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Development of Muscle Explosive Power Tests on Upper Body

Qory Jumrotul 'Aqobah[1]✉, Reqgi First Trasia[2], Masnur Ali[3], Adito Joyo Ari Pratama[4]

Ilmu Keolahragaan FKIK Universitas Sultan Ageng Tirtayasa, Serang, Indonesia[1]
Pendidikan Kedokteran FKIK Universitas Sultan Ageng Tirtayasa, Serang, Indonesia[2]
Olahraga Rekreasi FIK Universitas Negeri Jakarta, Jakarta Timur, Indonesia[3]
Ilmu Keolahragaan Pascasarjana Universitas Negeri Jakarta, Jakarta Timur, Indonesia[4]

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Abstract

Tests and measurements in the field of sports are important to reach the peak of achievement. With advances in technology in the field of sports can help make it easier to carry out tests and measurements. Upper muscle explosive power (upper body) is one important component to achieve achievement in each sport. The results of observations in the field, tests and measurement of upper muscle explosive power are still using manuals not digitally, such as push up Ball uses a measuring instrument in the form of a long ruler or meter. The method used in this study is the Research & Development (R&D) method that refers to the 4D model of the development of Thiagaradjan & Semmel with steps including Define, Design, Develop, and Disseminate. The research subjects are athletes who will compete in the 2024 National Sports Week (PON) Banten Province and its surroundings. Data collection methods are carried out using media and material validation questionnaires. Data analysis techniques use descriptive statistics that refer to the guide of Mardapi (2018), namely by converting score data on the questionnaire sheet into a qualitative form, calculating the average score of the total filling of the questionnaire sheet, and changing the average score into a qualitative value. The results show that it is very practical as indicated by the results of the questionnaire and has good effectiveness on training results.

How to Cite

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✉ Correspondence address :
E-mail: qoryaqobah@untirta.ac.id

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INTRODUCTION

Sports achievement is the highest result or achievement of an athlete or sports team in a competition or match. The factors that influence sports achievement include natural talent, exercise, psychological, environment, and nutrition. However, these factors can have different influences depending on the type of exercise done (Gould et al., 2002; Hanton et al., 2005; Phillips, 2015).

The application of science and technology (science and technology) in sports is very important in improving sports achievement. One of them is the role of technology on physical fitness tests. This technology can be used to measure the level of athlete's fitness, such as cardiovascular abilities, muscle endurance, and strength. By knowing the results of this measurement, the trainer can determine a more appropriate training program to improve athlete sports achievements (T. Bompa & Carrera, 2015). Generally physical fitness tests are carried out at one time or testing session. In the testing session, Atelt will be asked to do various tests that aim to measure their physical fitness level. The physical fitness test at one time aims to minimize the variables that affect the test results and ensure accurate and consistent results (Bayles et al., 2021).

There are many kinds of physical fitness tests, one of which is tests and measurements of the upper body muscles, such as push up tests and SMBT (Seated Medicine Ball Throw). Like push ups, is one of the upper body muscle strength tests that requires athletes to do for 30-60 seconds (depending on physiological including gender and athlete's age). While SMBT, athletes must throw the Medicine Ball upright with both legs straightened forward and then throw the ball by parabol using a chest pass technique such as the technique used in the basketball game. However, the two tests in our opinion have shortcomings in the process of implementation. When viewed in terms of effectiveness and efficiency, the two tests are still classified as poor. Examples such as push ups that must be done for 30-60 seconds, and SMBT that require the assessment team to measure the fall of the Medicine Ball using a measuring device in the form of a long ruler or meter. (Hanton et al, 2005)

From these problems, the author tries to apply science and technology and make a conceptual design of sports for the physical fitness test on the upper body muscles. The author makes a physical fitness test gauge to measure the explosive power of upper body muscles that are more effective and efficient, and safe and easy to carry. This tool is assembled from several electronic devices, sensors, microcontrollers, and sports equipment. This tool is also equipped with results that appear on the LCD screen. So that it can facilitate the assessment team's assessment. The procedure for using this tool is to do a drop push up movement with the second position of the hand on the aerobic stairs and ending with your hands back to its original position. Then, the LCD screen will display the highest results of the movements that have been made.

