PHYSICAL ACTIVITY PATTERNS AND FITNESS STATUS OF A AND B DIVISION SOLDIERS OF UGANDA PEOPLES' DEFENCE FORCES

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SUPERVISORS' APPROVAL

This is to certify that this study has been carried out by Mwebaze Nicholas. It has been done under our supervision and it is now ready for submission with our approval as the University supervisors.

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DEDICATION

This study is dedicated to my dear parents Mr and Mrs Rusaniya Musenene, my wife Vianney, and children, Andrew, Mark and Becky Zion who missed my care during the time I was at the university.

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I am indebted to the almighty God who has always blessed me beyond words.

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LIST OF ABBREVIATIONS

APFT	Army Physical Fitness Tests
APTG	Army Physical Training Guide
CAD	Coronary Artery Disease
DSO	Division Sports Officer
FITT	Frequency Intensity Time and Type
HRQL	Health-related Quality of life
KAR	Kings African Riffles
LRA	Lords Resistance Army
METs	Metabolic Equivalents
NRA	National Resistance Army
PAP-Q	Physical Activity Patterns Questionnaire
PF	Physical Fitness
PT	Physical Training
RMR	Resting Metabolic Rate
ROM	Range of Motion
UNLA	Uganda National Liberation Army
UPDF	Uganda Peoples Defence Forces
USDHHS	United States Department of Health and Human Services
WHO	World Health Organisation

ABSTRACT

The main objective of this study was to assess physical activity patterns and fitness status of soldiers in A and B Divisions of UPDF. The study employed a cross-sectional survey, a pre-experimental research design and a stratified sampling procedure was used to select 200 subjects based on division and duration of service. The data was analyzed using the Statistical Package for Social Sciences (SPSS) version 16.0. Descriptive statistics was also used which included; mean, mode, standard deviation percentages and frequencies. ANOVA was performed to examine the differences. A p-value ≤ 0.05 was considered statistically significant. The study found out that most soldiers engage in physical activities around their home and work place. However, 70% of the subjects registered no leisure time activity at all which would be the best since its contribution to fitness can easily be measured. The study found no significant difference in law back and hamstring flexibility. The findings also indicated that, there was a significant difference between the junior and senior soldiers in core muscle endurance, and aerobic endurance, with a p value of 0.005 for sit ups, 0.000 for push-ups and 0.002 for a two mile run. The study concluded that majority of the subjects do not engage in leisure time activities and the performance of the subjects compared to the US standards was good. It was recommended that there is a need to conduct regular fitness tests, increase the official time for sports. The study also emphasized the need to sensitize soldiers on the importance of fitness, the need for commanders to be given a duty to ensure the fitness of their soldiers which will make work and responsibility distributed easily to ensure all soldiers engage in fitness activities.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Lawman (2010) defined physical activity as any bodily movement produced by skeletal muscles that result in energy expenditure above resting level. Physical activity was further defined as any bodily activity that enhances or maintains physical fitness and improves overall health (Malmberg, 2011). Physical activity is performed for many reasons, such as strengthening muscles and the cardiovascular system, harmonizing athletic skills, weight loss or maintenance and for enjoyment. Thence, physical activity is important to all categories of people irrespective of age, gender, ability and whether civilian or in the army. The design of one's engagement in these physical activities can be referred to as physical activity patterns. These patterns encompass several components (e.g. intensity, frequency, duration and type) that can be carried out in different settings or contexts (e.g. leisure-time, occupational, incidental and transport). When these activities are engaged in adequately they consequently result in physical fitness. Measurement of physical activity is complicated because there are several dimensions of physical activity related to fitness and health (e.g. energy expenditure, fitness, strength and flexibility), (USDHHS, 2000). Methods for measuring physical activity array from: self-reported instruments to more objective assessments of movement.

Physical fitness is a set of attributes that are either skill related or health related. The degree to which people have these attributes can be measured with specific tests depending on what is needed (Army Physical Training Guide, 2011). Brown (2005) defined physical fitness as the ability to perform daily tasks vigorously and alertly, with energy left over for enjoying leisure-time activities and meeting emergency demands. It is the ability to endure, to bear up, to withstand stress, to carry on in circumstances where an unfit person could not continue pursuits and meet unforeseen emergency without undue exhaustion. It is a major basis for good health and well-being. This definition fits

the military as they occasionally engage in vigorous activities and need to always be alert. A person can become physically fit only when he/she has been physically active. It is perceived that throughout military history, physical fitness has been a cornerstone for all personnel among the various armed forces (Mechikoff & Estes 2002). The military, in general, feel that the physical conditioning of soldiers has enhanced success on a very stressful and physically demanding battlefield throughout past conflicts, (Mechikoff & Estes 2002).

In Uganda physical activity to improve physical fitness in the army was thought about in the colonial army which was called Kings African Riffles (KAR). KAR was then changed to Uganda Riffles (UR), then to Uganda Army (UA), Uganda Defence (UD), Uganda National Liberation Army (UNLA), National Resistance Army (NRA), and to currently Uganda Peoples Defence Forces (UPDF). Every Wednesday afternoon the UD soldiers had to dress in Red or White t/shirts and Blue shorts and go for physical exercises. In the early stages of NRA, this was abandoned. However, the leadership of Uganda Peoples Defence Forces rejuvenated and emphasised physical exercises in the late 1980s. On Wednesday every week, from mid-day all offices close and soldiers are supposed to go for sports. A Directorate of Sports was established, and all divisions given Division Sports Officers (DSO). The purpose of this officer is to oversee all sports activities in the division (Personal communication, 2010).

It is indispensable that soldiers increase the time of physical activity during their life time, more than ever before to match the remarkable change in lifestyle since the time of industrial revolution. Automobiles, aircrafts, television sets, and several automatic machines have made life relatively easier, thereby relegating manual labour to the background, (Goon, 2006), Although the influence of this advanced technology boom has been documented in developed nations such as the United States of America, Western Europe and Japan, many developing countries such as Uganda are also experiencing the effects of increased mechanization, (Goon, 2006). Malmberg (2011) stated that peoples'

daily involvement in physical activity is shifting from mobile and vigorous activities to immobile and less vigorous lifestyle.

For example, there is a general shift from walking, riding bicycles and playing physical games to riding motorcycles (*boda bodas*), playing video games, watching television, or engaging in computer games rather than participating in games that need vigorous body movement (Brown,2005).

Bernard, *et al* (2006) stated that, one of the most harmful effects of modern-day technology is an increase in chronic conditions related to a lack of physical activity. These hypokinetic (also called no-communicable diseases) include hypertension, heart disease, chronic low back pain and obesity (Scott, 2008). A physiotherapist at one of the Military Hospitals in Uganda stated that "'there are many backache problems and mainly soldiers who are 25 years and most of them are big and stiff'. She related this to failure to participate in regular exercises or to engage in wrongly administered exercises" (personal communication April 2012).

Lack of ample physical activity is a fact of modern life that most people can no longer avoid to address. This has resulted to a growing concern regarding the increase of non-communicable diseases among the population, which would have otherwise been prevented (Standage, Duda, & Ntoumamis 2003). The army is not being mindful of the detrimental effects of physical inactivity. Unfortunately, the health concerns linger for long periods of time, if not for a lifetime, (Scott, 2008). This could be very dangerous for all categories of people, most importantly in the army where most of their daily duties demand physical fitness such as strength, endurance and flexibility at all times that can only be attained with regular engagement in physical activity.

Physical activity and physical fitness are closely related. This physical fitness is mainly, although not entirely, determined by physical activity patterns over weeks or months, (Lawman, 2010). For most individuals, increase in physical activity increases physical

fitness, although the amount of adaptation in fitness to a standard physical activity vary widely and is influenced by genetic control, nutritional factors, environmental factors and health status also has a big bearing, (Lawman, 2010). It therefore follows that, at one level you may need to revert to the often considered question of the relative importance of nature versus nurture. Consensus has perhaps never been achieved in response to this nature-nurture issue in other contexts. These factors, singly or in concert, are important determinants of the several components of physical fitness. The fitness variables are important determinants of various health outcomes, performance and several specific biological mechanisms have been elucidated to confirm the causal relation of physical activity to fitness variables and health, (Drury, 1989). In general therefore, a soldier's level of physical fitness has a direct impact on his/her combat readiness. The interest in this area is supported by many studies on effects of regular participation in several fitness programmes. These programmes enhance a soldier quality of life, improve their productivity and bring about positive, physical and mental changes.

To date, while there is some evidence that positively correlates physical fitness and physical activity, casual observation reveals that, its importance to the soldiers has not been emphasized in Uganda. Yet Ugandan soldiers have been instrumental in bringing peace in the region, for example peace keeping in Liberia, in Democratic Republic of Congo, South Sudan, and in Uganda herself where there were several rebel activities in the past many years. Presently it is relatively peaceful, there is a need to worry about the fitness of soldiers in the UPDF, thus the researcher was prompted to conduct the study in order to find out physical activity patterns and fitness status, and recommend strategies to keep soldiers physically fit.

1.2 Problem Statement

Emery, Shermer and Hauck, (2003) noted that when physical activity is designed well it improves physical fitness and will even give greater improvements in quality of life and greater reductions in disease and mortality risks. In addition, physical fitness enables

soldiers to endure stress in emergency times. For a soldier, physical fitness is more important when you consider the demands of his profession.

Technology has improved weapons, by increasing range, lethality, and weight. But to move those weapons and being able to physically endure days with limited rest requires a soldier to be fit (Bathrellou, Lazarou, Panagiotakos & Sidossis 2007). Even when technology has improved weapons, today's army still needs a fit soldier. To maintain that standard a soldier needs to be physically active and regular PF surveillance needs to be conducted. It is well documented that physical inactivity has been linked to an increase in the risk of non-communicable diseases such as a low back pain (Barnard, Gonzales, Liva, & Ngo 2006).

In Uganda, Soldiers are tested for fitness prior to their joining the army and military training further improves their fitness level. After training, the soldier is expected to maintain fitness and such fitness can be regularly tested using surveillance programmes. However, it is apparent that these programmes might not be regularly conducted and hence data on the PF Status of UPDF is scanty. It is against this background that the researcher sought to establish, the PA patterns and PF status of UPDF soldiers.

1.3 General Objective

The main objective of this study was to assess PA patterns and the PF status of soldiers in A and B Divisions of UPDF.

1.3.1 Specific Objectives

The study sought to:

i. Determine the PA patterns of UPDF soldiers in A and B divisions
ii. Establish the PF status of UPDF soldiers in A and B divisions
iii. Compare PF status of UPDF soldiers with other standards
iv. Compare the PF status of senior and junior soldiers in UPDF

1.4 Research Questions and research hypotheses

The study was guided by the following research questions and hypotheses;-

1.4.1 Research Questions

i. What are the physical activity patterns in the UPDF soldiers in A and B divisions?

ii. What is the physical fitness status of UPDF junior and senior soldiers in A and B divisions be?

1.4.2 Research Hypothesis

It was hypothesized that:-

Ho_1 There would be no significant difference in physical fitness status of senior soldiers and junior soldiers of A and B Divisions of the UPDF.

1.4.3 Sub-hypothesis

Ho_2 There would be no significant difference low back and hamstring flexibility between soldiers in A and B Divisions of UPDF.

Ho_3 There would be no significant difference in muscular endurance between the senior and junior soldiers in A and B divisions of UPDF.

Ho_4 There would be no significant difference in body composition of the senior and junior soldiers in A and B divisions of UPDF.

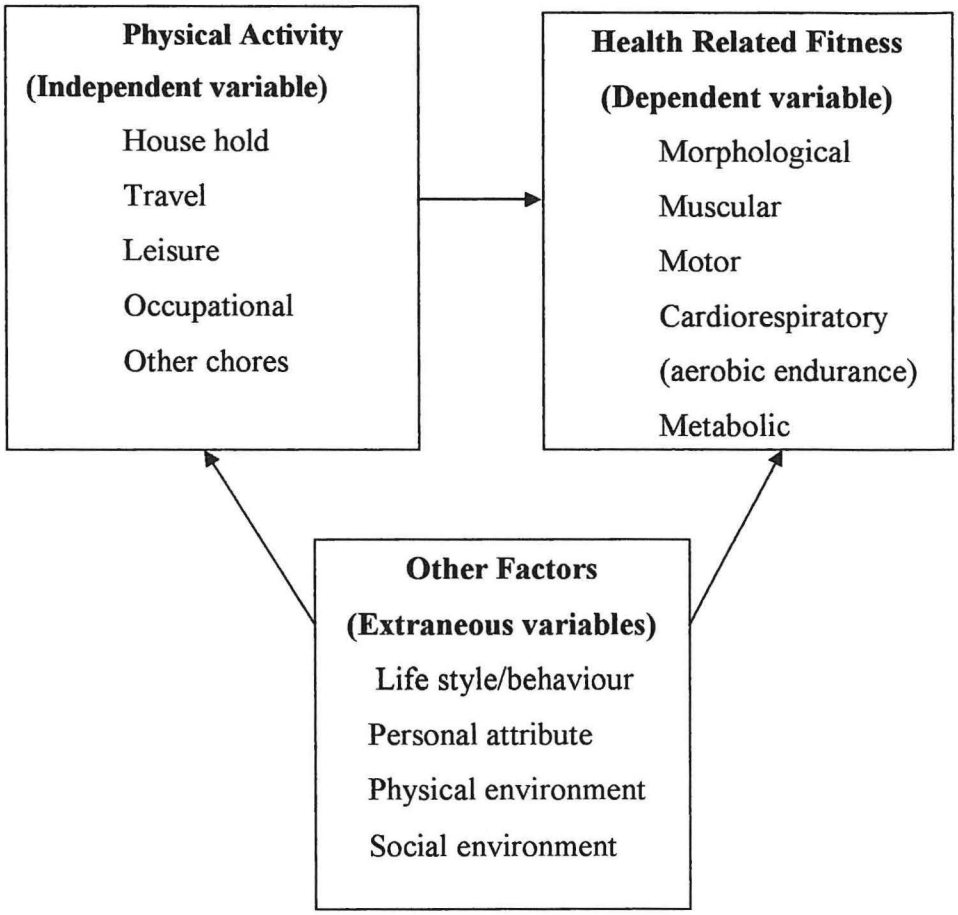
Ho_5 There would be no significant difference in aerobic endurance of the senior and junior soldiers in A and B divisions of UPDF.

1.5 Significance of the Study

This study may help in providing useful information to the administrators of UPDF on patterns of PA and physical fitness of the UPDF soldiers. The study has generated data which can be used to design programmes to improve or maintain the PF status of soldiers.

This study may also help other armed forces such as Police, Prisons as a source of reference to be able to improve on the fitness of their officers.

1.6 Conceptual Framework



(Adapted with modification by the researcher from, Bouchard & Shephard 1994)

Figure 1:1 Conceptual Framework

Physical activity performed in daily life during household work, travels, at work place and during our leisure time can improve health related fitness. Health related fitness can in turn enhance ones participation in physical activities, (Bouchard & Shephard, 1994).These health related fitness components will improve one's wellness, morbidity

and mortality. These factors are affected by one's life style and behaviour which will later leads to direct effect on our health related fitness.

Health-related physical fitness consists of those components of physical fitness that have a relationship with good health. The components are commonly defined by flexibility, muscular endurance, and strength, body composition and cardiovascular fitness, (Bouchard & Shephard, 1994).

A non-performance component of fitness related to body composition factors such as body circumferences, body fat content, and regional body fat distribution is morphological fitness measures are often related to metabolic fitness components. Those measures used to assess body composition are also used to assess morphological fitness, as are measures such as body mass index, fat mass percentage, waist circumference, and waist to hip ratio (Bouchard& Shephard, 1994).

There are many healthy lifestyles or behaviours that contribute to fitness, health and wellness. In this study the processes or healthy lifestyles that are defined relate primarily to one healthy lifestyle; physical activity. The importance of other healthy lifestyles such as nutrition and stress management were not considered in this study, (USDHHS, 1996; Bouchard & Shephard, 1994).

Leisure activity is physical activity undertaken during discretionary time. Research in physical activity often separates leisure physical activity from vocational activity. Leisure activity includes exercise but all forms of leisure activities are not exercise, (USDHHS, 1996; Bouchard & Shephard, 1994). In this study, the researcher looked at physical activity patterns as done in the household work, travel and during leisure time that were assumed to be affecting the physical fitness status of UPDF soldiers in 4 and 5 divisions.

It is apparent that physical activity patterns influence physical fitness that means the levels of performance of an individual will greatly determine ones physical fitness and health status.

1.7 Study variables

It has been conceptualized that PA patterns have an influence on the PF status of A or B division soldiers within the UPDF. The variables likely to determine the fitness status of A or B division soldiers have been categories as independent, dependent and intermediary variables.

1.7.1 The independent variables

The physical activity patterns have directly been identified as the independent variable. For the purpose of this research, therefore, household, occupational and leisure were three core (independent) variables.

1.7.2 The dependent variables.

Since the study variables aid in analyzing the causal – effect relationship between and among variables, the independent variables were defined as the physical activity patterns exhibited by the soldiers. It is herein perceived that the dependent variables (fitness status of A or B division soldiers) are more likely to be influenced by the independent variables (the physical activity patterns).

1.7.3 The intermediary variables

More so other external factors may have a direct or an indirect toll on the fitness status of A or B division soldiers such as morphological, nutrition, muscular and motor among others. All these, individually or otherwise may serve to nurture particular traits that would otherwise be absent from the soldiers. These environment factors have been herein identified as intermediary variables. In this study, these variables have assumed to have similar on all subjects.

1.8 Delimitations

The study was delimited to physical activity patterns as found in the physical activity questionnaire and the physical fitness status of soldiers particularly, low back and hamstring flexibility, body composition, core muscular endurance and aerobic endurance. The study was also delimited to timing and counting the number of push- ups and sit-ups made in one minute and timing aerobic endurance delimiting it to a two mile run. This study was delimited to UPDF soldiers who were working in the Division headquarters of A and B Divisions in Uganda and had served in UPDF for not less than 6 months at the time of data collection. And 200 subjects were selected for the study.

1.9 Limitations of the study

During the course of the study the following problems were encountered:- the tests were carried out from 9:00 am to 11:00am, the subjects that were tested at 11:00am could have been affected by sunshine. The unpredictable weather and unstable electricity also limited the study.

1.10 Operational definitions/Definition of key terms

A or B Divisions: Are divisions of the UPDF where the study was conducted

Division: This is an administrative structure in the Army

Junior soldier: This represents a soldier who has been serving the army for not more than four years

Senior soldier: One who has been serving the Army for more than four years

Unit: A group of soldiers operating together

Core muscle: in this study includes the abdominal and the upper body muscles.

Cardiorepiratory: also means aerobic endurance

Bioelectric impedance: Assessing body composition using electrical current through the body.

Cross-sectional study Research plan in which data are collected at a single point in time and participants are classified by predictor (independent) and outcome (dependent) variables.

Fat mass All extractable lipids from adipose and other tissues in the body.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter presents the literature reviewed under the study. It was guided by the following themes; - concept of physical activity, physical activity patterns, concept of physical activity and fitness, and measuring of Physical Fitness, related studies and summary.

2.1 Concept of physical activity

Physical activity is defined as any bodily movement produced by skeletal muscles that results in energy expenditure above resting level (Lawman, 2010). Physical activity in daily life can be categorized into occupational, sports, household activities, and leisure time activities. They can be of low intensity, moderate intensity or high intensity. They are made up of exercise that is planned, structured, and repeated and has a final or intermediate objective of improving or maintaining physical fitness (USDHHS 2000).

The term physical activity commonly represents sport, active recreation, exercise, fitness, incidental activity and active living, (Bouchard & Shephard, 1994). The element of personal choice is inherent to this definition. The activities done in the household, mode of travel, workplace activities and even leisure activities become part of us and natural. It is important to measure those activities and find out if they are adequate to improve one's health fitness status. One of the important aims of population physical activity measurement is to measure physical activity in as many settings as possible, using reliable and valid self-reported questions. What shows how better one is doing, is determined by physical activity patterns which has a direct effect on fitness status (USDHHS 2000).

Physical activity patterns comprise several components namely:- intensity, frequency, duration and type that can be carried out in different settings or contexts such as in the

household, travel, occupational, and leisure-time, (APTG, 2011) Measurement of physical activity is complicated because there are several dimensions of physical activity related to fitness and health. These dimensions include;- energy expenditure, fitness, strength and flexibility. Methods for measuring physical activity range from self-reported instruments to more objective assessments of movement, fitness or energy balance (Amstrong et al, 2000).

Different intensities and duration of activity are needed for different purposes. For example, more vigorous and sustained activity may confer additional benefits for disease prevention, but may be required for weight loss, military service or improvements of lipid profiles (USDHHS 1996). Underpinning the measurement of physical activity is the integration of information on intensity, frequency, duration and type of physical activity. Furthermore, recent developments in the epidemiology of physical activity suggest that components of everyday activity, such as transport, physical occupation, leisure, household and incidental or unplanned activity might be considered in broader approaches to measurement (Amstrong et al, 2000).

Physical activity duration also contributes to physical activity patterns. Physical activity duration is defined as the length of time spent participating in physical activity within a specified period. This item is generally reported in hours and minutes and may be summed to provide an indication of total time participating in physical activity over a period. More recent surveys focus on a shorter time period, with one or two weeks often used (Baker & Shane 2003). In this study minutes were used to consider the duration spent doing any physical activity whether vigorous, moderate or of low intensity. Related to physical activity intensity is physical activity frequency.

Physical activity frequency refers to how often one does exercises. It is related to the intensity and duration of the exercise session. Conditioning can best be accomplished by three adequately intense workouts per week. Soldiers should do these on alternate days. By building up gradually, soldiers can get even greater benefits from working out five

times a week. However, leaders should recognize the need for recovery between hard exercise periods and should adjust the training intensity or frequency accordingly (Field manual (FM) 21-20, 1998). They should also be aware of the danger of overtraining and know that the risk of injury increases as the intensity and duration of training increases without adequate rest. The FM 21-20, (1998) recommends soldiers to do physical activities five times a week. In this study, one week was used, because it is considered to be less prone to recall bias and hence to provide better population estimates of activity patterns.

