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THE DEVELOPMENT OF PHYSICAL FITNESS APPLICATION BASED ON INFORMATION AND COMMUNICATON TECHNOLOGY FOR HIGHER STUDENT

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Abstract

The purpose of this research is to develop physical fitness applications based on information and communication technology in order to improve students' physical fitness. The method of this study uses the Design Based Research (DBR) to develop android-based applications. The DBR method consists of four stages, namely practical problem analysis; Designing solutions based on design principles and technological innovation; Repeated cycles of testing and improving solutions; Reflection to generate design and implementation principles. The development of this application produces a hypothetical model and design of a physical fitness application based on Design Based Research (DBR). This research resulted in the initial design of the application, the revised application design, the application registration manual, the body composition measurement manual, and the physical fitness measurement manual. This research concludes that the physical fitness applications based on information and communication technology can be well developed into a product that can be useful for improving physical fitness. The results of this research are expected to be a benchmark for designing a more perfect application which will develop in the future and can be massively down streamed.

Keywords: Applications, Desain based research, Physical fitness, Information and communication technology.

1. Introduction

The benefits of physical activity have been extensively studied and it has been recognized that it can help improve health, physical fitness, prevent non-infectious diseases and reduce mortality [1-3]. However, actually being physically active is a challenge for many people, especially people who are very busy so they don't have free time to do physical activity or exercise. Research in several developed countries such as in the Netherlands shows that 41% percent of adults do not comply with the Public Health Physical Activity Guidelines imposed by the government (at least 30 minutes of moderate to vigorous physical activity for at least 5 days a week). In addition, only 20% of the population who meet the Guidelines for Heavy-Intensity Physical Activity at least three times a week by doing strenuous exercise for 20 minutes [4]. Likewise, in Indonesia, physical activity and exercise are still not a habit or lifestyle. This is evident from the level of fitness of the Indonesian people which is still relatively low. Based on the 2021 National Sport Development Index Report conducted by the Ministry of Youth and Sports in 34 Provinces in Indonesia, it is stated that 76% of people are in the unfit category. Of these, 53.63% were in the very unfit category, and only 5.86% of the people were in the very fit category.

The low level of fitness is triggered by a lazy attitude of physical activity or exercise. Based on the survey results, it shows that only 32.83% of Indonesian people are active in sports. This means that out of 100 Indonesian citizens, only 33 people actively participate in sports and other physical activities. This lack of physical activity will become a public health problem that will likely increase significant morbidity and mortality. Several diseases that cause high mortality rates include cardiovascular disease, diabetes, cancer, and an increased risk of depression that may arise due to lack of movement, physical activity and exercise [6-10]. The less physical activity carried out by the community will have fatal consequences, while in Indonesia the level of physical activity of the community is lower compared to other countries, especially western countries, Australia, or other more developed Asian countries. The lack of awareness in doing physical activity and sports is increasing from year to year, as a result, people's fitness level is always low.

As with physical activities, sedentary behavior is also a concern. Sedentary behavior includes everyday activities that use little energy such as sitting, lying, or reclining [11, 12]. Another influencing factor is technological advances and urbanization that also affect sedentary behavior [13, 14]. The use of smartphones and laptops has driven higher screen time and greater preference for sedentary behavior [13]. Research results also link sedentary behavior with poor health, such as an increased risk of diabetes and poor quality of life [15, 16]. One of the solutions to stay healthy and fit is to be physically active and exercise, even though in reality the community's commitment to doing so is still low. One of the reasons that is often expressed is feeling lazy and not having enough time to do physical activity and exercise. Therefore, it is necessary to think of a way or an alternative to motivate and facilitate people to do physical activity more easily.

Based on the information above, a method and innovation are needed to promote physical activity so that people can improve their healthy lifestyle. Specially to increase physical activity among students, of course, must pay attention to their needs and suitability for their conditions. The conditions referred to include the density of their activities with lectures, social activities and personal

activities. Therefore, the innovations made must be simple, easy, and applicable, so that students can access physical activities anytime and anywhere. One form of innovation in question is the use of mobile applications which are expected to be powerful tools to encourage physical activity and student health [17, 18]. The use of applications is believed to be accessible to students and has a broad reach, as well as having many interactive functions and the opportunity to provide positive feedback [19, 20]. The results of the meta-analysis study stated that there was a positive relationship between the effects of cell phone interventions, interventions with cellular technology, and interventions using the web that contained health news with health improvements in individuals who were inactive and overweight [18, 21, 22]. Interventions using applications are also often combined with education level, self-reporting frequency, and the types of applications and programs used on smartphones. This has a positive effect on increasing physical activity, cardiovascular fitness and reducing overweight [18, 21, 22].

