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Development and Validation of Physical Education Awareness Instrument (PEA-I)

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Abstract

***Research Background**: The importance of physical education in the development of young children has long been recognized. Despite this, there is a lack of a standardized instrument to accurately measure awareness of physical education among this demographic. The absence of such a tool hampers our understanding of children's perceptions and the impact of physical education on their overall well-being. **Purpose:** The primary objective of this study is to develop and validate the Physical Education Awareness Instrument (PEA-I) to assess young children's awareness of physical education. Through rigorous statistical techniques, including factor analysis and reliability assessment, the study seeks to establish the validity and reliability of the newly developed instrument. **Materials and Methodology:** The study involved 817 participants, randomly divided into two groups. The researchers utilized the expectation-maximization (EM) algorithm to handle potential missing values, although none were found in the collected responses. The first half of the sample (N = 317) underwent exploratory factor analysis (EFA) using IBM SPSS 26 for Windows. Latent root criteria and the Kaiser-Meyer-Olkin (KMO) index determined the optimal number of factors, indicating significant adequacy for principal component analysis (PCA). The EFA revealed a one-factor scale, with nine items demonstrating strong internal consistency (Cronbach's alpha ranged from 0.740 to 0.796). **Statistical Procedure:** Following the EFA, confirmatory factor analysis (CFA) was conducted on the second half of the sample using AMOS 23. All items in the CFA met the standard criterion, confirming the instrument's acceptable factor validity. The (PEA-I) exhibited good reliability and validity, establishing it as a robust tool to assess young children's awareness of physical education. **Results:** The results solidify the PEA-I as a valid and reliable measure of physical education awareness among young children. Its factor loadings, internal consistency, and factor validity indicate its effectiveness in assessing individuals' perceived awareness of physical education accurately. **Conclusion and practical implication:** The (PEA-I) has practical implications, serving as a valuable tool for identifying individuals' awareness of physical education and evaluating the effectiveness of physical education programs. Its potential to aid policymakers, physical educators, and health professionals is significant, as it emphasizes the importance of physical education in overall well-being and advocates for its inclusion as a compulsory subject in schools. This study contributes substantially to the field, underscoring the significance of physical education in fostering healthier lifestyles and well-rounded individuals. The findings highlight the need for increased awareness and the positive impact of physical education on youth development, shaping the discourse on its promotion among policymakers, educators, and health professionals.*

Keywords: *Awareness, physical education, Factor Analysis, Instrument, Validation*

1. Introduction

Physical education plays a vital role in the comprehensive development of young children, encompassing their physical well-being and their cognitive, social, and emotional growth. Regular

physical activity during early childhood has been widely acknowledged to contribute to improved motor skills, increased fitness levels, enhanced self-esteem, and better academic performance (Dowda et al., 2016; Tremblay et al., 2017). Therefore, fostering awareness and positive attitudes towards physical education among young children is imperative to encourage lifelong engagement in physical activities. Assessing children's awareness of physical education is critical to understanding their perceptions, attitudes, and knowledge in this domain. Previous research has explored various aspects related to physical education awareness, such as the benefits of physical activity (McKenzie et al., 2017), understanding of health-related concepts (Keating et al., 2019), and familiarity with physical education terminology (Webster et al., 2020). However, there is a need for a comprehensive and validated instrument that can effectively measure awareness of physical education among young children. The construction and validation of an instrument to measure awareness of physical education among young children will provide researchers, educators, and policymakers with a reliable tool to assess children's knowledge, attitudes, and perceptions regarding physical education. Such an instrument can inform the development of evidence-based interventions and curricula aimed at promoting positive physical education experiences and fostering a lifelong commitment to physical activity. To construct a robust instrument, it is essential to follow established guidelines and best practices in scale development. The process involves several key steps, including item generation, content validity assessment, pilot testing, and psychometric evaluation (DeVellis, 2017). Rigorous construction and validation procedures will ensure that the instrument accurately captures the intended constructs and yields reliable and valid results.

