
Literacy dimension in physical education: analysis of construct validity instrument

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Abstract

This research aims to test the dimension of literacy in physical education in students at Singaperbangsa Karawang University. Research is conducted using quantitative approaches with survey methods. The population in this study was all student-athletes in various sports at Singaperbangsa Karawang University which amounted to 721 people. The study sample was determined using proportional random sampling techniques totalling 342 people. The dimensions of physical literacy used are the dimensions of variation and utilization of books (BK), dimensions of variation and use of scientific articles (WM), dimensions of variation and utilization of technology (TECH), and dimensions of environmental variation (LK). Data analysis used is Confirmatory Factor Analysis (CFA) with Second-Order Confirmation Factor (SO-CF) with Lisrel program version 8.80. Data analysis showed that the literacy scale developed for physical learning is a valid and reliable scale and consists of 15 indicators. The dimension of variety and use of writing materials is the most dominant in shaping college student literacy.

Keywords: Literacy, Physical education, Construct validity

INTRODUCTION

Physical learning is a complex educational process through the medium of physical activity that focuses on achieving all domains of learning objectives consisting of cognitive, affective, and psychomotor domains. (Pasaribu, 2016), simultaneously developed in a quality learning design (Kanca, 2018). Education in Indonesia must play a role in preparing human resources through the educational process, where physical education is an integral part of achieving these goals (Abildsnes et al., 2015; Nugroho et al., 2018; Nurkholis, 2013). In addition, the problems in physical learning to date have never subsided and are

multidimensional, for example, related to student literacy skills in the learning process that have not been maximally measured. Whereas in the international world, physical literacy has begun to develop and be developed because it has an important role in the physical, psychological, behavioural, attitude, and social development and growth of school children (Edwards et al., 2017; Neibert, 2013). In Indonesia, the attention to developing physical literacy in various activities has not been seen, but it is this concept that frames the objectives of physical activity education in the curriculum (Dinham & Williams, 2019).

Literacy in contemporary contexts is defined as being knowledgeable and able to construct, represent and communicate meaning in various contexts by using conventions and symbol systems from a particular field or subject (Dinham & Williams, 2019; Gustian, 2020; Park, 2017). Literacy is a symbol, system and sound system that contains meaning. Literacy activities are important to do to get information that suits our interests. Physical literacy is the foundation for the formation of behaviour, awareness, understanding of active lifestyles, pleasure in doing activities, the ability to identify, understand, interpret, respond effectively in the use of body movement abilities in a wide and varied context (Scott et al., 2021; Tremblay & Lloyd, 2009). Physical literacy can also be said as motivation or confidence in forming competence, knowledge and understanding in being responsible for the involvement of lifelong physical activity (Whitehead, 2019). This makes literacy an important part of human life towards a better quality of life.

The education system in several developed countries has integrated physical literacy into their educational curriculum, starting from early childhood education, including Australia (Dinham & Williams, 2019). Physical literacy is considered as one of the most important life skills so that a person can participate actively in society (Roetert & Jefferies, 2014), so that physical literacy needs to be developed in everyone (Roetert & Couturier, 2015). Physical literacy is the development of movement skills and self-confidence so that they have the motivation and ability to

understand, believe in their abilities, apply a healthy lifestyle with an active lifestyle, and have good movement skills (Gustian, 2020). Physical literacy is seen as an important life skill for active participation in society (Roetert & Jeffries, 2014; Basoglu, 2018) and should be seen as an important factor in developing all students in educational settings (Roetert & Couturier, 2015). Physical literacy momentum comes mainly from within the field of physical education. Scott et al., (2021) explained that physical literacy is not the same as physical education nor does it replace it. Physical literacy is the goal of a physical education curriculum that provides a strong philosophical basis and unifies a research and development platform for an inclusive physical education curriculum model that aims to develop each child's physical and active lifestyle adoption throughout the ages.

Construct validity is an operationalized concept so that it can be measured through empirical observation (Baskarada, 2014). Recent philosophy has paid attention to the logic of justification of measures, such as construct validation, but not to the question of what it means for an instrument to be a valid construct measure. The salient approach bases validity on the existence of a causal relationship between attributes and their detectable manifestations. Some of its proponents claim that validity does not depend on pragmatics and research context (Philippi, 2020). This construct validity test also refers to research conducted in proving that literacy is an important part of physical activity (Giblin et al., 2014; Li et al., 2020; Yilmaz & Kabak, 2021). Therefore, a study of construct validity is needed to provide scientific theoretical evidence in applying literacy to physics.

