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The reliability of active motor card instruments as an evaluation of motor skills of elementary school children ages 10-12 years

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Abstract

This study aims to test the reliability of the Active Motor Card instrument in measuring the motor skills of children aged 10-12 years. Motor skills play an important role in physical development and support the achievement of the Sustainable Development Goals (SDGs) related to health. The research design used was the development of instruments with the main focus of research conducting reliability tests. The research population is students at SDN Sumbersari 3 using total sampling techniques. The sample in this instrument trial was all students in grades 4-6 with a total of 78 students. The test results were then analyzed using Cronbach's Alpha and Corrected Item-Total Correlation methods. The Active Motor Card subtest consists of locomotor and non-locomotor skills. The results of the reliability test showed a value of $\alpha = 0.949$, indicating high internal consistency. In conclusion, the Active Motor Card is a reliable instrument to assess the motor skills of children aged 10-12 years and is suitable for monitoring children's motor development systematically. Further research with a wider sample is recommended for further development.

Keywords: Reliability, Instruments, Active Motor Card, Motor Skills Evaluation.

INTRODUCTION

A child's physical activity level and motor skills contribute positively to their physical, social, and psychological development, thus increasing their activity levels (Cohen et al., 2015). Physical activity also influences a child's motor skills (Zeng et al., 2017). Children aged 6-12 years have a developmental characteristic, which is learning the physical skills needed for play. During this period, muscle and bone growth is very rapid, which is necessary for learning motor skills, so the need for activity and play is very high (Sabani, 2019). WHO emphasizes that children and adolescents should get an average of 60 minutes of physical activity per day. In addition, children and adolescents should limit the time they spend sitting still (WHO), 2022).

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The rapid development of technology has led to children having unhealthy lifestyles, resulting in reduced levels of physical activity and an increased risk of obesity. One factor influencing obesity is the lack of space for active play and exercise. (Stidder, 2023).The latest data from the Central Statistics Agency (BPS) reports that in 2023, 12.27% of children aged 5-12 years had internet access. Although there was a decrease from 12.43% in 2022, this figure still ranks 3rd among other age groups from year to year (BPS, 2024). From this data, it can be seen that many children in Indonesia already use *smartphones* . Meanwhile, using *smartphones* can be addictive, which affects a person's low level of physical activity (Harfika et al, 2019).

The Ministry of Health of the Republic of Indonesia reported in 2023 that the proportion of physical activity in Indonesian children aged 10-14 years showed a sufficient level of activity of 42% and insufficient activity of 58% (Kemenkes, 2023). From the data above, it can be seen that the level of physical activity of children aged 10-14 is more lacking. Lack of physical activity affects children's growth and development and will affect children's motor development. Physical activity is closely related to physical fitness, so active children who move have better physical condition and motor development (M. V Lopes et al., 2023). Motor development is an important factor because the quality of skills possessed can facilitate motor abilities (Nusufi, 2016).

Understanding the level of motor development of elementary school children in Indonesia is crucial because it can be used to evaluate and monitor their development. This aligns with *Sustainable Development Goals (SDGs*) 3, namely Healthy and Well-Being Lives (United Nations, n.d.). This goal emphasizes the importance of ensuring healthy lives and improving well-being for all ages, including children. Understanding motor development is also crucial for monitoring children's performance in sports (Pasaribu et al., 2021). Furthermore, motor skills play a crucial role in achievement, particularly in sports (Priyambada & Darussalam, 2023).

In sports, to assess a person's skills, tests and measurements are carried out. One of the needs for using tests and measurements is to diagnose such as movement mechanisms, physical fitness, and movement skills (Nurhasan, 2001). In Indonesia, there are two existing test instruments, namely TKSI (Indonesian Student Fitness Test) developed by the Ministry of Education, Culture, Research, and Technology (Kementerian Pendidikan, n.d.)and TKPN (Nusantara Student Fitness Test) developed by the Ministry of Youth and Sports (Kementerian Pemuda dan Olahraga Republik Indonesia, 2022). However, both instruments are still unable to measure the motor development of children aged 6-12 years because the tests developed are still focused on physical components, so the tests that need to be developed still need to focus on important components such as: growth anthropometry, children's motor development, and motor fitness (Taufik et al., 2024). The need for test instruments that need to be developed requires

stages included in the development of test instruments that have several steps consisting of concept identification, product construction, validity testing, and reliability testing (Davis, 1996).

