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Android based karateka physical test instrument

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Abstract: This study aims to develop an android-based karate athlete physical test instrument. This study uses the Research and Development research method, namely the ADDIE development model, which includes the Analyze, Design, Develop, Implement, and Evaluate stages. This study involved several experts consisting of karate experts, physical standard experts, linguists, and media experts to validate the developed instrument. In addition, this study also involved a number of karate athletes in the implementation and evaluation process. The research data collection technique was carried out through a questionnaire. From the five stages carried out, this study succeeded in producing an android-based karate athlete physical test instrument according to the needs in the field. From the evaluation of the suitability of the android-based karate athlete physical test instrument based on the assessment of karate experts, physical standard experts, linguists, and media experts, it was found that the developed instrument was declared feasible for use. These results are also supported by the results of trials on athletes in small groups and large groups also stating that the android-based karate athlete physical test instrument developed is feasible for use. Based on these results, this study concludes that the android-based karate athlete physical test instrument developed is ready for use. The detailed results of the analysis, design, develop, implement, and evaluate stages are explained in this article.

Keywords: *Android applications, Karate, Physical test standards.*

1. Introduction

Achieving achievements in sports certainly requires continuous coaching and certainly needs to be supported by the development of science and technology. The achievement of becoming a champion certainly requires a long process. To improve sports achievements, prime physical condition is one aspect that is very much needed. As stated (Bafirman & Wahyuri (2018) and Maimun and Alfian (2019) that "physical condition is one of the prerequisites that are very necessary in efforts to improve an athlete's performance, it can even be said to be the starting point for a sports achievement". Furthermore, according to Harsono (2018) that "the physical condition in question is strength, endurance, flexibility, agility, speed, and power".

Sports achievement needs to use valid and reliable physical tests so that they can be used as a guide based on physical indicators so that they can be used as evaluation material for karate athletes. According to Ngatman and Adriyani (2017) a test is a measurement instrument that can be used to obtain information about the characteristics of individuals or groups; which can be done in writing in the form of a question form, orally (interviews), observations using checklists or anecdotal notes, and performance with the help of mechanical equipment such as treadmills, javelins, balls, and so on. Karate athletes from North Sumatra have participated in many national and international events. But it is still dominated by the kumite number, while the kata number is still far from behind.

Kata in karate is a series of predetermined movements. Kata is a sequence of defensive and attacking movements that simulate a fight without an opponent. Kata means "form" of predetermined attack and kick techniques that are practiced in real life. Kata in karate is practiced with slow, smooth, methodical movements and in a low horse stance so that the ability to master all qualified kihon techniques will support when performing kata movements. In kata movements there are slow and fast movements and

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must have good balance. Kata rhythmically combines all the techniques in karate. Another karate match is kata (art performance) which is competed in the male and female categories (Swanson, 2017).

To improve sports performance, there are several problems that must receive serious attention, such as physical components, because physical components are the basis for efforts to improve sports performance. Some physical components that must be developed to achieve optimal performance include reaction speed, arm strength, abdominal muscle strength, leg muscle explosive power, and flexibility (Harsono, 2018); (Ahmad, 2013). Physical condition status can reach an optimal point if training is started from an early age and carried out continuously by adhering to the basic principles of training. A person's physical condition status can be known by means of an assessment in the form of a physical test. The test can be done in a laboratory or in the field. Although tests carried out in the laboratory require expensive equipment, both tests should be carried out so that the assessment results are truly objective. Without being supported by prime physical condition, achieving peak performance will experience many obstacles and it is impossible to achieve high performance.

Physical condition is a prerequisite that is very necessary in efforts to improve an athlete's performance, it can even be said to be a basic need that cannot be postponed or negotiated (Hendarto et al., 2018). Ratno et al. (2019) stated that the karate talent identification instrument can be a means of finding talented athletes. According to Arikunto (2012), a test is a tool or procedure used to find out or measure something in a situation with predetermined methods and rules. Meanwhile, Widoyoki (2009) states that a test is a measurement tool in the form of questions, commands, and instructions aimed at the testee to get a response according to the instructions given. According to Arifin (2011), measurement is a process or activity to determine the quantity of something. Meanwhile, according to Sepdanius et al. (2019) said that measurement is the process of collecting data or information that is carried out objectively. The measuring instrument used must have good criteria. Through measurement, all programs related to developments in any field can be controlled and evaluated. So, later from the results of the evaluation, efforts can be made to improve the desired results. Based on the problems above, this study aims to develop an Android Based Karateka Physical Test Instrument. It is hoped that with.

