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Brief Report

Concurrent Validity of Selected Movement Skill Items in the New Zealand Ministry of Education's Health and Physical Education Assessment

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ABSTRACT

The concurrent validity of the New Zealand Ministry of Education's Health and Physical Education Assessment (HPEA) (Crooks & Flockton, 1999) was examined with the respective items from the Movement Assessment Battery for Children (Henderson & Sugden, 2000) and the Bruininks-Oseretsky Test of Motor Proficiency (Bruininks, 1978) on manual dexterity, ball skills and balance skills. Of the 28 items of the HPEA, 7 items were significantly correlated with the established movement skill measures. The low concurrent validity of the HPEA suggests a need for further validation studies.

INTRODUCTION

Movement skills like drawing and catching a ball require practice and experience to learn and develop, in contrast to genetically defined movements (Schmidt, 1982), such as reflexive movements (Cf. Miyahara & Reynders, 2003). Through an interaction between our genetically inherited characteristics and experience in our environment we develop movement skills that serve as platforms for activities of daily living, academic performance, play, sports, leisure and recreation. Without the development of movement skills participation in such activities may be limited, and the potential benefits to education, development, health and well-being can be diminished. Therefore it is important to identify individuals with movement skill difficulties, and provide necessary remedial education that maximises the potential benefits of fully developed movement skills.

One of the four aims of New Zealand's Health and Physical Education Curriculum (NZHPEC) is to develop movement concepts and motor skills wherein the development of motor skills is encouraged in accordance with the knowledge, understanding, and positive attitudes toward physical activities. Consistent with the aims of the NZHPEC, the Health and Physical

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Education Assessment (HPEA) in the National Education Monitoring Program (NEMP) has a central organising theme, personal and community well-being through enhancing health practices and physical education. The HPEA includes the assessment of movement skills, consisting of 23 tasks. In developing the HPEA procedures and tasks, the NEMP emphasises the validity of assessment, the value of educational community, and the balanced coverage of important skill (Crooks & Flockton, 1999). A high degree of authenticity and validity is claimed for the assessment in the NEMP (Eley & Caygill, 2002).

Validity of assessment has been traditionally categorised into content validity, construct validity, and criterion-related validity. The validity mentioned in the NEMP assessment is content validity, or the degree to which the content of the assessment actually represents the content of the knowledge, skills, and attitude that the assessment intends to tap. In content validity, assessment tasks are directly judged by experts in light of the definition of construct (i.e., movement skills) itself. In addition to content validity, it is essential to ensure the actual function of the assessment items by external variable, or criterion. Subtypes of criterion-related validity include concurrent validity which indicates the degree to which an assessment measures the target domain by correlating the results of a new assessment with the results from an assessment that has already been established as being valid. It is especially important that a new assessment, such as the HPEA is actually representing the domain that it is supposed to measure. If the concurrent validity of the movement skill items in the HPEA is high, the HPEA data would further demonstrate the utility of the assessment, corollary the findings from the NEMP.

Validity of tests can be viewed as a property of the meaning of test scores. Messick (1995) maintains that test scores depend not only on test items themselves, but also on an interaction between test takers and the context of assessment. He called criterion-related validity the external aspect of validity that can be examined by convergent and discriminant correlations with external variables. This study aimed to examine concurrent validity. Convergent correlations of selected movement skill items from the HPEA were examined with theoretically similar tests. The HPEA was compared with the Movement Assessment Battery for Children: Extended Age Band 4 (MABC) (Henderson & Sugden, 2000) and the Bruininks-Oseretsky Test of Motor Proficiency (BOTMP) (Bruininks, 1978) which have already been established as valid, and considered as "golden standards" of movement skill tests (Croce, Horvat, & McCarthy, 2001; Barnett, Kooistra, & Henderson, 1998).

METHOD

A sample of 31 students (13 males and 18 females) in Year 8 (12 and 13 years of age) from a public intermediate school in Dunedin participated in the present study. Classes were randomly chosen within the school, and information sheets and consent forms were sent to the parents of the students in the classes. Only those who returned the parental consent forms were assessed. Ethical approval for this project was obtained from the University of Otago Ethics Committee.

Selected movement skill items from the HPEA (Crooks & Flockton, 1999) were used as the primary assessment tool, while corresponding items from the BOTMP (Bruininks, 1978) and the MABC (Henderson & Sugden, 2000) were used as secondary assessment tools to evaluate the concurrent validity of the HPEA.

The participants were individually assessed on the HPEA, the MABC, and the BOTMP items at multiple assessment stations set up in the school hall. The participants moved around the stations, each with a trained tester who administered one item consistently. Individual participants took approximately half an hour to complete all items. Raw scores for all of the items were used to compute the Pearson product moment correlation coefficients to indicate the concurrent validity of selected movement skill items from the HPEA .