The purpose of this development research is so that science and technology in sports, especially in tests and measurement of upper muscle explosive power is increasingly developing to be efficient, effective and safe. And can be an alternative as a developing technology development in the sports industry. And helps the effectiveness of energy or minimize energy expenditure that is in vain during the implementation of tests and measurements.

Tests and measurements in sports are the process of collecting data that is carried out to evaluate the physical abilities, techniques, and tactics of an athlete. The purpose of this test and measurement is to help track the progress of athletes, identify their strengths and weaknesses, and determine the right training program to improve their performance (T. O. Bompa & Buzzichelli, 2018). There are several examples of tests and measurements in sports, namely physical fitness tests, technical tests, tactic tests, and psychological tests (McGuigan, 2017). The use of tests and measurements in sports is very important to develop quality athletes and ensure that they are physically, technical and tactical in the face of competition at a higher level. However, this test and measurement must be done carefully and with adequate knowledge to avoid injury or other negative effects on athletes.

Drop Push Up is one of several types of variations of push ups that have the main purpose of developing power in the muscles of the upper body. Here's how to do a push up drop movement: (1) Starting from the push up position, with two hands above the two boards beside the body. (2) Encourage both arms explosively with maximum strength to leave the board and drop the arm until it touches the floor. (3) When both arms have touched the floor, hurry up and do the push -up movement with the exploired push to leave the floor, and return to the board.

Arduino is an open-source microcontroller circuit board designed to facilitate the development of electronic prototypes (Oby, 2017).

Arduino uses the C ++ programming language. Therefore, if someone already understands the basics of the C ++ programming language, it will be easy to learn and understand the Arduino programming language. Arduino is available in various types and models, including Microcontroller ARM (Advanced RISC Machine) and AVR (ALF and Vegard's RISC Processor boards. By using Arduino, users can create various kinds of electronic projects, such as automatic control systems, robotics, and Internet of Things (IoT). 50kg load cell sensor is a type of sensor used to measure load or weight with a maximum capacity of 50kg. This sensor usually consists of two parts, namely strain gauge (tenuous switch) and hardener material (usually metal) that captures and measures the pressure or strain produced by the load placed above it. Then, the data produced by the sensor is sent to an electronic device or microcontroller to be processed and displayed in the form of numbers or graphics on the screen or computer. The 50kg load cell sensor can be used in various applications that require weight measurements, such as digital scales, packaging machines, or industrial robots. This sensor is also often used on a laboratory scale or material testing equipment. HX711 is an amplifier or signal amplifier that is often used in load cell sensors to read and process weight measurement data or loads and change analog signals from load cells into digital signals that will be read by microcontrollers (Al Mutlaq & The Giant, T.T.).

METHODS

This research is a type of research and research and development (R&D) that refers to the 4-D model of the development of Thiagaradjan, Semmel, & Semmel. Development procedures on 4-D models include four stages, including defining (define), design, development (develop), and dissemination.

Defining is the initial stage of development research. This stage consists of two activity steps, namely analyzing the components of tool development and analyzing the characteristics of sports, especially upper body muscle explosiveness.

Design The step that links the defining and design stages of development research is called design, and it includes creating test standards as well. The findings of examining the objectives' requirements in sports requiring upper body explosive power (upperbody) are used to prepare test standards. The exam is modified based on the athlete's skill level.

