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Development of Physical Fitness Test Measurement Application for Teacher Working Group and Subject Teacher Deliberation Physical Education in Tanjung Redeb District, Berau Regency

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Abstract

This research aims to develop an android-based physical fitness test measurement application to facilitate PE teachers in implementing and managing the results of students' physical fitness tests effectively and efficiently in the Elementary School Teacher Working Group and the Subject Teacher Meeting of Junior High School Tanjung Redeb District, Berau Regency. The research method uses the Research and Development (R&D) Borg and Gall model which is modified into three stages including preliminary study, product development, and experiment with physical education teacher research subjects and selected students. The research instrument was in the form of an expert validation questionnaire using a likert scale with a value range of 1-4, while the data analysis used descriptive statistics and a T-test test to measure the effectiveness of implementation. The results of expert validation showed a very high feasibility rate with a percentage of 91%-100%, small group trials obtained 82%, and large group trials reached 87% for the elementary level and 88% for the junior high school level. The implementation of the application through pretest and posttest resulted in an increase in the physical fitness category of students from less to less at the elementary level, and from less to moderate at the junior high school level in a span of two weeks. The conclusion of this study shows that the TESPEN TKJI application is feasible and effective in increasing teachers' understanding of physical fitness tests, facilitating the assessment process through automating calculations and structured databases, and providing a positive influence on improving students' physical fitness through continuous monitoring of development.

How to Cite

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INTRODUCTION

The era of digitalization has integrated technology into all aspects of human life, including the education sector. Technology that was originally intended for industry players has now penetrated into various circles of society, providing easy access to information, encouraging economic growth, and creating distance education solutions as an effort to equalize access to education (By Putu Dwi Sucita Dartini, 2021). In the context of physical education, technology facilitates the process of learning delivery, data collection, and assessment management both face-to-face and Online. The use of technology in education is able to provide learning opportunities through the design, development, use, management and evaluation of comprehensive learning resources and improve the quality of education in an integrated manner. The rapid growth of technology requires educators to continue to adapt and produce technology-based learning innovations, including the development of learning media with diverse variations. Especially for physical education and sports and health (PE) teachers, the ability to align technological developments with practical teaching in the field is a challenge in itself that requires the development of professionalism through training, seminars, and Workshop Related to technology-based learning media (Martinko, Sorić, Jurak, & Starc, 2023).

Physical fitness is a learning material that is contained at all levels of education, both elementary and high school, with components such as strength, endurance, speed, explosiveness, flexibility, balance, agility, and coordination. Based on the 2013 Curriculum, basic competencies of physical fitness are taught starting from grades I to VI for elementary school level and grades VII to IX for junior high school (Calella et al., 2023). Although this material is very important for the growth and development of students, PE teachers often face obstacles in determining the form of the test, assessment criteria that are appropriate for age and level of education, and formulating assessment results. Most PE teachers experience problems in the system of recording time and physical fitness test scores, including difficulties in storing data safely (Nurulfa, 2019). Limited understanding of the basics of physical fitness, which starts from minimal knowledge during the education period, has a negative impact on the quality of physical fitness test implementation, especially for teachers in the frontier, outermost, and disadvantaged areas (3T) (Paradisis, 2014).

The results of observations with the Chairman of the Teacher Working Group of PE Elementary School and the Chairman of the Subject Teacher Meeting of physical Education Tanjung Redeb District revealed that teachers are still practicing conventional physical fitness learning in the field, test measurements are still carried out manually by recording on paper and then calculating using formulas, and teachers have difficulties in categorizing the level of fitness of students. In fact, in this digital era, almost all teachers have Smartphone personal skills that can be used for learning innovation. Test based application Android has been developed as needed, providing facilities for trainers, teachers, and students to conduct tests independently more effectively and efficiently (Martinko et al., 2023).

