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Research Article

Validity and reliability of TGMD-2 Surakarta children aged 7-10 years

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ABSTRACT
Motor assessment tests are widely used in many countries, including the Gross Motor Development Test 2 (TGMD-2). TGMD-2 is the most frequently used test to measure children's gross motor development in many countries. The purpose of this research is to be investigated whether TGMD-2 is suitable for measuring gross motor development in Surakarta boys aged 7-10 years. The participants involved in this study were 355 boys aged between 7-10 years, who attended state elementary school. Construct validity was calculated by Exploratory Factor Analysis, and reliability by Cronbach's Alpha. The result of the calculation is average Keyser-Meyer-Olkin (KMO) value is 0.837. This figure indicates that TGMD-2 is good for confirmation purposes. While the reliability is 0.743, categorized as medium. In conclusion, thus it can be concluded that TGMD-2 can used to assess gross motor development of the studied population.

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KEYWORDS
TGMD-2; exploratory factor analysis; construct validity; gross motor skill assessment

Introduction

The development of gross motor skills involves the large muscles in the leg, arms, and chest. Gross motor skills are important for performing everyday physical tasks like running, walking, lifting, kicking, throwing, etc. Well-developed gross motor skills make children to perform everyday tasks, such as running and walking, playground skills; examples are climbing, and sports skills; for examples catching, throwing, hitting the shuttle cock with a racket, etc.

The importance of gross motor skills for children are improves balance, strength, muscular endurance and coordination (Bukvić, Nikolić, & Ćirović, 2021). By maintaining and developing children's gross motor skills: maintain long-term health, encourage physical literacy (Lopes, 2017). Assessing motor skills can assist in identification initial delays that may affect aspects other developments include cognitive and affective (Choo et al., 2019).

Second Edition Gross Motor Development Test (TGMD-2) is a test that aims to assess and identify the development of gross motor skills of children aged 3-10 years. The test ca be used by kinesiologists, general and special educators, psychologists, and physical therapists (Ulrich, 2000). The TGMD-2 consist of two subtests, there are; locomotor and object control. The locomotor are composed of six skills: run, gallop, hop, leap, horizontal jump, slide. Object control is made up six skills to: striking a stationary ball, stationary dribble, underhand roll, kick, overhand throw, and catch.

The TGMD-2 is standardized test, developed with samples from different geographic regions, gender, race, and residence (Ulrich, 2000). Of course, Surakarta children aged 7-10 years have different characteristics from the children who were sampled to develop the TGMD-2, so it is important to ensure that the TGMD-2 is suitable for measuring the gross motor development of children in Surakarta. This research is very useful, because after it is known that the results of measuring gross motor development are valid and reliable, TGMD-2 can be applied to boys aged 7-10 years in Surakarta.

Validity is the degree of precision and accuracy of the data collection instrument. Validity indicates the suitability between the test or instrument with the attribute to be measured (Ismaryati, 2018). The instrument is said to be valid if it can measure objects precisely and thoroughly according to the attributes it measures. Reliability refers to the consitancy of a test or instrument in measuring the attributes being measured. Reliability test is to check internal consistency of measuring instruments, whether the results remain consistent if the measurements are repeated (Rajiv, et al., 2020). In a research, validity and reliability tests are concepts for evaluating the quality of research. Validity is used to measure research accuracy, while reliability is used to assess consistency in the content of research results. Both play a very important role in determining how well the research is done. The purpose of this study was to investigate whether TGMD-2 is suitable for measuring gross motor development in Surakarta children 7-10 years old.

Method

Participants

The participants involved in this study were 355 boys aged between 7-10 years, who attended state elementary school. They are selected proportionally from the population.

Instrument

Gross motor development participant was measured by the Test of Gross Motor Development (TGMD-2) by Ulrich (2000). The test consists of two subtests: locomotor and object control. Locomotor subtes consists of hopping, galopping, running, jumping, sliding, and leaping. While object control consists of dribbling, striking, throwing, catching, kicking, and rolling. Each skills are carried out twice in the order of the locomotor subtest followed by object control, after a short rest then a second trial is carried out.

Data Collection and Analysis

This research has received approval from the principals of the participating participating. Testing is carried out to collect data about the development of gross motor movements of participants. Physical education teachers were involved as tester. To ensure consistency of measurement, the same tester observes and assesses the performance of all children. Prior to testing, the tester is trained on the administration and assessment of TGMD-2 based on manual instructions.

