; educación física; validez.

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Introduction

PL has been systematized by Whitehead (2010) as a multidimensional concept that includes all aspects of an individual's ability to move skillfully and in a motivated way in PA settings. Recently, there has been growing interest from the scientific community in PL because of its potential to promote overall health, and whole-person development, and its relation to positive attitudes toward PA among children and adolescents in physical education settings (Carl et al., 2023; Edwards et al., 2017). The concept of PL, systematized by Whitehead (2010), is seen as a strong argument as it supports human flourishing and human embodiment of individuals beyond a mere health behavior (Durden-Myers et al., 2021). Accordingly, the definition of PL is "the motivation, confidence, physical competence, knowledge, and understanding to value and take responsibility for engagement in PA for life." (IPLA, 2017). Researchers emphasize that while the definition is comprehensive, PL is a philosophically rich concept that goes far beyond its definition and establishes dynamic relationships with numerous contexts (Durden-Myers et al., 2021). While respecting the monist and existential traditions of PL (Whitehead, 2010), scholars emphasize the need for empirical research on the development and statement of PL to advance conceptual understanding and knowledge in the field (Cairney et al., 2019). In line with this, Green et al. (2018) have proposed PL assessment as an initial action.

In the literature, there is a growing interest in measuring and monitoring PL (Essiet et al., 2021; Jean de Dieu & Zhou, 2021; Ryom et al., 2022). Whitehead (2019) states that only when PL measurement is a process of "charting" will the measurements align with the philosophical principles underlying PL and consider its multidimensional and authentic nature. The "charting" process consists of four key components: 1) motivation to participate in PA, 2) self-confidence, 3) physical competence in basic movement patterns, 4) knowledge and understanding (Whitehead, 2019). Shearer et al. (2021) has highlighted numerous studies that have tried to monitor PL across its key components in various ways. However, due to its current multidimensional, holistic, and authentic nature (Whitehead, 2019), comprehensive and standardized instruments are required to reflect the multidimensional structure of PL. It is also necessary that these comprehensive and standardized tools be compatible for international use to explain PL in multiple cultures (Knisel et al., 2024). It is believed that a valid, reliable, and

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holistic PL assessment tool may help us better to understand the factors that contribute to a physically active life (Longmuir et al., 2015). In addition, a comprehensive and systematic assessment of PL benefits not only researchers but also funders, administrators, and practitioners in understanding which methods and approaches are effective in improving children's PL (Elsborg et al., 2021; Shearer et al., 2021).

In parallel, the Canadian Physical Literacy Assessment (CAPL) (Longmuir et al., 2015), and hence the CAPL-2 (Longmuir et al., 2018a), were originally developed in Canada and have successfully passed validity, feasibility and reliability tests (Francis et al., 2016; Longmuir et al., 2015; Longmuir et al., 2018a). The CAPL-2 assessment tool is a highly effective instrument for charting the PL levels of children aged 8-12 (Dania et al., 2020) and comprises the areas of fundamental motor skills, PA motivation and behavior, physical fitness, knowledge and understanding of PA (Longmuir et al., 2018a). Through this structure it has, it evaluates PL manifestations in domains that operate in harmony, making it a comprehensive tool that aligns well with the broader concept of PL (Green et al., 2018). Since its development, the instrument has been successfully adapted and utilized in countries beyond Canada, such as Greece (Dania et al., 2020), Denmark (Elsborg et al., 2021), China (Li et al., 2020), Spain (Mendoza-Muñoz et al., 2021; Paster-Cisneros et al., 2022), Portugal (Mendoza-Muñoz et al., 2023), Urdu (Hadier et al., 2024), and Iran (Valadi & Cairney, 2023). In addition, the questionnaires included in the CAPL-2 tool have been translated into German and Polish (Knisel et al., 2024) languages. Although various assessment tools have been developed to measure PL in the literature, such as Passport for Life (PPL) (Lodewyk and Mandigo, 2017), PlayFun (Cairney et al., 2018; Stearns et al., 2019), and Portuguese Physical Literacy Assessment (PPLA) (Mota et al., 2021), the successful adaptation to such a large number of languages and cultures has made CAPL-2 one of the most robust and widely used tools worldwide for assessing PL in children and adolescents (Mendoza-Muñoz et al., 2023). Nevertheless, Longmuir et al. (2015) stated that additional international research is necessary to apply CAPL to children and adolescents from diverse cultures.