Previous research shows the effectiveness of physical fitness-based applications Android. (Ohta et al., 2017) It found that physical fitness apps provide 80% ease in classifying fitness levels without manual calculations. (Marpaung & Amzah, 2022) Develop applications that provide effectiveness in the implementation of tests as well as understanding theory and practice. App-based Android provides convenience, saves time, and can be used at any time. Other research by (Calella et al., 2023), (Chen, Hammond-Bennett, Hypnar, & Mason, 2018), (Cheng, Chiu, & Su, 2019) and (Marpaung & Amzah, 2022) consistently demonstrate the feasibility and effectiveness of the application-based Android in measuring and assessing physical fitness with a feasibility level of 85-90%.

Based on the problems and results of previous research, the problem formulation in this study includes: What is the development process of an android-based physical fitness test measurement application? What is the implementation process for an android-based physical fitness test measurement application? How effective is the android-based physical fitness test measurement application in the Teacher Working Group of PE Elementary School and the Subject Teacher Meeting of physical education junior high school in Tanjung Redeb District? This research aims to develop an android-based physical fitness test measurement application, implement the application in elementary and junior high school environments, and determine the level of application effectiveness in the physical fitness test assessment process. The hypothesis of this research is that an android-based physical fitness test measurement application can be developed with a minimum feasibility level of 80% and provides significant effectiveness in making it easier for te-

achers to assess students' physical fitness tests in Tanjung Redeb District.

The novelty of this research lies in three fundamental aspects that distinguish it from previous physical fitness application developments. First, the integration of a structured database feature that enables longitudinal tracking of student fitness development provides a monitoring capability that not only records instantaneous scores but also visualizes fitness improvement or decline trends over an extended period, addressing the limitation of conventional manual recording systems. Second, this application is specifically designed to adapt Indonesian TKJI standards in accordance with the characteristics of the national education system, namely clear differentiation between elementary and junior high school levels with corresponding adjustments in assessment norms and criteria, thereby resolving the result interpretation challenges that have persistently confronted educators, particularly in frontier and disadvantaged regions. Third, the unique combination of evaluation and educational functions through the integration of test procedure video tutorials and structured implementation guidelines positions this application as a comprehensive learning instrument that enhances teacher literacy regarding TKJI standards, functioning not merely as an automated calculation tool but as a pedagogical resource. An additional significant advantage is the individual account system that ensures data security alongside the capability to export results in PDF format for academic documentation; these features have not been found simultaneously in comparable applications available on the Playstore, making the TESPEN TKJI application a contextually appropriate innovative solution for enhancing the quality of physical fitness assessment practices across Indonesian educational institutions.

METHODS

This study uses the Research and Development (R&D) with Mix Method that integrates quantitative and qualitative methods simultaneously in one research activity (Alomari, Khabour, Alawneh, Alzoubi, & Maikano, 2020). The research design adopts a development model (Anjasmara, Widanti, & Mulyadi, 2021) which is modified into three main stages, namely Study introduction, product development, and experimentation. The research instrument was designed using modifications from (Artanayasa, Kusuma, & Wirawan, 2023) which consists of three types of questionnaires for expert validation, including learning technology media experts with 25 questions covering aspects of utility, operation, and design; Physical education, sports and health experts with 20 questions containing aspects of materials, operation, and design; as well as fitness test and measurement experts with 20 question items that measure fitness, operation, and design aspects. All instruments use scales Likert with a value range of 1 to 4 to measure the feasibility of the product. The subject of the study involved PE teachers who are members of the Elementary School Teacher Working Group () and the Junior High School Subject Teacher Conference () in Tanjung Redeb District, Berau Regency, as well as selected students as the object of the application implementation trial. Research data consists of two types, namely qualitative data obtained through interviews and direct observation to explore in-depth information about application development problems and needs, and quantitative data obtained through expert validation questionnaires and user satisfaction questionnaires to measure the feasibility and effectiveness of products. Qualitative data collection techniques are carried out at the Study introduction and product development through structured interviews with 20 questions to PE teachers regarding understanding, learning practices, and physical fitness assessments, while quantitative data were collected at the experimental stage through Pretest and Posttest to compare the effectiveness of using the app. Quantitative data analysis using descriptive statistics and differential tests T-test with the help of Software SPSS to test the significance of differences before and after application implementation, with the eligibility criteria of adopting the standard (Boisson et al., 2021) which categorized the percentage results as very valid (75.01%-100.00%), quite valid (50.01%-75.00%), invalid (25.01%-50.00%), and very invalid (00.00%-25.01%). Qualitative data analysis uses qualitative descriptive by interpreting interview results, validator suggestions, and observational findings into a comprehensive descriptive narrative. The test of the validity of the data, validity, and reliability of the instrument is carried out after the expert validator provides an assessment to ensure that the instrument used is feasible and trustworthy before it is disseminated to a wider range of research subjects. The overall research procedure follows a systematic flow from problem identification, application design development, expert validation, product revision, small group trial, follow-up revision, large group trial, to final evaluation of product effectiveness.