It is important to consider the intensity of the activity whether the activity was vigorous or moderate. Physical activity intensity is usually the rate at which the activity is done (U.S. Department of the Army[USDA], 2000). Intensity is defined as how hard an individual works while exercising. Intensity is probably the single most important factor for improving performance. To determine the correct intensity for a cardio-respiratory workout, varying percentages of Heart Rate Reserve (HRR), Maximum Heart Rate (MHR), Resting Heart Rate (RHR), and Training Heart Rate (THR) are utilized. In this study, intensity was considered at as physical activity being moderate or vigorous, (USDA, 2000). Examples of moderate-intensity activities include gentle swimming, social tennis correspond to around 3–5 METs. More vigorous activities such as aerobics, jogging and competitive tennis correspond to around 7–9 METs as physical activity type (USDHHS 2000). In this case self-perceived and self-reported intensity at which a respondent participated in physical activity.

Generally, to obtain fitness and health benefits, physical activity at a moderate intensity (at least) is required. The FM 21-20 (1998) recommends vigorous activities for soldiers three to five times a week. Participation in vigorous-intensity physical activities confers even greater health and performance benefits than participation in more moderate activity (USDHHS 2000). The primary measurement goal is to provide examples within questions of the kinds of activity that reach a sufficient energy expenditure threshold to be of health and performance benefit. There are other activities however that are very

complicated to measure, for that matter another important component is the physical activity type.

Type refers to what specific training is performed. Closely related to the exercise principle of specificity, this factor draws a direct correlation between the similarity of the exercise performed and the desired training effect, "to improve performance, one must practice the particular exercise, activity, or skill he wants to improve" (U.S. Department of the Army 1998, 1-7). Type is the specific physical activities self-reported by subjects, for example, walking, gardening and compound work. Although some occupations involve considerable amounts of walking for example, the army, traffic warden, there is currently insufficient evidence to assume that self-reported walking at work will provide fitness and health benefits (Brown, 2005). Gardening and compound work are also common physical activities. Information on these specific activities is required because it is unclear whether they contribute to achieving a 'sufficient' level of physical activity for health and performance benefit (Amstrong et al, 2000). Other important settings for expending energy, such as domestic or occupational settings, require validation studies to determine their usefulness in routine physical activity which can make them physically fit (Amstrong et al, 2000). When these factors are put into a critical consideration they lead to physical fitness.

2.2 Physical Fitness concept

Physical fitness is a dynamic construct and is continually growing in importance to everyday life and health (Dishman, Washburn & Heath, 2004) Although being an attribute that has a genetic basis, it is also sensitive to changes in type and amount of physical activity. Physical fitness is a set of attributes that are either skill related or health related (Dishman, Washburn & Heath, 2004). The degree to which people have these attributes can be measured with specific tests depending on what is needed (APTG, 2011). It is important to measure fitness both as an outcome of physical activity and as a mediator of physical activity's effect on disease morbidity, mortality and injury. The measurement of fitness should become an imperative part of surveillance systems that

track physical activity and risks for disease or injury (Dishman, Washburn & Heath, 2004). Physical fitness can be better understood by defining the specific components that can be measured and the circumstances in which those components relate to bodily function and health or reduced disease, (American College of Sports Medicine [ACSM], 2005). According to scientific consensus from the Second International Conference on Physical Activity, Fitness, and Health), the components of fitness can be categorized as health related fitness or motor related fitness (Bouchard, Shephard, & Stephens, 2006).

Motor skills are associated with muscle activity. There are six basic components to motor skills and these include;- ability to perform movements, quickly and in varied directions, (Kelly & Marrow, 2010). A simple routine physical activity will improve agility. Agility is an important components among soldiers since they are required to make quick reactions and change positions to avoid enemy shot. The other motor skill is balance. This is the stability produced by the distribution of weight. Balance is also of great importance to soldiers since they are required to cross obstacles. For one to balance well there is need for coordination, (Kelly & Marrow, 2010, Cooper, 2001).

Coordination is the harmonized functioning of all body parts. The proper functioning of the body cannot be by a single muscle or organ, so coordination is vital in fitness. Weight lifting and strength training can improve one's power which will determine how first one can move the body and this can be determined by how fast one can respond to a stimulus (USDHHS, 2000). Reaction time lies between the presentation of a stimulus and the muscular response. Last is speed, which is defined as the state of moving swiftly. It is possible to improve on the components of reaction time and speed with one exercise (USDHHS, 2000).

Strength in the past armies was looked at in terms of size and stature and that's why there existed one of those ludicrous requirements which were often found in military regulations stipulating a minimum height of five feet eight (1.77m) inches for KAR personnel (Martin & Michel, 1972). Most people from parts of Northern Uganda could

have access to the army because most of them could meet the height requirement. Today however fitness is looked at in its entirety because in the current army recruitment are other factors not major.

Physical fitness is typically defined with focus on two goals: - performance or health. Health-related physical fitness can be defined as the ability of a person to perform daily activities with vigour, and by traits and capacities that are associated with a low risk for the development of chronic diseases and premature death (USDHHS, 2000 ; Kelly & Marrow, 2010). Chronic diseases and cardiovascular diseases occur most frequently during or after the fifth decade of life, (ACSM, 2000). This study looked at four health related fitness components. These include:- flexibility, body composition, muscular strength and endurance, and aerobic endurance. These components are discussed in detail in the following text.

Cardio respiratory endurance is the ability or efficiency for the body to deliver oxygen and nutrients to muscle tissues and to remove wastes over sustained periods of time. Cardiovascular fitness is the ability of the heart (cardio) and circulatory system (vascular) to supply oxygen to muscles for an extended period of time, (Harvey & Mansfield, 2000).

Cardiovascular is also called cardiorespiratory (lungs) fitness, (Harvey & Mansfield, 2000:98). Usually the 2 mile run or some other type of continuous fitness activity (12 minute run, cycling, step-test, etc.) is used to assess cardiovascular fitness, FM 21-20 (1998). Similar to this is aerobic endurance (stamina) is defined as body's ability to perform for prolong period of time at a relatively low work rate. Examples of activities that improve aerobic endurance are running, cycling and swimming; but it should be done at a steady pace for at least 20 minutes. It is important to have a very good base of aerobic endurance, as it will help to train and improve other components of fitness (Sandler 2003). FM 21-20 (1998) states that the US Army uses the two mile run to assess a soldier's aerobic fitness and leg muscles' endurance.

The second component is muscular strength. This is the ability or efficiency of the muscle to exert force for a brief period of time. Muscular strength can be defined as the maximal force that can be generated by a specific muscle or muscle group. Body strength has been considered an important component of all-round physical fitness (Buck, Hillman & Castelli, 2008). For this reason, some measurement of relative strength has been included in the several 'field-testing batteries of soldiers', where commonly used tests are:- push-ups and sit ups for upper body muscle strength and flexibility (Brown, 2005). FM 21-20, (1998): Brown, (2005)

The third component is muscular endurance. This is the ability or efficiency of the muscles to sustain repeated contractions or to continue applying force against a fixed object (Buck, Hillman & Castelli, 2008). Muscular endurance, on the other hand, is the ability of a muscle or muscle group to execute repeated contractions over a period of time sufficient to cause muscular fatigue, or to maintain a specific percentage of the maximum voluntary contraction for a prolonged period of time. This is usually measured using a one minute sit-up and push-ups. A soldier is expected to score at least 60% to pass the test, (ACSM, 2000).

is shown in Table 2.1

Table 2.1 showing the US fitness tests standards

Age group	Push ups 60% pass mark	100%
17-21	42	82
22-26	40	80
27-31	38	78
32-36	33	73
	Sit ups	
17-21	52	92
22-26	47	87
27-31	42	82
32-36	38	78
	2 mile run	
17-21	15:54	11:54
22-26	16:36	12:36
27-31	17:18	13:18
32-36	18:00	14:00

Adopted from FM 21-20, (1998): Brown, (2005)

The fourth component is low back and hamstring muscle Flexibility. This is the ability or efficiency to move joints and use muscles through their full range of motion. Flexibility has been defined as the functional capacity of the joints to move through a full Range of Motion (ROM) (ACSM, 2000). The functional ROM refers to the ability to move the joint without incurring pain or a limit to performance. Flexibility depends on which muscle and joint is being evaluated; therefore, it is joint-specific (Harvey & Mansfield, 2000; ACSM, 2000). The range of motion at a joint is influenced by several factors. In this regard, the structure of the joint and interface between the two articulating surfaces can prevent excessive range of motion at different joints. The soft tissue surrounding the joint (muscles, tendons, fascia, ligaments and skin) also restricts joint motion (ACSM, 2000). However, the skin has little effect on restricting ROM unless pathology is present, while the ligaments and joint capsule provide a degree of stability and are not usually the focus of exercise aimed at improving flexibility (Harvey & Mansfield, 2000). Logical basis supports the importance of flexibility and the basic assumption that a degree of flexibility is necessary for athletes and individuals.

Therefore, measuring flexibility is useful in obtaining quantitative values that could help assess improvements and possibly assists to identify problem areas associated with poor performance or that can affect performance (Alter, 1990 as cited by Goon, 2006). There is no single test that can truly characterize flexibility; however, the sit-and reach test is the most widely used test for the assessment of flexibility of the lower back muscles and the hamstring muscles. It does not represent total flexibility, but it gives a general picture of how flexible one may be (ACSM, 2000). It should be stressed that flexibility is not a general component of physical fitness but is specific to each joint and the measure of the low back flexibility and the harm string muscles can be categorized as super, excellent, good, average, fair, poor and very poor (ACSM, 2000). The detail of performance rating in flexibility is detailed in the next table.

Table: 2.2: Performance standards for lower back and hamstring muscles flexibility

Inches	Remarks
> +10.5	Super
+6.5 to +10.5	Excellent
+2.5 to +6.0	Good
0 to +2.0	Average
-3.0 to -0.5	Fair
-7.5 to -3.5	Poor
< -7.5	Very Poor

Adopted from USDHHS (2000)

Body composition also plays a key role in physical fitness. It refers to the makeup of the body in terms of lean mass to include muscle, bone, vital tissue and organs, and fat mass, (Scot and Howley, 2001). According to the ACSM (2000), body composition is the relative proportion of fat and fat-free tissue in the body. Body composition provides an estimate of the percentage of an individuals' weight that is comprised of adipose tissue in contrast to lean body mass (muscles, bones, organs). Body composition is an important indicator of fitness status (Malina *et al.*, 1998:13-26; Bunc, 2001:46-52; Deurenberg *et al.*, 2003:405-409 as cited by Goon 2006), since maintaining appropriate body composition is vital in preventing the onset of obesity, which is associated with increased risk of cardiovascular diseases. It is documented that low percentage body fat can also adversely affect metabolism and health and may indicate the incidence of disease, under nutrition or an eating disorder such as anorexia nervosa, (Goon 2006). It is clear that body composition measures can be used to monitor health and to identify those at risk because of over or under fat. Excessive development of fat may result in adverse health problems in life (Westrage & Deurenberg, 1989). In addition to assessing total body fat and regional body fat to identify one's health risks, there are other important ways that

body composition measures can be used by medical, health and fitness professionals in this study we used biometric impendence and fat chart range is shown in table 2.3.

Table: 2.3 Showing the Fat ranges for Adult males

Age Group	Underfat	Healthy	Overfat	Obese
20 - 39	0 - 7.9%	8 - 20%	20.1 - 25%	25.1% +
40 - 59	0 - 10.9%	11 - 22%	22.1 - 28%	28.1% +
60 - 79	0 - 13.9%	14 - 25%	25.1 - 30%	30.1% +

Source; Adapted from http://www.amazon.co.uk/Tanita-Segmental-Composition-Monitor Analyser/dp/B000MDH5L2 accessed on 12 Jun 2013

2.3 Relationship between physical activity patterns and physical fitness

Army fitness is not just about assault courses, marches and gym work. Sport is an essential and integral part of Army life and it is actively encouraged and supported, regardless of whether you are playing for fun or aiming to compete, (Brown, 2005). In order to get fitter and more physically able for the challenges of Army life, a soldier needs to improve his/her physical fitness depending on his /her genetics. Whatever the soldier's natural build may be, he or she can still increase the functional strength of his/her muscles and improve physical fitness through physical activity, (APTG, 2011).

The Us Army Regulation 350-15 specifies that vigorous physical fitness training will be conducted three to five times per week. For optimal results, commanders must strive to conduct five days of physical training per week FM 21-20, (1998). Ideally, at least three exercise sessions for CR fitness, muscle endurance, muscle strength, and flexibility should be performed each week to improve fitness levels. Thus, for example, to obtain maximum gains in muscular strength, soldiers should have at least three strength-training sessions per week (Brown, 2005). Three physical activity periods a week, with one session each of cardiorespiratory, strength, and flexibility training will not improve any of these three components, (Drury, 1989). With some planning, a training program for the average soldier can be developed which provides fairly equal emphasis on all the

components of physical fitness by training continuously with equal emphasis can be given to developing muscular endurance and strength and to CR fitness while training five days per week, FM-2120 (1998); APTG, (2011). Numerous other approaches can be taken when tailoring a physical activity program to meet fitness needs as long as the principles of exercise are not violated. Such programs, when coupled with good nutrition, will help keep soldiers fit to win, (APTG, 2011).

According to ACSM (2000) physical activity in general has a direct effect on a soldier's body composition and this begins on the cellular level. Muscle cells aerobically break down glycogen, carbohydrates, and fats to produce energy ACSM (2000). The more regularly the individual conducts cardio-respiratory training, the more efficiently the body converts these substances to energy instead of storing them as potential energy, or fat. Several other factors also play a part in individual body composition training ability and fitness that is, effective and regular exercise, diet, and lifestyle choices such as consuming alcohol and smoking or dipping are factors within an individual's control (Lawman, 2010).

The level of physical activity that is 'sufficient' to confer a fitness and health benefits has been subject to debate. The accrual of 150 minutes of moderate-intensity (at least) physical activity over a period of one week is believed to confer health benefit and reflects the current National Physical Activity Guidelines message (DHAC 1999). Physical fitness benefits can also be obtained by participating in vigorous-intensity physical activity, in approximate proportion to the total amount of activity performed, measured in minutes of physical activity. Participation in vigorous-intensity leisure-time physical activity for 60 to 90 minutes over a period of a week will confer fitness and health benefits, (ACSM, 2000). The definition of 'sufficient' does not include gardening or heavy yard work (although these activities can be rated to be of vigorous intensity) because there is limited research regarding the actual energy expenditure of these activities, (Saunders, 2009). It is likely that, in future, these activities may be included as indicators of moderate-intensity physical activity. Insufficient physical activity is defined

as some reported physical activity, but not meeting either of the 'sufficient' criteria Cooper, (2010).

Different intensities and duration of activity are needed for different purposes—for example, more vigorous and sustained activity may confer additional benefits for disease prevention, but may be required for weight loss or improvements to lipid profiles, (Kelly & Marrow, 2010). Underpinning the measurement of physical activity is the integration of information on intensity, frequency, duration and type of physical activity. Furthermore, recent developments in the epidemiology of physical activity suggest that component of everyday activity, such as transport-related activity and incidental or unplanned activity, might be considered in broader approaches to measurement (Bauman 1987). In this study, activities in and around the home, travel, work place activities and leisure time were considered.

Improving fitness is dependent on the "dose" of physical activity that a person receives which dependent upon the factors contained within the *"F.I.T.T."* principle: FM 21-20 (1998) identifies four factors that constitute a successful physical fitness program of a soldier.

These four factors include frequency, intensity, time, and type, and can be remembered by the acronym FITT. Sandler (2003) uses these identical factors in his weight training principles, while Saunders, (2009) changes the terminology but uses the same concepts. Sandler (2003) defines frequency as the number of sets and repetitions a trainee performs. Intensity is defined as the amount of weight or resistance that is used in the respective sets and repetitions. Time is defined as the amount of time allotted to PT while type is the exercises that are performed. FM 21-20 (1998) and Sandler (2003) are very similar in their recommended PT programs. Both sources state that to improve physical fitness a person must improve muscle strength and muscle endurance. Sandler (2003) recommends that a person should perform PT three to five times per week with each session consisting of ten to twelve exercises and the PT lasting about one hour. Each muscle group should

be rested twenty-four to forty-eight hours after a PT session. FM 21-20 (1998), meanwhile, has varying recommendations depending on if the PT session is focused on muscle strength, muscle endurance, or a combination of muscle strength and muscle endurance.

Overall, the recommendations made by FM 21-20 (1998) are very similar to Sandler's (2003) recommendations. Saunders, (2009) advocates for short PT sessions lasting about fifteen minutes; however, PT should be done every day. His recommended schedule is to perform cardiovascular training on Mondays, upper body strengthening on Tuesdays, flexibility training on Wednesdays, lower body strengthening on Thursdays, cardiovascular training on Fridays, trainee select "targeted" training on Saturdays, and mind and body training on Sundays. Saunders, (2009) provides several recommended primary and secondary exercises for the Monday through Friday PT regimen. FM 21-20 (1998). Saunders, (2009) experts emphased the importance of proper nutrition in a successful PT program. FM 21-20 (1998), as well as Hanc (1994) . Proper form, or technique, is stressed by most PT experts, when a person is conducting any type of PT or exercise. Sandler (2003) stresses that to maximize strength training a joint must be made to go through its entire range of motion. Hanc (1994) also stresses and identifies proper running form. Proper form also reduces the likelihood of injuries while conducting PT activities. This has got related studies about physical activity and physical fitness is showed below.

2.4 Related literature

Skill-related physical fitness (From Surgeon General's Report on Physical Activity and Health, USDHHS, 1996) explains skill-related physical fitness to consist of those components of physical fitness that have a relationship with enhanced performance in sports and motor skills. The components are commonly defined as agility, balance, coordination, power, speed and reaction time. Possession of skill-related fitness abilities enhances ability to perform in many activities but has an indirect connection with health. The skill-related components of fitness are agility, balance, coordination, power, speed, and reaction time. It is assumed that people who possess skill-related fitness will be more

likely to engage in regular activity and for this reason will have enhanced health-related fitness and a lower risk of hypokinetic diseases.

Physiological fitness includes non-performance components of physical fitness that relate to biological systems which are influenced by one's level of habitual physical activity. (Bouchard & Shephard, 1994). The concept of physiological fitness was introduced in a publication of the first international consensus statement of current knowledge of physical activity (Bouchard & Shephard, 1994). Some of the sub-components of physiological fitness that have gained acceptance are metabolic fitness, morphological fitness, and bone integrity (Bouchard & Shephard,1994).

The state of metabolic systems and variables predictive of the risk for diabetes and cardiovascular disease which can be favourably altered by increased physical activity or regular endurance exercise without the requirement of a training-related increase inVO2max (American College of Sports Medicine (ACSM), 1998). The term metabolic fitness was described in the proceedings of the second International Consensus Conference on Physical Activity, Fitness and Health (Bouchard, & Shephard, 1994).

The use of the term metabolic fitness in the position statement describing the quality and quantity of physical activity needed to attain health-related physical fitness (ACSM, 1998) establishes it as a major fitness component. The International Consensus statement noted that metabolic fitness included such sub-components as blood glucose levels, blood lipid levels, and blood hormone levels. The reason for the identification of metabolic fitness as a separate component of fitness is because it is now clear that lower levels of physical activity (particularly intensity) than recommended (by this position stand) may reduce the risk for certain chronic degenerative diseases and improve metabolic fitness and yet may not be of sufficient quantity or quality to improve VO2max." (ACSM, 1998).

Hypokinetic diseases are conditions related to inactivity or low levels of habitual activity. The term "hypokinetic" was coined by Kraus and Raab in their book Hypokinetic Disease (Kraus & Raab, 1961 as cited by (USDHSS, 1996). This term is now widely accepted and can be used to describe many of the diseases and conditions associated with inactivity and poor fitness commonly known as non communicable diseases, (USDHSS, 1996) and when these arise they will always affect our health.

Exercise is a leisure time physical activity conducted with the intention of developing physical fitness (Bouchard & Shephard, 1994). Since the first international consensus statement on physical activity, fitness and health, the distinction has been made between physical activity and exercise noting that exercise is a specific form of physical activity dedicated to improving physical fitness. Physical training is another term that is used as a synonym for exercise, (Bouchard & Shephard, 1994).

Health is a state of being associated with freedom from disease and illness that also includes a positive component (wellness) that is associated with a quality of life and positive well-being (Bouchard & Shephard, 1994). More than 50 years ago the World Health Organization defined health as more than freedom from illness, disease, and debilitating conditions. Recent public health documents have acknowledged the positive component of health (USDHHS, 2000).

Wellness is a state of being of positive health in the individual and comprising biological and psychological well-being as exemplified by quality of life and a sense of well-being (USDHHS, 2000). The suggestion by the World Health Organization that health had a positive component led to the use of the term wellness. The term wellness is now widely used to describe the state of being representing the positive component of health (USDHHS, 2000). The health goals for the nation for the year 2010 uses quality of life measures such as self-rated health, a healthy day's index, and activity day's indicators of health and wellness (USDHHS, 2000). Other wellness or quality of life indicators include vitality, hardiness, and vigour.

Quality of life is a term that connotes an overall sense of well being. (USDHHS, 2000). Kaplan and Bush (1982) introduced the term health-related quality of life (HRQL). However, for public health use, two types of global quality of life are identified. These include;- health-related quality of life and quality of life (not health related). Health related quality of life is limited to those aspects that can clearly be shown to affect mental or physical health. Examples include functional status and well-being. Non-health related quality of life includes such factors as happiness and life satisfaction. Individual quality of life is identified as related to specific people or individuals. Community quality of life relates to groups of people or communities and these factors are mainly determined by life style and behaviours (USDHHS, 2000)

2.5 Related studies

The research about physical activity patterns is not new. Earlier studies by Harrison, Lee; Brennan, Mark, ACSM, (2000) obtained baseline data on the physical activity levels, preferences and intensity of Armed Forces members, their spouses and their families. It also collected a variety of data related to satisfaction with fitness facilities and programs. Among the areas of interest explored were specific activities and location of where these were performed, intensity and frequency of exercise, and identification of favourite and least favourite programs/facilities. All military members were compared on the basis of duty location, gender, rank, and service. Military spouses were compared by service and gender. Finally, military children were compared by gender, service, and academic grade (Harrison, Lee; Brennan, Mark, ACSM, 2000). Similarly this study compared soldiers according to their duration of service in the army. However, spouses were not considered since there are no physical activity programs focusing them.