Emerging technologies play a complex role in today's individual behavior and lifestyle, which is a double-edged sword. On the one hand, some new technologies (eg, video games and computer games) are contributing to the epidemic of low physical activity and high sedentary behavior. On the other hand, innovative technology is believed to be utilized to promote physical activity (PA) and health [23, 24]. New technologies such as applications on mobile devices, health devices, and videos of physical activity and active play have been adopted to improve health [25]. Research on production of exercise video show that the video contains material is suitable for everyone, easy and safe to do, and can be done at home [26]. Technology is becoming an increasingly prevalent part of everyday life and app-based health promotion programs are becoming a new way to promote physical activity and a lifelong healthy lifestyle, so the two are increasingly linked. Even though there have been many fitness applications that have been developed and are accessible to the public, literature that considers aspects of the relationship between physical activity using applications and health that focuses on college students is still relatively scarce. The main objective of this research is to build an independent physical fitness application for students so that they can carry out physical activities and self-report on their own. To obtain these outputs, four stages of research have been carried out, namely: 1) Practical Problem Analysis 2) Designing solutions based on design principles and technological innovation 3) Repeated cycles of testing and improving solutions 4) Reflection to generate design and implementation principles.

2.Method

The method used in this study is the Design Based Research (DBR) approach, which is a research-based design to develop a program based on analysis, design, evaluation, and revision processes. This method is appropriate because this research aims to produce an information and communication technology (ICT)-based fitness program that is used for the educational process of students. In this method there are five characteristics of DBR, namely interventionist, iterative, process oriented, utility oriented, and theory oriented. This can strengthen the suitability of using the DBR method in this study. The DBR method used to develop information and communication technology-based physical fitness applications in this study consists of four stages, namely problem identification and analysis,

solution design, repeated cycles in testing and design improvement, and reflection to generate design and implementation principles such as depicted in Fig. 1.

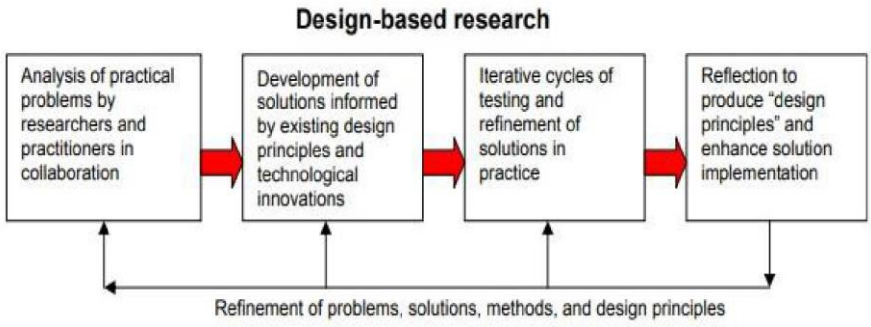


Fig. 1. Design based research.

The first stage, namely practical problem analysis, is the initial stage in research using the DBR method where researchers before going into the field must identify and analyse the problems to be studied through sources in the surrounding environment, starting from what problems a person asks, what factors what causes the problem, and what can be done to solve the problem. The second stage is the design of solutions based on the principles of design and technological innovation, where solutions will be designed based on the background of the problems that occur to obtain results from research objectives using existing technological innovations. The third stage is an iterative cycle of testing and improving solutions, so that it will produce the best final design with improvements to existing solutions. Then in the last stage, namely reflection to produce design and implementation principles, this reflection is carried out by holding discussions with experts who are experts in fields related to these problems, namely software experts and material experts so that they can produce useful applications.

3. Results and Discussion

3.1. Results

3.1.1. Initial application design

The application design that has been made has been validated by human visual design experts and computer experts. The conclusion obtained after validation is that the application is designed too complicated and requires a long time to design the application. An overview of the initial design of the application can be seen in Fig. 2.

3.1.2. Application revision design

The solution offered is to simplify the application and reduce the features in the application. This year the fitness application that is a priority to design is the physical fitness testing application as attached in Tables 1 to 4.

