Mobile Software Application for Measuring Cardiovascular Endurance Fitness for Cadets Officers

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Abstract: the purpose of this study is to build portable application software to determine the level of cardiovascular fitness for cadet students of the National Defence University of Malaysia (UPNM). Fitness in the context of this study refers to physical fitness, specifically the cardiovascular endurance level test battery in the form of a 2.4 km run test for UPNM cadet students. This run test will be conducted to measure, test, and evaluate the performance of UPNM cadet students. All the run test results can be recorded electronically inside the portable software and will later be able to show the level of cardiovascular fitness of every cadet student according to age and gender. This software can also calculate the body mass index (BMI). Normative survey method will be used in this study through the analysis of the 2.4 km run test results. The run test scores will be classified in interval and ratio scales. Based on the findings of this study, portable application software will have produced. The software will be able to directly assist the Military Training Academy (ALK), Malaysian Armed Forces (ATM), and other relevant agencies in determining the level of cardiovascular fitness among their staff. The test can be done electronically and on portable mode. The next step to be taken is to have this application patented.

Index Terms: Development, Software, Application, Portable, Fitness Norms, Cardiovascular Endurance,

I. INTRODUCTION

Fitness is defined as the condition that allows an individual to lead a perfect life and to deliver his tasks efficiently, and in turn produces useful contributions and services. Fitness consists of five components, which are physical, emotional, spiritual, intellectual, and social fitness. All the five components of fitness need to be adjusted and balanced in order for an individual to get on with his daily life.

Physical fitness is the most important aspect to be paid attention to by all cadet officers of the National Defence University of Malaysia. This component of fitness is required because cadet officers will be absorbed into permanent position in the Malaysian Armed Forces, which require their staff to be at optimum fitness level [1]. In our

daily life, fitness is an important aspect that allows us to move and carry out our daily activities. A physically active life is important in increasing an individual's level of health [2]. Physical fitness is a component that is used all the time to carry out an activity. Physical fitness is defined as one's condition that makes him able to undertake a daily task without feeling tired when maximum energy has been used, and there is still an extra energy for use during leisure time and in an emergency situation. This definition is supported by Penny & Clarke [3] who state that physical fitness is the ability to carry out daily activities efficiently and energetically, without feeling extreme fatigue, and still have enough energy for recreational activities. This means that fitness is extremely important for every individual, especially in this age of rapid development that requires an individual to be constantly active and be at the optimum level of health. This scenario is in line with the advent of modern science and technology, which has become increasingly advanced in this millennium.

There are five components of physical fitness, which are muscle endurance, cardiovascular endurance, muscle strength, flexibility, and body composition. Among these 6 components, one component will be chosen to be studied in this study through the development of cardiovascular endurance norm. The reason for this was because muscle endurance is a component that dominates the daily fitness of an individual. Whether or not an individual is fit, his performance would be measured based on his level of cardiovascular endurance.

II. OBJECTIVES OF THE STUDY

This study was carried out to achieve the following objectives:

1.1.1 To develop a cardiovascular fitness norm for UPNM cadet students according to their age and gender based on test scores of the mentioned norm.

1.1.2 To evaluate the physical fitness level of UPNM cadet students based on a number of criteria fixed.

1.1.3 To build portable application software based on the cardiovascular fitness level of UPNM cadet students.

1.2 Important of the study

With increasing time, the development of science and technology occurs more rapidly and widely. Access to science and technology focuses not only on those residing in cities; in fact, those living in the suburbs are also receivers of the advent of technology.

Technological development simplifies every process in life, such as the invention of environmentally friendly cars, mobile communication devices, invention of numerous systems that facilitate matters like Internet banking, social networks, and many more [4]. This also applies to the use of technology in the field of sports and medicine. Technological sophistication makes it easier for doctors to treat patients affected with various diseases, and even brings about the discovery of medicines to cure chronic diseases. In sports, technology helps in finding the best methods and techniques to improve the quality of an athlete and the public in general.

Through this study, a portable application will be developed based on cardiovascular endurance norm, which will be built using the 2.4 km physical fitness test. A brief picture of this application is that users will enter their personal details first before doing the 2.4 km run test. After completing the test, the time recorded will be put into the application to show the run test result. This application is very easy, simple to use, and saves time. It makes it easy for one to find out about his fitness level with accurate and efficient information.

The development of this mobile application requires accurate and specific data with high validity and reliability. These data refer to the norms of cardiovascular endurance according to age hierarchy produced through 2.4 km run test. The validity and reliability of a physical test are needed for a test battery so that the output of the test can be applied by all parties [5]. Thus, the norm for the test to be performed should be obtained prior to the development of this application.