2. Method

This development research refers to the ADDIE procedure model. This model consists of five main stages, namely Analysis, Design, Development, Implementation, and Evaluation. in accordance with initial expectations or not (Omega et al., 2021). This research was conducted at the Faculty of Sport Science in the Sports Coaching Education Study Program, State University of Medan which was carried out from April to May 2024. Research data were collected through interviews, observations and using questionnaires involving a number of athletes and several experts including karate experts, physical standards experts, language experts, and media. The data collected were analyzed qualitatively and quantitatively. Qualitative data from interviews and observations were analyzed using thematic analysis. While the results of the questionnaire were analyzed quantitatively to obtain data in the form of a percentage of the assessment results carried out by experts and athletes. The percentage obtained was then categorized based on the category table as seen in Table 1 below.

Table 1.
Category criteria.

No	Percentage	Category
1.	85%-100%	
2.	70%-84%	
3.	55%-69%	
4.	≤ 49%	

3. Findings

The purpose of this study is to develop a product in the form of a karate physical test standard. In accordance with the stages of the ADDIE approach, this section explains the results of the analysis,

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design, development, implementation, and evaluation stages. The following is an explanation of the findings from each of these stages.

3.1. Analyze

In the analysis stage, the method used by the researcher is observation of the needs of physical test standards for karate athletes with kata material by conducting interviews with the achievement division of the North Sumatra National Sports Committee and several athletes. Observations and interviews were conducted to determine the physical test standards for karate athletes used for national sports week athletes.

From the results of the observation, it was found that in karate training activities, physical tests were carried out according to the needs of the branch. In general, physical tests have been carried out to identify each karate test item including flexibility, agility, balance, coordination, speed, arm power, leg power, abdominal endurance and cardio vascular endurance. However, the physical tests carried out have not been carried out with standard standards and are carried out by recording the test results manually.

The results of interviews conducted with the achievement division of the North Sumatra National Sports Committee showed the need to develop an Android-based physical test instrument for karate athletes. Based on the results of the interview, five reasons were obtained why the Android-based physical test instrument. The five reasons include the need for efficient monitoring, ease of access for athletes and coaches, personalization of training programs, increasing data accuracy and reliability, increasing athlete motivation, and adaptation to the digital era.

Coaches revealed that one of the biggest challenges in coaching athletes is the limited time to conduct physical tests manually. By utilizing Android-based applications, data can be accessed in real time and stored in an organized system. Athletes interviewed stated that they often do not get a clear picture of their physical condition due to limited measuring tools or overly complicated processes. Karate sports administrators also considered this Android-based test instrument important because it requires personalized training programs based on accurate physical test results. Meanwhile, from the explanation of a senior coach, the manual physical test process is prone to recording errors and subjectivity. Athletes also admitted that they are more motivated if they can monitor their physical development directly through technological devices. It was further conveyed that the world of sports, including karate, must follow technological developments to increase efficiency and competitiveness. Specifically, the opinions of the respondents can be seen from the excerpts from the interview results shown in Table 2 below.

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Table 2.
Interview results.

Excerpt from the interview	Conclusion
" The manual measurement process takes a long time, and the results are often difficult to integrate into the training data directly"	The Need for Efficient Monitoring
"If there is an application, we can immediately see our test results at any time and know which areas need improvement."	Ease of access for athletes and coaches
"With digital instruments, coaches can immediately adjust training programs to the weaknesses of each athlete, without having to wait for the manual analysis process"	Personalize Your Training Program
"Android application allows more accurate data acquisition because measurements are made with technology"	Improving Data Accuracy and Reliability
"This application can be a tool to motivate us, because the results that are immediately visible make us want to continue to improve ourselves"	Increasing Athlete Motivation
"In the digital era, we cannot just rely on conventional methods. Applications like this are an investment for the future"	Adapting to the Digital Era

Based on the interviews in Table 2, it can be concluded that the development of Android-based karate physical test instruments is very much needed to answer various challenges in coaching karate athletes, both in terms of efficiency, accuracy, and athlete motivation. This is in line with the vision of sports modernization which emphasizes the importance of technology integration in the coaching process.

