UNIVERSITY OF EDUCATION, WINNEBA

AN INVESTIGATION OF THE INFLUENCE OF PHYSICAL TRAINING ON PHYSICAL FITNESS OF PERSONNEL IN THE GHANA ARMED FORCES

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UNIVERSITY OF EDUCATION, WINNEBA

TOPIC

AN INVESTIGATION OF THE INFLUENCE OF PHYSICAL TRAINING ON PHYSICAL FITNESS OF PERSONNEL IN THE GHANA ARMED FORCES

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A THESISIN THE DEPARTMENT OF HEALTH,PHYSICAL EDUCATION, RECREATION AND SPORTS, FACULTY OF SCIENCE EDUCATION,SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES, UNIVERSITY OF EDUCATION, WINNEBA IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR AWARD OF THE MASTER OF PHILOSOPHY IN (PHYSICAL EDUCATION)DEGREE

JUNE, 2014

DECLARATION

Candidate's Declaration

I, Abu Zakariah declare that, this thesis with exception of quotations contained in published works which have all been identified and duly acknowledged is entirely my original work and it has not been submitted either in part or whole, for another degree elsewhere.

Signature:..... Date:.....

Supervisor's Declaration

I hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines for supervision of Thesis as laid down by the University of Education, Winneba.

Supervisor's Name: Prof. Henry Augustine Pufaa

Signature:..... Date:.....

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DEDICATION

This research study is dedicated to my mother Ms Grace Lanseini for her words of encouragement to the importance of been educated, and for making my growth, development and attainment to higher standard in life worth-well. I am forever grateful. I say thank you mother.

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ABSTRACT

This study investigated the influence of physical training on initial entry personnel of the Ghana Armed Forces (GAF). A quantitative and qualitative research approach was used for the study. The research technique used was the mixed methods**.** The significance of the study was that it would help to create the awareness about the fitness levels of personnel of the Ghana Armed Forces (GAF) for decisions to be taken by policy makers. Four research questions were raised. The instrument used was a structured questionnaire and six (6) items interview questions. Data was analysed using descriptive statistics of frequency counts and percentage. The findings of the study revealed that majority of the respondents agreed that physical fitness was very important to them. They also agreed that they were aware that possessing good health related fitness is related to lower risk of illness and improved quality of life. The study further revealed that Initial Entry Trainees (IET) soldiers are fitter comparatively to other personnel of the GAF as their physical training regime in the academy ensures that they are very fit. Even though the personnel of the GAF were aware of the importance or benefits of physical training, only a few of them actually exercised regularly. The findings revealed that majority of the trainees or IET soldiers felt that the level of physical training was adequate whereas for the personnel of the GAF majority felt the physical training for personnel was inadequate but needed an improvement. These findings signify that the IET soldiers are indeed very fit when coming out of the Academy. The study further revealed that the resources available for trainees were strictly training programmes: drill sergeants/trainers, diet plans, physical training and fitness training equipment and grass fields. The current study also revealed that the fitness levels of female counterparts over 40 years was bad with about 50% of the respondents stating that they were not fit. For senior

members and other ranks over 40 years a majority representing 70% stated that they were not fit or somewhat fit. A comparison of fitness levels of Initial Entry Trainee (IET) soldiers and other personnel of the GAF show that that the fitness levels of IET soldiers are not equal to the fitness levels of soldiers who have served 10 years or more with the IET soldier being more fit than the other soldiers.

Some recommendations were that there is the need to emphasize the benefits of maintaining a continuous physical training programme for members of the GAF. There is the need for Trainees of the academy to be educated about the need for continuous physical training throughout the course of their career and not for it to be seen as a means to an end. Thus they would continually be motivated to exercise regularly leading to them maintaining fitness and them receiving improved health benefits. There is also the need to institute improved compulsory physical training for other staff of the GAF. They also need for them to be educated on the benefits of physical training so that they would not relapse into sedentary life styles as they age or progress in the profession. There is the need to replicate this study in military arms in Ghana. Also the necessary resources and equipment should be provided for personnel who are willing to adopt physical training programmes. Some form of motivation should be given to personnel of the GAF who are always involved in physical fitness training.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The impact of physical training has been known since antiquity. Marcus Cicero, around 65 BC, stated: "It is exercise alone that supports the spirits, and keeps the mind in vigor." This establishes the very essence of physical training for man as an active being. Globally, physical training consists of developing and building on the individual's physical fitness and stamina, incorporating structured programme of fitness, agility and cardiovascular routines. Wang (2011) reported that, in U.S, people who are to join the army prepare themselves for such efforts by practicing few basic exercises used regularly by the army for endurance, strength, stamina, and weight maintenance. According to Centers for Disease Control and Prevention (2007a) as cited by Ezine (2010) all ages can improve the quality of their lives and reduce the risks of developing coronary heart disease, hypertension, and some cancers and type-2 diabetes with ongoing participation in moderate physical activity and exercise. Daily exercise enhances one's mental well-being and promotes healthy musculoskeletal function throughout life. Although habitual physical activity is an attainable goal on the path to a healthier life, more than half of U.S. adults do not get greater than 30 minutes of moderate-intensity exercise per day at least 5 days per week (Centers for Disease Control and Prevention (2007a) as cited in Ezine Articles (2010).

After accepting a job with the Canadian Forces, all new recruits are required to complete basic training. These courses are designed to teach them the core skills and necessary

knowledge to succeed in a military environment. Since physical fitness is an integral component of military service, a large part of the course is spent in physical fitness training (FORCES, 2009). Passing the Canadian forces minimum physical fitness standard is a requirement of Basic Training. The training includes; skill and strength development, running progressively longer distances, and completing forced marches of various lengths (FORCES, 2009). It is suggested that strength and endurance could mean the difference between success and failure in a military operation. For this reason, Canadian forces personnel must be more physically fit than the general Canadian population. All Canadian Force personnel are required, therefore, to undergo an annual physical fitness evaluation, known as the Canadian forces EXPRES test, where they must meet a Minimum Physical Fitness Standard (Physical Training and Standards, 2009). The majority (96%) of Regular Force personnel who undergo the Canadian forces EXPRES test pass the evaluation. Those who fail and those who do not complete the evaluation are considered non-deployable and may face career restrictions. To ensure that Canadian forces physical fitness standards and programs maintain their relevance, the Minimum Physical Fitness Standard is evaluated on a regular basis with a focus on its scientific validity and its correspondence to common military tasks, gender and age (Physical Training and Standards, 2009).

In Africa, despite considerable recent technological advancement and increasing mechanization, a high level of physical fitness has remained an essential requisite of the modern-day South African soldier (Gordon, Van Rensburg, Moolman, Kruger, Russell, Grobler & Cilliers, 1986). Irrespective of the energy demands on their daily duties, all South African Defence Force personnel require a significant reserve of physical work capacity in order to cope successfully with the emergency situation that have become an expected

feature of today's military life (Gordon, Van Rensburg, Moolman, Kruger, Russell, Grobler, & Cilliers, 1986). Furthermore, it has been suggested that physical conditioning or enhance fitness also improves morale, sense of well-being, health and sedentary job performance-benefits desirable for all soldiers. In Africa, physical training in the army is a daily endeavour. Recruits are tested for fitness when they first join and undergo basic training.

Physical Training is not peculiar to the world and Africa alone. In Ghana, physical training is an essential component of military training for all officer candidates of the army, air force, and navy and is conducted at the Ghana Military Academy (Ghana Index, 2006). Basic combat training equips the individual with the fundamentals of being a soldier and provides the platform for individuals to undergo rigorous physical training to prepare their bodies and their minds for the eventual physical and mental strain of combat. Brigadier General Nkrumah, Deputy Commandant of Military Academy and Training Schools, indicated that a 'suitable systematic and adequate physical training programmes should be drawn to cater for various units' roles in war'. He noted that the physical training of units like 66 Artillery Regiment (Arty Regt), 48 Engineer Regiment (Engr Regt) and Infantry units should be more of resistance training while that of Support units like Forces Pay Office, Base Ordinance Depot and 37 Military Hospital should be more of basic Physical training to cater for health related physical fitness component (Ghana Armed Forces, 2010).

Physical training leads to physical fitness which has a positive impact on body composition and will result to less body fat (Ezine Articles, 2010). To improve level of fitness in preparation for basic training, focus should be on the following components of physical fitness; Cardio Respiratory Endurance, Muscular Strength and Endurance, Flexibility, and body composition (White, Wilson, Davis, & Petajan, (2000).Cited in EzineArticles,

(2010).The process of physical training for people of all works of life has impact with regards to their health and wellbeing with the Ghana Armed Force without exception.

1.2 Statement of the Problem

Soldiers report to initial entry training ranging widely in physical fitness. Although, there are special considerations when designing physical training programme for initial entry training for soldiers (550 Cord, 2004). Physical training involves safely training and challenging of all soldiers while improving their fitness level to meet required standards. The mission of physical training in initial entry training is in twofold: to safely train soldiers meet the graduation requirements of each course, and to prepare soldiers meet the physical demands of their future assignments. The regulations and conventions which govern the conduct of physical training in the Ghana Armed Forces stipulated in volume one of the Armed Forces Regulations; Administration and Command Staff, and Instructional Procedures.

All physical training programmes in initial entry training must follow: (1) progressive condition and toughen soldiers for military duties; (2) develop soldiers' self- confidence, discipline, and team spirit; (3) develop healthy lifestyle through education; and, (4) improve physical fitness (cardio-respiratory endurance, muscular strength, muscular endurance, flexibility, and body composition). The graduation requirement for the course and established appropriate fitness objectives is priority at the training center for commanders. The principles of exercise which include; precision, progression, and integration is integrated in to the training programme. Thus, the level of physical fitness of initial entry personnel of the Ghana Armed Forces has a direct impact on their ability to accomplish their mission as soldiers.

Ultimately, by adequately preparing these initial entry personnel for the physical demands of the work, they become soldiers who possess some level of reserved stamina and strength that can be utilized when the need arises. With a focused approach to physical training, both mental and physical toughness are built. Yet, today only a few basic and isolated components of physical fitness like the push-up, sit-up, and three kilometer run have become the center of gravity in many Army Physical Fitness Programmes. However being physically ready means enduring hardship, withstanding stress, and executing tasks under difficult demanding situation. Thus, physical training has both physical and mental components, but essential throughout the training process of initial entry personnel of the Ghana Armed Forces. Physical training serves as the bed rock to produce better soldiers not underestimating the essence of other training programmes. Therefore, the study was set to investigate the impact of physical training for new entries.

1.3 Purpose of the Study

The purpose of the research is to assess the impact of physical training on physical fitness of personnel of the Ghana Armed forces after they have graduated from the initial entry training.

1.4 Objectives of the Study

The general objective of the study is to assess the impact of physical training on initial entry personnel of the Ghana Armed Forces and the fitness level of the personnel after having passed out. Specifically the study sought to;

1. Examined the physical fitness level of personnel after they have passed out.

2. Compare the physical fitness level of trainees and some of the Ghana Armed Forces personnel.

3. Examine the fitness level of female counterparts, senior officers and other ranks above 40 years.

4. Identify the resources available and their adequacy to the Ghana Armed forces with regards to physical training.

1.5 Research Questions

To investigate the impact of physical training on initial entry personnel of the Ghana Armed Forces, the study seeks to answer the following research questions;

1. What is the physical fitness level of personnel of GAF after they have passed out?
2. What is the adequacy level of the physical training programme for the trainees (IET soldiers) and personnel of Ghana Armed Forces?
3. What is the difference in the physical fitness level of male and female senior officers and other ranks above 40 years of age?
4. What is the difference in the physical fitness level of initial entry training soldiers and those that have served for 10 years or more?

1.6 Significance of the Study

Physical fitness training is essential for society's survival and sustenance, but for the Armed Forces it is the bedrock of its existence. Without physical training and fitness the essence of the military to effectively perform its core duties of protecting the territorial integrity of Ghana is compromised. It is therefore important to critically examine the IET of soldiers to

ascertain and the level of preparedness of the military so that policy makers will be better informed in resourcing the Armed Forces. This would therefore aid them to plan and formulate physical fitness policies. While it is generally assumed that soldiers are physically fit, this study will serve as a source of empirical data to ascertain the fitness level of soldiers in the GAF. The recommendations that will follow from this study will be valuable therefore to guide future research and praxis.

1.7 Limitation of the Study

This study was limited to members of the Ghana Armed Forces only in the 1st and 2nd Garrisons of the Ghana Armed Forces. This encompasses personnel from Units, Bases and Ships, of the three Arms of Services of the Ghana Armed Forces (Army, Navy and Air Force).Some of the difficulties that the researcher confronted include; resources, the long distance between the study area and the academic field. It must be stated that though official permission was given by General Headquarters' Personnel Administration (GHQ, PA) for the conduct of this research, some difficulties were encountered in accessing records at firsthand due to the very nature of the military which regards information out flow as a security breach and risk. Primary data were collected through personal interviews of both male and female officers and soldiers of the three arms of service of the Ghana Armed Forces. Another Challenge has to do with the limited time frame for this type of research, more insight could have been derived given a longer time to delve deeper into the research area. In spite of these challenges, the researcher was determined and with assurance of confidentiality and anonymity to respondents primary data was gathered and together with secondary data enrich the presentation outcome of research.

1.8 Organization of the Study

The work is organised into five chapters. The first chapter comprises; the general introduction and the background to the study, statement of the problem, purpose of the study, objectives of the study, research questions, the significance of the study, the delimitations of the study and organization of the study. The second chapter presents a review of relevant literature to the study and also looks at the concept of physical training/fitness and theories explaining physical activity.

Chapter three looks at the methodology. Chapter four examines and analyses data, interpretation, discussions and inferences. The final chapter contains the conclusions and recommendations drawn from the study.

1.9 Operational/Definition of Terms

Armed Forces Regulations (AFR): the rule and regulations follow during entry level to the forces

Advance Individual Training (AIT): training that extend beyond individual limit

Basic Combat Training (BCT): training that involved strength and endurance level of army force

Basic Fitness Test (BFT): initial training rudiment undergo by the initial entry personnel and personnel of the Armed Forces.

Ghana Armed Forces (GAF): armed forces of the Republic of Ghana

IDF: Israeli Defence Force

IET: Initial Entry Training

Physically Readiness (PR): enduring hardship not withstanding stress experience during the training.

Recruit Training Centre (RTC): initial enrollment center of the Armed Forces.

RCT: Rational Choice Theory

SCT: Social Cognitive Theory

HBM: Health Belief Model

TTM: Trans-Theoretical Model

CHAPTER TWO

LITERATURE REVIEW

This section of the work aims at placing the study in a scholarly context by reviewing contributions made by researchers on the concept of physical fitness/training and its linkages with the military. It unveils some of the global views that people have shared particularly on the impact of physical training on soldiers. This seeks to put the issue of impact of physical fitness on initial entry personnel in its right perspective. The literature reviewed based on three main sections. The first section contains literature on definitions of physical training/fitness and related concepts in the field of physical training/fitness. The second section consists of theories and models of physical activity while the third section looks at others relevant literature in relation to the objectives of this research.

2.1 Theoretical Framework

2.1.1 The Concept of Physical Training/Fitness

The concept of physical fitness has undergone a wide range of studies and researches over the past years resulting in varying definitions and explanations. Physical fitness may be perceived primarily as a condition of complete physical balance and wellbeing of the individual in order to function well. Physical fitness can be achieved through physical exercise. The U.S. Army Center for Health Promotion and Preventive Medicine (2004) posits that, physical fitness is a set of attributes that allows individuals to perform purposeful, coordinated physical activity in a satisfactory manner. Thus the attributes or capabilities that make up physical fitness are called the "components" and these can be used to quantify

physical fitness in individuals. It is achieved through correct nutrition, exercise, and enough rest. This definition encompasses both the general view of physical and the specificity which is related to various fields like sports, the army among many others.

The World Health Organization (WHO) defines Physical Activity to include bodily movement produced by skeletal muscles that require energy expenditure. From this definition, one can comprehend the use and need of energy to stay fit and strong daily. Physical inactivity (lack of physical activity) has been identified as the fourth leading risk factor for global mortality (6% of deaths globally).

The term "physical fitness" has been defined in many ways. Most often, it has been related to the capacity for movement. It refers to a set of health- or skill-related attributes that people have or achieve which is related to the ability to perform physical activity, i.e. any bodily movement produced by skeletal muscles that results in an expenditure of energy (Caspersen et al., 1985). In general terms, physical fitness can be considered to be the matching of soldier's physical performance to his or her physical, psychological and social environment. The health-related attributes of physical fitness include body composition, cardio-respiratory fitness, flexibility, muscular endurance and muscular strength. The skill related attributes of physical fitness are comprised of agility, balance, coordination, speed, power and reaction time (Bouchard & Shephard, 1994; Caspersen et al., 1985). The degree to which soldiers have these attributes can be assessed with specific tests.

Physical fitness as related to health is characterized as the ability to perform daily tasks with vigor (Dumith; Junior; Rombaldi, 2009). These demonstrated traits and characteristics are associated with a lower risk of premature development of hypo-kinetic disease (Pate, 1988). This conclusion was derived primarily from clinical studies that showed that this was the

highest incidence of health problems among the elderly, young adults and sedentary lifestyles (Lunardi; Kaipper; Santos, 2007). In other words, the sum of these definitions take into account a very essential component of human existence which is health but limits its scope to the elderly, young adults and sedentary lifestyles, without expanding it to include vigorous and demanding professions like the military.

In military use, training means gaining the physical ability to perform and survive in combat, and learning the many skills needed in a time of war. According to the President's Council on Physical Fitness and Sports of the United States of America, physical fitness is defined as a set of characteristics enhancing performance of physical activity and decreasing your risk of premature health concerns. Accordingly, each branch of the Special Forces has a specific list of guidance for physical fitness. The minimum scores for each physical fitness test are used to determine if a soldier is capable of performing job requirement in the line of duty. One example of a physically fitness training test for the Army Green Berets is a 2-mile run in at least 12 to 14 minutes.

Passing the test indicates you have adequate amounts of physical, emotional and mental stamina. When your U.S. Army enlistment begins, you'll go through training courses to prepare you for active duty. Called initial entry training, it ensures that you're physically and mentally prepared to be a soldier, as well as teaches you how to perform the duties of your chosen career.

2.1.2 Theories Explaining Physical Activity

Different theoretical models seeking to explain mediators and moderators of physical activity have been identified in the literature. As King, Stokols,Ta len, Brassington, and Killingsworth, (2002) explained, some theories give more emphasis on the cognitive,

emotional, and psychological influences surrounding the individual and his or her choices to be active (personal level perspectives). While other theories stress the dynamic interplay among interpersonal factors, the behavior in question, and environmental influences (ecological perspectives).

2.1.3 Personal Level Perspectives

A series of theories articulate personal level perspectives that seek to predict and explain a physically active lifestyle. These include the following;

The health-belief model (HBM)

This model argues that, a person's propensity to be active is determined by his or her perception of the consequences of a potential illness and the perceived benefits of using physical activity as a countermeasure to the risk of getting sick (Seefeldt, Malina, & Clark, 2002).The HBM was developed in the 1950s as part of an effort by social psychologists in the United States Public Health Service to explain the lack of public participation in health screening and prevention programs. This theory is relevant to the topic under review because it is a psychological model that can be used to explain and predict health fitness in the Military by focusing on the attitudes and beliefs of individuals' entry level training and fitness level and military, a personnel's drive towards physical training.

The relapse-prevention model (RPM)

The model is derived from the study of the processes common to relapse in addictions, and emphasizes the significance of maintaining a desired behavior change. Even among the regularly active population, unexpected disruptions and negative factors can decrease or end engagement in physical activity. Such negative factors (e.g. limited social support or coping skills, low motivation, and interpersonal conflicts) may be diminished if the individual

anticipates them and plans to counteract them by developing skills for preventing relapses to inactivity (King, Blair, Bild, Dishman, Dubbert, Marcus, Oldridge, Paffenbarger, Powell, and Yeager, 1992; Seefeldt et al. 2002). This model helps to understand why maintaining an active lifestyle should be a continuous process so as to avoid physical inactivity. The key to identifying and avoiding high-risk situations to fitness lapses is to look out for any situation that makes an individual vulnerable to having a lapse in his or her normal physical activity regimen. This theory therefore, also helps us to appreciate what preventive measures or behavioral change strategies individuals can adopt to maintain an optimal fitness level before entry into the Armed Forces.

The social-cognitive theory (SCT)

This theory emphasizes self-efficacy as a central tenet and stresses "the importance of people's ability to regulate their own behavior by setting goals, monitoring their progress towards these goals, and actively intervening to make the socio-physical environment supportive of these goals" (King et al. 1992). Social cognitive theory as developed by Bandura explains behavior in terms of reciprocal relationships between the characteristics of a person, the behavior of a person, and the environment in which the behavior is performed (Bandura 1986; Baranowski, Buday, Thompson, & Baranowski, 2008, Perry, Tremblay, Signorile, Kaplan, & Miller, 1997).

The Social Cognitive Theory (SCT) specifies a core set of psychosocial determinants for effectively understanding a broad range of health behaviors, including physical activity. Self-efficacy has been identified as one of the most consistent determinants of physical activity behavior and adherence to exercise programs (White & Skinner, 1988). There are the four sources of Self-efficacy information which provides insight into an individual's self-

confidence in his or her ability to accomplish a task-mastery experience, social modeling, social persuasion, and the interpretation of physiological and emotional responses. These components will be explored in the literature of this research in relation to military personnel physical fitness and test of endurance.

The rational choice theory (RCT)

This theory argues that people, as rational individuals, weigh and carefully evaluate the advantages and disadvantages of their decisions and the experienced or anticipated hurdles and benefits from physical activity (Epstein, 1998). The model draws from behavioral choice theory which attempts to understand decision making under different available options. This model is also referred to in the literature as the expectancy-value decision theory and it views behavior as "a function of one's expectations of outcome stemming from a behavior and the evaluation of these outcomes compared with outcomes of alternative actions" (King et al. 1992).

Rational Choice Theory includes a broad body of research that attempts to account for how people act in a variety of contexts, including economic, political social and even health wise. This theory posits that, generally, individuals rationally pursue their self-interests regardless of the context. The three features of rational choice theory are: its assumption of egoism or self-interest as the central motivation of individuals; its reliance on consequences as part of a comparative decision making framework; and finally, its focuses on the individual and not on groups as the methodological and normative unit of analysis.

In Rational Choice Theory, individuals are seen as motivated by the wants or goals that best reflect their 'preferences'. They act within specific, given constraints and on the basis of the

information that they have about the conditions under which they are acting. In other words, individuals take decisions as a means to an end or to achieve a goal (Scott, 1991).

As it is not possible for individuals to achieve all of the various things that they want, they must make choices in relation to both their goals and the means for attaining these goals. Rational choice theory holds that individuals must anticipate the outcomes of alternative courses of action and calculate that which will be best for them. Rational individuals therefore choose the alternative that is likely to give them the greatest satisfaction (Heath 1976; Carling 1992; Coleman 1973).

