



The Effect of Physical Education Teacher Competence on Children's Physical Literacy: Structural Equation Modeling



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ABSTRACT

Aims This study examined how physical education teacher competence can influence children's physical literacy in Bojonegoro, Indonesia.

Instrument & Methods This study used a convenience sampling strategy to collect data from students across 100 elementary schools in the Bojonegoro district from September to October 2022. The sample comprised 351 students, 52% boys and 48% girls aged 9 to 13 years (average age: 11.50±13.4 years). Data on children's physical literacy and physical education teachers' competence were measured using two questionnaires. The data were analyzed using structural equation modeling.

Findings The model fitness indices were as follows: CMIN/DF=1.902, CFI=0.980, GFI=0.919, NFI=0.976, RMR=0.008, RMSEA=0.051, TLI=0.970, and IFI=0.980. Thus, the model was compatible with the data. There was a significant direct relationship between physical education teacher's competence and children's physical literacy ($r=0.136$, $p=0.015$). The model explained that physical education teachers' competencies significantly affected children's physical literacy. The findings also revealed that physical education teachers who are competent in their field were more capable of improving children's physical, psychological, social, and cognitive abilities.

Conclusion Physical education teachers' competencies can improve children's physical literacy if they apply the principles of pedagogy, personality, and social professional development to learning. Further studies will be conducted to assess other factors in the school environment that may predict students' physical literacy.

Keywords Literacy; Physical Education and Training; Students

CITATION LINKS

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Introduction

Physical literacy uses basic movement skills to respond to the environment and others in various physical activities [1] and is operationalized as the application of autonomous movement [2]. Physically literate people can use their integrated physical, psychological, cognitive, and social skills to facilitate healthy and beneficial movement and physical activity throughout their lives [3, 4]. Physical literacy is essential for the individual and can be promoted at all stages of life [5], for lifelong physical activity [6], and for the design of physical activity for youth [7]. Because high levels of physical literacy among children are associated with good health outcomes [8] and beneficial for behavior and mental health during adolescence [9], physical literacy may be necessary for a healthy and fulfilling lifestyle.

Physical literacy is an emerging concept in Indonesia, but slower than in developed countries [10]. The Indonesian government recognizes the importance of physical fitness and literacy for school-age groups [11]. Physical literacy studies in Indonesia also focus on elementary school children [12, 13]. Physical literacy programs in Indonesia are currently designed to target school-aged children, focusing on developing attitudes and habits of healthy living with physical activity that can last a lifetime.

Promoting physical literacy in schools is a big challenge for physical education teachers. Physical education teachers must gain the necessary knowledge and skills to promote physical literacy [14]. Physical education teachers need more time to teach physical literacy due to competing demands on their time, such as academic subjects and standardized tests [15]. Physical education teachers need access to the resources to promote physical literacy, such as equipment, facilities, and professional development opportunities. Physical education does not prioritize the development of physical literacy, instead focusing on traditional physical education objectives, such as skill development and fitness [16].

The fundamental question is how does the competence of physical education teachers contribute to the development of children's physical literacy? Physical education teachers are essential actors in supporting children's physical literacy [17]. Therefore, the role of physical education teachers is vital in promoting physical literacy in schools. Quality physical education contributes to children's physical literacy [18]. Implicitly, physical education teachers' competence in carrying out their school duties can be used to determine the quality of physical education. However, research on physical education teachers' competence in physical literacy still needs to be improved.

Regarding teacher competence, the Indonesian government has regulations and laws on teacher competence. Teacher competence is a set of knowledge, skills, and behaviors that teachers should

have, live, master, and apply in performing their professional duties [19]. Teacher competencies include professional (subject matter knowledge), pedagogical, social, and personal competencies [19, 20]. However, it is unclear whether these teacher competencies describe the ideal competencies that physical education teachers need to promote their students' physical literacy.

There are explicit and implicit relationships between the four aspects of physical education teachers' competence and students' physical literacy. According to professional competence, physical education teachers can create learning content that facilitates students' development of physical abilities and progress in their physical literacy journey [21]. According to pedagogical competence, physical education teachers use a physical literacy-enriched pedagogy that focuses on developing children's physical competence, confidence, motivation, and physical activity [15]. Providing learning situations where students can discover and develop their potential to remain motivated, confident, and competent in engaging in lifelong physical activity can develop their physical literacy [22]. Teachers can make several organizational (Learning) decisions and build content that can help students learn skills so that they can use them outside of physical education classes [23]. The learning environment structured by teachers can affect the development of their students' physical literacy [24].