Figure 1. Research Procedure Flow (Source: (Borg & Gall, 1983)).

RESULTS AND DISCUSSION

This development research was carried out through a series of systematic stages using the Research and Development (R&D) model modified from (Borg & Gall, 1983) into three main stages. The development process of the android-based TESPEN TKJI application produces products that have been validated by experts and tested on research subjects to measure their feasibility and effectiveness.

The preliminary stage is the initial foundation of development which consists of four main components, namely the study of physical fitness literature, TKJI literature, application literature, as well as direct observation and interviews. (Schoeppe et al., 2016) research shows that applications based on Smartphone can be leveraged to effectively improve physical activity in children and adults, with 19 of 27 studies reporting significant improvements in physical activity-related health behaviors. Child's (2019:1) findings reveal that more than 80% of school adolescents globally do not meet daily physical activity standards, which has the potential to be a health threat in the future. (Adhi, Soenyoto, & Sugiharto., 2017) Reinforcing the findings by stating that low physical activity results in 6% to 10% of non-communicable diseases such as coronary heart disease, type two diabetes, and breast cancer. The results of the interview with the Chairman of and PE Tanjung Redeb District revealed that most of the health teachers do not understand and apply physical fitness tests in measuring the level of fitness of students. Discussions about physical fitness, ranging from test kits, procedures, to measurement results, are rarely discussed in the and forums. Even though we have discussed the basics of physical fitness using TKJI, the implementation is still classified as manual and confusing, so some teachers only understand the basics without being able to apply it optimally to students. This condition indicates an urgent need for new innovations that can facilitate and provide direct education to health care teachers in implementing physical fitness tests.

Product Development

Product Design

The product developed in this study is the TESPEN TKJI application which is specifically designed for the android operating system. This application aims to help educators assess, control, and record the level of physical fitness of students in a systematic manner. The main features of the application include complete information about the TKJI test, student data input, automatic management of TKJI test raw results, control of test results, and the ability to download test results per student or in whole in PDF format. Each educator has an individual account that ensures data doesn't mix with other users, with the flexibility of access through various android devices. Here's what the app that has been developed looks like **Figure 2, Figure 3, Figure 4, Figure 5**.