According to Scott (1995), one of the criticisms against this theory postulates that Rational Choice Theory adopts an individualist position and attempts to explain all social phenomena in terms of the rational calculations made by self-interested individuals while obliterating the pull of social forces on behavior. In respect of the research under review, it is assumed that individuals make decisions on their physical fitness in a rational, rather than a random manner, therefore implies that their behavior can be modeled and thus predictions can be made about future actions. It also helps to understand how given the vast array of available behavioral change options and fitness level programs, military men and women engage in decision-making concerning their physical fitness for combat.

The trans-theoretical model (TTM)

The model proposes that individuals generally move sequentially through five major stages of change (pre-contemplation, contemplation, preparation, action, and maintenance) in adopting a new behavior and maintaining an active lifestyle (Seefeldt 2002). This model overlaps, with some of the theoretical formulations listed previously and incorporates several

other dimensions of behavior change including an estimation of the pros and cons of change and self-efficacy.

The trans-theoretical model was coined by the American researchers and psychologists Prochaska and DiClemente (1983). The model implies that an individual passes through the five different stages of change in physical training exercise, with increased motivation and greater propensity to change as they move through the stages. The theory therefore describes how a person modifies a problem behavior or acquires a positive behavior and has formed the basis for developing effective interventions to promote health behavior change (Prochaska, DiClemente, & Norcross, 1992; Prochaska & Velicer, 1994). In relation to this research, the Trans-theoretical Model is designed to help us understand how when military personnel or recruits are put in physical training regimens, interventions can be developed that catch match the specific needs and endurance level of the individual to meet combat-readiness standards of the Ghana Armed Forces. Since such interventions take cognizance of the individualized needs of recruits, people are much less likely to drop out because of demanding characteristics of set standards. Moreover, the Trans-theoretical Model makes it possible for this research to appreciate and focus on the intentional change processes military personnel undergo in physical training. The theory recognizes that different individuals will be in different stages of their physical training behavior change and that appropriate interventions must be developed to help such recruits meet the required standards of physical fitness.

2.2 Components of physical fitness

In this section, an attempt is made to explain some common and current definitions or key terms in physical fitness as used within the context of this study. This is necessary since

though some of the terms typically reoccur in the literature their usage and context are different from this present study. It is not to suggest though that the terms defined in this section is a comprehensive list of all relevant terms. Rather, it is a notion to define some of the most commonly used terms in the field (and commonly in my thesis) and to use definitions that are consistent with experts in our field.

2.2.1 Common Physical Fitness and Fitness Related Terms

Physical fitness is a state of well-being with low risk of premature health problems and energy to participate in a variety of physical activities (Howley & Franks, 1997). While either is a good definition, most experts agree that physical fitness is both multidimensional and hierarchical (Corbin, Lindsey, 2004). Bouchard, Shephard, and Stephens (1994) presented a comprehensive model for physical fitness that includes morphological fitness, bone strength, muscular fitness, flexibility, motor fitness, cardiovascular fitness, and metabolic fitness.

Assessment of Physical Fitness

It has been proposed that assessing and monitoring relevant attributes of physical fitness have an important role for the promotion of soldiers' work ability and health, as well as for the prevention of injuries in soldiers' field duties (Jones et al., 1993; Jette et al., 1992). Consequently, physical fitness may be understood by the assessment of those attributes that need to be taken into consideration according to the context in which soldiers' physical fitness is operationalized (Bouchard & Shephard, 1994). When a health-related fitness assessment is used as a method for increasing physical activity, it serves to: (a) assess the need for physical activity in reference to physical fitness and health; (b) provide a safe basis for individual physical activity counseling and exercise prescription; (c) follow individual

changes in physical fitness; and (d) educate and motivate with respect to regular physical activity (ACSM, 1995; Jette et al., 1992). Effective physical training programs and reliable fitness testing protocols that reflect changes in society and the requirements of warfare are needed.

Physical Fitness Test

In terms of measuring employees' physical capabilities, all military organisations participating in the Research Technical Group of the North Atlantic Treaty Organization (NATO) test their soldiers' physical fitness at least once a year (NATO, 1997; Williamson et al., 2009). The Ghana Armed Forces as well has a long tradition of testing the physical capabilities of its personnel. Over time, the physical performance test has been modified frequently, but it is still an important part of the recruitment procedure and soldiers' performance evaluations during military service.

The fitness-test batteries of the armed forces of different nations described in NATO (1997) all contain an assessment of aerobic endurance capacity, namely a distance run of 1.5 to 2.0 miles in the United Kingdom (UK), the United States of America (USA), Czech Republic (CZ), Austria (AT), and Georgia (GE); a 20-meter shuttle run in Canada (CA); and a 12-minute running test in Finland (FI), the Netherlands (NL), and Germany (DE). Most of those fitness-test batteries further contain sit-ups to assess abdominal muscle fitness (UK, CA, FI, NL, USA, CZ, and DE). Additionally, diverse tests for muscle power and agility are conducted, namely push-ups, hand grip tests, standing long jumps, timed squats, and 4x10m shuttle run tests.

Health-Related Physical Fitness

Physical fitness is defined by Corbin et al. (2003) as the body's ability to function effectively and efficiently, enjoy leisure time, be healthy, resist hypokinetic diseases and meet

emergency situations. They went further to explain that physical fitness is a state of being that consists of at least five health-related and six skill-related components, each of which contributes to total quality of life. It is related to, but different from health and wellness. Another definition given to physical fitness is, "a set of physical attributes that allow the body to respond or adapt to the demands and stresses of physical effort, that is, to perform moderate to vigorous levels of physical activity without becoming overly tired" (Insel et al., 2001). Robbins et al. (1997) define physical fitness as the capacity of the heart, lungs, blood vessels and muscles to function at optimal efficiency. According to Hahn et al (2003) physical fitness is achieved when "the various systems of the body are healthy and function effectively so as to enable the fit person to engage in activities without unreasonable fatigue". Physical fitness also means that the various systems of the body are healthy and function effectively so as to enable the fit person to engage in activities of daily living, as well as recreational pursuits and leisure activities, without unreasonable fatigue. The road to physical fitness includes proper medical care, the right kinds of food in the right amounts, good oral hygiene, appropriate physical activity that is adapted to individual needs and physical limitations, satisfying that, is adapted to individual needs and proper amount of rest and relaxation, since physical fitness affects the total person's intellect, emotional stability and physical conditioning (Prentice, 1997).

Apart from the above, physical fitness has been defined 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, and is a major basis for good health and well-being. It is important to note that physical fitness is an individual quality that varies from person to person, and it is influenced by age, sex, heredity, personal habits, exercise and

eating practice. Unfortunately, nothing can be done about the first three factors, however, an individual can improve the state of the others when needed (PCPFS, 2005). Proper nutrition is important to physical fitness, because energy expenditure depends on nutrition. If diet is inadequate, the fitness level will drop.

Overweight, underweight and weak individuals will have below average strength fitness levels (Ulrich,2006). All the above definitions emphasize on the positive and optimal organic function with efficiency in relation to the tasks ahead. Health-related fitness concerns itself with cardio-vascular or cardio-respiratory endurance, muscular strength, joint flexibility and body composition. The importance of physical fitness has been highlighted by Wessel and Arant(2004), with the statement that, physical fitness and activity reduces the risk of coronary artery diseases (CAD) in women with suspected ischemia. According to Weuve, King and Maison (2004), regular physical activity over a period of a year is associated with improved cognitive function and reduced cognitive decline in older women. From the above discussion, one is confident to say that physical fitness or health-related fitness is just a component of the total health concept. A person with a very high level of health related fitness should not think that is automatically healthy.

Cardiovascular Endurance

A health-related component of physical fitness that relates to ability of the circulatory and respiratory systems to supply oxygen during sustained physical activity. (Surgeon General's Report on Physical Activity and Health, USDHHS, 1996).Cardiovascular endurance is considered as the most important aspect of health-related fitness due to its importance in decreasing risk of heart disease, and promotion of optimum performance. Other names given

to cardiovascular endurance are cardio-respiratory fitness, cardio-respiratory endurance, cardiovascular fitness or aerobic fitness.

The name cardio-respiratory fitness is given because it requires the delivery and utilization of oxygen, which is only possible if the circulatory and respiratory systems are capable to perform these functions. The term "aerobic fitness" has been in use, because aerobic capacity is considered to be the best indicator of cardio-vascular fitness, and aerobic physical activities are the only means to achieve it (Corbin et al., 2003). Cardio-vascular endurance, according to Wuest and Lombardo (1994), is often referred to as cardio-respiratory endurance. It is the entire body's ability to exercise vigorously for extended periods of time without undue fatigue. Robbins et al. (1997) state that "cardio-respiratory endurance is the ability to deliver essential nutrients, especially oxygen to the working muscles of the body, and to remove waste products during prolonged physical exertion". They go on to say, that exercise reduces coronary heart disease risk, but that does not mean that when you exercise you will not have heart attack.

Genetic and other lifestyle factors are involved. Cardio-respiratory endurance, according to Insel et al. (2001), depends on the ability of the lungs to deliver oxygen from the environment to the bloodstream, the hearts capacity to pump blood, ability of the nervous system and blood vessels to regulate blood flow, the muscles capacity to generate power and capability of the body's chemical systems to use oxygen and process fuels for exercise. They have made it clear that improved cardio-respiratory fitness helps the heart to function efficiently, resting heart rate slows down, blood volumes increase, improved blood supply to tissues, blood pressure at rest decreases, bio-chemical function in muscle and liver are improved, increase in the ability of the body to use energy supplied by food and to do more

exercise with less effort from the oxygen transport system. Hahn et al., (2003) also share the view that cardio-respiratory endurance increases the capacity to sustain a given level of energy production for a prolonged period. It helps your body to work longer and at greater levels of intensity.

Cardio-vascular endurance has also been explained as the ability to deliver oxygen and nutrients to tissues, and to remove wastes over sustained periods of time (PCPFS, 2005). Apart from the above, Prentice (1997) has defined cardio-respiratory endurance as the ability to persist in a physical activity requiring oxygen for physical exertion without experiencing undue fatigue. Contrary to the belief that strenuous work harms the heart, experts have found no evidence that regular progressive exercise is bad for the normal heart. The heart muscles rather increase in size and power to allow the pumping of greater volumes of blood with fewer strokes per minute. They explain that "the heart of a normal individual beats reflexively about 40 million times a year. Over 4000 gallons or 10 tons of blood are circulated each day. The workload of the heart every night is equivalent to a person carrying a 30 pound pack to the top of the 102-storey Empire state building"(Lindsey, Welk, & Corbin, 2000). Good Cardiovascular fitness requires a fit heart muscle, fit vascular system, fit respiratory system, fit blood with adequate hemoglobin in the red blood cells and fit muscle tissue capable of using oxygen. These reduce risk of heart disease, other hypokinetic conditions and early death. It is now known that appropriate physical activity can build cardiovascular fitness in all types of people and those with excess body fatness. Good cardiovascular fitness enhances the ability to perform various tasks, improves the ability to function and is associated with a feeling of wellbeing (Newport, 2001).

Cardiovascular fitness could be developed through performance of active aerobic activities such as brisk walking, jogging, aerobic dancing, cycling, tennis, playing football, swimming and many others. For optimal level of development, activities should be done daily, at least, not less than three times a week. However, it should be noted that vigorous physical activities have the potentials to increase the risk of orthopedic injury if done too frequently. In view of this, most experts recommend, at least, one day a week off. The recommended duration of physical activities capable of building cardio-vascular fitness is 20-60 minutes of active aerobic activity. Activity could be either intermittent or continuous if the amount of exercise is the same, and last at least 10 minutes (Walt, 2003). Just as the duration of cardio-respiratory activities is important, so is intensity. Heart rate is widely accepted as a good method for measuring intensity during running, swimming, cycling, and other aerobic activities. Exercise that does not raise your heart rate to a certain level, and keep it there for 20 minutes would not contribute significantly to cardiovascular fitness.

Some experts like Blair and Connelly (1996), have come up with research findings that low to moderate exercise intensity is associated with favourable status on coronary artery disease risk factors, and other clinical variables, including less over-weight, lower lipid levels and higher bone mineral intensity. According to Arakawa (1993) training at 40% of maximal aerobic power reduces mildly elevated blood pressure. The stand of the America College of Sports Medicine (ACSM, 1993) on this issue of exercise intensity and blood pressure is that, low to moderate intensity exercise reduces blood pressure as much, or more than higher intensity exercise. A study conducted by Paternostro-Bayles, Wing and Rorbertson. (1989) involving ten women with Type II diabetes, resulted in an acute reduction in blood glucose

and insulin levels, after a 20-40 minutes exercise on a bicycle ergometer at 40% of maximal aerobic power.

Heart rate and oxygen consumption during exercise and recovery are good indicators of a person's aerobic efficiency. It is approximated that the heart beat rate of the untrained person is 72 times per minute. In a trained person, the heart becomes more efficient and the resting heart rate is often much lower than 72 beats per minutes.

The resting heart rate is best detected by placing a finger on the radial artery or carotid artery. Resting heart rate should be determined by taking your pulse after sitting quietly for five minutes. When checking heart rate during a workout, take your pulse within five seconds after interrupting exercise, because it starts to go down once you stop moving. Count pulse for 10 seconds and multiply by six to get the per-minute rate. The heart rate that should be maintained is called Target Heart Rate. There are several ways of arriving at this figure. One of the simplest is Maximum Heart Rate (220 - age) x 70%. Thus, the target heart rate for a 40 year-old would be 126. Some methods for figuring the target rate take individual differences into consideration.

Examples of such methods are as follows;

1. Subtract age from 220 to find Maximum Heart Rate.
2. Subtract resting heart rate (see below) from maximum heart rate to determine Heart Rate Reserve.
3. Take 70% of heart rate reserve to determine Heart Rate Raise.
4. Add heart rate raise to resting heart rate to find Target Rate (PCPFS, 2005).

Maximal oxygen uptake (VO2max) is considered to be the best measure of cardio-vascular fitness. It is the all-round predictor of a person's ability to perform sustained physical work

and a measure of how well the body can take in and use oxygen to release energy from the 'fuels' protein, fat and carbohydrate. The most appropriate method of expressing VO2max takes the subject's body weight into account. Typical VO2max results for sedentary young Australian menare around 40 millilitres of oxygen per kilogram of body weight per minute (mL/kg/min). Taking part in vigorous exercise such as jogging or walking/jogging for 20-30 minutes three to five times a week can improve VO2max by 10-20%. Athletes who have good running time have a better aerobic capacity (Laliberte, 2001).VO2max is best measured in a physiology laboratory, with the subject gradually increasing work output on a treadmill or bicycle ergometer, while his/her oxygen consumption is measured. The person to be tested is fitted with a mouth piece through which inhalation and exhalation is done, to enable the capture of the breath for analysis. Oxygen use is monitored minute by minute as exercise becomes harder and harder. When exercise becomes very hard, oxygen use reaches its maximum. The highest amount of oxygen used in one minute of maximum intensity physical activity is your maximum oxygen uptake. Oxygen uptake reserves (VO2 R) is achieved when resting oxygen uptake is subtracted from maximum oxygen uptake. A percentage of oxygen uptake reserve is often used to calculate the intensities for physical activities.

The treadmill test has been proved to be highly accurate and useful; however, it has its own problems. The treadmill test has proved to be expensive in terms of the equipment and the expertise needed to carry out the test. Apart from the above the process of gradually increasing the speed of the treadmill till the subject being tested gives an all-out effort, is time consuming (Siedentop, 2001).

The Harvard step-up test, the 12-minutes run-walk, and the 1-mile run-walk test are not as accurate as the treadmill test, because they are much less tightly controlled. Their advantages

are that no specialised or highly trained personnel is needed, but any sane person could be taught to carry out the test. They also do not consume time as the treadmill test. With the Harvard step-up test, a 12-inch bench is needed for the subject to step up and down for 3 minutes at a rate of 24 steps per minute. The left foot goes up followed by the right foot, and they come down with the left foot again then the right foot. The cycle of steps or beats makes up one step. After exercise, the subject sits down relaxed and not talking. Five seconds after the exercise, the pulse of the subject is counted for 60 seconds as the score. Eighty four or less heart rate per 60-seconds is classified as high performance zone, 85-95 heart rates per 60-seconds is in the good fitness zone, and the marginal zone is 96-119 heart rate and 120 and above heart rate is the low zone (Corbin et al., 2003).

The 12-minute run/walk test is done where a specific distance is already marked, especially on an athletics oval. The candidate starts running from a starting point at a steady pace for the entire 12- minutes being timed with a stop watch. At the 12-munite point, the candidate is informed to stop. The total distance covered within the 12 minutes is calculated as the score of the candidate. Depending on age, the score is rated as high performance, good fitness, marginal fitness or low fitness (Lindsey et al., 2000).

Muscular Strength

Strength in the muscle is necessary for the normal physical activities and enjoyment of a happier life. Hoeger and Hoeger (2002) have condemned the idea that strength is necessary only for highly trained athletes and other individuals who have jobs that require muscular work. To them, strength is undoubtedly a basic component of fitness and wellness, and is crucial for optimal performance in daily activities such as sitting, walking, running, lifting carrying objects and doing household work or even enjoying recreational activities. Strength

is seen as an equally important aspect of health-related fitness and refers to the maximum tension or force muscles develop in a single contraction against a given resistance. Wuest and Lombardo (1994) also state that muscle strength is the ability of a muscle or muscle group to exert force in a single effort against resistance. It is also made clear, that there is some crossover effect between muscular strength and muscular endurance.

Development of muscular strength also produces some increase in muscular endurance. However, muscular endurance does not enhance strength. Corbin et al. (2003) have defined strength as the amount of force produced with a single maximal effort of a muscle group. Apart from the above definitions Fall, Baylor and Dishman (1996) have also, stated that strength is the relative ability of a muscle group to exert force against resistance. Muscle strength is said to be on the same continuum with endurance. This has brought about the name "strength endurance" used by some writers. "Pure" strength is reached as one nears one end of the continuum where only one maximum contraction is required. As the number of repetitions increases and the contractile force decreases, the other end of the continuum; "pure" endurance, would be reached (Lindsey et al., 2000).

Talking about the "strongest" human muscle, experts propounded that, since three factors affect muscle strength simultaneously, and muscles, never work individually, it is unrealistic to compare strength in individual muscles, and state that one is the "strongest". If strength refers to the ability to exert a force on an external object, then, the strongest muscle should be the masseter or jaw muscle. The 1992 Guinness Book of Records, has been cited to record an achievement of a bite strength of 4337 Newton(N) for two seconds. To the experts, if strength refers to force exerted by the muscle itself, then the strongest muscles are those muscles with the largest cross-sectional area, since strength exerted by an individual skeletal

muscle fibre does not vary much. Each fibre can exert a force on the other of 0.3 micro-Newton. By this definition, the strongest muscle will be the quadriceps femoris or the gluteus maximus. By weight, shorter muscles would be stronger than longer muscles. Going by this principle, then the uterus may be the strongest weight in the body, because at the time of delivery, the uterus weighs about 1.1kg and exerts a downward force of 100 to 400 N with each contraction.

The tongue, which consists of sixteen muscles, appears frequently in the list of surprising facts as the strongest muscle in the body, but authorities are finding it difficult to come with a definition to make the statement true. Another school of thought also considers the heart which has the claim to being the muscle that performs the largest quantity of physical work in the course of a lifetime, to be the strongest muscle. Estimates of the power output of the human heart ranges from 1-5 watts, which is much lesser than the output of the quadriceps which can produce over 100watts, but only for a few minutes. The hearts low power output of one watt continuously for 70 years, yields a total work output of 2-3 gigajoules (Wikipedia, 2004).

Muscle strength is best developed with exercises done against resistance; also referred to as progressive resistance training (PRT) or progressive resistance exercise (PRE). This name is given because the frequency, intensity, and length of time of muscle overload are progressively increased as muscle strength increases. Hippocrates was the first to explain the principle behind strength training when he wrote "that which is used develops, and that which is not used wastes away", referring to muscular hypertrophy and atrophy. PRT dates back, at least, to Ancient Greece, when legends have it that the wrestler Milo of Croton,

trained by carrying a newborn calf on his back every day until it was fully grown. Isometric strength training was popularized by Charles Atlas from the 1930′s onwards.

Strength training became popular in the 1980′s following the release of the body building movie, "Pumping Iron", and the subsequent popularity of Arnold Schwarzeneger (Wikipedia, 2004). A PRE is typically done in 3 sets of 8 to 15 repetitions (reps) (Corbin et al., 2003). PRT could be done in a variety of ways, and with different equipment. Isotonic, isometric and isokinetic exercises are the variety of ways in PRT. Isotonic exercises involve muscle contraction in which the muscle changes length, either shortening (concentrically) or lengthening (eccentrically). In isotonic exercises, a resistance is raised and then lowered, as in weight training, and calisthenics to build dynamic strength in the muscle. Plyometrics is a form of isotonic exercise useful for athletes training for power. It involves jumping from boxes, hopping on a foot and similar types of activities.

Isometric exercises are those in which no movement takes place while a force is exerted against an immovable object. Muscle contraction is said to be static and is effective for developing strength. In such exercises little or no equipment and only minimal space is required to build static strength in the muscle. Isokinetic are isotonic-concentric exercises done with a machine that regulates both movement velocity and resistance. The Apollo, Exer-Genie, Mini-Gym, Hydra-Fitness (hydraulic machine) and others. These machines keep the velocity of the movement constant, and by matching the resistance to the effort of the performer, permitting maximal tension to be exerted throughout the range of motion, thus attempting to overcome the basic weakness of isotonics. However, isokinetic exercises are not better for the development of pure strength (Corbin et al., 2003).

Strength training requires the use of "good form", that is, performing the movements with the appropriate muscle groups and not transferring the weight to different body parts in order to move greater weight or resistance, called "cheating". Failure to use "good form" leads to injury or inability to meet training goals, since the desired muscle group is not challenged sufficiently, the threshold of overload is never reached and the muscle does not gain in strength (Bouchard, 1993).

Strength training is governed by principles including the principles of specificity, diminishing returns, rest, and recovery. The principle of specificity indicates that different types of resistance training programmes are used depending on the muscles you want to develop. To develop strength in the arms to enable you easily lift and push heavy loads onto shelves, isotonic contractions at a relatively slow speed, with a relatively high resistance are to be used. But, to develop strength in muscle of the fingers to enable you hold and throw heavy objects, the training should be done isometrically, using the fingers the same way as you would hold the objects.

Strength training develops strength, but it should be noted that anaerobic athletes need endurance training just as aerobic athletes need some strength training. The negative aspect of endurance training is that, athletes whose event rely too much on strength and power run the risk of losing their strength and power, when they train much on endurance, due to the modification that will take place in the different muscle fibres (Fahey et al., 2003). Properly performed, strength training can provide significant functional benefits and improvements in overall health and well-being including increase in bone, muscle, tendon and ligament strength and toughness, improved joint function, reduced potential for injury, improved cardiac function and elevated good cholesterol.