Based on the results of the construction of literacy theory in physical learning, it can be concluded that the implementation of learning literacy is important, especially in physical education. This is because physical education requires motivation and effort. Students' academic improvement is expected to know the level of literacy as the basis of the learning process. Therefore, a valid and reliable physical education literacy

scale is needed using Structural Equation Modeling (SEM) through this study.

METHOD

The quantitative approach used in this study was through a cross-sectional technique of filling out the literacy dimension questionnaire in the physical education of Singaperbangsa Karawang University students. The research location is in Karawang, West Java, Indonesia. The research population was all students at Singaperbangsa Karawang University, amounting to 721 people. The sampling technique uses proportional random sampling, where each sport is represented.

The instrument used is a physical education literacy questionnaire filled out by students who are active in each sport. The instrument is composed of the results of theoretical construction taken four dimensions, namely (1) the dimensions of variation and use of books (BK), (2) the dimensions of variation and the use of scientific article sources (WM), (3) the dimensions of variation and technology utilization (TECH), and (4) dimensions of environmental variation (LK) (Dyenia et al., 2018). The 21-item literacy instrument items with answer choices are (1) strongly disagree, (2) disagree, (3) quite agree, (4) agree, and (5) strongly agree. The number of samples can be seen in Table 1, while the instrument grid is in Table 2.

Table 1. Number of Research Subjects

Sports	Amount Athlete	Sample Study
Athletics	41	22
Basketball	51	21
Volleyball	59	28
Badminton	31	12
Cricket	21	13
Paddle	27	14
Futsal	69	26
Handball	31	17
Karate	29	16
Archery	25	12
Martial arts	35	16
Swimming	38	18
Gymnastics	49	23
Aerobics	48	26
Sepak takraw	36	19
Football	87	37
Taekwondo	29	14
Woodball	15	8
Amount	721	342

Table 2. Grid of literacy questionnaire instruments in physical education

Dimension	Aspect
Variation and use of books (BK)	Class library Book information book concept Updated book theme Time spent in the library
Variety and use of scientific articles (WM)	Availability of scientific article resources Complete scientific article references Time spent reviewing scientific articles Availability of guides for searching scientific articles
Technology variation and utilization (TECH)	Audiovisual centre Availability of computers Time spent listening to audio-visual and computer IT-based learning media Physical education learning videos
Environmental variations	Availability of sports equipment Printing material Produced posts The suitability of the resulting writing Relevant labels or wall writing Writing portfolio

Data analysis used Confirmatory Factor Analysis (CFA) with second-order or Secondary Order Confirmatory Factor Analysis (SOCF). according to Hair et al., (2014), SOCF is the CFA of a construct that has several dimensions of the construct as measured by its indicators. The data were tested based on the size of the model fit and construct validity using the Lisrel 8.80 program. The criteria used to determine the size of the appropriate model fit are goodness of fit which consists of absolute fit measures, incremental fit indices, and parsimony fit indices. Meanwhile, to determine the criteria for construct validity, the standardized factor loading value and the t-value obtained are used.

Estimation of the reliability of literacy instruments in physical education is carried out using composite reliability and construct reliability. The estimation of the composite reliability of literacy instruments in physical education was analyzed using the Alpha formula from Cronbach, namely as follows (Retnawati, 2016). The above criteria are used as a reference to state the construct. Good reliability refers to if the construct reliability coefficient must be ≥ 0.6 then the literacy instrument in physical education meets good criteria.

RESULTS

Pre-analysis

The initial analysis was carried out on data consisting of 21 statements that represent the literacy dimensions in physical education. The analysis is carried out by modifying the model by freeing several items that contain measurement errors to correlate. Based on these data, the results of the analysis obtained are as follows.

Table 3. Results of Preliminary Analysis of CFA 2nd order

No.	Goodness of Fit	Acceptable Values	Fit Values	Decision
1.	GFI	$GFI \geq 0.90$	0.93	Accepted
2.	AGFI	$AGFI \geq 0.85$	0.90	Accepted
3.	CFI	$CFI \geq 0.90$	0.94	Accepted
4.	IFI	$IFI \geq 0.90$	0.94	Accepted

Table 3 above displays the results of the measurement of the fit of the model as well as the criteria for acceptable or perfect fit values according to (Hair et al., 2014; Korkmaz, 2016). Based on these data, it can be seen that the goodness of fit value in the model has met the required interval, so it can be said that the model obtained is appropriate. Furthermore, the construct validity test was conducted to determine the significance of the items in measuring the literacy dimension in physical education. Testing is done by looking at the value of the standardized factor loading and t-value. The value received in the test is more than 0.5 for the standardized factor loading and more than 1.96 for the t-value. The results of the construct validity test can be shown in the following second-order CFA diagram.

