Validity and reliability of questionnaires measuring physical activity self-efficacy, enjoyment, social support among Hong Kong Chinese children

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ABSTRACT

Background: Physical activity (PA) correlates have not been extensively studied in Hong Kong children.
Objective: The aim of this study is to assess the validity and reliability of translated scales to measure PA related self-efficacy, enjoyment and social support in Hong Kong Chinese children.
Methods: Sample 1 ($n = 273$, aged 8–12 years) was recruited (May–June, 2013) from two primary schools. Confirmatory factor analyses (CFA) were conducted to assess factorial validity. Criterion validity was assessed by correlating measured constructs with self-reported PA. Cronbach's alpha was computed to assess scale internal consistency. The intraclass correlation coefficient (ICC) was performed to assess scale test–retest reliability. Criterion validity was further examined in Sample 2 ($n = 84$, aged 8–12 years) from a third school by correlating measured constructs with objectively measured PA collected in September 2013 and February 2014.
Results: The CFA results supported the one-factor structure of the scales. All PA correlates were significantly ($p < 0.01$) associated with self-reported PA in Sample 1. Self-efficacy and enjoyment were significantly ($p < 0.05$) correlated with objectively measured PA in Sample 2. All the scales demonstrated acceptable internal consistency. All ICC values of the scales suggested acceptable test–retest reliability.
Conclusion: The results provide psychometric support for using the scales to measure PA correlates among Hong Kong Chinese children.

Introduction

The benefits of physical activity (PA) for children have been well documented (Biddle et al., 2004; World Health Organization, 2010). However, a large proportion of children do not perform PA at levels necessary to enhance health (Biddle et al., 2004; Troiano et al., 2008), including Chinese children in Mainland China (Wang et al., 2013) and Hong Kong (Sports Commission of Hong Kong Special Administrative Region Government, 2012). Only 9% of Hong Kong primary school children (7–12 years old) accumulated at least 60 min of moderate-to-vigorous physical activity (MVPA) every day (Sports Commission of Hong Kong Special Administrative Region Government, 2012). Thus effective strategies are needed to promote PA among Hong Kong children. Identifying and understanding the factors associated with PA are needed to modify the behavior (Sallis and Owen, 1999).

In western countries psychosocial variables, such as self-efficacy and social support, have been positively associated with children's PA (Van der Horst et al., 2007). Enjoyment of PA was a mediator of the effect of a school-based PA intervention (Dishman et al., 2005). Few measures have been validated of such PA correlates in Chinese. One questionnaire, developed for Taiwanese adolescents, measured PA correlates based on the health promotion model (Wu et al., 2002), and one questionnaire, developed for Hong Kong children, measured psychosocial and environmental correlates (Huang et al., 2011). The latter questionnaire included items to measure self-efficacy, peer support, and family support, but focused on the influence of environmental factors (Huang et al., 2011). The self-efficacy measure focused on children's confidence in finding and creating an environment to support their PA, not a suitable measure for the overall self-efficacy including barriers-efficacy, seeking-support-efficacy, being active despite competitive activities, and engaging in the task of being regularly active. Peer support was only captured by two items (being physically active with me; and offer encouragement to be physically active); and enjoyment was not examined, thereby limiting their use. Studies of PA correlates among children speaking Cantonese Chinese, like the children in Hong Kong, would benefit from having documented validated full scales of self-efficacy, peer and family support, and enjoyment of PA.

This study examined the validity and reliability of instruments to assess PA self-efficacy, PA enjoyment, and social support for PA among Hong Kong Chinese children.

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Methods

Participants

A sample (Sample 1) of 273 Chinese children (134 girls and 139 boys) in grades 3–6 were recruited from two Hong Kong Government primary schools. An additional sample (Sample 2) of 84 children (33 girls and 51 boys) in grades 4–6 was recruited from a third similar school to further examine the criterion validity of the scales. All participants had no restrictions, such as physical or psychological limitations, to engage in PA. Both participants and their guardians provided written informed consent. The study was approved by the Senate Committee on the Use of Human and Animal Subjects in Teaching and Research, Hong Kong Baptist University.

Tested questionnaires

An 8-item scale was used to measure PA self-efficacy (see Appendix). The items were taken from a previously validated instrument (Motl et al., 2000), and modified based on a published simpler version (Ward et al., 2007, p.243). The modifications included: 1) shortening the items, 2) specifying video game as sedentary video game, since active video game could lead to light to moderate PA (Liang and Lau, 2014) and has been positively associated with self-reported PA (Simons et al., 2012), and 3) replacing one item ("I have the coordination I need to be physically active during my free time on most days") with another one ("I can do active things because I know how to do them"). These modifications were based on the target population being younger than the previous study (Motl et al., 2000). Each item used a Likert scale ranging from 1 ("Disagree a lot") to 5 ("Agree a lot").