Physical education Teachers' social and personality competencies have a direct relationship with physical literacy. However, teachers' social and personality competencies are implicitly related to physical literacy, particularly in the psychological and social aspects. Teacher personality competence significantly increases student motivation [25]. A positive relationship exists between challenging, encouraging, praising, nonverbal support, understanding, and friendly teacher communication and student motivation to learn [26]. According to social competence, teachers' communication behaviors routinely affect classroom learning outcomes, especially students' motivation to learn [27], and the reason can be considered an intermediary factor between teachers' communication behaviors and learning outcomes [28]. Social and personality competencies are potentially positively related to students' physical literacy through the ability to give orders and communicate, and teachers' authority and assertiveness in learning.

Although many studies explicitly and implicitly have examined the effect of physical education teacher competence on physical literacy, more research needs to explore these variables simultaneously. This study was done to develop a theoretical model explaining the simultaneous relationship between physical education teacher competence and student physical literacy, given the importance of physical literacy in

the lives of children. Therefore, to find practical, easy, and inexpensive ways to achieve physical literacy in students, the results of this study are useful for stakeholders and physical education teachers. From the perspective of developing theory, this study explained how to achieve physically literate children by empowering physical education teachers' competencies.

Instrument and Methods

Participants

This study used a convenience sampling strategy to collect data from students across 100 elementary schools in the Bojonegoro district. The students were given a structured questionnaire for data collection, conducted for approximately two months (September to October 2022). The sample comprised 351 students, 52% boys and 48% girls aged 9 to 13 years (average age: 11.50±13.4 years). Although the questionnaire was distributed to more than 400 students, only 351 students completed the questionnaires.

Research tools

This study was conducted using two questionnaires, one measuring children's physical literacy and the other measuring physical education teachers' competence. In measuring physical literacy, at least four aspects need to be considered: physical ability, physiological ability, social ability, and cognitive ability [3,29]. The four principles were then developed into 30 indicator statements with a scoring technique. In case of choosing a more extended answer, a score of '4' for the statement "A lot like them", a score of '3' for the statement "a little like them", and in case of choosing a less developed answer, a score of "2" for the statement "a little like them", or a score of '1' for the statement "a lot like them" were considered. The results of the pilot testing showed that this instrument had relatively high validity using the items-total correlation analysis. The validity coefficient ranged from 0.283 to 0.661. A reliability coefficient of 0.915 was obtained using Cronbach's alpha. The instrument to measure the competence of physical education teachers was

developed based on the regulations and laws on teacher competence in Indonesia [19, 20]. It was in the form of student perceptions that measured the quality of physical education teacher competence in their schools. The stronger the physical education teacher's competence behavior, the higher the respondent's perception score. This instrument consists of four aspects: Pedagogical competence, personality competence, social competence, and professional competence. The tool is designed as a questionnaire totaling 23 items, consisting of ten items measuring pedagogical competence, four items measuring personality competence, four items measuring social competence, and five items measuring professional competence. This instrument is a rating scale ranging from one (bad) to four (good). The validity coefficient ranges from 0.588 to 0.841 when employing the items-total correlation analysis. The dependability coefficient while utilizing Cronbach's alpha was 0.985.

Statistical analysis

Data were analyzed using the structural equation modeling (SEM) method, a multivariate confirmatory statistical technique for simultaneously testing structural relationships among multiple variables. In statistical terms, the SEM is a combination of regression analysis and factor analysis. Two types of variables, latent and observed variables, are commonly used in SEM. Latent variables, often called factors, are abstract constructs that can only be measured indirectly by how they affect observed variables.

In contrast, observed variables, also known as indicators, can be measured empirically. In causal logic, the latent variable is the exogenous or independent variable, while the observed variable is the endogenous or dependent variable. The specification of the hypothesized model in this study can be seen in Figure 1. While the final results of SEM are theoretical models, theoretical summaries describe the relationships between variables typically represented by mathematical formulas. If a model can explain the phenomenon with a low error rate, it is said to be good.

