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Perceived physical literacy instrument for adolescents: A further validation of PPLI

K.W.R. Sum ^{a,*}, C.F. Cheng ^b, T. Wallhead ^c, C.C. Kuo ^d, F.J. Wang ^b, S.M. Choi ^a^a Department of Sports Science and Physical Education, The Chinese University of Hong Kong, Hong Kong^b College of Sports and Recreation, National Taiwan Normal University, Taiwan, ROC^c Division of Kinesiology and Health, University of Wyoming, USA^d Department of Physical Education, Tung Hai University, Taiwan, ROC

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ABSTRACT

The purpose of this study is to examine the reliability and validity of “Perceived Physical Literacy Instrument” (PPLI) questionnaire in adolescents. Methods: Based on physical literacy literature, a 9-item instrument was developed for initial tests. The self-report measure was administered to 1945 adolescents in Hong Kong. Confirmatory factor analysis (CFA) was used to examine a three-factor structure of physical literacy. A chi-square difference test analysed several competing models and compared the results between the proposed models (i.e., a three-factor solution) and other alternative models (i.e., a one-factor or two-factor solution). Furthermore, the measurement invariance across gender groups was examined by using multiple-group confirmatory factor analysis. Mean scores for physical literacy factors were also examined by demographic characteristics. Results: Confirmatory factor analysis (CFA) showed that the construct demonstrated a good fit to the model. For convergent validity, our results, evaluating the factor loading of each items, the values of composite reliability (CR) and the average variance extracted (AVE) of the three factors, revealed that the three-factor validity of physical literacy was satisfactory. The chi-square difference test between models was significant indicating that all the latent variables had satisfactory discriminant validity. Moreover, the findings of measurement invariance showed that the PPLI is invariant across gender. Conclusions: The PPLI thus appeared to be reliable and valid as a measure of the perceived physical literacy of adolescents. Thus, along with other validated instruments, protocols and research designs, the PPLI could be widely used to test adolescents’ self-perception of physical literacy and their own physical and mental health conditions and thereby health. Physical education professionals may thus recommend appropriate intervention programmes for younger generations.

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Introduction

The development of individual physical literacy has been recognised as critically important to long-term individual health. Several international agencies have suggested that it is a necessary disposition for children and adolescents of all abilities to establish

* Corresponding author. Department of Sports Science and Physical Education, Chinese University of Hong Kong, G09, Kwok Sports Building, Shatin, N.T., Hong Kong.

E-mail addresses: kwsun@cuhk.edu.hk (K.W.R. Sum), chihfucheng@gmail.com (C.F. Cheng), wallhead@uwyo.edu (T. Wallhead), chechunk@gmail.com (C.C. Kuo), arno1991324@gmail.com (F.J. Wang), choisiuming@link.cuhk.edu.hk (S.M. Choi).

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lifelong adherence to physical activity.^{1,2} Physical literacy is not equivalent to physical activity, but rather an intelligence related to physicality, which is an important antecedent to physical activity.³ In this sense, individuals might not participate in physical activity without the understanding of physical literacy, yet through participating in physical activity, they can develop as physically literate individuals. Physically literate adolescents can gain self-confidence in fundamental movement, coordination and control in their changing environments through physical activity. Therefore, physical literacy is also developed through participation in physical activity. The components of physical literacy and physical activity are interlinked and concomitant. Physical literacy is considered to be an integral component of whole-person

development which is made up of a wide range of intelligences.⁴ Physical literacy is a specific intelligence that includes the motivation, confidence, physical competence, and knowledge and understanding to value and take responsibility for maintaining purposeful physical pursuits and activities throughout the course of one's life.⁵

Understanding adolescent physical literacy development remains a priority as levels of physical activity participation within this population have continued to decline due to an increase in sedentary lifestyles.⁶ These reduced patterns of physical activity seem to also continue into adulthood which may have implications for their future lifestyle and subsequent health and well-being.⁷ The benefits of higher levels of physical literacy remain unanswered in literature,⁸ therefore understanding the development of adolescents' physical literacy not only prepares the adolescents of today to live a healthier lifestyle, but also may have implications for future generations to establish lifelong physical activity behaviours.