The purpose of this study was to estimate the prevalence of walking for physical activity and the proportion of walkers who met current public health physical activity recommendations. Physical activity measures included the type, frequency, and duration of the two LTPAs in which subjects engaged most often during the previous month. The study calculated the prevalence of walking and the prevalence of three physical activity

patterns defined by combinations of walking duration and frequency. It also examined the effect on these patterns of participating in a second LTPA. Less than 40% of walkers complied through walking with even our most liberal physical activity pattern (> or =150 minute per week (regardless of frequency). For walkers to meet current public health recommendations, many need to walk more frequently and/or to engage in additional physical activities. This study looked at the patterns of walking as a physical activity and components of physical activity (Reeves, McGee , & Pivarnik, 2002). Similarly in this study physical activities done in the past were looked at but in this study the activities looked at are those done in the past week.

In another study, the Army Physical Fitness Test (APFT) as a measure of aerobic capacity and muscular strength/endurance, the APFT consisted of a two-mile run, push-ups, and sit-ups. The two-mile run was used as a measure of aerobic fitness because this test is highly correlated with maximal oxygen uptake (VO2max). Muscular strength and absolute muscular endurance are highly correlated, justifying the use of a single measurement for both. This study showed that push-ups and sit-ups have moderate to high factor loadings on various muscular strength/endurance factors. However, there are methodological problems in relating these studies to the APFT (Mil Med 2006). In this study the above three methods were used in addition to other two that have a bearing on ones fitness that is:- body composition and flexibility.

2.6 Summary

This chapter has reviewed a wide range of the current literature on the subject of army fitness in general, historical background of fitness and particularly in the army. The literature indicated that many researchers have shown that physical activity patterns contribute to physical fitness. Furthermore literature showed that armies in developed countries conduct regular physical fitness testing using various batteries. There was no literature found showing physical fitness tests in the UPDF.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This section presents the methods used in study. It presents the research design, study area, research variables, target population, sampling procedure, data collection instruments, data collection, tools for data collection, data analysis and presentation, validity and reliability of the instruments and ethical consideration of the study.

3.2 Research Design

The study employed a cross-sectional survey to estimate PA patterns. Cross – sectional surveys are studies aimed at determining the frequency (or level) of a particular attribute,, in a defined population at a particular point in time (Dooley 1995 as cited by Odiya 2009). In the study, subjects were contacted at a fixed point in time to obtain relevant information about engaging in PA. The study went further to collect information on both the attribute of interest and potential risk factors, other than collecting data on physical activity patterns.

A pre- experimental research design was also used. In this a single group is studied at a single point in time for collection of quantitative data (Odiya, 2009). This design was selected because the study aimed at establishing the status without manipulating.

3.3 Study Area

The study was conducted in A and B Divisions of UPDF in Uganda.

3.4 Research Variables

The physical activity pattern has been identified as the independent variable. For the purpose of this research, therefore, household, occupational and leisure time activities were the three (independent) variables. Physical activity patterns influence the fitness status of A and B division soldiers. Physical fitness status has been identified as a

dependent variable with core components being:- low back and hamstring muscle flexibility, body composition, strength endurance, and aerobic endurance. Since the study variables help to analyze the causal –effect relationship between and among variables, the independent variables was defined as the physical activity patterns exhibited by the soldiers.

3.5 Target Population

The target population was both junior and senior soldiers of the UPDF in A and B Divisions. The number of soldiers in these divisions is classified information that cannot be mentioned in this study. Since by establishment the number of soldiers in division's headquarters should be equal that is why an equal number of subjects was selected from each division.

3.6.0 Sampling Procedure and sample size

A stratified random sampling was used to sample subjects from A and B divisions. Stratified random sampling was also used to select 50 junior and 50 senior soldiers in each of the two divisions. Thus 100 subjects were sampled from each division using lotting making a total of 200 subjects.

3.7.0 Data Collection Instruments

The data collection instruments that were used in the study are as follows;-

3.7.1 Questionnaire

International Physical Activity Questionnaire (IPAQ) was used to collect information on physical activity in everyday life. It was a standardized and instrument used to evaluate the trends in physical activity in everyday life, (Armstrong, Bauman and Joanne, 2000). This was used to collect data on physical activity patterns of the subjects, it helped in examining the patterns in and around the house hold, travel and work place, and leisure time physical activities.

3.7.2 Protocol Sheet

This is a guide which designated the details to be measured. This helped the researcher to record the performance in low back and hamstring muscle flexibility, percentage fat mass, recording the number of push-ups and sit ups made in one minute and the time taken to run 2 miles. These were the parameters used to measure the fitness status if the subjects.

3.7.3 Tools for Data Collection

The following tools were used:- Sit to reach box which was used to measure flexibility of the back muscles and the hamstring muscles, Timers sportline 2787 which was used to time one minute push-ups and sit-ups, and a two mile run. Tape measure used to measure the field for a two mile run and height of the subjects, Tanita biometric impedance analyzer for fat analysis imported from the USA used to measure weight and body composition.

3.8 Validity and Reliability of the Instruments

Since validity is the extent to which a test measures what it is supposed to appraise, the researcher pre-tested the physical activity questionnaires before collecting the data. A sample of five (5) subjects, who were not part of the study sample were required to fill in the questionnaires to test the validity of the questions. Using the results of this test, the questionnaire was revised and later used to collect the data from the two hundred subjects. The reliability of the collected data was tested using SPSS where it was established that the Cronbach's Alpha value was 0.741. In addition the questionnaire and the protocol sheet used were standard. The tape measure used was calibrated, the sit to reach box was also well calibrated and was imported from the US, the timers which were used sportline 2787 is internationally recognized, body composition analyser Tanota biometreic impedance also imported from the US manufactured by a reputable company Tanita Corporation of America INC. This was considered satisfactory to allow for the analysis of the data. Arising from this, the results as obtained are shown and discussed in the following sub-sections of this chapter.

3.9 Data Collection Procedure

A letter of introduction to collect data was obtained from the department of Sportscience. This helped the researcher in getting a recommendation from the commander land forces of the UPDF. The researcher went ahead to seek permission from the divisions where data was collected. After being authorized the subjects were sensitized about the tests that were to be done. Sampling was done using stratified sampling procedure to select the strata. The subjects were allotted numbers from 1-50 for each strata and the members were given the self administered questionnaire and a date was set. On the day the subjects were asked to empty their bowls, warm-up was conducted. The tests were conducted starting with low back and hamstring muscle flexibility using a sit to reach box, upper body strength and endurance using a timed one minute sit ups and push-ups and cardiovascular endurance in that order" as recommended by, FM 21-20 (1998); Brown (2005). The details of the battery that was used is detailed in Appendix III

3.10 Data Analysis and Presentation

Data was analyzed using descriptive statistics (frequencies percentages, means, mode, range and standard deviation). Analysis of variance (ANOVA) was used to compare the difference between the groups mentioned. Where significant differences were observed; a Tukey Post hoc test was performed to examine the differences. A p-value ≤ 0.05 was considered statistically significant. Analysis was performed using the Statistical Package for Social Sciences (SPSS) version 16.0. Data was presented in graphs, pie-charts and tables.

3.11 Ethical Considerations

The purpose, nature and scope of the study was explained to the participants prior to data collection and they were fully sensitized about what will be entailed. Informed consent was obtained from the participation and they were assured of confidentiality, anonymity and right to withdraw from the study should they feel like without any penalty. Confidentiality was ensured by allotting numbers. Approval to conduct the study was obtained from UPDF leadership from land forces headquarters to the division where data

was collected see Appendix V, the divisions were named A and B to ensure confidentiality.

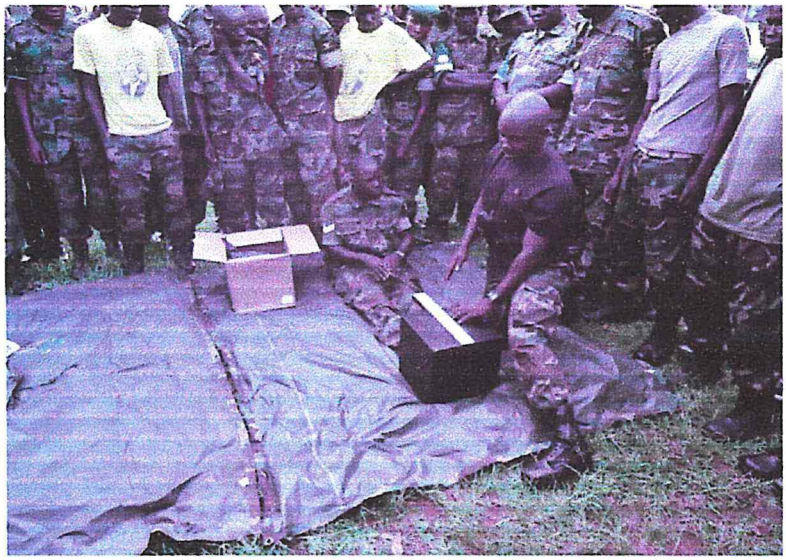


Figure 3.1: Researcher and a research assistant sensitizing subjects

3.11.1 Inclusion and Exclusion Criteria in the study

The soldiers who were in the unit for 6 months prior to the study were considered. This was so because it ensured that subjects were used to the environment. Soldiers who do general duties are below 40 years of age because, at that age (40 and above) most of the soldiers have proved management ability and are no longer active in general duties they would not clearly show a picture of the UPDF soldiers.

The Soldiers with implants, fragments or bullets in the body were excluded because, they are not allowed to use the fat analyzer; those with medical conditions that do not allow them to do physical activities were also excluded from the study.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.0 Introduction

This chapter presents the findings from the field and their discussion. This study was aimed at establishing the PA patterns and PF status of A and B division soldiers of UPDF. Across-sectional survey was used to establish the patterns and a pre-experimental design was employed to establish the fitness status. To achieve this, the following objectives were set:-

The main objective of this study was to assess PA patterns and the PF status of soldiers in A and B Divisions of UPDF.

The specific objectives were:

To establish the PA patterns of UPDF soldiers in A and B divisions,.

To establish the PF status of UPDF soldiers in A and B divisions.

To compare PF status of UPDF soldiers with other standards.

To compare the fitness status of the senior and the junior soldiers UPDF.

The study was guided by the following research questions and hypotheses: Research questions were,

What are the physical activity patterns in the UPDF soldiers in A and B divisions?

What is the physical fitness status of UPDF junior and senior soldiers in A and B divisions be?

It was hypothesized that: There would be no significant difference in physical fitness status between senior soldiers and junior soldiers of A and B Divisions of the UPDF; Furthermore, there would be no significant difference in low back and hamstring flexibility between soldiers in A and B Divisions of UPDF, There will be no significant difference in core muscle endurance between the senior and junior soldiers in A and B divisions of UPDF, There would be no significant difference in body composition of the senior and junior soldiers in A and B divisions of UPDF, and finally there would be

no significant difference in aerobic endurance of the senior and junior soldiers in A and B divisions of UPDF.

Data was analysed using descriptive statistics (frequencies percentages, means, mode, range and standard deviation). To establish the difference, analysis of variance (ANOVA) was used to compare the difference between the groups mentioned. Where significant differences are observed; a Tukey Post hoc test was performed to examine the differences. A p-value ≤ 0.05 was considered statistically significant. Analysis's was performed using the Statistical Package for Social Sciences (SPSS) version 16.0. data was presented in graphs, pi-charts and tables.

The results are presented in the form of tables, line graphs, bar charts, and pie charts. Specifically, the Chapter covers the bio-data of the subjects, and also addresses both the research questions and hypotheses.

4.1 Presentation and Discussion of the Findings

Following the data collection and analysis, the findings of this study are presented and discussed in the following subsections:

4.1.1 Bio data of Subjects

The age, weight and height of the subjects constitute the bio data. However, the results presented in this sub-section are only about the ages of the subjects while the weights, heights, and fat percentage are presented under the sub-section on body composition/percent body fat for the purpose of aiding the discussions in that sub-section.

4.1.1.1 The age distribution of the subjects

Out of the 200 subjects that participated in this study, one did not indicate his age hence the valid frequency was 199. The findings as shown in Table 4.1, indicate that out of a total 199 subjects, the minimum and maximum ages of the subjects was 20 years and 36 years respectively while the mean age was about 29 years with a standard deviation of 4

(29 ± 4). The mode age was 30 years and the range 16. This population is relatively young and still has time to save the country hence data on their physical activity patterns and fitness levels should be of great interest.

Table 4.1: Age Characteristics of Subjects

Parameter		Value
N	Valid	199
	Missing	1
Mean		28.93
Median		29.00
Std. Deviation		4.065
Minimum		20
Maximum		36

The subjects' years ranged from 20 to 36 years. With respect to the age of the subjects, it is clear that there is a wide disparity between the lowest age (20) and the maximum age (36) this is a recommendable range for the study since at that age most of the soldiers are still active in military duties. This, therefore, was expected to give an indication as to how physically fit the soldiers are. The correlation between these two variables is discussed later.

To better comprehend the age variations within the study sample, the ages of the subjects were plotted in terms of percentage distribution of the various age groups and the results were as shown in Figure 4.1:

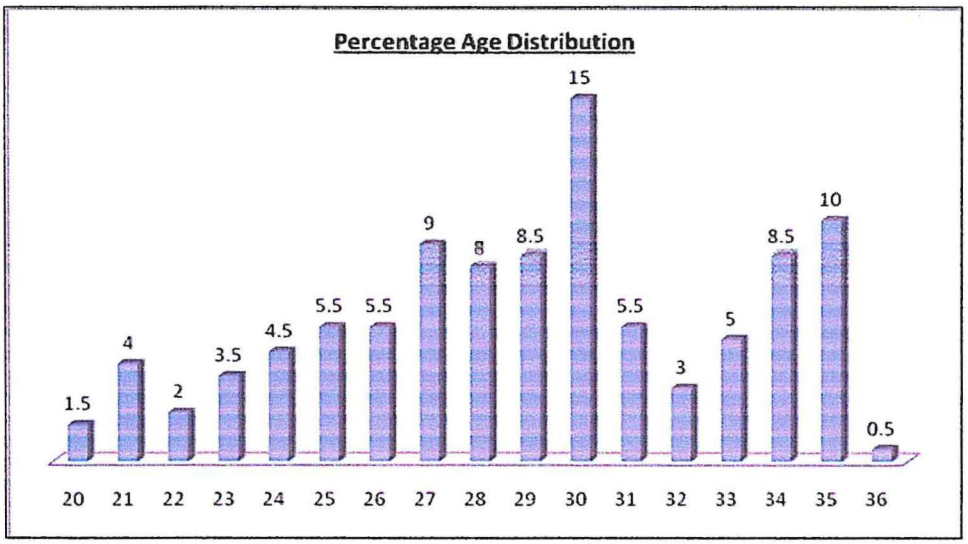


Figure 4.1: Percentage Age Distribution of Subjects

The finding of the study revealed that 15% of the 199 subjects were aged 30 years. These were followed by those aged 35 years at 10% and then those aged 27 years at 9%. There was a general increase in the percentage of subjects as the age value increased from 20 years to 30 years. This was followed by a decline from 15% at 30 years to 3% at 32 years and an increase thereafter.

4.1.1.2 Comparison of age parameters across the four strata

Table 4.2: Age Parameters Across the Study Strata

Parameter	A Division Junior	A Division Senior	B Division Junior	B Division Senior
Mean	26.3	31.57	26.56	31.36
Std. Deviation	3.688	2.908	2.991	3.186
Range	13	9	10	11
Minimum	20	26	20	25
Maximum	23	35	30	36

According to these findings, while the mean age was 26 years and standard deviations of 3.7 (26 $\pm$ 3.70) for A Division Junior that of B Division Junior the mean age was about 27 years and a standard deviation of 3, (27$\pm$ 3.0). Both the ages were lower than in the correspondning senior categories in that, the mean age for the A Division Senior mean age was about 32 year and a standard deviation of 2.9 (32$\pm$ 2.9) and for the B Division Senior the mean age was about 31 years and a standard deviation of 3 (31$\pm$ 3.0). This brings a mean age difference of about five years in both the Divisions.

According to these results, while the standard deviation values were comparable for all the four strata, the mean ages of the junior categories were lower. This indicates that the seniority in the army is correlated to the age of the soldiers. This is true because there is an age limit for joining which 18-25 years according to the recent recruitment. As such, the more senior a soldier is, the higher is his age. This is further supported by the fact that both the minimum and the maximum ages of the junior categories are lower than those of the senior categories. This is most likely to affect the fitness of the senior categories since the older you grow the more un fit you become.

4.1.1.3 The height distributions of the subjects

As far as the heights of the subjects were concerned, the findings out of the 200 subjects were as shown in Table 4.3 were obtained: the findings revealed that the mean height was1.7m with a standard deviation of 0.1 (1.7$\pm$ 0.1). Considering that the mean, the median and the mode were almost the same implies that the height distribution of the subjects exhibited a nearly perfect normal distribution pattern.

Table 4.3: Height Distribution of Subjects

		Height Of Respondent in metres
N	Valid	200
	Missing	0
Mean		1.6908
Median		1.6900
Mode		1.70
Std. Deviation		.06058
Variance		.004
Range		.37
Minimum		1.51
Maximum		1.88

From Table 4.3, it can truly be argued that the minimum height of the subjects was 1.51m while the maximum was 1.88m giving a range of 0.37m. Using a histogram to display the results, the findings reveal that height of subjects indicated a normal distribution curve just as it was pointed out above. This is shown in Figure 4.2.

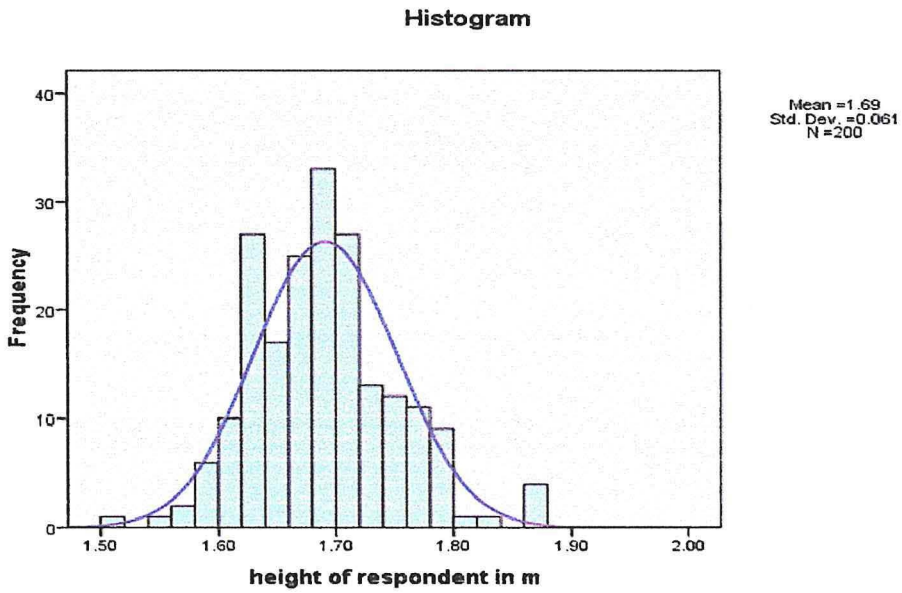


Figure 4.2 Normal Distribution Display of the Height Values of subjects

According to the Figure 4.2, the tallest subject was 1.88m and the shortest being 1.51m tall. Considering that 200 subjects participated in this study and that two divisions were involved in the study, these findings imply that it is not only the tall and big men only allowed in the army all heights can ably serve the UPDF. This is supported by the fact that the height distribution exhibits a normal distribution of what may be expected in a standard population. Contrary to what used to happen in the army, strength in the past armies was looked at in terms of size and stature that is why there existed one of those ludicrous requirements which was often found in military regulations stipulating a minimum height of 5 feet 8 (1.77m) inches for KAR personnel Martin & Michel (1972). more people from Northern Uganda would qualify for recruitment than other Ugandans because, most of them could meet the height requirement. Today however fitness is looked at in its entirety, if that regulation was to exist many of the subjects would not have qualified.

4.1.1.4 Comparisons of the height distributions across strata

As per the objectives of this study, it was relevant that the results obtained be used to compare the status of the A and B divisions at both the junior and senior levels. The findings are as shown in Tables 4.4 and 4.5

Table 4.4: Comparisons of Heights between A and B Division

Parameter (height in m)		A Division	B Division
N	Valid	100	100
	Missing	0	0
Mean		1.6906	1.6909
Median		1.6950	1.6900
Std. Deviation		.06130	.06017
Minimum		1.51	1.57
Maximum		1.87	1.88

According to the results above, the mean heights of the two divisions was comparable at about 1.69±0.06m. At the same time, the median and maximum height values for the two divisions were close (1.70 compared to 1.69m for the median and 1.87m compared to 1.88m for the height). These results point out that there was no significant variation between the height characteristics of the two divisions.

Table 4.5: Comparisons of Heights Across Divisions

Parameter	Stratum	Height of Respondent in m
Mean	AJ	1.6772
	AS	1.7038
	BJ	1.6954
	BS	1.6864
Std. Deviation	AJ	.0658
	AS	.0536
	BJ	.0652
	BS	.0550
Range	AJ	.32
	AS	.29
	BJ	.31
	BS	.21
Minimum	AJ	1.51
	AS	1.58
	BJ	1.57
	BS	1.58
Maximum	AJ	1.83
	AS	1.87
	BJ	1.88
	BS	1.79

According to the findings in Table 4.5, the mean height values did not vary much within and across the divisions. These measured about 1.7±0.07; 1.7±0.05; 1.7±0.07; and

1.7±0.06 for the strata A Division Junior; A Division Senior; B Division Junior and B Division Senior respectively. In terms of the range, the value of all the junior categories were higher compared to the senior categories, that is, .32 and .31 compared to .29 and .21. This implied that there were greater variations in the height the junior subjects. All this is reflected in the minimum and maximum height values.