3.2. Design

The design process is the stage of designing test standards and media. At this stage, research instruments are also designed to measure the feasibility of test standards and media used and developed. For this reason, at this stage, researchers carry out several stages in compiling the design of an Android-based physical test instrument. The first step is to collect sources of material that will be presented in each physical test indicator from various sources such as books, in addition there are also photos and videos downloaded from Youtube. Second, researchers compile a framework for teaching media for lectures. The compilation of the karate test instrument media framework generally consists of three main parts, namely the test implementation instructions section, test norms, test standards. The instructions section contains instructions and steps for implementing the test. The norms section consists of the age level of the test subjects. In the third section, enter the test standards in the standards section, the results obtained will be explained according to the predetermined standards. Third, researchers compile the contents of the Android application. The material that will be included in the Android application is related to the karate athlete physical test indicators which contain nine indicators. All physical tests will present a video of each test item and a scoring range that is in accordance with KONI standards as seen in Table 3.

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Table 3.
Karateka physical test instrument design.

No	Sub Variabel	Indikator	InstrumenTes
1.	Reaction Speed	• Ability to react by catching objects/rulers that are dropped	• Ruller drop test • Handreaction test
2.	Strength	• The result of squeezing the hand muscles	• Handgrip Strength
3.	Explosive Power	• The distance of 2 consecutive horizontal jumps. • The furthest distance of three jumps in centimeters. • The furthest push of 2 repetitions.	• Triplehoopjump • Standingbroad jump • Bola medicine
4.	Muscle Endurance	• The ability of muscles to contract for a long period or time and to recover quickly after fatigue • The ability to perform movements supporting the straightening of the arms and head, shoulders, back to the feet. • The ability to perform maximum lying-sitting movements.	• Push-Up (1 minute) • Sit-Up (2 minutes)
5.	Heart-Lung Endurance	• Number of levels and shuttles	• MTF run/ Bleep test
6.	Flexibility	• Flexibility tests and measurements and torso	• Stand reach test • Shoulder flexibility
7.	Agility	• Speed of performing a six-way back and forth jump (hexagon) in three rounds. • Speed of performing a back and forth run covering a distance of 5 meters.	• Hexagon abstacle test • Shuttle run
8.	Balance	• The athlete's time to maintain body balance in static conditions.	• Stork standing • balance.
9.	Coordination	• Number of points earned • When the ball hits the target.	• Eye hand foot coordination test
10.	Speed	• 30 meter running time results.	• 30 meters run

In addition to designing the karate athlete physical test instrument, at this design stage the researcher also created a questionnaire for experts (karate, physical standards, language, and media) and karate athletes to test the feasibility of the developed android-based karate athlete physical test instrument. This research instrument is an instrument to measure the feasibility of the test instrument and media designed in the form of a questionnaire with a Likert scale of 4 answers, namely Strongly Agree, Agree, Disagree, and Strongly Disagree. The answers are then converted into a score of 4, 3, 2, 1.

3.3. Develop

The development stage consists of 3 steps, namely the development of athlete physical test standards, media development, and product validation. In the karate standard test development stage,

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the karate physical standard test is developed through previous standard tests, where previous standard tests are evaluated and improvements are needed according to the development and physical needs of karate athletes. Furthermore, media development, where the karate standard test is made into a tool that will be used by athletes as a form of guidance for implementing training in improving physical test components. Each athlete can measure and use it as a guide in seeing the progress of training that has been and will be done. After the instrument is finished, validation is carried out. Validation is carried out by karate experts, physical standard experts, language experts and android application experts.

3.4. Karate Expert Validation

Validation by karate experts includes indicators of flexibility, agility, balance. Coordination, arm power speed, leg power, abdominal endurance, cardio endurance. The results of the karate expert validation are shown in Table 4 below. Based on the data obtained, karate experts gave a value of the flexibility indicator of 75% with a feasible category, agility indicator 80% very feasible category, balance indicator 80% feasible category, coordination indicator 85% feasible category, speed indicator 80% feasible category, arm power indicator 80% feasible category, leg power indicator 75% feasible category, abdominal endurance 80% feasible category, and cardio endurance 80% feasible category. The overall assessment mean score is 79% with a feasible category.

