

Test and measurement of cardiovascular fitness for female cadet officers

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Abstract: The aims of this research are to investigate the level of fitness and determine the cardiovascular endurance fitness norm for 18 year old female cadet officers. This research is a descriptive quantitative research and it involves a 2.4 km Run Test. A total of 46 respondents from the National Defense University of Malaysia (NDUM) Foundation Programmed 2013/2014 session were selected at random for this research. The analyses of descriptive data used included mean, median and standard deviation. The findings showed that the level of cardiovascular endurance fitness for the respondents is at a very satisfactory level ($M=13.13$, $SD=1.068$) as the normal percentile norm; with a recorded time of 13.01 minutes that is located at the 50th percentile and above. The fitness norm is determined by using guidelines which was introduced by Cooper (2007). Therefore, the norm that has been established is recommended to be made used as a reference to measure the level of cardiovascular endurance fitness for other age groups. There is an intention of investigating the physical fitness endurance norm of other age group in the future.

Key words: 2.4 km run test; Physical fitness norm; Cardiovascular endurance fitness; Female cadet officers; NDUM

1. Introduction

Physical fitness is a component that constitutes total fitness that is constantly being used in any form of action including sports and acting. Physical fitness is defined as the ability of a person to do daily routines without fatigue by utilising optimum energy; and still has extra energy to be used during leisure time or in emergencies. This is supported by Penny and Clarke (2005) who pointed out that physical fitness is defined as the ability to carry out daily routine efficiently with fitness without feeling extreme fatigue while having sufficient energy to carry out any other types of recreation.

Physical fitness can be further classified into health-based and motor-based fitness (Glassman, 2002; Haskell, et al., 2007). Haskell et al. (2007) and Glassman (2002) described that health-based fitness such as cardiovascular endurance, muscular endurance, muscle strength, softness of muscles, and the composition of body that covers the aspect that is related to the function of physiology and psychology; are believed to give an individual protection from threats of hypokinetic diseases. These diseases include heart diseases, obesity, and muscular diseases. On the other hand, motor-based fitness refers to the muscle potential and ability of an individual to carry out physical activity in terms of balance, agility, speed, power, reaction time and coordination.

The primary element of health-based fitness is the cardiovascular endurance which means the ability of the heart and lungs to provide oxygenated

blood to the working muscle tissues for them to use the oxygen to generate energy that is needed for any action to be carried out (Zupan, 2012). He further suggested that the level of cardiovascular endurance can be assessed by a physical test, for example a 2.4 km Run Test. The time recorded for running in the test is compared to the 2.4 km Run Test norms. The 2.4 km Run Test norms elicit the level of cardiovascular endurance fitness of a person by comparing the recorded time with the norms.

1.1. Background

Fitness tests are often referred as an appraisal for the level of fitness or a measure in determining the health status and physical fitness of an individual. In every test, there are norms that have been predetermined which act as the controlling factors of the tests and they are used by trainers to assess athletes' level of fitness. The norms or guidelines help not only in assessing the level of fitness but also detect the efficacy of the fitness training being carried out (Quinn, 2012). Quinn (2012) added that the norms of a particular fitness test constitute motivation elements to help an individual carry out better physical workout.

The fitness norm is referred as the guideline or range of marks that has been formulated after the process of calculation and analysis for a particular fitness test (Dove-Edwin, 2009). A research on physical fitness norm; conducted by Keating (2003) involved an investigation on a fitness test programme carried out for teenagers in the United

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States. The research revealed the effectiveness of the programme through test battery that constitutes the fitness norms and has proven that the fitness programme enhances lifestyle quality related to health. He later concluded that trainers should choose, use and develop training programmes that are available to make them more efficient and dynamic.

The cardiovascular fitness norm for a 2.4 km Run Test used is based on the American College of Sports Medicine standard (ACSM, 1999). The norm is produced by using the same procedure as suggested in this research but in a different environmental condition as compared to our country, Malaysia. This will inevitably produce a variation in results in determining the true level of fitness of an individual amongst Malaysians. Until today, there is no local fitness norm produced to test the level of physical fitness of 18 year old Malaysians. Hence, the researcher has taken the initiative to carry out this research so that a local cardiovascular endurance fitness norm is produced.

As the first research of its kind in Malaysia, the researcher only focused on the production of cardiovascular endurance fitness norms for 18 year old females. The cardiovascular endurance fitness norms are produced from the analysed data obtained from the 2.4 km Run Test results as the instrument in this research.

