

AIMC 2017
Asia International Multidisciplinary Conference

**DEVELOPING A PHYSICAL FITNESS INDEX TO EVALUATE
EXPLOSIVE POWER**

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Abstract

The aim of this study is to develop a Physical Fitness Index (PFI) to ascertain the physical fitness level of the Malaysian Army Reserve Officer Training Unit Cadets. This study uses the standing broad jump test as a physical fitness test battery to develop a Physical Fitness Index and to evaluate the subjects' leg explosive power. 212 male respondents (N=212) consisting of cadets from the Army Reserve Officer Training Unit of the National Defence University of Malaysia were selected for this study. The standing broad jump test was used as an instrument for this study. The quasi-experimental method is used to measure and evaluate the level of physical fitness and develop a Physical Fitness Index especially pertaining to power. Design of this study is a quasi-experimental study with pre-test and post-test where data were obtained through practical test in the field. SPSS software version 20.0 was used to calculate the mean, standard deviation and paired sample t-test in developing the Physical Fitness Index (PFI) and to evaluate the explosive power level of the Army Reserve Officers Training Unit cadets. The findings showed that the mean and standard deviation for the developed Physical Fitness Index is (M=204.01) and (SD=23.197). The Paired-Sample t-test for evaluating the fitness level in power for pre-test and post-test is significantly different ($p < 0.05$). The implication of this study is that the developed standard Physical Fitness Index is able to identify the level of physical fitness amongst the Malaysian Army Reserve Officer Training Unit cadets.

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Keywords: Physical fitness, physical fitness index, Army reserve officer training unit cadet, standing broad jump.



1. Introduction

Physical fitness is the foundation of holistic wellness. Physical fitness concept includes physical, mental, emotional, social and spiritual aspects of human beings. Physical fitness is a universal concept where an individual has to be totally healthy and strong (Kassim & Rustam, 2017). In today's modern life, physical fitness is very important for a person. According to Ahmad (2015), the perception that individuals who are engaged in sports are the only group that requires physical fitness, should be denied. The important thing that should be realised by each individual is that a deteriorating physical condition will impact the individual's mental and social capacity. In other words, fitness at the minimum level will influence and affect a person's mental function and ability to react. Kasim (2016) defined fitness as the ability to compete in a balanced and complete life. In addition, fitness also includes other aspects such as social, psychological and physiology fitness which are determined by the individual's environment, heredity, genes and lifestyle (Kassim, 2016). Rustam and Kassim (2016) posited that physical fitness activities are the exemplification of learning attributes and values contained in educational programmes.

Roy et al. (2010) mentioned that it is generally realised that the armed forces personnel require a specific level fitness to meet the physical demand of war. Soldiers are required to hop, slither, jump, climb, push, sprint from cover to cover, and carry overwhelming loads over long periods in their missions. These are the required undertakings put upon the armed forces personnel. Hence, from the military perspective, the key measurable fitness components include mobility, strength, endurance and flexibility.

The human element and physical fitness of military personnel have been the benchmark and will stay as the prominent characteristics of soldiers around the world, even to the extent of being superior to weapons improvements and innovation (Rodic, 1994). Based on events in history, physical preparation is of utmost importance for both troopers and officers in ensuring a formidable command and control.

Erikssen (2001) stated that physical fitness is an important marker of the health of armed forces and security personnel. Security forces personnel should have a high level of physical fitness since they are always engaged in physically demanding activities especially in military exercises and during war (Knapik et al., 1990). Monitoring the physical fitness level of armed forces and security personnel is important not only from the performance point of view but also to assess their combat capability.

Stone et al. (2002) defined power as the ability to express high rates of force development which is often related to an athlete's overall strength levels and ability to express high power outputs (Haff, 2005). In addition, Stone et al. (2002) suggested that the ability to express high rates of force development and high power outputs are critical performance characteristics central to the success in most sporting events. This statement is supported by Haff (2005), who stated that these abilities are considered to be amongst the most important sports performance characteristics, especially in activities that rely on jumping, changing of direction, and/or sprinting performance. Power is the result of solid muscular strength as a momentary incentive amid a given development. The last mentioned, regularly alluded as peak power (PP), is commonly connected with explosive movements, such as sprinting and jumping, can be a vital variable related to accomplishment in a given training.

2. Problem Statement

A Physical Fitness Index is a criterion that can be used to help interpret the physical fitness level of a person in a sports skills (Ahmad, 2015). Physical Fitness Index can help trainers gauge the physical fitness level of army officers engaged in physical activities. Additionally, through Physical Fitness Index, army physical trainers can identify the strengths and weaknesses of military personnel in the Malaysian Armed Forces.

Knowledge of the physical fitness level of military personnel can help military physical fitness trainers provide appropriate military training to increase the level of physical fitness. Developing a Physical Fitness Index for military officers in Malaysia is crucial so as to gauge and maintain the performance level of physical fitness of Malaysian military officers.

