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DEVELOPMENT OF BASIC MOVEMENT SKILLS TEST INSTRUMENTS FOR EARLY CHILDHOOD

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Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

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Abstract

Study purpose. The aim of the study was to develop a manual and easy test instrument for basic movement skills in early childhood.

Materials and methods. In this work, we use a research and development (R&D) method. The research procedures are: (1) the first stage is a preliminary study in the form of potential problems, data collection, and needs analysis, (2) the second stage is instrument development planning, and (3) the third stage is trial, expert evaluations, and product revisions, and (4) the fourth stage is model implementation. A total of 155 children aged 4-6 years participated in this study. Statistical analysis used is the product-moment correlation for the validity test and Cronbach alpha for the reliability test. Data were analyzed using the SPSS application.

Results. The results of this study are 1) the creation of a basic movement skill test instrument that can measure three components, namely locomotor, non-locomotor, and manipulative. 2) Based on this validity test, from 15 research instruments of basic movement skills (Y) tested, 15 items were obtained with r-count > 0.133 and were declared valid to be used in capturing research data. 3) The results obtained were r-count = 0.676 and r table 0.133, so the value of r arithmetic > r table, then this instrument is declared reliable and can be used as a data collection tool.

Conclusions. The development of basic motion test instruments produce instruments that can measure and evaluate the basic movement skills of children aged 4-6 years which include three components, namely, locomotor, non-locomotor, and manipulative.

Keywords: physical activity, motor skills, test instrument, children.

Introduction

The basis of the development of motion becomes the foundation for each individual to understand the scope of motion, namely related to the understanding of the development of motion, the principles of motion development, and the purpose and function of the development of motion. Some literature recommends that physical education programs should provide intensive guidance on the basic movement skills needed to support various physical activities (O'Brien et al., 2016). Motion skills are closely related to motor development. Motor development discusses changes in movement behavior over time, including all behaviors during life, where the underlying processes of the changes we see, and the factors that affect motor behavior (Haywood et al., 2012). In humans, the development of motion is a change from the ability of motion in infants to adults involving various aspects of behavior and ability to move, aspects of behavior and development of motion affect each other. The development of basic motion or motor skills in children is shaped and influenced by their environment (Zhang & Cheung, 2019). One of the developments of motor skills in children is eruptions at different levels, some children can be enriched, but others are not ready, some can route, while others are not visually ready.

The importance of motor skills as the main basis for improving special motor skills, especially in general sports

(Komaini et., al 2022). However, to date, research on the relationship between basic and specialized motor skills in movement has been very rarely reported (Kokstejn & Musalek, 2019). The effectiveness of movement is often overlooked because it is a natural part of human life. However, it is essential for children's physical, cognitive, and social development. In addition, experience strongly supports the learning and development of fundamental movement skills. The foundation of these skills is laid in childhood which is important to encourage lifestyle active behavior (Bouffard, 2016).

Basic motor skills are divided into three categories, namely locomotor, non-locomotor, and manipulative. Non-locomotor abilities are performed on the spot, without an adequate range of motion. Non-locomotor abilities such as stretching, bending, lifting, pulling, folding, twisting, dragging, coiling, soaring, and others. The locomotor ability is used to move an object from one place to another. in addition to locomotor abilities such as jumping, walking, and running. Meanwhile, manipulative abilities are developed when children master various objects. Manipulative abilities involve more hands and feet, but other parts of our body can also be used. Object manipulation is far superior to the coordination of the ankles and eyes of the hand, where this coordination is important enough for the process of walking in the motion space, the forms of manipulative abilities consist of, the movement of pushing (throwing and hitting, kicking), the movement of receiving (capturing) objects is an important ability taught by using plastic balls made of rubber pads (medical balls) or plastic balls with bouncing and dribbling movements. Movement actions such as catching, kicking, and running appear to have a stronger relationship with children's functional abilities (Capio et al., 2011). Low competence in fundamental motor skills is associated with lower levels of cardiorespiratory fitness and physical activity in children and adolescents. Characteristics of students who have competence in movement skills differ in gender and skills (Hardy et al., 2012). One study reported that children's movement and object control skills were not correlated with their BMI levels. In addition, most of the correlation coefficients between BMI and locomotor skills, as well as the correlation between BMI and object control skills were not significant (Kim & Lee, 2016).

