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Physical Literacy in Children Questionnaire (PL-C Quest) for Children Aged 4 to 8: Turkish Adaptation, Validity and Reliability Study

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Abstract

The study examined the validity and reliability of the Turkish version of the Physical Literacy Questionnaire for Children (PL-C Quest), developed by Barnett and colleagues (2020) for children aged 4 - 8. The sample consisted of 375 students from kindergartens and elementary schools in Kocaeli. The value for internal consistency was found to be 0.95 for the physical domain, 0.73 for the social domain, 0.75 for the cognitive domain, 0.78 for the psychological domain, and 0.89 for the total scale. Exploratory factor analysis (EFA) revealed a structure consisting of 24 items - 4 factors. Confirmatory factor analysis (CFA) subsequently validated the theoretical structure, resulting in a 21-item form after the removal of three items. Both versions demonstrated acceptable psychometric properties. These results indicate that the Turkish PL-C Quest is a valid and reliable measurement tool for assessing the physical literacy levels of children aged 4 - 8 years. Furthermore, it is expected that it will contribute to upcoming research and applications in the area of early childhood education.
Keywords: Physical literacy, Physical development, Movement training, Early childhood

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INTRODUCTION

Physical literacy is vital for individuals to develop their physical abilities and use these skills effectively. This concept was first discussed in the literature in the 1940s within the framework of physical education and has since formed the basis for deeper philosophical approaches (Robinson et al., 2018). Since the mid-1990s, Margaret Whitehead's work has examined physical literacy more comprehensively, highlighting its importance for maintaining lifelong physical activity in individuals (Whitehead, 2013). Physical literacy contributes to positive attitudes toward physical activity and provides significant benefits to public health (Lundvall, 2015). Whitehead's research has revealed that this concept is related to philosophical approaches such as embodiment, monism, phenomenology, and existentialism. In this context, embodiment emphasizes that the body is not merely a tool for experiencing the world but the very place where experiences are perceived; monism emphasizes that mind and body are one; phenomenology highlights the significance of individual experiences; and existentialism emphasizes the individual's interactions with their environment (Whitehead, 2007; Whitehead, 2010).

According to Whitehead (2010), physical literacy represents the motivation, confidence, competence, and knowledge necessary for lifetime sustainable physical activity. In 2013, this definition was updated with a global perspective emphasizing the motivation to value physical activity (Whitehead, 2013). The International Physical Literacy Association defines physical literacy as valuing lifelong participation in physical activities, encompassing motivation, confidence, physical competence, and understanding. This approach aims to integrate physical activity seamlessly into daily life by developing individuals' ability to interact with their physical environment (Luo et al., 2022; Tremblay et al., 2018).

Physical literacy includes the elements of physical competence, motivation, confidence, knowledge, and understanding. Physical competence represents the capability to carry out a variety of activities; motivation refers to the desire to participate in these activities; confidence refers to an individual's belief in their abilities; while knowledge and understanding refer to the ability to understand the health benefits of physical activity and integrate this knowledge into one's life throughout their lifetime (Foulkes et al., 2020; Giblin et al., 2014; Jefferies et al., 2019; Shearer et al., 2021; Suntoda et al., 2021).

In recent years, the shift towards performance-oriented physical education programs, the neglect of motor development, and the decline in lifelong involvement in physical activity have increased the importance of physical literacy. This term is accepted as a holistic field that supports individuals' interactions with their environment in emotional, physical, psychological, cognitive, and social dimensions (Hallal, 2014). School environments contribute to the development of physical literacy by helping students incorporate physical activity into their lifestyles and improve their overall health (Durden-Myers, 2024; Roberts et al., 2018). Teachers can motivate students to engage in physical activities using pedagogical approaches (Roberts et al., 2018).

Early childhood represents a crucial stage in cultivating physical literacy. This period is fundamental for children to acquire basic motor skills, develop body awareness, and establish healthy lifestyle habits (Wright and Stork, 2013). Increased physical activity supports the growth of bones and muscles as well as cardiovascular health in children, while reducing the risk of obesity (Bánfai-Csonka et al., 2022; Dimitri et al., 2020). Physical activity is known to benefit people psychologically, mentally, and psychosocially (Strong et al., 2005; Telama et al., 2005). Activity habits acquired during childhood form the basis for maintaining a healthy lifestyle in adulthood (Liu and Chen, 2020).