4.1.5 The weight distributions of the subjects

As for the weights of the subjects, the findings for the 200 subjects were as shown in Table 4.6:

The mean weight was 64± 9kg with mode being 59kg.

The mean weight was 64 kg with standard deviation of 9 (64±9)

Table 4.6: Weight Distribution of Subjects

		Weight of Respondent (kg)
N	Valid	200
	Missing	0
Mean		64.4890
Mode		59.00
Std. Deviation		9.04326
Range		49.10
Minimum		46.60
Maximum		95.70

As shown in the table the maximum weight was 95.7kg and the minimum 46.6kg giving a range of 49.10. This gap can be considered to be rather large and hence point out at a big variation in weight. Considering that weight is vital in determining the physical fitness of a soldier, the heavier subjects may be required to cut down their weight.

When a histogram was developed for the weights of the subjects, it was established that the distribution if the weights exhibited a normal distribution curve scenario as shown in

Figure 4.3. These results pointed out at a distribution that is close to what is expected in a standard population despite a few subjects presenting above normal results.

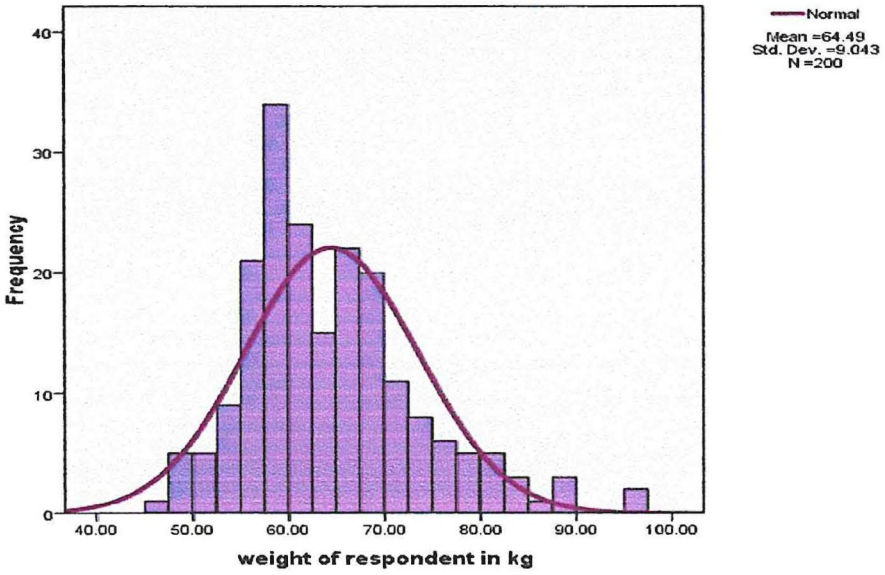


Figure 4.3: Normal Distribution Display of the Weight Values of Subjects

4.1.6 Comparisons of the weight distributions across strata

In line with the study objectives, it was important to compare the weight findings of the A and B divisions at both the junior and senior levels. The findings are as shown in Table 4.7

Table 4.7: Comparisons of weights across Divisions

Parameter	Stratum	Weight of Respondent in Kg
Mean	AJ	62.54
	AS	65.91
	BJ	64.72
	BS	64.79
Std. Deviation	AJ	10.42
	AS	9.48
	BJ	8.94
	BS	6.91
Range	AJ	47.3
	AS	36.8
	BJ	48.9
	BS	31.3
Minimum	AJ	48.4
	AS	48.1
	BJ	46.6
	BS	55.4
Maximum	AJ	95.7
	AS	84.9
	BJ	95.5
	BS	86.7

According to the findings, the mean weight values revealed some variations in which the figures for A Division Junior; A Division Senior; B Division Junior and B Division Senior were about 63±10, 66±9, 65±9 and 65±7.0 respectively. There were also some marked differences as far as the ranges were concerned. While the ranges for junior

categories were 47.3 and 48.9 respectively, those for the senior categories were lower at 36.8 and 31.3 in that order. This implied that there were greater variations in weight of the junior subjects than in that of the senior. Indeed, looking at the minimum and maximum values for the different categories, the differences are evident.

4.2 Physical Activity Patterns of UPDF Soldiers in A and B Divisions

To determine the physical activity patterns of the Soldiers, the subjects were required to recall the activities done in the last seven days.

The questionnaire was in four areas namely; the physical activities done in and around their homes, the activities related to their travel to work and while at work, activities relating to their recreation engagements during their leisure time, during the said seven days and suggestions on how the physical activity participation may be improved. This was in line with what Amstrong et al, (2000) stated that, recent developments in the epidemiology of physical activity suggest that components of everyday activity, such as transport-related activity, occupational physical activity, leisure time activity, house hold activity and incidental or unplanned activity, might be considered in broader approaches to measurement of physical activity patterns (Amstrong et al, 2000). The results so obtained are presented in the following sub-sections:

4.2.1 Physical activity patterns in and around the homes

The results below are about vigorous and moderate physical activities done by the subjects around the homes.

4.2.1.1 Household vigorous physical activity in days per week

According to the findings as shown in Figure 4.4, 32% of the subjects reported being involved in vigorous activities lasting at least 10 minutes in their gardens or compounds, followed by 28% who did so in 3 days and 18% in 1 day. Lastly, 12% recorded vigorous activities for 4 days and another 12% did not undertake any vigorous activity.

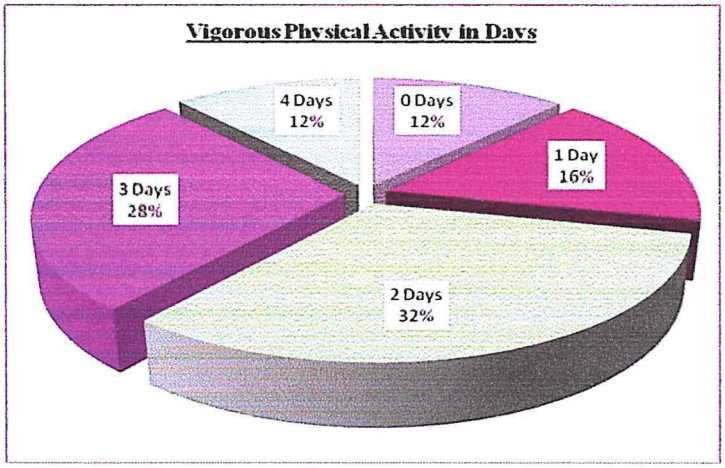


Figure 4.4: Patterns of Vigorous Physical Activity

According to the above results, most of the subjects undertook vigorous activities for one to three days. This accounted for 76% of the total subjects. A significant percentage (12%) did not do any vigorous activity at all in seven days. Considering that the FM 20-21, (1998) recommends at least three days of activity, then, only 40% (those with three and four days of vigorous activity) of the subjects conform to this standard. It is thus a concern that a sizeable percentage (60%) did not meet the standard and further still, 12% did not do any activity at all yet the nature of their job requires that they be physically fit at all times. This is contrary to the recommended schedule to perform cardiovascular training on Mondays, upper body strengthening on Tuesdays, flexibility training on Wednesdays, lower body strengthening on Thursdays, cardiovascular training on Fridays, trainee select "targeted" training on Saturdays, and mind and body training on Sundays. Saunders 2009 provides several recommended primary and secondary exercises for the Monday through Friday PT regimen. FM 21-20 (1998), Saunders (2009) this means a soldier should do physical activity five times a week.

4.2.1.2 Comparisons of the Vigorous Physical activity in days

By categorizing the findings under the junior and senior soldiers in the A and B divisions, the findings were as follows:

Table 4.8: Days for engagement in Physical Activity among division 4 and 5

Totals	Days	Stratum	Frequency	Percentage
	0	AJ	9	37.50
		AS	1	4.17
		BJ	7	29.17
		BS	7	29.17
Sub-total			24	100.00
	1	AJ	6	18.18
		AS	3	9.09
		BJ	9	27.27
		BS	15	45.45
Sub-total			33	100.00
	2	AJ	11	16.92
		AS	21	32.31
		BJ	16	24.62
		BS	17	26.15
Sub-total			65	100.00
	3	AJ	14	25.45
		AS	20	36.36
		BJ	15	27.27
		BS	6	10.91
Sub-total			55	100.00
	4	AJ	10	43.48
		AS	5	21.74
		BJ	3	13.04
		BS	5	21.74
Sub-total			23	100.00
Grand Total			200	100.00

According to Table 4.8, 65% of the subjects undertook vigorous physical activities for two days followed by 55% who did so in three days. In A Division Senior soldiers were the most active at 32.31% and 36.36% respectively. Majority of those who did not do any vigorous activity at all were A Division Junior at 37.5% while the least were A Division Senior at 4.17%, which corresponded to only one respondent. At one (1) day vigorous activity, it was the B Division Senior who topped the list at 45.45% followed by B

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Totals	Days	Stratum	Frequency	Percentage
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		AS	1	4.17
		BJ	7	29.17
		BS	7	29.17
Sub-total			24	100.00
	1	AJ	6	18.18
		AS	3	9.09
		BJ	9	27.27
		BS	15	45.45
Sub-total			33	100.00
	2	AJ	11	16.92
		AS	21	32.31
		BJ	16	24.62
		BS	17	26.15
Sub-total			65	100.00
	3	AJ	14	25.45
		AS	20	36.36
		BJ	15	27.27
		BS	6	10.91
Sub-total			55	100.00
	4	AJ	10	43.48
		AS	5	21.74
		BJ	3	13.04
		BS	5	21.74
Sub-total			23	100.00
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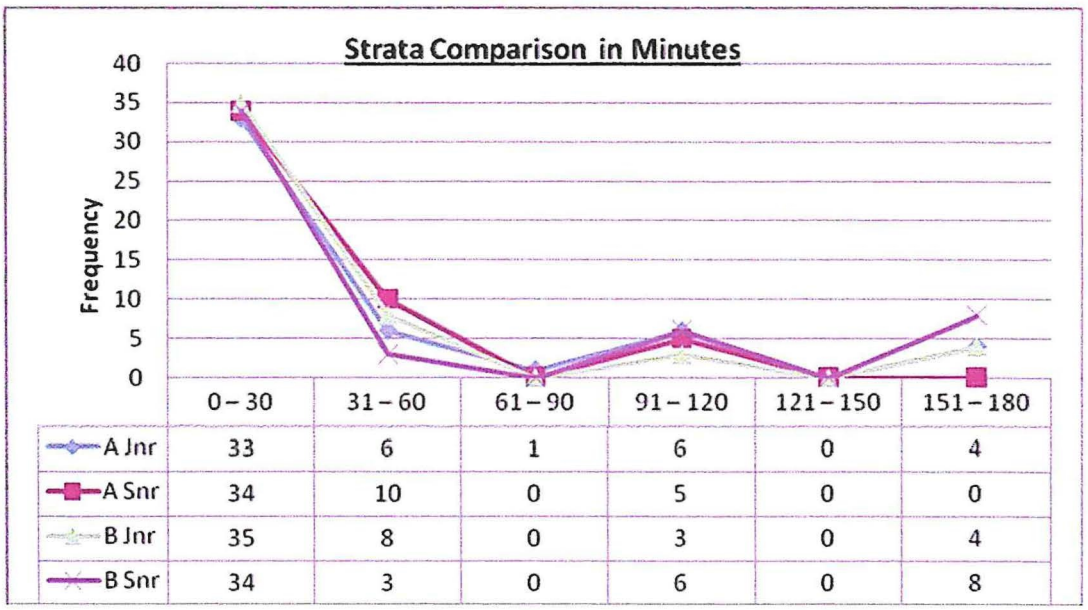
Division Junior at 27.27%. At 4 days vigorous activity, the A Division Junior came top with 43.38% while the last were the B Division Junior at 13.04%.

Considering that it is only those subjects who undertook vigorous activities for three and four days who met the set standards, and looking at Table 4.8, more of subjects of the A Division were considered to have conformed to the standard compared to the B Division.

4.2.1.3 Duration of Vigorous Physical activity

Duration is defined as the length of time spent participating in physical activity within a specified period. This item is generally reported in minutes and may be summed to provide an indication of total time participating in physical activity over a period. More recent surveys focus on a shorter time period, with one or two weeks often used (Baker and Shane, 2003). In this study, one week was used because it is considered to be less prone to recall bias and hence to provide better population estimates of activity patterns. The finding of the vigorous physical activities in minutes within the subjects' homes shows that the patterns were basically similar across the different the divisions and even within the divisions as shown in Figure 4.5 and most subjects did not meet the requirement of the FM 21-20, (1998) which states that for a soldier at least 5 times a week.



	0 – 30	31 – 60	61 – 90	91 – 120	121 – 150	151 – 180
A Jnr	33	6	1	6	0	4
A Snr	34	10	0	5	0	0
B Jnr	35	8	0	3	0	4
B Snr	34	3	0	6	0	8

Figure 4.5: Duration of Vigorous Activities in minutes

According to the results above, the patterns of the days of vigorous activities undertaken is very similar. This is to say that as much as microanalysis points out at some differences, the general trend is the same for all the strata. This is evidenced by the frequency at 0-30 minutes varying only from 33 to 35 while the frequencies at 61-90 minutes and 121-150 were the same at about zero. These results seem to indicate that there is a "culture" relating to the involvement in vigorous activities in which majority subjects use not more than one hour to do such activities. Out of the 200 subjects 136 were participating in activities for less than 30 minutes. From previous result it clearly shows that most of the subjects do physical activities for less than 3 days. This means the cannot meet the recommendation in the US National activity guideline which state that; the accrual of 150 minutes of moderate-intensity (at least) physical activity over a period of one week is believed to confer health benefit and reflects the current National Physical Activity Guidelines message (DHAC 1999).

4.2.1.2 Moderate Physical activity in garden or compound in minutes per day

The findings of the four different strata were compared as shown in Figure 4.6.

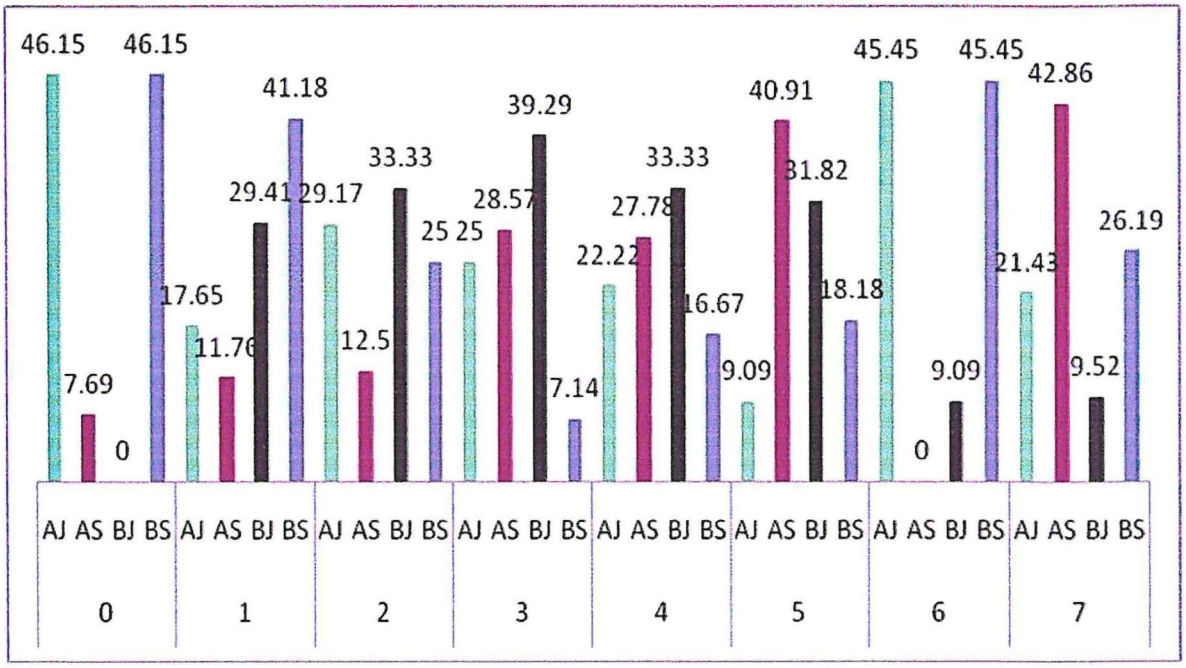


Figure 4.6: Days engaged in Moderate Physical Activity across Strata

According to the results, there were varied results as depicted by the percentages (displayed on the y axis) of the subjects who undertook moderate physical activities. For instance, among those who did not do any activity at all (zero days), the A Division Junior and B Division Senior each accounted for 46.15% while the B Division Junior accounted for none (0%). Similarly, A Division Junior and B Division Senior each scored 45.45% at six (6) days. Also, the trend of A Division Senior (red bars) seemed to have increased from 7.68 at 0 days to 42.86% at 7 days. On the other hand, the B division Junior percentage increased up to a maximum of 39.29% at 3 days and then decreased to 9.52% at 7 days.

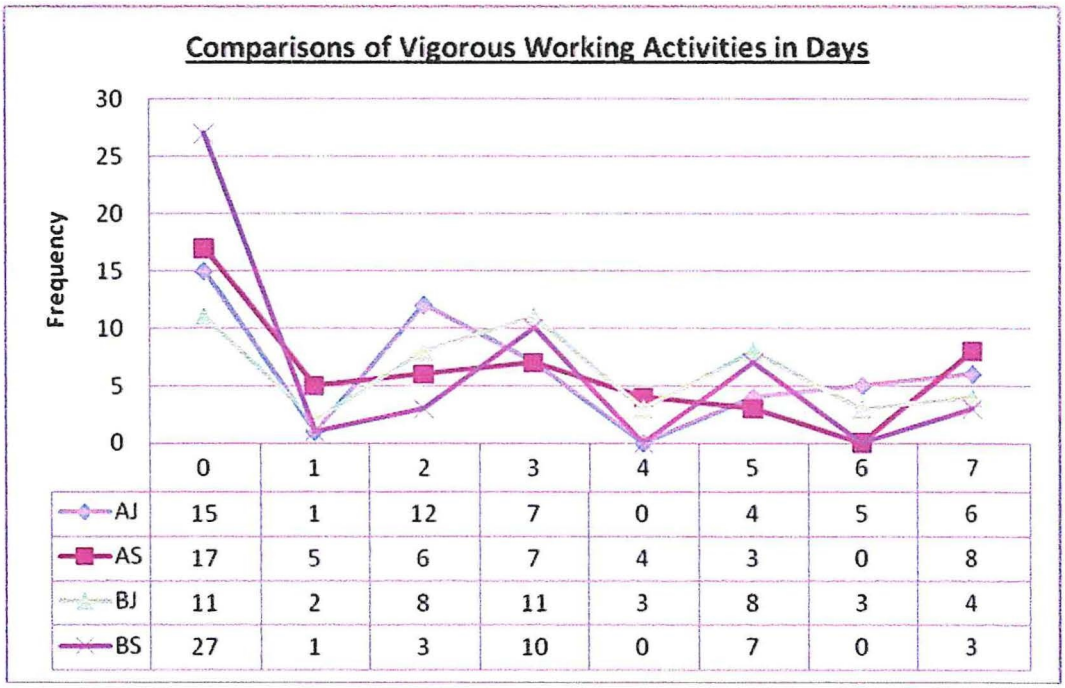
Going by these results, it is evident that there are varied patterns for the moderate physical activities not as it was in vigorous activities seen in Figure 4.5. It is difficult to interpret these results because one may have expected a trend that closely resembled that of vigorous activities. However, some patterns as indicated above are evident at the strata level.

4.2.2 Physical activity patterns due to travel to and at work

As far as the physical activities are concerned while travelling to and during work, the findings across the strata are as shown in Figure 4.7 and Figure 4.8 as presented in the following two subsections.

4.2.2.1 Vigorous Physical activity patterns at work

According to the results, in all categories, those subjects who reported not to have undertaken any vigorous activity were the more than those who did so for each of the various days ranging from one to seven days. The other outstanding frequencies were 12 subjects (24%) of A Division Junior at 2 days and B Division Junior and B Division Senior at 11 and 10 subjects respectively. Looking at the Figure 4.7, days one (1), four (4) and six (6) recorded the lowest frequencies compared to the other days giving a general zigzag pattern for all strata except the A Division Senior.

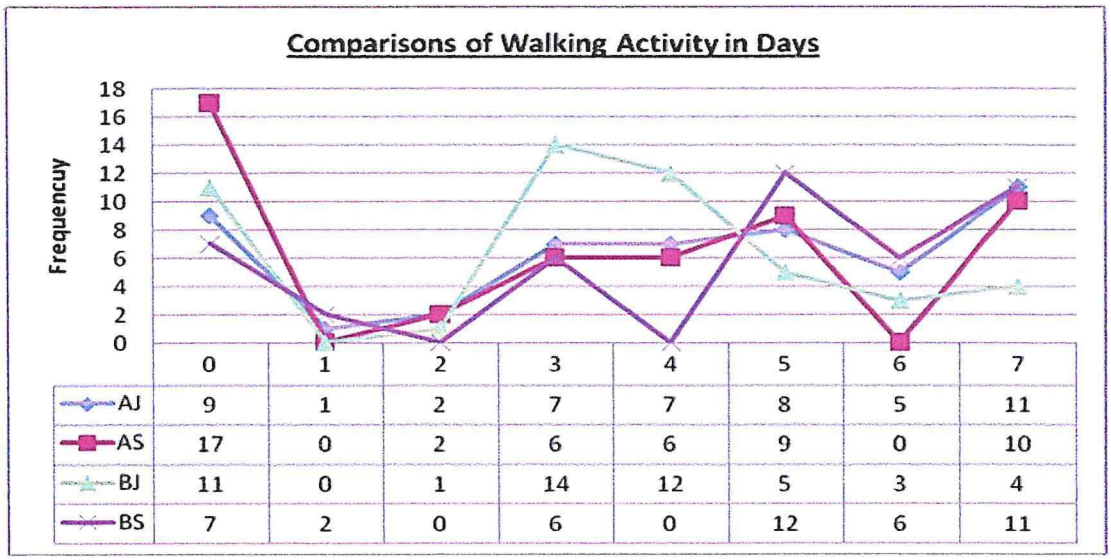


	0	1	2	3	4	5	6	7
AJ	15	1	12	7	0	4	5	6
AS	17	5	6	7	4	3	0	8
BJ	11	2	8	11	3	8	3	4
BS	27	1	3	10	0	7	0	3

Figure 4.7: Comparisons of Vigorous Working Activities in Days

According to the finding all the divisions about 70 subjects did not do any vigorous physical activity at all during that week and 93 subjects did vigorous activity as required by FM 21-20 (1998). This is a concern in that the frequency of 70 actually corresponds to about 35% and that it is the highest compared with any other days.

