DIAGNOSTIC POSSIBILITIES OF MOTOR PERFORMANCE IN PRIMARY EDUCATION

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ABSTRACT

There is an ambiguity in approaches to application of individual test issues within the primary school age. In order to identify the substance of a complex of motor abilities not only the information on specific elements is important but also on mutual relations between them and their structure. The aim of the study was to define a factor model of motor and physical indicators in primary school children. This model could be applied as a tool for defining valid, reliable, and feasible diagnostic methods within the elementary physical education context.

Test battery consisted of items indicating of condition and coordination abilities. 382 8-year-old children participated in the research, 190 boys. Tested children were randomly selected from 12 primary schools in the East Region of the Slovak Republic. In both examined groups boys and girls the factor model consisted of similar factors saturated by power, speed, and coordination, and physical indicators with a great share on the whole variance. The results show on a necessity to apply a multidimensional approach to motor performance diagnostics in primary school children. Knowledge about the dimensionality of motor performance ability should be critical for further research, as well as for selection valid, reliable, and feasible diagnostic methods.

Key words: primary grade children, motor abilities, assessment

INTRODUCTION

Motor, fitness and physical activity assessment are very important aspects of the physical education program. Entry-level assessment helps the teachers develop instruction based on where students actually are. Exit-level assessment, in combination with entry-level assessment, provides information about the progress of individual learners. Assessment may be process based or product based. Both process and product assessments provide information that is useful for determining a student´s present status, measuring process, and helping teachers plan the program for movement skill acquisition and fitness enhancement. All must be valid, reliable, objective, and administratively feasible (Gallahue & Donnelly, 2003).

In the research studies of motor development in early childhood many various motor tests were applied. However, their feasibility seems problematic, particularly with respect to the specificity of motor development at that age (Ružbarská & Turek, 2007; Davis, 2001). There is an ambiguity in approaches to application of individual test issues within this age group. It is necessary to stem from the premise that a child is not a smaller model of an adult. Due to these reasons methodological approaches used with this age group are diametrically opposite and their results are difficult to compare (Gallahue & Donnelly, 2003; Kroes et al., 2004). A discussion has been in the professional literature and societies over what we should measure in children fitness testing. Should we prefer health-related components or include rather performance-related components (Lämmle et al., 2010).

A variety of tasks can be used to document levels of motor performance. But emphasis is placed on standardized tasks that can be used in the field or school setting, in contrast to those limited to the laboratory (Malina, 2003). That is considered to be very important point for selection of motor tests applied in preschool and primary education settings.

METHODS

Within the research objective, there was the motor performance of 8-years-old primary school children diagnosed using 16 motor tests and 3 anthropometric measures. 382 children participated in the study, 192 girls and 190 boys. Tested children were randomly selected from primary schools in the Region of Prešov in the Slovak Republic during years 2005 – 2008. A selection of the tests was based on well-known *Eurofit* (Adam et al., 1988) test battery and on motor tests for coordination abilities (Hirtz, 1985; Měkota - Blahuš, 1983), which are listed in a table 1. Body weight was measured using with a precision of 0.5 kg. Stature was measured using Martin's anthropometer with a precision of 0.1 cm. Skinfolds were measured using the Harpenden caliper and following skinfolds were measured with a precision of 0.1 mm. Then the sum of all 5 skinfolds was calculated.

Research data was processed using the SPSS 16.0 programme at the Faculty of Sports, University in Presov. Interpretation of factors is based on evaluating of factor loadings. Criterion was stated at the level of > *0.4.* Factors contain the same information as a correlation matrix, but in a different form. There are rotated into the position, in which is presented the simplest relation among variables and factors. *Varimax rotation* was appliedwithin the factor analysis. The aim of this paper is to find a valid differentiation of motor performance for children.