In this context, promoting physical literacy in early childhood has a beneficial effect on their social, physical, psychological, cognitive, and emotional growth (Lundvall, 2015; Whitehead, 2010). The shortage of physical literacy assessment tools for early childhood in Türkiye limits evaluation and development studies in this age group. Cultural adaptations of internationally validated scales are necessary to fill this gap.

This study aims to assess PL-C Quest in Turkish for validity and reliability, developed by Barnett and colleagues (2020) for children aged 4 - 8. During the adaptation process, the linguistic, conceptual, and cultural appropriateness of the scales was considered, and comprehensive validity and reliability analyses were conducted. This study is expected to contribute to physical literacy research in early childhood in Türkiye and to serve as a resource for educators and researchers in terms of assessment.

METHOD

Research Model

The survey method, a well-known quantitative research technique, was used in the study. In the survey research method, the attitudes, behaviors, and tendencies of the population are determined through data obtained from the sample. The data obtained are analyzed using various statistical methods (Fraenkel et al., 2012). Since scale adaptation was performed in this study, statistical analyses were applied, and evidence regarding the validity and reliability of the PL-C Quest was presented.

Population and Sample

In this study, a convenience sampling method was used (Patton, 2015). Scale adaptation studies suggest that the sample should include at least five respondents for each item (Şahin and Öztürk, 2018). During the 2024 – 2025 academic year, a total of 375 students aged 4 – 8 in Kocaeli voluntarily participated as the study's sample group. There were 195 (52 %) men and 180 (48 %) women among the participants. Of the pupils, 150 (40 %) were in kindergarten and 225 (60 %) were in elementary school.

Data Collection Tools

Demographic Information Form: Researchers created it to ascertain participant demographics, including age, gender, and grade level.

Physical Literacy Questionnaire for Children (PL-C Quest): The PL-C Quest, developed by Barnett et al. (2020), is available in two different forms: one for younger children (ages 4 –8) and one for older children (ages 8 – 12). The scale has thirty items overall, divided into four subscales: physical, social, psychological, and cognitive. A four-point pictorial Likert scale is used in the scale. Children are asked to select the picture box that best describes them in terms of physical literacy (see Figure 1).

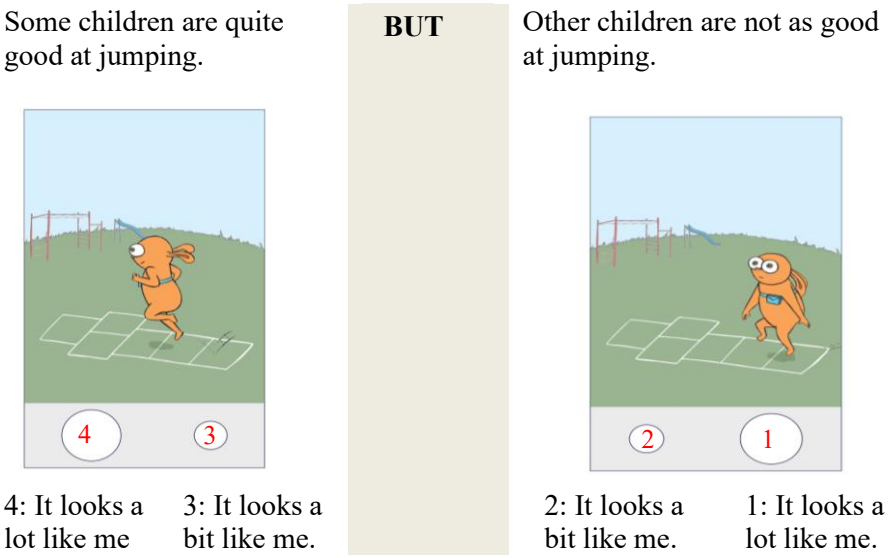

Figure 1. First question in the physical domain sub-dimension (Note. Adapted from Barnett et al. 2020).

Table 1. Score ranges of the original PL-C Quest sub-dimensions

Sub-dimension	Physical Domain	Psychological Domain	Social Domain	Cognitive Domain
Score	12 - 48	7 - 28	4 - 16	7 - 28

The original PL-C Quest defines score ranges for each sub-dimension, while the total score represents children's overall physical literacy level (Table 1). Initially containing 30 items for children aged 4–8 years, the PL-C Quest was reduced to 24 items following linguistic adaptation and content validity procedures. CFA subsequently led to the removal of three items and the development of a short form consisting of 21 items. The study reported both the 24-item screening form and the 21-item short form with established validity.