Development Following the design stage comes the advanced level of development. At this point, the following tasks are completed: (1) One method for obtaining recommendations for enhancing Thi's content is expert appraisal. An expert evaluates the tool and provides suggestions for enhancements; the test tool is then constructed based on the expert's recommendations. It is anticipated that expert evaluation will increase the accuracy, potency, testing, and technical proficiency of learning gadgets. In order to assess the quality of the developed media from both media and material perspectives, this stage evaluates the first product development (prototype) on three tool experts and three material experts. After that, the findings of the material experts' and media's validation will be examined. In the event that revisions are necessary, the findings of this research will serve as a roadmap for enhancing the relevant sections. In addition, small groups will evaluate the generated products—five different sports—that have been changed in response to advice and comments from media and subject matter experts. At this point, the test findings will be reexamined and updated in the event that recommendations and input are received. In addition, a sizable sample will be used to test the updated development product and assess its usefulness. At this point, the test results will be changed in light of the comments and suggestions made. At this point, the outcome is a finished good that is prepared for distribution.

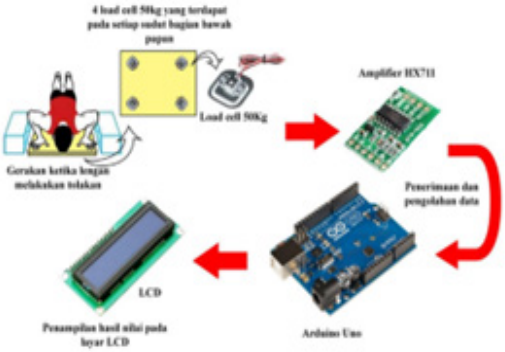

Figure 1. Prototype Development of Upper Body Muscle Explosiveness Test Tool (Upper Body)

The dissemination is the last phase of study for development. At this point, researchers disseminate the finished product development results more widely in order to socialize them. It is intended to carry out the diffusion stage in a number of sports in the province of Banten and the surrounding areas.

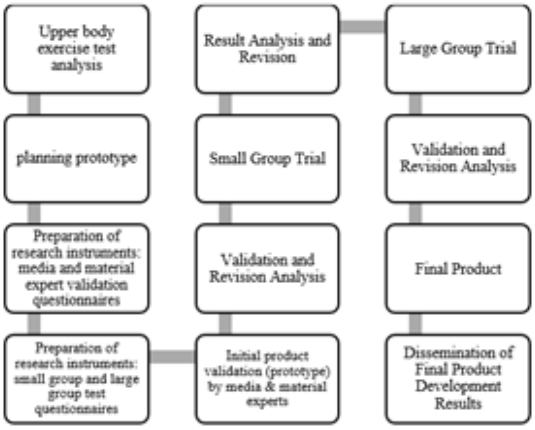

Figure 2. 4D Model Research Development Scheme

The subjects in this study were Banten province athletes. Data collection starts from the development stage by recapitulating and analyzing the results of product prototype validation from 3 media experts and material experts. After that, it is continued by recapitulating and analyzing the results of trials in small groups and large groups. The data obtained through the trial assessment instrument was analyzed using qualitative descriptive statistics. This analysis is intended to describe the data characteristics of each data variable. In this way, it is expected to facilitate understanding of the data for the next analysis process. The results of data analysis are used as a basis for revising the test tool products developed. Quantitative data analysis techniques Quantitative data analysis techniques in this study used statistical analysis. After the product is declared valid, practical, and has a good effect on student learning outcomes, the product can be mass produced. Descriptive data presentation of animated video-based learning media products in the form of statements that are very less, less, enough, good, and very good are converted into quantitative data on a scale of 4, with a score of 1 to 4. The steps in data analysis include: a) collecting rough data; b) scoring; c) converting the scores obtained into a scale of 5 using the conversion reference from Sukarjo quoted by (Fauzan & Rahdiyanta, 2017) as follows **Table 1.**

Table 1. Score Description

Score	Description	Calculation
4	Very Good	76 – 100
3	Good	56 – 75
2	Fair	26 – 55
1	Poor	0 – 25

The research location is in several places as follows: (1) The location of the testing was carried out at the Fitness Lab of Sports Science Study Program and Lab Concentration of Sports Science Study Program, Faculty of Medicine Untirta. (2) Locations of small and large group trials are carried out in sports in the City of Banten Province. The subject in this study is a thletes who were registered with the Banten Provincial KONI.