The absence of a Physical Fitness Index results in the practice of using tests that do not conform to standard procedure for measuring the physical fitness level. This can cause major problems to Physical Trainers. So far, no Physical Fitness Index is adopted in determining the physical fitness level, especially pertaining to power of army officers in Malaysia. Currently, there are no test procedures and standard Physical Fitness Index being introduced and implemented in the Malaysia Armed Forces.

As a result, military officers who undergo physical training or physical fitness session could not know their physical fitness level because their performance was not measured and assessed systematically. Since there is no standard Physical Fitness Index, the military Physical trainers have to resort to inconsistent measurement tests, therefore the test scores obtained do not demonstrate the actual level of physical fitness of the actual military officers.

Thus, the researchers plan to investigate the physical fitness level of the Army Reserve Officer Training Unit (ROTU) cadets through the development of a physical fitness standard index for the Army ROTU Cadets.

3. Research Questions

The research question in this study work on an assumption that muscle power are a performance condition to physical fitness amongst Malaysian Army Reserve Officer Training Unit Cadet (ROTU). This study suggested that better participants have better developed muscle power.

In this study it was investigate what the status of physical fitness index on muscle power and the level of muscle power fitness amongst Malaysian Army Reserve Officer Training Unit Cadet?

4. Purpose of the Study

This study is conducted with the aim of developing a Physical Fitness Index for muscle explosive power and also to evaluate the muscle power level amongst the Malaysian Army Reserve Officer Training Unit (ROTU) cadets.

5. Research Methods

This study is a quantitative research in the form of a quasi-experiment. A quasi-experimental method is used to measure and evaluate the level of physical fitness and develop a Physical Fitness Index. This experimental observation study uses a power physical fitness test battery that best suits the activity. The

design of this study is a quasi-experimental study design with pre-test and post-test data. In a quasi-experimental research design, data is obtained through practical test in the field (Ahmad & Gunathevan, 2015).

Samples comprising of 19 to 21 year old Army Reserve Officer Training Unit (ROTU) cadets from the National Defence University of Malaysia took part in this research. A total of 212 male Army Reserve Officer Training cadets were selected as study subjects. The purpose of this study is to develop a Physical Fitness Index of muscle power using the standing broad jump test battery. Morrow et al. (2005) proposed a sample size of at least 200 in order to create a Physical Fitness Index for each variable.

Table 01. Selected test battery for study instrument

Physical fitness component	Test battery
Muscle power	Standing broad jump

A pilot study was conducted to determine the reliability and validity of the instruments used in the study. A pilot study is a small study or a trial version conducted in preparation for a larger scale study. The main purpose of this pilot study is to determine the validity and reliability of the instrument. This pilot study is also a pre-test to try a special instrument.

The pilot study is conducted to test the validity and reliability of the selected physical fitness test battery which form the standard physical fitness norm standards for the Army Reserve Officers Training Unit cadets. This study uses the test repetition to obtain the coefficient of reliability. A total of 50 National Defence University of Malaysia military cadets who are not samples in the study participated in the pilot study. The objective of the pilot study is to ensure the validity and reliability of the chosen battery of tests to form indices for a standard Physical Fitness Index of Malaysian Armed Forces personnel.

Table 02. Method of data analysis

Part A	Analysis type	Measurement tool
A	Background data of respondents	Frequency, percentage
B	Develop Physical Fitness Index for muscle power	Mean, standard deviation
C	Pre-test and post-test fitness level for power	Paired sample T-test

6. Findings

All raw data comprising scores of selected physical fitness test battery were collected and analysed using SPSS version 20.0 so as to obtain the mean and standard deviation to be used in developing the Physical Fitness Index. Paired t-test sample was used to evaluate the pre test and post test muscle power level for the Reserve Officers Training Unit cadets. This study used the standing broad jump test to ascertain the leg explosive power.

This normative research is used to develop a Physical Fitness Index using a selected test battery and statistical inference will be used to analyse the level of physical fitness according to age and gender. Paired T-test samples were used to observe the difference between pre-test and post-test fitness level of the subjects. The physical fitness level of subjects were analysed by looking at the score during the performance of the battery tests The data analysis process involved several steps such as storing, uncoding, isolating,

and calculating the data. All the measurements of the test battery were collected and recorded. Revisions were made to fitness tests data to ensure the data is complete and in accordance with established procedures. For this study, the researchers set three levels of measurement. First, the pre measurement level. Prior to the measurements, the researchers briefed the respondents on the purpose of the measurement.

Second, is the level measurement, where the samples were divided into three groups based on their age (19 years, 20 years and 21 years). After dividing the subjects into three groups, the subjects were required to fill the sample score form. The researchers explained how the test is carried, the procedures to be followed and how the measurements are taken.

Third, is the test procedure where each test battery was measured according to the fitness components. Data taken from measurements made during the pre-test and post-test were then analysed to determine the fitness level of the subjects.