Weight training for strength, can stimulate the cardiovascular system, but exercise physiologists, based on their observations on maximal oxygen intake, argue that aerobic training is a better cardiovascular stimulus (Johnson, 2006). Though aerobic training is an effective therapy for heart failure patients, combined aerobic, and strength training is ineffective. A noted side effect of any intense exercise is increased levels of dopamine, serotonin, and epinephrine, which can help to improve mood and counter feelings of depression.

Strength training is primarily an anaerobic activity, although some proponents have adapted it to provide the benefit of aerobic exercise through circuit training. Strength training differs from bodybuilding, weightlifting, and others, which are sports rather than forms of exercise. However, strength training forms part of their training regimen (Wikipedia, 2004).

According to Corbin et al. (2003), about 80 – 90% of the fitness and health benefits are gained in the first set. The benefit reduces down and down with any additional set; thus the principle of diminishing returns. To prevent boredom, the A.C.S.M.(1993) has recently recommended single-set programmes for adults. The principle of rest and recovery also indicates that progressive resistance training for strength done every day of the week, does not allow enough rest and time for the muscles to recover and, therefore, gain nothing from the programme.

The greatest portion of strength is said to be gained in two days of training per week. The amount of gain in the third day of training is relatively small compared to earlier gains. It is interesting to know that, the amount of exercise needed to maintain strength is less than that needed to develop it. There is also a threshold of training and a target zone for strength development. The threshold for any strength programme should involve the interplay of the

frequency, intensity and time for training. (Wuest & Lombardo, 1994). The effect of some growth hormones on strength development has been highlighted by some experts. Insulin-like Growth Factor 1 (IGF-1) is a potent anabolic factor stored in the liver and peripheral tissues which plays a significant role in the development of muscle hypertrophy and strength in women. Hence strength programmes for women should focus on maximizing growth hormones. The use of contraceptives which are not of the tri-phasic variety by women, affects the production of growth hormones. Authorities in strength training have recommended that, strength training for women should be tailored to each athletes menstrual cycle because, there is slight greater exercise response towards strength development, when a woman is in both the follicular (first half) and the luteal phases of the menstrual cycle.

It is, however, recommended that, during the luteal phase, strength training should consist of moderate intensity loading, using 3-4 sets of 8-10 repetitions at 65-75% of 1-RM, done three times a week, involving the large muscle groups. The rest period should not be more than two days (Brown, 1996). Some misconceptions and myths about strength training are as follows. The idea that progressive resistance training (PRT) is only for young people is not true, because according to experts people within the ages of 80 and 90 can benefit from regular PRT. The popular belief that complete weight training workout requires two hours is for competition lifters and body builders, but not for athletic training which requires about 45– 90 minutes and 30 -45 minutes for recreation fitness. The expression "no pain, no gain" is also a misconception. If your training hurts your muscle fibres, you may probably be harming yourself, but it may be helpful to strive for a burning sensation in the muscle. Increased strength does not also make you move more slowly or make you uncoordinated. Up to a point, increased strength leads to increased speed (Lindsey et al., 2000). Insel et al.,

(2001) say that muscular strength helps keep the muscles in proper alignment, preventing back and leg pain and providing the support necessary for good posture. Muscle mass also increases during strength training, therefore, making it possible for higher rate of metabolism and fast energy use which helps to maintain a healthy body weight. To them strength training is good for healthy ageing, prevents life–threatening injuries, and also has some benefits to cardiovascular health. On the other hand, muscle weakness can result in abnormal movement or gait and can impair normal functional movement. It can also produce poor posture, lower back pain and unappreciated appearance (Prentice, 1997).

Strength training in the form of progressive resistance exercises are ideal for strength building. Some experts have indicated that strength-training exercises tend to selectively develop fast-twitch muscle fibres, and muscle endurance training, selectively develops slow-twitch fibres (Corbin et al., 2003). The effect of strength training on children depends on what type of strength.

training is utilized, however, orthopaedic specialists used to recommend that children avoid strength training, because the growth plates on their bones might be at risk.

Recent studies by The National Strength and Conditioning Association have shown that a properly designed and supervised resistance training programme is safe for children (Wikipedia, 2004). Muscle strength is measured in various ways depending on the muscle group involved. Weight lifting exercises like the bench press, overhead (military press) and push-ups could be used to measure upper-body strength. Sit-ups, crunch (curl-up) and trunk-lift could be used to develop and to measure abdominal strength. Leg press and squats with weights could also be used to measure lower-body strength, whiles the hand dynamometer is used to measure grip strength (Wuest et al., 1994).

Muscular Endurance

Muscular Endurance is the ability to perform repeated contractions against a sub-maximal resistance (Anderson, Broom, Pooley, Schrodt, and Brown, 1995). The ability of the muscle to exert a sub-maximal force against resistance repeatedly or to sustain muscular contraction continuously overtime, is characterized by activities of long duration but low intensity (Robbins et al., 1997).Corbin et al. (2003) define muscular endurance as the maximum number of repetitions or muscle contractions one can perform against a given resistance. For example, the number of times you can bench press 60 kilogramme weight. Muscular endurance could be classified as static and dynamic endurance which are all called isotonic endurance.

Muscular endurance is developed through endurance training which leads to adaptations in the slow-twitch fibres that allow them to produce energy more efficiently and better resist fatigue. The PRT is used in a number of ways to develop muscular endurance in slow-twitch muscles fibers. Isotonic, isometric and isokinetic exercises could be mentioned here. Unlike strength development which requires high resistance, muscular endurance requires low resistance and repeated contractions with short rests. Muscular endurance exercises are performed with a relatively high number of repetitions and lower resistance (Siedentop, 2001). Just like muscle strength, muscle endurance is also necessary for optimal health and maximum performance. The fireman without this mentioned component of health-related fitness would not be able to fight bushfire for hours continuously. The marathon and other long distance athletes also need muscular endurance for them to perform creditably.

It has been proved by Corbin et al. (2003) that athletes and people interested in jobs requiring high-level performance such as the law enforcement and fire safety are, especially, likely to

benefit from good muscular endurance fitness. A person with appreciable muscle endurance will be able to perform for long periods of time without undue fatigue. In this state, the person will have enough energy to perform daily work efficiently and effectively and has reserve energy to enjoy leisure time. Authorities, including Welk and Blair (2000) share the view that an individual who is strong would be less fatigued, because relatively less effort would be required to repeat muscular contraction. An assertion made by Clement and Hartman (1996) indicates that, a person who is strength trained would fatigue as much as four times faster than a person who is endurance trained.

A postulation by Fahey et al. (2003) also confirms a slight correlation between endurance and strength, since the development of one component influences the development of the other to some extent. Training for muscular endurance follows the same variables just like training for muscular strength. The difference comes in as follows. Whiles strength training requires higher resistance or heavier weights, endurance training requires lighter weights or lower resistances. The number of repetitions per set is lower for strength training, but the number of sets, usually 3 sets, per workout is the same for both strength and endurance training. It is important to note that both strength and endurance training need a day or two within a week for resting to prevent any health problem (Siedentop, 2001).

Trunk Curl-Up (dynamic), Push-Ups, Flexed- Arm support (static) and Side Leg Raises performed for a number of repetitions without a weight are exercises that could be used to develop muscular endurance in the abdominals, the triceps of the arms and the outer thigh muscles respectively. The above mentioned activities are also used to evaluate muscular endurance. A rating scale which is age based is used for the classification. To be in the high performance zone, a man of 17-26 years should be able to perform Curl-Up 35+as a score.

For the same age group, a score of 29+ for Press-Ups will be in the high performance zone. A man of the same age group falls to the low zone when he scores less than 15 and 16 respectively for Curl-Ups and Press-Ups.

Flexibility

Flexibility is a health-related component of physical fitness that relates to the range of motion available at a joint. (Surgeon General's Report on Physical Activity and Health, USDHHS, 1996). Experts are of the view that, flexibility requires range of motion without discomfort or pain (Howley and Franks, 1997).Flexibility is specific to each joint of the body, thus there is no general measurement of flexibility as there is for cardiovascular fitness. Flexibility is typically measured in the lab using measurement devices such as a goniometer, flexometer and in the field with tests such as the sit and reach, and the zipper.

Flexibility is the measurement of the achievable distance between the flexed position and the extended position of a particular joint or muscle group. This measurement depends on the length and looseness of the muscles and ligaments due to normal human variation and the shape of the bones and cartilage that make up the joint (Chek, 2002). Wuest and Lombardo (1994) have defined flexibility as the ability of the various joints of the body to move through their full range of motion. Insel et al. (2001) refer to flexibility as the ability to move the joints through their full range of motion. To them flexibility is not a significant factor in the everyday activity of most people, but inactivity causes the joints to become stiffer with age, causing poor posture, back, shoulder and neck pains. Prentice (1997), has defined flexibility as the ability to move freely throughout a full, non-restricted, pain-free range of motion about a joint or series of joints.

According to Lindsey et al. (2000), flexibility is the measure of the range of motion available at a joint or group of joints. It is determined by the shape of the bones, cartilage in the joint, length and extensibility of muscles, tendons, ligaments and fascia that cross the joint. The PCPFS (2005) has defined flexibility as the ability to move joints and use muscles through their full range of motion. To the Council, sit-and-reach test is a good measure of flexibility of the lower back and the back of the upper leg muscles. As well as the potential for muscle wasting, inactivity brings with it a tendency for our muscles to become less flexible, thus decreasing the 'range of motion' of our joints as we age (i.e. the joints stiffen). Regular stretching exercises and full 'range of motion' activities (such as gently swinging the arms and 'high kicking') will reduce or delay this onset of inflexibility. Stretching for flexibility is best done after you have completed your endurance or resistance training, because the muscles are warm; as a result they will be able to be fully stretched. Long, slow stretches are recommended (hold for 20-30 seconds), with each stretch being taken to the point where a slight discomfort is experienced. Each stretch should be followed by a short rest, and then repeated several times. All the major muscle/tendon groups (legs, abdomen, arms, shoulders, wrists and so on) should be stretched. Stretching should be conducted several times per week, preferably after conducting aerobic and/or resistance training (American Heart Association and the National Heart, Lung and Blood Institute, 2005).

Too much flexibility as well as too little flexibility could be detrimental (Corbin et al., 2003).To develop flexibility, it is recommended that muscles are stretched past normal length until resistance is felt. For duration, the stretch should be held from 5 to 10 seconds initially, building to 30to 45 seconds (Wuest et al., 1994). The importance of flexibility to health, good posture and physical performance is even appreciated by animals like the cat and the

dog who stretch after sleeping to maintain good joint mobility. Every person needs some flexibility to perform efficiently and effectively in daily life. Body builders who have developed bulged muscles through improper weight-training, usually sacrifice flexibility in order to develop muscle strength.

Improvement in flexibility can reduce muscle strain from trying to do things which your current flexibility prohibits without effort. It can improve back movement and muscle pain and will sometime help with problems such as migraines (Crump, 2000). Proper stretching is one of the more helpful ways to reduce chronic pain. If you don't stretch, your muscles get tight and weak, which leads to pain. One of the main causes of back pain is tight hamstrings (Calabrese, 2001). While stretching may make you feel better, it does not remove a potential case of injury. This is why stretching, especially static stretching, before working out does not prevent injuries (Kurz, 2000).

Fox (1998) and other authorities like Fahey, Insel and Roth (2001), have recommended flexibility and stretching exercises to help maintain good joint mobility, increase resistance to muscle injury and soreness, maintain good postural alignment and help to improve personal appearance and image. According to Lindsey et al. (2000), adequate flexibility provide the following health benefits. Backache and the risk of muscle strain is reduced when a person is flexible. Flexibility is also associated with effective daily functioning, including driving ability among older adults and brings about improved athletic performance. Lack of flexibility causes stiffness or contractures. Too much flexibility also leads to problems like loose jointed, hyper mobility or erroneously as double jointed. Some experts believe that hyper mobility may lead to athletic and dance injury at the knee and ankle. It may also develop premature osteoarthritis. Stretching has been the physical activity used to improve

flexibility. The three basic types of flexibility exercises are ballistic or dynamic stretching, static stretching and Proprioceptive Neuromuscular Facilitation (PNF) stretching. Static stretching, by its name, is done by stretching the muscles slowly and held for a period of several seconds with no movement in the group of muscles stretched. If performed correctly the probability of tearing a soft tissue is very low and is recommended for beginners, for people with a history of muscle injury and for people who do not need exceptional levels of flexibility for athletic performances. This type of stretching could be done with active or passive assistance.

Static stretching reduces the force production of the stretched muscles (Rosenbaum & Hennig, 1995). It was revealed that, after performing 3-15 seconds stretches of the hamstrings, quadriceps and the calf muscles, the vertical velocity of majority of vertical jumpers reduced (Knuds, 2000). A fast dynamic movement immediately after a static stretch may injure the stretched muscles (Kokkomen, 1995). The PNF stretching is also static in nature, but most commonly characterized by a pre-contraction of the muscles to be stretched and a contraction of the antagonist muscle during the stretch against a passive assistance. This type of stretching has been popular for rehabilitation since the 1960s (Corbin et al.,2003).

Ballistic stretch comes in when muscles are stretched by the force of momentum of a body part that is either bounced, swung, jerked or rocked. It is the momentum created by the movement of the body part that stretches the muscle. As with static stretching, ballistic stretching could be done actively, passively with the assistance of a partner or by gravity. This method of stretching has the advantage of stretching the muscles further than the other methods, but there is always the high risk of injury. However, because many athletic

activities are ballistic in nature, sport-specific ballistic stretches are appropriate for most athletes. This brings in the principle of specificity in sports training. It is important to appreciate the fact that each method of stretching has its advantages and disadvantages, and the best method for anyone will depend on the persons physical condition and the aim for stretching, whether to increase range of motion or just to maintain it. (Corbin et al., 2003; Fahey et al., 2003).

Many people do not realize the impact that periodic stretching has on the fitness level of their body, or its ability to perform. Stretching before weight training can actually improve your overall lift strength, as well as your endurance. Stretching before a workout is paramount to realizing maximum strength gains and necessary to experience the greatest benefit during a workout. Gains in strength are not the only benefit from routinely stretching during a workout. After the cardiovascular or weight training activity you should always stretch to allow your muscles to extend to their fullest range of motion. This provides two significant benefits: the first of which is that it prevents your range of motion from becoming limited. This prevents you from becoming muscle bound, and from having to work too hard in your daily activities. The second benefit is that stretching after a workout helps to remove the waste that has built up in your muscles during the workout. This speed up muscle recovery, and lessens the muscle soreness that is typical of any fitness programme (Johnson, 2006). The appropriate time for stretching is still a problem among experts, but until scientists reach a consensus, it seems wise to stretch when the muscles are warm. This means that stretching could be done in the middle or near the end of the workout (Fahey et al., 2003). It is impractical to test the flexibility of all joints. The tests for flexibility are therefore, specific to joints. Prentice (1997) has outlined a series of tests which include the sit-and-reach test, total

body rotation and shoulder rotation test to measure flexibility in the hamstrings and low-back, the trunk and hip and the shoulders, respectively. The sit-and-reach test, for example, is done by sitting on the floor, legs straight and feet 12 inches apart, the student places the hands together and reaches forward as far as possible.

The reach is measured on a graduated scale along which the forward stretch is made. The greater the distance reached, the greater is the flexibility (Wuest et al., 1994). Some common and natural limitation factors to flexibility are as follows. Lack of use of a body part or joint, injury or disease can decrease joint mobility. The lack of use of a body part or joint or static positions held for long periods leads to shortened muscles, ligaments and other soft tissues and loss of mobility. The inability to stretch far enough forward indicates tightness in the lower back and hamstrings which comes by due to ageing and inactivity (Lidell, 1997). Bodybuilders who fail to move the weights through a joint's full range of movement lose flexibility in that joint. Diseases such as arthritis and calcium deposits can damage a joint, and inflammation at joints can cause pain that prevents movement. Injuries and accident of various kinds which damage muscles and tendons also lead to loss of flexibility in the affected joints (Scott, 2002).

Body Composition

Body Composition is a health-related component of physical fitness that relates to the relative amounts of muscle, fat, bone and other vital parts of the body. (Surgeon General's Report on Physical Activity and Health, USDHHS, 1996). This component of physical fitness is measured in the laboratory using such measures as underwater weighing and in the field using skinfold caliper. There are a variety of other methods of assessing body composition; also referred to as relative leanness (Howley & Franks, 1997). As noted

previously body composition is the only non-performance measure among the health-related physical fitness components.

Body composition, the fifth composition of health-related fitness and wellness has been defined by Corbin et al. (2003) as the relative percentage of muscle, fat, bone, and other tissues of the body. Wuest and Lombardo (1994) have also defined body composition as the attainment of the appropriate proportion of lean body tissues to fat body tissue. Another definition given by Anderson et al. (1995) is that body composition refers to the relative percentage or amount of fat tissue in the body. Apart from the above, the PCPFS (2005) has also come out that, body composition is the make-up of the body in terms of lean mass (muscle, bone, vital tissue, and organs) and fat mass. Fat is found in all of the body's cells. However, a special type, the adipose cell, stores fat. Body fat serves to cushion organs and stores energy for future needs. In general, people tend to have large stores of fat in the abdominal area; women tend to store more fat in their hips and thighs than men. Under this condition, adipose cells swell fat. When the energy from fat is needed to fuel activities, the fat cells lose stored fat and shrink in size. (Prentice, 1997).

Apart from the above factors, Corbin and associates (2003) glandular disorders and basal metabolic rates (BMR) are contributing fattening agents. Experts have mentioned that, about one or two percent of over-fatness is directly caused by glandular disorders. Thyroid problems can cause low metabolic rates that result in fat gains. In the view of Wyne (2000), this "old myth" that obesity occurs as a result of a low metabolic rate is unfounded. To him, obesity can only occur when energy intake remains higher than energy expenditure for an extended period of time. BMR is the indicator of a person's energy expenditure when totally inactive. Younger and active people have a higher BMR which prevents fats accumulation,

and older and inactive people have a lower BMR which leads to fats accumulation. Kearney (2000) has made it clear that, physical inactivity is an important contributor to the ever increasing levels of overweight and obesity. Lindsey et al. (2000) have pointed out that, it is the essential fat tissues which are used in the body for insulation around nerves, fat pads in joints, temperature regulation, shock absorption, regulation of essential body nutrients including vitamins A, D, E and K and forming cell membranes are the amount of fats most needed for good health than storage fat located beneath the skin as well as inside the abdominal cavity are necessary.

Experts have agreed that males and females should possess not less than 5% and not more than 10% of essential fats. It is then on essential fat levels in excess of the essential fat that poses health risks. (Anderson et al., 1995) Higher percentages (over 25% in men and over 35% in women) of storage fat in the body promote obesity, heart disease, diabetes, stroke, cancer, liver disease, depression, low self-esteem and others(Corbin et al., 2003). Although some scientists and dieticians reject the "eat less at night to burn more fat" theory and believe that 24 hour calorie balance is the only thing that matters, there are some logical and scientific reasons why fat loss is accelerated if you eat less at night and keep the last meal at least two hours from bedtime:

1. You are less active at night and are burning fewer calories
2. Your metabolism is slowest while you are sleeping
3. You will release more insulin at night compared to in the morning
4. Your glycogen stores are fuller after a day of eating so you are more likely to store excess carbohydrate as fat instead of storing it as muscle glycogen (Johnson, 2006).

Obesity can lead to severe health problems. Willett (2004) warns of the danger of Type II diabetes for even young people who are obese. Weight-related conditions lead to some 300,000 premature deaths a year in the United States of America. According to Velcu, Adolphine and Angus (2005), obesity can have a tremendous impact on the psycho-social, physical and economic health of those afflicted by it. In the view of Haughton (2000), obesity raises the risk of diabetes, and fatness is linked to early menstruation, a risk for hormone influenced cancer. People who are obese are more likely to suffer from coronary diseases, adult onset diabetes, gallstone, arthritis, high blood pressure and some types of cancer. People with extra weight around their middle; 'apple shape' are at more risk of some disease than those who have most of the extra weight around their hips and thighs; 'pear shaped'. People who are over-weight find it more difficult to be physically active and this may add to their health problems. Most of the health problems are removed once the extra weight is lost. Although cigarette smokers weigh less than people who do not smoke, the risk from smoking are more than those of being obese (British Nutritional Foundation, 1998). Being over-weight, can have the effect of hastening sickness and death. The fatter people are, the more likely they are to die earlier than they should (Hope, 2000). The International Obesity Task Force (2004) has found out that, the health risk of obesity takes time to develop and can be avoided by losing weight.

A study conducted by Weinstein, Sesso and Lee (2004) revealed that BMI and physical activity were both significant independent predictors of incident diabetes with increased BMI having a greater effect than low activity. Obese, low activity women were at highest risk of developing diabetes. The fight against obesity has also become a problem. Most people use dietary restrictions to control obesity, but experts in this field of study recommend the

combination of regular exercise for only 30 minutes, can be beneficial, because exercise burns calories. Jones (2004), has emphasized that, increased physical activity and healthful dietary behaviours are necessary for the reduction of obesity. Kearney (2000), shares the same view by pointing out that, weight loss is best achieved by combining changes in eating habits with increased amounts of physical activities. According to the British Nutrition Foundation (1998) being plump (BMI 25- 30) but not obese, is not a risk to health, but people in this range are encouraged not to put on any more weight and to ensure that they are exercising regularly and making sensible dietary choice.

The basic premise behind weight training is the promotion of fat loss by increasing lactic acid levels in the body, which in turn produces higher growth hormone levels. This puts the body in an optimal state to burn fat and build lean tissue (Johnson, 2006).

Excessive dieting may increase the prevalence of eating disorders such as anorexia, nervosa, bulimia and even obesity. Being underweight or having low body fat levels of between 11-16% is also a risk to health, as it can increase the risk of conditions such as osteoporosis and amenorrhea; absence or infrequent menstruation and frequent injuries in women (British Nutritional Foundation, 1998). Walking can be a very effective component of a weight-loss program. It is beneficial and ranks high compared to other popular exercise activities. For example, walking at 4 miles per hour, matches bicycling at 10 miles per hour. Striding at a more leisurely rate at 3 miles per hour requires the same energy as cycling at 5 miles per hour (Prentice, 1997). According to Willett (2004), a well-known writer on nutrition and health, for many people, walking is an excellent alternative to other types of physical activity because it does not require any special equipment, can be done anytime and anyplace, and is generally quite safe. His advice refers to brisk walking, not just taking a stroll, for 30 minutes

daily. Bird (2005) has also postulated that, walking drops weight makes you faster and brings diabetes under better control.

A medium-sized adult would have to walk more than 30 miles to burn up 3,500 calories, the equivalent of one pound of fat. Although that may seem like a lot, you don't have to walk the 30 miles all at once. Walking a mile a day for 30days will achieve the same result, providing you don't increase your food intake to negate the effects of walking (American Heart Association and the National Heart Lung and Blood Institute, 2005). A study by Krall and Hughes (1994) also revealed that, a walk of only about 1 mile per day may improve bone health. They measured bone mineral density and habitual walking in a group of 239 post-menopausal women. Women who walked more than 7.5 miles per week had higher mean bone density of the whole body and of the leg and trunk regions, than women who walked less than 1 mile per week. They also had fewer declines in bone density during a year's follow-up.