Test conditions: The test environment should be set up to minimize distraction and according to specific instructions for each skill item. The equipment required for each item is usually included in the movement skills program and listed in the manual for each item. Test conditions should be set before starting the test to help minimize execution time. The list of equipment required is described below. Students must wear rubber-soled shoes when taking the test. This is to minimize the possibility of slipping or falling, thus allowing students to exert maximum effort in displaying some locomotor.

Assessment criteria: each gross motor skill includes three to five behavioral components that are recorded as performance criteria. In general, these skills describe the maturity of the skill pattern. The specific steps in the assessment are: (1) participants do two repetitions on each item, (2) observe student performance, and concentrate on performance or performance appraisal criteria, (3) if the participant does it correctly, it is given a score of 1. But if it does not do it correctly, it is scored 0. There are 2 separate columns provided for each assessment opportunity. Initial student assessment data will appear in the first column.

The data that has been collected its validity is calculated by exploratory factor analysis (EFA). EFA tries to uncover complex patterns by tracking data sets and testing predictions (Watkins, 2018). Reliability of TGMD-2 results was calculated by Cronbach's alpha (Taber, 2018). Internal consistency

reliability refers to the consistency of individual item scores on an instrument, with the scores of a set of items, or subscales, which usually consist of several items to measure a single construct.

Results and Discussion

Validity

Table1. KMO and Barlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.837
Bartlett's Test of Sphericity	Approx. Chi-Square	548.053
	df	66
	Sig.	.000

A quality test can be seen from its validity and reliability coefficients, validity concerns the ability of a measuring instrument to measure what is to be measured and how consistent (reliable) the measuring instrument shows the same results when used to measure the same abilities in different subjects and places (Andrade & Heritage, 2017). This study found that the test used was categorized as valid, because the average Keyser-Meyer-Olkin (KMO) score was above 0.60, which was 0.837. According to Garson (2012), construct validity with a KMO value of 0.60 is considered acceptable for exploration purposes, 0.70 is considered sufficient for confirmation purposes, and 0.80 is considered good for confirmation purposes. Thus TGMD-2 falls into the category of "accepted" or proven to be valid in terms of its construct.

This opinion is reinforced by Kartowagiran & Jaedun (2016) who reveal that construct validity can be measured using factor analysis, namely exploratory factor analysis, with the provision that if all items or tests/questions have a factor loading ranging from 0.52 to 0.64, it means that the test has good construct validity. Construct validity is sometimes also called factorial validity (Garson, 2012) because it relates to the logic of items consisting of conceptual measures (constructs). A good construct has a theoretical basis that is explained through a detailed operational definition that includes measurable indicators. Conversely, if the construct validity is bad or low, then this indicates low theoretical agreement about the content or by poor operationalization so that the indicators have multiple interpretations, one researcher and another researcher do not understand what the indicator measures.

Table 2. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.153	26.274	26.274	3.153	26.274	26.274	2.787	23.228	23.228
2	1.146	9.553	35.827	1.146	9.553	35.827	1.508	12.570	35.799
3	1.025	8.539	44.366	1.025	8.539	44.366	1.028	8.568	44.366
4	.984	8.201	52.567						
5	.959	7.995	60.562						
6	.832	6.935	67.497						
7	.793	6.606	74.103						
8	.726	6.048	80.152						
9	.656	5.464	85.616						
10	.619	5.158	90.773						
11	.567	4.722	95.495						
12	.541	4.505	100.000						

Extraction Method: Principal Component Analysis.