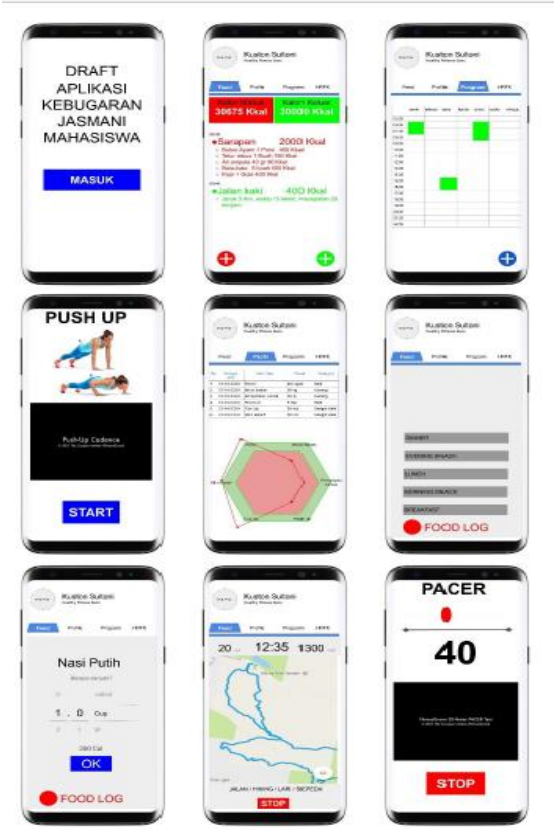


Fig. 2. Draft of initial design of mobile phone apps.

Table 1. Application registration manual.

Mobile Screen	Explanation
	1. Login using the registered email and password 2. If not registered yet, click "Create Account"

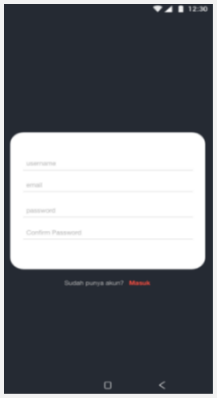
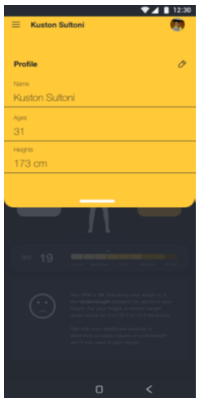
	To register, 1. Enter the username that will be used as an account in the application in the username box 2. Enter the email address in the email box 3. Enter the desired password into the password box 4. Enter the same password in the confirm password box
	1. To edit a user profile tap image = in the top left corner 2. Enter Username in the name box 3. Enter the user's age in the user box 4. Enter your height in cm into the height box

Table 2. Body composition measurement manual.

Mobile Screen	Explanation
	1. Measurement of Body Composition using body mass index and body fat percentage. 2. To find out the body mass index, enter your weight (in kg) into the weight box. 3. BMI information will appear in the gauge. 4. To find out the Body Fat Percentage, measure the thickness of the fat under the skin with a skinfold caliper at three specified locations. 5. Enter the three skinfold caliper scores in the boxes provided. 6. The body fat score is displayed in the form of a human-illustrated gauge

	Users can see the development of body mass index and body fat percentage in this view

Table 3. Vo2max measurement with test pacer manual.

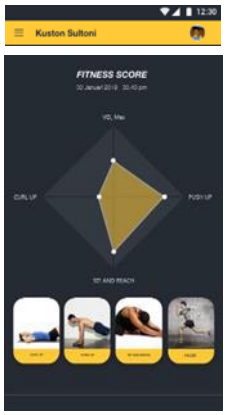
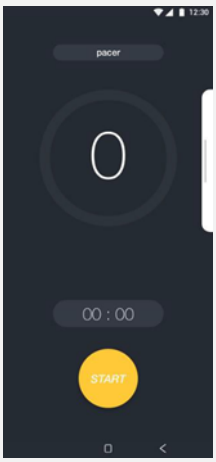
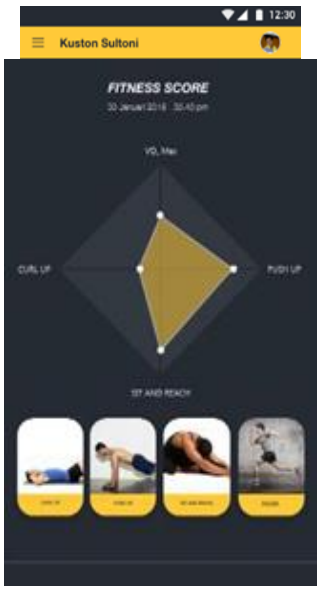
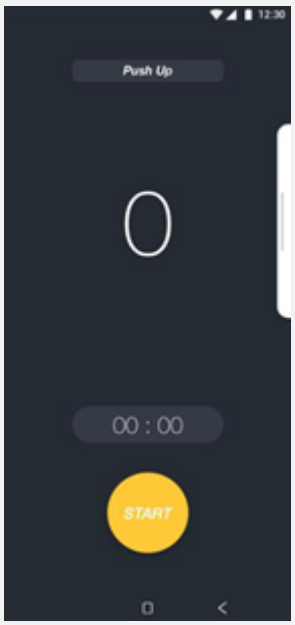
Mobile Screen	Explanation
	1. On the spiderwed graph in the fitness score profile view the user can see his fitness condition. 2. The Vo2max white dot in the graph shows the user's aerobic fitness condition, if the point is still in the spiderweb, then the user's aerobic fitness is in an unfit condition. 3. If there is no white point, then the user must measure vo2max by clicking on the pacer image and the user will enter the display to start the pacer test.
	1. To start the test, the user must prepare the necessary equipment such as a field with a distance of 20 meters marked with a barrier, a headset to listen to the pacer test audio. 2. Click start to start the test pacer, the user runs back and forth on the field 20 meters away by following the audio being played.