A recent report by a team of Japanese and Danish researchers indicated that, breaking up an exercise session, by adding a rest period in between, may boost a workout's fat-burning efficiency. In their researcher, seven men were made to exercise for two 30 minute stretches, taking 20 minute rest break in between, they burned more fat than when they exercised for a single 60 minute session, and then rested afterward (Exciting Ebony, 2007). Continuous cardiovascular exercise, such as walking, jogging, stair climbing, or cycling, sustained for at least 30 minutes, will burn body fat no matter when you do it. However, to get the maximum benefits possible from every minute you invest in your workouts, experts advise that aerobic exercises should be done before you eat your first meal.

It has been revealed that early morning aerobic exercise on an empty stomach has three major advantages over exercising later in the day. Early in the morning before breakfast, the levels of muscle and liver glycogen, as well as blood sugar are low since they breakdown to provide glucose for various bodily functions that go on during sleeping. Working-out before breakfast, when glycogen, the body's primary and preferred energy source is in short supply, forces the body to tap into its secondary or reserve energy source; body fat. The body always burns a combination of fat and carbohydrate for fuel, but depending on when exercise is performed, one can burn a greater proportion of fat relative to carbohydrate. The second benefit derived from early morning exercise sessions, according to experts, is what is called the "afterburn" effect. When an exercise is performed in the morning, fat is not only burnt during the session, but the body also continues to burn fat at an accelerated rate after the workout. This happens because; an intense session of cardiovascular exercise can keep your metabolism elevated for hours after the session are over. The third benefit of early morning workouts though is not fat reduction, but a feeling of accomplishment that stays with you all day long after an invigorating workout (Venuto, 2005).

Obesity is a reversible condition, and with careful attention to both prevention and treatment, it should be possible to tackle this problem in the future. Where dietary intervention, behavioral therapy and promotion of physical activity have failed to manage clinical obesity, anti-obesity drugs like orhistat, which is a pancreatic lipase inhibitor, could be used (Wyne, 2000). Comparing a person's weight to his or her age and height is a poor way of checking whether that person is obese or of a healthy weight. Care should be taken when using the body weight of a person to determine his or her health or wellness status, because people who do a lot of exercise and possess a large muscle mass can be high in body weight without

being too fat. Also the state of hydration or dehydration of a person affects his weight. Weight can be lost just by losing body water, or gain weight by increasing body water. You can also be overweight, yet not be over-fat.

Over-weight means having excessive weight relative to physical size and stature, whiles over-fat or obese refers to excessive fat. The age-height-weight method often gives broad ranges for acceptable weight and fails to take into account different body types (Wuest et al., 1994). A person having large muscle mass due to regular physical activity could appear to be over-weight, but not too fat (Fahey et al., 2003). This is to emphasize the point that using only one technique to measure body composition may result in misinformation. The use of the Body Mass Index (BMI) is better than the use of the height-weight charts. Having a BMI of 25 is a standard for over-weight, 30 is a standard for obesity and can be damaging to health, whiles BMI of 40 is for severe obesity.

BMI is calculated by dividing total body weight in kilogrammes by the square of height in meters (Key, 2004). BMI increases with age in both men and women up to the age 64 years, then decreases slightly in older age groups. In women, BMI tends to be higher in the manual social class than in the non-manual social classes. It is not clear in men (Wyne, 2000). When used with other techniques, the BMI can provide useful information, but the risk of misclassification is high among active people with a high amount of muscle if the BMI is used alone. The problem with weight measurement is that body weight varies from day to day and even hour to hour based on the level of hydration at the time of measurement. Short-term weight changes are mostly due to changes in quantity of water than real body composition changes. Weighing at the same time of the day, preferably early in the morning, is the best to prevent variations in weight (Lindsey et al., 2000).

The underwater weighing also known as "hydrostatic weighing" has proved to be the best method for assessing body fatness. This method involves the weighing of the body on land and under water to estimate body density. Corrections are made for the amount of air in the lungs when the underwater weight is measured. Calculation is based on Archimede's principles on floatation or buoyancy, which says that "a body immersed in a fluid is buoyed up by a force equal to the weight of the displaced fluid" (Adrian et al., 1995), and the fact that fat is lighter per unit volume than is water and, therefore, floats. People with higher percentage of body fat have lower density and are good floaters. The problem with the hydrostatic weighing is that it takes considerable time, specialized training and needs a well-equipped laboratory (Siedentop, 2001).

The skinfold measurements is a preferred practical method for assessing body fatness, because it is relatively cheaper, does not require expensive equip- equipment and easy to do. A pair of calipers is used to measure the thickness of the subcutaneous fat at two or three specific designated sites, the sum of which is used to predict the percentage of body fat. The smaller the value of the sum, the fitter the individual is in terms of body composition. For better results, three measurements should be taken at each site and the middle result used. Measurements are made at the iliac crest, thigh, triceps, chest, abdomen and the calf. The skinfold method, if done carefully by a trained person, can provide a sufficient accurate gross measure of body composition (Wuest et al., 1994).

Another technique is the use of the waist-to-hip circumference ratio. In this method, the circumference of the waist and the hip are measured. After the measurements, calculation is made by dividing the hip measurement by the waist measurement. The Waist-to-Hip Ratio Rating Scale is then used to determine the body composition rating. A high waist-to-hip ratio

of greater than 1.0 and 0.85 for men and women, respectively, has been shown to be correlated with a high incidence of heart attack, stroke, chest pain, breast cancer, and death. This is true because experts have shown that upper body fat poses a greater health risk than lower body fatness (Corbin et al., 2003). The bioelectric impedance analysis (BIA) is also a method used to assess body composition. The method ranks quite favourably for accuracy and has similar overall rankings to skinfold measurements technique. This test has an advantage over the skinfolds method in the sense that it could be performed quickly and is more effective for people high in body fatness. To measure body fatness, electrodes are placed on the body and low dose of currents are passed through the skin to measure the resistance to current flow.

The principles behind this method is that muscles have greater water content than fat, and are better conductors and have less resistance to current. Predictions of body fatness are made considering the overall amount of resistance and body size. Dehydration can affect results, and measurements should not be taken within three to four hours after a meal (Corbin et al., 2003).A more recent method for the determination of fat-free mass (FFM) is the dual-energy x-ray absorptiometry (DXA). This is considered one of the reference methods for body composition analysis, but it requires sophisticated technology. BIA is easy, non-invasive and relatively inexpensive (Pichard, Kyle, Gremion and Slosman, 1997).

Factors affecting Health-Related Physical Fitness

Health-related physical fitness, considering the above reviewed literature, has been proved to be an important component of general health. Just as most of the concepts, it is influenced by factors such as heredity, age, sex and race.

Heredity

Heredity has been identified as an influencing factor of cardiovascular fitness. Genetic research has shown that the type of cardiovascular system an individual inherits affects his or her cardiovascular fitness. This brings about individual differences in the development of cardiovascular endurance. The rate of development will differ, but no matter who you are, you can improve your cardiovascular fitness.(Corbin et al., 2003). Bouchard and colleagues have explained in Physical Activity and Fitness Research Digest (Bouchard, 1993), that, not only do people differ in fitness based on heredity, but people of different genetic backgrounds respond differently to training. In other words, two people of different genetic backgrounds could do the exact same exercise programme and get quite different benefits. Some people get as much as ten (10) times as much benefit from activity as others who do the same programme.

Bouchard's studies on twins indicated how heredity affects fitness levels just because of the different genes they inherited. The heritability of body fatness is 25%+, muscle fitness is 20-40% and cardio-vascular endurance is 10-25%. Experts have suggested that, people are born with a predisposition towards fatness or leanness and that some people will have more difficulty than others controlling fatness, because of their body type, and because they come from families with a history of obesity. From the findings of Bouchard, it is dangerous to conclude that, the lower fitness level of a person compared to another is a result of inactivity. This is because, people do not respond similarly to various components of health-related fitness.

A person who has less hereditary predisposition to one type of fitness may respond well to another. We should, therefore, be careful not to expect people to perform well on all health-

related fitness tests, just because they scored well on one test. According to Bouchard, "not only is it important to recognize that there are individual differences in the response to regular physical activity but research indicates that there are non-responders in the population. Heredity may account for fitness differences as large as 3 to 10 -fold when comparing low and high responders who have performed the same physical activity programme". Heredity also determines flexibility in some people. Hyper mobility or loose joints is seen to be a family trait which is passed on from generation to generation.

Experts believe that people with this trait of joint looseness are more prone to dislocation and more susceptible to athletic or dance injuries especially at the shoulder, ankle and knee. Other problem with joint looseness is the higher probability to develop premature osteoarthritis and the usage of more energy in walking and jogging than medium and tight jointed people. Performing press-ups with elbows which lock into hyperextension will be difficult because more effort will be needed to unlock the joint. The muscles around the loose joints should be strengthened to avoid the above problems. Studies have also shown that the percentage of fast-twitch and slow twitch muscle fibres in a person is influenced by heredity. People who inherit higher percentage of fast-twitch muscles will readily increase in muscle size and strength than people having more slow-twitch muscles, who also have the advantage of greater potential for endurance performance. However, with proper training each muscle type could improve in strength and endurance (Corbin et al., 2003).

Age

Age affects muscular strength in that maximum strength is generally reached in the twenties and declines with age. Age also affects muscular endurance but not as remarkable as muscular strength (Lindsey et al., 2000). According to Bemben (1998), aging often results in

a decline of most physiological systems of the body, affecting muscle strength and endurance. However, some authorities have confirmed that, with strength training the elderly, even in their 90′s, can increase their strength and muscle mass but not as fast as much as young people (Fiatarome, 1990).The influence of age on flexibility has also been noticed. Children are naturally flexible, but decline from early adolescent to adulthood due to changes with maturation. The coccyx and sacrum are separate bones in children but fuse together into a rigid vertebra from the adolescent age affecting the flexibility of the vertebral column (Gibson, 1992), but according to Brown (2000) even elderly men and women over 70 years old can improve their flexibility. Apart from the above, age has some effect on cardiovascular endurance.

To improve cardiovascular endurance, the intensity and time/duration of exercise are important determinants, because heart rate is related to the oxygen consumption and the intensity of exercise necessary to experience benefits from training. The intensity of 60-85% of the maximal heart rate (MaxHR) is recommended if cardiovascular endurance is to be experienced from a workout. The influence of age comes in because MaxHR is age related (Wuest et al., 1994). According to Corbin et al (2003) MaxHR decreases with age, therefore, a young adult of 22years old will have a higher MaxHR than an older person of 50 years. It has also been found out that, the level of body fat also starts to increase as a typical person ages. Ageing people become less active, their BMR gradually decreases, so seems their calorie intake. The problem is that, the rate of decrease in the calorie intake does not adequately compensate for the decrease in BMR and activity levels. This leads to the gradual accumulation of fat known as "creeping obesity" (Lindsey et al., 200).

Gender

The influence of sex on flexibility is remarkable usually in children than in adults. Generally, girls are seen to be more flexible than boys. Women are more flexible at some specific areas due to anatomical and hormonal influences. For easy delivery, the pelvic girdle of women is naturally flexible and different from that of men (Gibson, 1992). Muscular strength is also influenced by sex. By their physiological make up, it has been proved that women generally have 60-80% of the absolute strength of men, due to the fact that women have smaller amount of the anabolic hormone; testosterone, and less muscle mass than men. Absolute muscular endurance also favours men, though not as dramatic as strength. In relative terms, experts say that women have muscular strength and endurance similar to men when size and muscle mass are considered (Lindsey et al., 2000). A study conducted in India to ascertain the gender differences in muscle strength and endurance in young Indian adults revealed that males had close to two times hand grip strength of females in absolute terms. Males also had significant greater muscle mass and lower body fat as compared to the females. On the other hand, women demonstrated greater muscle endurance to males. (Padamavathi, Bharathi and Vas, 1999).

Physiological Fitness: Physiological fitness includes non-performance components of physical fitness that relate to biological systems that are influenced by one's level of habitual physical activity. (Bouchard, et al., 1994).The concept of physiological fitness was introduced in a publication of the first international consensus statement of current knowledge of physical activity (Bouchard, et al., 1990). It differentiated health-related (primarily performance measures) from non-performance measures. Some of these measures

are defined below. Some of the sub-components of physiological fitness that have gained acceptance are metabolic fitness, morphological fitness, and bone integrity.

Metabolic Fitness: The state of metabolic systems and variables predictive of the risk for diabetes and cardiovascular disease which can be favorably altered by increased physical activity or regular endurance exercise without the requirement of a training related increase inV•O2max. (ACSM, 1998).Though Depres, et al. (1990, 1991) are first credited with using the term metabolic fitness it was first used widely after it was described in the proceedings of the second International Consensus Conference on Physical Activity, Fitness and Health (Bouchard, et al, 1990). The use of the term metabolic fitness in the recent position statement describing the quality and quantity of physical activity needed to attain health-related benefits (ACSM,1998) establishes it as a major fitness component. The International Consensus statement noted that metabolic fitness included such sub-components as blood sugar 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)".

Morphological Fitness: A non-performance component of fitness related to body composition factors such as body circumferences, body fat content, and regional body fat distribution (Bouchard, et al., 1990).

Morphological fitness measures are often related to metabolic fitness components. As noted earlier body composition is often included as a component of health-related fitness but is also

appropriately considered a component of morphological fitness. Those measures used to assess body composition are also used to assess morphological fitness as are measures such as body mass index, waist circumference, and waist to hip ratio.

Bone Integrity (Bone Strength): A non-performance component of fitness related to bone mineral density. Bone strength was identified as a component of physical fitness in the first International Consensus Statement (Bouchard, 1990). Because measurement is expensive and requires special instrumentation and a high degree of expertise, there are no currently used field measures that are used extensively. There is general consensus, however, that bone integrity is related to habitual physical activity.

2.3 The Cadets Physical Fitness Programme

The goal of the cadets physical fitness program at the Ghana Military Academy is to make the cadets physically fit and to motivate them to develop a lifelong habit of exercising regularly. They need strength, flexibility, and endurance to meet the challenges of being a cadet in the Military. The physical training they accomplish as cadets will also improve their self-confidence, build teamwork, and instill a sense of determination. More importantly, it helps them to become fit to accrue the necessary energy to achieve their train goals. (Ghana Military Academy Joining Instructions)

Research has proven that people who are physically fit feel better about themselves and live longer than those who do not exercise. At the entrance of the Cadet Mess is the inscription "I came here as a boy, I will leave as a man, bold, fit and strong. This inscription stresses the cardinal important of physical training and fitness to the general training given to cadets.

2.3.1 Physical Fitness in the Cadet Program

Physical fitness is one of the four components of the Cadet Program. There are two facets to this physical fitness program; training and testing.

Training*:* Fitness training includes stretching, calisthenics, fitness drills, circuits, team sports, and any activities that are fun but still physically challenging. Cadets are expected to give their fullest effort because they are not really exercising if they are not training hard. Their training also includes briefings on the basic principles of exercise, why fitness is important, and how to exercise safely. Cadets are expected not to limit their training to their Platoons but to be self-disciplined by exercising on their own, too.

Testing*:* Because it is vital to be physically fit, passing the Cadet Physical Fitness Test (CPFT) is one of the promotion requirements. For every achievement, cadets must take and pass all four elements of the CPFT.

2.3.2 Cadets Leadership Responsibilities in training Programme

Effective leadership is crucial to the success of the cadet physical fitness program. At the Military Academy, Physical Training Instructors (PTIs) and other instructors are designated to supervise fitness programs and they must emphasize the value of physical training and clearly explain the objectives and benefits of the program. Instructors must be familiar with the principles of exercise and the correct techniques for each exercise to ensure the training is productive and safe.

Individual Differences: Leaders must closely observe cadets during physical training. Especially watch for cadets who are struggling with one or all of the activities; help these cadets attain the standards of the four CPFT events. Leaders must also understand the physiological differences between male and female cadets and the developmental stages of

younger and older cadets in their platoons. No two cadets are alike in ability, but under the right leadership every cadet will give fitness training their fullest effort. By encouraging each cadet in a manner that motivates, not humiliates, this can go a long way in bringing them up to the required standard.

Prohibitions. Physical exercise in the Cadet Program will be used only to further the goal of improving physical fitness while increasing confidence, teamwork, and determination. When PTIs, Platoon Commanders, other instructors and ranking cadets use physical training as a form of punishment or remedial discipline it creates the impression that physical training is punishment and it erodes it overall importance to the training.

2.4 Comparative Examination of Adequacy of the Level of Physical Training for the Ghana Armed Forces

In the Ghana Army Pocket Physical Training Guide (2011), "a standardized physical training session consists of the following three essential elements: warm-up, activity, and cool-down. These elements are integrated to produce the desired training effect. More importantly, every standardized physical training session must have a specific purpose. This purpose, to prepare the trainee for the physical demands of IMT, follows a recommended rate of progression, specific to each individual's tolerance to the current level of training. There are three stages of standardized progression: initial, improvement, and maintenance. The initial conditioning stage includes light muscular endurance activities and moderate-level cardio-respiratory endurance activities that produce minimal muscle soreness and control injuries.

This stage usually lasts up to 4 weeks and is dependent upon the individual's adaptation to exercise. The duration of the main activity during the initial stage will begin with

approximately 15 to 20 minutes and may progress to 30 minutes. Individual goals are established by the PTIs early in the exercise program and are reflected in the training schedule. The initial stage is the walk-to-run program and the muscular strength and endurance sessions conducted in weeks one through four. The goal of the improvement stage is to provide a gradual increase in the overall exercise stimulus to allow for more significant improvements in fitness level. This is shown through the increased running times in the running progression and the increased number of sets and repetitions in conditioning drill programme. The goal of the maintenance stage is the long-term maintenance fitness developed during the weeks spent in the improvement stage. This stage of the standardized physical fitness training program begins when trainees reached the pre-established fitness goals set by the PTIs.

2.5 Phases of Training in the Ghana Armed Forces

2.5.1 Basic Combat Training Phase One

When most soldiers enlist in the Ghana Army, Navy or Air Force, their first step is basic combat training, or BCT. This twelve-week programme is the same for every soldier, regardless of job, and starts with the red phase. During this initial phase, you'll receive your uniforms, and learn about the "Army Core Values" during classroom sessions--loyalty, duty, respect, selfless service, honor, integrity, personal courage, devotion and sacrifice. You will also begin a strict physical training regimen to get your body in peak condition, as well as learn to work as a team with your unit.

2.5.2 Basic Combat Training Phase Two

During the 2ndphase in BCT, soldiers focus on marksmanship. You'll continue to work on physical conditioning and teamwork, but much of your education will involve using a rifle,

hand-to-hand combat skills and decision-making in stressful situations. You will also take part in the Confidence Obstacle Course, which includes rappelling and airborne parachuting at many basic training facilities.

2.5.3 Basic Combat Training Phase Three

The twelve-week BCT programme is wrapped up with the blue phase. This part of the course builds on the foundations you've built in marksmanship and teamwork in the red and white phases, as well as teaches advanced skills in using hand grenades and automatic weapons. To graduate, you must also go through the night infiltration course, go on 10 km and 15 km foot steeple-chase, and pass a physical fitness test with push-ups, sit-ups and a two-mile run.

2.5.4 Advanced Individual Training

After graduating from basic training, you will go to advanced individual training, or AIT. This course teaches you about the job you will perform while in the military. The length of your AIT course will depend on your career path, more difficult jobs require more training. There are 14 different AIT schools under the Military Academy and Training Schools (MATS) command, each combining classroom learning with on-job- training.

2.5.5 Basic Officer Leadership Course

Although most soldiers go through BCT and AIT, some professionals who wish to join the Army go through a Basic Officer Leadership Course or the Special Medical Intake instead. This training programme is more specialized. You will still learn combat skills, and go through physical conditioning, but most of the training will focus on how to do the job in a military capacity. Along with medical, those in chaplain and legal careers go through the Basic Officer Leadership Course.

All soldiers in the Ghana Armed Forces (GAF) must first complete Basic Training at the Army, Navy and Air Force Recruit Training Centre (RTC) at Shai-Hills, Tema, and Sekondi-Takoradi. The duration of the Basic Training course at RTC is six months for recruits and fifteen months for the Regular Officer Cadet training. The length and location of this training is dependent on the job. Trainees undergo physical training and drills and learn valuable first aid skills, skills at arms and tactics. After this they are sent to their respective units and their career as soldiers will have begun. The skills learnt at RTC form the foundation of a career as a soldier and are called upon for years to come.

The Army Physical Fitness Test (APFT) is a three-event physical performance test used to assess endurance. It is a simple way to measure physical strengths, abilities, and cardio-respiratory fitness. The intent of the APFT is to provide a baseline assessment regardless of military occupational specificity. The three PFT events are two minutes of push-ups, two minutes of sit-ups, and a timed 2-mile run. To pass, one must score 180 points or higher with at least 60 points in each event.

According to the Canadian Physical Fitness Guide (2000), to ensure one gets the physical activity needed, the Canadian Forces provides trained professional staff, first class facilities, and a wide range of exercise, sport and recreation programs. The exercise prescription or eXPres program includes a fitness test, exercise programs and resources to help you achieve your personal fitness goals. Thus, to better prepare for Basic Training, cadets fitness training program are be geared towards meeting the Canadian forces minimum physical fitness standard. Before starting Basic Training, it is expected that trainees be able to: run 5km, run, run 2.4 km within an appropriate time, complete push-ups and sit-ups, complete a hand-grip test, tread water for at least 2 minutes and swim 20 m without a life jacket. Regular physical

training sessions will prepare trainees for field exercises, a 13 km forced march will help you meet the Canadian forces minimum physical fitness standard. Passing the Canadian forces fitness standard is a requirement of Basic Training which include: skill and strength development, running progressively longer distances up to 6 km and completing force marches of various lengths. Standards are based on age and gender. For example, a male under age 35 must do 19 push-ups, while a woman under age 35 must do 9 pushups.

The Australian Army Physical Fitness Assessment (PTA) has the following requirements for recruits: 45 full sit-ups for both males and females, 15 push-ups for males and 8 for females, and beep test level 7.5 for both males and females. Once chosen, the bi-annual basic fitness requirements include the following tests. The requirements will vary between males and females, and age groups. 2.5 km run (men U/25 must do at least 11:18, women 13:30), push-ups (men U/25 must do at least 40 women 21), and sit-ups (men and women U/25 must do at least 70).

2.6 Physical Adaptability of the Female and Senior Members of the Military

To Moran S.D et al (2009), integrating women into combat professions that have been male-dominated in the past has become a main issue in the Israeli Defence Forces (IDF), as well as a matter of discussion in armed forces worldwide. In the U.S Army, policies regarding acceptable roles and suitable assignments for women have been updated to encompass the demographic shift in female recruitment. Over a thirty-year period, the percentage of females in the U.S Army military forces has increased from 1.6% in 1972 to 15% in 2001 and this trend is projected to increase in the near future to 20%. In Israel, military service is mandatory for both males and females, and the percentage of female involvement reaches approximately 30% of the total military force.