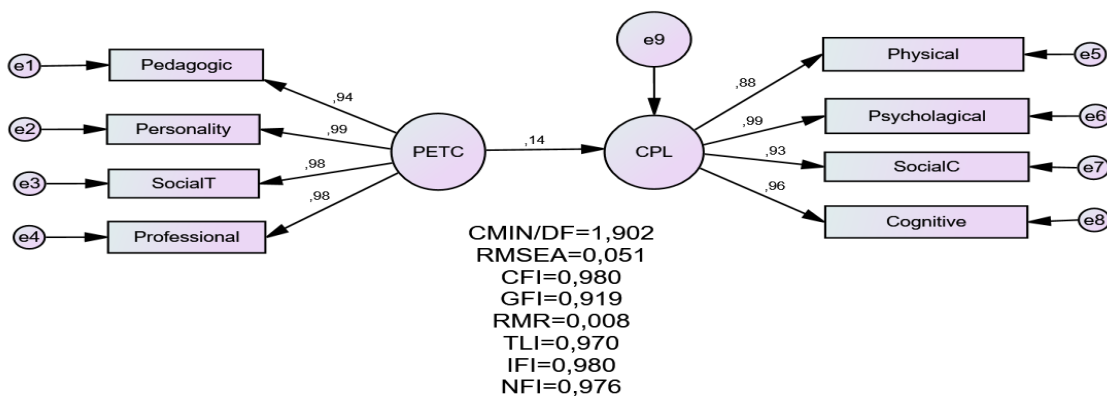


Figure 1) The causal structure of PETC and CPL. PETC=Physical education teacher competence; CPL=Children physical literacy; SocialT=Sosial teacher ability; SosialC=Sosial children ability.

There are two interrelated steps in SEM. First, there is a test of the model's accuracy by examining whether there is a significant difference between the model and the data. Second, the structural relationship of the model can be analyzed to test the fit of the theoretical model to the data if there is agreement between the model and the data. If the proposed theoretical model adequately explains the data, then the hypothesis is not accepted. That is, there is no difference between the model and the data. With an appropriate model, each hypothesis can be tested, showing the effect of one variable on another. The test criteria are based on $\chi^2/df < 2$, comparative fit index (CFI) ≥ 0.90 , incremental fit index (IFI) ≥ 0.90 , root mean square error of approval (RMSEA) ≤ 0.08 , and root mean square residual (RMR) ≤ 0.05 .

Findings

Observed reliability scores indicated that the scales used in this study had acceptable internal reliability for composite reliability (CR) > 0.70 and average variance extracted (AVE) > 0.50 [30]. Bivariate correlation showed a significant positive relationship with an R-value of 0.136 ($p < 0.05$; Table 1). Maximum likelihood was used to test the hypothesized path

model. With a multivariate kurtosis value of $18.237 > 2.58$, the data in the measurement model did not exhibit multivariate normality. The Bootstrap technique is one approach to dealing with multivariate non-normal data sets because the data distribution in this study was not normal. The Bootstrap method performs better than analytical procedures for time series data with excessive kurtosis [31]. The Bootstrapped sample distribution is used for further analysis and computing models, parameters, and standard errors.

The results of the SEM suggested that the revised model fit the data reasonably well, according to the goodness of fit indices: $\chi^2/df = 1.902$, CFI = 0.980, goodness of fit index (GFI) = 0.919, normed fit index (NFI) = 0.976, RMR = 0.008, RMSEA = 0.051, Tucker-Lewis index (TLI) = 0.970, and incremental fit index (IFI) = 0.980 (Figure 1). Pedagogical ability, personality ability, social teacher ability, and professional ability contributed sequentially to the variables affecting physical education teacher's competence. Physical, psychological, social, and cognitive abilities contributed to children's physical literacy variables (Table 2). There was a significant direct relationship between physical education teachers' competence and children's physical literacy ($r = 0.136, p = 0.015$).

Table 1) Correlation analysis

	Composite reliability (CR)	Average variance extracted (AVE)	Maximum shared variance (MSV)	Maximum Reliability (MaxR(H))	H Physical teacher (PETC)	education Children's physical literacy (CPL)
PETC	0.979	0.920	0.019	0.982	0.959	
CPL	0.934	0.781	0.019	0.954	0.136**	0.884

Table 2) Effect Size in the adjusted structural equation model

Dependent Variables	Independent Variable					
	PETS		CPL			
	DE	IE	TE	DE	IE	TE
CPL	0.136*(.015)	-	0.136*(.015)	-	-	-
Physical	-	0.131*(.02)	0.131*(.01)	0.877** (.00)	-	0.877**(.00)
Psychological	-	0.117*(.02)	0.117*(.02)	0.994** (.00)	-	0.994**(.00)
Social Children	-	0.124*(.02)	0.124*(.02)	0.934** (.00)	-	0.934**(.00)
Cognitive	-	0.109*(.01)	0.109*(.01)	0.960** (.00)	-	0.960**(.00)
Pedagogic	0.941**(.00)	-	0.941**(.00)	-	-	-
Personality	0.986**(.00)	-	0.986**(.00)	-	-	-
Social Teacher	0.985**(.00)	-	0.985**(.00)	-	-	-
Professional	0.980**(.00)	-	0.980**(.00)	-	-	-

PETC=Physical education teacher competence, CPL: Children's physical literacy, DE=Direct effect, IE=Indirect effect, TE=Total product; * $P < 0.05$, ** $P < 0.01$.