4.3.2.2 Vigorous physical activity patterns while walking to work



	0	1	2	3	4	5	6	7
AJ	9	1	2	7	7	8	5	11
AS	17	0	2	6	6	9	0	10
BJ	11	0	1	14	12	5	3	4
BS	7	2	0	6	0	12	6	11

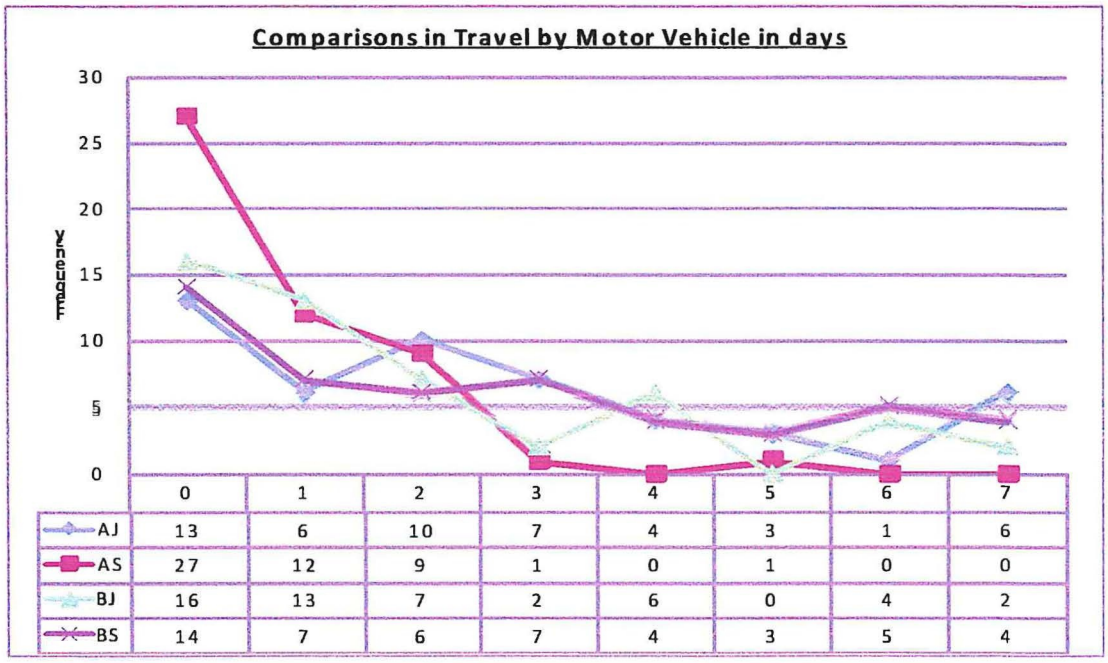
Figure 4.8: Comparisons of Vigorous walking Activities in Days

Subjects were also required to indicate the number of days in which they undertook vigorous walking activities in the last seven days prior to this study. The findings are as shown in Figure 4.8. The A Division senior recorded the highest number of subjects who did not undertake any vigorous activity (0 days). The B Division Junior led at three and four days. The B Division senior recorded rather low frequencies all through except for the five and seven days when the frequencies were 12 and 11 subjects respectively.

Whereas in all cases the frequencies were relatively higher for zero days, the patterns for the other days varied with a few indications of low frequencies on one and two days and similarly six days. Since these findings cannot be generalized under the junior and senior

categories, it means that the category to which a respondent belonged to did not matter on physically active one would be.

4.2.2.3 Comparison of travel by motor vehicle to work



	0	1	2	3	4	5	6	7
AJ	13	6	10	7	4	3	1	6
AS	27	12	9	1	0	1	0	0
BJ	16	13	7	2	6	0	4	2
BS	14	7	6	7	4	3	5	4

Figure 4.9: Comparisons of number of Days Travelled using Motor Vehicle

The findings on frequency of travelling to work using motor vehicles, as shown in Figure 4.9 indicated that all categories recorded highest frequencies at zero and one day. Indeed all graphs showed a gradual drop from zero days to seven days. This implied that majority of the subjects did not use vehicles to go to work. This can partly be explained by the fact that this is not necessary since the subjects reside within the barracks and that their duties and assignments are also carried out within the barracks.

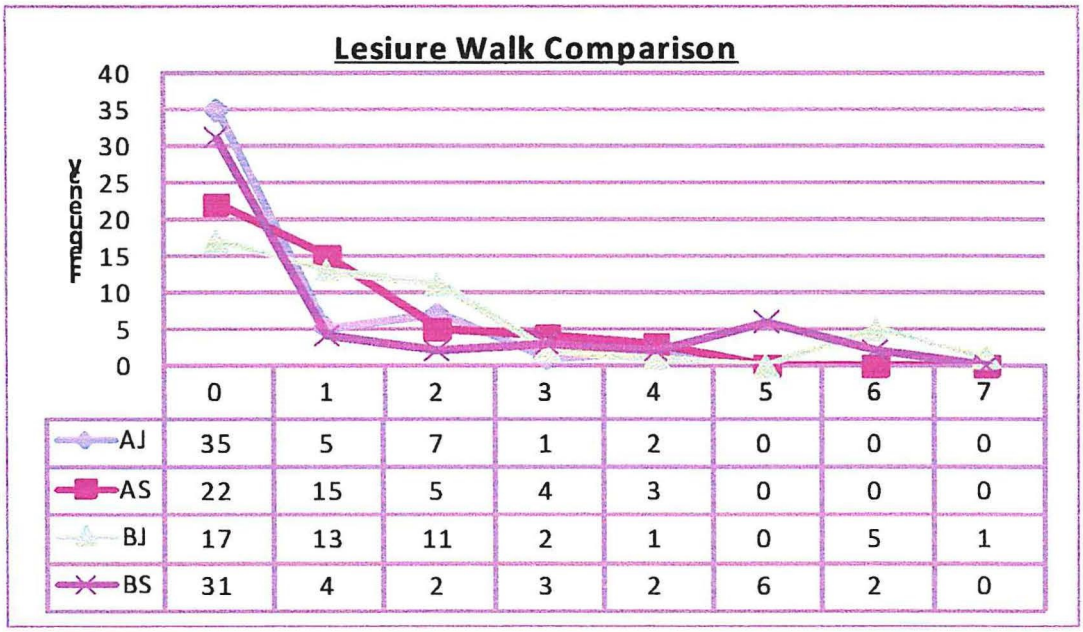
4.2.3 Physical Activity Patterns due to Recreation

The findings in this sub-section are about the physical activities undertaken by the subjects in the last seven days prior to this study purely for recreation, sport, exercise or

leisure. The subjects were required not to include any of the responses already made under the previous sub-headings.

4.2.3.1 Days of leisure walk by subjects

Under this sub-section, subjects were required to point out the number of days they were involved in leisure walk for at least 10 minutes. The findings are as shown in Figure 4.10.



	0	1	2	3	4	5	6	7
AJ	35	5	7	1	2	0	0	0
AS	22	15	5	4	3	0	0	0
BJ	17	13	11	2	1	0	5	1
BS	31	4	2	3	2	6	2	0

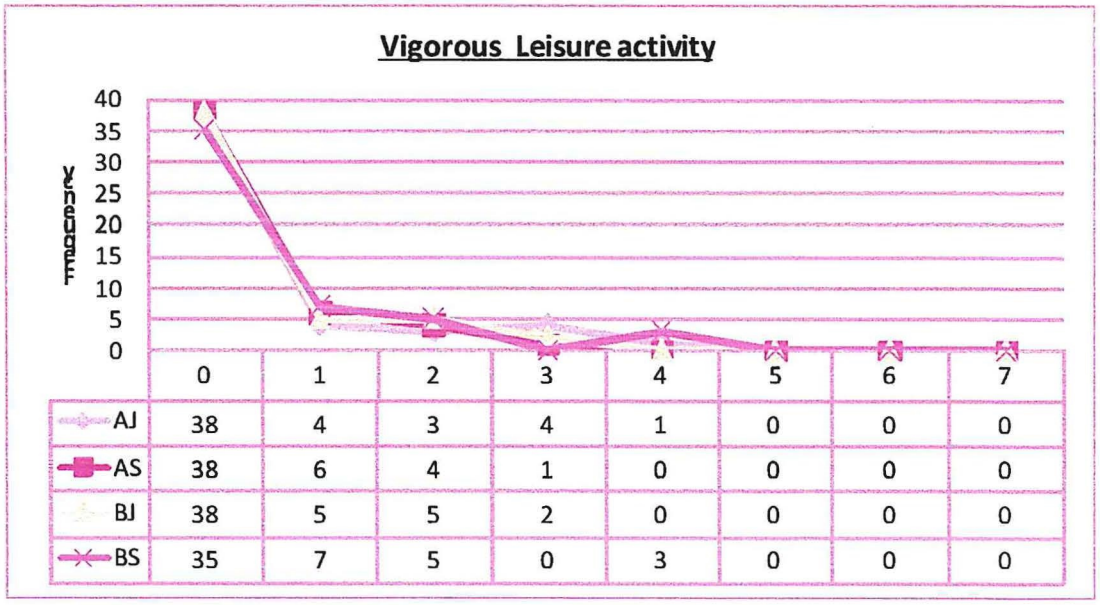
Figure 4.10: Comparisons of number of Days in Leisure Walk

According to the findings, most of the subjects under each category did not undertake any leisure walk. The A Division Junior and B Division Senior had 35 and 31 respectively, out of 50 subjects in each category who reported no leisure walk (0 frequencies). The A Division senior and B Division junior similarly recorded their highest frequencies under the zero days leisure walk. These results point out to the fact that leisure walk is not preferred by the respondents and that most of the walking they do is for a purpose other than leisure. Saunders, (2009) stated that the definition of 'sufficient' does not include gardening or heavy yard work (although these activities can be rated be of vigorous

intensity) because there is limited research regarding the actual energy expenditure of these activities, Saunders, (2009). That means the activities done by the respondents may not be sufficient. Therefore leisure time activities would confer more physical fitness benefits since their contribution can be measured.

4.2.3.2 Vigorous leisure physical activities

The respondent were required to state the number of days in the last 7 days when they got involved in vigorous physical activities like aerobics, running, fast bicycling, or fast swimming during their leisure time. According to the findings as shown in Figure 4.11, most subjects were not did not undertake vigorous leisure activities. In all categories, at least 35 subjects out of 50 in each category (which translate to at least 70%) recorded no activities. Whereas a few reported some activity in just a few days in the week, none did leisure activities for five, six, or seven days.



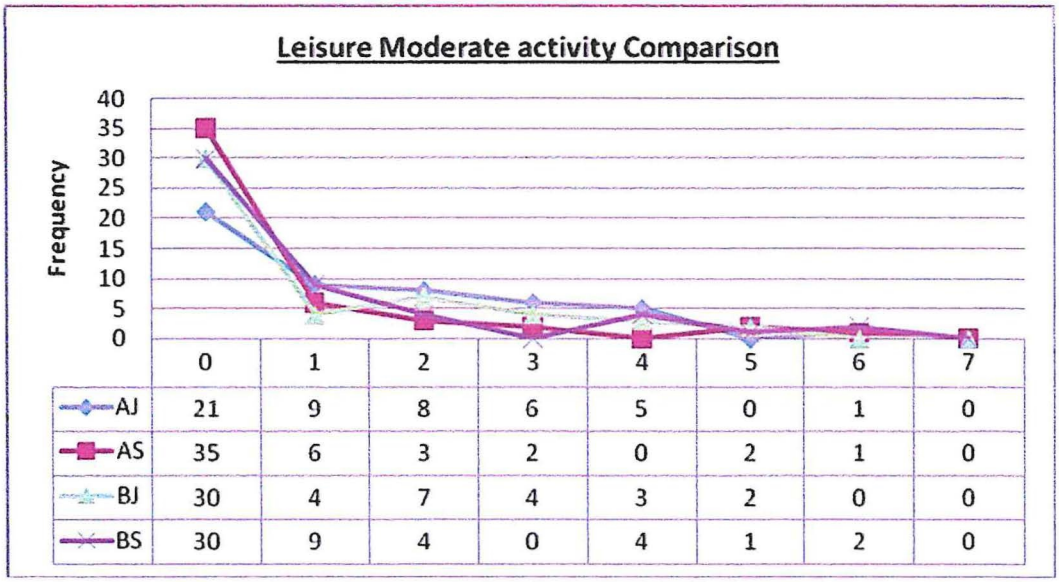
	0	1	2	3	4	5	6	7
AJ	38	4	3	4	1	0	0	0
AS	38	6	4	1	0	0	0	0
BJ	38	5	5	2	0	0	0	0
BS	35	7	5	0	3	0	0	0

Figure 4.11: Comparisons of number of Days in Vigorous Leisure Activities

4.2.3.3 Comparisons of moderate leisure activities

This subsection was about the number of days during which the subjects undertook moderate physical activities like bicycle riding at a regular pace, swimming at a regular

pace, and matching for at least 10 minutes during their leisure time. According to the results as shown in Figure 4.12, most of the subjects did not undertake any moderate leisure activity in the seven days prior to this study. While none of the subjects reported to have also done any moderate activity for seven (7) days, very few got involved for anyway from one day to six days this does not meet the requirement of FM 21-20 (1998).



	0	1	2	3	4	5	6	7
AJ	21	9	8	6	5	0	1	0
AS	35	6	3	2	0	2	1	0
BJ	30	4	7	4	3	2	0	0
BS	30	9	4	0	4	1	2	0

Figure 4.12: Comparisons of number of Days of Moderate Activity

4.2.4 Suggestions of Increasing Physical Activity Participation

Subjects were asked to give suggestions on how the physical activity participation can be increased. The following were the responses:

Table 4.9: Suggestions for Improving Physical Activity Participation

S. No	Suggestion	Frequency	Percentage
1	Encourage all soldiers to attend daily morning running as part of physical fitness	40	20
2	Provide necessary materials for use during the exercises e.g. uniform and sports shoes	33	16.5
3	Provide first-aid kits and other medical facilities in case of injuries during training	25	12.5
4	Participating in both morning and evening running	19	9.5
5	Introduce more physical activities/exercises for soldiers	17	8.5
6	Include physical exercise as part of routine work for soldiers	14	7
7	Allocate enough time for exercises	11	5.5
8	Motivate soldiers to do regular exercises	11	5.5
9	Sensitize/educate soldiers about physical fitness	9	4.5
10	Improve on the feeding/nutrition of the soldiers	8	4
11	Provide good place/space for exercising	6	3
12	Avoiding alcohol drinking and smoking	6	3
13	Invalid	1	0.5
	Total	200	100

The subjects suggested ways in which Physical Activity Participation can be improved. The highest percentage of the subjects was 20% (40) indicated that encouraging all soldiers to attend daily morning running as part of physical fitness, 16.5% indicated that necessary materials should be provided for use during the exercises for example uniform and sports shoes; 12.5% indicated that first-aid kits and other medical facilities should be

provided in case of injuries during training; 9.5% indicated that soldiers should participate in both morning and evening running; 8.5% indicated that more physical activities/exercises for soldiers should be introduced. At the same time, 7% indicated that physical exercise be Included as part of routine work for soldiers, enough time for exercises be allocated and soldiers should be motivated to do regular exercises. The other suggestions came from fewer subjects and as such may be considered not to be very significant. It may be expected that if all the above suggestions are put in consideration, there will be a great improvement in the soldiers' physical activity patterns and consequently physical fitness.

4.3. Low back and hamstring flexibility

The low back and hamstring muscle flexibility of the subjects was determined using the sit-and-stretch test and the findings are as outlined in Table 4.10.

4.3.1 Sit-and-Stretch Test Results

Carrying out a sit-and-reach test was aimed at establishing the flexibility of the back and the hamstring muscles in inches. It was established that the mean value varies across the different trials with the "best attempt" mean being about 6.0±2 inches. The range was 14 for all categories while the minimum value for the best attempt was -3.00 inches, the corresponding maximum value was 11.0 inches.

Table 4.10 Sit-and-Reach Test Results

		Trial One	Trial Two	Final Trial	Best Attempt
N	Valid	199	199	199	199
	Missing	1	1	1	1
Mean		5.1151	5.7161	6.0598	6.0960
Mode		6.00	7.00	6.00	6.00
Std. Deviation		2.33463	2.32123	2.29897	2.28004
Range		14.00	14.00	14.00	14.00
Minimum		-4.00	-4.00	-3.00	-3.00
Maximum		10.00	10.00	11.00	11.00

According to these results, there was not big difference between the different trials and as such, the best trial values were close to the best attempt. They, however, point out that to get the most appropriate and accurate results, one must carry out this test more than once. The test was done three times and the best trial was picked and the results are shown

4.3.2 Performance of low back and hamstring flexibility

To appreciate the generation of the results in this test, the patterns arising from the different trials have been are as shown in Figure 4.15:

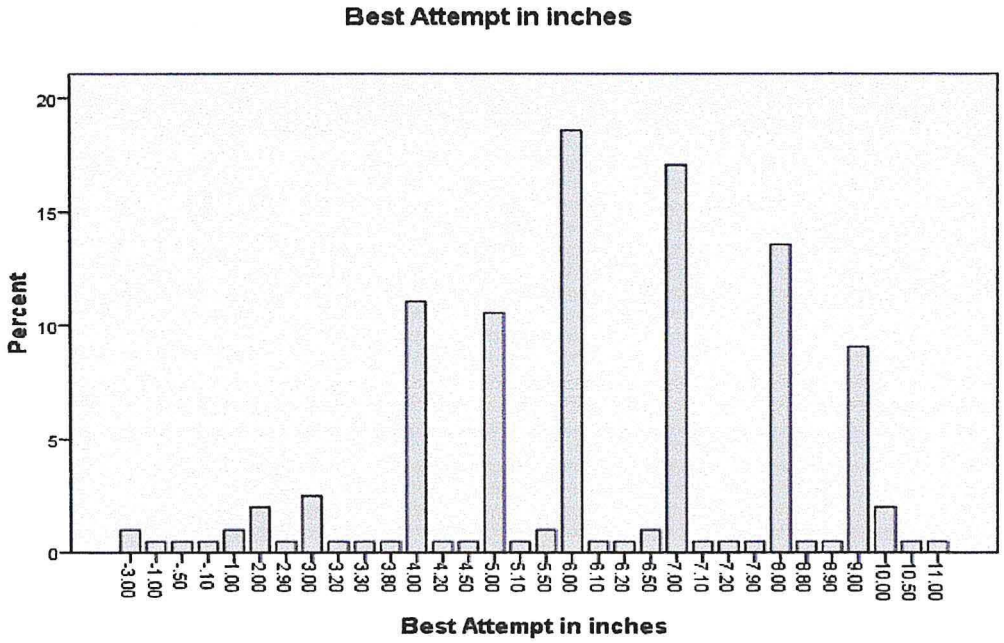


Figure 4.13: Best Attempt Results for Sit-and-Reach Test

4.3.3. Performance rating of low back and hamstring flexibility

It should be stressed that flexibility is not a general component of PF but is specific to each joint and the measure of the low back flexibility and the hamstring muscles can be categorized as super, excellent, good, average, fair, poor and very poor as shown. ACSM (2000) It was upon this rating that the performance of the subjects was rated to determine the level of fitness. In this test, the standards used are as shown in the Table 2.1:

According to the rating of the low back flexibility test against the standards, it was established that majority of the subjects (about 48%) were rated at being "Good" followed by those at "Excellent" at about 45%. The rest were at about 3% as shown in Figure 4.16.

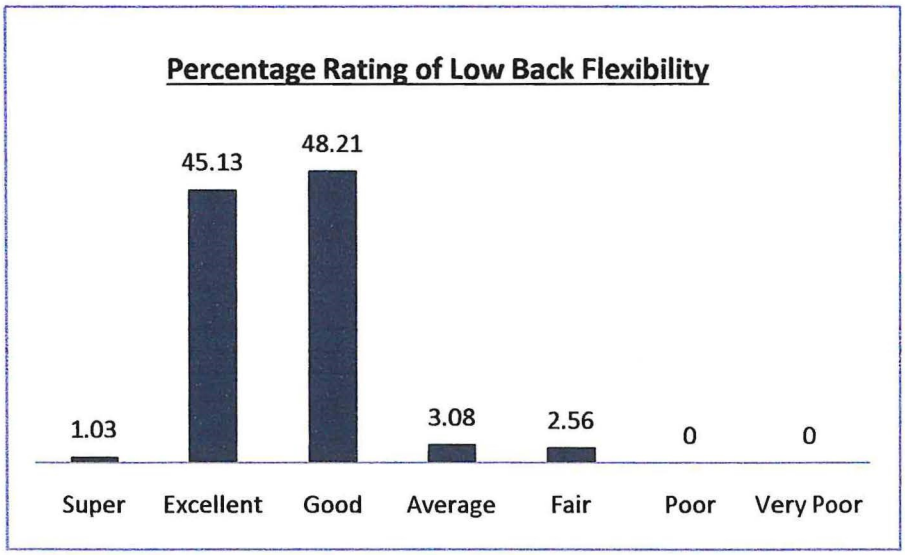


Figure 4.14: Best Attempt Results for Sit-and-Reach Test

According to these results, none of the subjects was rated as either poor or very poor. At the same time, only 5.64% were rated as being either average or fair. The general picture, therefore, is that the subjects' low back and hamstring muscle flexibility was indicative of high level of flexibility.