Adaptation Process (Validity and Reliability)

Written permission has been obtained from the original scale developers to independently adapt two forms into Turkish for the 4 - 8 and 8 - 12 age groups. During the approval process, it was explicitly stated that this study would only cover the form designed for the 4 - 8 age group and that the adaptation would be based on this form. Differences in content and expression levels according to age groups in the original scale made it methodologically necessary to adapt each form separately. During the adaptation process, a form suitable for the target age group was selected, the back-translation method was applied, and the opinions of subject matter experts were sought to ensure linguistic and conceptual equivalence. After the pilot application, necessary corrections were made, and validity and reliability analyses were conducted.

Ethics Approval

This research was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki and was approved by the Bursa Uludağ University Research and Publication Ethics Committee at its meeting dated 03/05/2024, Decision No: 100 (Protocol No: 2024-04)**.** Written informed consent was obtained from the parents/legal guardians of all participating children, and participation in the study was voluntary.

Data Collection

On March 24, 2024, the necessary permissions were obtained from the author of the scale. In the process of achieving linguistic equivalence for the scale, the standard method of translation and back-translation suggested by Beaton et al. (2000) was favored. The scale was first translated from English into Turkish by two English language specialists. The scale's Turkish translation was then translated back into English by two additional English language specialists. Semantic equivalency between the original and newly translated English versions was examined. The resulting Turkish form was reviewed by a Turkish and linguistics expert in terms of expression and grammar. Subsequently, the 30-item Turkish translation form was reviewed by 30 teachers who graduated from the English Language teaching program in the faculty of education, and feedback was obtained regarding the comprehensibility of the items. Before finalizing the scale, two experts in this field were consulted, and their approval was obtained. The necessary adjustments have been made.

Appropriateness in Terms of Language Development

To assess the suitability of the scale items for the language development level of children aged 4 - 8, the opinions of two linguists working with this age group and an expert in early childhood education were sought. The experts assessed the comprehensibility of long or complex statements for children and made linguistic simplifications where necessary. During this simplification process, the original meaning of the statements was preserved, and age-appropriate expressions were preferred.

Application Procedure

Throughout the process of gathering data, the parents of the children provided written informed consent, and participation was entirely voluntary. Scale applications were conducted in the school environment. First, instructions were explained to all students in their class groups using simple and understandable language. The children listened to the researcher read aloud the items on the picture-based Likert scale and marked the picture that best represented them. Individual sessions were conducted with students who had difficulty understanding the material or who needed additional support. Data collection was executed with a sample of 375 students, taking into account their developmental level. The average session duration varied between 25 and 35 minutes, depending on class size.

Data Analysis

The data set was reviewed before proceeding to data analysis. An analysis of the PL-C Quest's factor structure was carried out using AMOS v24 and SPSS v27. Initially, the instrument's reliability and validity characteristics were evaluated. The internal consistency technique and Cronbach's alpha coefficient were utilized to calculate reliability. The validity of the scale was assessed using both EFA and CFA. In the exploratory factor analysis, specific criteria were considered for item retention. Items with factor loadings below 0.30 were considered for removal. Additionally, items displaying cross-loadings greater than 0.30 on more than one factor were excluded from the analysis. Communality values were also examined, and items with communalities below 0.30 were considered for removal. These criteria were applied in order to obtain a clearer and theoretically interpretable factor structure.

FINDINGS

The findings obtained from the analyses conducted to evaluate the validity and reliability of the PL-C Quest are presented below.

Table 2. KMO and Bartlett's test results

KMO (Kaiser-Meyer-Olkin)	0.889
Bartlett's Test – Chi-Square	7347.338
Degrees of Freedom (df)	435
p	< .001

