Original research

How important is young children's actual and perceived movement skill competence to their physical activity?

Sarah Slykerman [a], Nicola D. Ridgers [b], Christopher Stevenson [a], Lisa M. Barnett [a],*

[a] School of Health and Social Development, Deakin University, Australia
[b] Centre for Physical Activity and Nutrition Research, Deakin University, Australia

ABSTRACT

Objectives: To determine the associations between young children's actual and perceived object control and locomotor skills and physical activity and whether associations differ by sex.
Design: Cross sectional study.
Methods: A total of 136 children consented. Children had actual skill (Test of Gross Motor Development-2), perceived skill (Pictorial Scale of Perceived Movement Skill Competence for Young Children), and moderate- to vigorous-intensity physical activity (MVPA) (accelerometers) assessed. Independent t-tests assessed sex differences. A regression (with MVPA as the outcome) was performed with all predictor variables (i.e. Actual Object Control, Actual Locomotor, Perceived Object Control, and Perceived Locomotor). Model 2 also adjusted for age, sex, accelerometer wear time and whether the child was from an English speaking background. Interaction terms between the respective actual or perceived skill factor and sex were added to assess sex differences.
Results: Analyses were conducted on 109 children (59 boys, 50 girls; mean age = 6.5 years, SD = 1.0). Boys had higher actual and perceived object control skill and were more active by an average of 19 min per day. There were no sex differences in locomotor skills. There were no associations between skill factors and MVPA, except for girls, where locomotor skill was a significant predictor of MVPA ($B = 3.66$, $p = 0.016$).
Conclusions: Actual rather than perceived skill competence was more important to MVPA in this sample. Locomotor skill competence may be more important than object control skill competence for girls as they may engage in types of physical activity that do not require object control mastery.

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1. Introduction

There is concern children are not participating in the recommended 60 min per day of moderate- to vigorous-intensity physical activity (MVPA).[1] Research has shown it is important to understand the correlates that may influence children's physical activity participation[2] as without movement skill competence (e.g. the ability to throw, kick and jump proficiently) and a positive perception of such, children may be less likely to be physically active.[3,4] Stodden and colleagues[5] describe this process as a positive spiral of engagement in their conceptual model. Children's physical activity participation influences their motor skill development,[5] and in turn their movement competence influences their physical activity

engagement. Perceived movement competence is described as a mediator in this model that also influences levels of physical activity.[5] In young children (<8 years) movement competence is developing and perceptions of competence tend to be inflated. As children age, their perceptions of their abilities better reflect their actual motor competence.[5] Thus, the model purports that relationships between the constructs will increase in strength as children age.

Whilst the relationship between movement skill competence and physical activity is fairly well established,[4] studies in young children (<8 years) have shown varying associations between skill type (i.e. object control and locomotor) and between boys and girls.[6] Hardy[7] and LeGear[8] found young girls (preschool and kindergarten age, respectively) had better locomotor skills than boys, potentially due to the rhythm and balance required to perform these skills. However, this ability may not translate to physical activity, with a study in similar-aged children finding an inverse association between locomotor ability and physical activity in girls.[9] In contrast, young boys have better object control skill than

* Corresponding author.
  E-mail addresses: sarah.slykerman@deakin.edu.au (S. Slykerman),
nicky.ridgers@deakin.edu.au (N.D. Ridgers), christopher.stevenson@deakin.edu.au
(C. Stevenson), lisa.barnett@deakin.edu.au (L.M. Barnett).

girls[7] and object control competence has been associated with physical activity in boys.[9] Interestingly, two recent studies have recently reported that both object control and locomotor skills were associated with physical activity in young children,[10,11] with one of these studies noting that sex did not influence the relationship between object control competence and physical activity.[11] Given the mixed findings to date, it is clear that further research is needed to understand these relationships in young children.

Few studies have focused on perceived competence in young children.[3,12,13] Young children tend to inflate their perception of their physical competence and therefore perceptions are not always accurate when matched with teacher's perceptions of their fundamental movement skills.[14,15] Nevertheless it is still important to investigate perceived competence in young children as it is a known determinant of physical activity in older children and adolescents.[3] Existing studies tend to investigate more general perceptions of physical competence. One study in young obese children (aged 5–9 years) found perceived competence was not associated with physical activity.[13] In contrast, Robinson and colleagues reported a moderate positive association between perceived competence and physical activity in younger children (mean age of 4 years).[12] Interestingly, Robinson also reported that children in this study exhibited low perceived physical competence scores in comparison to other similar populations. This is a concern as children with low self-perceptions may lose motivation and interest in movement related tasks, leading to lower levels of physical activity.[12] This also reinforces the need to investigate perceived physical competence in this age group.

