

**Development of Measuring Tools For Swimming Physical Tests on Students  
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**Abstract**

The purpose of this research is to develop a practical, valid, and effective measuring tool for physical training among Physical Education and Health students at FKIP Unsri. The research method employed is the Research and Development (R&D) approach, which aims to produce an application as a measuring tool for physical tests in various sports disciplines. The sample for this study consists of third-semester Physical Education and Health students at FKIP Unsri. Data collection techniques include validation tests, practicality tests, and effectiveness tests. The research instruments used are validation sheets, questionnaires, and the application itself used by the students. Data analysis involves assessing validity, practicality, and effectiveness. Based on the research findings, the measuring tool for physical tests in various sports disciplines developed in this study is highly valid, with a percentage of 83.92%, and the average results of the trial tests are 81.25%, indicating that the measuring tool is deemed highly suitable for use. The research outcome is a practical and valid software application that can be used to measure physical tests in various sports disciplines. The implication of this research is that the application of the measuring tool for various sports disciplines can assist coaches, athletes, students, and individuals in accurately and easily measuring the process and results of their training, as it eliminates the previous manual measurement method, which often led to measurement errors during training and assessment.

**How to Cite**

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## INTRODUCTION

The development of sports in Indonesia can thrive if the quantity and quality of learning can be improved. The utilization of technology in training and education processes would greatly assist in this endeavor. In today's world, scientific and technological advancements are rapidly progressing globally, including in Indonesia. Technology is being utilized in various fields such as communication, economics, social sciences, sports, and education, leading to increased convenience and assistance for individuals, particularly in sports and education-related tasks. According to (Victorian et al. (2021:95), the fourth industrial revolution has also influenced the progress of technology and information as educational tools, allowing for online learning and provisions.

Interestingly, there is more emphasis on advancing technology rather than understanding the individual needs, learning styles, and preferences of students. To enhance the field, there is a need for an accessible application that can improve the components of physical testing and the performance of athletes. Utilizing useful sports-related scientific and technological advancements in the process of creating successful athletes is crucial. Sports-related scientific and technological advancements can be utilized during training sessions, competitions, and sporting events. Effective scientific and technological advancements is instrumental in achieving outstanding performance and should be incorporated in training processes, as training plays a vital role in determining the success of sports achievements. Thus, it is recommended to adopt a sports-focused scientific and technological advancements approach during this process, as scientific and technological advancements serves as a means to provide accurate information about an athlete's physical condition (Pranata et al., 2019: 107). Consequently, the integration of technological applications in the field is necessary to facilitate effective and tailored coaching processes.

Applications are devices that can be used and managed according to the desired function. (Syani & Werstantia, 2019) application is a piece of software that contains coding or commands which can be changed as desired. In general, an application is a specialized and integrated tool that is designed to perform specific functions according to its capabilities. It serves as a ready-to-use computer program for users (Widarma & Kumala, 2017:2). This can be used in designing and formulating appropriate forms of tests in sports.

The test is a method or procedure that must be carried out in activities, especially sports in order

to find out and adjust to changes in body conditions. Physical is an individual's body or body that needs to be maintained in its condition. Physical tests are carried out in order to determine the athlete's physical condition and fitness, the fitness in question requires components that are trained according to the portion, these components are endurance, flexibility, strength, speed, agility, coordination, balance and so on. According to (Susilawati, 2018:11), a test is a tool used to gather information, which can be in the form of items or questions designed to be given to individuals under specific conditions. In the context of physical education or sports, tests and measurements are conducted to assess an individual's performance regarding the material that has been taught or trained (Dewi & Sukadiyanto, 2015: 3). Sugihartono et al. (2021: 38), physical fitness measurements are intended to assess the achievement of learning objectives, where the objectives and functions of physical education and health are the development of physical fitness and the improvement of motor skills.

The results of observations on 3rd semester penjaskes students of fkip sriwijaya university, the physical tests carried out were still in manual form from recording athlete identities, so it took quite a long time due to limited access and facilities, as well as physical test criteria and physical test components carried out manually, as a result it was not close the possibility that errors or mistakes can occur in recording the results of the athlete's physical test. While the results of these tests are the condition of athletes during training as a source of data and information for them as well as being a reference in improving physical condition. Therefore, it is important to adjust the tests and develop the application of measuring instruments so that they can help athletes, coaches and lecturers in the field of physical education to achieve maximum performance under optimal conditions.