Table 4. Vo2max measurement with push-up test manual.

Mobile Screen	Explanation
	1. On the spiderwed graph in the fitness score profile view the user can see his fitness condition. 2. The white dot of Push-Up in the graph shows the condition of the user's upper body muscle fitness, if the point is still in the spiderweb, then the user's upper body muscle fitness is in an unfit condition. 3. If there is no white point, then the user must measure the fitness of the upper body muscles by clicking on the push-up image and the user will enter the push-u test start display.
	1. To start the test, the user performs push-up movements according to the audio guide. 2. To find out the correct push-up movement, users can see the push-up guide by clicking on the white bar on the right. 3. Click start to start the push-up test, click the start button.

3.2. Discussion

3.2.1. Result of Preliminary Study

Preliminary studies mean that researchers conduct studies from various literature on health-related fitness knowledge. In this step the researcher also conducts a

survey of the objective conditions of the field, especially collecting various characteristics that are strongly suspected of influencing the effectiveness of the fitness development of the learning model carried out. The results of the preliminary study have been published.

3.2.2. Result of Model Development

The model development in this study referred the development of a physical education learning model that utilizes ICT, especially with smart phones. In this second year of research, it is expected that there will be two results, namely a physical education learning model for students and smart phone applications that support this learning. So that the process of this second year's research is divided into two parts, the first is to build a learning model and the second is to build applications that support learning.

3.2.2.1. The Development of Learning Model

The basis for building a physical education learning model for students is from the research results produced in the first year. Where it can be concluded is the learning that students are interested in is practical learning and doing games and sports. However, if all learning is filled with games, knowledge about fitness and motivation to do a fitness program after completing contracting fitness courses will stop. Therefore, learning that is predicted to be appropriate for fostering physical fitness is by combining material with practice and supported by technology.

3.2.2.2. The Development of Applications that Support Learning

The number of smart device users (e.g., smart phones, tablets) among students is increasing. At the level of the world of education this can be a double-edged knife. It can be detrimental, because it will interfere with the learning process, but it can also be used as an effective learning tool. Research explains that there are many applications on smart phones that can help physical and health education learning. One of the popular application categories is the training program application. Many applications fall into this category, their focus and functionality vary widely. These programs usually provide training examples for the user and a way to record training results. Types of exercise include aerobic fitness (running, cycling), weight lifting, calisthenics, yoga, and lifestyle physical activities (walking, gardening). Often, the logging function of the application allows for uploading exercises to a website which allows for tracking and tabulating the data.

This app includes various functions as well. Some include pictures or videos of the exercises. Certain programs use the device's accelerometer (motion sensor) to record the user's movements during exercise. Some provide customizable workouts, where the user selects an exercise goal (e.g., "increase strength") and selects a suitable exercise. Some apps guide users through exercises, like trainers. Even social networks are included in some of them. In this app, the user's progress is shared with a network of friends, allowing for social support or competition.

Since many applications allow recording or logging of practice, students can submit their practice logs electronically. One of the benefits of this type of assignment is its high degree of authenticity and accuracy. Students can choose which exercises they want to do based on their individual goals and available

resources, and then complete the exercises themselves. This not only provides a more authentic experience, but also increases students' motivation by cultivating their feelings of control and dependability as they can choose what, when, and how to practice. In building the application, the researcher collaborates with design experts and computer science experts, related to the application features, the researcher adapts to the needs in learning.

4. Conclusions

This research concludes the development of information and communication technology-based physical fitness applications can improve student physical fitness. The results of this research are expected to be a benchmark for designing a more perfect application which will develop in the future and can be massively down streamed.

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