The initial KMO value was found to be 0.889, indicating that the sample size was adequate for factor analysis (Table 2). In addition, Bartlett's test yielded statistically significant results ($p < .001$), demonstrating that the data were suitable for factor analysis (Table 2). In the first factor analysis, the unrotated Principal Component Analysis (PCA) method was used. Although Principal Component Analysis (PCA) is frequently used in exploratory analyses during scale adaptation studies, it is acknowledged that extraction techniques such as Principal Axis Factoring (PAF) or Maximum Likelihood (ML) may provide stronger

estimation of latent constructs. Therefore, the findings obtained from the exploratory phase were interpreted cautiously and were further evaluated through confirmatory factor analysis. In the second analysis, considering that the variables might be interrelated, Oblimin was chosen from among the oblique rotation methods (Çokluk et al., 2014). As a result of this analysis, the structure was grouped under seven factors, with factor loadings varying between -0.631 and 0.909. Subsequently, the analysis performed using the Varimax orthogonal rotation method revealed main factor groups similar to those obtained with oblique rotation. However, in the 7-factor structure, some items (items 6, 17, 7, 9, 15, and 4) were excluded from the analysis because they loaded on more than one factor or because the correlations between factors were not significant. The analysis was repeated each time an item was removed, ultimately yielding a 4-factor structure. After the items were removed, the KMO value was found to be 0.893, and Bartlett's test again yielded significant results ($p < .001$).

Table 3. KMO and Bartlett's test results after removing items

KMO (Kaiser-Meyer-Olkin)	0.893
Bartlett's Test – Chi-Square	6665.729
Degrees of Freedom (df)	276
p	< .001

The KMO value after item removal increased to 0.893, indicating that the sample remained adequate for factor analysis, while Bartlett's test results remained statistically significant (Table 3).

Table 4. PL-C Quest scale factor loadings

Item Code	Factor Load
Question 1	0.936
Question 2	0.927
Question 3	0.913
Question 4	0.901
Question 5	0.890
Question 6	0.881
Question 7	0.847
Question 8	0.790
Question 9	0.529
Question 10	0.525
Question 11	0.809
Question 12	0.734
Question 13	0.714
Question 14	0.688
Question 15	0.655
Question 16	0.533
Question 17	0.782
Question 18	0.786
Question 19	0.640
Question 20	0.552
Question 21	0.406
Question 22	0.884
Question 23	0.836
Question 24	0.343

Factor loadings ranged between 0.343 and 0.936, indicating acceptable item-factor relationships (Table 4).

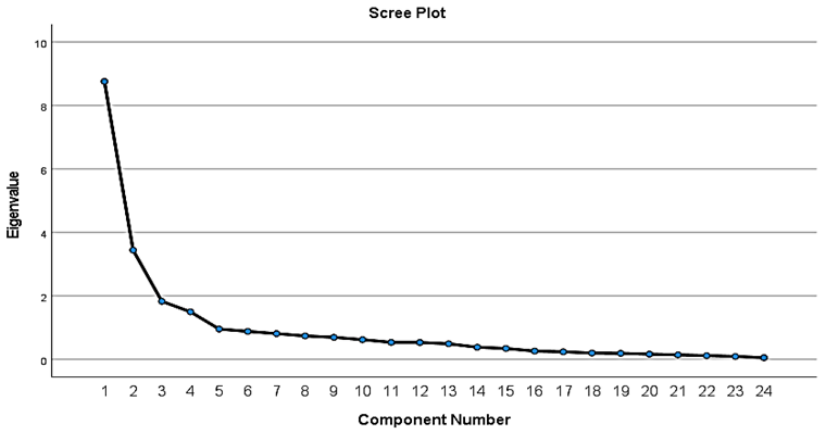

Figure 2. Scree plot of the PL-C Quest scale

As shown in Figure 2, a four-factor structure with eigenvalues greater than one was obtained. Factor analysis indicated that Factor 1 (Eigenvalue = 8.760) explained 36.50 % of the observed variance, Factor 2 (Eigenvalue = 3.442) explained 14.34 %, Factor 3 (Eigenvalue = 1.831) explained 7.63 %, and Factor 4 (Eigenvalue = 1.498) explained 6.24 % of the observed variance. The total variance explained by the four factors was 64.713%. This ratio can be interpreted as meeting approximately two-thirds of the criterion when considering the eigenvalues of the factors and the explained variance criterion (Büyüköztürk, 2024).

Table 5. Eigenvalues and explained variance of PL-C Quest scale dimensions

Sub-dimensions	Eigenvalue	Explained Variance (%)	Cumulative Variance (%)
Physical Domain	8.760	36.498	36.498
Psychological Domain	3.442	14.343	50.841
Social Domain	1.831	7.629	58.470
Cognitive Domain	1.498	6.244	64.713

As presented in Table 5, four factors with eigenvalues greater than one explained 64.713% of the total variance, indicating an acceptable factor structure.