Movement skills are fundamental as a term related to physical activity (Basman, 2019). Fundamental motor skills are defined as a series of organized basic movements involving a combination of movement patterns from two or more segments of the body (Hardy et al., 2012). The development of children's fundamental motor skills is shaped by the surrounding environment (Cheung & Zhang, 2020). Recent evidence reports that children have the developmental potential to master most of the fundamental motor skills by the age of 6 years during physical education, physical activity, and sports (O'Brien et al., 2016). However, 61% of teachers indicated they were aware of their current limitations and thus requested professional development opportunities related to early childhood physical activity (Sevimli-Celik & Johnson, 2013). Adequate development of fundamental motor skills in children can result in participation in more varied physical activities (Gu, 2016). Schools that include learning experiences of fundamental motor skills that are in line with developments delivered by highly trained physical education teachers significantly increase the fundamental skills of motor skills in adolescents (Morgan et al., 2013). Children who don't learn fundamental motor skills are more likely to become unskilled adults who don't innovate much (Johnson et al., 2019). Children who move very rarely are at risk for developmental disorders in the cognitive, motor, linguistic, behavioral, and social domains. In addition, several environmental factors are known to be the main triggers (Mürner-Lavanchy and Anderson, 2018). Low competence in fundamental motor skills is associated with lower levels of cardiorespiratory fitness and physical activity in children and adolescents (Hardy et al., 2012). The results found that girls had higher levels of motor skills compared to boys of the same age (Nikolić et al., 2016). In addition, inaccurate perceptions of motor competence can jeopardize children's involvement in physical activity (Almeida et al., 2017).

The measuring instrument for the test of movement skills is considered indispensable to determine the motor development of children. Several measuring tools to measure the development of human movement such as (1) Motor test für vier bis sechsjahrige Kinder (MOT 4-6) which is a coordination assessment tool for preschool children recommended for educational research purposes due to a certain age range. To assess children at the age of 4 years to 6 years 11 months. This test kit comes from Germany and has been developed to contribute to the measurement of fundamental motor skills development. In addition, this tool opens up opportunities for early detection of delays or deficiencies in fundamental motor skills (Bouffard, 2016). Furthermore, the measurement of movement skills for children using the movement-ABC test is a revision of the Motor Test Drop derived from the Oseretsky scale for children's motor capacity. This tool is suitable for children aged 4 to 12 years and is very useful in exploring problems of functional integration of motor control or problems that often first arise in the late early preschool and elementary school years (Hu et al., 2021). Furthermore, Peabody Developmental Motor Scales-Second Edition (PDMS-2) is a motor skills assessment tool that measures gross and fine motor skills. This tool focuses on assessing children with disabilities and also determines the balanced development of fine and gross motor movement skills, identifies skill deficits, and evaluates progress. Furthermore, the Deutsche Motoric Test (DMT) is to objectively assess quantitative aspects of movement skill patterns in addition to the performance of qualitative movement skills such as flexibility, balance, and strength (Gruber et al., 2020). Assessment of basic motor skills remains an important tool in classifying a person's level of basic motor skill proficiency. Fundamental motor skills performance collection for assessment and monitoring has remained unchanged over the past few years (Ward et al., 2017). The test distinguishes between children with normal motor behavior and without normal motor behavior. Each measuring instrument has a certain classification or function because each measuring instrument is not suitable for every age, it is necessary to understand the appropriate measuring instrument used so that the measuring instrument used is valid or appropriate.

Instrument Development is very important to do. Research is needed to examine the efficacy of such techniques in real-world settings, which could change our perspective on the potential of technology to enable children's physical motion activity and fundamental motor skills (Barnett et

al., 2013). The test has important implications for implementing freely available, manageable, fun, interventional, and interactive motion learning to help children improve their manual dexterity skills (McGlashan et al., 2017). It also developed measuring instruments such as PERF-FIT that can measure fitness related to motor skills in children aged 5 to 12 years in a variety of settings and help doctors monitor the level of basic motor skills (throwing, bounce, catching, jumping , and balancing) (Smits-Engelsman et al., 2021). But for some of the tools that have been described definitely require adequate technology. In order to answer a challenge in the development of tests that are felt to make it easier for parents or teachers to know the child's motor skills, it is necessary to develop senior test equipment. In addition to being a test, the instrument can also be used as one of the learning media. To achieve this, a greater understanding of the process of assessing human movement skills is required (Ward et al., 2017).

Materials and methods

Study Design

This study used a Research and Development (R&D) approach. The research procedure is: (1) the first stage is a preliminary study in the form of potential problems, data collection, and analysis of needs, (2) the second stage is the planning of instrument development, and (3) the third stage is trials, expert evaluation, and product revision, and (4) the fourth stage is the implementation of the model.

Participants

A total of 155 children aged 4-6 years participated in this study.

Statistical Analysis

Statistical analysis used is the product-moment correlation for validity test and Cronbach alpha for reliability test. Data were analyzed using the SPSS application.