The Active Motor Card is an instrument used to assess children's gross motor skills in Indonesia. Research related to *the Active Motor Card* has been conducted on children aged 6-9 years. In terms of completing all aspects of the test items and having a reliability value of 0.88, *the Active Motor Card* is a valid and reliable instrument (Taufik et al., 2024). Development is continued for children aged 10-12 years. This age range requires motor skill assessment because during this period children must learn the physical skills needed for play and activities . Instrument validation has been conducted on children aged 10-12 years and is included in the valid category (Rohali & Fadhli, 2025). However, its reliability is still unknown.

An instrument developed must be related to the characteristics being measured. So a valid instrument must measure certain traits, characteristics, or abilities consistently and must be relevant. The issues of validity, reliability, and objectivity are the most important issues in testing test instruments. Validity is a determinant of the truth of test scores, while validity depends on two characteristics, namely reliability and relevance. (Morrow et al., 2000). Test reliability can be known, one of which is through the *Internal Consistency reliability test* . The purpose of this internal consistency reliability is the consistency of the measurement itself, which means that the measurement obtains similar results from the test section designed to measure the same thing.

METHOD

This research method uses instrument development according toDavis (1996) which consists of 4 steps. The research flow diagram can be seen in Figure 1.

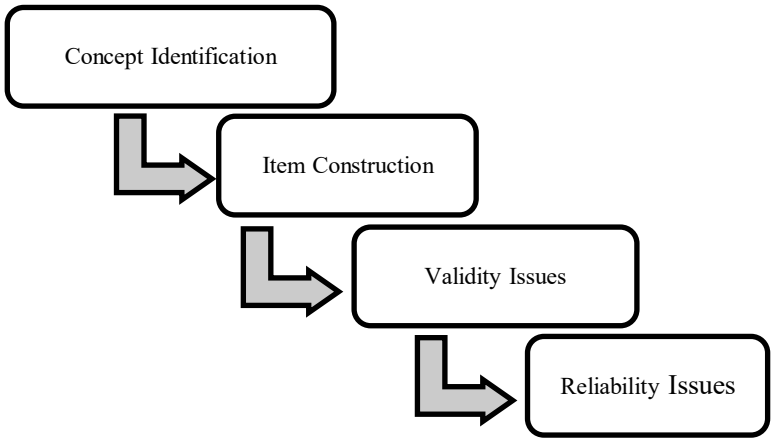

Figure 1. Research Flow Diagram

The first step is *Concept* Identification, which involves collecting initial data through *Focus Group Discussions* (FGDs) and a literature review. The second step is *Item Construction* . writing instrument items and establishing a scoring system. The third step , *Validity Issues* , involves

expert testing, factor analysis, contrast group testing, and hypothesis testing. The fourth step, *Reliability Issues* , conducts reliability analysis using methods such as test-retest, split-half testing, and internal consistency.

The population in this study were students at SDN Sumbersari 3 aged 10-12 years. The sampling technique used *total sampling* , so the sample in this instrument trial was all students in grades 4-6 of SDN Sumbersari 3 with a total of 78 students who had agreed to participate in this study. The instrument used was a validated Active Motor Card followed by a trial consisting of Locomotor aspects (*Obstacle Run, Combine Leg Hop, Triangle Step, Alternate Board Jump, and Rolling*) and Non-Locomotor aspects (*One Hand Bounce, Catching, Wall Throw, Kicking on Target, and Batting*) with five types of skill measurements each.

Each motor skill assessed consisted of two to six assessment criteria. If the subject correctly performed a movement criterion, they received a score of 1 for that criterion. Otherwise, they received a score of 0. Each participant performed two trials for assessment. The trial data were then subjected to a reliability test using *the Cronbach's Alpha method* . The analysis results were conducted using *the Cronbach's Alpha formula* with reliability assessment criteria (George, 2003).