Table 6. Cronbach's alpha values for PL-C Quest subfactors

Factor	Number of Items	Cronbach Alpha
Physical Domain	10	0.955
Psychological Domain	6	0.781
Social Domain	5	0.736
Cognitive Domain	3	0.598
Total Score	24	0.891

Cronbach’s alpha coefficients ranged from 0.598 to 0.955, indicating acceptable to high internal consistency across the scale dimensions (Table 6).

Thirty items and four factors constituted the original PL-C Quest. Consequently, the PL-C Quest was reduced to 24 items in a sample of 375 people, and a 4-factor structure was again achieved. Table 7 displays the scale's items and subscales.

Table 7. Factor loadings of PL-C Quest items

Items	Factors			
	Physical Domain	Psychological Domain	Social Domain	Cognitive Domain
26- Some children think about following rules, like not to do a bomb in a pool, but other children do not think about following rules, and would do a bomb in a pool.	0.936			
29- Some children think about how to be in the right spot so the ball is passed to them, but other children do not think about how to be in the right spot so the ball is passed to them.	0.927			
28- Some children think about which way is going to be the best when they climb up, but other children do not think about which way is going to be the best when they climb up – and they get stuck.	0.913			
27- Some children think of another physical activity to do if their favourite activity is not possible, but other children do not think of another physical activity to do if their favourite activity is not possible.	0.901			
25- Some children think of many reasons why physical activity is good for them, but other children do not think of many reasons why physical activity is good for them.	0.890			
30- Some children think about where it is safe to swim before they go in the water, but other children do not think about where it is safe to swim before they go in the water.	0.881			
24- Some children think they can ride and notice what could be in their way, but other children do not think they can ride and notice what could be in their way.	0.847			
11- Some children are pretty good at running straight away when they hear the starting gun, but some children are not so good at running straight away when they hear the starting gun.	0.790			
18- Some children feel they like being active in lots of different ways, because they enjoy it, but other children do not feel like being active in lots of different ways, because they don't enjoy it.	0.529			
19- Some children feel they have favourite places to hang out and play, but other children do not feel they have favourite places to hang out and play.	0.525			
12- Some children are pretty good at running very fast, but other children are not so good at running very fast.		0.809		
2- Some children are pretty good at skateboarding, but other children are not so good at skateboarding.		0.734		
8- Some children are pretty good at touching their toes without bending their knees, but other children are not so good at touching their toes and bend their knees.		0.714		
1- Some children are pretty good at hopping, but other children are not so good at hopping.		0.688		
13- Some children feel like being active and playing sport whenever they can, for lots of reasons, but other children do not find any good reasons for being active and playing sports.		0.655		
5- Some children are pretty good at hanging for a long time without letting go, but other children are not so good at hanging for a long time without letting go.		0.533		
22- Some children want to join in an activity or game where they can work together, but other children do not want to join in an activity or game where they can work together.			0.782	
21- Some children want to invite other kids to play with them, but other children do not want to invite other kids to play with them.			0.786	
20- Some children want to shake hands with kids from the other team after losing a game, but other children do not want to shake hands with kids from the other team after losing a game.			0.640	
14- Some children feel they can control their disappointment when they miss the target, but other children do not feel they can control their disappointment when they miss the target.			0.552	
23- Some children want to learn about activities and games from other places and people, but other children do not want to learn about activities and games from other places and people.			0.406	
10- Some children are pretty good when strong muscles are needed, like when picking up a big rock, but other children are not so good when strong muscles are needed, like when picking up a big rock.				0.884
3- Some children are pretty good at overarm throwing, but other children are not so good at overarm throwing.				0.836
16- Some children feel they have a pretty good idea of their own ability, but other children sometimes think they are better than who they are.				0.343

The PL-C Quest items were grouped under four dimensions: Physical, Psychological, Social, and Cognitive domains (Table 7).

Findings Related to Confirmatory Factor Analysis

(PL-C Quest) To examine whether the 4 - 8 structure was valid, CFA was conducted via AMOS v24. The congruence between the theoretical model and the actual data was examined using CFA. During the analytical process, inter-item relationships were assessed, and items with correlation values below 0.40 were excluded from the scale. This procedure was implemented to enhance the model's goodness-of-fit measures.