Table 4.
Results of the first karate expert test.

No	Indicator	Score obtained	Score maximum	Percentage (%)	Category
1	Flexibility	15	20	75%	Feasible
2	Agility	16	20	80%	Feasible
3	Balance	16	20	80%	Feasible
4	Coordination	17	20	85%	Very feasible
5	Speed	16	20	80%	Feasible
6	Arm Power	16	20	80%	Feasible
7	Power Stem	15	20	75%	Feasible
8	Durability Stomach	16	20	80%	Feasible
9	Cardio Endurance	16	20	80%	Feasible
Final Score				79%	Feasible

Of the nine aspects of the test that were implemented, improvements need to be made, including the need to create a standard implementation book according to the indicators; alignment of perceptions about the implementation of each indicator; alignment of assessment norms according to implementation indicators; alignment of perceptions about the implementation opportunities given to athletes. After revising the karate physical test product in the kata category, the first revised test application product was produced which was then validated by karate experts again. The results of the second test can be seen in Table 5 below.

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Table 5.
Hasil Uji Ahli Karate Kedua.

No	Indicator	Score obtained	Score maximum	Percentage (%)	Category
1	Flexibility	18	20	90%	Very feasible
2	Agility	18	20	90%	Very feasible
3	Balance	18	20	90%	Very feasible
4	Coordination	17	20	85%	Very feasible
5	Speed	19	20	95%	Very feasible
6	Arm power	18	20	90%	Very feasible
7	Power stem	18	20	90%	Very feasible
8	Durability stomach	18	20	90%	Very feasible
9	Cardio endurance	18	20	90%	Very feasible
Final Score				91%	Very feasible

Based on Table 5 above, the assessment of the karate physical test conducted by the second karate expert with a flexibility indicator of 90% in the very feasible category, agility indicator of 90% in the very feasible category, balance indicator of 90% in the very feasible category, coordination indicator of 85% in the very feasible category, speed indicator of 95% in the very feasible category, arm power indicator of 95% in the very feasible category, leg power indicator of 90% in the very feasible category, abdominal endurance of 90% in the very feasible category, cardio endurance of 90% in the very feasible category. The mean score in this second test was 91% in the very feasible category.

3.5. Physical Standards Expert Validation

Validation by physical standard experts includes aspects of the achievement of each indicator produced by athletes. The physical expert validator is. Validation by physical standard experts aims to obtain information, criticism, and suggestions so that the developed standard results become good products in terms of national standards. The results of the validation by physical standard experts can be seen in Table 6. Based on the data obtained, it was found that the flexibility indicator obtained a value of 75% with a feasible category, the agility indicator 80% feasible category, the balance indicator 80% feasible category, the coordination indicator 85% very feasible category, the speed indicator 85% very feasible category, the arm power indicator 75% feasible category, the leg power indicator 80% feasible category, the abdominal endurance 80% feasible category, the cardio endurance 80% very feasible category for use.

Table 6.
Results of the first physical standard expert test.

No	Indicator	Score obtained	Score maximum	Percentage (%)	Category
1	Flexibility	15	20	75%	Feasible
2	Agility	16	20	80%	Feasible
3	Balance	16	20	80%	Feasible
4	Coordination	17	20	85%	Very feasible
5	Speed	17	20	85%	Very feasible
6	Arm power	15	20	75%	Feasible
7	Power stem	16	20	80%	Feasible
8	Durability stomach	16	20	80%	Feasible
9	Cardio endurance	16	20	80%	Feasible
Final Score				80%	Feasible

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Although it has obtained a final score of 80% with a category that is suitable for use, according to the input given by the physical standard expert, several revisions are needed. The revisions include, the test sequence must be reviewed by recording the sequence according to the applicable test, the length of rest for each test indicator that is carried out, before the test begins, a previous simulation must be carried out, and standardization of the understanding of the test officers. After the revision, the developed karateka physical test instrument was re-tested with a physical standard expert. The results of this second test can be seen in Table 7.