Results

Product Description

Basic Motion is a skill that involves large muscles, and muscle strength involving arms and legs that are used to achieve an exercise or movement goal. The muscles that play a role include arm muscles, limb muscles, shoulder muscles, back muscles, and abdominal muscles. Basic moves are performed in the form of walking, tiptoeing, jumping, running, rolling, catching, throwing, twisting, kicking, and bouncing the ball. The instrument developed includes three components: 1) Locomotor movement consists of a) Running, stepping quickly, until there is a movement where both legs float briefly in the air, b) Gallop – performing horse steps quickly, c) Hops – jumping within the minimum distance on each foot, d) Leap – carrying out related skills by jumping over objects with one foot, e) Horizontal jump – performing horizontal jumps from standing positions forward as far as possible, f) Slide – sideways movement on a straight line from one point to another, 2) Non-locomotor movement consists of a) jumping in a place with two legs, b) jumping in a place with one leg, three times in a row, c) standing with one leg for 10 seconds, d) movement resembling an airplane, e) and climbing stairs in turn, and 3) Manipulative movements include: a) throw the ball with one hand, b) catch the ball with two hands, c) kick the ball, d) roll the ball, e) bounce the ball.

The Basic Movement Skills Test instrument grid includes 3 (three) components, namely Locomotor, Non-locomotor, and Manipulative (see Table 1). The results of the development of basic movement skills test instruments (see Table 2).

Expert Improvement Advice Data

The next step is to seek opinions and advice from experts. Experts' opinions and suggestions are used to improve the quality of products made. The following opinions and suggestions from experts on the draft motor learning model for early childhood (see Table 3).

Based on expert input, the basic motion instrument development model underwent several improvements. Improvements were made to the instructions for implementing

Table 1. Development of Basic Motion Skills Instrument Grid

Variable	Sub variable	Indicator	Sub Indicator	Test Items
Early Childhood Basic Motion	Locomotor	1. Run 2. Gallop 3. Walk 4. Hop 5. Leap	1. Running Straight 2. Horse Run 3. Jinjit walk 4. Jump forward with two legs 5. Jumping in different directions	1, 2, 3, 4, 5
	Non-Locomotor	1. Skip 2. Balance 3. Movement 4. Coordination	1. Jump in place with two feet 2. Jump in place with one foot 3. Stand on one leg 4. Move like an airplane 5. Go up and down stairs	6, 7, 8, 9, 10
	Manipulative	1. Hand Gestures 2. Foot movement	1. Throw the ball with one hand 2. Catch the ball with one hand 3. Kick the ball with one foot 4. Rolling the ball with one hand 5. Bounce the ball	11, 12, 13, 14, 15

Table 2. Basic Motion Skills test instruments

MOTOR SKILLS TEST FUNDAMENTAL FORM				
Note: this form is used to perform basic motion skills tests for Early Childhood				
Test Dates:				
Name:		Date of birth:		
Gender:		School/Kindergarten Origin:		
Address:		Parent Name:		
Anthropometry				
Weight				
Height				
Arm Circumference				
Head Circumference				
	I. LOCOMOTOR COMPONENTS	**Bs**	**Bdb**	**Tb**
1	Running back and forth on a 10-meter straight line			
2	Horse Run (Gallop) back and forth Bali On a straight line for 10 meters			
3	Walk back and forth with the tips of the toes for 5 meters			
4	Jumping forward with two legs 5 times			
5	Jump to the left and right sides and back and land on two legs simultaneously twice			
	II. NON-LOCOMOTOR COMPONENTS	**Bs**	**Bdb**	**Tb**
6	Stand on one leg with eyes closed for 10 seconds			
7	The attitude resembles an airplane that is one of the legs raised, both hands stretched out and then slowly wrapped around the body for 5 seconds			
8	Rotate half the body where the position of both legs remains, and the limbs from the waist to the head are directed to the left and right sides alternately			
9	Bend the body to duck and squat			
10	Rotate the Body by changing the position of the legs to change the position of the body facing in different directions.			
	III. MANIPULATIVE COMPONENTS	**Bs**	**Bdb**	**Tb**
11	Throw the ball with one hand			
12	Catch the ball with two hands			
13	Kicking a Ball with one foot			
14	Rolling the ball with one hand			
15	Bounce the ball with one hand			

Table 3. Expert advice and input

Number	Material Experts	Feedback on Learning Models
1	Expert 1	1. The instructions for the implementation of the test need to be clarified. 2. Explanation of the test item
2	Expert 2	1. Instruments need to be clarified. 2. Balance of test items between components, namely locomotor, non-locomotor, and manipulative
3	Expert 3	1. Research criteria must be made 2. Terms must be given a description

activities, instruments, and objectives. The next step after the repair is product trial.

Product Test Results
Validity

Based on the validity test, of the 15 basic movement skills research test instruments tested, 15 items were obtained whose r-count > 0.133 and were declared valid to be used in research data collection.