The cardiovascular fitness norm that will be produced consists of analysed data from the result of 2.4 km run test as according to the specified protocols and procedures. The researcher will select UPNM cadet students aged 18–22 years old as participants for the test. After the test, the data will be compiled and analysed to produce the cardiovascular fitness norm. Cardiovascular fitness norm for the 2.4 km run has been produced only by the American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD) in 1996, which was based in the US. However, the norm was produced using environmental conditions and procedures different from those in Malaysia. Using the norm from AAHPERD will probably be inaccurate in determining the true fitness level among Malaysians.

So far, there is no local fitness norm applied in evaluating the physical fitness level of UPNM cadet students. Therefore, the researcher is taking the initiative to conduct this experiment in order to produce local cardiovascular fitness norm. The cardiovascular fitness norm produced must be proven to be valid and reliable before it can be uploaded to the mobile application that will be developed later.

As this is the first development of physical fitness norm for the UPNM cadets, it will give a significant impact on UPNM. This is because the research outcome will be used by the UPNM administration as the preliminary criteria for cadets' enrolment into UPNM.

III. MATERIALS AND METHODS

The method of this research is by experimental observation. The design of this research is therefore due to utilization of the available instrument that was introduced by The Cooper Institute. The Statistical Package for Social Sciences (SPSS) software version 20 was used to calculate and translate the data by descriptive in the descriptive statistical analysis. The findings has enable the researcher to calculate the percentile, mean and standard deviation for the overall result in this research.

NDUM students consist of cadet officers and public students. Cadet students or more precisely known as cadet officers study in NDUM with military orientation because they will be absorbed into ATM right after graduation. Public students are not bound to the same rules and regulation imposed on cadet officers. However, all NDUM students are obliged to participate in trainings as according to the curriculum. The objective of the trainings is to produce graduates that possess not only great erudition, but also strong physicals to endure the working world.

2.1 Respondents

UPNM students consist of cadet students and public students. Cadet students study in UPNM with military orientation because they will be absorbed into Malaysian Armed Forces (ATM) right after graduation. Public students are not bound to the same rules and regulation imposed on cadet students. However, all UPNM students are obliged to participate in trainings as according to the curriculum. The objective of the trainings is to produce graduates that possess not only great erudition, but also strong physicals to endure the working world.

The respondents will consist of 700 male and female cadet students, involving the first year foundation students up until the fourth year cadet students. The selection of respondents will be done randomly from a population of 2000 cadets in the entire UPNM for academic session 2014/2015. The selected individuals are those who receive military training from the Military Training Academy (MTA).

2.2 Instrument of Research

To measure the level of physical fitness in a study, there must be a test suitable that matches the study. The physical fitness test that is carried out is considered as the instrument of study. The instrument used in physical fitness study must have high validity and reliability in order for the result to be indisputable [6] [7]. In this study, the instrument chosen is a 2.4 km Run Test that was developed by The Cooper Institute, [8] [9]. The 2.4 km Run Test has high a reliability where $r=0.92$, [10], and $r=0.86$, [11].

IV. RESEARCH ANALYSIS

The collected data will be analysed and presented to answer the research questions and to determine whether the research objectives have been successfully achieved. Analyses on various relationships can be performed using various techniques.

The selection of statistical test will be determined according to the research design and measurement scale. This research requires two analyses. The first analysis is for the 2.4 km run test to produce the cardiovascular fitness norm. The second analysis is for the development of cardiovascular fitness norm mobile application.

For the first analysis, the data obtained in this test will involve three types of scales namely nominal, ratio, and interval scales. The nominal scale is for the institution, race and gender. The ratio scale will be used for height, weight, and body mass index, while the interval scale will be used for cardiovascular endurance ability that will be obtained from the 2.4 km run test.

The data will be presented using descriptive statistics procedure. Frequencies and descriptive statistics procedures in SPSS will be used to calculate and present the data descriptively. The result will enable the researcher to illustrate the demographic variables (i.e., gender, race, height, weight, and body mass index) using frequencies, percentage, mean, and standard deviation.

The second analysis will be performed after the cardiovascular fitness norm has been produced. The analysis involves the development of the mobile application software. The researcher will use a program that is commonly used for creating software. The figure below explains the process of developing the mobile application
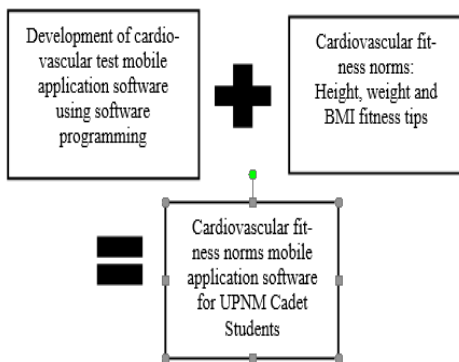

Figure 1. The Process of Developing Cardiovascular Fitness Norms Mobile Application Software

V. RESULTS AND DISCUSSION

The development of a technology to achieve a certain goal is not an easy task. Although this mobile application software is not as advanced as the existing ones in the market, it is a pioneer program for the technological development in UPNM to produce a more complete and efficient system in the future. This software will be extended to the whole country so that everyone will be using software developed through local expertise.