Application development in the form of measuring instruments needs to be developed so that it fits the physical fitness conditions of students and can be improved for the better. Because physical activity can affect cognitive and student achievement. So, it is necessary to develop an application in the form of a physical test measuring tool to optimize students' physical training activities for deepening sports in achieving achievement. In application development there are several stages that have been designed as a requirement so that an application can be made in a structured and well-designed manner. Application development is a series of processes carried out by a designer or group of designers to create a series of processes from the initial design of the application, creating a working model of the

application, implementation, final testing of the application until the application is complete and ready for use (Aufa, 2019:1). The components of fitness are necessary to determine areas that need improvement and training. According to Ihsan et al. (2022: 219), the components of physical fitness include strength, speed, endurance, flexibility, coordination, agility, balance, and explosive power. Additionally, Pasaribu (2020: 4) provides a list of fitness components as follows:

- a. Endurance: The ability of the cardiovascular and respiratory systems to function optimally during daily activities for a prolonged period without significant fatigue. It is crucial in supporting muscle work by supplying oxygen and removing metabolic waste.
- b. Strength: Physiologically, strength refers to the ability of a muscle or group of muscles to exert maximal force against resistance. Mechanically, strength is defined as the force generated by muscles in a maximal contraction. Strength is important for everyone.
- c. Flexibility: Flexibility is the joint's ability to move through its full range of motion. It indicates the maximum range of joint movement. Flexibility is particularly important for children in their play activities, as it requires not only speed and power but also agility and quick changes of direction. Insufficient flexibility can lead to muscle strain during sudden changes in speed and direction.
- d. Speed: Speed is the ability to move from one place to another in the shortest possible time. It involves locomotor movements, such as running, as well as specific body movements like striking. Speed is important for both children, to maintain their mobility during play, and adults, to preserve their mobility.
- e. Power: Power is the combination of speed and strength, or the ability to generate maximum force with maximum speed. It is often used by school-age children in explosive and fast movements, which showcase their abilities. Adults also need power for actions requiring maximum energy, such as executing a powerful smash in sports. Each component of movement activities has different significance and weight depending on age and purpose.
- f. Agility: Agility is the ability to change body position or direction quickly, performed simultaneously with other movements. For children, agility is a fundamental component of physical fitness. Without agility, a child is considered abnormal or possibly ill. Agility should be a top priority in training the physical coordination of every child. For adults, agility is still important but limited to the specific sports they engage in.
- g. Balance: Balance is the ability to maintain body position and stability while standing (static balance) or performing movements (dynamic balance). Balance is influenced by various factors, including visual and vestibular cues. Both static and dynamic balance are components of physical fitness commonly practiced by children and adults. For example, walking on a balance beam or tightrope requires balance to maintain a stable position.
- h. Accuracy: Accuracy, as a motor skill, is a component of physical fitness necessary for daily activities. It can refer to the accuracy of performance or the accuracy of results. Accuracy is closely related to the maturity of the nervous system in processing external inputs or stimuli, such as judging space and time accurately, efficiently distributing energy, coordinating muscles, and more. Training for accuracy can be provided to children with relatively simple coordination, while adolescents can engage in accuracy training involving more complex muscle coordination.
- i. Coordination: Coordination is the ability to perform movements or work accurately and efficiently. It represents the harmonious relationship between various factors involved in a movement. Coordination abilities provide a solid foundation for sensory-motor learning. The higher the level of coordination, the faster and more effective the execution of complex movements.

Based on the above description, the main components related to physical fitness include:

- 1) The capacity and ability of individuals to perform daily tasks.
- 2) Improvement in functional aspects such as heart, blood circulation, lungs, and muscles.
- 3) Avoidance of significant fatigue and allowing for recovery.
- 4) Maintenance

These stages are information gathering, planning, development, and maintenance. Previous research by Pranata et al. (2019) entitled Development of the Physical Test Application Model for Volleyball Sports at the Regional Student Education and Training Center in Musi Banyuasin Regency obtained results that could be categorized as feasible with field trial results of 75%, so that it can be assist coaches in conducting and improving physical tests in volleyball. Therefore, the application in the form of a measuring tool needs to be improved for Physical Education students in every sport they are interested in so that it can help the training process and increase maximum performance. Because previously students were still doing physical tests manually so they were not optimal and it was necessary to develop a practical measurement tool to

be used as a trainer and can be accessed or published for anyone who wants to use it. The physical fitness testing activities in various sports disciplines cannot be conducted randomly; they must be carried out with proper techniques and rules according to the specific criteria of each sport. One example is swimming, which is trained with specific goals such as increasing height or qualifying for police or military academies. Even civilians may also desire swimming skills to align with their life goals. In the defense and law enforcement sectors, most personnel must be proficient in swimming to perform their duties in any condition. This research is conducted to enhance the physical abilities, particularly in swimming, of military and police personnel, aiming for optimal results.

Based on the description above, the researcher is interested in providing a solution by conducting a study entitled "Development of a Physical Test Measuring Instrument for In-Depth Sports Achievement for Physical Education Students Semester 3 FKIP UNSRI" so that it can be a guide and reference when carrying out physical tests by developing a good and correct training process .