RESULTS AND DISCUSSION

Results

Active Motor Card instrument trial on students who have been tested for reliability using Internal Consistency with the Cronbach's Alpha technique , the results obtained are as follows. The reliability test of the Active Motor Card instrument for elementary school children aged 10-12 years is reliable α = 0.949. So it can be stated that the level of reliability of the instrument is in the high category because the Cronbach's Alpha value is > 0.80 **.**

Table 1. *Cronbach's Alpha* Reliability Test for Active Motor Card *Locomotor* Aspect

Variables	α	Information	Category
Obstacle Run	0.783	Reliable	Accepted
Combine Leg Hop	0.749	Reliable	Accepted
Triangle Step	0.903	Reliable	Good
Alternate board jump	0.878	Reliable	Good
Rolling	0.860	Reliable	Good

Based on the analysis in Table 2, the results of the Cronbach's Alpha reliability test on the locomotor subtest show that the obstacle run variable analysis results have a value of 0.783. The combined leg hop variable analysis results have a value of 0.749. The triangle step variable analysis results have a value of 0.903. The alternate board jump variable analysis results have a value of 0.878. The rolling variable analysis results have a value of 0.860.

Table 2. *Cronbach's Alpha* Reliability Test *Active Motor Card Non - Locomotor* Aspects

Variables	α	Information	Category
One Hand Bounce	0.839	Reliable	Good
Catching	0.954	Reliable	Very good
Wall Throw	0.895	Reliable	Good
Kicking on Target	0.902	Reliable	Good
Batting	0.782	Reliable	Accepted

Based on the analysis in Table 3, the results of the Cronbach's Alpha reliability test on the non-locomotor subtest can be seen, the results of the one hand bounce variable analysis have a value of 0.839. The results of the catching variable analysis have a value of 0.954. The results of the wall throw variable analysis have a value of 0.895. The results of the kicking on target variable analysis have a value of 0.902. The results of the batting variable analysis have a value of 0.782.

Data of locomotor and non-locomotor aspects in tables 1 and 2, it shows that the two subtests with 10 test instrument variables have acceptable reliability values because the results of the Cronbach's Alpha value are > 0.70. The value of each variable shows a varying range of values consisting of a sufficient value category, namely Cronbach's Alpha > 0.70 and a high value, namely Cronbach's Alpha > 0.80 (Garson, 2013).

Discussion

The results of the reliability test using *the Cronbach's Alpha technique* showed that the Active Motor Card instrument for children aged 10–12 years had a very good level of reliability with an overall value of α = 0.949, which is included in the high category (α > 0.80) (Garson, 2013). In *the locomotor aspect* , all test items showed acceptable to good reliability, with the highest value in *the Triangle Step* (α = 0.903) and the lowest in *the Combine Leg Hop* (α = 0.749). Meanwhile, the *non-locomotor aspect* showed a relatively higher reliability, with the *Catching item* producing the highest value (α = 0.954), indicating very strong internal consistency. Overall, these results indicate that all test items in this instrument are able to measure aspects of motor skills consistently and are reliable for use in the context of measuring motor skills in elementary school children.

The analysis results show that the *Active Motor Card instrument* is reliable. This statement can be determined by conducting tests and data analysis. Reliability is the degree of consistency, or stability of the results of a test instrument measurement even though it is used repeatedly (Sepdanius et al., 2019). If the reliability value on the instrument is low, it can result in a decrease in objective measurements, because the results are influenced by the instrument used (Boumans, 2004). Motor instrument measurements require reliable instruments so that they have consistency in measurement (Lubans et al., 2010). Through this study, it can be seen that the instrument items that have been developed have good reliability values so they can be relied upon in assessing the motor skills of children aged 10-12 years. Motor skills are related to the level of performance of

young athletes in various sports and long-term athlete development. This states that motor skills are important in many sports such as soccer, basketball, *ice hockey, ice skating,* gymnastics, etc.(Jukic et al., 2019; Rouvali & Häkkinen, 2015; Vandorpe et al., 2012).