A 5-point Likert scale (Ward et al., 2007, p.244) was used to measure PA enjoyment ranging from 1 ("Disagree a lot") to 5 ("Agree a lot"). All 7 items (e.g., "When I am active, I feel bored") were negatively worded; thus higher scores indicated lower PA enjoyment. These 7 items were taken from a modified 16-item version (Motl et al., 2001) of Physical Activity Enjoyment Scale (PACES) (Kendzierski and DeCarlo, 1991). The other 9 items were all positively worded, and were found associated with an irrelevant methodologic effect which may explain the lack of support for the unidimensional structure of the original PACES (Motl et al., 2001).

Ten items adapted from the Social Support for Exercise Scale (Sallis et al., 1987) were used to measure social support for PA. The word "exercise" was changed to "PA" in the present study. Although the scale was developed for college students, the 10 items have been used in a younger population (12.55 ± 0.65 years old) (Hsu et al., 2011). Children rated how often they received PA related social support (e.g., "During the past three months, my family or friends discussed PA with me") on a 5-point scale (1 = none to 5 = very often). There was also a rating of "do not apply".

No culture-specific items were identified (judged by LY and LPWC) in the English items. Therefore all the items were translated from English to Chinese by two bilingual Chinese researchers (two Ph. D. students who have experience in PA epidemiology and translating surveys from English to Chinese), and consensus was achieved by discussion with a bilingual expert panel (including the translators, two researchers in exercise science, and two authors LY and LPWC). LPWC made all final decisions based on the discussion. Back-translation was then conducted by an independent translator. A satisfactory version was reached by discussion of the panel. Cognitive interviews were conducted with a separate sample (n = 16) of similar age from one of the participating schools. Participants were asked whether they completely understood the items in the translated questionnaires, and if not, which of the alternative expressions sounded more understandable. Minor changes (e.g., because children did not understand "does not apply" in the social support scale, so this rating was excluded) were made by the expert panel based on the responses from these interviews.

This multistep approach was conducted for the translation because it "could provide a series of filters that function in tandem to ferret out both obvious and subtle defects in the questions" (Willis et al., 2010). The specific items of each scale are provided in the appendix.

Children's physical activity behaviors

To test scale criterion validity, a previously validated questionnaire (Children's Leisure Activities Study Survey questionnaire-Chinese version, CLASS-C) (Huang et al., 2009), was completed by participants. Children reported the total time they spent in PA in the past week with a checklist of activities during weekdays and weekend days. The questionnaire was scored for the daily time spent in MVPA (Huang et al., 2011).

Objectively measured PA was assessed in Sample 2 using the triaxial GT3X accelerometer (ActiGraph Ltd, Pensacola, FL, USA). Children were instructed to wear the accelerometer on their right hip during waking hours, except during bathing, water sports or contact sports for 7 consecutive days. If the wearing time was 480 min or more a day, that day was completed. Non-wear time was defined as 20 min or more of consecutive 0 s. To be included in the analyses, subjects needed to provide at least 2 completed weekdays and 1 completed weekend day. Age-specific cut-off points were used to determine the minutes of MVPA (Freedson et al., 2005). The average minutes of daily MVPA was computed. In addition, vector magnitude (VM) counts per minute (cpm) was also derived to reflect the overall PA (Yildirim et al., 2011).

Height and weight

In Sample 1, children reported their heights and weights in questionnaires. In Sample 2, standing heights were measured to the nearest 0.1 cm using a portable stadiometer (Seca, Model 214, Hamburg, Germany). Weight (measured to the nearest 0.1 kg) was assessed using an electronic scale (Tanita, Model TBF-410GS, Tokyo, Japan). Body mass index (BMI) was computed (weight in kilograms divided by height in meters squared), and BMI percentiles were computed based on an international sample as recommended by Cole and Lobstein (2012).

Procedures

The main study was conducted from May to June, 2013. Children (Sample 1) were surveyed during physical education classes or school recess, and were encouraged to ask questions as necessary. To assess test–retest reliability, the questionnaires were administered on two occasions 7 days apart. Each time took approximately 15–20 min for participants to complete the questionnaires. The criterion validity of the scales was further examined in Sample 2 by correlating the correlates with the objectively measured PA collected in September 2013 (n = 49) and February 2014 (n = 35). The two rounds of data collection is because the objectively measured PA data were collected for another school-based PA intervention study, for which baseline data were collected at the beginning of two semesters as specified above. Children who would like to take part in the intervention study and provided both self-reported PA and objectively measured PA data at baseline, no matter whether they met the inclusion criteria for the intervention study, were included in Sample 2.

Data analysis

Scale factorial validity was tested by confirmatory factor analyses (CFA) using Amos 21.0 (IBM Inc. Armonk, NY) with the maximum likelihood model. The sample size (Sample 1) was adequate to conduct CFA since the ratio of the sample size to the number of freely estimated parameters was greater than 10:1 (Bentler and Chou, 1987). Since the four scales were supposed to be unidimensional, the one-factor model