Table 1 List of coordination abilities tests

Motor tests	**Motor abilities**
Target jumping	Kinaesthetic differentiation
Turns on the bench	Dynamic balance
Run towards balls	Orientation ability
Stop a rolling ball	Reaction ability
Random drumming	Rhythmical ability
Jump without a swing	Ability of joining the acyclic movements
Jump backwards	Ability of adaptation and transfer of movements

RESULTS

Results of applied factor analysis are presented in tables 2 and 3. *Factors 2* in both examined groups are defined as physical factors. In both examined groups there are physical factors (F2) with a share of approximately 13 % on the whole variance. These factors indicate an importance of physical development during this period of motor development.

Factor 1 in a group of boys can be called as complex factors with the „weight" of approximately 18 % in a motor space. Similarly, *Factor 1* in a group of girls with almost 19 % share on the whole variance is defined as strength, endurance and coordination factor.

Factor 4 in boys represents "strength and coordination of the hand". *Factor 3* in girls is a coordination factor with a share of 10,2 % on the whole variance and *Factor 4* is an example of force factor with a share of 9,84 %.

Small communality values (0,42 – 0,51) of some indicators such as *Sit and reach, Jump without a swing, Jump backwards, Stopping a rolling ball, Random drumming* strongly suggest their lower relevance within the factor model and they indicate their lower predicative relevance within the age period. Relatively high values of specific variance (37 %) in both examined groups suggest that there are other factors which determine the level of motor performance in children but which we could not encompass.

Table 2 Factor analysis of motor and physical indicators in 8 years old boys (n = 190)

Indicators	F1	F2	F3	F4	F5	F6	h^2
Flamingo balance	**0,69**	-0,07	0,03	-0,10	0,01	-0,30	*0,58*
Plate tapping	0,28	0,10	-0,10	**0,44**	0,17	**-0,53**	*0,55*
Sit and reach	0,15	0,20	0,30	0,06	0,12	**0,49**	*0,42*
Standing broad jump	**-0,47**	0,15	**0,44**	-0,09	-0,35	**0,40**	*0,69*
Hand grip	-0,29	0,38	0,25	**0,42**	-0,33	0,15	*0,56*
Sit-ups	-0,08	0,12	**0,85**	0,08	-0,10	0,10	*0,77*
Bent arm hang	-0,08	-0,18	**0,82**	-0,15	0,10	-0,01	*0,75*
Shuttle run 10x5 m	0,32	-0,01	-0,08	-0,17	**-0,65**	0,10	*0,56*
Endurance shuttle run	**-0,68**	-0,18	0,12	-0,22	0,17	-0,08	*0,60*
Body weight	0,09	**0,88**	0,04	-0,14	-0,02	-0,05	*0,81*
Body height	-0,02	**0,83**	0,14	-0,01	-0,09	0,09	*0,72*
Sum of 5 skinfolds	0,07	**0,65**	-0,27	0,13	0,17	-0,03	*0,54*
Target jumping	0,23	0,06	0,12	-0,01	-0,07	**-0,70**	*0,56*
Bench turns	-0,07	0,02	0,11	0,06	**0,63**	0,39	*0,57*
Run towards balls	**0,72**	-0,09	-0,11	0,23	-0,15	-0,06	*0,61*
Stop a rolling ball	0,07	-0,18	-0,21	**0,78**	0,01	0,06	*0,69*
Random drumming	0,01	0,19	0,39	**0,65**	0,19	-0,21	*0,69*
Jump without a swing	**-0,64**	-0,14	0,01	0,19	-0,10	0,08	*0,48*
Jump backwards	-0,27	-0,01	0,37	0,15	**-0,53**	0,06	*0,51*

DISCUSSION

The internal structure of the studied variables proved some distinctions in boys and girls. Such a differentiation cannot be detected by applying only partial analyses. However, there is a difficulty in interpreting so-called condition and coordination factors as there is still unclearly defined relationship between individual abilities and due to limited discriminatory value of some ability tests for this age period.