Table 1: Summary of movement skill items from the NEMP, the MABC, and the BOTMP.

NEMP			MABC			BOTMP		
Task	Description	Measurement	Task	Description	Measurement	Task	Description	Measurement
Knuckle bones	Participant is shown video of 3 knucklebone tasks (flips, scatters, and horse in the stable) and asked to complete the tasks	Number of knucklebones successfully caught	Bicycle Trail II	The child draws one continuous line, following the trail without crossing it's boundaries.	Number of errors	Drawing a line through curved path	Tracing a continuous line with a pen between 2 curved lines without crossing its boundaries	Number of errors
			Turning Pegs	With one hand 12 pegs are picked up one at a time, are inverted and replaced in the same hole on the pegboard. Both hands are tested.	Time taken in seconds	Displacing pegs with preferred hand	Displace pegs on pegboard, moving peg to hole directly above it	Number of pegs displaced in 15 seconds
			Lifting Beads	With one stick in each hand the child grips the beads with the flat sides of the two sticks pressed against it. Twelve beads are lifted into the box one at a time.	Time taken in seconds	Placing pennies in two boxes with two hands	Pennies are simultaneously picked up and placed in separate boxes	Number of seconds taken to place seven pairs of pennies in the boxes

NEMP			MABC			BOTMP		
Task	Description	Measurement	Task	Description	Measurement	Task	Description	Measurement
Small ball wall juggle	Participant stands behind a line at 1m and 2m from wall, ball is thrown against the wall and caught with one Hand	Number of successful catches in 15 seconds from both 1m and 2m	One-hand Catch	Throwing the ball at the wall from 2metres and catching it with one hand on its return. Both hands are tested.	Number of catches	Catching a tossed ball with preferred hand	Tennis ball is thrown from 3m, ball is caught with preferred hand	Number of times ball is caught correctly out of five attempts
Bean bag toss	Participant stands behind a line 2m or 3m from the tray. Bean bag is thrown underarm into the tray	Number of successful throws from 3 attempts from both 2m and 3m	Throwing at Wall Target	Throwing the ball at the target from 2.5metres with the preferred hand.	Number of hits	Throwing a ball at a target with preferred hand	Tennis ball is thrown overhand with preferred hand at target mounted on wall 1.5m from participant	Number of times the ball hits the target
Balance	Participant walks to the end of the beam (90cm), turns around, walks to the middle, then turns sideways and balances on one foot	Overall performance: Very good, good, moderate, or weak	Walking Backwards	Walking backwards on a 4.5metre line placing the toe of one foot against the heel of the other with each step, for a maximum of 15 steps.	Number of correct consecutive steps	Standing on preferred leg on balance beam	Participant stands on preferred leg on the balance beam with knee bent to 90º, and hands on hips	Time balanced, without dropping non-supporting leg, or touching the floor

NEMP			MABC			BOTMP		
Task	Description	Measurement	Task	Description	Measurement	Task	Description	Measurement
Ladder hop-hop	Participant starts outside of the ladder, hops in 1 square at a time on right leg, then hops to left leg half way along the ladder	Accuracy and control: Consistently good, mostly good, moderate, or low	Zig-Zag Hopping	Hopping the length of a 4.5metre line in zig-zag fashion using one leg, without pausing. Both legs are tested.	Number of correct consecutive hops	Stepping over the response speed stick on the balance beam	Participant walks along beam and steps over a stick held over the beam at knee height	Whether the participant can successfully step over the stick and remain on the beam
			Jumping and clapping	Participant jumps over a cord suspended between two poles at knee height, and claps as many times as possible while in the air	Number of claps made while in the air	Walking forwards heel to toe on balance beam	Participant walks forwards heel to toe on the beam with hands on hips	Record number of steps
			Two-board balance	Balancing on the keels of the balance boards which are placed end-to-end. The feet are placed hell-to-toe along the length of the boards, balance of 30 seconds.	Duration in seconds			

RESULTS and DISCUSSION

Table 2. Concurrent validity of the HPEA except the knucklebone items against the MABC and the BOTMP.