Physiological differences in women such as lower muscle mass, higher fat percentage, lower aerobic musculoskeletal injuries, which previously had excluded them from most combat duties, have shown to improve with proper training regiments. One study, in which both genders participated in a similar 8-week training program, revealed a substantial decrease in the difference between men and women in aerobic power. In addition, other studies have shown a reduction in body fat percentage (%BF) of up to 7.1 % along with an increase in total weight when comparing weight and lean body mass (LBM) after proper physical training. These results denote a significant increase in muscle tissue. Military standards in combat units have been set for male soldiers. Therefore the question arises whether female soldiers can adapt to these physical demands with the implementation of proper military relevant training programs. For example, women have been shown to be more susceptible to overuse injuries such as stress fractures when compared to males engaged in similar activities. Stress fracture, an overuse injury to bone, is one of the most common and potential debilitating overuse injuries seen in military recruits. Some studies have shown a stress fracture incidence ranging from 12% to 30% among female army recruits in comparison with only 7-10% amongst the male recruits. However, despite the high incidence of injury among female soldiers, Knapik et al, showed that a carefully controlled physical training program resulted with a lower overall injury rate in basic combat training.

In a previous study, Yanovich et al investigated the changes in physical fitness of male and female soldiers following a 4-month BT course in a unit that was comprised of a vast majority of female soldiers (70%). In that unit all soldiers regardless of their gender served under the same environment conditions and participated equally in al combat duties: e.g. patrols, pursuits, ambushes and surveillance. Physical requirements for both female and male

soldiers were supposed to be equal. It was reported that the physiological advantage of male soldiers was lowered by almost 4 % during BT, but the overall gender differences were still evident in favor of the males, indication a 20% aerobic and 25% anaerobic advantage over their female counterparts. The purpose of the study was to further evaluate whether gender differences in anthropometric and physical fitness parameters relevant to military task performance could be narrowed after a 4-month period of gender integrated BT". This study unravels the essence of physical fitness not just for men but women to be specific. It is clear, that in a gender friendly training environment, women soldiers are capable to stand tall just us their male counterparts. The physiological difference between men and women must therefore be taken into consideration for setting principles and standards for new recruits. With such innovations, women will improve and perform much better as soldiers.

In a study conducted by Wright D.A. et al (1994), over a 5-year period (1986-1990), 1,223 male, senior military officers were tested to determine lipoprotein profiles, body composition (by densitometry), peak oxygen consumption (VO2 peak by graded, treadmill walking), and strength (one repetition maximum). Average (+/- SD) VO2 peak and body fat were 44.9 +/- 6.7 ml/kg x min and 24.4 +/- 5.1%, respectively. Although the average VO2 peak of these individuals is in the top 10-15% of this age group, nearly 39% are over-fat (by U.S. Army Regulation 600-9). Mean (+/- SD) total cholesterol, and triglycerides were 205 +/- 36, 50 +/- 12, 134 +/- 32, and 108 +/- 71 mg%, respectively. These results reflect an apparently healthy diet and lifestyle, which was strengthened, for the most part, when an average Framingham risk index (FRI) of approximately 2.3 was calculated. The low mean FRI for this group may possibly be attributed to lower total cholesterol and smoking rates than the average 45-year old man in the Framingham study. The results of the testing indicate that this group generally

has a high aerobic capacity, is normo-tensive, non-obese and at low risk for the development of cardiovascular disease.

2.7 Summary of Literature Review

Literature was reviewed in the following related areas: the concept of physical training/fitness, theories explaining physical activity, components of physical fitness, the cadets physical fitness programme, comparative examination of the adequacy of physical training for the Ghana Armed Forces, Physical Adaptability of Female and Senior Members in the Military.

After reviewing the literature and theories of physical training/fitness we can say that it is very important in the lives of military personnel. Based on the literature, the majority of studies stated that participants experienced healthy lives and lived longer than their counterparts who didn't engage in physical fitness.

The current study assesses the impact of physical training on physical fitness personnel of the Ghana Armed Forces personnel (i.e. IET and serving personnel).

Unlike the studies reviewed above this study restricted to the Ghana Armed Forces. In the current study the focus is on comparing the fitness levels of IET soldiers and soldiers who have been serving for some time in the GAF and to ascertain whether the training programmes for both groups are adequate.

CHAPTER THREE

METHODOLOGY

This aspect of the study dealt with the various techniques, methods and tools the researcher employed in collection and analysis of data and evaluating and making conclusion of results. Areas covered include the research design, population, sample and sampling techniques, data collection and analysis.

3.1 Research Design

The mixed methods (qualitative & quantitative) design was employed. This is considered an attempt to determine the reason for pre-existing differences in groups of individuals. This helped the study to focus critically on examining the impact of physical training on initial entry personnel of the Ghana Armed Forces.

3.2 Population

The population for the study constitutes the entire population of the Ghana Armed Forces which is about twenty thousand (20,000) with the active personnel of the Ghana Armed Forces been used for study.

3.3 Sample and Sampling Techniques

The sample size selected was four hundred (400) respondents to represent the entire population. The 100 respondents include; 100 female counterparts, 100 senior officers and other rank age 40 years and above. The rest of the 200 will be initial entry personnel. Sampling design is a definite plan for obtaining a sample from a given population. It refers to the techniques or the procedures the researcher adopts in selecting items for the sample. The simple random sampling technique was employed. It permits specifying the probability that

each sampling unit are included and has an equal chance of inclusion in the sample. The cluster sampling specifically was used in selecting the sampling units since it ensures that every sample units of the population has an equal and known probability of being included in the sample. The area was put into clusters and randomly selected for the study. In cluster sampling the total population is divided into a number of relatively small subdivisions which are themselves clusters of still smaller units, and then some of these clusters are randomly selected for the inclusion in the overall sample.

3.4 Instrument

The data collection was from questionnaire administered to respondents. A questionnaire is a form or document containing a number of questions on a particular theme, problem, issue, or opinion to be investigated (Kumekpor, 2002). Closed and open-ended questions were used to ascertain response of respondents. Close-ended questions were also used because the kind of data sought were categorical that required clear-cut answers devoid of ambiguities. The open-ended questions intended to give respondents the opportunity to express themselves on an issue and give basis for their answers. The questionnaire was a 19 items questions of two sections: Section A (5 items) for demographic information and Section B (14 items) with a closed-ended questions of 5 point likert scale format from strongly agree (SA) to Strongly disagree (SD) rated from 1 to 5 as well as open-ended questions. Also an interview was carried out on the respondents. The interview is a 6 items questionnaire that was transcribed into related terms used to support the main questionnaire for the respondents. The interview was organized based on earlier arrangement with the respondents. The researcher met with each respondent and conducted a face to face interview. The interviews were conducted in English language. Each item of the interview guide was addressed and the researcher wrote

down the responses of each respondent which were later analysed. Creswell (2007), opines that respondents in an interview will not necessarily answer the question being asked by the researcher and, in fact, may answer a question that is asked in another question later in the interview. Therefore, the researcher must construct questions in such a manner as to keep respondents on focus with their responses to the questions. In addition, the researcher must be prepared with follow-up questions or prompts in order to ensure that they obtain optimal responses from respondents.

3.5 Validation of the Study

The structured questionnaire was validated by experts from the department of Health, Physical Education, Recreation and Sports (HPERS), of the University of Education, Winneba. Glense (1999) suggest that a pilot study be used to identify potential problems, test the language and substance of the questions. Therefore a pilot study was conducted using test-re-test method of ten personnel from the Military Academy and Training Schools (MATS) and ten officer cadres for content validation purpose.

3.6 Reliability of the Study

The questionnaire were administered transcription process and coding, the researcher was able to listen, code and analyse the style of questioning posed and answering recorded during the interview schedule. After the analysis of the pilot study, minor corrections were made to the interview schedule and potential probe questions were identified for the researcher to refer during actual testing of the instrument. The pilot study confirms the sampling technique was suitable for acquiring the required information to answer the research questions. The reliability coefficient found was 0.67 for the internal consistency.

3.7 Procedure for Data Collection

In this, both primary and secondary data was employed as a means of sourcing data. In undertaking this research quantitative methods of data collection was employed. The primary data was collected through questionnaire survey conducted with the respondents. The distribution was carried out with the help of three research assistants and collected immediately and or through courier delivery from units, ships and bases outside Accra not later than three days upon receipt of the questionnaire. The interview was conducted three days after the completion of the questionnaire by same selected respondents.

Several sources of secondary materials were consulted to gain an insight into the current practice, theories, definitions and conclusions of similar researches that will be used to affirm or dismiss some of the assertions about physical fitness within the Ghana Armed Forces. Specifically, secondary data was sourced from institutions that have conducted research on physical training. Institutions such as: Ghana Army, Air Force and Navy and other research works from books, magazines, journals, bulletins and newspapers.

3.8 Procedure for Data Analysis

Data collected from the field were analyzed to draw findings and conclusions and to make recommendations. Data collected were used for quantitative analysis and results presented in the report. The qualitative method was employed in cases where the situation demanded only description of a phenomenon. Various analytical tools were used to show the relationship, direction and significance of the variables as well as descriptive statistical tools such as frequency and percentage, with charts, and bar charts also employed to show a pictorial presentation and to give a visual outcome of findings.

CHAPTER FOUR

RESULTS, FINDINGS AND DISCUSSIONS

This chapter was divided into three sections. The first section presents the demographic characteristics of the respondents. The second section presents general information concerning data presentation for research questions physical training/fitness in the GAF. The third section presents the findings based on the research questions for the study.

4.1 Demographic Characteristics of Respondents

Table 1 Sex distribution of the Respondents

Sex	**Frequency**	**Percentage (%)**
Male	280	70
Female	120	30
Total	**400**	**100**

Table 1 presents the distribution of the respondents by their sex. Table 1 above shows that for the respondents 70% (n=70) were males and 30 (n=30) were females. Figure 1 below shows a pie chart illustration of the sex distribution of the respondents.

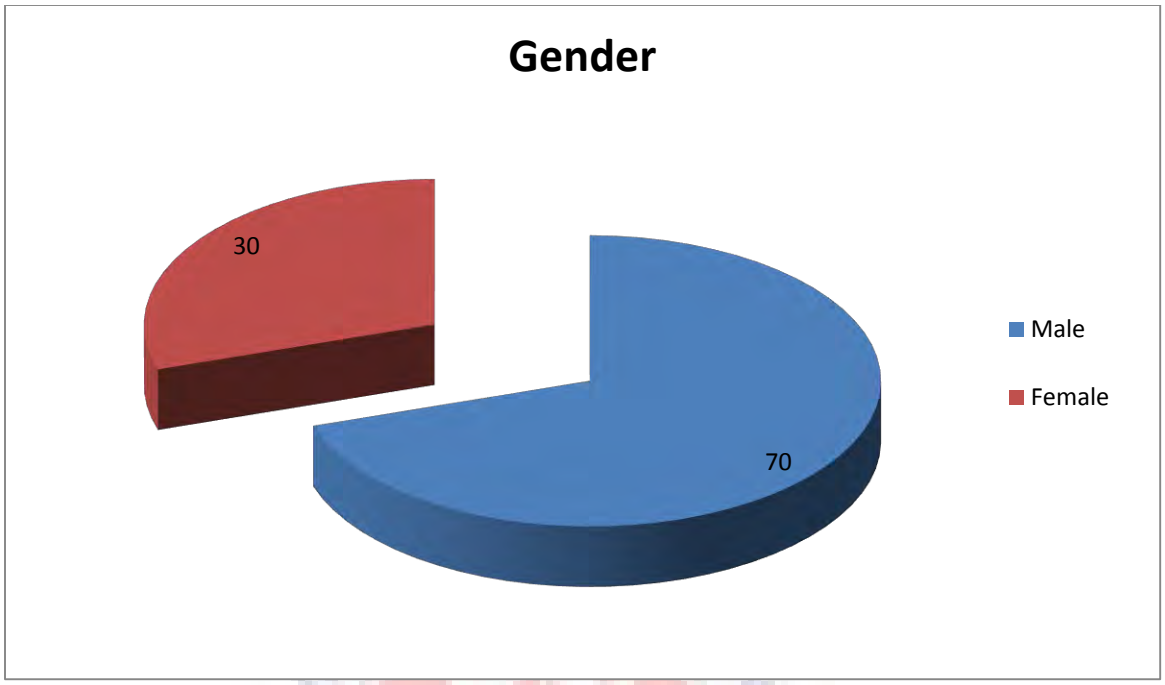

Figure 1 Sex distribution of the Respondents

Table 2: Age Distribution of Respondents

Age (Years)	Frequency	Percentage (%)
20 - 29	160	40
30 - 39	140	35
40 - 49	60	15
50 and Above	40	10
Total	**400**	**100**

Table 2 provides the age distribution of the respondents as presented in the study. The dominant age group of the respondents ranged between 20 – 29 years (40%, n=160) followed by 30 – 39 years (35%, n=140), followed by ages 40 – 49 years (15%, n=60) and finally 50 years and above (10%, n=40).

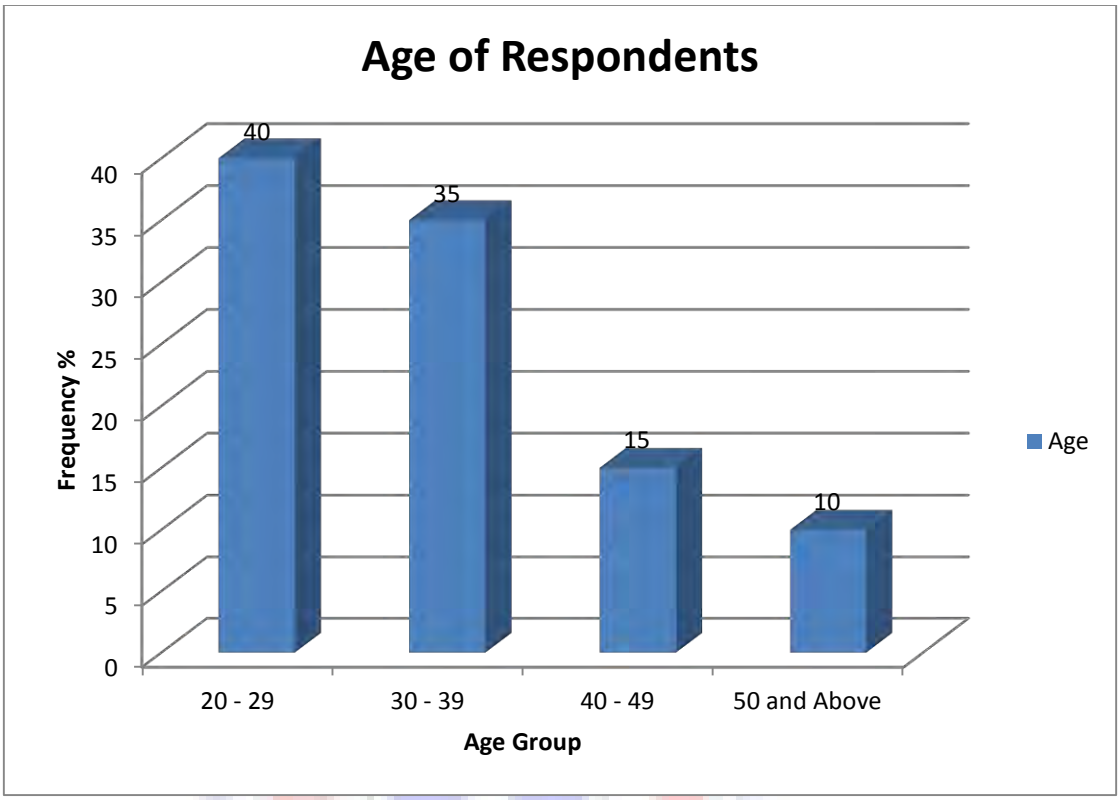

Figure 2 Age of Respondents

Table 3: Rank Distribution of Respondents

School	Frequency	Percentage (%)
General	8	2
Major	12	3
	24	6
Captain	16	4
Lieutenant	40	10
Warrant Officer	20	5
Sergeant	40	10
Corporal	40	10
Recruit/cadet	200	50
Total	**400**	**100**

Table 3 presents the distribution of the respondents by their rank. Two percent (2%, n=8) of the respondents were ranked as Generals, 3% (n=12) were Majors, 6% (n=24) were Colonels, 4% (n=16) were Captains, 10% (n=40) were Lieutenants, 5% (n=20) were Warrant Officers, 10% (n=40) were Sergeants and Corporals respectively and 50% (n=200) were Recruits or Trainees.

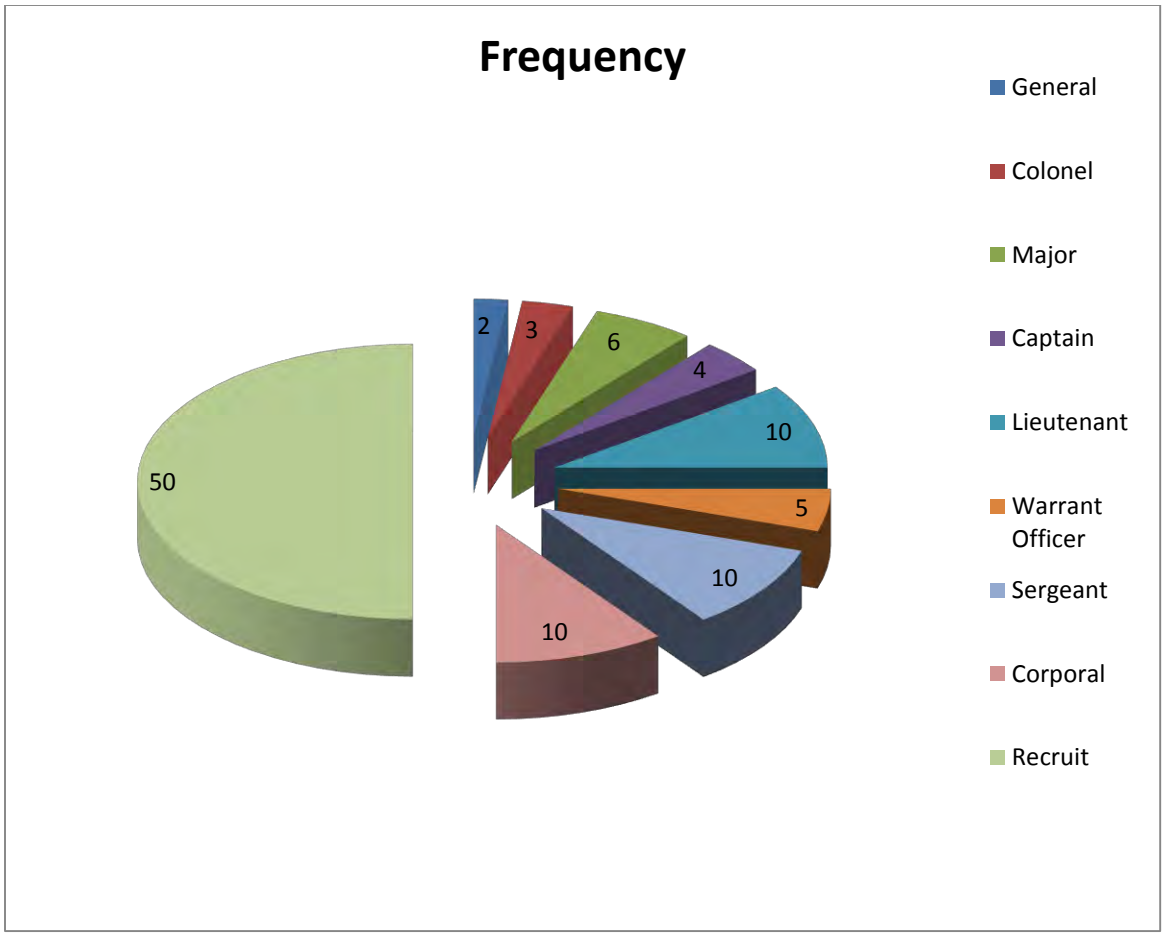

Figure 3 Rank Distribution of Respondents

Table 4: Educational Status of Respondents

Educational Status	Frequency	Percentage (%)
Masters Degree	40	10
First Degree	88	22
HND/Diploma Degree	60	15
SSSCE/WASSCE	212	53
Total	**400**	**100**

Table 4 above illustrates that 10% (n=40) of the respondents were Masters degree holders, 22% (n=88) were First degree 15% (n=60) were HND/Diploma degree holders, while a majority representing 53% (n=212) were SSSCE/WASSCE holders.

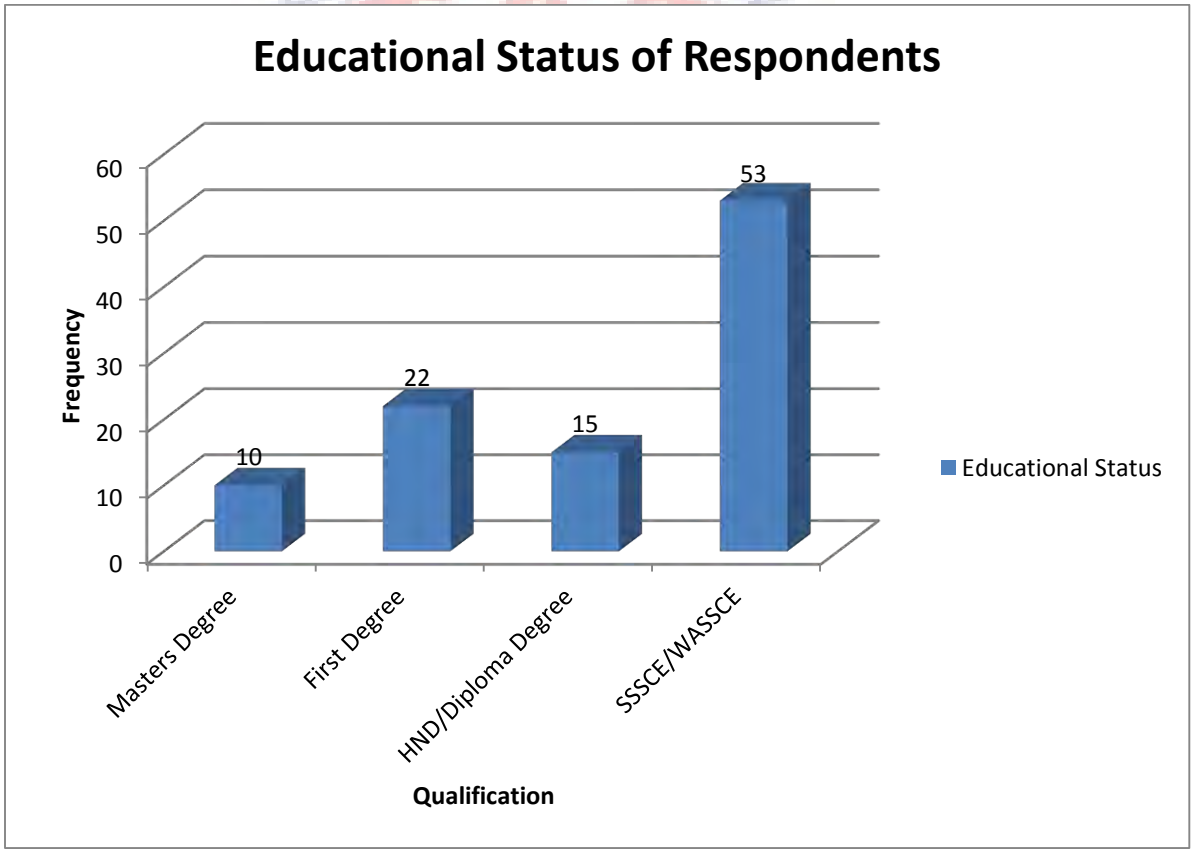

Figure 4 Qualification of Respondents

Table 5 Work Experience of Respondents

Working Experience	Frequency	Percentage (%)
Less than a year	200	50
1 – 5 years	80	20
6 – 10 years	40	10
11 – 15 years	44	11
16- 20 years	16	4
20 years and above	20	5
Total	**400**	**100**

With regards to their working experience, 50% (n=200) of the respondents reported that they had worked for less than a year, 20% (n=-80) stated that they had worked between the years 1 to 5, 10% (n=40) indicated that they have worked for 6 to 10 years, 11% (n=44) also reported that they have worked for 11 to 15 years, 4% (n=16) stated that they had worked between 16-20 years whiles 5% (n=20) of the respondents indicated that they had worked for 20 years and above.