Table 7.
Results of the second physical standard expert test.

No	Indicator	Score obtained	Score maximum	Percentage (%)	Category
1	Flexibility	18	20	90%	Very feasible
2	Agility	19	20	95%	Very feasible
3	Balance	17	20	85%	Very feasible
4	Coordination	17	20	85%	Very feasible
5	Speed	18	20	90%	Very feasible
6	Arm Power	17	20	85%	Very feasible
7	Power Stem	19	20	95%	Very feasible
8	Durability Stomach	17	20	85%	Very feasible
9	Cardio Endurance	18	20	90%	Very feasible
Final Score				90%	Very feasible

Based on Table 7, the assessment of the karate physical test conducted by a physical standard expert, it was found that for the flexibility indicator, a value of 90% was obtained, with a very feasible category, agility indicator 95% in a very feasible category, balance indicator 85% in a very feasible category, coordination indicator 85% in a very feasible category, speed indicator 90% in a very feasible category, arm power indicator 85% in a very feasible category, leg power indicator 95% in a very feasible category, abdominal endurance 85% in a very feasible category, cardio endurance 90% in a very feasible category. The mean score obtained in this second assessment was 90% in a very feasible category.

3.6. Linguist Validation

Validation by language experts This validation aims to obtain information, criticism, and suggestions so that the supporting media for karate physical tests that are developed become good products in terms of language. And it is useful to find out whether the use of language used by researchers has met the applicable rules so that it is easy to understand and comprehend athletes. The assessment includes the use of words in the guidebook, the order of words in the guide, implementation instructions, the use of language in images (the language used to provide instructions), the language of the sentence editorial in each material, and educational diction.

Table 8.
Results of the first language expert test.

No	Indicator	Score obtained	Score maximum	Percentage (%)	Category
1	Use of words in the instruction	241	300	80%	Feasible
2	Word order in the instruction	237	300	79%	Feasible
3	Implementation instructions	237	300	79%	Feasible
4	Use of language in images	241	300	80%	Feasible
Final Score				80%	Feasible

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Based on Table 8 above, the assessment of the karate physical test conducted by a language expert with the indicator of language use in the picture obtained a value of 80% with a very feasible category, the indicator of implementation instructions 79% category very feasible, the indicator of word order in the guide 79% category very feasible, the indicator of word use in the guide 80. The mean score for the overall assessment is 80% with a category feasible to use. However, according to the notes given by the expert, revisions were made such as the need to create a standard implementation book according to the indicators, aligning perceptions about the implementation of each indicator, and aligning assessment norms according to the implementation indicators.

Table 9.
Results of the second language expert test

No	Indicator	Score obtained	Score maximum	Percentage (%)	Category
1	Use of words in the instruction	267	300	89%	Very feasible
2	Word order in the instruction	265	300	88%	Very feasible
3	Implementation instructions	268	300	89%	Very feasible
4	Use of language in images	267	300	89%	Very feasible
Final Score				89%	Very feasible

Based on Table 9 above, the assessment of the karate physical test conducted by a linguist, it can be seen that the indicator of language use in the picture obtained a score of 89% with a very feasible category, the indicator of implementation instructions 88% in a very feasible category, the indicator of word order in the guide 89% in a very feasible category, the indicator of word use in the guide 89% in a very feasible category. The mean score for the overall assessment is 89% in a very feasible category.

3.7. Android Expert Validation

Validation by Android experts aims to obtain input on what kind of Android media design contains junior kata category karate physical test material which will be one form of tool used to guide athletes in each training to obtain physical results as outlined by the national sports parent organization.

Table 10:
First Android Expert Test Results.