Studies investigating perceived movement competence in young children have not aligned the assessment of actual skill with the assessment of perceived movement competence.[8,12] In other words, children complete assessments of actual skills that do not match the same skills they are asked to rate how good they are at. For instance, one commonly used instrument does not have an object control item for the preschool age group, and for the school age group, only one of the six items is an object control item.[14] It is possible that children may have different perceptions of how good they are depending on the type of skill.[16] Only one other study could be located that has explored skill type in terms of competence perceptions and their association with physical activity. Barnett and colleagues used the TGMD-2 to assess object control skills, but unlike other studies, assessed perceived competence in object control skills using the same pictorial instrument as the current study, which matches skill perceptions to the TGMD-2 skills.[17] The purpose of the current study was therefore to determine if actual and perceived skills (in terms of object control and locomotor) are associated with young children's MVPA and whether observed associations differed by sex.

2. Method

This cross-sectional study was approved by the University Human Ethics Advisory Group-Health. Convenience sampling was used to recruit from two primary schools in Victoria, Australia, with School Principals providing written consent for the schools to participate in June 2013. Children were eligible to participate if they were in the first three years of school (Prep-Grade 2; aged 5 to 8 years) and returned their parental consent form. Informed written parent/guardian consent was obtained for 136 children (44% consent response rate; 136/308). Demographic information was parent-reported through a survey returned at the time of consent. Information reported included child date of birth, parent country of birth, whether English is the language spoken at home, and parents highest level of education. Data were collected in August 2013.

The Test of Gross Motor Development-2 (TGMD-2) was used to evaluate children's actual Fundamental Movement Skill (FMS) competence, in six object control skills (throw, catch, roll, kick, hit and bounce) and six locomotor skills (run, gallop, hop, leap, jump and slide).[18] Each skill has between three and five performance component indicators.[18] If children successfully execute a component of the skill, they received a score of one, or a zero if not. Children completed two trials of each skill live in the field and the sum of each skill score was summed to obtain an overall object control skill (max out of 48) and locomotor skill score (max out of 48).[18] Inter-rater reliability was conducted for 21/63 paired rater combinations in this study, which equated to 252 skill tests. The overall ICC was 0.78 (95% confidence intervals 0.54–0.91) indicating good reliability between raters for the scores given.

Children's perceived FMS were assessed using a modified version of the Pictorial Scale of Perceived Competence and Acceptance for Young Children[14] which assessed the same 12 skills assessed in the TGMD-2.[16] Each child was shown an illustration of six object control and six locomotor skills, where a boy or girl completing that skill 'competently' or 'not so competently' was presented. All children were asked if they were like the child illustrating the task competently or the child illustrating the task performed not as competently. If the child selected the competent illustration, they were then asked if they were 'really good' at the skill or 'pretty good' at the skill.[16] If the child selected the not so competent illustration, they were then asked if they were 'not too good' at the skill or 'sort of good' at the skill. Each item was scored on a one to four scale, with one indicating low competency to four being highly competent. This process was repeated for all 12 skills to give a maximum total score of 24 for each of the object control and locomotor skills.[16] This instrument has good internal consistency for object control (Test 1: $\alpha = 0.63$, Test 2: $\alpha = 0.72$), and locomotor skills (Test 1: $\alpha = 0.64$, Test 2: $\alpha = 0.68$).[16] This instrument has also been assessed for 7 day test re-test reliability with good results (0.78 [95% CI 0.60–0.89]) for object control and locomotor skill perceptions (0.82 [95% CI 0.63–0.92]).[16]

MVPA was objectively assessed for eight consecutive days using GT3X+ ActiGraph (Pensacola, FL) accelerometers. Data from the vertical plane were utilised in this study. To be included in the analyses, children needed to have worn the monitor for ≥ 8 h a day for a minimum of 3 days.[19] A 15 s epoch length was used. Children were shown in small groups how to wear accelerometers, and the circumstances in which they could remove them (e.g. if engaged in water-based activities and when sleeping). Children were instructed to wear the monitor on the right hip, attached using an elasticated nylon belt. This monitor has been validated for use in this population and has acceptable reliability.[20] Accelerometer data were initially downloaded using ActiLife Software (version 6.0) and checked for compliance. The accelerometer files were then processed using a customised macro in Microsoft Excel 2010. Non-wear time was indicated by periods of 20 min of consecutive zeros.[21] The accelerometer cut-points developed by Evenson and colleagues[22] were used to define moderate and vigorous intensity physical activity (2296–4011 cpm for moderate, and ≥ 4012 cpm for vigorous intensity physical activity).[22] These cut-points have been validated and have recently been found to provide acceptable classifications of moderate and vigorous physical activity in children.[23] Time spent in moderate and vigorous intensity physical activity were summed to obtain time spent in MVPA.

The mean and standard deviation was calculated for all variables. Differences between boys' and girls' actual object control, actual locomotor, perceived object control, perceived locomotor and MVPA were assessed using independent *t*-tests. TGMD-2 raw scores were standardised according to the manual[18] and used in the analyses. To examine associations between actual and perceived object control and locomotor skills and physical activity,