Because of the analysis, items 16, 20, and 1 were removed from the scale because they negatively affected the model's fit indices. These items belonged to the Cognitive, Social, and Psychological domains. The removal of one item from each factor was done to improve the model's overall fit and create a more robust and reliable structure.

Table 8. PL-C Quest scale fit indices

χ^2/df	GFI	CFI	IFI	RMSEA	NFI	NNFI (TLI)	AGFI	p
4.355	0.844	0.902	0.903	0.095	0.940	0.898	0.800	< .001

The model fit indices indicated an acceptable level of model fit based on the CFA results (Table 8). The χ^2/df value was found to be 4.355, which is within acceptable limits. The GFI value was determined to be 0.844, the CFI value 0.902, and the IFI value 0.903. The AGFI value was calculated as 0.800, the NFI value as 0.940, and the NNFI value as 0.898. The RMSEA value was determined to be 0.095, indicating a moderate or marginal level of model fit rather than an excellent fit. Although several indices (CFI, IFI, and NFI) indicate acceptable model fit, the RMSEA value slightly exceeds the commonly recommended threshold. Therefore, the model fit should be interpreted cautiously.

The model demonstrates an acceptable level of fit, although further improvements may strengthen the model structure. The removal of items from the scale and the modifications implemented are crucial measures aimed at improving the overall validity and reliability of the model. In addition, Average Variance Extracted (AVE) and Composite Reliability (CR) values were calculated to provide further evidence regarding convergent validity. Overall, the findings suggest that the model demonstrated acceptable fit despite some indices indicating room for improvement (Table 8).

Reliabilities After CFA

Table 9. Reliability of the scale and subscales after CFA

Factor	Number of Items	Cronbach's alpha
Physical Domain	10	0.955
Psychological Domain	5	0.744
Social Domain	4	0.752
Cognitive Domain	2	0.754
Total Score	21	0.897

Reliability coefficients after CFA indicated acceptable to high internal consistency across the scale and its subdimensions (Table 9).

Following CFA, reliability analyses were conducted on the scale and subscales. Reliability analyses were evaluated using Cronbach's alpha coefficients. Typically, a reliability score of 0.70 or higher suggests an adequate level of reliability. The Physical Domain ($\alpha = 0.955$) is very high; the Psychological Domain ($\alpha = 0.744$) and Social Domain ($\alpha = 0.752$) are at an acceptable level; the two-item Cognitive Domain ($\alpha = 0.754$) is at an acceptable level considering the number of items. The $\alpha = 0.897$ figure for the Total Score (21 items) suggests that the scale possesses a strong degree of internal consistency.

The high Cronbach's alpha value obtained for the Physical Domain ($\alpha = 0.955$) indicates very strong internal consistency. However, extremely high alpha coefficients may also suggest potential item redundancy or conceptual overlap among items. Therefore, this finding should be interpreted cautiously, and future studies may examine possible redundancy among items in this domain.

Table 10. Convergent validity and composite reliability values

Factor	Number of Items	AVE	CR
Physical Domain	10	0.69	0.96
Psychological Domain	5	0.48	0.82
Social Domain	4	0.43	0.74
Cognitive Domain	2	0.74	0.85

Convergent validity and composite reliability findings indicated acceptable measurement properties across the scale dimensions (Table 10). The Average Variance Extracted (AVE) and Composite Reliability (CR) values were calculated to provide additional evidence for convergent validity. Composite reliability values for all sub-dimensions were above the recommended threshold of 0.70, indicating adequate reliability. AVE values were above 0.50 for the Physical and Cognitive Domains. Although the AVE values for the Psychological and Social Domains were slightly below the recommended threshold, their CR values exceeded 0.70, suggesting that convergent validity can still be considered acceptable. These results are consistent with the recommendations of Fornell and Larcker (1981), which state that convergent validity can be considered acceptable when composite reliability values exceed 0.70 even if AVE values are slightly below 0.50.