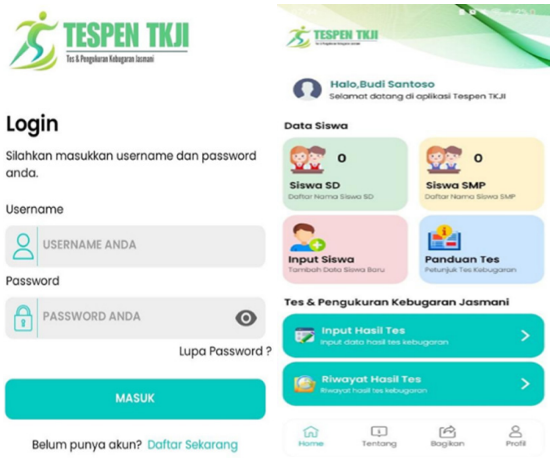

Figure 2. Initial view of the app

Figure 3. App menu view

Figure 4. Display of student data input

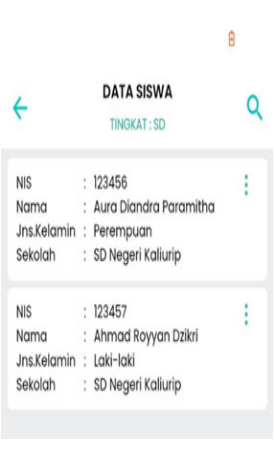

Figure 5. Student data that has been entered

Expert Assessments and Inputs

Product validation is carried out by four categories of experts to ensure feasibility from

various aspects. The assessment of physical education, sports and health experts at the elementary level resulted in a total score of 96 out of a maximum score of 100, with a percentage of 96% that belongs to the very valid category. Physical education, sports and health experts at the junior high school level gave an assessment with a total score of 91 out of a maximum score of 100, resulting in a percentage of 91% which is also included in the very valid category. Physical fitness expert validators rated the app with a total score of 93 out of a maximum score of 100, resulting in a percentage of 93% in the highly valid category. The highest score was obtained from learning technology media experts with a perfect score of 115 out of a maximum score of 115, resulting in a percentage of 100% that shows very valid eligibility without revision.

Table 1. Assessment of Elementary Physical Education, Sports and Health Experts

Assessment Criteria	Valuation	
	Value	Max
Material Aspects		
The test material is in accordance with the level of education	4	5
The fitness test component is found in the teaching material	5	5
Form a physical fitness test according to ability		
Educational Levels	4	5
The information on the procedure for implementing the test form is appropriate		
with the level of education	4	5
The implementation procedure is easy to understand and		
Implemented	5	5
Calculation of test tables and norms according to the level		
education	4	5
All test results of students are in accordance with the category of physical fitness level obtained based on		
table/norm.	5	5
Total	31	35
Operational Aspects		
Runs smoothly on android operating system	5	5
Availability of information about the application	5	5
Easier menu selection procedure	5	5
Easier student data filling	5	5
Edit, delete and check test history easier	5	5
Input test result data is easier and more concise	5	5
The history of per-student test data input is very clear and		
Easy to understand	5	5
A list of the test results can be downloaded		
in PDF form	5	5
Total	40	40
Design Aspects		
Easy and attractive application interface	4	5
Shape and Size of the writing used	4	5
Color composition used	4	5
Background design selection	4	5
Menu placement and navigation	4	5
Total	20	25
Overall Total	91	100
Percentage	91%	

Based on the eligibility norm of Setiawan (2014:42), all validator assessment results are in the range of 75.01%-100.00% with very valid categories and meanings used without revision. Input from experts includes the addition of a video tutorial feature for the implementation of physical fitness tests, the addition of units to the input of test results according to the type of test, the improvement of the caption of the test result text box input , and the need for step-by-step tutorials in the form of images or videos for the use of applications and how to measure fitness tests. The input is then used as a basis for product improvement and refinement before proceeding to the small group trial stage.

Experimental Stage

Small Group Trials

The small group trial involved 14 PE teachers who are members of and in Tanjung Redeb District. The results of the trial showed that the physical aspect obtained a score of 225 out of a maximum of 280 with a percentage of 80%, the use aspect obtained a score of 219 out of a maximum of 280 with a percentage of 78%, the material aspect obtained a score of 299 out of a maximum of 350 with a percentage of 85%, and the data collection aspect obtained a score of 406 out of a maximum of 490 with a percentage of 83%. The overall total of the four aspects resulted in a score of 1149 out of a maximum of 1400 with a

percentage of 82%, which based on the eligibility norms of Setiawan (2014:42) includes a very valid category with the meaning of being suitable to be used without revision.