No	Indicator	Score obtained	Score maximum	Percentage (%)	Category
1	App Opening View	241	300	80%	Feasible
2	Application usage guide	237	300	79%	Feasible
3	Ease of operation	237	300	79%	Feasible
4	Use of music accompaniment in video	240	300	80%	Feasible
Final Score				80%	Feasible

Based on Table 10, the assessment of the karate physical test conducted by the android application expert with the application opening display 80% in the feasible category, the application opening guide 79% in the feasible category, the ease of operation indicator 79% in the feasible category, the indicator of the use of accompaniment in the video 80% in the feasible category. The mean score for the overall assessment is 80% in the feasible category. However, according to input from the expert, there are several revisions that must be made. The revisions include, the application opening display is accompanied by music that is adjusted to the sport, the application lead guide is designed to be simpler and more attractive, and each video display should be made with a slomotion and explanation. After the revision, a second test was carried out. The results of the second test by the android expert can be seen in Table 11.

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Table 11.
Results of the Second Android Expert Test.

No	Indicator	Score obtained	Score maximum	Percentage (%)	Category
1	App Opening View	263	300	88%	Very feasible
2	Application usage guide	268	300	89%	Very feasible
3	Ease of operation	289	300	96%	Very feasible
4	Use of music accompaniment in video	267	300	89%	Very feasible
Final Score				89%	Very feasible

Based on Table 11 above, the assessment of the second karate physical test conducted by the android application expert found that for the application opening display obtained a value of 88% with a very feasible category, the application opening guide 89% category very feasible, the ease of operation indicator 96% category very feasible, the indicator of the use of accompaniment in the video 89% with a very feasible category. The overall assessment percentage is 89% with a very feasible category.

3.8. Implementation

After the product is validated by android experts, then the next stage is the product is tested on a small group. This trial aims to see the feasibility of the product being developed. Initial product trials in medium groups totaling 20 people. The athletes provide assessment responses to the pencak silat teaching media based on aspects of physical standards, content feasibility, linguistic aspects, and usefulness aspects.

Table 12. Small Group Implementation Results.

No	Indicator	Score obtained	Score maximum	Percentage (%)	Category
1	Flexibility	237	300	79%	Feasible
2	Agility	239	300	80%	Feasible
3	Balance	238	300	79%	Feasible
4	Coordination	240	300	80%	Feasible
5	Speed	240	300	80%	Feasible
6	Arm Power	241	300	80%	Feasible
7	Power Stem	240	300	80%	Feasible
8	Durability Stomach	241	300	80%	Feasible
9	Cardio Endurance	241	300	80%	Feasible
Final Score				80%	Feasible

Based on Table 12 above, the assessment of the karate physical test carried out by athletes for the flexibility indicator obtained a value of 79% with a feasible category, agility indicator 80% feasible category, balance indicator 79% feasible category, coordination indicator 80% feasible category, speed indicator 80% feasible category, arm power indicator 80% feasible category, leg power indicator 80% feasible category, abdominal endurance 80% feasible category, cardio endurance 80% feasible category. The mean score for the overall assessment is 80% with a feasible category for use.

After the karate physical test standard for the kata category went through a small-scale trial stage, the standard test was used for training for athletes with a total of 60 athletes. Then each respondent gave an assessment response to the standard test developed and supporting media for karate physical training in the kata category based on aspects of Percentage of content feasibility, linguistic aspects, usefulness aspects, and graphic aspects to see student responses to the use of physical standard tests and karate media in the kata category. The results of the implementation in large groups can be seen in Table 13.

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Table 13.
Large Group Implementation Results.

No	Indicator	Score obtained	Score maximum	Percentage (%)	Category
1	Flexibility	260	300	87%	Very feasible
2	Agility	265	300	88%	Very feasible
3	Balance	267	300	89%	Very feasible
4	Coordination	268	300	89%	Very feasible
5	Speed	265	300	88%	Very feasible
6	Arm Power	267	300	89%	Very feasible
7	Power Stem	267	300	89%	Very feasible
8	Durability Stomach	267	300	89%	Very feasible
9	Cardio Endurance	269	300	90%	Very feasible
Total		2395	2700	89%	Very feasible

Based on Table 13 above, the assessment of the karate physical test conducted by a large group with a flexibility indicator of 87% in the very feasible category, agility indicator of 88% in the very feasible category, balance indicator of 89% in the very feasible category, coordination indicator of 89% in the very very feasible category, speed indicator of 88% in the very feasible category, arm power indicator of 89% in the very feasible category, leg power indicator of 89% in the very feasible category, abdominal endurance of 89% in the very feasible category, cardio endurance of 90% in the very feasible category. The mean score for the overall assessment is 89% in the very feasible category. The results of the study above show a fairly good percentage of student responses to the development of karate physical test standards in the kata category and android media.