As far as the authors are aware, there is currently no tool available for charting PL holistically in Türkiye. Based on the limited number of CAPL-2 studies, it is highly necessary to explore the model proposed by this concept and establish the psychometric properties of CAPL-2 in Turkiye in order to evaluate children's PL levels. Considering the extensive

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utilization of the CAPL-2 and its proven validity and measurement characteristics, alongside the requirement for a reliable and valid assessment tool for assessing Turkish children's PL, this study aimed to translate the CAPL-2 into Turkish, adapt it to the Turkish context, and evaluate its measurement properties using a sample of Turkish school children aged between 9-12 years.

Methodology

Participants

The participants of this study were 240 children from Turkiye, who were selected from among all 9 to 12-year-old students using a multistage, random sampling approach. In determining the number of participants, Westland's (2010) minimum sample calculation formula for model validity in testing structural equation models was used to calculate the sample size. As a result of the calculation, it was found that the sample should consist of at least 168 participants. The inclusion criteria for the study were determined as follows: a) being a student in secondary schools, b) obtaining parental consent, c) willingness to participate, d) not suffering from diseases that would prevent participation in PA such as cardiovascular diseases, high blood pressure, diabetes, etc., and e) not having been diagnosed with motor, physical, or mental disorders that would affect participation in the study.

Within the scope of the research, a sample was selected based on the types of schools in the Turkish education system, specifically targeting secondary schools that align with the 8-12 age range of CAPL-2. Given that students aged 9 and above attend these schools, the measurement tool was adapted for Turkish children aged 9-12. All analyses were conducted according to the relevant age groups, as outlined in the CAPL-2 manual (Healthy Active Living and Obesity Research Group [HALO], 2017).

Measures

The CAPL-2 [19] assesses PL in four interrelated domains which are composed of different tests and protocols, which are summarized in Table 1. All four domains of the CAPL-2 (Turkish) were assessed in the study.

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Table 1. CAPL-2 questionnaires and tests (Longmuir et al., 2018a)

Domain	Measurements
Daily Behavior (2 protocols)	• Objectively measure PA (25 points) • Subjectively measure PA (5 points)
Physical Competence (3 protocols)	• Canadian agility and movement skill assessment ([CAMSA] Longmuir et al., 2017) (10 points) • Plank isometric hold (Boyer et al., 2013) (10 points) • Progressive aerobic cardiovascular endurance run ([PACER] Scott et al., 2013) (10 points)
Motivation and Confidence (12-item questionnaire) (Longmuir et al., 2018a)	• Predilection (3 items - 7.5 points) • Adequacy (3 items - 7.5 points) • Perceived competence (3 items - 7.5 points) • Intrinsic motivation (3 items - 7.5 points)
Knowledge and Understanding (five-item questionnaire) (Longmuir et al., 2018b)	• PA comprehension and understanding (6 points) • Daily PA guideline (1 point) • Cardiorespiratory fitness definition (1 point) • Muscular strength and endurance definition (1 point) • Improve sport skills (1 point)

In the Daily Behavior domain, objective measurements were measured with the scores obtained from the activity wristband (Huawei Band 8) for 7 days, while in subjective measurements, participants were asked how many days a week they were active for at least 60 minutes a day. This question has a score from 1 to 5, with 1 being the lowest daily activity and 5 being the highest (HALO, 2017).

The CAMSA tool, utilized for evaluating Physical Competence, measures children's proficiency in various fundamental, complex, and combined movement skills (Longmuir et al., 2017). Each skill is scored based on 14 movement criteria, and the time taken to complete the sequence is recorded. Children perform four trials (two practice and two test trials), with the best score from the test trials being used for evaluation. The PACER protocol involves children running back and forth across a 15-meter space, with the number of lengths completed being recorded (Scott et al., 2013). The isometric plank hold protocol measures the maximum time a child can maintain a straight body position (from ears to ankles) supported only by the forearms and toes (Boyer et al., 2013). Each protocol can score up to 10 points, with the maximum physical competence score being 30 points.