This study aims to contribute to the field by constructing and validating an instrument to measure awareness of physical education among young children. The instrument will be designed to capture various dimensions of physical education awareness, including knowledge of physical activities, understanding of health-related concepts, familiarity with physical education terminology, and attitudes toward physical education. It will be administered to a diverse sample of young children to ensure its applicability across different populations.

The findings of this study will have implications for educational and health professionals involved in promoting physical activity and well-being among young children. By providing a reliable and valid instrument, this research will facilitate accurate assessments of children's awareness of physical education, enabling educators to tailor interventions that effectively address knowledge gaps and misconceptions. Ultimately, fostering a positive awareness of physical education during early childhood can lay the foundation for a lifetime of healthy habits and overall well-being.

2. Materials And Methods

This study employed a rigorous methodology to investigate the sports backgrounds of physical education students at Lakshmibai National Institute of Physical Education, Gwalior, with a specific focus on assessing the representation of state and school-level games among the participants. Ethical approval for the study was obtained from the officiating Vice-Chancellor of the institute, ensuring compliance with ethical guidelines and the protection of participants' rights. A total of 817 students, including both male and female candidates, were selected for the study. These students were participating in the selection trials for the Bachelor of Physical Education program in various sports and were chosen from different regions of the country. Data collection was conducted in June 2022 using a purposive sampling technique. This approach was employed to ensure the inclusion of students who had minimal representation at state and school-level games in their respective sports. Participants were selected based on their eligibility and willingness to participate, and written informed consent was obtained from each participant. Trained research staff members were responsible for distributing and collecting the questionnaires. They also addressed any questions or concerns raised by the participants during the data collection process and the completion time for the questionnaire ranged from 8 to 10 minutes on average.

Designing The Awareness of Physical Education Questionnaire

The initially selected item pool was developed through a systematic review of the physical education literature published between 2022 and the present. The researchers conducted a literature review between January and May of 2022 in order to inform the focus group interviews used to determine certain essential qualities of Physical Education and correlations between these characteristics. The seven-member expert panel encompassed associate professors and professors with a collective total of at least 17 years of physical education classroom experience. Interviewees were recorded and transcribed by researchers. Circular content analysis was utilized to uncover the codes. Mary B. Miles, 1994 The researchers discussed their codes and their interrelationships in order to aid in the analysis of various instrument objects. The purpose of codes was to identify overarching concepts within which

more specific patterns could be comprehended. After items were drafted and revised, an 18-item version of the instrument was given to members of the focus group. They filled out a response form, assessed the intelligibility of the items, and suggested enhancements. A four-point Likert scale anchored by 1) "Low Degree" 2) "some Degree" and 3) "High Degree" was proposed as the effective means of accomplishing the intended outcomes, and the feedback suggested minor modifications to two items. (1995 according to Lovibond) There are three tiers: Low, Moderate, and High. The study encompasses multiple phases, including item generation, expert panel formation, and content validity assessment (Dubey et al., 2023).

The second (updated) edition of the instrument was given to four instructors and researchers in sports science, physical education, health education, and instrument development for their feedback. We solicited feedback on the item language, the duration of the instrument, the lucidity of the statement, and the answer type. Several revisions were made in response to their comments. In accordance with established methodological protocols, Likert (1932) proposed the utilization of a 5-point Likert scale as endorsed by the expert panel for the explicit purpose of elucidating attitudes. The feedback from the expert panel further recommended the elimination of three (3) items. Subsequently, a final set of 15 questions was established. This structured rating system, recognized for its efficacy in quantifying subjective responses, was deemed optimal for capturing nuanced variations in participant sentiments. The specialists made no additional construction recommendations. The initial instrument was well received and commented on as useful. A full outline of the items of the instrument which contained 15 questions on the understanding of physical education is shown in Table 1.