Large Group Trials

The large group trial was carried out at two levels of education, namely junior high and elementary levels by involving a wider range of research subjects. The results of the trial at the junior high school level with 34 respondents showed that the physical aspect obtained a score of 599 out of a maximum of 680 with a percentage of 88%, the use aspect obtained a score of 594 out of a maximum of 680 with a percentage of 87%, the material aspect obtained a score of 762 out of a maximum of 850 with a percentage of 90%, and the data collection aspect obtained a score of 1023 out of a maximum of 1190 with a percentage of 86%. The overall total resulted in a score of 2978 out of a maximum of 3400 with a percentage of 88%, including the very valid category.

Table 2. Junior High School Large Group Trial

Assessment Criteria	N	Value	Max	%
Physical Aspects				
Do you think the design of the application is interesting?	34	147	170	86%
Do you think the symbols and buttons are clearly visible ?	34	150	170	88%
Do you think the menu layout in the app Neatly organized?	34	151	170	89%
Do you think the application font style is interesting?	34	151	170	89%
Total		599	680	88%
Usage Aspects				
Do you think the app is easy to use?	34	154	170	91%
Do you think the application runs smoothly when Used?	34	143	170	84%
Do you think the application is practical to use?	34	149	170	88%
Do you think the order or information is easy understood to do ?	34	148	170	87%
Total		594	680	87%
Material Aspects				
Do you think the type of test for elementary level has been appropriate?	34	154	170	91%
Do you think the type of test for junior high school level Is it appropriate?	34	157	170	92%
Do you think the guidelines for implementing the TKJI test Is it appropriate?	34	153	170	90%
Do you think the values and norms of the TKJI test have been according to the elementary and junior high levels?	34	155	170	91%
Do you think the test implementation video and Is TKJI's measurement appropriate and clear?	34	143	170	84%
Total		762	850	90%
Aspects Of Data Collection				
Do you think the account registration process is easy Done?	34	141	170	83%
Do you think the data addition/input Students who will be tested are doing well?	34	146	170	86%
Do you think the input of the fitness test results Physically going well?	34	145	170	85%
Do you think the data of the students that have been inputted Can it be easily fixed and controlled?	34	148	170	87%
Do you think the test results are per student?	34	147	170	86%
Help users control fitness?				
Do you think the test results are helpful?	34	147	170	86%
Do users know the fitness level of the students?				
Do you think the download results from the test history per-student and per-date test results recaps in PDF form help users?	34	149	170	88%
Total		1023	1190	8%
Overall Total		2978	3400	
Percentage		88%		

The large group trial at the elementary level with 34 respondents produced the physical aspect with a score of 590 out of a maximum of 680 with a percentage of 87%, the use aspect obtained a score of 588 out of a maximum of 680 with a percentage of 86%, the material aspect obtained a score of 758 out of a maximum of 850 with a percentage of 89%, and the data collection aspect obtained a score of 1023 out of a maximum of 1190 with a percentage of 86%. The overall total

yields a score of 2960 out of a maximum of 3400 with a percentage of 87%, which belongs to the category of very valid and worth using.

Pretest and posttest experimental tests were carried out at Public Junior High School 1 Berau and Public Junior High School 2 Berau with an interval of two weeks. The results of the pretest showed that Public Junior High School 1 Berau obtained an average score of 11 with less physical fitness criteria, while Public Junior High School 2 Berau obtained an average score of 10 with the same criteria. After being given independent training treatment according to the TKJI test for two weeks, the posttest results showed a significant improvement with Public Junior High School 1 Berau obtaining an average score of 17 and Public Junior High School 2 Berau obtaining an average score of 16, both in moderate physical fitness criteria. This increase indicates the effectiveness of the app in helping teachers guide students to improve physical fitness.