The Motivation and Confidence domain includes a questionnaire (Longmuir et al., 2018a) designed to evaluate participants' confidence in their ability to be physically active and

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their motivation to engage in PA. The questionnaire consists of four subdomains named intrinsic motivation, competition, predilection, and adequacy. The score for each dimension ranges from 1 to 7.5 points, with the total sum of the domain ranging from 1 to 30 points, where 1 is the worst possible score and 30 the best (HALO, 2017).

Knowledge and Understanding domain assessed using an instrument (Longmuir et al., 2018b) designed to evaluate knowledge about PA. The questionnaire includes four multiple-choice questions, each worth 1 point, and a fill-in-the-blank text where each correct response earns 1 point, up to 6 points. The total possible score ranges from 1 to 10 points, with 1 indicating the lowest and 10 indicating the highest level of PA knowledge (HALO, 2017).

Completing the CAPL-2 assessments results in numerical scores for each protocol, which are then converted into domain scores and added up to form the total CAPL-2 score and interpretive categories (beginning, progressing, achieving and excelling) scores for each domain as well as for the overall CAPL-2 score (Longmuir et al., 2018a).

Translation and cultural adaptation

During the process of translating the CAPL-2 questionnaires into Turkish, similar to the previous studies conducted in Danish (Elsborg et al., 2021), Greek (Dania et al., 2020), Spanish (Mendoza-Muñoz et al., 2021; Paster-Cisneros et al., 2022), and Portuguese (Mendoza-Muñoz et al., 2023) cultures, the translation-back-translation methodology of the World Health Organization ([WHO], 2024) was applied. Accordingly, the phases including steps of the translation, are detailed in Table 2.

Table 2. Procedure for translation and cultural adaptation of the Turkish version of the of CAPL-2

First Phase	1. Step:	English version
	2. Step:	Translation independently by two different exercise and sports science experts who are native Turkish speakers and have good English writing, speaking, and listening skills
	3. Step:	Combining of Turkish translations by consensus of a third expert in the field of exercise and sports sciences who is fluent in English
	4. Step:	Linguistic changes
Second Phase	5. Step:	Back translation into English by a translator who is a native English speaker and has good speaking, writing and listening skills in Turkish
	6. Step:	Analysis of the translation-back-translation, and comparison with the original version
	7. Step:	Analysis of problematic sections and items
Third Phase	8. Step:	Initial version of the Turkish
	9. Step:	Pilot interviews to analyze comprehensibility
Fourth Phase	10. Step	Meetings to ensure conceptual equivalence and analysis of problematic elements
	11. Step:	Turkish version

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To finalize the translation, one-on-one pilot interviews were conducted with 12 students in the relevant age group by the same interviewer. The pilot interviews were based on the steps followed by Pastor-Cisneros et al. (2022). During these interviews, students were asked questions about the comprehensibility of the items and were expected to identify any potential errors or misunderstandings. Based on this, students were first asked to evaluate the items on a scale of 1 to 3 (1: incomprehensible, 2: difficult to understand, 3: clear and understandable). Then, the students rated the items on a numerical scale from 0 to 10 (0: very easy to understand, 10: very difficult to understand). Finally, the participants were asked to provide an explanation, in their own words, of the perceived meaning of the scale items.

Procedures

The cultural adaptation was completed between January 2023 and June 2024. We recruited and trained research assessors who specialize in physical education over a one-month period in accordance with the CAPL-2 manual (HALO, 2017) to ensure accurate administration of each protocol and the generation of reliable results. All measurements were conducted at schools and the full assessment protocol was completed in two visits during scheduled physical education classes. No additional school visits were possible to recover missing data for children who were absent or unable to participate on any specific testing day. During the first visit, CAMSA and isometric plank hold measurements, and in the second visit, PACER measurements were conducted, and students completed the questionnaires. Due to limited space, all participants ran between two markers set 15 m apart. The total number of laps achieved was converted to the standardized 20 m PACER score using the FitnessGram PACER Conversion Chart, which is recommended in the CAPL-2 manual (HALO, 2017). During each visit, students were divided into two groups, with two assessors accompanying each group. Researchers supervised the process, and physical education teachers acted as observers. The entire protocol was administered uniformly by highly trained assessors and typically took 30–40 minutes per child. All participants received equal attention and encouragement to prevent bias. Huawei Band 8 smart bracelets were placed on each student whose measurements were completed, their step data was tracked according to the criteria in the guide (HALO, 2017).