1.2. Research objective

The objective of this research is to produce a cardiovascular endurance fitness norm for 18 year old female cadet officers which utilises the 2.4 km Run Test introduced by The Cooper Institute. Besides that, the purpose of this research is to assess the level of cardiovascular fitness for 18 year old individuals to be set as a reference norm for future studies on fitness level of Malaysians.

2. Methodology

The method of this research is experimental observation. The design of this research resembles the design of research done by the Cooper Institute in producing its instrument to assess the cardiovascular endurance fitness norm. The Statistical Package for Social Sciences (SPSS) software version 20 was used to calculate and translate descriptive statistical analysis for research data of this research. The finding has enabled the researcher to calculate the percentile, mean and standard deviation for the overall result. In addition, demographic variables such as gender, ethnicity, height, and weight are also tabulated as dependent variables in this research.

The sample of the research comprised of female cadet officers aged 18 years old from the UPNM Foundation Programme, 2013/2014 session. A total of 46 respondents were selected to perform the 2.4 km Fitness Run Test; and this total represented 50 percent of the total female cadet officers of the

UPNM Foundation Programme 2013/2014 session (UPNM, 2014).

2.1. Instrument of research

To measure the level of physical fitness in a study, there must be a suitable test that matches the objectives of the study. The physical fitness test that was carried out is considered as the best instrument to be utilised in this research. The instrument chosen must also have high validity and reliability in order for the result to be indisputable (Ahmad, 2004; Bird, 2014). The instrument chosen was the 2.4 km Run Test, was developed by The Cooper Institute (Gregory & Charles, 2012; The Cooper Institute, 2007). The 2.4 km Run Test has a high reliability where $r=0.92$ (ACSM, 1999; Johnson & Nelson, 1986) and $r=0.86$ (John et al., 1999).

3. Results

The respondents of this research were randomly chosen. The descriptive statistical analysis on data obtained provided the mean score and the standard deviation for all respondents involved in the 2.4 Run Test ($M=13.13$, $SD=1.068$).

Table 1: Descriptive statistics on respondents' 2.4 km run test scores

18 year old female cadet officers	
Descriptive statistics	Test score
Minimum	12.04
Maximum	16.50
Mean	13.1346
Median	13.0100
Std. Deviation	1.141
Skewness	1.222
18 year old female N	46

Table 1 shows the statistical descriptive on the 2.4 km Run Test scores for the female cadet officers in this research. The minimum recorded time is 12:04 minutes and maximum is 16:05 minutes while the median is 13.01. The statistical skewness is 1.222 that leads to a normal shaped distribution.

Table 2 shows the percentile obtained from the analysed data. It is shown that the recorded time of 13.01 minutes and below for the 2.4 km Run Test is located on the 50th percentile and above. This means that about 33 female cadet officers from the total sample of 46, representing 72 percent of the total sample size; are at a moderate level of fitness. Only 2 female cadet officers were recorded to be on the lowest percentile which is in the 5th percentile with the recorded time of 15:34 minutes and above. The highest scores are located on the 95th percentile with a recorded time of 12:06 minutes.

Table 3 shows the norms produced based on the respondents' 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 (2004), grading a test in the production of norms enables different levels of potential in a particular group based on the abilities of each one of individuals in the group. Every

category of accomplishment states the scores achieved starting from the highest score which is 5 to 1, where 5 indicates the highest and 1 the lowest score.

Table 2: Percentile Norm Score for respondents' 2.4 km Run Test scores

Percentile	18 year old female (mm:ss)	Total
95	12:06	2
90	12:13	6
75	12:28	12
50	13:01	13
25	14:01	9
10	15:09	2
5	15:34	2
N		46

Note. (mm: ss)=(minutes: seconds); N= n

Table 3: Cardiovascular Endurance Physical Fitness Norm for 18 years old NDUM Foundation Programme Female Cadet Officers

Category	Score	Duration(mm: ss)
Excellent	5	< 11:52
Very Good	4	11:53 – 12:59
Good	3	13:00 - 14:06
Satisfactory	2	14:07 - 15:13
Poor	1	15:14>

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

Such norms are also being used by the National Physical Fitness Award (NAPFA) Singapore (MINDEF, 2015). From the table, the highest achievement which is Excellent with the score of 5 starts from 11:52 and below. The next level which is Very Good with the score of 4 is from 11:53 to 12:59 minutes, the Good level with the score of 3 is from 13:00 to 14:06 minutes, and the Satisfactory level with the score of 2 is from 14:07 to 15:13 minutes. The last level that is the Poor level with the score of 1 is from 15:14 minutes and above.