Table 1 Descriptive Statistics and Reliabilities Assessments Of (Pea-I)

SL.NO	***CHARACTERISTICS***	***Mean ± SD***	***Corrected item-subscale***	***α if item deleted***
1.	How much of a favorable impression did you have of your high school Physical Education teacher?	3.25±956	.699	.925
2.	How much do you like engaging in physical activity as a participant?	3.69±.789	.618	.921
3.	To what extent do you think physical education professionals get equal recognition in comparison to other field professionals?	3.17± .956	.536	.925
4.	How much encouragement did you get from your parents for pursuing a career in physical education?	3.60±.788	.501	.924
5.	To what extent do you think Physical Education should be a compulsory subject in schools?	3.70±.733	.716	.918
6.	To what extent do you think people/pupils who carry out physical education activities would have led more of a healthy lifestyle in comparison to those who are not?	3.55±.800	.687	.919
7.	To what extent do you think physical education does contribute to a wholesome development of personality?	3.65±.760	.670	.920
8.	To what extent do you think physical education mitigates stress and anxiety and helps you live a positive way of life?	3.62±.746	.711	.918
9.	To what extent is your peer group's perspective "positive" about physical education?	3.44±.829	.618	.921
10.	To what extent do you think physical education has provided and contributed a way out to live more of a healthy lifestyle post-COVID-19 occurrence?	3.59±.779	.701	.919
11.	To what extent do you think physical education is a multi-dimensional field?	3.60±.757	.750	.917
12.	To what extent do you think that physical education needs more awareness among youth?	3.63±.760	.694	.919
13.	To what extent do you think physical education provides relaxation and pleasure in life?	3.62±.724	.675	.919
14.	To what extent do you think physical education provides a chance to be in the mainfold in comparison to the other core professions?	3.60±.757	.750	.917
15.	To what extent do you think you have chosen physical education by your choice?	3.71±.703	.691	.919

Data Analysis

The researchers employed the expectation-maximization (EM) algorithm (Dempster AP, 1997) to estimate any missing values in the returned questionnaires. However, it was found that there were no missing data fields in the collected responses. A total of 817 samples were randomly assigned to two groups using a computer-generated randomization sequence (GraphPad Software, Inc.). The first survey," comprised 317 cases, while the second survey," consisted of 500 cases (Tabachnick GB, 2001). For data analysis, the researchers entered the responses from the first half of the split sample (N = 317) into the IBM SPSS 26 for Windows program. In this phase, the researchers conducted an exploratory factor analysis (EFA) to explore the underlying factor structure within the collected data. To validate and confirm the factor structure obtained in the first half of the split sample, the research team conducted a confirmatory factor analysis (CFA) using structural equation modeling (SEM) techniques. This analysis was performed on the second half of the split sample. CFA serves as a crucial step in refining the questionnaire instrument and identifying the underlying factor structure related to the awareness of physical education. The statistical software AMOS 23 was utilized to conduct the CFA and analyze the data obtained from the second half of the split sample. By employing these rigorous statistical techniques, the researchers aimed to ensure the validity and reliability of the questionnaire and provide a scientifically sound analysis of the perception of children on physical education as a profession.

3. Results

Results revealed a one-factor scale with an eigenvalue greater than 1. 0, accounting for percent of the total variance factor loading from .69 to .87. Nine items were retained. The internal consistency of each factor was assessed using Cronbach's alpha; These values ranged from .902 to .906, all meeting the criterion level of .70 (LJ, 1951) . The values of item and total correlation range from .667 to .729.

Result of Exploratory Factor Analysis (Efa) on Subset 1

The research team performed EFA for the first subset of the 18 items (see Table 1). The optimal number of factors was determined by latent root criteria (eigenvalues > 1.0, the Kaiser's criterion K1). The Kaiser-Meyer-Olkin (KMO) index of sampling adequacy appeared to be significant (.941). Bartlett's test of sphericity proved that correlations between items were large enough for conducting a principal components analysis (PCA) ($p < .001$; our model 0.000) (Tabachnick GB, 2001) . Communalities of the variable which were ranged from 0.547 to 0.633 and thus considered appropriate (Hair, Black, et al., 2019). The total variance explained was 60.834 and thus deemed as appropriate (Hair, L.D.S. Gabriel, et al., 2019) the factor loadings values ranged from 0.740 to 0.796 which were all above 0.50 which were deemed appropriate. 6 out of 15 items were deleted after initial factor analysis However, the deletion of 6 cases simultaneously led to an improvement in model fit Mario and Das (2022), and this resulted in the final factor as shown in the pattern matrix in Table 2.