Table 3 Factor analysis of motor and physical indicators in 8 years old girls (n = 192)

Indicators	F1	F2	F3	F4	F5	F6	h^2
Flamingo balance	-0,24	-0,01	0,23	0,00	**0,76**	0,03	*0,69*
Plate tapping	-0,14	-0,15	**0,65**	0,27	0,13	0,27	*0,63*
Sit and reach	-0,17	0,17	-0,18	**0,74**	0,12	-0,26	*0,72*
Standing broad jump	**0,72**	-0,28	-0,06	0,04	0,16	0,08	*0,63*
Hand grip	**0,44**	**0,42**	-0,13	-0,29	**-0,42**	-0,07	*0,63*
Sit-ups	0,03	-0,12	**0,41**	**0,77**	-0,13	0,01	*0,80*
Bent arm hang	-0,06	-0,10	-0,26	**0,73**	-0,19	0,11	*0,66*
Shuttle run 10x5 m	-0,02	0,04	0,03	0,00	-0,01	**0,86**	*0,74*
Endurance shuttle run	**0,52**	0,01	-0,11	-0,36	-0,12	**-0,41**	*0,58*
Body weight	-0,04	**0,89**	-0,02	0,07	0,08	0,13	*0,81*
Body height	0,04	**0,71**	0,07	0,16	-0,05	-0,32	*0,65*
Sum of 5 skinfolds	-0,12	**0,64**	-0,05	-0,29	0,18	0,11	*0,56*
Target jumping	0,27	0,18	-0,10	0,00	**0,77**	-0,03	*0,70*
Bench turns	0,17	-0,18	**-0,65**	0,15	0,01	0,22	*0,55*
Run towards balls	**-0,77**	-0,10	0,07	0,23	0,16	-0,05	*0,69*
Stop a rolling ball	0,08	-0,14	**0,46**	-0,25	0,06	0,20	*0,44*
Random drumming	-0,11	0,01	0,01	**0,38**	0,13	0,06	*0,49*
Jump without a swing	**0,46**	-0,36	-0,02	-0,33	0,09	-0,12	*0,50*
Jump backwards	**0,60**	0,17	**0,56**	0,12	0,06	-0,17	*0,76*

Motor performance is a complex, multidimensional construct, which cannot be described adequately using only one or two parameters, as is often desired by professionals using reduced test batteries at school. However, there are used different subdimensions of motor performance. What is the most important, it became obvious that dimensionality of motor performance is not the same for the different target groups (Lämmle et al., 2010).

There is much intraindividual and interindividual variability in the level of motor performance among young children. Changes in mean levels of performance with age should be viewed with this variability in mind (Malina et al., 2004). Motor performance is influenced beside physical characteristics by motivational factors, opportunity for practice, habitual physical activity, and other in the cultural environment. There is a need to consider all these factors while assessing motor performance differences. These variables may be especially relevant in the context of examining sex differences in performance (Malina, 2003).

It should be emphasized that during this specific period of motor development movement outcomes for the children are evidence of their undergoing biologically-driven growth and intersection of the underlying movement capacity of coordination with the learned performance of motor skills (Miller, 2006). The choice of motor tests can be debated since no definitive consensus on the best measurement exists in this field.

CONCLUSION

Study results verify a concept of motor complexity with a need to involve into the assessment of motor perfomance in primary grade children the main factors of abilities to achieve reliable information about current status or progress of motor development in children. Product based assessment in primary education context should involve diagnostics of motor performance and physical growth. To be of value, school fitness testing needs to be a systematic and regular part of education program, it must reflect curricular goals.

Preschool or primary grade children, and upper elementary children vary considerably in their needs, interests and activities included in the physical education program. Assessment is one of the most important aspects of any physical education program. It helps teachers measure students´ level of abilities, their progress, and their own teaching effectiveness. Motor diagnostics refer to the collection of information for the purpose of making effective curricular decisions and discriminations among children.

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