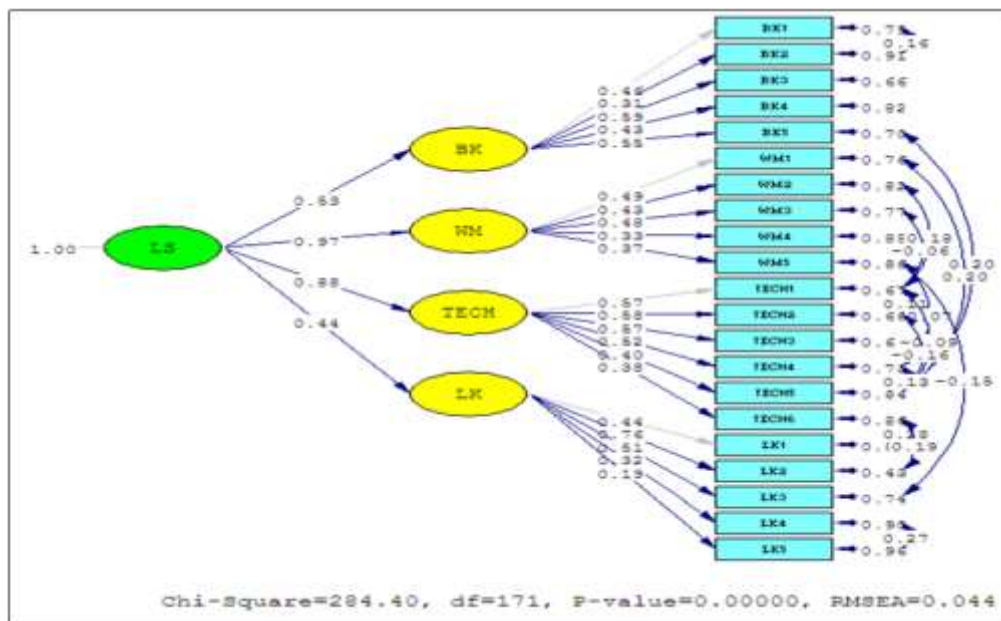


Figure 1. Preliminary Analysis Diagram with 2nd Order CFA Based on Standardized Factor Loading

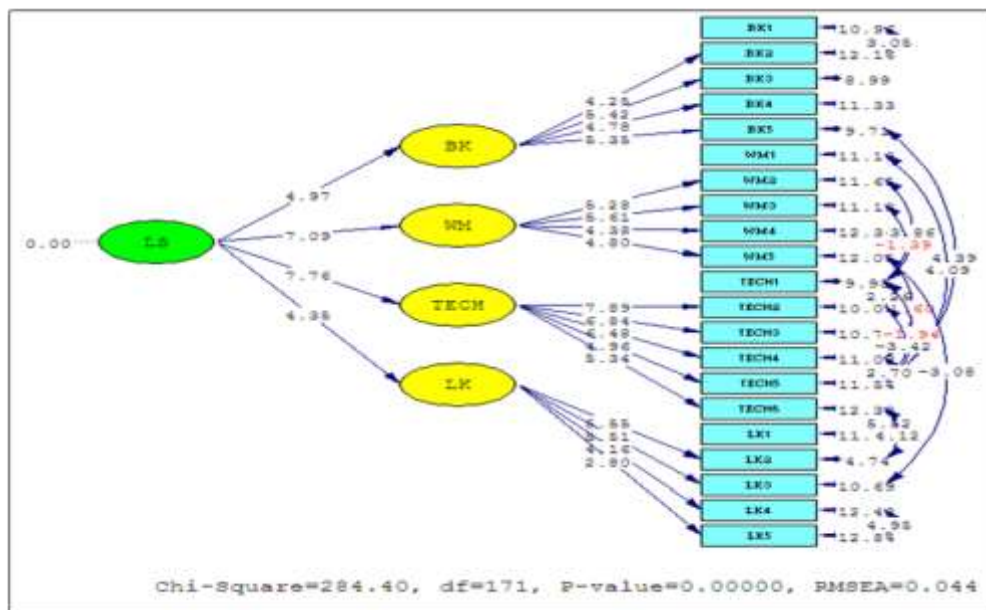


Figure 2. Preliminary Analysis Diagram with CFA 2nd Order Based on t-Value

Figure 1 shows that the standardized factor loading output for items BK1, BK3, BK4, BK5, WM1, WM2, WM3, TECH1, TECH2, TECH3, TECH4, TECH5, LK1, LK2, and LK3 has a loading factor of more than 0.4, but not for items BK2, WM4, WM5, TECH6, LK4, and LK5 which obtain a value less than 0.4 ie. Diagram 2 shows that the t-value for all items has met the test criteria, which is more than 1.96. Thus, there are six items from the dimensions that are not valid in measuring literacy in physical education. This resulted in items BK2, WM4, WM5, TECH6, LK4, and LK5 being eliminated so that in the next analysis there were 15 items analyzed.