With 1 variable factor, 1 component factor was found in the final analysis generally confirming the understanding of awareness about physical education. Items with the commonality of less than 0.40 were removed from the analysis (Kremers, 2008) and the PCA has computed again with all items greater than 0.50 in our final model. (Costello AB, 2005) Cross-loading items were dropped from the analysis, and the PCA was re-conducted. (A, 2005) In terms of the internal consistency of the factors, the research team used Cronbach's α for the entire data set (see Table 2), and all factors showed sufficient to good (>0.7).

Table: 2 Component Matrix

Question	Component
Q8	0.796
Q5	0.794
Q14	0.788
Q15	0.772
Q12	0.763
Q10	0.763
Q7	0.755
Q13	0.751
Q6	0.740

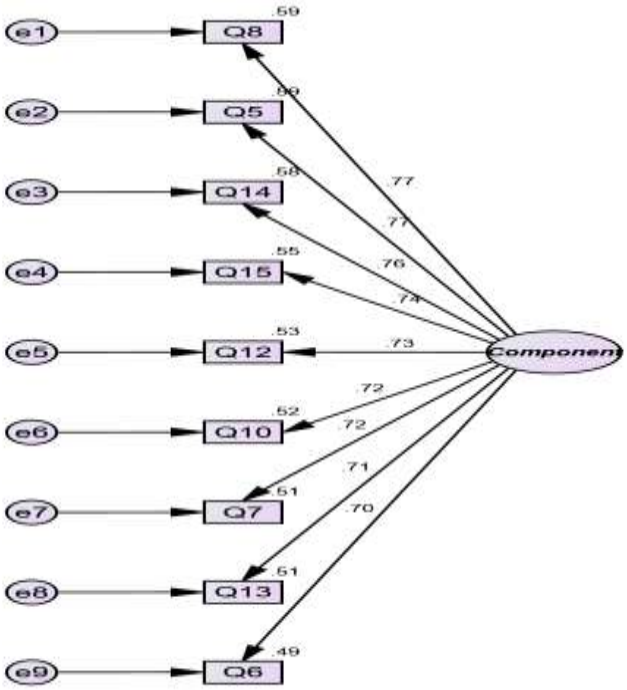
Extraction Method: Principal component Analysis

a. 1 component extracted

Result of Confirmatory Factor Analysis (Cfa) on Subset 2

IBM SPSS-Amos 23 was used for the confirmatory cross-validation of the single-factor structure discovered using EFA on the first subset. Researchers assessed the factorial validity of the four measures using confirmatory factor analysis. All items had factor loadings (Figure 1) above the threshold of 0.45 (Joreskog KG, 1989), indicating the factor validity of the measurement. Goodness-of-fit Index (GFI) values greater than 0.90 are accepted (Kline, 2005). Chi-square, CFI, and RMSEA were used to evaluate the model (PM, 1990). According to (JH, 1990), an acceptable model fit is one in which the chi-squares are not statistically significant. Analysis of a linear structural relationship utilising maximum likelihood and least squares techniques (Joreskog KG, LISREL V: Analysis of a linear structural relationship, 1981). CFI scores greater than 0.90 indicate a model with adequate fit. (1980, P.M. Bennett) The root-mean-squared error of approximation (RMSEA) is among the most useful fit indices in SEM. According to Hu and Bentler, a match with a score of.06 would be deemed satisfactory. CFI = 0.979, RMSEA = 0.038, CMIN/DF = 2.828, and SRMR = 0.030 (chi-square, p>.05). **(Cronbach's alpha ranged from 0.740 to 0.796).**

Fig.1. CFA Diagram



Start tools package offered by gaskin, J, (2016) has been used for the calculations of composite reliability, convergent and discriminant validity. The standardized loading estimates for all the variables were higher than 0.50.