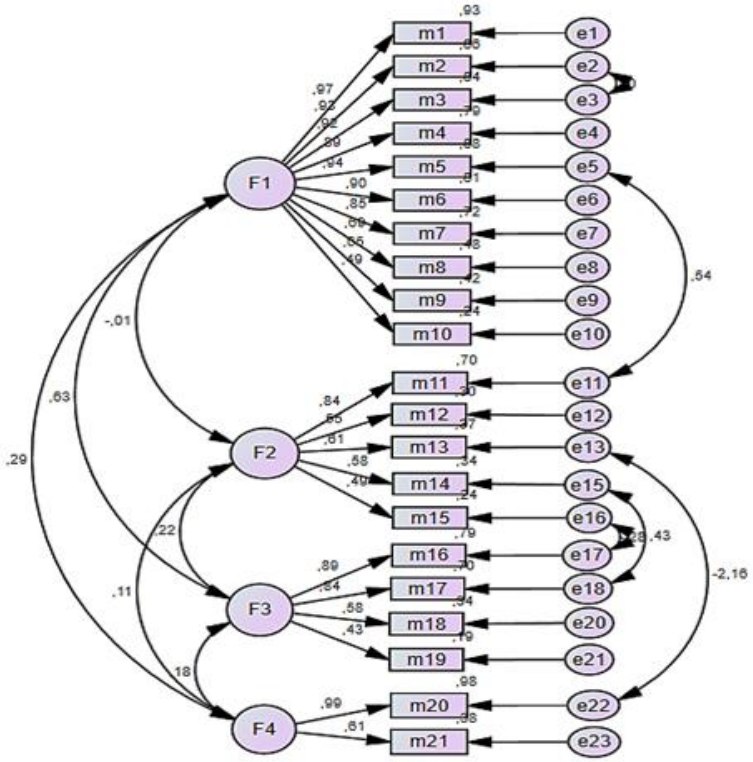

Figure 3. Confirmatory factor analysis diagram of the PL-C Quest scale

As shown in Figure 3, the confirmatory factor analysis supported the proposed four-factor structure.

Scoring (Turkish - approved forms)

As a result of EFA, 24 items were retained, while three items were removed during CFA, resulting in a validated 21-item structure.

Table 11. Scoring ranges of the Turkish-validated forms

Analysis	Number of Items	Physical Domain	Psychological Domain	Social Domain	Cognitive Domain	Total
EFA	24	10 - 40	6 - 24	5 - 20	3 - 12	24 - 96
CFA	21	10 - 40	5 - 20	4 - 16	2 - 8	21 - 84

The scoring ranges differed between the EFA and CFA forms due to the item reduction process, resulting in changes across sub-dimensions and total score values (Table 11).

DISCUSSION AND CONCLUSION

In this study, the validity and reliability of the Turkish version of the Physical Literacy Questionnaire for Children Aged 4 - 8 (PL-C Quest), developed by Barnett et al. (2020), were analyzed to adapt it to Turkish culture. The findings related to CFA indicate a consistent structure between the original scale and the Turkish version. According to Clayton and Pett (2008), for model fit to be appropriate, CFI, GFI, IFI, and AGFI values must be between 0.90 and 0.95. Ferrer et al. (2004) state that an RMSEA value between 0.00 and 0.05 indicates an excellent fit, whereas values between 0.08 and 0.10 indicate a marginal fit. Upon reviewing the study's findings, it can be stated that several fit indices indicate acceptable model fit, although the RMSEA value suggests a marginal level of fit and therefore should be interpreted cautiously.

The scale's fit values indicate a structure that aligns with the initial model suggested by Barnett et al. (2020). The 30-item form used in the original study was adapted into Turkish with 24 items. Albright and Park (2008) state that factor loadings between 0.30 and 0.40 represent the lowest level for interpreting the structure; load values above 0.50 are considered meaningful, while load values above 0.70 indicate a well-defined structure. According to the findings, the factor loadings for the "physical domain" subscale of the PL-C Quest range from 0.52 to 0.93; 0.53 - 0.80 for "psychological domain"; 0.40 - 0.78 for "social domain"; and 0.34 - 0.88 for "cognitive domain," indicating that the factor structure of the scale is acceptable. In their study, Barnett et al. (2020) found factor loadings ranging from 0.46 to 0.66 for the "psychological domain," 0.40 to 0.63 for the "physical domain," 0.40 to 0.68 for the "cognitive domain," and 0.59 to 0.63 for the "social domain." The findings of this study are corroborated by these values. In this study, a four-factor structure consisting of 24 items was obtained through EFA, and after three items were removed, a final four-factor structure consisting of 21 items was confirmed through CFA. Therefore, both the 24-item and 21-item forms of the scale can be considered valid and reliable structures that can be used in research.