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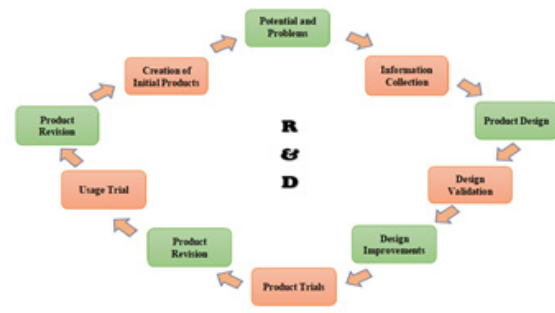
**METHODS**

This research uses research type Research and development (R&D). Research and development, or what is known as R&D, is a research method that aims to create special products and test their level of effectiveness, so that they can produce products that are used and useful in society. This method involves needs analysis and testing to ensure that the product can function properly in a wider context (Sugiyono, 2019: 297). The subjects in this study were all 3rd semester Physical Education students The instruments needed aim to measure the validity, practicality and effectiveness of the physical test measuring software developed, namely validation sheets, questionnaires and student physical

test. The results of data calculations are then made in the form of a percentage multiplied by 100%.

**Table 1.** Kategori Persentase Kelayakan (Arikunto, 2013: 210)

Score in Percentage	Eligibility Category
<40%	Not Good / Not Worthy
40% - 55%	Less Good / Less Worthy
56% - 75%	Good Worthy / Worthy Enough
76% - 100%	Good / Worthy



**Figure 1.** Steps of the Research Procedure Source: Sugiyono (2022: 298).

**RESULTS AND DISCUSSION**

This measuring instrument has several components of a physical test that can be tested, namely: a test of strength, flexibility, muscle power, balance, endurance, speed and agility. These seven components are dominant in various sports, so this physical test measuring product can be used in helping sports to further improve the physical performance of athletes and students majoring in sports. Based on the development procedure, after the tool has been designed and made, the next step is testing. Tests are carried out in two ways, namely functional tests and measurement error tests. The measurement results are as follows **Table 2.**

**Table 2.** Small Group Trial Results

Rated Aspect	Score	Max Score	(%)	Category
Feasibility of the content of the material	312	400	78	Worthy
Total score	312	400	78	Worthy

Based on **Table 2.** on the results of this trial the percentage obtained from the eligibility of the application content was 78%. Therefore, from the aspect of the feasibility of the application of the Sports Branch Physical Test Measurement Tool, it gets the "decent" category.

**Table 3.** Large Group Trial Results

Rated Aspect	Score	Max Score	(%)	Category
Feasibility of the content of the material	338	400	84,5	Worthy
Total score	338	400	84,5	Worthy

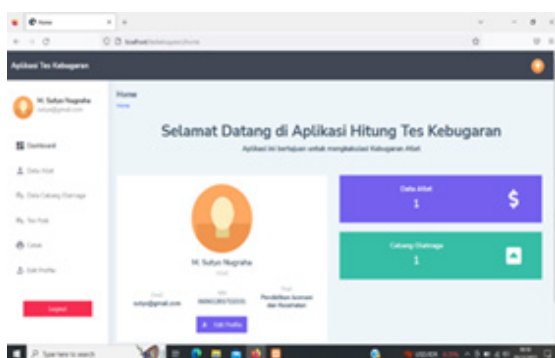
Based on **Table 3.** in the results of this trial the percentage obtained from the eligibility of the application content was 84.5%. Therefore, from the aspect of the feasibility of the application of the Sports Branch Physical Test Measurement Tool, it gets the "decent" category.

This research falls under research and development (R&D). Research and Development aims to bring about innovations, utilizing mixed methods, combining concepts, employing multidisciplinary and interdisciplinary approaches over a sustained, structured, and measurable period (Amelia, 2022:11). According to (Darmawan, 2017), with the advancement of technology, a personal trainer can be replaced by an application that helps beginners understand the use of exercise equipment. Besides being efficient and cost-effective, beginners can follow a formal training program guided by a personal trainer. The development process involves several stages: application design, customization, revision, small group testing, large group testing, and implementation among students. Based on expert validation, the content suitability of the Physical Fitness Test Measurement App for different sports achieved a percentage of 89.28%, indicating a "feasible" category. Additionally, the IT expert validation yielded a percentage of 78.57% for the application's content suitability, also categorized as "feasible." Subsequently, a small group test was conducted in a single session involving 10 respondents, consisting of third-semester Physical Education students at FKIP Universitas Sriwijaya during the odd semester. Physical tests were conducted, including strength tests (push-ups, sit-ups, pull-ups, wall squats), muscle power tests (vertical jump, standing broad jump, medicine ball), flexibility tests (sit and reach, standing trunk flexion), balance tests (stork stand), endurance tests (1.6 km run, 12-minute run, 300-meter run, step test), speed tests (30-meter sprint, 50-meter sprint), and agility tests (agility run, Illinois run, shuttle run, zig-zag). The results of this small group test showed a content suitability percentage of 78% for the application, indicating a "feasible" category. Furthermore, a large group test was conducted in a single session with 30 respondents, performing the same physical tests as in the small group test. The results of this large group test yielded a content suitability percentage of 84.5% for the application,

also falling into the "feasible" category.