Table 3: Validity Assessment of The Model with One Latent Variable

Component	Composite Reliability (CR)	Average Variance Extracted (AVE)	MaxR (H)
Component	0.914	0.541	0.915

Our model had one latent variable so there was no correlation matrix or MSV, no validity concerns here. (Hu, 1999) CR (Composite Reliability): CR is a measure of the internal consistency or reliability of a component or factor in a factor analysis. It assesses how well the observed variables within a component correlate with each other. A CR value of 0.914 indicates a high level of internal consistency, suggesting that the variables within the component are closely related. AVE (Average Variance Extracted): AVE represents the amount of variance captured by the component or factor. It measures the extent to which the observed variables within a component share a common variance. An AVE value of 0.541 suggests that, on average, the component explains 54.1% of the variance in the observed variables. This indicates a moderate level of shared variance. MaxR (Maximum R Squared): MaxR is a measure of the maximum proportion of variance in an observed variable that can be explained by the component. In this case, MaxR (H) likely refers to the maximum R-squared value for the component. A MaxR (H) value of 0.915 indicates that the component explains up to 91.5% of the variance in the

observed variables. These values provide insights into the reliability, amount of shared variance, and explanatory power of the component obtained through the factor analysis. The high CR and MaxR (H) values suggest that the component is reliable and explains a substantial proportion of the variance in the observed variables.

Table 4: Selected Items After Confirmatory Factor Analysis with Reliability Analysis For (Pea-I)

	CHARACTERISTICS	***α if item deleted***
Q8	To what extent do you think physical education mitigates stress and anxiety and helps you live a positive way of life?	.796
Q5	To what extent do you think Physical Education should be a compulsory subject in schools?	.794
Q14	To what extent do you think physical education provides a chance to be in the manifold in comparison to the other core professions?	.788
Q15	To what extent do you think you have chosen physical education by your choice?	.772
Q12	To what extent do you think that physical education needs more awareness among youth?	.763
Q10	To what extent do you think physical education has provided and contributed a way out to live more of a healthy lifestyle post-COVID-19 occurrence?	.763
Q7	To what extent do you think physical education does contribute to a wholesome development of personality?	.755
Q13	To what extent do you think physical education provides relaxation and pleasure in life?	.751
Q6	To what extent do you think people/pupils who carry out physical education activities would have led more of a healthy lifestyle in comparison to those who are not?	.740

NOTE- Cronbach's alpha for full scale is .795

Table 4 showcases the key items selected following a confirmatory factor analysis (CFA) alongside a reliability analysis. The Cronbach alpha's value general accepted rule is that α of 0.6-0.7 indicates an acceptable level of reliability (Hulin, Netemeyer, and Cudeck, 2001). With individual item alpha values ranging from 0.740 to 0.796, scale is likely demonstrating good reliability, as all values fall within the range considered acceptable or better. In the present study, a meticulous interpretation of scores derived from a 5-point Likert scale questionnaire was conducted, employing well-defined cutoffs and categories to gain a nuanced understanding of participants' attitudes. The computation of total scores involved summing participant responses across all items, with the potential range extending from the minimum possible score (sum of all 1s) to the maximum (sum of all 5s), contingent upon the number of items. Specific cutoffs were implemented to categorize participants distinctly: scores falling between 1 and 2 signified low agreement or a negative attitude, while a score of 3 denoted a neutral or moderate level of agreement. Scores between 4 and 5 were indicative of high agreement or a positive attitude. This interpretative framework was contextually aligned with the research goals, ensuring congruence with the nature of the construct under examination. Such a systematic approach facilitated a structured categorization of participants, providing valuable insights into sentiment distribution within the study population. Therefore, it can be deduced that a higher score on the instrument is indicative of an elevated level of awareness regarding physical education among the study participants M L Kamlesh (1990). This inference aligns with the established understanding that increased scores on the measurement tool correspond to heightened levels of awareness within the observed population.