HPEA item	M	SD	BOTMP/ MABC	M	SD	n	*r*	*p*
NEMP Small ball wall juggle 1 metre	11.06	2.89	BOTMP catching	4.87	0.43	31	-.05	.80
NEMP Small ball wall juggle 1 metre	11.06	2.89	MABC Catching preferred hand	8.45	2.05	31	.54	< .01
HPEA Small ball wall juggle 1 metre	11.06	2.89	MABC Catching non-preferred hand	8.16	2.48	31	.61	< .01
HPEA Small ball wall juggle 2 metres	7.84	3.21	BOTMP catching	4.87	0.43	31	.11	.57
HPEA Small ball wall juggle 2 metres	7.84	3.21	MABC Catching preferred hand	8.45	2.05	31	.60	< .01
HPEA Small ball wall juggle 2 metres	7.84	3.21	MABC Catching non-preferred hand	8.16	2.48	31	.69	< .01
HPEA bean bag throw 2m	2.26	0.77	BOTMP target	4.10	0.80	30	.39	< .05
HPEA bean bag throw 2m	2.26	0.77	MABC Throwing at target	6.00	1.84	31	.23	.21
HPEA bean bag throw 3m	1.42	1.12	BOTMP target	4.10	0.80	30	.22	.25
HPEA bean bag throw 3m	1.42	1.12	MABC Throwing at target	6.00	1.84	31	.00	1.00
HPEA balance	1.42	1.12	MABC Two board balance	20.30	8.66	31	-.48	< .01
HPEA balance	1.42	1.12	MABC Walking backwards	14.14	1.87	31	.20	.28
HPEA balance	1.42	1.12	BOTMP One leg balance	9.81	0.79	31	.02	.92
HPEA balance	1.42	1.12	BOTMP heel to toe walking	5.71	0.78	31	-.35	.05
HPEA ladder hop	0.61	0.84	MABC Zigzag hop preferred leg	6.90	1.45	31	-.20	.29
HPEA ladder hop	0.61	0.84	MABC Zigzag hop non-preferred leg	6.87	1.36	31	.07	.70

Of the 28 comparisons between the 4 knucklebone tasks from the HPEA and the MABC and the BOTMP manual dexterity tasks, none reached significance with correlations ranging from -.26 ($p = .16$) to .34 ($p = .06$). Some participants reported that the weight of knucklebones was different from the weight that they were used to, which might have biased their performance. Thus, the knucklebones scores failed to converge on other established manual dexterity test scores. Although it follows that the knucklebone items measure the knucklebone skills, which category in the taxonomy of movement skills the knucklebone items tap remains unknown. Indeed, the knucklebone skills could be task-specific, and might not converge on any other movement skills.

With regard to ball skills, the catching items from the HPEA significantly correlated with the corresponding task from the MABC, but not with the BOTMP catching items. The discrepancy might have been caused by the different methods of ball projection towards participants: on both HPEA and MABC participants throw a ball to the wall, then catch the ball on the rebound, whereas on the BOTMP participants catch a ball thrown by a tester. Due to the different nature of ball projection, a lack of correlation between the HPEA and the BOTMP does not necessarily undermine the validity of the HPEA catching task.

Of the throwing items there was one significant correlation between the HPEA score of throwing a beanbag from 3 metres and the BOTMP score of throwing at a target. However, the other three correlations failed to reach significance, which might be partly due to the difference in throwing objects and the distance of throws. In addition, three attempts were allowed in the HPEA item, five attempts in the BOTMP item, and ten attempts in the MABC item. The relatively smaller numbers of throwing attempts in the HPEA and the BOTMP items reduced the variability of score distributions, thus making it easier for the two items to highly correlate each other. Taken together, the correlation between the HPEA and the BOTMP throwing items would suffice for the concurrent validity of the HPEA items.

The HPEA balance items were significantly correlated with the MABC two-board balance and the BOTMP heel-to-toe walking, and the remaining two correlations were not significant. On one hand, the HPEA balance item and the MABC two-board balance are similar in that they both demands students to balance on platforms. On the other hand, both the HPEA balance item and the BOTMP heel-to-toe walking require walking on balance beams. In contrast, the MABC walking backwards item and the BOTMP one leg balance have little in common with the HPEA balance item, and therefore, yield no significant correlations.

In summary, low concurrent validity of the HPEA was demonstrated with established movement skill measures. In particular, the knucklebone tasks from the HPEA failed to correlate with any of manual dexterity items from the MABC and the BOTMP. As a final note, the administrative instructions and scoring criteria for the HPEA movement skill items, such as ladder activities, are not entirely clear, and need to be further specified. Conclusively, this study lends limited support to the concurrent validity of the HPEA, and the HPEA's capability to operationise the construct of movement skills is questioned. Further validation studies are required before the HPEA is used as an accepted measure of movement skills.

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Biographical note:

Motohide Miyahara is a registered psychologist of New Zealand working as a Senior Lecturer at the School of Physical Education. His research and clinical works involve comorbid conditions of developmental disorders.

Jenny Clarkson was a Masters student when she assisted this study. She completed her Master's project on reliability and validity of movement skill tests, and currently works as an Assistant Research Fellow at the Department of Physiology, University of Otago.