Figure 1 and 2 also show that the standardized factor loading outputs from the dimensions of BK, WM, TECH, and LK are 0.53, 0.97, 0.88, and 0.44, respectively. This value has met the criteria of greater than 0.4. In addition, the t-value of each resulting dimension is 4.97, 7.09, 7.76, and 4.35 or greater than 1.96. Therefore, it can be said that each dimension contributes to the formation of literacy skills dimensions in physical education.

Reanalysis Results

Reanalysis was carried out on 15 items which were the results of the evaluation of the initial data analysis. The analysis is carried out by modifying the model by freeing some items that contain measurement errors to correlate with items. Based on the data analysis carried out, the following results were obtained.

Table 4. 2nd order CFA Reanalysis Results

No.	Goodness of Fit	Acceptable Values	Fit Values	Decision
1.	GFI	$GFI \geq 0.90$	0.93	Accepted
2.	AGFI	$AGFI \geq 0.85$	0.88	Accepted
3.	CFI	$CFI \geq 0.90$	0.97	Accepted
4.	IFI	$IFI \geq 0.90$	0.97	Accepted

Table 4 shows that the model obtained is appropriate. This is indicated by the goodness of fit value that has been fulfilled at the required interval. So it can be said that the dimensions of literacy. These four dimensions are described in 15 statement items that have been tested with second-order CFA. The test results are shown in the image below.