Statistical analyses

Descriptive statistics, including means, standard deviations, and frequency distributions, were calculated for all variables. Frequency distributions were computed for the total and

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domain-specific scores, categorized by Canadian interpretive criteria and separated by gender. Confirmatory factor analysis was performed to validate the factor structure. The model fit was assessed using the chi-square statistic (χ^2), the Comparative Fit Index (CFI), the Tucker-Lewis Index (NNFI), the Goodness of Fit Index (GFI), the Adjusted Goodness of Fit Index (AGFI), the Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR). If the model fit was deemed unacceptable, modification indices were examined to guide improvements. This involved allowing correlations between the error terms of indicators within the same domain to enhance the model fit. Secondly, reliability analyses were conducted using Cronbach's alpha to determine the internal consistency psychometric structure of the Motivation and Confidence domain. Cronbach alpha values above 0.7 were considered acceptable (Raykov, 2001). Statistical analyses were conducted using SPSS-25 and AMOS-23 software.

Results

Descriptive statistics

The results of the data collected for the purpose of adapting the CAPL-2 inventory to Turkish culture are presented in Table 3 with the total, domain, and mean scores of the participants, disaggregated by age and gender. Furthermore, the standard deviation and the overall CAPL-2 score for each domain of PL are given in detail.

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Table 3. Age and gender-specific total and domain scores for the overall sample

	9 years		10 years		11 years		12 years	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
Total CAPL-2	55.44 (8.10)	62.81 (11.18)	54.91 (8.96)	60.76 (9.02)	56.20 (9.22)	63.90 (10.16)	55.48 (7.45)	58.32 (10.15)
Daily Behavior	14.78 (4.66)	19.00 (6.84)	14.44 (5.69)	17.68 (6.51	15.45 (6.00)	18.57 (5.50)	13.63 (4.71)	15.81 (7.13)
Average Step	10.70 (4.31)	15.36 (6.37)	11.13 (5.39)	13.93 (5.92	12.40 (5.16)	14.85 (5.24)	9.94 (4.70)	12.18 (7.41)
Self-Reported PA	4.08 (0.98)	3.63 (1.44)	3.30 (1.61)	3.75 (1.36)	3.04 (1.64)	3.71 (1.23)	3.69 (1.19)	3.63 (1.17)
Physical Competence	11.28 (3.83)	14.35 (4.55)	12.51 (4.25)	14.72 (3.82)	12.94 (3.89)	16.45 (4.77)	13.52 (3.33)	12.39 (3.83)
PACER	2.83 (1.21)	3.76 (2.01)	2.72 (1.71)	3.62 (1.49)	3.09 (1.99)	4.57 (2.57)	2.36 (1.22)	2.00 (1.27)
CAMSA	4.58 (1.48)	5.78 (1.43)	5.73 (1.48)	6.12 (1.57)	6.21 (1.93)	6.93 (1.62)	7.08 (1.51)	6.39 (1.86)
Plank	3.86 (2.56)	4.80 (2.41)	4.05 (2.54)	4.96 (2.57)	3.63 (2.36)	4.95 (2.56)	4.08 (2.52)	4.00 (2.70)
Knowledge and Understanding	5.70 (1.71)	5.63 (1.77)	5.33 (1.80)	4.62 (1.91)	5.95 (2.05)	6.11 (1.99)	6.11 (1.65)	6.50 (2.13)
PA Guidelines	0.62 (0.49)	0.53 (0.50)	0.66 (0.47)	0.43 (0.50)	0.31 (0.47)	0.52 (0.50)	0.58 (0.50)	0.63 (0.49)
Cardiorespiratory Fitness	0.91 (0.27)	0.93 (0.25)	0.69 (0.46)	0.56 (0.50)	0.77 (0.42)	0.59 (0.49)	0.91 (0.28)	0.72 (0.45)
Muscular Endurance	0.78 (0.41)	0.80 (0.40)	0.66 (0.47)	0.62 (0.49)	0.95 (0.21)	0.69 (0.46)	0.91 (0.28)	0.81 (0.39)
Improve Sport Skills	0.43 (0.50)	0.46 (0.50)	0.36 (0.48)	0.25 (0.43)	0.63 (0.49)	0.47 (0.50)	0.36 (0.48)	0.45 (0.50)
Comprehension	2.94 (1.17)	2.90 (1.53)	2.94 (1.43)	2.75 (1.29)	3.27 (1.48)	3.83 (1.16)	3.33 (1.21)	3.86 (1.45)
Motivation and Confidence	23.67 (3.26)	23.83 (2.80)	22.62 (3.08)	23.73 (3.29)	21.85 (3.25)	22.76 (2.98)	22.20 (3.13)	23.60 (3.14)
Adequacy	5.52 (1.26)	5.43 (1.07)	5.50 (1.25)	5.27 (1.23)	5.25 (1.08)	5.36 (0.95)	5.12 (1.19)	5.45 (1.07)
Predilection	5.51 (1.09)	5.61 (1.09)	5.23 (1.43)	5.70 (1.22)	5.00 (0.93)	5.07 (1.12)	5.18 (0.99)	5.29 (1.33)
Intrinsic Motivation	6.64 (1.07)	6.66 (1.05)	6.19 (1.32)	6.81 (0.98)	6.34 (1.49)	6.39 (1.43)	6.26 (1.21)	6.52 (1.45)
PA Competence	5.98 (1.11)	6.11 (1.10)	5.69 (1.30)	5.93 (1.15)	5.25 (1.25)	5.92 (1.23)	5.62 (1.23)	6.34 (1.02)