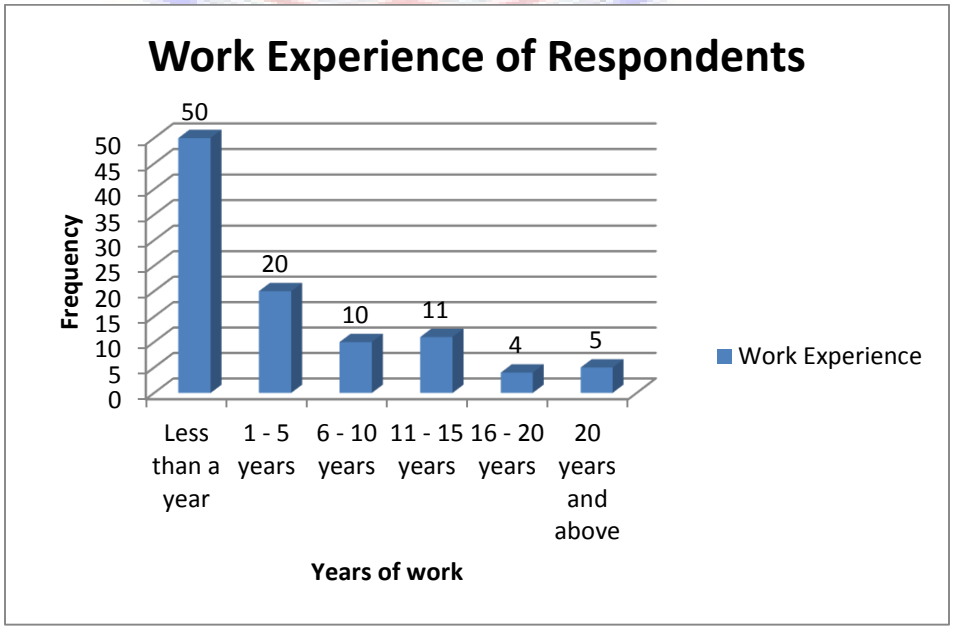

Figure 5 Work Experiences of Respondents

4.2 General Data Presentation on Physical Training by GAF Personnel and Trainees

Fifty percent of the respondents (50%, n=200) strongly agreed physical fitness was very important to them. Twenty percent (20%, n=80) also agreed with this assertion, whiles 10% (n=40) were undecided and 20% (n=80) disagreed with it.

Sixty four percent (64%, n=256) of the respondents stated that they were aware that possessing good health related fitness is related to lower risk of illness and improved quality of life, 12% (n=48) agreed that they were aware of it and 24% (n=96) stated that they were not aware of it. No respondent disagreed with this point.

4.3 Data Presentation for Research Questions

Research Question 1: What is the physical fitness level of personnel of GAF after passing out?

Answers for research question 1 were restricted to analyzing the data of only the 200 personnel respondents from the GAF.

Table 6: In your opinion what is your fitness level as a member of the GAF (IET Soldiers)?

In your opinion what is your physical fitness level as a member of the GAF??	Frequency	Percentage (%)
Very Fit	104	52
Fit	72	36
Somewhat Fit	24	12
Cannot Tell	0	0
Unfit	0	0
Total	**200**	**100**

From table 6 above, 52% (n=104) of the GAF personnel that are very fit were 36% (n=72), while 12% (n=24) stated that they were somewhat fit and 0% (n=0) stated that they could not tell if they were fit and that they were not fit respectively.

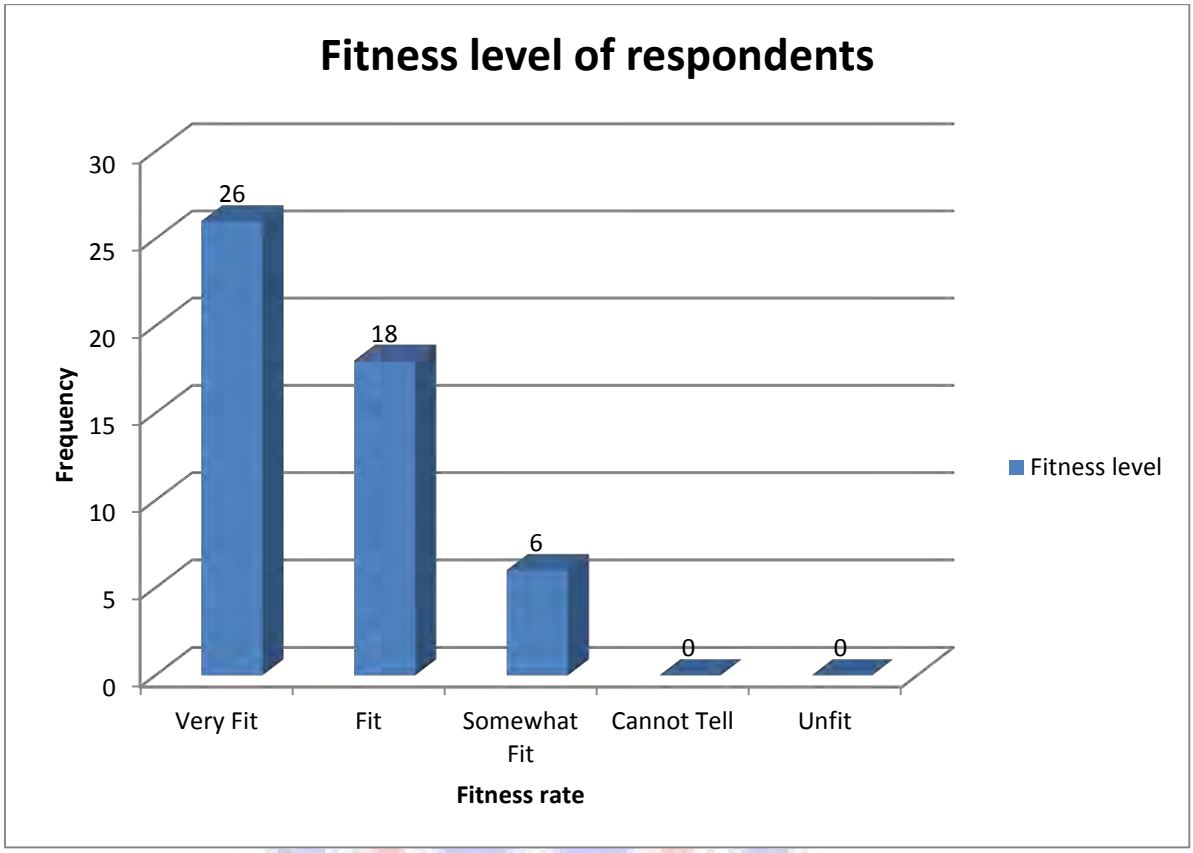

Figure 6: Fitness level of Respondents

Table 7: I am able to perform daily tasks with vigour (IET Soldiers)?

I am able to perform daily tasks with vigor?	Frequency	Percentage (%)
Strongly Agree	124	62
Agree	56	28
Neutral	20	10
Disagree	0	0
Strongly Disagree	0	0
Total	**200**	**100**

From table 7 above, 62% (n=124) of the respondents stated that they strongly agreed that they were able to perform daily tasks with vigor, 28% (n=56) agreed with to this assertion, 10% (n=20) were neutral and 0% (n=0) disagreed and strongly disagreed with this assertion.

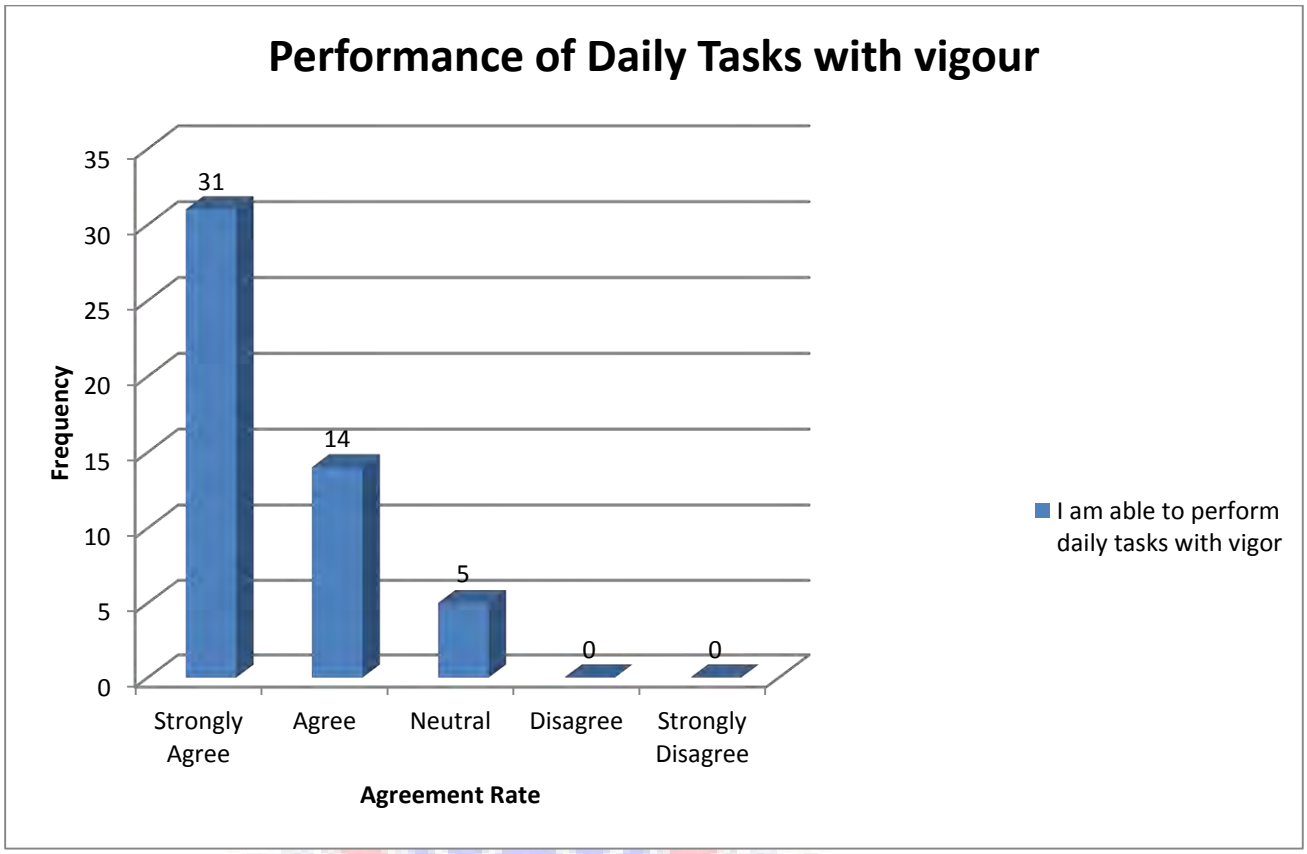

Figure 7: Performance of Daily Tasks with vigour

Table 8: In your opinion how fast can you run a 2mile run (IET Soldiers)?

In your opinion how fast can you run a 2mile run?	Frequency	Percentage (%)
Less than 8 minutes	32	16
9 – 11 minutes	48	24
12 – 14 minutes	107	54
More than 15 minutes	12	6
Total	**200**	**100**

From table 8 above, 16% (n=32) of the respondents stated that they could run a 2 mile run in less than 8 minutes, 24% (n=48) stated that they could run in between 9 – 11 minutes, 54%

(n=107) stated that they could run it in between 12 – 14 minutes, and 6% (n=12) stated that they would complete the run in more than 15 minutes.

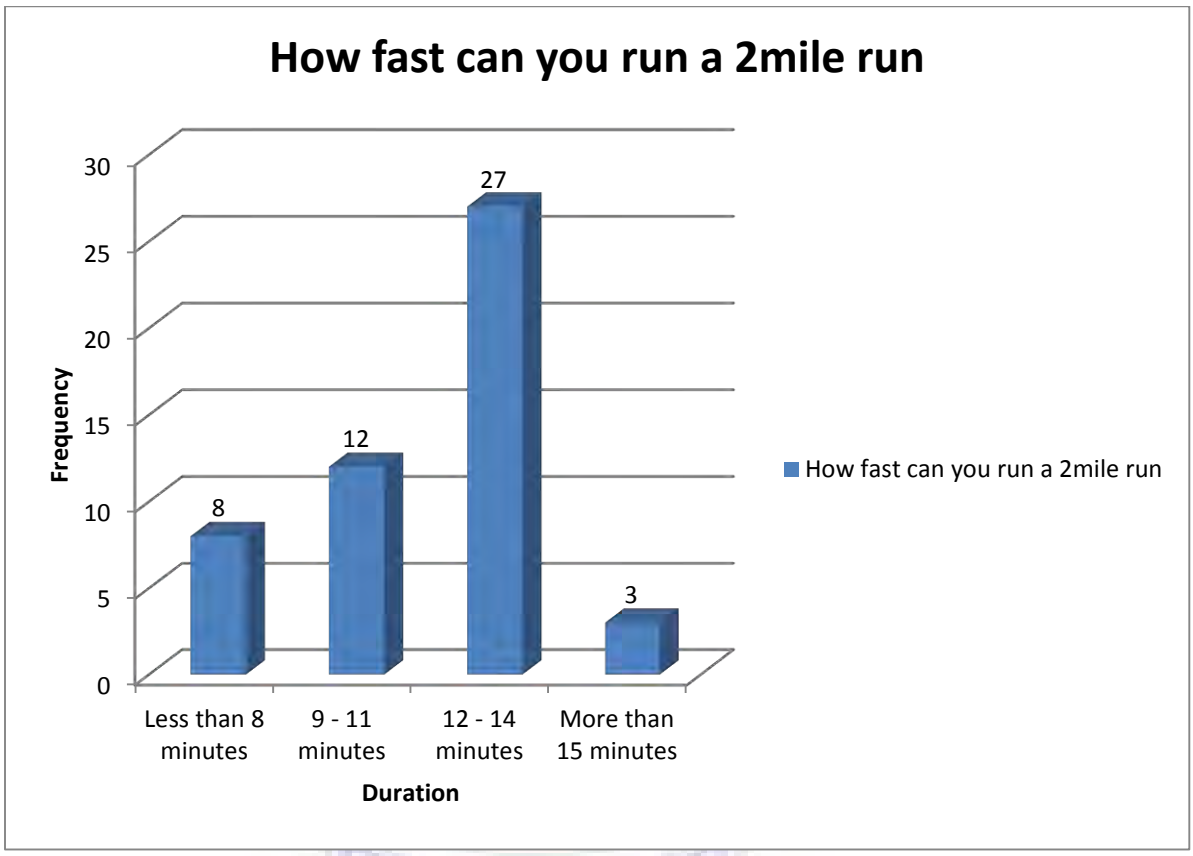

Figure 8: How fast can you run the 2 mile run of Respondents

Table 9: How would you classify your body weight (IET Soldiers)?

How would you classify your body weight?	Frequency	Percentage (%)
Underweight	0	0
Normal Range	180	90
Overweight	12	6
Obese	8	4
Total	**50**	**100**

From table 8 above, 0% (n=0) of the respondents stated that they were underweight, 90% (n=180) stated that they were in the normal range, 6% (n=8) stated that they were overweight and 4% (n=8) stated that they were obese.

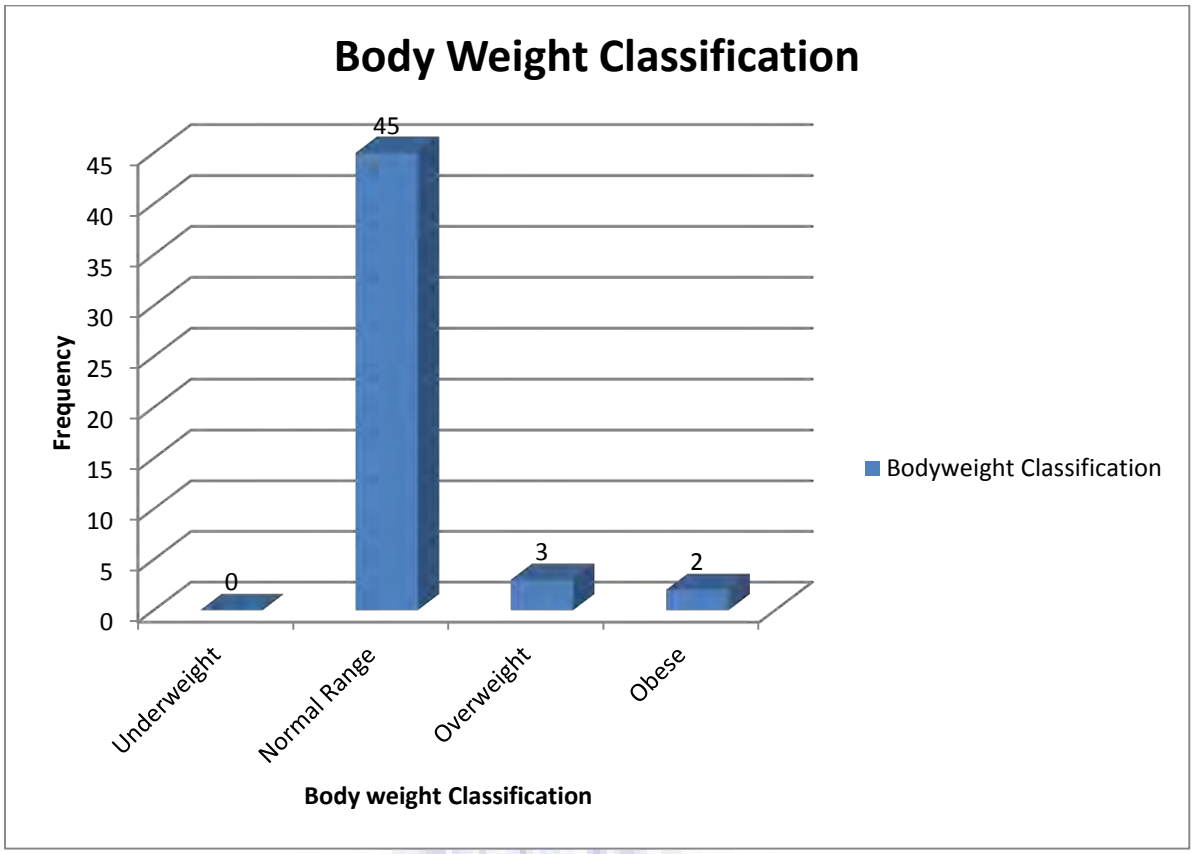

Figure 9: Bodyweight Classification of Respondents

Research Question Two: What is the adequacy level of the training programme for the trainees (IET soldiers) and personnel of the Ghana Armed Forces?

Table 10: Cross tabulation of status against level of physical training

		Do you feel that the level of physical training as a trainee/personnel of the Ghana Armed Forces is adequate for you?					Total
		Adequate	Somewhat Adequate	Undecided	Inadequate	Room for Improvement	
Status	Personnel	16 8%	16 8%	24 12%	104 52%	40 20%	200 100%
	Trainee	108 54%	28 14%	32 16%	8 4%	24 12%	200 100%
	Total	**120 (100.0%)**	**40 (100.0%)**	**66 (100.0%)**	**112 (100%)**	**64 (100%)**	100

Table 10 above shows a cross tabulation of respondents status against answers to the question about whether respondents felt that the level of physical training as a trainee/personnel of the GAF is adequate. The above table shows that only 8% (n=16) of personnel of the GAF felt that the level of physical training for personnel was adequate and somewhat adequate respectively. Twelve percent (12%, n=24) were undecided and 52% (n=104) felt that the level of physical training for personnel was inadequate and finally 20% (n=40) felt that there was room for improvement in the level of physical training. For the trainees, the table above shows that 54% (n=104) felt that the level of physical training for personnel was adequate, 14% (n=28) felt that the training was somewhat adequate, 16% (n=32) were undecided and 4% (n=8) felt that the level of physical training for trainees was inadequate and finally 12% (n=32) felt that there was room for improvement in the level of physical training.

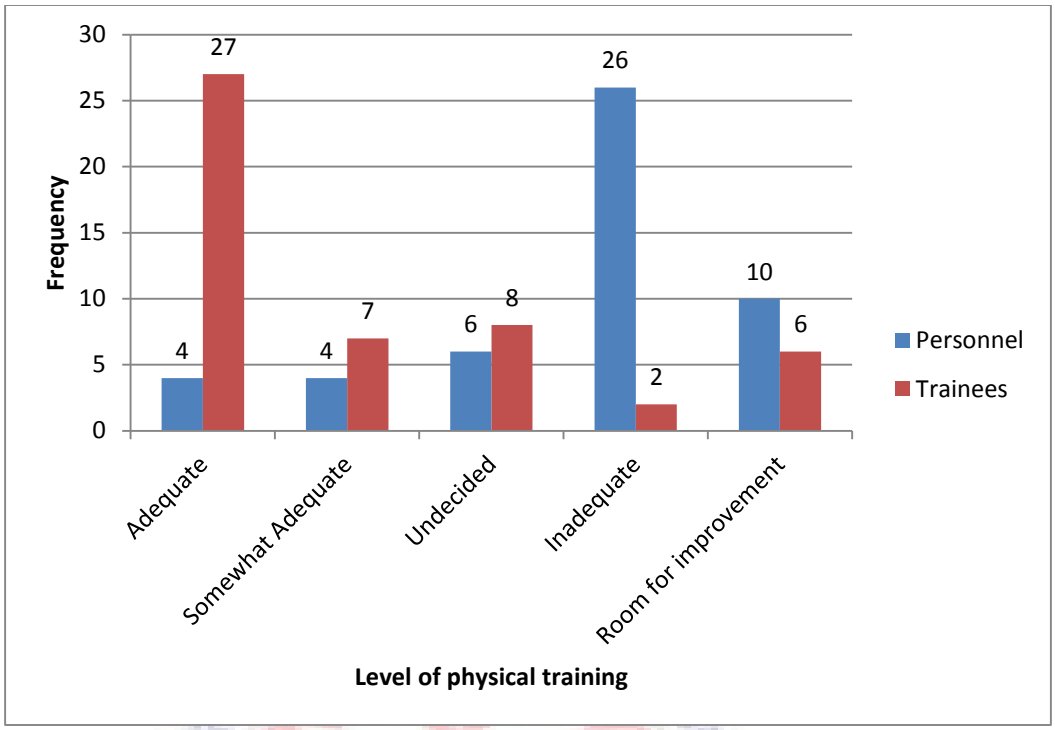

Figure 10: Cross tabulation of status against level of physical training

Research Question Three: What is the difference in physical fitness training of male and female senior officers and other ranks above 40 years of age?