Testing at the elementary level was carried out at Public Elementary School 17 Tanjung Redeb and Public Elementary School 15 Tanjung Redeb with the same procedure. The results of the pretest showed that Public Elementary School 17 Tanjung Redeb obtained an average score of 8 with less than one physical fitness criteria, while Public Elementary School 15 Tanjung Redeb obtained an average score of 10 with the same criteria. After treatment, posttest results showed improvement with both schools obtaining an average score of 13 in the criteria of less physical fitness. Although still in the underperforming category, the increase in scores shows a positive influence on students' physical abilities.

Mass Production

To disseminate the TESPEN TKJI application product so that it can be used by a wider audience, researchers have published an application along with a user guide through the Kompasiana platform with the search keyword "Kompasiana Muhammad Rifqi Aidiansyah". This publication aims to facilitate access for PE teachers throughout Indonesia to download and implement applications in the learning process and assessment of the physical fitness of students in their respective schools.

Based on the results of the research that has been described, the development of the TESPEN TKJI application shows a very high level of feasibility through a comprehensive series of validation from experts. A perfect assessment of 100% of learning technology media experts indicates that the app meets optimal technical and functional standards, in line with (Schoeppe et al., 2016) findings that the app is based on Smartphone Proven to be effective in improving physical activity in various age groups. Validation from physical fitness experts who reached 93% and physical education experts at the elementary and junior high school levels of 96% and 91%, respectively, proved that the content of the material, implementation procedures, and assessment system were in accordance with the applicable TKJI standards. The results of the small group trial with 82% and the large group trial reached 87% for the elementary level and 88% for the junior high school level showed that this application provides significant operational convenience for PE teachers in managing data and interpreting the results of students' physical fitness tests. Measurable fitness score improvement through Pretest and Posttest in four schools is empirical evidence of the effectiveness of this application, where the elementary level has increased from the low to less category, while the junior high school level has increased from the low to moderate category in a span of two weeks. These findings are in line with (UMTAS, 2016) which confirms that digital technology in learning evaluation provides an accuracy level of at least 75% and increases the effectiveness and efficiency of the assessment process. Advantages of the TESPEN TKJI application compared to similar applications in Playstore lies in the features Database structured learners, longitudinal monitoring of fitness development, and the ability to download test results in PDF format for academic documentation. The integration of video tutorials for the implementation of tests and comprehensive procedure guides provides additional educational value for users, making this application not only an evaluation tool but also a learning medium that supports the improvement of physical fitness literacy of PE teachers, especially in the 3T area which has been facing limited access to technology-based educational innovations.

CONCLUSION

The research on the development of the android-based TESPEN TKJI application has succeeded in producing innovative products that meet technical and pedagogical feasibility standards with a very high level of validation from experts validation and large-scale user trials demonstrated strong feasibility and positive acceptance of the application across both educational levels. The implementation of this application has been proven to have a substantial impact on improving

the effectiveness and efficiency of the physical fitness assessment process, which is shown through the ease of operation in managing the student database, the automation of test result calculations, and the ability to monitor the progress of fitness longitudinally which can be downloaded in PDF format for academic documentation. The results of pretest and posttest experiments in four schools showed an increase in the physical fitness category of students in a span of two weeks, where the elementary level progressed from the less to less category, while the junior high school level increased from the less to moderate category, indicating that this application not only functions as an evaluation instrument but also as a learning medium that encourages an increase in activities physical fitness and literacy. The advantages of the TESPEN TKJI application in terms of completeness of features, accuracy in calculating TKJI norms according to the level of education, integration of video tutorials, and an individual account system that ensures data security make it a practical solution for PE teachers, especially in the 3T area who have been facing limitations in understanding and applying physical fitness tests in learning. The dissemination of products through digital platforms allows for a wider range of implementation, contributing to the improvement of the quality of physical education nationwide through the use of adaptive, accessible, and sustainable technology..

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