In the era of globalization, it is essential to use computer applications or software that can record and calculate the results of tests performed by athletes to determine their physical fitness level or VO<sub>2</sub>Max (Hartati & Victorian et al., 2018: 1). According to Hartati et al. (2020), advancements in technology, information, and communication, particularly computer technology, are expected to help overcome learning problems. Physical education and health are fields of study that encompass various sports disciplines. Each sport has specific physical fitness components that need to be trained and maintained for optimal performance. Victorian et al. (2021: 79) state that physical education is a discipline primarily known for developing motor skills and movement competence, promoting physical activity and physical fitness. According to (Aryanti, S., & Hartati, 2020), physical education is an effort to enhance human quality by focusing on character formation, discipline, high sportsmanship, and improved achievements that foster national pride. Every sport follows a similar process and objective, all of which are formed through training. One of the goals of sports is to improve athletic performance, and achieving excellence requires early development through talent identification, nurturing, education, and scientifically based sports training to enhance the quality of sports organizations at both the central and regional levels (Yusfi et al., 2019: 78). Hartati et al. (2018: 233) emphasize the important role of physical education in creating individuals with character, quality, and global competitiveness. Effective learning strategies that involve students' cognitive, affective, and psychomotor aspects are crucial in physical education. Training plays a vital role in improving desired components in sports. Training is an effort to enhance the functional quality of the body's organs and the psychological well-being of the participants (Hartati et al., 2019). This physical fitness measurement application is designed to assist coaches, athletes, students, and sports educators in facilitating physical tests and preparing appropriate training programs based on athletes' identified physical weaknesses. Mardapi (2017:94) states that tests are instruments used for measurement purposes. The process of measurement involves obtaining data, interpreting the data, and deriving the value or status of a particular object based on the data (Wati, 2021: 3). With the assistance of an application, tests and measurements can be conducted easily and practically. An application is a software unit created to assist in performing various activities that humans engage in on a daily basis (Subagio & Samsir, 2022: 101). According to Putri et al. (2023: 609), an application is software created by an organization

to carry out specific tasks, such as Microsoft Word or Microsoft Excel. Furthermore, an application is a ready-to-use program that executes commands from the user to achieve accurate results according to the intended purpose of the application (Dhanta, 2015). The developed application by the researchers is a software designed to meet the needs of athletes' physical training. Previously, physical tests were conducted manually by students, resulting in suboptimal outcomes. Therefore, a practical measurement tool needed to be developed for use by coaches and accessible to anyone interested in utilizing it. The following is the application form designed **Figure 2**.



**Figure 2.** Application Front Page Display

The image above is the overall appearance of the front page of the application. The development of a physical fitness measurement tool called "Tes Kebugaran Jasmani" (Physical Fitness Test) utilizes the XAMPP application (Control Panel) and can be accessed through the Mozilla Firefox application via the link: <https://localhost/teskebugaranjasmani/>. This tool enables users to perform physical tests in various sports disciplines. The physical measurement tool consists of several components, including strength, flexibility, muscle power, balance, endurance, speed, and agility tests. These seven components are crucial in various sports disciplines, making this physical measurement tool a valuable aid in improving the physical performance of athletes and students majoring in sports.

The research on the "Development of Physical Fitness Test Measurement Device for Performance Sports Branches in 3rd Semester Physical Education Students at FKIP UNSRI" has the following general impacts:

1. The physical fitness measurement device for sports branches serves as a more objective testing tool.
2. The physical fitness measurement device becomes a resource and reference for athletes, students, or individuals to achieve training goals. Its comprehensive components and

valid results eliminate doubts in utilizing the application.

3. It motivates coaches to expand their knowledge regarding technological advancements.

The Development Research Faced Several Limitations And Weaknesses, Including The Following:

1. Limited Research Funding.
2. The Design And Development Of The Application Required A Significant Amount Of Time.
3. The Students Were Accustomed To Conducting Manual Physical Tests, While The Application Required Access Through An Admin, Limiting Its Availability To A Wider Audience And Restricting Its Usage.

## CONCLUSION

Based on the results of the research and discussion above, it can be concluded that the physical test measuring instrument for various sports is very valid with a percentage of 83.92% and the average of the two trial results is 81.25% so that it is stated that the physical test measuring instrument for various sports has been developed fall into the very feasible category.

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