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Table 4 presents the frequency distributions of total and domain-specific scores for Turkish children, categorized by Canadian interpretive criteria, separated by gender. Interpretive categories evaluate the PL scores of girls and boys in 4 different groups: beginning, progressing achieving and excelling.

Table 4. Total and domain scores frequency distributions of Turkish children categorized by Canadian interpretive criteria, n and %

	Beginning		Progressing		Achieving		Excelling	
Domains	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
Total CAPL-2	46 (35.11)	17 (13.49)	77 (58.78)	77 (61.11)	7 (5.34)	20 (15.87)	1 (0.76)	12 (9.52)
Daily Behavior	33 (25.19)	6 (4.76)	81 (61.83)	8 6 (68.25)	13 (9.92)	21 (16.67)	3 (2.29)	14 (11.11)
Physical Competence	94 (71.76)	60 (47.62)	34 (25.95)	52 (41.27)	3 (2.29)	6 (4.76)	0	8 (6.35)
Knowledge and Understanding	58 (44.27)	45 (35.71)	42 (32.06)	54 (42.86)	21 (16.03)	15 (11.90)	10 (7.63)	12 (9.52)
Motivation and Confidence	4 (3.05)	5 (3.97)	52 (39.69)	57 (45.24)	40 (30.53)	39 (30.95)	35 (26.72)	26 (20.63)

Confirmatory factor analysis

Confirmatory factor analysis (CFA) was performed to validate the factor structure identified in the EFA. The initial model showed a fair fit with the data, with fit indices as follows: $x^2/sd = 1.757$, CFI = 0.832, NNFI= 0.785, GFI = 0.937, AGFI= 0.907, RMSEA = 0.054 (90% CI 0.038-0.070), and SRMR = 0.060. After inspecting modification indices and allowing for error covariances between certain items, the model fit improved significantly, resulting in the following indices: $x^2/sd = 1.442$ CFI = 0.903, NNFI = 0.874, GFI = 0.949, AGFI= 0.923 RMSEA =0.042 (90% CI 0.021-0.059), and SRMR = 0.053. The standardized factor loadings for each item are presented in Figure 1, with majority of the loadings exceeding the acceptable threshold of 0.30. The factor loadings predilection (0.22) adequacy (0.15) in Motivation and Confidence; PA guidelines (0.01) and sport skills (0.26) in Knowledge and Understanding were insignificant but kept in model, due to the value that these indicators can add to the understanding of PL behaviors as suggested previously by Dania et al (2020). The correlations between Physical Competence and Daily Behavior domains were the strongest (r= 0.943, t= 4.446, p<0.001). Second strongest correlation was between Daily Behavior and Motivation and Confidence domains (r= 0.823, t= 2.282, p=0.022). Finally, there was also weak

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correlation between Motivation and Confidence and Physical Competence domains (r= 0.308, t= 2.036, p=0.042). All significant correlations were positive.