4.3.4 Performance rating of low back and hamstring flexibility

It was necessary that the performance of the subjects be rated to determine the level of fitness. In this test, the standards used are as shown in the Table 4.11:

Table 4.11: Rating of the Low Back and hamstring Flexibility

Inches	Frequency	Percentage	Remarks
> +10.5	2	1.0	Super
+6.5 to +10.5	88	44.0	Excellent
+2.5 to +6.0	94	47.0	Good
0 to +2.0	6	3.0	Average
-3.0 to -0.5	5	2.5	Fair
-7.5 to -3.5	0	0.0	Poor
< -7.5	0	0.0	Very Poor
Missing	5	2.5	
Total	200	100.0	

According to the rating of the low back flexibility test against the standards, it was established that majority of the subjects (48.21%) were rated at being "Good" followed by those at "Excellent" at 45.13%. The rest were at 3.08% and none was rated as poor and very poor. Figure 2.1 shows the rating standards.

4.3.4.1 Comparison of Performance rating of low back and hamstring flexibility across strata

Using the "best attempt" values only, the performance across the different strata was evaluated and presented in Table 4.12. The findings which closely follow those outlined in Table 4.10 show that most of the results of the subjects for all strata were clustered around "excellent" and "good" performance. While under the "excellent" category the A Division Junior category led with 52% followed by A Division senior at 44%, both the B Division categories scored 42%. Under the "good" grade, the B Division Senior led with 54% while the A Division Junior came last with 44%

Table 4.12: Low Back and hamstring Flexibility Rating Comparisons with US standards

Inches	Stratum	Frequency	Percentage	Remarks
> +10.5	AJ	0	0	Super
	AS	0	0	
	BJ	1	2	
	BS	1	2	
+6.5 to +10.5	AJ	26	52	Excellent
	AS	22	44	
	BJ	21	42	
	BS	21	42	
+2.5 to +6.0	AJ	22	44	Good
	AS	23	46	
	BJ	24	48	
	BS	27	54	
0 to +2.0	AJ	1	2	Average
	AS	3	6	
	BJ	2	4	
	BS	0	0	
-3.0 to -0.5	AJ	1	2	Fair
	AS	1	2	
	BJ	2	4	
	BS	1	2	
-7.5 to -3.5	AJ	0	0	Poor
	AS	0	0	
	BJ	0	0	
	BS	0	0	
< -7.5	AJ	0	0	Very Poor
	AS	0	0	
	BJ	0	0	
	BS	0	0	

4.4. Body composition/percent body fat

To determine the respondent's body composition with an emphasis of percent body fat percentage, the subjects' heights, weights, and fat composition were determined. The height and weight findings are presented together and those of the fat composition separately as follows:

4.4.1 The fat percentage distribution of the subjects

The findings about the fat percentage of the subjects revealed that the mean value was 17.5 while the minimum and maximum percentages were 6.70% and 38.60% respectively. A graphical distribution is illustrated in Figure 4.14:

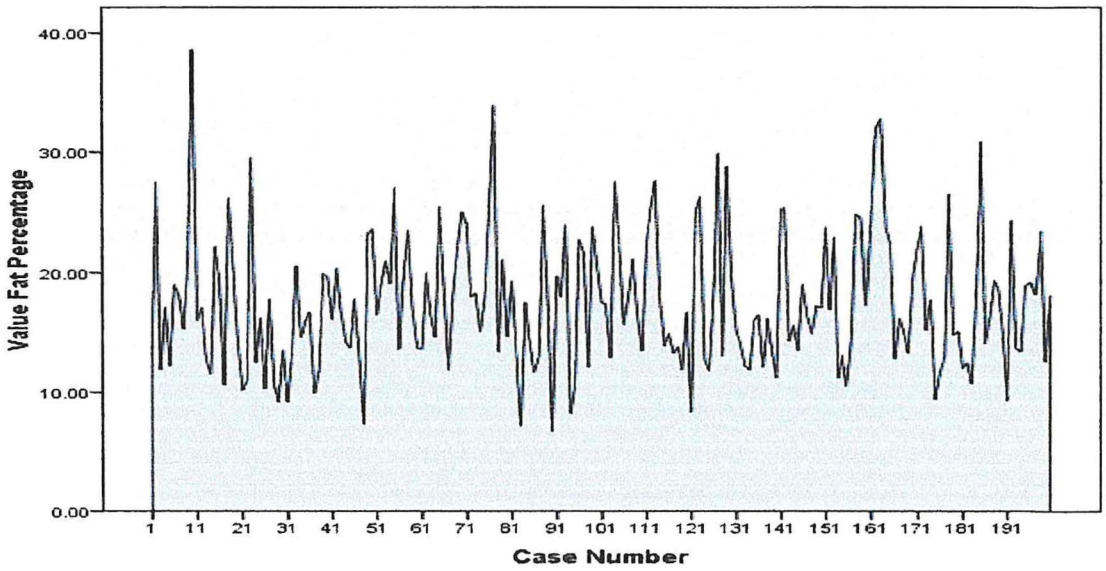


Figure 4.15: Graphical Presentation of Percentage Fat Distribution

The categorization of the percentages, as shown in Table 4.13, shows that 0.5% of the subjects were under-fat; 73.5% were healthy; 16.5% were over-fat; and 9.5% were obese. The highest fat percentage was 38% and the lowest being 7.0% this indicates both extremes were un healthy, with highest being obese and the lowest being under fat under fat or over fat affects ones PF levels (Goon, 2006). The general distribution across the subjects was uniform oscillating around the same levels. This was rated using Tanita

segmental composition monitor ratings refer to table 2.3 (http://www.amazon.co.uk/Tanita-Segmental-Composition-Monitor-Analyser/dp/B000MDH5L2 accessed on 12 Jun 2013)

Table 4.13: Fat Percentage Distribution

Fat Range (%)	Frequency	Percentage	Remarks
0 .0 – 7.0	1	0.5	Under-fat
7.1 – 20.0	147	73.5	Healthy
20.1 – 25.0	33	16.5	Over-fat
25.1 & Above	19	9.5	Obese
Total	200	100.0	

The findings as displayed in the Table 4.13 imply that almost three quarters of the subjects were healthy going by this scale indicated in Table 2.3 It can also be noted that the problem may be seen to be on the higher weights than the lower considering that a total of 26% of the subjects were either over-fat or obese while only 0.5% were considered to be under-fat. And this can compromise to their fitness levels as stated, body composition is an important indicator of fitness status (Malina et al., 1998:13-26; Bunc, 2001:46-52; Deurenberg et al., 2003:405-409 as cited by Goon 2006), who further stated that, since maintaining appropriate body composition is vital in preventing the onset of obesity, which is associated with increased risk of cardiovascular diseases. Low percentage body fat can also adversely affect metabolism and health and may indicate the incidence of disease, under nutrition or an eating disorder such as anorexia nervosa Goon, (2006).

4.4.2 Comparison of fat percentage distribution across strata

Table 4.14 shows the differences in the parameters of the fat percent age of the different strata under study. Accordingly, the mean values (about 16±6, 18±5, 17±5, 18±6) are comparable although those on of the junior categories were lower in both the study

Divisions. The range varied from 21.6% for the B Division Junior to 33.3% of the A Division Junior. While the minimum values for the A Division were lower compared to those of the B Division, the maximum values of the former were higher as shown in Table 4.14.

Table 4.14: Comparisons of Fat Percent Parameters

Parameter	Strata	Fat (%)
Mean	AJ	16.468
	AS	18.136
	BJ	17.428
	BS	18.018
Std. Deviation	AJ	5.905
	AS	5.451
	BJ	5.251
	BS	5.866
Range	AJ	31.3
	AS	27.2
	BJ	21.6
	BS	23.5
Minimum	AJ	7.3
	AS	6.7
	BJ	8.3
	BS	9.3
Maximum	AJ	38.6
	AS	33.9
	BJ	29.9
	BS	32.8

The mean values as shown in Table 4.14 generally indicate that generally the subjects were healthy apart from some who were over fat and obese as indicated.

4.4.3 Abdominal/Core muscle endurance

To test the Abdominal/core muscle endurance, the subjects participated in a sit-up test. Muscular endurance is the ability of a muscle or muscle group to execute repeated

contractions over a period of time sufficient to cause muscular fatigue, or to maintain a specific percentage of the maximum voluntary contraction for a prolonged period of time (ACSM 2000). Muscular endurance has been considered an important component of all-round physical fitness. For this reason, some measurement of relative muscular endurance has been included in the several field-testing batteries of soldiers, a one minute sit up and push-up is always used to measure endurance of upper and abdominal core body muscles FM 21-20, (1998); Brown, (2005). The findings of the study are presented as follows:

4.4.3.1 Parameters of the Abdominal/core muscle endurance test

For the abdominal/core muscle endurance the subjects were required to perform as many sit-ups as possible within sixty (60) seconds without resting and the performance of each respondent was then recorded.

Table 4.15: Performance of 1 minute-situp test.

Parameter		Sit Ups In 60 Seconds
N	Valid	199
	Missing	1
Mean		57.3573
Mode		46.00[a]
Std. Deviation		14.10480
Range		82.90
Minimum		5.10
Maximum		88.00

According to the findings the maximum sit-ups from the 199 subjects were 88 and minimum were 5 giving a range of about 83 push-ups which is a very big difference from the best performing to the list. The mean number of sit-ups were 57 with a SD of 14. The cause of that big disparity could not be established.

4.4.3.2 Summary of the Abdominal/core muscle endurance test

Using the US Army fitness standards in Table 2.1, the results of the sit-up test were compared as shown in Table 4.17:

Table 4.16: Summary of the Sit-ups Test Results

Age range	60% Points no of sit-ups (Pass mark)	Frequency		% Pass	100% Point (no of sit-ups)	Frequency		% Pass
		Above	Below			Above	Below	
17-21	52	6	5	5.45	93	4	7	36.36
22-26	47	35	7	83.33	87	4	38	9.52
27-31	42	80	12	86.96	82	3	89	3.26
32-36	38	46	9	83.64	78	1	54	1.82

According to findings out of the 200 subjects that underwent the test 167 would have passed at 60% minimum requirement of the US standards, that is, 83% pass (FM 21-20, 1998; Brown, 2005). And 12 were able to score 100% which was a good performance in this event. The age category of 27-31 performed best in all categories. Then 17-21 age category were least in the 60% pass mark and 32-36 were least in the 100% pass mark this indicates that at middle ages subjects performed better.

4.4.3.3 Comparisons of the Abdominal/Core muscle endurance Test

To appreciate the differences across the four strata under study, Table 4.17 was derived.

Table 4.17: Comparisons of the Sit-up Results

Age Range	Stratum	Limits at 60% (no of sit-ups)	Frequency		Percentage Pass at 60%	Limits at 100% (no of sit-ups)	Frequency		Percentage Pass at 100%
			Above	Below			Above	Below	
17-21	AJ	52	4	3	57.14	92	2	5	28.57
	AS	52	0	0	n/a	92	0	0	n/a
	BJ	52	2	2	50.00	92	2	3	40.00
	BS	52	0	0	n/a	92	0	0	n/a
22-26	AJ	47	17	2	89.47	87	3	16	15.79
	AS	47	3	0	100.00	87	0	3	0.00
	BJ	47	14	3	82.35	87	3	14	17.65
	BS	47	2	1	66.67	87	0	3	0.00
27-31	AJ	42	15	5	66.67	82	2	18	10.00
	AS	42	18	4	81.82	82	0	22	0.00
	BJ	42	26	3	89.66	82	1	28	3.45
	BS	42	18	3	85.71	82	0	21	0.00
32-36	AJ	38	4	1	80.00	78	0	5	0.00
	AS	38	23	1	95.83	78	1	23	4.17
	BJ	38	0	0	n/a	78	0	0	n/a
	BS	38	21	5	80.77	78	0	26	0.00

According to the findings in Table 4.17, the senior categories in both Divisions did not have subjects in the age range of 17 – 21 years old. Similarly, there were very few subjects under the junior categories. In all categories, there was better performance at 60% pass mark where 167 subjects would have passed the test out of the 200 subjects than at 100%. Indeed, it was only B Division Junior and A Division Junior that recorded 17.6% and 14.3% while the rest were less that 11.0%. The performance generally was good.

Table 4.17: Comparisons of the Sit-up Results

Age Range	Stratum	Limits at 60% (no of sit-ups)	Frequency		Percentage Pass at 60%	Limits at 100% (no of sit-ups)	Frequency		Percentage Pass at 100%
			Above	Below			Above	Below	
17-21	AJ	52	4	3	57.14	92	2	5	28.57
	AS	52	0	0	n/a	92	0	0	n/a
	BJ	52	2	2	50.00	92	2	3	40.00
	BS	52	0	0	n/a	92	0	0	n/a
22-26	AJ	47	17	2	89.47	87	3	16	15.79
	AS	47	3	0	100.00	87	0	3	0.00
	BJ	47	14	3	82.35	87	3	14	17.65
	BS	47	2	1	66.67	87	0	3	0.00
27-31	AJ	42	15	5	66.67	82	2	18	10.00
	AS	42	18	4	81.82	82	0	22	0.00
	BJ	42	26	3	89.66	82	1	28	3.45
	BS	42	18	3	85.71	82	0	21	0.00
32-36	AJ	38	4	1	80.00	78	0	5	0.00
	AS	38	23	1	95.83	78	1	23	4.17
	BJ	38	0	0	n/a	78	0	0	n/a
	BS	38	21	5	80.77	78	0	26	0.00

According to the findings in Table 4.17, the senior categories in both Divisions did not have subjects in the age range of 17 – 21 years old. Similarly, there were very few subjects under the junior categories. In all categories, there was better performance at 60% pass mark where 167 subjects would have passed the test out of the 200 subjects than at 100%. Indeed, it was only B Division Junior and A Division Junior that recorded 17.6% and 14.3% while the rest were less that 11.0%. The performance generally was good.

4.4.4 Upper body muscular endurance

To ascertain the upper body muscular endurance, the subjects were required to do as many push-ups as possible within sixty (60) seconds. The number of push-ups per respondent was recorded and used to generate the sample findings as indicated below: this was in line with the recommendation of the FM 21-20 (1998): Brown, 2005.

4.4.4.1 Characteritics of the push-ups results

As shown in Table 4.19, the mean value of the push-up test was 57 with SD of 15 seconds while the mode was 60. The minimum value was recorded as 15.2 while the maximum value was 87 push ups per minute.

Table 4.18: Characteristics of the Results on push –ups

		Push Ups In 60 Seconds
N	Valid	199
	Missing	1
Mean		57.9447
Mode		60.00
Std. Deviation		15.20506
Range		76.00
Minimum		11.00
Maximum		87.00

The above results implied that a reasonable number of subjects were able to at least do a push-up. The maximum number was 87 push-ups while the minimum was 11 push-ups. The mean value was 58±15.2 which indicated generally a good performance as further compared with the existing standards.

4.4.4.2 Comparison of US Army Standards with Ugandan Soldiers

It was pertinent to rate the performance of the subjects by comparing it with the set standards as shown in Table 4.19. The standards used were US standards FM 21-20

(1998) since there are no standards set in Uganda and these standards were also used by other researchers like, Brown (2005)

Table 4.19: Push-ups by Subjects comparing with US army standards

Age range	60% Points (Pass mark) no of push-ups	Frequency		% Pass	100% Point no of push-ups	Frequency		% Pass
		Above	Below			Above	Below	
17-21	42	9	3	75.00	82	2	9	18.18
22-26	40	37	5	88.10	80	8	34	19.05
27-31	38	80	12	86.96	78	10	82	10.87
32-36	33	48	6	88.89	73	4	50	7.41

According to the results above, while the subjects of all the age groups recorded an 87% with a total of 174 subjects out of the 200 passing the lower mark when rated using the US standards, (FM 21-20, 1998). They both dropped to 36.36% and 40% respectively at the 100% pass mark. On the other hand, the drop for the age groups 27-31 and 32-36 years old was not very significant. While that of the former dropped from 86% to 81% that of the latter dropped from 53% to 52%. According to these findings, the performance was better for all ages at 60% pass mark compared to the 100% mark.

4.4.4.3 Comparisons of the push-ups results across the study strata

As was an objective of this study, the push-ups results were compared within and without the A and B divisions. The findings are as shown in Table 4.20

Table 4.20: Comparisons of the Push Ups Results across the Strata

Age Range	Stratum	Limits at 60%	Frequency		Percentage Pass at 60%	Limits at 100%	Frequency		Percentage Pass at 100%
			Above	Below			Above	Below	
17-21	AJ	42	4	3	57.14	82	2	5	28.57
	AS	42	0	0	n/a	82	0	0	n/a
	BJ	42	2	2	50.00	82	1	3	25.00
	BS	42	0	0	n/a	82	0	0	n/a
22-26	AJ	31	15	4	78.95	80	3	16	15.79
	AS	31	2	1	66.67	80	0	3	0.00
	BJ	31	14	3	82.35	80	6	11	35.29
	BS	31	2	1	66.67	80	0	3	0.00
27-31	AJ	30	15	5	75.00	78	0	18	0.00
	AS	30	16	6	72.73	78	0	22	0.00
	BJ	30	25	4	86.21	78	7	22	24.14
	BS	30	18	3	85.71	78	1	20	4.76
32-36	AJ	26	2	2	50.00	73	0	4	0.00
	AS	26	18	6	75.00	73	0	34	0.00
	BJ	26	0	0	n/a	73	0	0	n/a
	BS	26	19	7	73.08	73	1	25	3.85

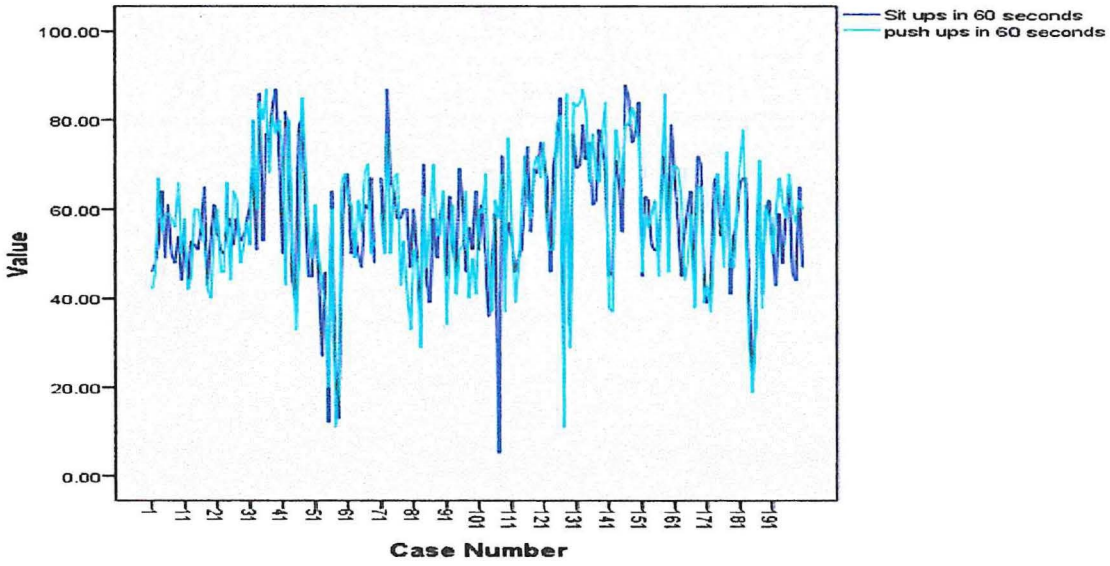
As is evident from Table 4.20, there were no senior subjects in both divisions for the age group 17 – 21 years old. At the same time the few junior subjects in both divisions in this age group all passed 100% at the 60% pass mark and dropped significantly at the 100% pass mark. All categories at the age group 22-26 years old passed 100% at the 60% pass mark although there were only three (3) of each for the senior categories in both divisions.

4.4.4.4 Comparisons between Sit-ups and Push-ups Findings

The mean of the results of the sit-ups and push-up excercises were established to be 57.3 sit-ups with a standard deviation of 14.1 (57.34±14.1). And 57.9 push-ups with a standard deviation of 15.2 (57.94±15.2). Similarly, while the minimum and maximum

numbers for the sit ups were 5.00 and 88.00 in that order, those of the push ups were correspondingly 11.00 and 87.00. When plotted together, although different tests, the patterns were found to match very closely as shown in Figure 4.17. The findings indicate that there was a relationship in performance in the sit-ups and push-ups across the strata.

Figure 4.16: Comparison between Sit-ups and Push-Ups Results



4.5 Aerobic Endurance (Time for the two mile run)

To test for the cardiovascular endurance of the subjects, they were required to run a distance of 2 miles and the individual time for each respondent was recorded. It is important to have a very good base of aerobic endurance, as it will help to train and perk up other components of fitness (Sandler 2003). FM 21-20 (1998) states that the US Army uses the two mile run to assess a soldier's aerobic fitness and leg muscles' endurance. Due to the fact that body composition is influenced by age and gender, which in turn affects one's ability to perform this event, age and gender are considered in the scoring of the two mile event.

4.5.1 Summarized findings on aerobic endurance

Using the US Army basic training information APFT standards refer to Table 2.1, the time taken to run 2 miles by the subjects was summarized in Table 4.21. According to the findings, all subjects in the age groups 17 -21 years old and 22 – 26 years old passed the test at 60% while for the other categories (27 – 31 years and 32 – 36 years) one respondent in each, failed the test. However, on moving to limits at 100%, all the percentage passes dropped as shown in the last column of the Table 4.21.