Documents in the fields of health and policy, such as the 2018 - 2030 Global Physical Activity Action Plan (WHO, 2018), demonstrate the need for countries to implement physical literacy practices; however, not all countries are effectively implementing these practices (Carl et al., 2022). Research indicates that students in Türkiye engage in sports activities at a lower frequency compared to their counterparts in other nations (Özdoğru, 2018). Children should participate in moderate-to-intense physical activity for at least an hour each day, according to Yetgin (2020). But most children in Türkiye do not meet this requirement, which increases their risk of obesity. A research investigation examining the influence of daily routines on physical activity in children aged 7 – 10 found that reductions in screen time were associated with increased levels of physical activity. It stated that creating activities appropriate for all age groups and making physical exercise more pleasurable are necessary to sustain or improve physical activity (Çolak, 2019). Caldwell et al. (2020) investigated the relationship among physical literacy, physical activity, and health indicators in children. Research indicated that different aspects of physical literacy, such as competence, motivation, enjoyment, and motor skills, affect the amount of physical activity in children. Caldwell et al.

(2020) determined that children with high levels of physical literacy are more active and have better health indicators. Jefferies et al. (2019) examined the relationship between physical literacy and resilience in children and adolescents. They found that physically literate individuals have higher stress management and problem-solving skills. According to Pekğöz Çeviker and Ayhan (2023), elementary school students' physical literacy levels can be developed based on the physical education curriculum, and this can contribute to the adoption of healthy lifestyles. In a similar vein, Gerger (2023) argues that enhancing physical literacy can lead to higher levels of physical activity among students. In this instance, physical literacy is essential for the healthy development of children, and introducing a physical literacy program in schools can enhance the overall resilience of children and young people. Pot and Van Hilvoorde (2013) state that participation in physical activity is the main goal of physical literacy. A study examining the relationship between the physical activity levels of elementary school children and their parents found that children with physically active parents were 5 - 8 times more active than children with physically inactive parents (Vainauskas et al., 2020). Similarly, Xu et al. (2018) indicate that parents' physical activity levels affect preschool children's physical activity levels. These results underscore how the physical activity routines of parents influence their children's behaviors. Erdem and Eğmir (2018) reported that developing teacher candidates' knowledge and skills in physical literacy would contribute positively to the education process. Sevimli-Celik et al. (2011) discovered that support from parents plays a vital role in boosting levels of physical activity and that motivating children to spend time outdoors at school can enhance their physical activity. Recent technological advances have restricted children's movements. In Türkiye, school life generally focuses solely on academic achievement, so sports activities have taken a back seat (Orhan, 2019).

As a result of this study, children's physical literacy can be monitored using a scale adapted to Turkish. This can contribute to raising healthier generations. Within this framework, (PL-C Quest) serves as a valuable assessment instrument for evaluating the physical literacy levels of children between the ages of 4 and 8. Therefore, this study is considered to fill an important gap in physical literacy in preschool and elementary school.

Limitations

One limitation of the present study is that the Cognitive Domain consisted of only two items after the CFA procedure. Although acceptable reliability was obtained, factors composed of only two items may be considered psychometrically less stable. Future studies may expand this dimension by including additional items in order to better represent the cognitive components of physical literacy. In addition, measurement invariance across gender and age groups was not tested in the present study. Examining measurement invariance through multi-group confirmatory factor analysis in future research may provide further evidence regarding whether the scale functions equivalently across different demographic groups. Furthermore, test–retest reliability was not examined in the present study. Future studies may evaluate the temporal stability of the scale by applying the instrument to the same participants at different time intervals.

Recommendations

The scale developed in this study can be used to conduct new research on physical literacy. Enhanced research could play a role in creating innovative techniques and frameworks for physical education and sports classes. In addition, it may provide significant benefits in terms of children maintaining physical activity throughout their lives, acquiring transferable skills, and developing a sports culture. Future studies will guide families, teachers, educators, and program developers.

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Generative AI Disclosure: The conception and execution of this study, including the development of the research framework, methodological design, data analysis, interpretation of findings, and manuscript preparation, were undertaken entirely by the authors. No generative artificial intelligence tools were used in the creation of the scientific content of the study. AI-based tools were used only for limited linguistic refinement purposes, such as grammar checking and improving the readability of the English text, without influencing the scientific content, interpretation, originality, or conclusions of the work. All scientific and ethical responsibility remains with the authors.

Ethics Approval

Ethics Committee: Bursa Uludağ University Research and Publication Ethics Committee
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