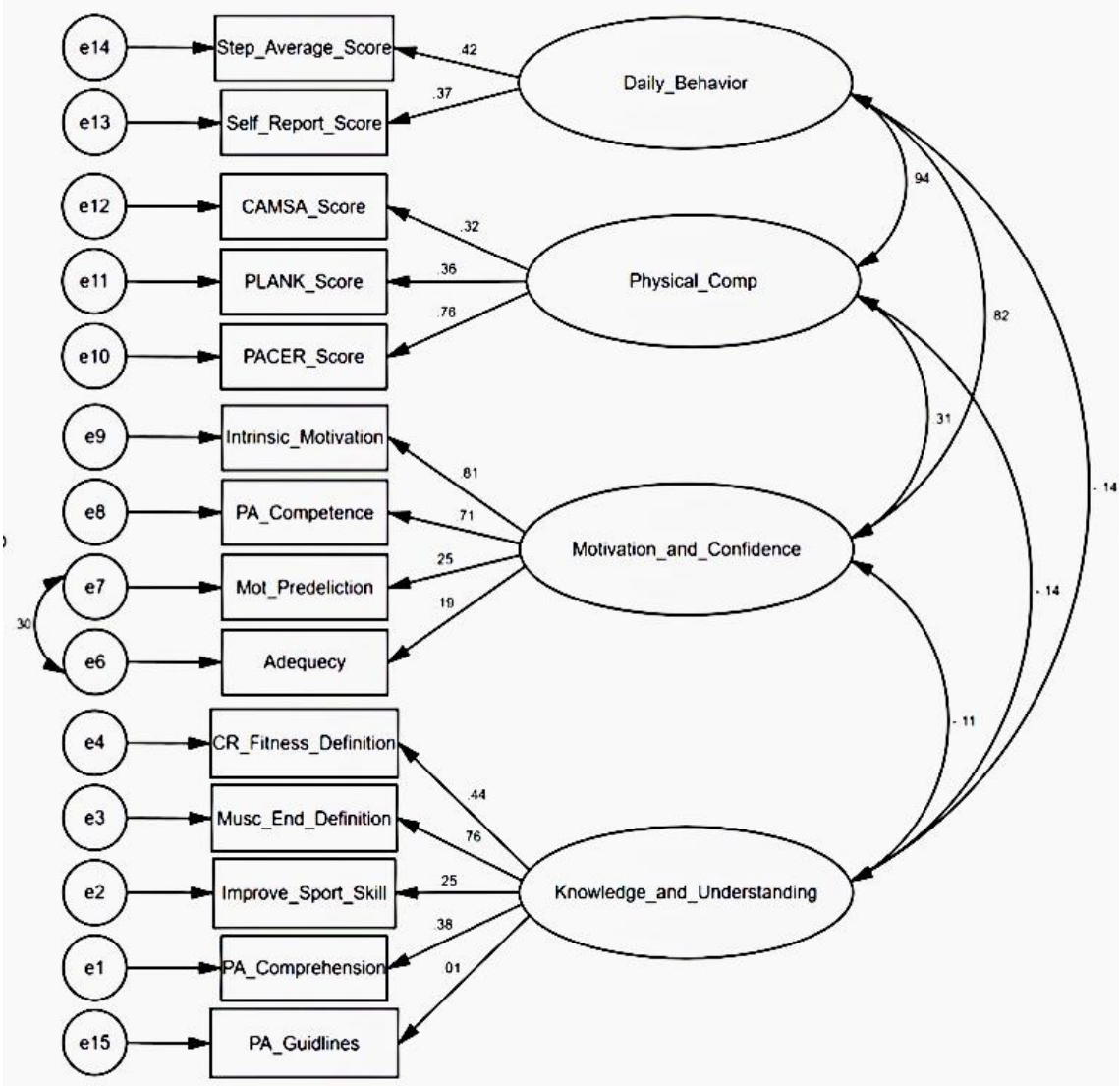

Figure 1. Confirmatory factor analysis indicating standardized factor loading, significant factor correlations and significant error term correlations

Reliability analysis

Cronbach alpha values for four psychometric scales of the Motivation and Confidence domain showed good and acceptable reliability (Raykov, 2001). The Cronbach alpha values were 0.85 for Intrinsic Motivation; 0.72 for PA Competence; 0.82 for Predilection and 0.71 for Adequacy subscales. The entire Motivation and Confidence domain also showed good reliability with 0.90 Cronbach alpha value.