Table 4.21: Two Mile Run Results

Age Range	Limits at 60%	Frequency		Percentage Pass at 60%	Limits at 100%	Frequency		Percentage Pass at 100%
		Above	Below			Above	Below	
17-21	12:57	2	10	16.67	11:54	8	4	66.67
22-26	16:36	6	34	15.00	12:36	13	27	32.50
27-31	17:18	5	87	5.43	13:18	40	52	43.48
32-36	18:00	6	49	10.91	14:00	33	22	60.00
Total		19	180			94	105	

4.5.2 Comparisons of the findings across strata on aerobic endurance

As one of the objectives of this study, it was important that the findings of this test be compared across the four different strata. This was to provide an inner understanding of the physical status of the subjects. Table 4.22 shows the differences between the four different strata under different age categories as stipulated under the US Army basic training information APFT standards for testing for cardiovascular endurance.

Table 4.22: Differences in Aerobic Endurance across Strata

Age Range	Stratum	Limits at 60%	Frequency		Percentage Pass at 50%	Limits at 100%	Frequency		Percentage Pass at 100%
			Above	Below			Above	Below	
17-21	A Jnr	15:54	2	5	71.43	11:54	6	1	14.29
	A Snr	15:54	0	0	n/a	11:54	0	0	n/a
	B Jnr	15:54	1	3	75.00	11:54	3	1	25.00
	B Snr	15:54	0	0	n/a	11:54	0	0	n/a
22-26	A Jnr	16:36	4	15	78.95	12:36	8	11	57.89
	A Snr	16:36	1	2	66.67	12:36	1	2	66.67
	B Jnr	16:36	4	11	73.33	12:36	6	9	60.00
	B Snr	16:36	1	2	66.67	12:36	3	0	0.00
27-31	A Jnr	17:18	5	15	75.00	13:18	8	12	60.00
	A Snr	17:18	2	20	90.91	13:18	13	9	40.91
	B Jnr	17:18	4	25	86.21	13:18	9	20	68.97
	B Snr	17:18	3	19	86.36	13:18	9	12	57.14
32-36	A Jnr	18:00	1	3	75.00	14:00	2	2	50.00
	A Snr	18:00	4	20	83.33	14:00	21	6	22.22
	B Jnr	18:00	0	0	n/a	14:00	0	0	n/a
	B Snr	18:00	3	23	88.46	14:00	14	12	46.15
Total			5	192			89	108	

According to the results, there were no senior subjects at the age group of 17 – 21 years old. As for the junior subjects in both the A and B Divisions, their performance was 100% at 60% pass limit but both dropped tremendously at 100% pass limits. The values were 42.9% and 5.0% for A and B Divisions respectively. At the age group 22-26 years old, in which all strata had subjects, it was established that all subjects passed 100% at the 60% pass limit. However, at the 100% pass limit, all strata recorded a drop in percentage except for the A Division senior.

At the age limits of 27 – 31 year s of age, it is only the senior subjects in both divisions who scored 100% at the 60% pass limit. The juniors were at about 90%. Although at the 100% pass limit, the performance of all divisions dropped, that of the junior soldier performance was higher than for the senior categories.

The last age category (32 – 36 years) had only A junior subjects in A Division and none in B Division. Both the senior categories of the two divisions recorded their respective highest number of subjects (23 and 26 for A and B Divisions respectively). Also, this category realised the lowest performances at the 100% pass limit.

The general characteristics of the subjects are as shown in Table 4.23 shows how the fitness status of the junior subjects differed from that of the senior subjects. The table highlights the mean, standard deviation, standard error, confidence intervals for mean, and the maximum and minimum values. These findings focus on the fitness variables namely the Best Attempt in the flexibility test the, fat percentage, the sit-ups and push-ups, and the time in minutes taken to run two miles.

Table 4.23: General Descriptive statistics of the subjects

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Fat Percentage	Junior	98	17.0194	5.60522	.56621	15.8956	18.1432	7.30	38.60
	Senior	99	18.0071	5.61909	.56474	16.8864	19.1278	6.70	33.90
	Total	197	17.5157	5.61971	.40039	16.7261	18.3054	6.70	38.60
Flexibility "Best Attempt"	Junior	98	6.1755	2.51359	.25391	5.6716	6.6795	-3.00	11.00
	Senior	99	6.0495	2.04547	.20558	5.6415	6.4575	-1.00	10.50
	Total	197	6.1122	2.28535	.16282	5.7911	6.4333	-3.00	11.00
Sit ups in 60 seconds	Junior	98	60.1439	14.90900	1.50604	57.1548	63.1329	5.10	88.00
	Senior	99	54.4646	12.81844	1.28830	51.9081	57.0212	12.00	87.00
	Total	197	57.2898	14.15152	1.00825	55.3014	59.2783	5.10	88.00
Push-ups in 60 seconds	Junior	98	61.7041	15.66677	1.58258	58.5631	64.8451	11.00	87.00
	Senior	99	53.9192	13.65887	1.37277	51.1950	56.6434	11.00	86.00
	Total	197	57.7919	15.16516	1.08047	55.6610	59.9227	11.00	87.00
Time in minutes taken to cover 2 miles	Junior	98	12.5826	2.09288	.21141	12.1630	13.0021	10.00	24.24
	Senior	99	13.4869	1.89175	.19013	13.1096	13.8642	10.00	19.10
	Total	197	13.0370	2.04023	.14536	12.7503	13.3237	10.00	24.24

The analysis of variance (ANOVA) results for the fat percentage, the best attempt in the flexibility test, the sit-ups, push-ups, and the time in minutes taken to run two miles are as shown in Table 4.24. Apparently, while some findings were statistically significant going by the p-values (Sig, values), others were not. The former included the sit-ups; the push-ups, and the time taken to run two (2) miles.

Table 4.24: The Analysis of Variance (ANOVA) Results

		Sum of Squares	Df	Mean Square	F	Sig.
Fat Percentage	Be between Groups	48.043	1	48.043	1.525	.218
	Within Groups	6141.858	195	31.497		
	Total	6189.901	196			
Flexibility	Between Groups	.782	1	.782	.149	.700
	Within Groups	1022.889	195	5.246		
	Total	1023.671	196			
Sit ups in 60 seconds	Between Groups	1588.452	1	1588.452	8.224	.005
	Within Groups	37663.608	195	193.147		
	Total	39252.060	196			
Push-ups in 60 seconds	Between Groups	2984.695	1	2984.695	13.827	.000
	Within Groups	42091.772	195	215.855		
	Total	45076.467	196			
Time in minutes taken to cover 2 miles	Between Groups	40.275	1	40.275	10.126	.002
	Within Groups	775.585	195	3.977		
	Total	815.860	196			

Considering that the study involved four categories, two from each of the two Divisions, a further analysis of the variances between them was carried out. The general descriptions of the four strata (categories) are as indicated in Table 4.25, According to these results, the significant results where the p-Value was less that 0.05 were the sit-ups with a p-value of 0.005; push-ups with a p-value of .000; and the time taken to run 2 miles (p-value = .002). On the other hand, fat composition and back flexibility were not significant as the p=values were .218 and .700 respectively.

Hypothesis Testing Results

According to the results as shown in Table 4.25, the following hypothesis testing results were obtained:

Table 4.6 Hypothesis Testing Results

$H0_1$ The null hypothesis stated that there will be no significant difference in physical fitness between senior and junior soldiers of A and B divisions of the UPDF. The findings of the study showed that, there was a significant difference in physical fitness status between senior soldiers and junior soldiers of A and B divisions of the UPDF ($p \leq 0.005$; $p \leq 0.05$) therefore the null hypothesis was rejected and the research hypothesis accepted.

$H0_2$ The null hypothesis stated that, there will be no significant difference in law back and hamstring muscles between soldiers in A and B divisions of the UPDF. The findings revealed that, there was no significant difference in law back and hamstring muscle flexibility between soldiers in A and B divisions of the UPDF ($p \leq 0.700$; $p \leq 0.05$). This led to accepting the null hypothesis and rejecting the research hypothesis.

$H0_3$ This null hypothesis proposed that, there will be no significant difference in body composition of senior and junior soldiers of A and B divisions of the UPDF. Statistical testing of this null hypothesis revealed that, there was no significant difference in body composition of the senior and junior soldiers of A and B divisions of the UPDF ($p \leq 0.218$; $p \leq 0.05$). The null hypothesis was therefore accepted and the research hypothesis rejected.

$H0_4$ In the null form this hypothesis stated that, there will be no significant difference in muscular endurance between junior and senior soldiers of A and B divisions of the UPDF. The results of this study demonstrated that there was a significant difference in muscular endurance between senior and junior soldiers in A and B divisions of the UPDF ($p \leq 0.000$; $p \leq 0.05$). The null hypothesis was rejected and the research hypothesis was accepted.

$H0_5$ The null hypothesis held that, there was no significant difference in aerobic endurance between junior and senior soldiers of A and B divisions of the UPDF ($p \leq 0.002p \leq 0.05$). The null hypothesis was therefore rejected and the research hypothesis accepted.

The multiple comparisons between the four categories was achieved by carrying out the Post Hoc Test and the results are as shown in Appendix VII. The performance across the strata was also analysed using a post Hoc test see Appendix VIII According to these results, the overall variances within the different variables were as a result of variances between just two of the four categories and the causes of these variances were not part of this study.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMENDATIONS

5.1 Introduction

This chapter summarizes the findings and discussions of the study. It also highlights the conclusions and recommendations of the study.

Summary

The main objective of this study was to assess physical activity patterns and the fitness status of soldiers in A and B Divisions of UPDF. The study therefore evaluated the patterns of physical activity participation and physical fitness status of soldiers of A and B division of the UPDF, compared the performances in the different strata's, and the results were also compared to international fitness standards.

A pre- experimental research design was used where a single group was studied at a single point in time after some treatment that is presumed to have caused change to help conduct the study. A total of 200 subjects were selected. The data was analyzed using descriptive statistics. Analysis of variance (ANOVA) was used to compare the differences between the groups. A p-value ≤ 0.05 was considered statistically significant. All analysis's was performed using the Statistical Package for Social Sciences (SPSS) version 16.0. The soldiers fitness levels were found to be generally good in comparison to international standards. The junior and senior soldiers exhibited similar performance in law back and hamstring flexibility and body composition, with a difference in core muscle flexibility and aerobic endurance where the junior performed better. Compared to the levels of participation in PA it is assumed that the fitness levels of the UPDF soldiers would have been even higher than what it is now.

This study clearly indicated that a number of soldiers' do insufficient physical activities of two days and less contrary to APTG (2011): FM 21-20 (1998) which states that at least

30 minutes per day for three days a week. The soldiers are less engaged in leisure activities and more occupied in household and work related that are not easy to measure and irregular.

The study demonstrated that three quotas of the soldiers were healthy regarding fat content 0.5% are under fat and only 26% are over fat/obese. This situation is not a typical situation of a head quarter and most of the soldiers in head quarters are expected to be fat and obese. The reason could be that these two divisions have been handling insurgents for a long time and the subjects were mainly those who are doing active military service. The study also found that most junior soldiers were healthy as far as body composition is concerned. This is because some senior soldiers have moved to management positions which reduce their level of activity.

Considering law back and hamstring flexibility, the study clearly indicated that 95% of the soldier were flexible. For core muscle endurance the study demonstrated that if it was a US army fitness test majority of the soldiers would have passed the test with at least 60% points which is the pass mark of the US army fitness test. The study also demonstrated that the performance in sit ups and push-ups matched closely in the subjects under study, where they scored 11 minimum 87 maximum in push-ups, and 5 minimum and 88 maximum in sit ups.

Comparison

Comparing with other standards there was generally a good performance in law back and hamstring flexibility test, body composition, core muscle endurance. The study indicated that most of the subjects would have passed if they were to use those standards. However, the performance generally declined in aerobic endurance. This is not conclusive because the standards were not set for Ugandan soldiers.

In aerobic endurance junior soldiers performed better than senior soldiers and if it was a US test most of the senior soldiers would have failed the test. There was no significant

difference in flexibility of junior and senior soldiers with a variance of 0.700 which is above a p-value ≤ 0.05.

On the contrary there was a considerable difference between the junior and senior soldiers in core muscle endurance and aerobic endurance as follow; 0.005, 0.000, 0.002 for each respectively. Senior soldiers were more involved in administrative work and therefore leaving less time for active physical activities, compared to junior officer who were actively involved in physical activities.

5.2 Conclusions

The findings of this study relate to some anthropometric and physical fitness parameters and demonstrate that UPDF soldiers are in some aspects similar to other populations studied. They are also unique as a group, mainly because of differences in socio-economical, cultural and environmental conditions. It is therefore recommended that physical activity patterns and fitness profile should be established for soldiers from different regions within the country. The high prevalence of under performance in leisure activities found in this study has implications for the soldiers' performance. Physical activities during leisure can be measured to gauge to what extent they contribute to physical fitness. It is important that soldiers are encouraged to participate in them.

Comparison with physical fitness of UPDF soldiers from developed countries is subject to caution because of the distinct nature of the environment, nutrition, and the training curriculum; though it indicated a good performance of the UPDF soldiers given a good preparation and motivation. It is possible that UPDF soldiers were completely unfamiliar with some of the physical fitness tests, likely due to the lack of institutionalized physical fitness tests. Therefore, the apparent low scoring may be attributed to a learning effect. It is possible that if fitness testing was made regular the soldiers can do better. Soldiers from other developed and developing countries may be more "practiced" in performing for instance, push-ups, than UPDF soldiers, for whom this could have been a strange movement.

5.3 Recommendations for policy and practice

i. The commanders need to schedule regular fitness tests which will provide data on fitness and then improve or maintain the status accordingly.

ii. The army leadership need to increase the official time for sports day from one to at least three days in a week the other two days could begin in the evening not to compromise other duties. Soldiers will take it more serious when the days are set by the army leadership.

iii. There is need to sensitize soldiers on the importance of fitness which will increase their interest in the fitness exercises.

iv. Commanders need to be given a duty to ensure the fitness of their soldiers; this will make work and responsibility distributed easily to ensure all soldiers engage in fitness activities.

v. One of the most important human performance factor, is motivation. The army leadership needs to motivate soldiers who actively participate in physical activities whether they excel in sports or not. This will encourage others to take part also with morale.

vi. The army leadership should introduce many games, facilities and equipments so that soldiers have a variety of them this will work as entry point for the soldier in physical activities.

vii. Conducting fitness tests will continue to be a challenge if there are no standards set for Ugandan soldiers. There is need therefore to conduct a study and set standards for Ugandan Army, all the standards we referred to were for the US Army that may not be fully applicable in a Ugandan situation, and this study may help the Army to do regular fitness tests.

5.4 Recommendations for future Research

i. The conditions and the work that soldiers do is different from that done by soldiers in the division and their fitness may be different from the division head quarters. A study needs to be conducted on those soldiers who are in the field to establish their fitness status.

ii. The contribution made by military drills in the training wings may not be known. There is need to conduct a study on the contribution of military training on soldiers.

iii. The other factors affecting or contributing to fitness may not be known. There is a need to conduct a study on other factors that contribute to fitness in the army so as to give them attention.

iv. The nutritional status of soldiers should be investigated to ascertain whether their fitness status is linked with their nutrition. Future studies examining physical activity patterns as well as the environmental conditions that affect health and fitness of the soldiers are needed.

REFERENCES

American College of Sports Medicine (2000). *ACMS's guidelines for exercise testing and prescription. Philadelphia*: Lippincott Williams and Wilkins.

Armstrong, Bauman & Joanne, (2000) *Physical Activity Patterns of Australian Adults* AIHW cat no CVD10. Canberra.

Army Physical Training Guide (APTG), (2011), *Army Physical Training Guide*,US government printing office RPI 237 Sydney

Baker & Shane A. (2003). Physical training for Armor crewmen. Master's thesis, Command and General Staff College. Toronto

Barnard, R.J., Gonzales, J.H., Liva, M.E., & Ngo, T.H. (2006). The effects of a low-fat, high-fiber diet and exercise program on breast cancer risk factors in vivo and tumor cell growth and apoptosis in vitro. Nutrition and Cancer, 55(1), 28–34.

Bathrellou, E., Lazarou, C., Panagiotakos, D. B., & Sidossis, L. S. (2007). Physical activity patterns and sedentary behaviors of children from urban and rural areas of Cyprus. Central European Journal of Public Health, 15(2), 66-70. Cyprus

Bauman.A. (1987). *Trends in exercise prevalence in Australia*. Community Health Studies 11(3):190–96. Canberra

Bouchard, C. & Shephard, R.J. (1994). *Physical activity, fitness, and health: the model and key concepts*. In: Champaign

Bouchard, R.J. Shephard & T. Stephens, (2006) (Eds.) Physical activity, fitness, and health. Champaign, IL: Human Kinetics Books, 77-88.

Brown M.J, (2005), *Fitness and its Effects on the Military*, USA Army War College, Corlisle Barracks, Pennsylvania 17013

Buck, S. M., Hillman, C. H., & Castelli, D. M, (2008), *The relation of aerobic fitness to troop task performance in preadolescent children*. Medicine and Science in Sports and Exercise, 40(1), 166–172.

Commonwealth Department of Health and Aged Care (DHAC) (1999). *National physical activity guidelines for Australians*. DHAC: Canberra.

Cooper .K. H, (2001), M.D., *The Cooper Aerobics Center*, http://www.cooperaerobics.com, Accessed February 27, 2001.

Dalleck, L. D. & Kravitz, L. (n.d.). *The hist01Y offitness.* Retrieved October 27,(2008), from http://www.unm.edu/~lkravitz/Article%20folder/history.html

Dishman, R. K., Washburn, R. A. & Heath, G. W. (2004). *Physical Activity Epidemiology*. Champaign, Illinois: Human Kinetics.

Drury F.T. (1989), Assessing physical fitness and physical activity in population based surveys. (DHHS publication; no. (PHS) 89-1253).

Emery, C., Shermer, R., & Hauck, E. (2003). *Cognitive and psychological outcomes of* exercise in a 1-year follow-up study of patients with chronic obstructive, London

Environ J. 2011 International Journal of Environmental Research and Public Health ISSN 1660-4601 www.mdpi.com/journal/ijerph accessed 10 Jun 2013

FM 21-20, (1998), *Physical Fitness Training, Headquarters Department of the Army*, Washington DC. www.usarec.army.mil/hq/warrant Accessed on 13 November 2013

Goon, D.T, (2006), Evaluation of Physical Fitness And Body Composition Of Nigerian Children, np Makude

Hanc, J. (1994). *The essential runner,* Amazon.com. Publisher: Lyons Press, New York:

Harrison, Lee ; Brennan, Mark ; Shilanskis, Cynthia M (1998) Physical Activity Patterns and Satisfaction with Fitness Facilities Among Military Members and Their Families Washington DC

Harvey, D. & Mansfield, C. (2000). *Measuring Flexibility For Performance And Injury Prevention.* Champaign, Illinois: Human Kinetics: 98-113.

Heyward V.H (1998), *Advanced Fitness Assessment and Exercise Prescription* 3rd Edition, University of New Mexico, Human Kinetics.

Hinkle, S. (1992). *School children and fitness: Aerobics for life. ERIC Digest.* Ann Arbor, MI: ERIC Clearinghouse on Counselling and Personnel Services.

http://www.amazon.co.uk/*Tanita-Segmental-Composition-Monitor*-Analyser/dp/B000MDH5L2 accessed on 12 Jun 2013

http://www.topendsports.com/testing/tests/sit-and-reach.htm, accessed on 06/08/2013 12:38:49

Kelly K.P &R.R Marrow (2010), A Framework of Physical Activity as a complex and Multidimensional Behavior, Komsomolskaya Pravda

Lawman T. (2010), *Does current army physical fitness training doctrine adequately prepare soldiers for war,* fort leavenworth, Kansas

Martin, Michel L. (1972), The Uganda Military Coup of 1971. http://escholarship.org/uc/item/6v7015n9

Malmberg J., (2011), Physical fitness in Nomadic Armed Forces 4 dimension of basic test protocol, Norwegian Defence University College, West point New York.

Mechikoff R.A, S .G. Estes (2002).A history and Philosophy of Sports and Physical Education. From ancient civilization to the modern World. Published by McGraw-Hill Humanities London.

Mil Med. (2006) Jan;171(1):45-54. Increasing the physical fitness of low-fit recruits before basic combat training: an evaluation of fitness, injuries, and training outcomes.

Odiya J.N, (2009), Scholarly Writing Research Proposals and Reports, Kampala MUK Printery

Reeves MJ, McGee HB & Pivarnik JM, (2002), Physical activity patterns among walkers and compliance with public health recommendation, Rockvile Pike, Bethesda..

Sandler, D. (2003). *Weight training fundamentals, Champaign,* IL: Human Kinetics Publishers, Inc.

Saunders T. (2009), *Physical activity reduces risk of childhood fat gain.* In *Obesity Panacea.* Retrieved January 3, 2010, from http://www.obesitypanacea.com

Scot K. P. & Howley E.T (2001), Exercise Physiology Theory and Application to Fitness and performance, Fifth Edition, London

Scott, J. R. (2008), December 8). *Heart disease and your weight. l;aksdjf.* Retrieved from Oct 2012 http://weightloss.about.com/od/obesityhealth/a/heartdisease.htm

Standage, M., Duda, J., & Ntoumamis, N. (2003). A model of contextual motivation in physical education: using constructs from self-determination and achievement goal theories to predict physical activity intentions. Journal of Educational Psychology, 95, 97-110.

U.S. Department of Health and Human Services., (2000), *Physical activity and health: a report of the Surgeon General.* Atlanta GA: U.S. Department of the army.

Westrage, J. A. & Deurenberg, P. (1989). *Body Composition In Children:* Proposal For Calculating Body Fat Percentage From Density Or Skinfold Thickness Measurements. *American Journal Of Clinical Nutrition*, Antlanta.

Appendix I

Physical Activity Questionnaire for soldiers

Dear Respondent,

This questionnaire is designed to find out about your physical activity in your everyday life; for the last 7 days in this case. Please try to answer every question, except when there is a specific request to skip a section.