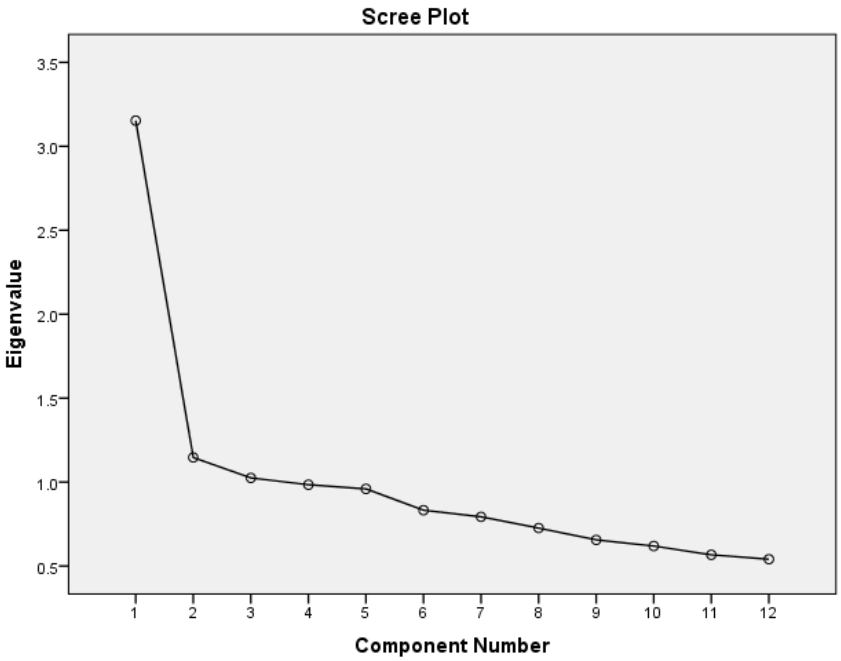

Figure 1. Screen Plot Unidimensi TGMD-2

Reliability

Table 3. Reliability Statistic

Cronbach's Alpha	N of Items
.743	12

Based on the parameters used in this study, it shows that the average reliability coefficient of TGMD-2 is much greater than 0.5 or 0.743, thus the reliability of the test used for the gross motor development of Surakarta children aged 10-11 years is in the moderate category, as revealed Andrade & Heritage (2017) that a reliability coefficient of 0.8 and higher is usually considered moderate to high, while a coefficient below 0.6 is low Garson (2012) states "internal consistency reliability" assumes that if all items on a scale really measure the same thing, then these items must be very strongly correlated with one another.

Conslusions

The results of data analysis show that the average Keyser-Meyer-Olkin (KMO) value is 0.837. This figure indicates that TGMD-2 is good for confirmation purposes. While the reliability is 0.743, categorized as medium. Based on the results of the investigation, it can be concluded that TGMD-2 is suitable for measuring the gross motor development of Surakarta boys aged 7-10 years.

References

Andrade, H. L., & Heritage, M. (2017). *Using formative assessment to enhance learning, achievement, and academic self-regulation*. Routledge. https://doi.org/10.4324/9781315623856

Bukvić, Z., Nikolić, D., & Ćirović, D. (2021). The importance of physical activity for the development of motor skills of younger school age children. *Medicinski podmladak*, *72*(2), 34-39. https://doi.org/10.5937/mp72-31878

Choo, Y. Y., Agarwal, P., How, C. H., & Yeleswarapu, S. P. (2019). Developmental delay: identification and management at primary care level. *Singapore medical journal*, *60*(3), 119. https://doi.org/10.11622%2Fsmedj.2019025

Garson, G. D. (2012). Testing statistical assumptions. Asheboro, NC: Statistical Associates Publishing

Ismaryati. (2018), *Tes & Pengukuran Olahraga*, Surakarta. UNS Press

Kartowagiran, B., & Jaedun, A. (2016). Model asesmen autentik untuk menilai hasil belajar siswa sekolah menengah pertama (SMP): Implementasi asesmen autentik di SMP. *Jurnal penelitian dan evaluasi pendidikan*, *20*(2), 131-141. http://dx.doi.org/10.21831/pep.v20i2.10063

Lopes, V. P., Stodden, D. F., & Rodrigues, L. P. (2017). Effectiveness of physical education to promote motor competence in primary school children. *Physical Education and Sport Pedagogy*, *22*(6), 589-602. https://doi.org/10.1080/17408989.2017.1341474

Rajiv, S. J, I-Chant A. C., Carrie, C., & Dana, C. L. (2020), *Research Methods in Psychology* 4nd Edition. Kwantlen Polytechnic University Surrey, BC.

Taber, K. S. (2018). The use of Cronbach's alpha when developing and reporting research instruments in science education. *Research in science education*, *48*, 1273-1296. https://doi.org/10.1007/s11165-016-9602-2

Ulrich, D. A. (2000). *Test of gross motor development 2: Examiner's manual* (2nd ed.). Austin, TX: PRO-ED.

Watkins, M. W. (2018). Exploratory factor analysis: A guide to best practice. *Journal of Black Psychology*, *44*(3), 219-246. https://doi.org/10.1177/0095798418771807