6.1 Background data for respondents

Table 03. Descriptive data for age

Subject	N	Age	Frequency	Percentages	Valid percent	Cumulative percent
Male	212	19	94	44.3	44.3	44.3
		20	75	35.4	35.4	79.7
		21	43	20.3	20.3	100.00

Table 04. Descriptive data for race

Subject	N	Race	Frequency	Percentages	Valid percent	Cumulative percent
Male	212	Malay	189	89.2	89.2	89.2
		Chinese	2	0.9	0.9	90.1
		Indian	19	9.0	9.0	99.1
		others	2	0.9	0.9	100.00

6.2 Data used to develop the Physical Fitness Index for power

Table 05. Descriptive statistic on respondents' standing broad jump test score

Descriptive statistic	Test score
Minimum	150
Maximum	285
Mean	204.01
Standard deviation	23.197
Skewness	0.167
N	212

Table 06. Physical fitness index for power

Category	Distance (cm)	Score
Excellent	241 cm <	5
Good	216cm – 240cm	4
Fair	192cm – 215cm	3
Poor	168cm – 191cm	2
Very poor	<167cm	1

Table 6 shows the Physical Fitness Index produced based on the standing broad jump test results where the mean and standard deviation is 204.01 and 23.197, respectively. There are 5 categories used to classify the grade in the Physical Fitness Index: Excellent (5), Good (4), Fair (3), Poor (2), and Very Poor (1). According to Ahmad (2004), grading of Physical Fitness Index enables the different levels of potential in a particular group according to the abilities of each individual to be identified. Scores from 5 (highest) to 1 (lowest) are given to indicate the achievement level. From Table 6, the highest achievement which is ‘Excellent’ having the score of 5 starts from 241cm, ‘Good’ with the score of 4 is from 216cm to 240cm, ‘Fair’ with the score of 3 is from 192cm to 215cm while ‘Poor’ with the score of 2 is from 168cm to 191cm and lastly, ‘Very Poor’ with the score of 1 is from 167cm and below.

6.3 Data for fitness level of power

Table 07. Frequency and percentages for fitness level of power amongst National of Defence University of Malaysia Army Reserve Officers Training Unit Cadets

Category	Frequency	Percent	Valid percent	Cumulative percent
Excellent	38	17.9	17.9	18.9
Good	100	47.2	47.2	65.1
Fair	61	28.8	28.8	93.9
Poor	13	6.1	6.1	100.00
Very poor	0	0.0	0.0	
Total	212	100.00	100.00	

Table 08. Paired Samples Statistics for pre-test and post-test explosive power level

Pair 1	Mean	N	Std. Deviation	Std. Error
Pre- test explosive power	204.01	212	23.197	1.593
Post-test explosive power	222.21	212	20.716	1.423

Table 09. Paired samples test for pre-test and post-test explosive power level

	Paired Differences					t	df
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference			
				Lower	Upper		
Pair 1 Pre-test explosive power –Post-test Explosive power	-18.203	23.443	1.610	-21.377	-15.029	-11.306	211

Paired sample T-test analysis is used to compare the mean score of pre-test explosive power and post-test explosive power. The findings showed the mean score of post-test explosive power (M=222.21, SD=20.716) is greater compared to the mean score of pre-test (M=204.01,SD=23.197), $t(211)=-11.306$, $p < 0.05$.

7. Conclusion

Physical fitness generally includes physical, mental, emotional, intellectual, spiritual and social aspects. Physical fitness is a comprehensive concept and it allows individuals to live a better, energised and confident life. Therefore, in this modern and advanced age, physical fitness is very important for a person's health. Deterioration of the physical condition of an individual will impact the individual's social mental strength. In other words, an individual's mental function and ability to react may be affected if he is physically less active.

By identifying the physical fitness level, one can choose the type of sports and career interest appropriately. The results of the test and measurement, allow coaches and sports science practitioners to utilise physical fitness performance information as a basis for placing groups of individuals based on their actual physical fitness level during training sessions. Knowledge of the individual's physical fitness level can help coaches and sports science practitioners to design strategies and methods which are effective for the athletes or players.

This study was conducted to establish the Physical Fitness Index for the Malaysian Army Reserve Officer Training Unit cadets based on Malaysia's demographic factors. This study also helps the Army physical trainers assess the level of physical fitness amongst the Malaysian Army Reserve Officer Training Unit cadets especially in the National Defence Universities of Malaysia. The establishment of a standard Physical Fitness Index may improve the quality of physical fitness level amongst army officers in general. Additionally, the Physical Fitness Index can be used by physical trainers to plan and identify appropriate types of training for Army Reserve Officer Training Unit cadets.

Acknowledgments

The authors would like to thank the Centre of Coaching Science, and the Research and Innovation Division of the National Defence University of Malaysia for giving the opportunity to conduct and publish this research under National Defence University of Malaysia research grant UPNM/2016/GPJP/4/SS/2. Special thanks goes to the National Defence University of Malaysia Army Reserve Officer Training Unit cadets, for participating in this research.

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