- ***Vigorous*** *physical activity refers to activities take hard physical effort making one breathe much harder than normal*
- ***Moderate*** *refers to activities that take moderate physical effort and make one breathe somewhat harder than normal.*

All information was treated as strictly confidential and was used only for study purpose

Date of Birth ...../...../.....DD/MM/YYYY

Duration of military service 0-04yrs ☐ 05yrs and above ☐

Part A: Physical activity patterns in and around the home

This section is about some of the physical activities you might have done in the **last 7 days** in and around your home, like housework, gardening, compound work, general maintenance work, and caring for your family.

01. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, chopping wood, slashing, digging **in the garden or compound for at least 10 minutes**?

_____ days per week

N☐orous activity in garden or yard ***Skip to question 3***

02. How much time did you usually spend on one of those days doing **vigorous** physical activities in the garden or compound?

_____ hours per day _____ minutes per day

03. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, sweeping, washing windows, and raking **in the garden or compound for at least 10 minutes**?

_____ days per week

☐ No moderate activity in garden or yard ***Skip to question 5***

04. How much time did you usually spend on one of those days doing **moderate** physical activities in the garden or compound?

_____ hours per day _____ minutes per day

05. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, washing windows, scrubbing floors and sweeping **inside your home for at least 10 minutes**?

_____ days per week

☐ No moderate activity inside home ***Skip to part B***

Part B: travel to work and activity while at work

This section is about your work. This includes your work, farming, and volunteer work. And travel from place to place, including to places like work, stores, movies, and so on.

6. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, heavy construction, walking while currying, or climbing up stairs **as part of your work for at least 10 minutes**?

_____ days per week

☐ No vigorous job-related physical activity ***Skip to question 3***

7. How much time did you usually spend on one of those days doing **vigorous** physical activities as part of your work?

_____ hours per day _____ minutes per day

8. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads **as part of your work for at least 10 minutes**? Please do not include walking. _____ **days per week**

☐ No moderate job-related physical activity ***Skip to question 5***

9. How much time did you usually spend on one of those days doing **moderate** physical activities as part of your work? _____ **hours per day** _____ **minutes per day**

10. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **as part of your work**? Please do not count any walking you did to travel to or from work.

_____ days per week

N☐-related walking *Skip to question 12*

11. How much time did you usually spend on one of those days **walking** as part of your work?

_____ hours per day _____ minutes per day

12. During the **last 7 days**, on how many days did you **travel in a motor vehicle** like a bus, car, or motor cycle? _____ **days per week**

☐ No travelling in a motor vehicle *Skip to question 14*

13. How much time did you usually spend on one of those days **travelling** in a bus, car, or other kind of motor vehicle? _____ **hours per day** _____ **minutes per day**

14. During the **last 7 days**, on how many days did you ride a **bicycle** for at least 10 minutes at a time to go **from place to place**?_____ **days per week**

☐ No bicycling from place to place *Skip to question 16*

15. How much time did you usually spend on one of those days riding a **bicycle** from place to place? _____ **hours per day** _____ **minutes per day**

16. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time to go **from place to place**? _____ **days per week**

No walking from place to place *Skip to part C*

Part C: Recreations engaged in last 7 days

This section is about all the physical activities that you did in the **last 7 days** solely for recreation, sport, exercise or leisure.

17. How much time did you usually spend on one of those days doing **moderate** physical activities inside your home? _____ **hours per day** _____ **minutes per day**

18. Not counting any walking you have already mentioned, during the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **in your leisure time**?

_____ **days per week**

No walking in leisure time ***Skip to question 20***

19. How much time did you usually spend on one of those days **walking** in your leisure time?

_____ hours per day _____ minutes per day

20. During the **last 7 days**, on how many days did you do **vigorous** physical activities like aerobics, running, fast bicycling, or fast swimming **in your leisure time for at least 10 minutes**? _____ **days per week**

No vigorous activity in leisure time ***Skip to question 23***

21. How much time did you usually spend on one of those days doing **vigorous** physical activities in your leisure time? _____ **hours per day** _____ **minutes per day**

22. During the **last 7 days**, on how many days did you do **moderate** physical activities like bicycling at a regular pace, swimming at a regular pace, and matching **in your leisure time for at least 10 minutes**? _____ **days per week**

No moderate activity in leisure time ***Skip to question 24***

23. How much time did you usually spend on one of those days doing **moderate** physical activities in your leisure time? _____ **hours per day** _____ **minutes per day**

24. Suggest ways in which you think physical activity participation can be improved

_____

_____

_____

_____

_____

_____

_____

The end, thank you for participating

Adapted from American medical association SEE-03-0107:4M:11/03 with modifications

Appendix II

Data Entry Form

ID No.....

Time of service in the Army 0 - 4yrs ☐ more than 4 years ☐

Low back flexibility

Sit-and-reach (cm)

First trial: ..... Second trial: ..... Final trial: ..... Best: .....

Body composition/Percent body fat

Height (cm) ..... Age ..... Weight (kg) .....

Abdominal/Core Muscle Strength and Endurance

Using Sit-Ups: Total counts ..... in 60 seconds

Upper Body Strength and Endurance

Using Push-ups: Total counts ..... in 60 seconds

Cardiovascular endurance

Time taken to cover 2 miles ... . in minutes

Research Assistant

Name:

Signature:

Telephone No.:

Date:

Appendix III

Procedure for administering the tests

The subjects were briefed that the exercise will be done within two hours and as recommended by FM 21-20 (1998) they will be allowed 10-15 minutes of rest between each test.

The subjects were led in a warm up and simple stretching exercises, the exercise started in this order: flexibility of the lower back and hamstring muscles, testing body composition, upper body strength using push-ups, stomach and lower body strength using sit-ups and cardiovascular endurance using a two mile run.

Flexibility test

The objective of this test was to establish the flexibility of the lower back and hamstring muscle of the subjects

The equipment used was a sit to reach box

Two people one to ensure proper procedure then the second to take the recordings.

Procedure: This test involved sitting on the floor with legs stretched out straight ahead. Shoes were removed.

The soles of the feet are placed flat against the box.

Both knees should be locked and pressed flat to the floor - the tester may assist by holding them down.

With the palms facing downwards, and the hands on top of each other or side by side, the subject reaches forward along the measuring line as far as possible.

Ensure that the hands remain at the same level, not one reaching further forward than the other.

After some practice reaches, the subject reaches out and holds that position for at one-two seconds while the distance is recorded.

Jerky movements were not allowed.

Scoring The test is repeated three times and the best results taken as the score of the subject.

Illustration of a sit to reach test

Source:http://www.topendsports.com/testing/tests/sit-and-reach.htm, accessed on 06/08/2013 12:38:49

Body composition measurement

The objective was to establish the fat percentage of the subjects.

The equipment used was a biometric impedance, body Composition scale Tanita BCS 41

Procedure

The subjects' age was recorded in years

The subject were asked to removed shoes including socks

Height was taken in centimetres using a tape measure with a stand

Their age and height was entered in the analyser and they were asked to step on the scale. The readings would then come automatically.

Scores were recorded as percentage fat.

The push-up

The objective of this test was to measure the endurance of the chest, shoulder, and triceps muscle.

The equipments used was timers, pocho and a whistle

Three people oversaw event one which was to ensure the proper body alignment, the second one to time and the third to count the number of push-ups made in a minute.

Procedure

The participant assumed the front leaning rest position by placing hands where they are comfortable shoulder width apart.

Feet may be together or up to 12 inches apart.

When viewed from the side the body should form a generally straight line from the shoulders to the ankle.

Begin the push-up by bending the elbows and lowering the entire body as a single unit until the upper arms are at least parallel to the ground.

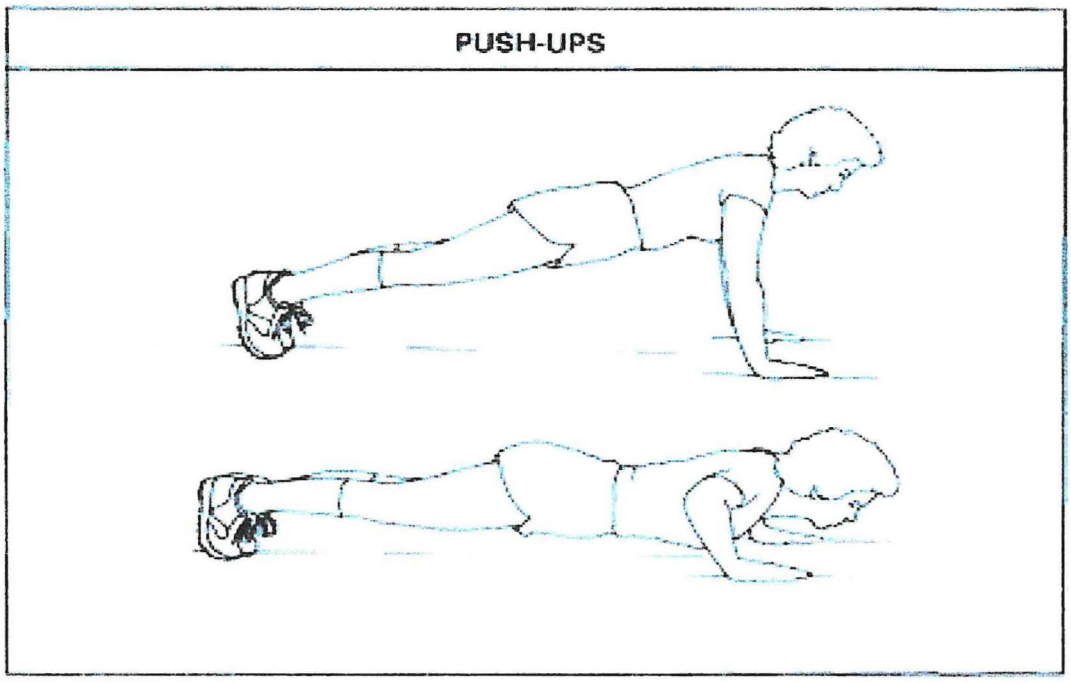
Then return to the starting position by raising your entire body that was one push-up.

At a command go a clock was started and a number of push-ups made in one minute was counted.

The subjects were only allowed to rest at the upper position, when he lays down the counting would stop. (U.S. department of the army, 1998, 14-11-14-12)

Scoring was done by just counting the number of push-ups made and recording them on the protocol sheet.

Illustration of a push-up



The push-up

Source: **(FM 21-20, U.S. Department of the Army, 1998), 14-12**

The sit-up event

The objective of the sit-up event was to measure the strength and endurance of the abdominal and hip flexor muscles. The equipments used was timers, pocho and a whistle Three people oversaw the event one was to ensure the proper position and hold the feet downwards, the second one to time and the third to count the number of push-ups made in a minute to ensure accuracy.

Procedure

Assume the starting position by lying on your back with your knees bent at a 90-degree angle

The feet may be together or up to twelve inches apart.

The heel is the only thing that must stay in contact with the ground.

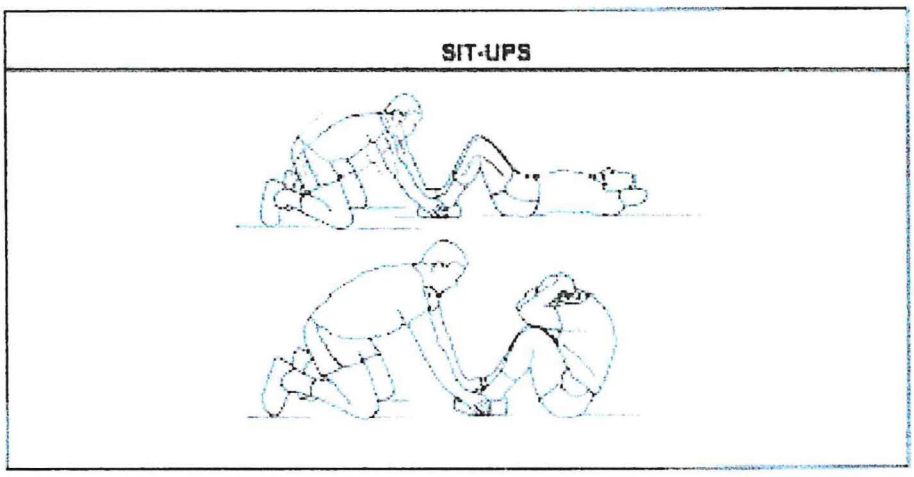
The fingers must be interlocked behind your head.

One person holds the feet from near the leg or ankle pressing them downwards.

At the command go, the subject was to raise the upper body forward to, or beyond, the vertical position, lower the body until the bottom of the shoulder blades touch the ground repeatedly for one minute.

The number of repetitions made was recorded on the protocol sheet. (U.S. department of the army, 1998, 14-14-14-16.)

Illustration of a sit-up test



The Sit-up

Source: **(FM 21-20, U.S. Department of the Army, 1998),14-14**

Aerobic fitness and leg muscle endurance:

The two mile run

The objective of the two-mile run was used to assess aerobic fitness and leg muscles' endurance.

The equipments used was timers, a 400m track and a whistle

Twelve people oversaw the event, four worked as corner judges, the other eight as timers and lap counters.

Procedure

The subjects were tested on their ability to complete the 2-mile course in the shortest time possible.

This was done on a 400m track with a flat surface; the distance was measured in meters. 2 mile is equivalent to 3219m which was 8 laps and 19m.

The race was started at19m behind the finishing point to ensure the 3219 metres are completed.

Although walking was authorized it was strongly discouraged. The time taken was recorded upon completion of the 2mile distance, (Department of the army, 1998, 14-17-14-18.). The race was well controlled with 10 subjects per race and eight timers to ensure accuracy in timing.

Appendix IV

Kyambogo University Letter of Introduction

KYAMBOGO UNIVERSITY

P.O Box 1 Kyambogo
KAMPALA – UGANDA

Phone: 285001/2
DIR Line: 285272
Fax No: 256-041-220464

FACULTY OF SCIENCE
Department of Sportscience

7-02-2013.

To Whom It May Concern

Dear Sir/Madam,

INTRODUCTION OF MASTER OF SCIENCE RESEARCH STUDENT

The bearer of this letter, ***Mr. Mwebaze Nicholas*** *is* an M.Sc. Sportscience research student (Reg. No. 2011/U/HD/185/MSc.SS) in the Sportscience Department.

He is conducting research for his MS.c in Sportscience entitled, ***"Fitness levels of UPDF soldiers in 4 and 5 Divisions."***

The purpose of this letter is to introduce to you the student and request you assist him conduct research in your organization.

KYAMBOGO UNIVERSITY P.O. BOX 1, KYAMBOGO 7 JAN 2013 FACULTY OF SCIENCE DEPARTMENT OF SPORTS SCIENCE

Looking forward to your cooperation,

Yours faithfully,

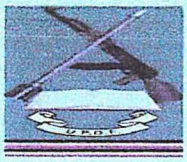
Mukana Roland (Ph.D)
COORDINATOR, Post graduate Programs [Sportscience Department]

Appendix V

UPDF Letter of Recommendation

RESTRICTED

UGANDA PEOPLE'S DEFENCE FORCES



OFFICE OF THE COMMANDER LAND FORCES
LAND FORCES HEADQUARTERS
P. O. BOX 132
BOMBO, UGANDA
Tel: 414 356270/632/272/273
Fax: 256-0414 356283

Our Ref: ***UPDF/COMD LF/S/3***

See Distr

21 Jun 12

REQUEST TO CONDUCT A STUDY IN 4 AND 5 DIVISIONS

Reference:

A. Unreferenced letter dated 11 Jun 12.

1. Enclosed is ref A above from our SNCO WOII Mwebaze Nicholas who is currently pursuing a Masters Degree in Sports and Science at Kyambogo University requesting to be allowed to conduct a research study on the fitness of the military having choosen 4 and 5 Divisions for this study.

2. In view of the above, I have no objection and I therefore request that you render him all possible assistance to enable him successfully conduct the study.

3. Forwarded.

KATUMBA WAMALA *psc fwc (MP)*
Lt Gen
Commander Land Forces

Distr
Ext
Act
Comd 4Div
Comd 5Div
Info
CPA
CESC

RESTRICTED

Appendix VI

Consent Form

I ..... Have properly understood the activities that will be involved in this fitness test, and have accepted willingly to take part. Aware that in case I feel I cannot continue I have the liberty in fallout at will

Name .....

Sign or thumb print ..... Date .....

Research assistant

Name .....

Signature .....

Date .....

Appendix VII

General Descriptions of the Subjects Across the Four Strata

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Fat Percentage	A Division Junior	50	16.4680	5.90505	.83510	14.7898	18.1462	7.30	38.60
	A Division Senior	49	17.9959	5.41595	.77371	16.4403	19.5516	6.70	33.90
	B Division Junior	48	17.5938	5.27529	.76142	16.0620	19.1255	8.30	29.90
	B Division Senior	50	18.0180	5.86636	.82963	16.3508	19.6852	9.30	32.80
	Total	197	17.5157	5.61971	.40039	16.7261	18.3054	6.70	38.60
Flexibility	A Division Junior	50	6.3540	2.14991	.30404	5.7430	6.9650	-.50	9.00
	A Division Senior	49	5.8755	2.14092	.30585	5.2606	6.4905	-.10	10.00
	B Division Junior	48	5.9896	2.85510	.41210	5.1605	6.8186	-3.00	11.00
	B Division Senior	50	6.2200	1.95396	.27633	5.6647	6.7753	-1.00	10.50
	Total	197	6.1122	2.28535	.16282	5.7911	6.4333	-3.00	11.00
Sit ups in 60 seconds	A Division Junior	50	58.1200	12.58545	1.77985	54.5433	61.6967	40.00	87.00
	A Division Senior	49	53.2653	13.93852	1.99122	49.2617	57.2689	12.00	87.00
	B Division Junior	48	62.2521	16.87347	2.43548	57.3525	67.1516	5.10	88.00
	B Division Senior	50	55.6400	11.63871	1.64596	52.3323	58.9477	22.00	79.00
	Total	197	57.2898	14.15152	1.00825	55.3014	59.2783	5.10	88.00
Push-ups in 60 seconds	A Division Junior	50	59.1000	13.60710	1.92433	55.2329	62.9671	33.00	87.00
	A Division Senior	49	51.6122	13.93410	1.99059	47.6099	55.6146	11.00	77.00
	B Division Junior	48	64.4167	17.28587	2.49500	59.3974	69.4360	11.00	87.00
	B Division Senior	50	56.1800	13.12995	1.85685	52.4485	59.9115	19.00	86.00
	Total	197	57.7919	15.16516	1.08047	55.6610	59.9227	11.00	87.00
Time in minutes taken to cover 2 miles	A Division Junior	50	12.7438	2.16559	.30626	12.1283	13.3593	10.00	24.24
	A Division Senior	49	13.8735	1.82389	.26056	13.3496	14.3974	11.10	19.10
	B Division Junior	48	12.4146	2.02337	.29205	11.8271	13.0021	10.00	19.10
	B Division Senior	50	13.1080	1.89810	.26843	12.5686	13.6474	10.00	16.30

Appendix VIII

The Post Hoc Multiple Comparisons Test Result

Dependent Variable	(I) Category of respondent per stratum	(J) Category of respondent per stratum	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Fat Percentage	A Division Junior	A Division Senior	-1.52792	1.13111	.532	-4.4593	1.4034
		B Division Junior	-1.12575	1.13705	.755	-4.0725	1.8210
		B Division Senior	-1.55000	1.12538	.515	-4.4665	1.3665
	A Division Senior	A Division Junior	1.52792	1.13111	.532	-1.4034	4.4593
		B Division Junior	.40217	1.14272	.985	-2.5592	3.3636
		B Division Senior	-.02208	1.13111	1.000	-2.9534	2.9093
	B Division Junior	A Division Junior	1.12575	1.13705	.755	-1.8210	4.0725
		A Division Senior	-.40217	1.14272	.985	-3.3636	2.5592
		B Division Senior	-.42425	1.13705	.982	-3.3710	2.5225
	B Division Senior	A Division Junior	1.55000	1.12538	.515	-1.3665	4.4665
		A Division Senior	.02208	1.13111	1.000	-2.9093	2.9534
		B Division Junior	.42425	1.13705	.982	-2.5225	3.3710
Best Attempt	A Division Junior	A Division Senior	.47849	.46137	.728	-.7172	1.6742
		B Division Junior	.36442	.46379	.861	-.8375	1.5664
		B Division Senior	.13400	.45904	.991	-1.0556	1.3236
	A Division Senior	A Division Junior	-.47849	.46137	.728	-1.6742	.7172
		B Division Junior	-.11407	.46611	.995	-1.3220	1.0939
		B Division Senior	-.34449	.46137	.878	-1.5402	.8512
	B Division Junior	A Division Junior	-.36442	.46379	.861	-1.5664	.8375
		A Division Senior	.11407	.46611	.995	-1.0939	1.3220
		B Division Senior	-.23042	.46379	.960	-1.4324	.9715
	B Division Senior	A Division Junior	-.13400	.45904	.991	-1.3236	1.0556
		A Division Senior	.34449	.46137	.878	-.8512	1.5402
		B Division Junior	.23042	.46379	.960	-.9715	1.4324
Sit ups in 60 seconds	A Division Junior	A Division Senior	4.85469	2.78726	.305	-2.3686	12.0780
		B Division Junior	-4.13208	2.80189	.455	-11.3933	3.1292
		B Division Senior	2.48000	2.77315	.808	-4.7068	9.6668
	A Division Senior	A Division Junior	-4.85469	2.78726	.305	-12.0780	2.3686
		B Division Junior	-8.98678*	2.81585	.009	-16.2842	-1.6893
		B Division Senior	-2.37469	2.78726	.829	-9.5980	4.8486
	B Division Junior	A Division Junior	4.13208	2.80189	.455	-3.1292	11.3933
		A Division Senior	8.98678*	2.81585	.009	1.6893	16.2842
		B Division Senior	6.61208	2.80189	.088	-.6492	13.8733
	B Division Senior	A Division Junior	-2.48000	2.77315	.808	-9.6668	4.7068
		A Division Senior	2.37469	2.78726	.829	-4.8486	9.5980
Pushups in 60 seconds	A Division Junior	A Division Senior	7.48776	2.92569	.054	-.0943	15.0698