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A study of the construct validity of the Democritus–psychomotor assessment tool for pre-school children

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Abstract

The aim of the present study was the examination of the construct validity of the Democritus Assessment Tool for Pre-school Children (PAT-PRE) (Kambas, Aggeloussis, & Gavrilidou, 2003). PAT-PRE was distributed to 435 children (238 boys and 197 girls) aged 48-71 months that were divided in four age groups [48-54 months ($\underline{n}$=92), 55-59 months ($\underline{n}$= 92), 60-65 months ($\underline{n}$= 125) and 66-71 months ($\underline{n}$=126). The results of the factor analysis revealed a model that accounted for the 60.38 % of the total score variance and was consisted of one strong multicollective factor and three weaker ones supporting the proposal of Kambas et al. (2003) for the use of the total score. Moreover, the item scores had statistically significant relationships with the total short form score. Age had a statistically significant effect on the total PAT-PRE score, while sex did not. PAT-PRE seemed to be a valid test on motor performance in normal Greek pre-school children.

Key words: *construct validity, PAT-PRE, pre-school age*

Introduction

The most important consideration in evaluating and selecting an assessment tool is its validity (Dunn, 1989). Democritus-Psychomotor Assessment Tool for Pre-school Children (PAT-PRE) (Kambas, et al., 2003) is a new assessment battery for children 4-6 years old. It requires cheap equipment, it is functional and attractive for the children (short duration, items presentation through short stories) and finally it responds to the conditions of the Greek Kindergartens. However, because of its recent creation, there is no sufficient evidence for its validity. Considering the importance of the motor assessment in pre-school age, and the need for assessments that are psychometrically sound, in this study, we sought to examine the construct validity of the PAT-PRE, using the following criteria: a) factor structure, b) internal consistency, c) the effect of age and sex on the total battery score.

Method

Participants

Four hundred and thirty five children (238 boys and 197 girls) 48-71 months old (M=60.45 months, SD= 6.98) without an identified neurological, sensory or motor problem, attending kindergartens in Peloponnesus Territory in Southern Greece

participated in the study. The aforementioned children were divided in four age-groups [48-54 months (n= 92), 54-59 months (n= 92), 60-65 months (n= 125) and 66-71 months (n=126)]. The method of stratified sampling was used to select the participants of the study from a number of randomly selected public schools, using sex and age-group as the stratification variables. All participants were required to bring a consent form written and signed by their parents prior to their participation in the study, a study which was approved by the Ethics Committee of the Democritus University of Thrace, Greece.

Procedure

The Democritus Assessment Tool for Pre-school Children (PAT-PRE) (Kambas et al., 2003) was used for the assessment of children's motor performance. The measurements were performed on an individual basis for each child in an indoor facility, according to the test guidelines. The mean duration for the administration of the test was 15-20 min per child.

Three statistical methods were then used to test the construct validity of PAT-PRE. First, a principal components factor analysis was performed with varimax rotation to examine the structure of the item scores. Then, the Pearson correlation coefficients between the item scores and the total short form score were calculated to test the internal consistency of the test. Finally, one-way analysis of variance (ANOVA) was employed to test the effect of age and sex on the total score of the test battery. Post hoc comparisons were made using the Bonferroni test, with alpha set at .05.

Results

The results of the principal components analysis showed that four factors had eigen values greater than 1.0 and accounted for the 60.38% of the score variance (Table 1). The first factor accounted for 35.04% of the total score variance and consisted of the following items: "tapping", "jumping repeatedly sideways", "carrying and placing a ball in a box", "toe-to-heel walking in backward direction", "picking up coins and placing them in an area", "standing jump over a hoop", "stride jumping, rebound with & without external stimulant". It could therefore be labeled "*gross and fine motor co-ordination*". In the second factor, which accounted for 9.20% of the total score variance, four items were loaded:

"Jumping repeatedly sideways", "step through vertical hoops", "standing jump over a stick", "body rolling along vertical axis". Thus, it could be labeled "*gross motor co-ordination*". The third factor comprised the following items: "Overhead toss to a specific target" and "catching a bean-bag". It accounted for 8.18% of the total score variance and could be named "*eye-hand coordination*". Finally, in the fourth factor only the item "catching a dropped stick" was loaded and it was therefore labelled "*reaction time in optical stimulant*".

Table 1. *Rotated Factor Loading and Pearson Correlation Coefficients between single items and total score of PAT-PRE*

ITEMS	Factors*				r**
	1	2	3	4	
Tapping	.413				.35
Jumping repeatedly sideways	.551	.450			.70
Catching a dropped stick				.745	.40
Carrying and placing a ball in a box	-.541				-.46
Toe-to-heel walking in backward direction	.669				.70
Overhead toss to a specific target			.813		.50
Picking up coins and placing them in an area	-.752				-.45
Step through vertical hoops		.788			.53
Standing jump over a hoop	.570				.72
Catching a bean-bag			.675		.64
Stride jumping, rebound with & without external stimulant	.745				.63
Standing jump over a stick		.686			.65
Body rolling along vertical axis		.427			.44
Eigenvalue	4.556	1.196	1.063	1.035	
Variance %	35.044	9.202	8.176	7.963	

*Only the loadings $\geq$ .40 are displayed
**   p < .001

Moreover, the results showed that the scores of all items had statistically significant relationships with the total score ranging between .35 and .72 (Table 1). The results also revealed that although there was not any difference between the performances of boys and girls, age had a statistically significant effect in the total PAT-PRE score.

According to the results of the Bonferroni test, there were statistical significant differences among all age-groups. The mean PAT-PRE score of each group was significantly greater than the score of the younger ones.

Discussion

The results of the factor analysis revealed a model that accounted for the 60.38 % of the total score variance and was consisted of one strong multicollective factor and three weaker ones agreeing with previous studies (Hassan, 2001; Kambas & Aggeloussis, 2006; Tabatabaina et al., 1995). The loadings of the items of both gross and fine motor skills in the first factor is an evidence that supports the Hattie and Edwards's (1987) statement according to which, the classification of motor skills into gross and fine motor skills is mostly theoretical. The gross and fine motor proficiency may be better seen as the output of a continuum, rather than as separate forms of motor proficiency. Additionally, the existence of one strong, multicollective factor that accounts for the greatest percentage of the total variance and some other clearly weaker factors that do not account for a significantly different percentage of the information, agrees with both Broadhead et al. (1985) and Broadhead and Bruininks (1982) who state that the factority of the motor performance depends on age. Thus, in the early years there are no differentiation trends, somethings that occurs in older children. That finding appears as a further support for the proposal of Kambas et al. (2003) considering the use of the total battery score instead of the item scores. The fact that all the items showed statistically significant correlations with the total short form score suggests good internal consistency of the PAT-PRE.

Regarding the effect of age, it was found that the total scores were significantly different in the four age groups of the sample: the older children performed better than the younger children. This finding is in close agreement with the findings of previous studies (Aponte et al., 1990; Hassan, 2001; Kambas & Aggeloussis, 2006). Furthermore, the absence of statistically significant differences between boys and girls agrees with many researchers' opinion that, until puberty, the motor performance of the two sexes is almost the same (Fjørtoft, 2000; Thomas, 2000).

What we infer from the above results is that the construct validity of PAT-PRE battery for the assessment of Greek pre-schoolers is sufficiently supported. As the administrative traits of the battery (short duration for test administration, inexpensive equipment, game like items) support its ecological validity (Zittel, 1994) and render it a very attractive and viable tool for the motor assessment of pre-school –aged children, a further examination of

the rest of the validity criteria is needed, so that the technical adequacy of the battery is established.

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