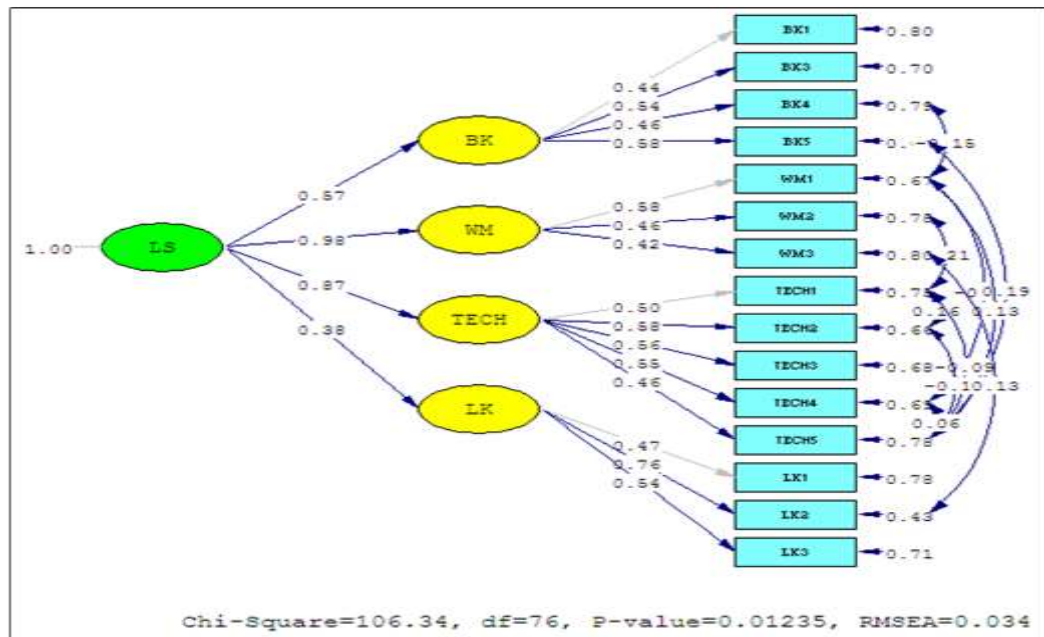


Figure 3. CFA 2 Reanalysis Diagram Based on Standardized Factor Loading

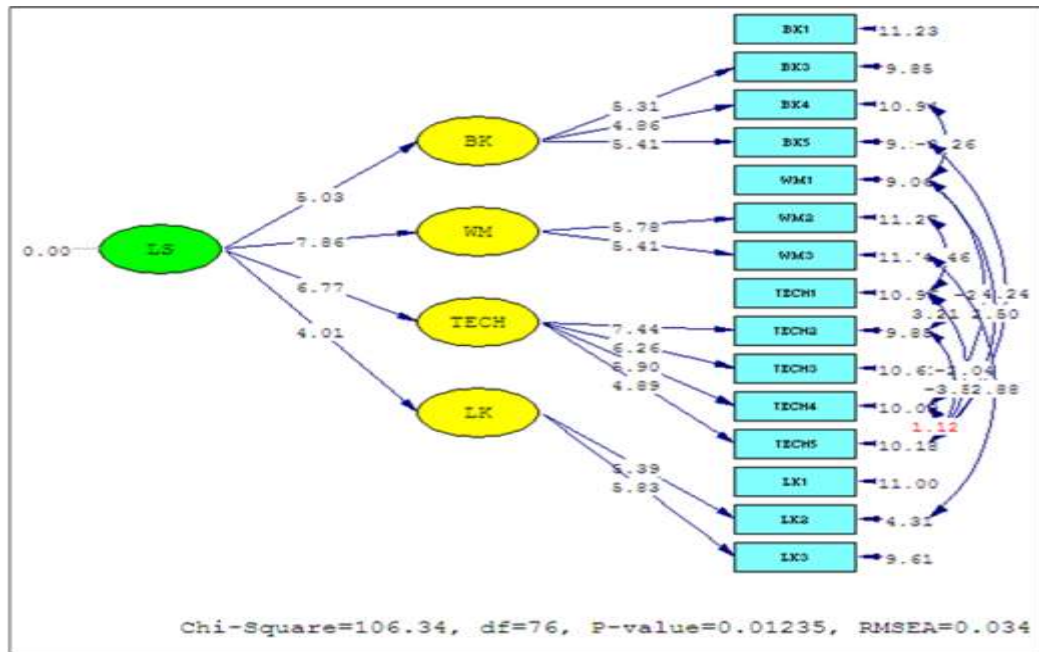


Figure 4. Reanalysis Diagram of 2nd CFA Based on t-Value

Based on Figures 3 and 4, it can be seen that the standardized factor loading and t-value values for all items have been met. The t-value for 15 items is greater than t-table 1.96, so it can be concluded that these items contribute to each indicator of the dimensions of literacy in physical education. In addition, the standardized factor loading value for each dimension of BK, WM, TECH, and LK > 0.5, means that each dimension contributes to literacy.

DISCUSSION

Based on the results of the study, it is known that the model resulting from the reanalysis is appropriate and meets the requirements of the goodness of fit value, standardized factor loading, and the required t-value. This shows that the modelled statement contributes to the formation of student literacy in various sports at Singaperbangsa University Karawang, West Java. The statement was developed based on the dimensions of variation and use of books (BK), dimensions of variation and use of scientific articles (WM), TECH: dimensions of variation and technology utilization (TECH), and dimensions of environmental variation (LK).

The results of this study also show that the largest standardized factor loading value of the four literacy dimensions is the WM dimension: the dimension of variation and the use of scientific articles with a loading factor of 0.98. This shows that the WM dimension is the dominant dimension in shaping student literacy. The use of variety and the use of scientific articles improve literacy skills because they are well available. Ease of access and easy access to the variety and use of scientific articles improves students' understanding and literacy skills (Thota & Berglund, 2016). So these results illustrate that student literacy in physical learning activities that involve several contexts will be able to increase student literacy levels in the physical learning process. The lowest loading factor value is the dimension of environmental variation (LK) with a value of 0.38. This shows that the contribution of the LK dimension to student literacy in physical education is not large. The lack of sensitivity to the learning environment influences the literacy level of students (Durmus & Kinaci, 2021; Nunez & Clores, 2017).

Efforts to measure and improve physical literacy should be the main focus in sports education as an effort to improve physical activity skills, self-confidence, and understanding abilities (Roetert & Jefferies, 2014). Appropriate and sustainable measurement of physical literacy can be the basis for educators/trainers (Roetert & MacDonald, 2015) in implementing learning and training systems that suit their needs. Thus, physical education must be aligned with the development of knowledge and technology, linking knowledge and behaviour change, and we must advocate for drastic changes in policies and curricula.

CONCLUSION

Based on the results of this study, it can be concluded that the literacy scale developed for physical learning is valid and reliable and consists of 15 statements. The dimensions that are the basis for developing the scale are the literacy dimensions, which consist of BK: dimensions of variation and use of books, WM: dimensions of variation and use of scientific articles, TECH: dimensions of variation and

technology utilization, and LK: dimensions of environmental variation. In addition, the dimensions of WM: the dimensions of variation and the use of scientific articles are the most dominant in shaping student literacy.

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