RESULTS AND DISCUSSION

The feasibility of muscle explosive power tests on upper body at the validation stage by material and media experts, as well as the assessment of BAnten Province athletes from the feasibility aspect, with the following results **Table 2.**

Table 2. The assessment results of each aspect by

Score	Description	Calculation
4	Very Good	76 – 100
3	Good	56 – 75
2	Fair	26 – 55
1	Poor	0 – 25

The results of giving test instruments with a Likert scale in the initial draft test, small-scale and large-scale trials will be quantitative data accumulated by the three experts and classified by the number of percentages as follows:

Tabel 3. The assessment results of each aspect by material experts

Aspects	Precentage	Description
Sefty	87%	Very Good
Easy To Use	95%	Very Good
Average	91%	Very Good

The assessment results for all aspects obtained 91%, with a very good classification, and concluded that this upper body test tool was declared feasible and could be used. After the product is declared valid, practical, and has a good effect on the results of the exercise, the product can be mass produced. Digital measuring instruments can make it easier to collect test data. Because the Hail is more accurate and easy to read (Gumantan & Mahfud, 2020). The digital program has a very good level of effectiveness where there will no longer be human errors when recording overall scores, the level of efficiency is more helpful when a coach will measure the ability of athletes.(Gumantan et al., 2021) Sports test

results after getting an exercise program can make an evaluation for coaches and athletes to improve athlete performance(Dwi Oktario Bongga & Aryanti, 2024). technology can facilitate in all fields, especially sports. rapid technological advances in the field of sports can improve athlete performance and prevent athletes from injury(Aqobah & Rahayu, 2022).

In this study, the tool developed is a tool to measure upper body explosive power. Explosive power in sports achievement is one of the components that must be owned, because this relates to the results of all techniques performed both individually and in groups in matches.

According to Harsono (2001) Explosive power is the ability of a muscle or group of muscles to use maximum strength exerted in the shortest time or as short as possible. If a person can utilize the explosive power of his body muscles well, then his best ability will definitely be obtained, and if the faster a person performs the action of muscle explosiveness, the results are also quite good. The accuracy between the two is not much different because it also depends on the person to get maximum results in performing the action as quickly as possible or in the shortest possible time. Here's a picture of the tool that was developed **Figure 3.**

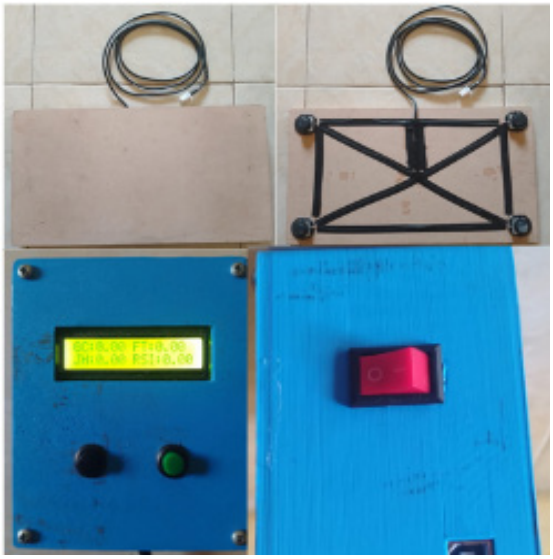

Figure 3. developed tools og upper body test.

CONCLUSION

re results and has good effectiveness on training results. Ability Evaluation Effective testing tools can provide an accurate picture of an athlete's up- per body ability. This research is a form of Research And Community Service institution of Sultan Ageng Tirtayasa University in supporting Sports Science in BAnten Province. The result is a tool that helps to test and measure athlete performance when preparing for a match. This allows the coach or physical trainer to plan an appropriate and individualized training program and by using the same test tool at regular intervals, we can monitor the athlete's development and progress over time. This helps in identifying areas that need improvement and evaluating the effectiveness of the training pro- gram.

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