Table 11:Descriptive statistics on physical fitness of male and female senior officers and other ranks above 40 years age?

		What is your fitness level?					Total
		Very Fit	Fit	Somewhat Fit	Cannot Tell	Unfit	
Gender of personnel above 40yrs	Male	8 11%	16 21%	20 26%	12 16%	20 26%	76 100%
	Female	0 0%	4 17%	8 33%	0 0%	12 50%	24 100%
	Total	**8 (100.0%)**	**20 (100.0%)**	**28 (100.0%)**	**12 (100%)**	**32 (100%)**	100 100

Table 11 above shows a cross tabulation of respondents gender of personnel above 40 years against answers to the question about their level of fitness. From the above table of Female personnel respondents who are over 40 years of age, 0% (n=0) stated that they were very fit, 17% (n=4) felt that they were fit, 33% (n=8) stated that they were somewhat fit, 0% (n=0) stated that they could not tell, and 50% (n=12) stated that they were unfit.

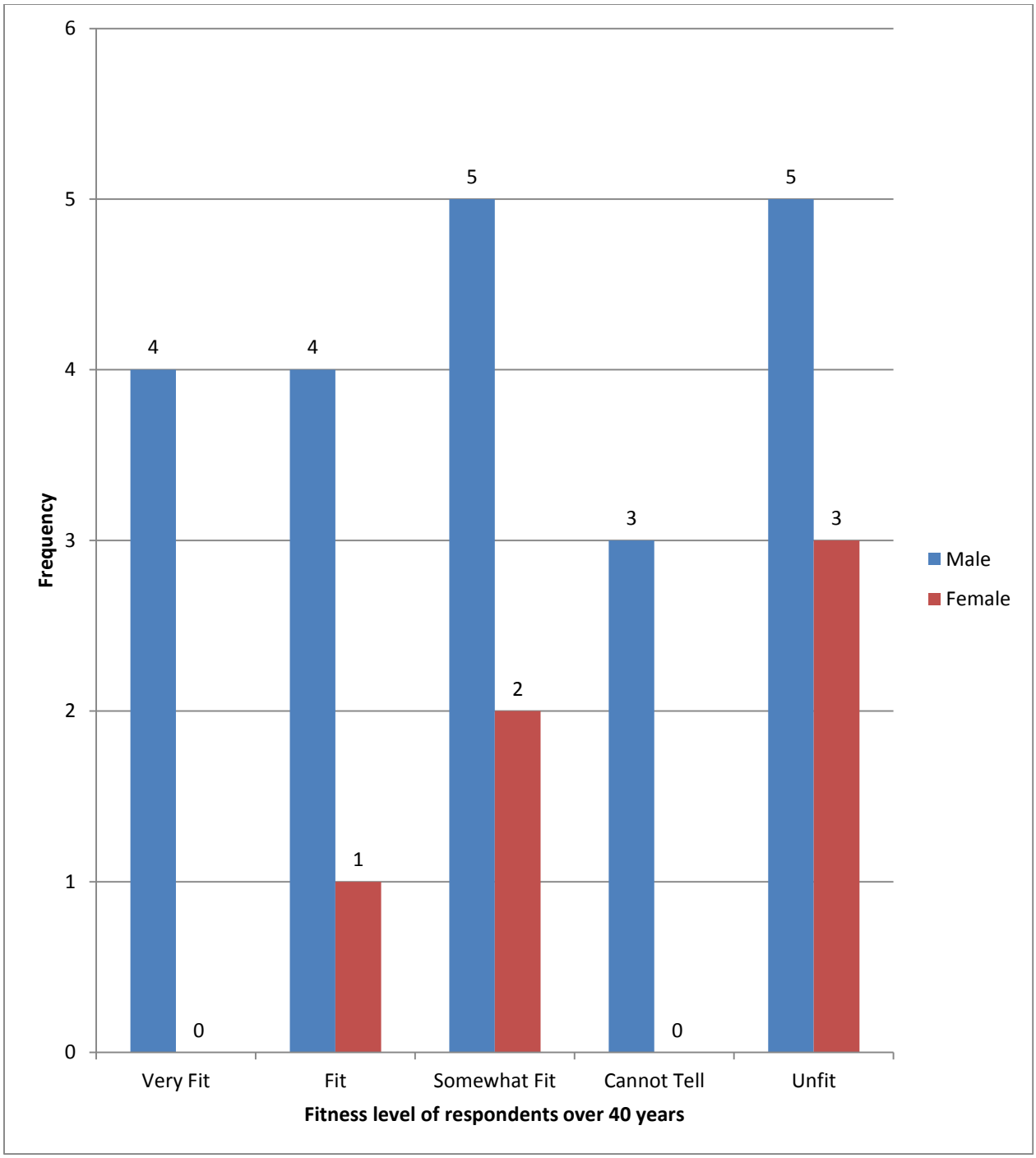

Figure 11: Cross Tabulation of Gender above 40 yrs against what is your fitness level?

Table 12: Cross Tabulation of rank of personnel above 40yrs against fitness level?

		What is your fitness level?					Total
		Very Fit	Fit	Somewhat Fit	Cannot Tell	Unfit	
Rank of personnel above 40yrs	General	0 0%	4 50%	4 50%	0 0%	0 0%	8 100%
	Colonel	0 0%	4 22.2%	6 33.3%	0 0%	8 44.4%	18 100%
	Major	4 16.6%	8 33.3%	4 16.6%	8 33.3%	0 0%	24 100%
	Captain	4 25%	4 25%	8 50%	0 0%	0 0%	16 100%
	Lieutenant	16 40%	8 20%	8 20%	8 20%	0 0%	40 100%
	Warrant Officer	0 0%	4 20%	4 20%	8 40%	4 20%	20 100%
	Sergeant	4 16.6%	8 33.3%	4 16.6%	4 16.6%	4 16.6%	24 100%
	Corporal	0 0%	0 0%	0 0%	0 %	0 0%	0 0%
	Recruit	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%
	Total	**28 (100.0%)**	**40 (100.0%)**	**38 (100.0%)**	**28 (100%)**	**16 (100%)**	150 100

Table 12 above shows a cross tabulation of respondents rank of senior officers and other ranks of personnel above 40 years against answers to the question about their level of fitness. From the above table only 18.6% (n=28) stated that they were very fit, 26.6% (n=40) felt that they were fit and 25.3% (n=38) somewhat fit respectively, 18.6% (n=28) stated that they could not tell, and 10.6% (n=16) stated that they were unfit.

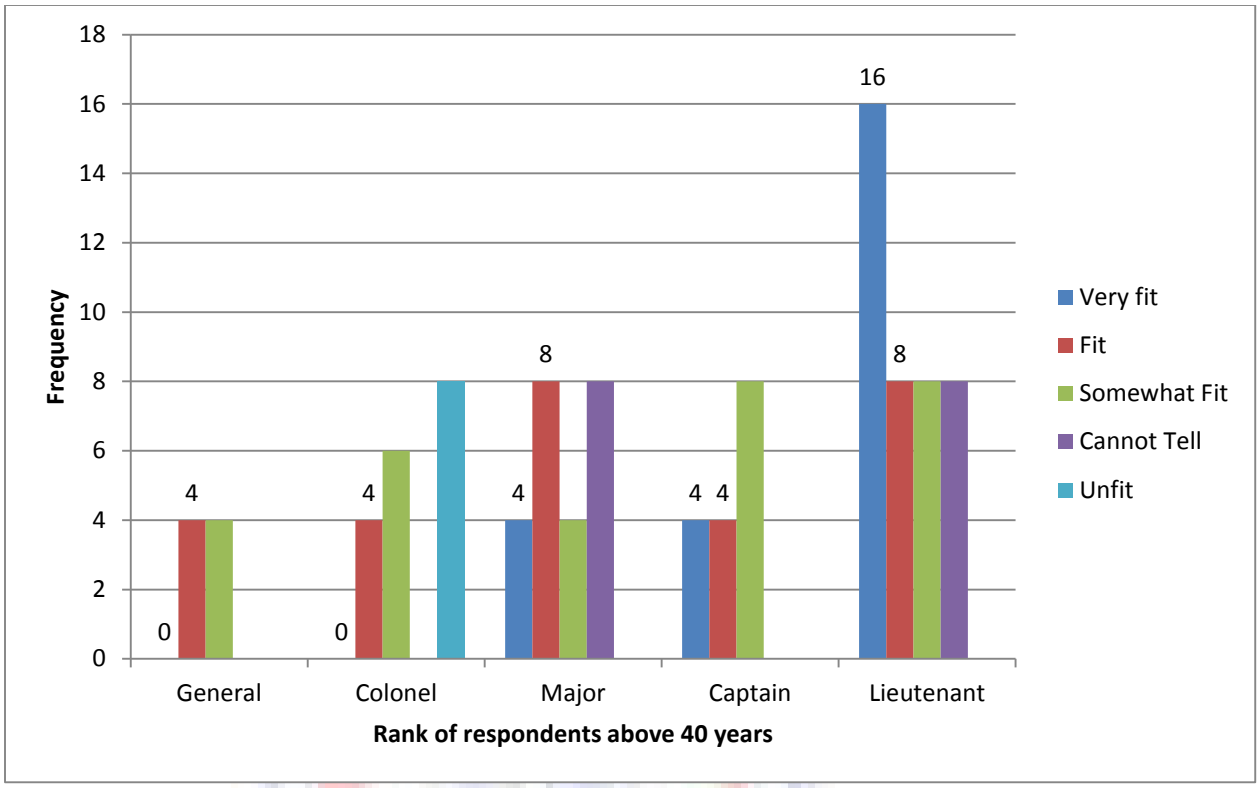

Figure 12: Cross Tabulation of Rank of respondents above 40 yrs against what is your fitness level?

Table 13: I am able to perform daily tasks with vigour (respondents who are 40 yrs and above)?

I am able to perform daily tasks with vigor?	Frequency	Percentage (%)
Strongly Agree	8	8
Agree	20	20
Neutral	32	32
Disagree	40	40
Strongly Disagree	0	0
Total	**100**	**100**

From table 13 above, 8% (n=8) of the respondents stated that they strongly agreed that they were able to perform daily tasks with vigor, 20% (n=20) agreed with to this assertion, 32% (n=32) were neutral, 40% (n=40) disagreed with this assertion and no respondent strongly disagreed with this.

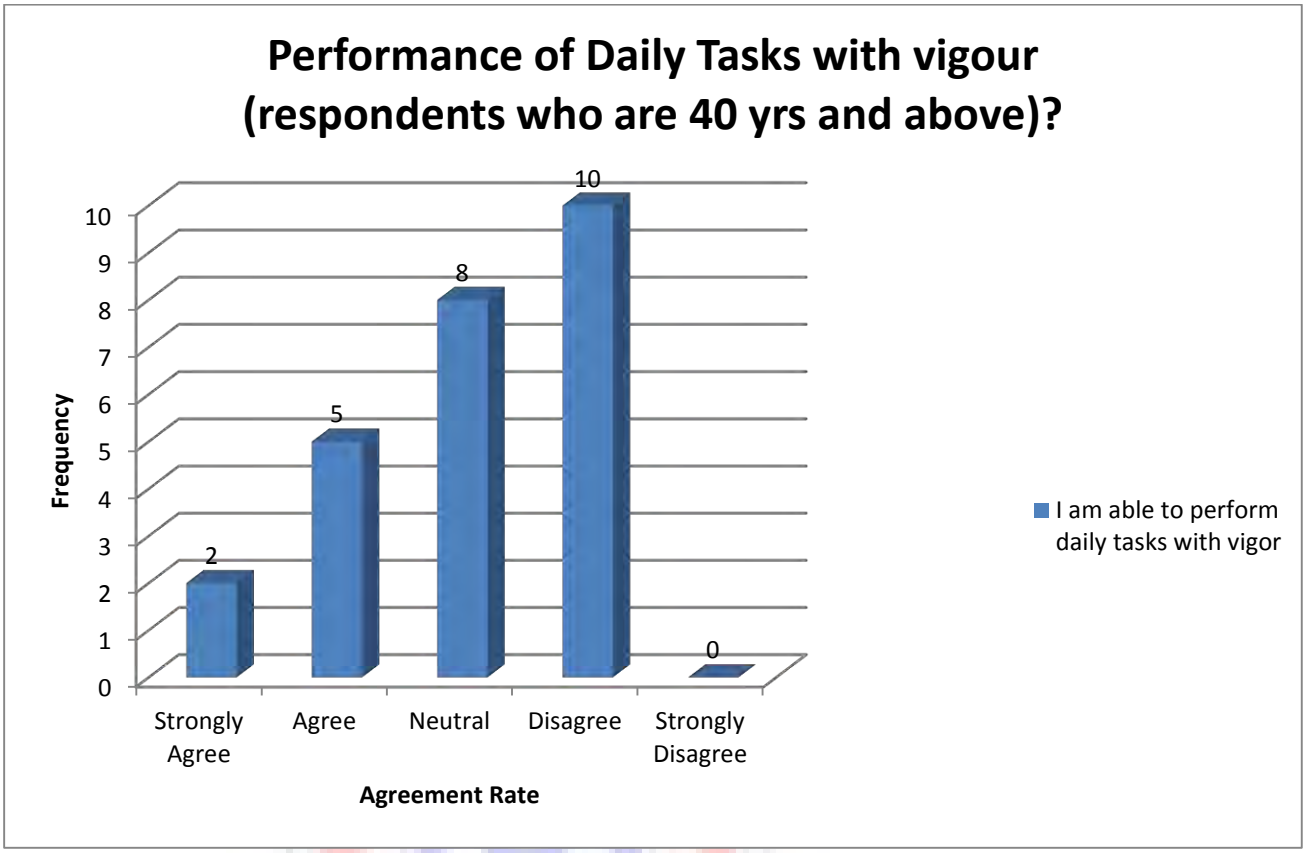

Figure 13: Performance of Daily Tasks with vigour (respondents who are 40 yrs and above)?

Table 14: In your opinion how fast can you run a 2mile run (respondents who are 40 yrs and above)?

In your opinion how fast can you run a 2mile run?	Frequency	Percentage (%)
Less than 8 minutes	0	0
9 – 11 minutes	0	0
12 – 14 minutes	24	24
More than 15 minutes	76	76
Total	**100**	**100**

From table 14 above, 0% (n=0) of the respondents stated that they could run a 2 mile run in less than 8 minutes, 0% (n=0) stated that they could run in between 9 – 11 minutes, 24%

(n=24) stated that they could run it in between 12 – 14 minutes, and 76% (n=19) stated that they would complete the run in more than 15 minutes.

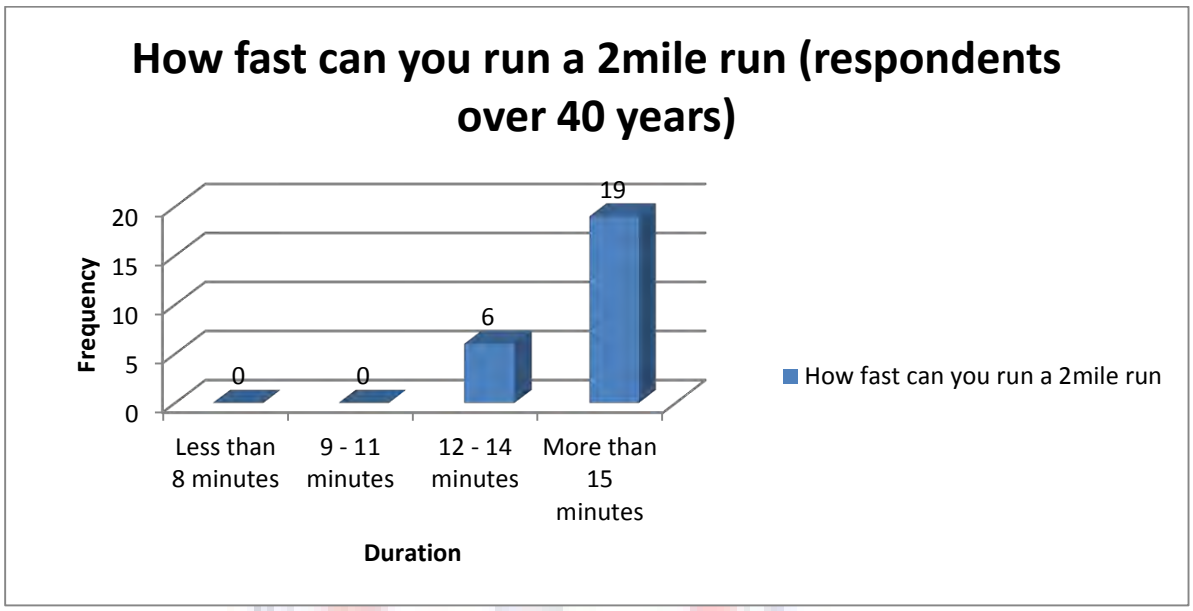

Figure 14: How fast can you run the 2 mile run of Respondents (respondents over 40 years)

Table 15: How would you classify your body weight (respondents who are 40 yrs and above)?

How would you classify your body weight?	Frequency	Percentage (%)
Underweight	0	0
Normal Range	20	20
Overweight	64	64
Obese	16	16
Total	**100**	**100**

From table 15 above, 0% (n=0) of the respondents stated that they were underweight, 20% (n=20) stated that they were in the normal range, 64% (n=64) stated that they were overweight and 16% (n=16) stated that they were obese.

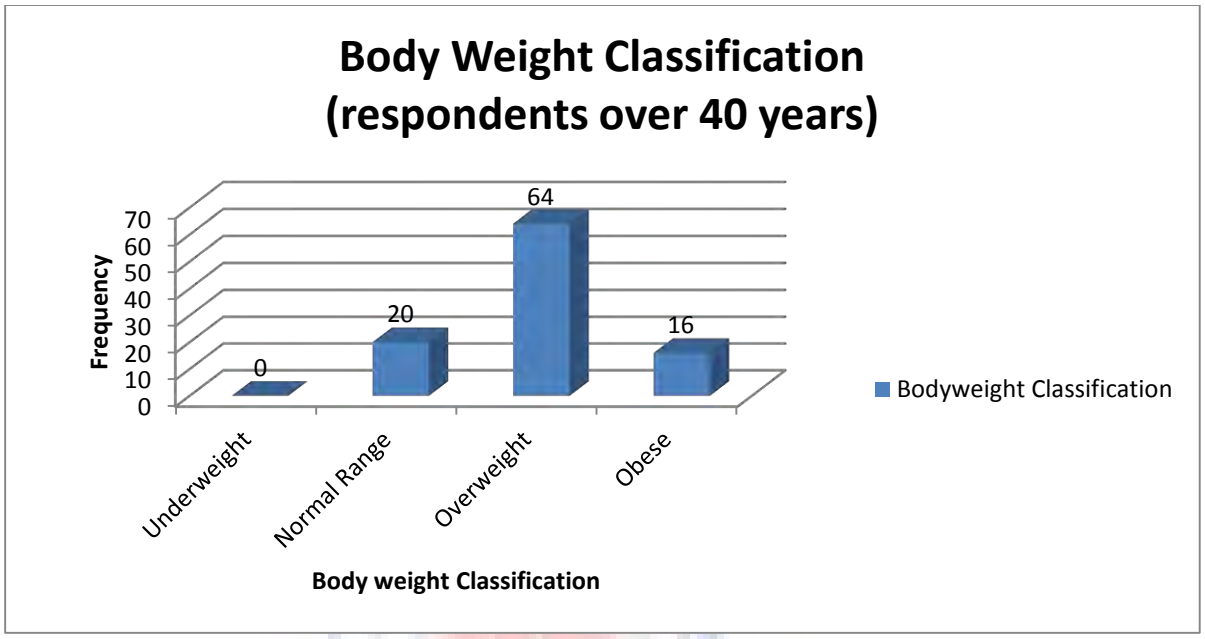

Figure 15: Bodyweight Classification of Respondents (respondents over 40 years)

Research Questions 4: What is the difference in physical fitness of IET soldiers and those that served for more than 10 years?

Table 16: Cross tabulation of IET soldiers and soldiers who have served for 10 years or more

		Fitness Level?					Total
		Very Fit	Fit	Somewhat Fit	Cannot Tell	Unfit	
Status	IET Soldiers	52 52%	36 36%	12 12%	0 0%	0 0%	100 100%
	Soldiers who have served 10yrs or more	12 12%	16 16%	22 22%	4 4%	36 36%	100 100%
	Total	**29 (100.0%)**	**22 (100.0%)**	**9 (100.0%)**	**1 (100%)**	**9 (100%)**	100

Table 16 above shows a cross tabulation of IET soldiers and soldiers who have served 10 years or more. The above table shows that for IET soldiers 52% (n=52) stated that they were very fit, 36% (n=36) stated that they were fit, 12% (n=12) stated that they were somewhat fit. No IET respondent stated that they cannot tell if they were fit and unfit. For the soldiers who

had served 10 years or more the above table shows that for 12% (n=12) stated that they were very fit, 16% (n=16) stated that they were fit, 22% (n=22) stated that they were somewhat fit, 4% (n=4) stated that they were could not tell if they were fit or not and 36% (n=36) stated that they were not fit.