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Discussion

The aim of our study was to translate and culturally adapt the questionnaire of CAPL-2 to the Turkish context and to assess its reliability when used with children aged 9 to 12. Besides, the PL levels of Turkish children were evaluated using the CAPL-2 interpretive categories to determine their appropriateness for the Turkish population. Using the four-factor structure proposed by the original CAPL-2 developers Gunnell et al., 2018; Longmuir et al., 2018a) confirmatory factor analysis with 240 school children indicated that the Turkish version of CAPL-2 was a good fit for the data. The Motivation and Confidence questionnaires demonstrated good internal reliability, and both the overall CAPL-2 score and each of the four domains exhibited high predictive validity. The primary findings of this study indicate that the proposed Turkish version of the CAPL-2 assessment tool is substantial for use in research and suitable for teachers to evaluate PL in physical education.

Analyses based on CAPL-2 interpretive categories revealed that most children remained in the "Beginning" or "Progressing" levels across multiple PL domains, particularly in Physical Competence, despite curricular emphasis on fundamental movement skills in Turkiye (Ministry of Education, 2018). Girls consistently scored lower than boys, especially in Physical Competence and Daily Behavior, underscoring the need for gender-sensitive interventions. Similar trends have been observed in Chinese (Li et al., 2020) and Greek (Dania et al. 2020) adaptations. In the Knowledge and Understanding domain, a considerable proportion of both genders were in the "Beginning" category, indicating a broader gap in PA-related awareness and suggesting the inclusion of knowledge-based components in PA programs. Motivation and Confidence scores were more evenly distributed between genders and relatively higher, reflecting moderate self-efficacy levels that could be leveraged to improve overall PL. While boys outperformed girls in certain domains, girls showed more balanced progress in Motivation and Confidence. The limited number of students, particularly girls, reaching "Achieving" or "Excelling" levels in Physical Competence is noteworthy. However, the dominance of the "Progressing" category indicates a developmental trajectory that, with targeted support, could be enhanced. These findings point to potential misalignments between the intended curriculum and its school-level implementation,

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positioning CAPL-2 results as a valuable lens for evaluating and improving physical education practices in Turkiye.

The overall validity indicators and fit indices support the CAPL-2 as a valid instrument for assessing PL in children aged 9–12, aligning with prior adaptations in China (Li et al., 2020), Greece (Dania et al. 2020), Denmark (Elsborg et al., 2021), and Iran (Valadi & Cairney, 2023). Notably, the Turkish version most closely mirrors the Greek study (Dania et al. 2020) in terms of model structure and fit indices. As in the Greek adaptation, the Turkish version preserved CAPL-2's multidimensional and original structure. Although some sub-domains, such as Knowledge and Understanding and Motivation and Confidence, showed lower path coefficients, all components were retained to ensure consistency with the original model.

Focusing on the values obtained from the four main components of the CAPL-2 measurement tool, it can be stated that the Physical Competence component achieved satisfactory regulation coefficients across all sub-dimensions. The data from the adaptation study in Turkish culture align well with the original measurement tool [19] and with previous adaptations in Chinese (Li et al., 2020), Greek (Dania et al. 2020), Danish (Elsborg et al., 2021), and Iranian (Valadi & Cairney, 2023) cultures. It can be stated that the Turkish version of CAPL-2 measures the Physical Competence domain as planned.