Physical literacy is developed through participation in physical activity.³ From this connection, United Nations Educational, Scientific and Cultural Organization (UNESCO)⁹ has asserted that quality physical education (QPE) should be a core component of school curricula as it is a foundation for a lifelong engagement in physical activity and sport for adolescents. QPE is designed to help students develop an interest in sports, engage regularly in physical activity, and lead an active and healthy lifestyle.⁹ Adolescents are entitled to a learning experience in QPE which develops their physical literacy and fosters the following key attributes: 1) their physical self and self-confidence; 2) motivation to engage; 3) how they interact with the environment, self-express and communicate with others, and 4) knowledge and understanding of how to maintain physical activity.⁴ Therefore, when adolescents acquire physical literacy, they have self-confidence in fundamental movement, coordination and control with respect to the changing environment. They can also demonstrate verbal and non-verbal communication to interact with other people in a physical environment, and enjoy discovering new physical activities.

Over the past two decades, the assessment of physical literacy has mainly focused on the demonstration of fundamental movement skills or sports talent identification.^{10,11} This assessment remains a somewhat narrow interpretation of physical literacy, which is biased towards skill-oriented assessment.³ Lundvall¹² has argued that this narrow assessment of physical literacy is insufficient in terms of understanding the complexity of the concept and has suggested that other aspects of physical literacy should be assessed. These physical literacy attributes should include "states of being"¹³ such as physical movement competency, and knowledge and understanding of how to be physically active, but also "health behaviour determinants"¹³ such as having the necessary motivation and confidence to want to be active. Despite this warrant there remains a dearth of instruments that have been validated to capture the broader attributes of physical literacy. Sum et al.¹⁴ provided an initial self-report instrument namely Perceived Physical Literacy Instrument (PPLI) that was designed to measure physical education teachers' perception of their own physical literacy in terms of their sense of self and self-confidence, self-expression and communication with others, and knowledge and understanding. The original PPLI has gone through a comprehensive literature review of physical literacy by focus group interviews utilising experienced physical education subject specialists followed by a panel of four experts from sports science, physical education, health education and instrument development in order to comment upon and revise the initial instrument. The PPLI appeared to be reliable and valid in order to measure the perceived physical literacy of physical education teachers.

Given the importance of physical literacy in the above key

attributes particularly for adolescents and given that there was no self-report instrument to measure the self-perception of physical literacy of adolescents, the purpose of this study is therefore to examine the reliability and validity of "Perceived Physical Literacy Instrument" (PPLI) questionnaire in adolescents.

Methods

Designing the PPLI instrument

The version of the PPLI was constructed based upon the "Perceived Physical Literacy Instrument" (PPLI) for physical education teachers.¹⁴ The PPLI consists of 9 items scored on a 5-point Likert scale (1 = strongly disagree and 5 = strongly agree) (see Table 1). The 9 items of the PPLI are equally divided into three subscales including: "knowledge and understanding" (3 items), "self-expression and communication with others" (3 items), and "sense of self and self-confidence" (3 items). Confirmatory factor analysis (CFA) showed that the construct demonstrated a good fit to the model. Since the questioning tone is quite generic and not designed for a designated population or profession, there were no changes made to the vocabulary for the adolescent population.

Data collection and sampling

The participants of this survey were Chinese adolescents from secondary schools in Hong Kong. A total of 1945 Hong Kong adolescents from 11 randomly selected secondary schools (ages 11–19) agreed to participate in this study after letters of invitation were sent to their school principals and PE teachers. All participants were asked to provide informed consent with emphasis on the voluntary nature of the survey before participating in the study. Approval for the use of human subjects was obtained from the first author's University Survey and Behavioural Research Ethics Committee.

Two classes were randomly selected in each grade (secondary one to secondary six) and parental consent was obtained before the questionnaire was distributed. The questionnaires were distributed to the participants by a research assistant in quiet conditions before the physical education classes. The research assistant was available to clarify questions raised by the participants and the questionnaires were returned within the lesson. The average range of questionnaire completion time was 8–10 min.

Data analysis and results

The research team used SPSS version 22 for Windows for the data analysis. The expectation-maximization (EM) algorithm was employed to estimate missing values in returned questionnaires. The research team implemented an *ad hoc* deletion of missing data before proceeding to the next step. In advance of validation of the

Table 1
Original 9-items of perceived physical literacy instrument for PE teachers.

Item	Items
PL1	I am physically fit, in accordance with my age.
PL2	I have a positive attitude and interest in sports
PL3	I appreciate myself or others doing sports
PL4	I possess self-management skills for fitness
PL5	I possess self-evaluation skills for health
PL6	I have strong social skills
PL7	I am confident in wild/natural survival
PL8	I am capable in handling problems and difficulties
PL9	I am aware of the benefits of sports related to health

All items are measured on a 5-point Likert scale (1: strongly disagree to 5: strongly agree).

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