Reliability

Calculation of reliability of regulatory variable instruments using Cronbach alpha formulas by comparing the calculated r-value with the r table. The criteria if the value of r count > r table, then the instrument is declared reliable. The results obtained at the calculated r-value = 0.676 and the r table value is 0.133, so the calculated r-value > r table, so this instrument is declared reliable and can be used as a tool to collect data.

Discussion

This research produces a product in the form of a basic movement skill test instrument. This product is recommended to be used to measure basic movement skills aged 4-6 years. If children are to live physically active lives, we need to help them acquire the motor skills that enable them to participate in a variety of physical activities. In addition, monitoring the level of development of basic movement skills needs more attention. Previous research reported that children given physical education showed higher standard motor skill scores than children given recreation (Lemos et al., 2012). These results explain that regular, structured physical education improves motor skills in early childhood.

There are several things needed to increase the physical activity of preschoolers: (1) improving teacher knowledge through both service training and in-service training, (2) creating classrooms, schools, and playrooms that allow children to move and play safely, and (3) developing teacher self-efficacy through health-related fitness activities, (4) encouraging parental involvement by educating parents about their role in physical-child behavior, and (5) collaborated and work with colleagues in other departments to share ideas, resources, and methods in terms of the implementation of physical activity in early years children (Tandon et al., 2015).

This test instrument has gone through a trial phase to calculate its validity and reliability level. Validity in research is something that shows accuracy or truth (Rifki et al., 2022). A valid instrument has high validity (Nurhasanah et al., 2022). Otherwise, an instrument that is less valid means it has low validity. The validity of content is the rate at which a test measures the scope of the intended content. The validity of the item point to the question of whether the test items represent the size of the scope of the desired content, and the validity of the sampling point at how well the test represents the entire scope of the overall content (Smits-Engelsman et al., 2021). It has been explained the importance of reliability and validity through a test. As for testing item validity (construct validity), expert opinion can be used. In this case, after the instrument has been constructed, the aspects to be measured are based on certain theories, then the experts are consulted. After the construction testing from experts and based on empirical experience in the field was completed, it was continued with instrument testing.

Based on the results of the study is known to have high reliability enough to be used as an instrument test in the motoric assessment of children. High reliability demonstrates consistency in such measurements (Smits-Engelsman et al., 2021). In addition to being an instrument for motor tests, it can also be used as a learning tool to continuously train and improve children's motors.

Conclusions

The development of basic motion test instruments produce instruments that can measure and evaluate the basic movement skills of children aged 4-6 years which include three components, namely, locomotor, non-locomotor, and manipulative.

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Conflict of interest

There is no conflict of interest in this study.

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РОЗРОБКА ІНСТРУМЕНТІВ ТЕСТУВАННЯ БАЗОВИХ РУХОВИХ НАВИЧОК ДЛЯ ДІТЕЙ МОЛОДШОГО ВІКУ

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Авторський вклад: A – дизайн дослідження; B – збір даних; C – статаналіз; D – підготовка рукопису; E – збір коштів

Реферат. Стаття: 8 с., 3 табл., 28 джерел.

Мета дослідження. Мета цього дослідження полягала в тому, щоб розробити ручний і зручний тестувальний інструмент для базових рухових навичок у дітей молодшого віку.

Матеріали та методи. У цій роботі ми використовуємо метод дослідження та розробки (R&D). Дослідницькі процедури: (1) перший етап – це попереднє дослідження у формі потенційних проблем, збору даних та аналізу потреб, (2) другий етап – планування розробки інструмента, (3) третій етап – випробування, експертні оцінки та доопрацювання продукту, (4) четвертий етап – впровадження моделі. У цьому дослідженні брали участь загалом 155 дітей віком 4–6 років. Як статистичний аналіз використовували коефіцієнт кореляції Пірсона для тесту на валідність та альфу Кронбаха для тесту на надійність. Аналіз даних здійснювали з використанням програмного забезпечення SPSS.

Результати. Результати цього дослідження полягають у 1) створенні інструмента тестування базових рухових навичок, який може вимірювати три компоненти, а саме локомоторний, нелокомоторний та маніпуляційний. 2) На підставі цього тесту на валідність із 15 протестованих дослідницьких інструментів для базових рухових навичок (Y) було отримано 15 елементів зі значенням r-count > 0,133 та визнано їх дійсними для використання при зборі даних досліджень. 3) Одержані результати були r-count = 0,676 та r table 0,133, тому значення r arithmetic > r table, тоді цей інструмент оголошено надійним і його можна використовувати як засіб збору даних.

Висновки. Розробка інструментів для тестування базових рухів створює інструменти, які можуть вимірювати та оцінювати базові рухові навички дітей віком 4–6 років, які включають три компоненти, а саме: локомоторний, нелокомоторний та маніпуляційний.

Ключові слова: фізична активність, рухові навички, тестувальний інструмент, діти.

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