Discussion

The study conceptualized a construct and developed and validated an instrument to measure awareness of physical education among young children. The results show that the instrument has good validity and reliability of a scheme designed to measure the physical education awareness of students. Physical education should be a compulsory subject in schools, pupils who carry out physical education activities would have led more of a healthier lifestyle in comparison to those who do not, physical education contributes to a wholesome development of personality, physical education mitigates stress, and anxiety and helps to live a positive way of life, physical education has provided and contributed a way out to live more of a healthy lifestyle post covid –19 occurrences., physical education needs more awareness among youth, physical education provides relaxation and pleasure towards life, physical education provides a chance to be in the main folds in comparison to another core profession, one has chosen physical education by their own choice. The researcher believed that there was a lack of studies

contributing to the awareness of physical education among students who were at the verge of pursuing higher education. As there was no appropriate tool to investigate or measure the level of awareness in physical education, as a result, the PEA-I (physical education awareness instrument) was made to fill the gap, With the novelty in the crux of the results of this empirical study which also appeared to be consistent with the attributes for the execution of the study as showing a significant result, on all 9 items. There are several practical implications. First, it should be highlighted that this instrument is an appropriate testing tool for identifying an individual's perceived awareness of physical education. As such, the instrument can be considered a measure of generalized physical education which is particularly useful for students because they should be involved in different physical activities that are aimed to develop their fundamental knowledge of a wide spectrum and internalize their physical education career. Second, this instrument can be devised to investigate the level of physical education awareness among students, studying in various parts of the nation, about their aspirations in physical education. Third, It's the most critical issue faced by the Indian government in terms of achieving medals at the Olympic podium at par with other Nations having population. This instrument will play a key role in acknowledging the power of physical education. In modern society, and also for the upcoming promising researchers to work. Results will provide policymakers, physical educators, and health professionals with an understanding of the need to uplift the level of physical education in the nation and also a drastic change in the paradigm of young minds.

4. Conclusion

This study aimed to develop and validate an instrument, the Physical Education Awareness Instrument (PEA-I), to measure the awareness of physical education among young children. The results of the factor analysis and reliability assessment indicated that the PEA-I has good validity and reliability for measuring physical education awareness. The study found that physical education should be compulsory in schools, as it contributes to a healthy lifestyle, wholesome personality development, stress and anxiety reduction, and post-COVID-19 well-being. The research emphasized the need for increased awareness of physical education among youth and its positive impact on individuals' lives. The study employed a meticulous interpretation of scores from a 5-point Likert scale questionnaire, utilizing specific cutoffs for categorization. Total scores were computed by summing participant responses, ranging from low to high agreement. The systematic approach provided valuable insights into sentiment distribution, concluding that higher scores corresponded to elevated awareness of physical education among participants, aligning with established understanding in the field. The PEA-I provides a valuable tool for assessing students' perceived awareness of physical education, which can be useful for understanding their aspirations in the field and evaluating the effectiveness of physical education programs. It can also aid policymakers, physical educators, and health professionals in recognizing the importance of physical education in national development and fostering a paradigm shift in the minds of young individuals. This study contributes to the field by providing a validated instrument and highlighting the significance of physical education in nurturing healthier and well-rounded individuals. This instrument which has been developed to measure awareness of physical education among young children in this context has been found to be valid and reliable. This instrument can be used to measure awareness of physical education among young children and particularly for those who have passed schooling and are about to enter college that incorporates physical education in the general physical education curriculum itself. The research is successfully constructed and validated an instrument to measure awareness of physical education among young children, the instrument is a reliable and valid tool for measuring this construct in this population. This would be an important contribution to the field of physical education research, as it allows for more accurate measurement and assessment of children's awareness of physical education. Embracing the competitive spirit in sports entails finding fulfillment not only in victory but also in achieving personal excellence and self-satisfaction. In a world where winning is not guaranteed for everyone, deriving a sense of contentment from one's performance becomes essential. Equally important is instilling a genuine passion for the sport in young individuals, ensuring their enduring participation, be it in competitive arenas or recreational settings (Dubey & Choudhary, 2022). Additionally, the study may have identified factors that are associated with awareness of physical education among young children, such as demographic variables or educational experiences. These findings could be used to inform the development of interventions aimed at increasing children's awareness of physical education and improving their overall enrolment in colleges that have physical education in their curriculum.

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Conflict of interest

We declare that there is no conflict of interest.

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