The first and second objectives of this research are respectively to produce cardiovascular fitness norm based on the result from the 2.4 km run test and to evaluate the cardiovascular fitness performance of the cadet students. The norm produced will be entered into the database to develop the cardiovascular fitness norm mobile application software. The fitness norm only involves 2.4 km run test with the respondents consisting of UPNM cadet students aged 18–22 years old. The fitness performances of these cadet students will be indirectly monitored through the

physical fitness test. Each run test result of each respondent will be recorded and entered into the database. The results will be analysed and tested to produce the desired fitness norm.

The third objective is to develop cardiovascular fitness norm mobile application software. To develop this software, software programming such as Microsoft Visual Basic, C++, Adobe Dreamweaver, etc. will be needed. After the software has been completed, the users will be able to see their fitness performances by entering their personal details such as age, gender, weight, height, and their time record for the 2.4 km run test. This software will display the result for the run test as well as the body mass index (BMI).

Opinions and commitments from the experts in the related areas are needed to help improve the software. Evaluation and opinions from them may be helpful for the researcher to identify the weaknesses in the software so that they can be fixed in the future.

Table 1. Cardiovascular Endurance Physical Fitness Norm for 18 Years old NDUM Foundation Programme Cadet Officers

Category	Score	Duration (mm:ss)
Excellent	5	< 9:40
Very Good	4	9:41 - 10:40
Good	3	10:41 - 11:30
Satisfactory	2	11:31 - 12:24
Poor	1	12:25 >

Note. (mm:ss)=(minutes:seconds)

Table 1 shows the norms produced based on the 2.4 Run Test results. There are 5 categories that are classified in the grade production of a fitness norm which are; Excellent (5), Very Good (4), Good (3), Satisfactory (2), and Poor (1). According to Ahmad [6], grading a test in the production of norms enables different levels of potential in a particular group according to the abilities of each one of the individuals. Every category of accomplishment states the scores achieved starting from the highest score which is 5 to 1, which 1 indicates the lowest score. Such norms also being used by the National Physical Fitness Award (NAPFA) Singapore [12]. From the table, the highest achievement which is Excellent with the score of 5 starts from 9:40 minutes and below, the next level is Very Good with the scores of 4 is from 9:41 to 10:40 minutes, the Good level with the score of 3 is from 10:41 to 11:31 minutes, and the Satisfactory level with the score of 2 is from 11:31 to 12:24 minutes and lastly, the Poor level with the score of 1 is from 12:25 minutes and above. The cardiovascular endurance physical fitness through the 2.4 km Run Test for an 18-year-old male cadet officers from the NDUM Foundation Program based on the norms produced guided by the procedure and administration that is outlined by The Cooper Institute, [9] is very satisfactory. From the analysis, the cadet officers passed with at least achieving the score of 1 in the run test.

The result of this research almost resembles the result that was conducted in the study by Cooper [13]. Many researchers opined that physical activity and physical fitness are directly related. However, facts revealed that both of them has their own respective characteristics. Physical activities can contribute to physical fitness, however the relationship between both of them is not as expected if disciplines and methods of training is not followed properly.

Analysis was made through the norms produced. There are not much differences between the fitness norms among the 18-year-old NDUM Foundation Program male cadet that has been produced in the research and the fitness norms showed in the NAPFA Program and Cooper [13]. The findings have also shown that the level of fitness between countries differs. The factors in the differences may be due to the environment and condition differences in a particular country besides the geography and people.

VI. CONCLUSION

Overall, the findings of this research which is the cardiovascular endurance fitness norm for an 18 years old NDUM Foundation Program male cadet officers can be used as a guideline to measure the overall level of fitness for the reference of other group of people. With the production of the norms, the level of cardiovascular fitness norm for an 18 years old male can be assessed through the 2.4 km Run Test. The norms measure and determines the level of fitness accurately when the test is done. Generally, the fitness norm benefits a lot of people especially the teenagers that falls into the age category of interest. Among the benefits are not only to know the level of fitness but also acts as the motivation to enhance a better lifestyle that is healthy and safe. Greater importance should be placed on the review of the coach education programme to ensure the effectiveness of the programme in producing competent coaches and quality players in future [14]. In addition, Kassim. M. [14] stated that training are elements of the coaching process and become important indicators for the hard work undertaken by the athletes to enhance performance.

This software will be suitable as a personal assistant that records everyday fitness performance. The produced norms will also be essential in this system. Technically, although the software is quite simple, it is expected to function well to fulfil the needs of users as well as the developers. The researcher hopes that the development of this system will provide ideas, encouragement, and an example for other researchers to develop a more effective and quality database management system.

It is also hoped that this software will become a benchmark in the development of various software with broader functions. The development of mobile application is relevant with the face-paced world we live in today. Thus, this novel study in Malaysia will be a reference for future research.

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