3.9. Evaluate

After going through the process of the previous stages, the development of the karate physical test standard for the kata category received several improvements that had to be made based on the results of the expert assessments. From this process, it can be said that the karate physical test standard for the kata category that was developed has been declared feasible from the perspective of karate experts, physical standard experts, language experts, and media experts. In addition, from the implementation that was carried out, it was also found that there were no obstacles experienced by athletes in using the android-based karateka physical test instrument that was developed.

4. Discussion

The results of the study indicate that the Android-based karate physical test instrument developed through the ADDIE model has met the eligibility criteria based on expert validation and trials on karate athletes. This is in line with Branch's (2009) view that the ADDIE model is an effective systematic approach to developing educational products, including evaluation instruments, because it includes needs analysis, targeted design, data-driven development, structured implementation, and comprehensive evaluation.

At the Analyze stage, this study identified the needs of users, namely karate athletes and coaches, for a modern, efficient, and easy-to-use physical test instrument. Identification of these needs is in accordance with the principles explained by Reiser and Dempsey (2017), which state that the analysis stage in the ADDIE model functions to ensure that the product being developed is relevant and in accordance with the needs of target users.

At the Design stage, researchers designed a physical test instrument by considering the established karate physical standards, simple and easy-to-understand language, and Android-based media features. Good design is a key factor in product success, as stated by Alessi and Trollip (2001), who stated that product design should be based on the principles of effectiveness and efficiency to achieve learning or evaluation goals.

The Develop stage involves validation from experts, including karate experts, physical standards experts, linguists, and media experts. This process ensures that the physical test instrument meets quality and relevance standards. Expert validation is an important step in instrument development, as emphasized by Fraenkel, Wallen, and Hyun (2014), that expert validation is needed to ensure the accuracy and sustainability of the product being developed.

In the Implement stage, trials were conducted on small groups and large groups of karate athletes to test the feasibility and practicality of the instrument. The results showed that this instrument was well accepted by users, supporting the findings of previous research by Zaineldeen et al (2020) which explained that user acceptance of technology is determined by perceptions of ease of use and its benefits.

The Evaluate stage includes formative evaluation during the development process and summative evaluation after implementation. Formative evaluation aims to improve the instrument during development, while summative evaluation ensures that the resulting product meets the expected objectives (Gustafson & Branch, 2002).

This study supports previous findings related to the development of technology-based instruments. For example, research by Chuang et al. (2020) showed that technology-based platforms can improve the effectiveness and efficiency of the evaluation process in a sports context. In addition, the results of this study also strengthen the argument that the integration of technology in the evaluation of athlete physical fitness can improve accuracy and ease of accessibility (Kim et al., 2018).

Thus, this study has succeeded in developing an Android-based karate physical test instrument that is ready to use. These findings provide a significant contribution in providing a modern and technology-based evaluation tool that can be adapted to other sports.

5. Conclusion

This study successfully produced an Android-based karate athlete physical test instrument that meets the needs in the field through five main stages, namely analysis, design, development, implementation, and evaluation. Based on the assessment of experts, including karate experts, physical standards experts, language experts, and media experts, this instrument was declared suitable for use. These results were reinforced by field trials in both small and large groups which showed that this Android-based physical test instrument can be used effectively to evaluate the physical condition of karate athletes. Thus, this instrument is ready to be applied in the context of training and developing karate athletes professionally.

Although this study has shown positive results, there are several limitations that need to be noted. First, the scope of this study is still limited to karate athlete samples in certain areas, so the external validity of this instrument may need to be tested further in a wider population. Second, testing of various age categories and skill levels of karate athletes has not been carried out comprehensively, so the application of this instrument to these various groups still requires additional research.

Based on the limitations of the study, further research is recommended to conduct external validation on various karate athlete populations in various regions to ensure the generalizability of the research results, examine the application of this instrument to various age categories and skill levels of karate athletes to expand the benefits of the instrument, and develop additional features, such as automatic updates and personalization based on individual athlete needs, to improve the functionality of the instrument.

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