There was an indirect relationship between physical education teacher's competence and physical ability and a direct relationship between PETC and CPL ($r = 0.131; p = 0.02$).

There was an indirect relationship between PETC and psychological ability ($r = 0.117; p = 0.02$).

There was an indirect relationship between physical education teacher's competence and children's social skills ($r = 0.124; p = 0.02$).

There was an indirect relationship between physical education teacher's competence and cognitive ability ($r = 0.109; p = 0.02$).

Discussion

This study tested a theoretical model examining the influence of physical education teachers' competence on the physical literacy of elementary school students in Bojonegoro district, Indonesia. After failing to fit the model, subsequent analysis techniques showed an acceptable fit for the final model. The results revealed that, in general, physical education teachers' competencies contributed positively to their students' physical literacy. Quality physical education teacher competence can be one of the predictors of promoting students' physical literacy. These findings

were consistent with research suggesting that teachers provide quality physical education that supports students' physical literacy [17, 18]. Students with physical education teachers who are more competent in learning activities show better physical literacy levels than those taught by teachers with lower competencies.

In terms of the physical dimension, physical education teachers' competencies positively contribute to improving students' physical abilities. Physical education teachers are responsible for providing maximum time for physical activity, teaching skills, and organizing space, equipment, and students [32]. Physical education is essential for healthy child development, improving fitness, gross motor skills, and health [33]. Teachers can promote physical activity by teaching activities children can do independently, such as skipping, non-elimination tag, and tetherball [32]. They should set a good example by being physically fit, skilled in sports, and creative in planning and implementing lessons.

In terms of the psychological dimension, this study provides evidence that physical education teachers' competencies positively improve students' psychological skills. Physical education teachers seem to play an important role in promoting children's development of a stronger sense of self, including higher self-esteem and self-confidence [32, 34]. Physical educators can help children develop self-regulation skills, such as perseverance and goal-setting through the promotion of physical activity [33]. Physical education teachers can help children develop self-regulation skills, such as decision-making and self-determination, by providing opportunities for choice [35]. Physical education teachers can teach children interpersonal skills, such as communicating effectively, resolving conflicts, and working as a team [36, 37].

In terms of the social dimension of students, this study provides evidence that the competencies of physical education teachers positively affect the improvement of students' social skills. Physical education teachers can provide opportunities for children to work together, follow the rules, and communicate effectively, which can help children develop social skills, such as teamwork, communication, and cooperation [36]. Physical education can help students develop essential life skills, such as teamwork, leadership, and contact [38, 39]. Physical education teachers can promote physical activity to help children develop social skills, such as leadership, sportsmanship, and fair play [35].

In terms of the cognitive dimension, this study demonstrated that the competence of physical education teachers has a positive effect on improving children's cognitive skills. Physical education teachers can provide developmentally appropriate physical activities that require children to follow the rules and cooperate, which can help children develop cognitive skills, such as problem-solving, critical

thinking, and decision-making [33]. Physical education teachers can promote a positive and supportive environment. Physical education teachers can help children develop cognitive skills, such as self-control, attention, and memory [32]. Physical education teachers can significantly affect improved cognitive development, classroom behavior, and academic achievement [34].

Physical education teacher competence is essential in promoting students' physical literacy. Physical education teachers must possess the necessary skills to encourage students' physical literacy. Physical education teachers need to apply the principles of effective professional development in a contextually sensitive way that improves primary teachers' knowledge and practice of physical literacy [39]. If teachers want to incorporate physical literacy into students' techniques, it is necessary to unpack the concepts and what physical literacy looks like in practice [21]. The content of lessons and units, teaching approaches, and curriculum planning should all be involved in promoting physical literacy for students.

There is always room for further research to refine the findings of previous studies. Although this study found a positive effect of physical education teacher competence on physical education performance, it remains uncertain whether the improvement in physical education performance was solely the result of physical education teachers' competence or was influenced by other factors. Further research is expected to address this issue.

Conclusion

This study contributes to a better understanding of the influence of physical education teacher competence on students' physical literacy. Although many studies implicitly include physical education teacher competence dimensions with students' physical literacy (physical, psychological, social, and cognitive). To the author's knowledge, no study has simultaneously examined physical education teacher competence to predict students' physical, psychological, social, and mental dimensions using path analysis techniques. It is recommended that further studies be conducted to assess other factors in the school environment that may be predictive of students' physical literacy.

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