Table 4: Comparison of the Cardiovascular Endurance Physical Fitness Norms of an 18 year old female

Category	Score	Cooper (1982) (13-19 years old)	NAPFA (2014)	Results from this study (2015)
Excellent	5	< 12:29	<14:01	< 11:52
Very Good	4	12:30 – 14:30	14:01 – 14:50	11:53 - 12:59
Good	3	14:31 – 16: 54	14:51 – 15:40	13:00 – 14:06
Satisfactory	2	16:55 – 18: 30	15:41 – 16:30	14:07 – 15:13
Poor	1	18:31 >	16:31 – 17:20	15:14>

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

Table 4 shows the comparison of norms from a few studies which were conducted using the 2.4 km Run Test. Through the comparisons, the Excellent category (5) in the NAPFA Programme is 14:01 and below, and in the Cooper study (1982), it is 12:29 and below. The NAPFA Programme recorded the Poor level (1) from 16:31 to 17:20 while the Cooper study recorded the poor level starting from 18:31 and above. The differences of the norms might be due to the difference in methods in organising each study, as well as the objectives of the respective sets of research. Other differences in levels of achievement which are Very Good, Good and Satisfactory are also shown in Table 4 above.

4. Discussion and implication

The cardiovascular endurance physical fitness through the 2.4 km Run Test for 18 year old female cadets from the UPNM Foundation Programme 2013/2014 Session based on the norms produced guided by the procedure and administration that is outlined by (The Cooper Institute, 2007) 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 (1982). Many researchers opined that physical activity and physical fitness are directly related. However, facts revealed that both activities have their own respective characteristics that were presumed to be related. Physical activities can contribute to physical fitness, however the relationship between both of them is not as expected if disciplines and methods of trainings are not followed correctly. Right techniques and methods are crucial in physical trainings but they also vary according to individuals depending on the necessities of the individual.

The Sports Sciences Programme should be re-organised according to the needs of stake holders and in line with the aspirations of the institution. A neat strategy should be planned ahead to ensure the implementation or practice is carried out well and successfully. The concept of sports science should be introduced as early as in elementary or primary schools and physical exercise should be cultured in a daily routine basis. This can be done through the inclusion of Sports Science Education in the education curriculum. Trainers and teachers are to

be equipped with the latest sports science knowledge in order to sustain the relevance of the technique and to raise the quality of education relevant to the facets of today's world. Besides that, the continuation of the dissemination of a healthy lifestyle recommendation should not only focus on a particular level but to every age level.

This is due to the fact that the exposures related to the sports science fields should be broaden in developing the quality healthy lifestyle habits with the right guidance and knowledge and not by merely accepting any suggestions.

Through the analysis made, there are not many differences between the fitness norms amongst the 18 year old UPNM Foundation Programme female cadet officers and the fitness norms of 18 year old females produced by the NAPFA Program, Singapore and research from the Cooper Institute (1982). It can be seen through the norms produced that the time range and differences between these three norms does not show big differences. However, there is an acute difference in the recorded time for the Excellent level in the NAPFA norms which is lower in value as compared to the Cooper's study. The acute difference is however negligible because the methods carried out in the respective set of norms are different. Furthermore, the studies were conducted at different geographical locations hence the difference may be due to the environment, climate and conditions in a particular country.

5. Conclusion

Overall, the findings of this research that is the cardiovascular endurance fitness norm for 18 years old NDUM Foundation Programme female cadets can be used as a guideline in measuring the overall level of fitness of other group of people. The findings also show that the 2.4 km Run Test can be utilised to measure the fitness level of this group of samples where it determines the level of fitness accurately. In general, it benefits a lot of people to know what their physical fitness level are as it can act as a motivation to enhance a better lifestyle which is healthy and safe.

It is hoped that the findings of this research will have positive impacts on several parties which are involved in the management of sports team particularly for trainers. Therefore, it is crucial to have a full and clear understanding on how efficient training systems can produce quality and planned goals for any sports team or athletes. This is consistent with the research conducted by Silverman, Keating, and Philips (2008) that proposed an efficient training system using fitness test procedure which have a high potential in offering interesting experiences to attract people to be involved in the trainings especially youths.

The findings of this research could be patented and used as a proprietary of the UPNM. This is because the research conducted has exclusively produced the physical fitness norms of the cadet officers and this is the area of specialisation of UPNM

in producing graduates to be employed in the *AngkatanTentera Malaysia (ATM)* or the Malaysian Armed Force. The findings of the research could also be used as a cardiovascular endurance physical fitness reference in producing physical fitness norms for every age and gender in Malaysia.

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