Active Motor Card instrument , as a new instrument, needs to have a reliable value. A measurement is considered reliable if the same results can be obtained consistently. Conversely, if the measurement has low reliability, the measurement cannot be trusted to provide stable information (Ahmed & Ishtiaq, 2021). An acceptable reliability score is 0.7 and higher (Heale & Twycross, 2015). The resulting *Cronbach's Alpha value* is ($\alpha = 0.949$) which is included in the high category, namely $\alpha > 0.80$ (Garson, 2013), so it can be seen that the results show that this instrument has very good internal consistency.

In addition, *the Active Motor Card* is a valid instrument used to measure basic motor skills because when compared with the Gross Motor Development (TGMD) *test instrument, there are gallop* and *slide movements* which are more common in western games, in contrast to games in Indonesia which are dominated by jumping movements such as jumping rope and stilts, even carts. (Yudasmara et al., 2024). Therefore, a valid and reliable instrument can be relied upon to measure motor skills in elementary school children (Kim et al., 2014). Motor development over time must be seen as it leads to skilled performance and in terms of various forms of movement to support and maintain physical activity (Hulteen et al., 2018). In addition, a reliable instrument also makes an effective measuring tool for assessing motor skills in young athletes (N. Lopes et al., 2024).

A good motor measurement instrument not only provides accurate data but also offers a more applicable approach in the selection process and monitoring of motor development of prospective athletes, such as providing an accurate assessment of athletic potential. This allows for efficient talent identification and a focus on performance monitoring, ultimately enhancing athlete development through targeted training and monitoring (Prukner & Sigmundová, 2014). Motor measurement instruments also allow for accurate assessment of an athlete's motor level, thus facilitating the planning of a planned training program. Through this approach, several things become focused, such as performance monitoring, training optimization and efficiency, and supporting athlete development (Braz et al., 2009).

High reliability supports the instrument's suitability for measuring motor skills in elementary school children (Kim et al., 2014). Although the *Active Motor Card instrument* has proven reliable, its implementation faces challenges. Factors such as adequate training and administrative support need to be considered to ensure the instrument's long-term sustainability. A deeper understanding of these limitations can pave the way for further research to improve its validity and reliability. The assessment instrument demonstrated high validity and reliability,

effectively addressing the challenges associated with the need for an assessment tailored to the characteristics, objectives, and relevance of the subjects being evaluated (Wibowo et al., 2024).

Good motor measurement contributes to sports performance development policies. This is in accordance with other statements that the high reliability and validity of motor measurement instruments for identifying sports talent provides a strong framework for data-driven training policies that support long-term athlete development through standardized performance measurements and outcomes (HÖner et al., 2015). The concept of sports development is implemented in various collaborations with several regional, central, and private government parties in organizing sporting events (Siedentop, 2002). Furthermore, physical education teachers also play a crucial role in preparing young athletes in schools from the foundational stage for training and competition (Hasmyati et al., 2023). It can be argued that the availability of valid and reliable motor skills measurement instruments also allows schools to participate more actively in identifying talented students early on. Therefore, schools, coaches, and policymakers can work together to ensure that aspiring athletes receive the best support in terms of facilities, coaching, and competitive opportunities to achieve their full potential in the long term.

The Cronbach's Alpha test on *the Active Motor Card* showed good internal consistency. A reliable instrument provides consistent and accurate results for diagnosing or assessing children's motor skill development. The results of the instrument testing in this study indicate that the *Active Motor Card test instrument* generally has a high reliability score. Empirical evidence can be seen from the results obtained from data analysis. The *Active Motor Card instrument* is designed to adapt to the growth, development, and characteristics of Indonesian children aged 10 to 12 years.

CONCLUSION

The results of the study indicate that the *Active Motor Card instrument* has a reliable value . The overall *Cronbach's Alpha* is $\alpha = 0.949$ which is included in the high category, namely $\alpha > 0.80$, so this instrument has excellent internal consistency. These findings are expected to provide an important contribution in the development of reliable motor skills measurement tools.

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