Analysis of the Daily Behavior component revealed that the perceived daily behavior scale, based on student self-reports, demonstrated high predictive validity, while the daily step count, collected via smart bracelets, showed a low path coefficient. Despite this, the step count, contributing 25 out of 30 points to the Daily Behavior score, was retained to maintain consistency with the original CAPL-2 structure, following the approach used in the Greek adaptation (Dania et al. 2020). The low coefficient may result from the limited sample size, suggesting larger samples could yield stronger predictive outcomes. Additionally, the similarly low step count reliability observed in both Turkish and Greek adaptations may reflect shared cultural factors. These findings highlight the need for more culture-specific research to strengthen the Daily Behavior component in cross-cultural CAPL-2 adaptations.

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Although low path coefficients were found in the predilection and adequacy sub-dimensions of the Motivation and Confidence component, sufficient coefficients were obtained from PA competence and intrinsic motivation. Compared to other adaptations, the Danish version (Elsborg et al., 2021) showed the strongest results, while the Chinese (Li et al., 2020) and Iranian (Valadi & Cairney, 2023) versions altered the original four-factor structure by removing a sub-dimension. The Greek version (Dania et al. 2020), despite low loadings in three sub-dimensions, preserved the original structure, resulting in marginally acceptable values. The Turkish version, positioned between the Danish and Greek adaptations, retained the four-factor model to preserve structural integrity, following the Greek approach. The lower coefficients in two sub-dimensions may reflect linguistic and cultural differences, as CAPL-2's Motivation and Confidence scales were originally developed in English within a Western context.

CFA results for the Knowledge and Understanding component confirmed the four-factor structure, supporting its use in the Turkish context, though path coefficients remained relatively low yet acceptable. Similar low coefficients were reported in other adaptations. The Chinese (Li et al., 2020), Danish (Elsborg et al., 2021), and Iranian (Valadi & Cairney, 2023) versions modified the original five-subdimension structure, reducing it to four or two. In contrast, the Greek version (Dania et al. 2020) retained the full structure despite low coefficients. These findings suggest that students' cognitive outcomes related to PA remain limited across cultures (Gunnell et al., 2018).

Analysis of the correlations among the four core CAPL-2 domains showed the strongest relationship between Physical Competence and Daily Behavior ($r = 0.943$), followed by Daily Behavior and Motivation and Confidence ($r = 0.823$), with a weaker correlation between Motivation and Confidence and Physical Competence ($r = 0.308$). The small sample size may explain the weaker correlations, which could vary in larger samples. Similar patterns were observed in other cultural adaptations, including Chinese (Li et al., 2020), Greek (Dania et al. 2020), Danish (Elsborg et al., 2021), Urdu (Hadier et al., 2024), German, and Polish (Knisel et al., 2024) versions. However, the Knowledge and Understanding domain consistently showed limited or no correlations with other domains, except in the Iranian version. As Caldwell et al. (2020) note, knowledge alone does not drive PA engagement, and Cairney et al. (2019) recommend further investigation

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into how Knowledge and Understanding relate to Daily Behavior and Physical Competence as potential predictors of healthy lifestyles. Future studies should also explore links between Motivation and Confidence and Knowledge and Understanding, and their long-term impact on PA (Knisel et al., 2024).

A key strength of this study lies in the meticulous cultural adaptation of the CAPL-2, characterized by precise translation procedures and accurate psychomotor measurements. The absence of missing data further enhances the reliability of the findings. However, a primary limitation of the study concerns the sample size and the lack of heterogeneity in terms of geographical and cultural representation across the country. Although Türkiye has a standardized language and physical education curriculum, its diverse geographical and cultural landscape suggests that administering the Turkish version of the CAPL-2 to larger and more regionally varied samples would yield more comprehensive results.

Conclusion

While PL promotes children's holistic development through physical education, culturally valid assessment tools remain limited (Dania et. Al, 2020). This study supports the construct validity of the Turkish CAPL-2 for assessing PL in children aged 9–12. Reflecting its multidimensional structure, findings confirmed a four-factor model consistent with theoretical and educational frameworks. The adapted CAPL-2 effectively captured the current PL levels of Turkish children across age and gender, providing culturally relevant benchmarks to inform educational policy.

Future research should involve larger, more diverse samples representing Turkiye's regional, cultural, and socio-economic variations to establish benchmarks aligned with national physical education practices. Longitudinal studies are recommended to track PL development over time. Integrating quantitative and qualitative data from physical education stakeholders could also offer more comprehensive insights.

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