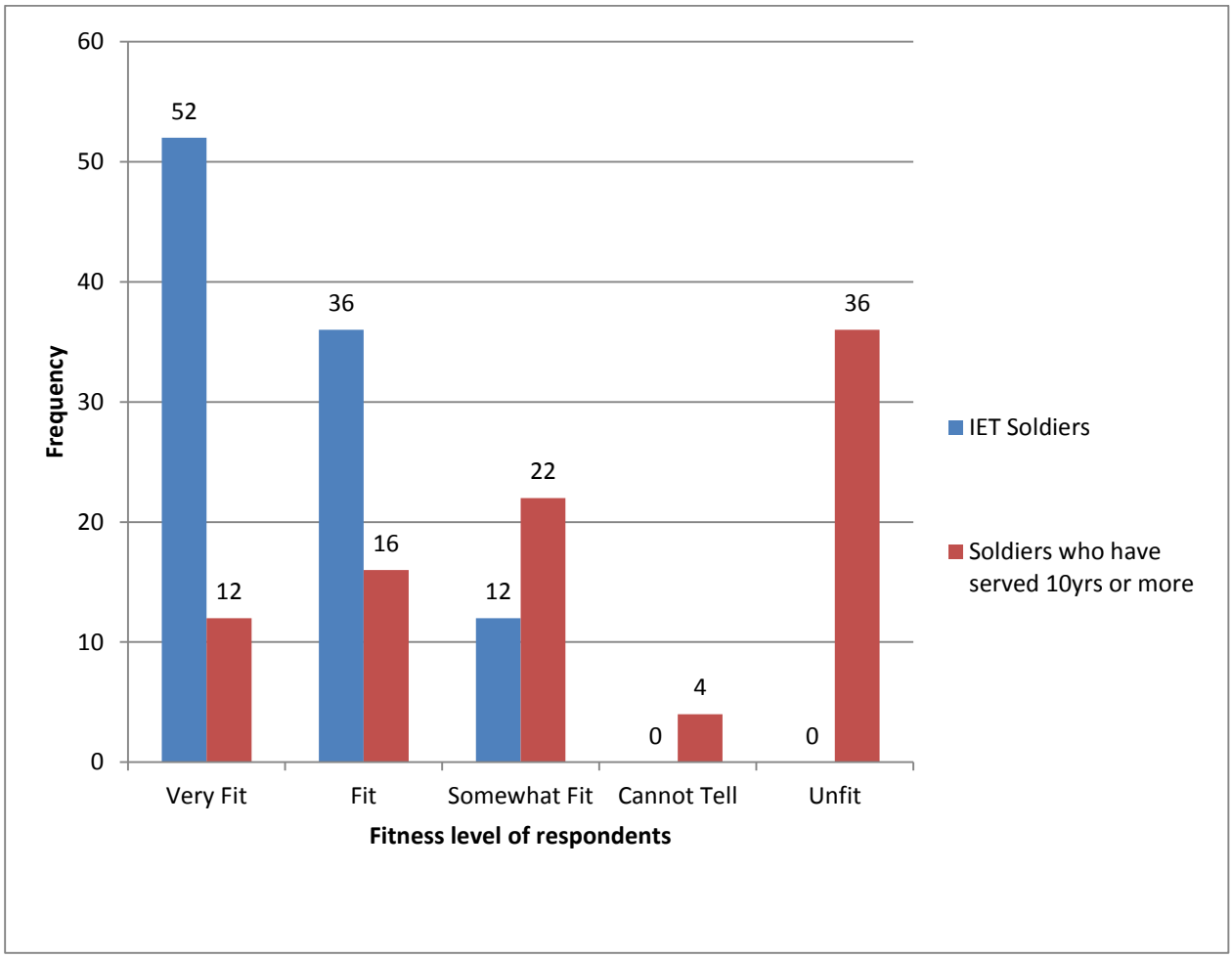

Figure 16: Cross tabulation of IET soldiers and soldiers who have served for 10 years or more

Clearly the comparisons show that that the fitness levels of IET soldiers are not equal to the fitness levels of soldiers who have served 10 years or more. Therefore this leads the researcher to conclude that states that soldiers who have served 10 years or more will not maintain the same level of fitness compared to those who just passed out.

4.4 DISCUSSION

4.4.1 General Findings

A majority of the respondents (70%) agreed that physical fitness was very important to them.

Response	Frequency	Percent	Valid Percent	Cumulative Percent
Agree	300	70.0	70.0	70.0
Disagree	100	30.0	30.0	100.0
Total	400	100.0	100.0	

A majority of the respondents (76%) also agreed that they were aware that possessing good health related fitness is related to lower risk of illness and improved quality of life.

Response	Frequency	Percent	Valid Percent	Cumulative Percent
Agree	304	76.0	76.0	76.0
Disagree	96	24.0	24.0	100.0
Total	400	100.0	100.0	

These findings are in order as the impact of physical training has been known since antiquity. Marcus Cicero, around 65 BC, stated: "It is exercise alone that supports the spirits, and keeps the mind in vigor." This establishes the very essence of physical training for man as an active being. Daily exercise will also enhance one's mental well-being and promote healthy musculoskeletal function throughout life. Physical training leads to physical fitness which has a positive impact on body composition and will result in less fat (Ezine Articles, 2010). To improve your level of fitness in preparation for Basic Training, you should focus on the following components of physical fitness; Cardio Respiratory Endurance (CR), Muscular Strength and Endurance, Flexibility, and body composition (Davis, 2000 as cited in Ezine

Articles, 2010). The process of physical training for people of all walks of life has impact with regards to their health and wellbeing and the Ghana armed forces is no exception to this.

4.5 Discussion of Research Questions Findings

4.5.1 Research Question One

The findings from the study for research question 1 revealed that a majority (88%) of the personnel who had just passed out were physically fit.

Response	Frequency	Percent	Valid Percent	Cumulative Percent
Fit	176	88.0	88.0	88.0
not fit	24	12.0	12.0	100.0
Total	200	100.0	100.0	

The data analysis also revealed that a majority of the IET soldiers (90%) were able to perform daily tasks with vigor.

Response	Frequency	Percent	Valid Percent	Cumulative Percent
able to perform daily task with vigor	180	90.0	90.0	90.0
unable to perform daily task with vigor	20	10.0	10.0	100.0
Total	200	100.0	100.0	

A majority (94%) of these IET soldiers were also able to run a 2 mile run below or in the stipulated time of 12 – 14 minutes.

Response	Frequency	Percent	Valid Percent	Cumulative Percent
able to run a 2mile run below of in the stipulated time of minutes-	188	94.0	94.0	94.0
unable to run a 2 mile run below or in the stipulated time of minutes-	12	6.0	6.0	100.0
Total	200	100.0	100.0	

The data analysis also revealed that a majority (90%) of these IET soldiers had a normal body weight.

Response	Frequency	Percent	Valid Percent	Cumulative Percent
normal body weight	180	90.0	90.0	90.0
abnormal body weight	20	10.0	10.0	100.0
Total	100	100.0	100.0	

These findings are in line with the goal of the cadets physical fitness program at the Ghana Military Academy which is to make the cadets physically fit and to motivate them to develop a lifelong habit of exercising regularly. They need strength, flexibility, and endurance to meet the challenges of being a cadet in the Military. The physical training they accomplish as cadets will also improve their self-confidence, build teamwork, and instill a sense of determination. More importantly, it helps them to become fit to accrue the necessary energy to achieve their train goals. (Ghana Military Academy Joining Instructions).

Research has proven that people who are physically fit feel better about themselves and live longer than those who do not exercise. At the entrance of the Cadet Mess at the Ghana

Military Academy is the inscription "I came here as a boy, I will leave as a man, bold, fit and strong". This inscription stresses the cardinal important of physical training and fitness to the general training given to cadets.

Physical fitness is one of the four components of the Cadet Programme. There are two facets to this physical fitness programme; training and testing.

Training*:* Fitness training includes stretching, calisthenics, fitness drills, circuits, team sports, and any activities that are fun but still physically challenging. Cadets are expected to give their fullest effort because they are not really exercising if they are not training hard. Their training also includes briefings on the basic principles of exercise, why fitness is important, and how to exercise safely. Cadets are expected not to limit their training to their Platoons but to be self-disciplined by exercising on their own, too.

Testing*:* Because it is vital to be physically fit, passing the Cadet Physical Fitness Test (CPFT) is one of the promotion requirements. For every achievement, cadets must take and pass all four elements of the CPFT.

Effective leadership is crucial to the success of the cadet physical fitness program. At the Military Academy, Physical Training Instructors (PTIs) and other instructors are designated to supervise fitness programmes and they must emphasize the value of physical training and clearly explain the objectives and benefits of the programme. Instructors must be familiar with the principles of exercise and the correct techniques for each exercise to ensure the training is productive and safe.

Individual Differences: Leaders must closely observe cadets during physical training. Especially watch for cadets who are struggling with one or all of the activities; help these cadets attain the standards of the four CPFT events. Leaders must also understand the

physiological differences between male and female cadets and the developmental stages of younger and older cadets in their platoons. No two cadets are alike in ability, but under the right leadership every cadet will give fitness training their fullest effort. By encouraging each cadet in a manner that motivates, not humiliates, this can go a long way in bringing them up to the required standard.

Prohibitions. Physical exercise in the Cadet Programme will be used only to further the goal of improving physical fitness while increasing confidence, teamwork, and determination. When PTIs, Platoon Commanders, other instructors and ranking cadets use physical training as a form of punishment or remedial discipline it creates the impression that physical training is punishment and it erodes it overall importance to the training.

In the Ghana Army Pocket Physical Training Guide (2011), "a standardized physical training session consists of the following three essential elements: warm-up, activity, and cool-down. These elements are integrated to produce the desired training effect. More importantly, every standardized physical training session must have a specific purpose. This purpose, to prepare the trainee for the physical demands of IMT, follows a recommended rate of progression, specific to each individual's tolerance to the current level of training. There are three stages of standardized progression: initial, improvement, and maintenance. The initial conditioning stage includes light muscular endurance activities and moderate-level cardio-respiratory endurance activities that produce minimal muscle soreness and control injuries. This stage usually lasts up to 4 weeks and is dependent upon the individual's adaptation to exercise. The duration of the main activity during the initial stage will begin with approximately 15 to 20 minutes and may progress to 30 minutes. Individual goals are established by the PTIs early in the exercise program and are reflected in the training schedule. The initial stage is the walk-

to-run program and the muscular strength and endurance sessions conducted in weeks one through four. The goal of the improvement stage is to provide a gradual increase in the overall exercise stimulus to allow for more significant improvements in fitness level. This is shown through the increased running times in the running progression and the increased number of sets and repetitions in conditioning drill programme. The goal of the maintenance stage is the long-term maintenance fitness developed during the weeks spent in the improvement stage. This stage of the standardized physical fitness training program begins when trainees reached the pre-established fitness goals set by the PTIs.

All soldiers in the Ghana Armed Forces (GAF) must first complete Basic Training at the Army, Navy and Air Force Recruit Training Centre (RTC) at Shai-Hills, Tema, and Sekondi-Takoradi. The duration of the Basic Training course at RTC is six months. The length and location of this training is dependent on the job. Trainees undergo physical training and drills and learn valuable first aid skills, skills at arms and tactics. After this they are sent to their respective units and their career as soldiers will have begun. The skills learnt at RTC form the foundation of a career as a soldier and are called upon for years to come.

The Army Physical Fitness Test (APFT) is a three-event physical performance test used to assess endurance. It is a simple way to measure physical strengths, abilities, and cardio-respiratory fitness. The intent of the APFT is to provide a baseline assessment regardless of military occupational specificity. The three PFT events are two minutes of push-ups, two minutes of sit-ups, and a timed 2-mile run. To pass, one must score 180 points or higher with at least 60 points in each event.

According to the Canadian physical fitness guide, to ensure one gets the physical activity needed, the Canadian Forces provides trained professional staff, first class facilities, and a wide range of exercise, sport and recreation programs. The exercise prescription or eXPres program includes a fitness test, exercise programs and resources to help you achieve your personal fitness goals. Thus, to better prepare for Basic Training, cadets fitness training program are be geared towards meeting the Canadian forces minimum physical fitness standard. Before starting Basic Training, it is expected that trainees be able to: run 5km, run, run 2.4 km within an appropriate time, complete push-ups and sit-ups, complete a hand-grip test, tread water for at least 2 minutes and swim 20 m without a life jacket. Regular physical training sessions will prepare trainees for field exercises, a 13 km forced march will help you meet the Canadian forces minimum physical fitness standard. Passing the Canadian forces fitness standard is a requirement of Basic Training which include: skill and strength development, running progressively longer distances up to 6 km and completing force marches of various lengths. Standards are based on age and gender. For example, a male under age 35 must do 19 push-ups, while a woman under age 35 must do 9 pushups.

The Australian Army Physical Fitness Assessment (PTA) has the following requirements for recruits: 45 full sit-ups for both males and females, 15 push-ups for males and 8 for females, and beep test level 7.5 for both males and females. Once chosen, the bi-annual basic fitness requirements include the following tests. The requirements will vary between males and females, and age groups. 2.5 km run (men U/25 must do at least 11:18, women 13:30), push-ups (men U/25 must do at least 40 women 21), and sit-ups (men and women U/25 must do at least 70).

Physical fitness as related to health is characterized as the ability to perform daily tasks with vigor (Dumith; Junior; Rombaldi, 2008 as cited in EF Deportes, 2012). These findings are in line with the findings of the current study where physically fit IET soldiers were able to perform tasks with vigor. These demonstrated traits and characteristics are associated with a lower risk of premature development of hypo-kinetic disease (Pate, 1988 as cited in EF Deportes, 2012). This conclusion was derived primarily from clinical studies that showed that this was the highest incidence of health problems among the elderly, young adults and sedentary lifestyles (Lunardi; Kaipper; Santos, 2007 as cited in EF Deportes, 2012). In other words, the sum of these definitions take into account a very essential component of human existence which is health but limits its scope to the elderly, young adults and sedentary lifestyles, without expanding it to include vigorous and demanding professions like the military.

In military use, training means gaining the physical ability to perform and survive in combat, and learning the many skills needed in a time of war. According to the President's Council on Physical Fitness and Sports of the United States of America, as cited by Hoefs (2010), physical fitness is defined as a set of characteristics enhancing performance of physical activity and decreasing your risk of premature health concerns. Accordingly, each branch of the Special Forces has a specific list of guidance for physical fitness. The minimum scores for each physical fitness test are used to determine if a soldier is capable of performing job requirement in the line of duty. One example of a physically fitness training test for the Army Green Berets is a 2-mile run in at least 12 to 14 minutes. Passing the test indicates you have adequate amounts of physical, emotional and mental stamina. This is in line with the findings of this study where physically fit soldiers indicated that they were able to run the 2 mile run in at least 12 – 14 minutes.

Physical training leads to physical fitness which has a positive impact on body composition and will result in less fat (Ezine Articles, 2010). This is in tune with the findings of the current study where a majority of IET trainees had a normal body weight. To improve your level of fitness in preparation for Basic Training, you should focus on the following components of physical fitness; Cardio Respiratory Endurance (CR), Muscular Strength and Endurance, Flexibility, and body composition (Davis, 2000 as cited in Ezine Articles, 2010).

4.5.2 Research Question Two

The findings of the data analysis revealed that a majority of the trainees or IET soldiers, (68%) felt that the level of physical training was adequate.

Response	Frequency	Percent	Valid Percent	Cumulative Percent
Adequate	272	68.0	68.0	68.0
Inadequate	128	32.0	32.0	100.0
Total	400	100.0	100.0	

With respect to the personnel of the GAF a majority of them (50%) felt the physical training for personnel was inadequate or needed improvement with only (30%) agreeing that it was adequate or somewhat adequate.

Response	Frequency	Percent	Valid Percent	Cumulative Percent
Adequate	60	30.0	8.0	8.0
Undecided	40	20.0	20.0	28.0
not adequate	100	50.0	72.0	100.0
Total	200	100.0	100.0	

These findings are in line with the goal of the cadets physical fitness program at the Ghana Military Academy which is to make the cadets physically fit and to motivate them to develop a lifelong habit of exercising regularly. They need strength, flexibility, and endurance to meet the challenges of being a cadet in the Military. The physical training they accomplish as cadets will also improve their self-confidence, build teamwork, and instill a sense of determination. More importantly, it helps them to become fit to accrue the necessary energy to achieve their train goals. (Ghana Military Academy Joining Instructions).

Globally, physical training consists of developing and building on the individual's physical fitness and stamina, by incorporating a structured programme of fitness, agility and cardiovascular routines. For example, in the U.S, people who are interested in joining the army have to prepare themselves for such efforts by practicing a few basic exercises used regularly by the army for endurance, strength, and stamina and weight maintenance (Wang, 2011). People of all ages can improve the quality of their lives and reduce the risks of developing coronary heart disease, hypertension, and some cancers and type 2 diabetes with ongoing participation in moderate physical activity and exercise (Centers for Disease Control and Prevention [CDC] 2007a as cited in Ezine Articles, 2010). Daily exercise will also enhance one's mental well-being and promote healthy musculoskeletal function throughout life. Although habitual physical activity is an attainable goal on the path to a healthier life, more than half of U.S. adults do not get greater than 30 minutes of moderate-intensity exercise per day at least 5 days per week (Centers for Disease Control and Prevention [CDC] 2007a as cited in Ezine Articles, 2010). After accepting a job with the Canadian forces, all new recruits are required to complete basic training. These courses are designed to teach them the core skills and necessary knowledge to succeed in a military environment. Since

physical fitness is an integral component of military service, a large part of the course is spent in physical fitness training (FORCES. CA, 2009).

Passing the Canadian forces minimum physical fitness standard is a requirement of Basic Training. The training includes; skill and strength development, running progressively longer distances, and completing forced marches of various lengths (FORCES. CA, 2009). Strength and endurance could mean the difference between success and failure in a military operation. For this reason, Canadian Forces (CF) personnel must be more physically fit than the general Canadian population. All CF personnel are required, therefore, to undergo an annual physical fitness evaluation, known as the CF EXPRES test, where they must meet a minimum physical fitness standard (MPFS) (Physical Training and Standards, 2009). The majority (96%) of Regular Force personnel who undergo the CF EXPRES test pass the evaluation. Those who fail and those who do not complete the evaluation are considered non-deployable and may face career restrictions. To ensure that CF physical fitness standards and programs maintain their relevance, the MPFS is evaluated on a regular basis with a focus on its scientific validity and its correspondence to common military tasks, gender and age (Physical Training and Standards, 2009).

In Ghana, physical training is an essential component of military training for all officer candidates of the army, air force, and navy and is conducted at the Ghana Military Academy (Ghana Index, 2006). Basic combat training (BCT) equips the individual with the fundamentals of being a soldier and provides the platform for individuals to undergo rigorous physical training to prepare their bodies and their minds for the eventual physical and mental strain of combat.

4.5.3 Research Question Three:

The findings of the current study also revealed that the fitness levels of female counterparts over 4 years was bad with about 50% of the respondents stating that they were not fit.

Response	Frequency	Percent	Valid Percent	Cumulative Percent
Fit	50	50.0	50.0	50.0
not fit	50	50.0	50.0	100.0
Total	100	100.0	100.0	

For senior members and other ranks over 40 years a majority representing 70% stated that they were not fit or somewhat fit.

Response	Frequency	Percent	Valid Percent	Cumulative Percent
Fit	30	30.0	30.0	30.0
not fit	70	70.0	70.0	100.0
Total	100	100.0	100.0	

To Moran S.D et al (2009), integrating women into combat professions that have been male-dominated in the past has become a main issue in the Israeli Defence Forces (IDF), as well as a matter of discussion in armed forces worldwide. In the U.S Army, policies regarding acceptable roles and suitable assignments for women have been updated to encompass the demographic shift in female recruitment. Over a thirty-year period, the percentage of females in the U.S Army military forces has increased from 1.6% in 1972 to 15% in 2001 and this trend is projected to increase in the near future to 20%. In Israel, military service is

mandatory for both males and females, and the percentage of female involvement reaches approximately 30% of the total military force. Physiological differences in women such as lower muscle mass, higher fat percentage, lower aerobic musculoskeletal injuries, which previously had excluded them from most combat duties, have shown to improve with proper training regiments. One study, in which both genders participated in a similar 8-week training program, revealed a substantial decrease in the difference between men and women in aerobic power. In addition, other studies have shown a reduction in body fat percentage (%BF) of up to 7.1 % along with an increase in total weight when comparing weight and lean body mass (LBM) after proper physical training.

These results denote a significant increase in muscle tissue. Military standards in combat units have been set for male soldiers. Therefore the question arises whether female soldiers can adapt to these physical demands with the implementation of proper military relevant training programs. For example, women have been shown to be more susceptible to overuse injuries such as stress fractures when compared to males engaged in similar activities. Stress fracture, an overuse injury to bone, is one of the most common and potential debilitating overuse injuries seen in military recruits. Some studies have shown a stress fracture incidence ranging from 12% to 30% among female army recruits in comparison with only 7-10% amongst the male recruits.

However, despite the high incidence of injury among female soldiers, Knapik et al, showed that a carefully controlled physical training program resulted with a lower overall injury rate in basic combat training. In a previous study, Yanovich et al investigated the changes in physical fitness of male and female soldiers following a 4-month BT course in a unit that was comprised of a vast majority of female soldiers (70%). In that unit all soldiers regardless of

their gender served under the same environment conditions and participated equally in al combat duties: e.g. patrols, pursuits, ambushes and surveillance. Physical requirements for both female and male soldiers were supposed to be equal. It was reported that the physiological advantage of male soldiers was lowered by almost 4 % during BT, but the overall gender differences were still evident in favor of the males, indication a 20% aerobic and 25% anaerobic advantage over their female counterparts. The purpose of the study was to further evaluate whether gender differences in anthropometric and physical fitness parameters relevant to military task performance could be narrowed after a 4-month period of gender integrated BT". This study unravels the essence of physical fitness not just for men but women to be specific. It is clear, that in a gender friendly training environment, women soldiers are capable to stand tall just us their male counterparts. The physiological difference between men and women must therefore be taken into consideration for setting principles and standards for new recruits. With such innovations, women will improve and perform much better as soldiers.

In a study conducted by Wright D.A. et al (1994), over a 5-year period (1986-1990), 1,223 male, senior military officers were tested to determine lipoprotein profiles, body composition (by densitometry), peak oxygen consumption (VO2 peak by graded, treadmill walking), and strength (one repetition maximum). Average (+/- SD) VO2 peak and body fat were 44.9 +/- 6.7 ml/kg x min and 24.4 +/- 5.1%, respectively. Although the average VO2 peak of these individuals is in the top 10-15% of this age group, nearly 39% are over-fat (by U.S. Army Regulation 600-9). Mean (+/- SD) total cholesterol, and triglycerides were 205 +/- 36, 50 +/- 12, 134 +/- 32, and 108 +/- 71 mg%, respectively. These results reflect an apparently healthy diet and lifestyle, which was strengthened, for the most part, when an average Framingham

risk index (FRI) of approximately 2.3 was calculated. The low mean FRI for this group may possibly be attributed to lower total cholesterol and smoking rates than the average 45-year old man in the Framingham study. The results of the testing indicate that this group generally has a high aerobic capacity, is normo-tensive, non-obese and at low risk for the development of cardiovascular disease.

Research Questions 4: What is the difference in physical fitness of IET soldiers and those that served for more than 10 years?

Table 16: Cross tabulation of IET soldiers and soldiers who have served for 10 years or more

		Fitness Level?					**Total**
		Very Fit	**Fit**	**Somewhat Fit**	**Cannot Tell**	**Unfit**	
Status	IET Soldiers	52	36	12	0	0	100
		52%	36%	12%	0%	0%	100%
	Soldiers who have served 10yrs or more	12	16	22	4	36	100
		12%	16%	22%	4%	36%	100%
	Total	**29**	**22**	**9**	**1**	**9**	100
		(100.0%)	**(100.0%)**	**(100.0%)**	**(100%)**	**(100%)**	

The result showsthat IET soldiers and soldiers who have served more than 10 years. It revealed that IET soldiers 52% (n=52) stated that they were very fit, 36% (n=36) stated that they were fit, 12% (n=12) stated that they were somewhat fit. No IET respondent stated that

they cannot tell if they were fit and unfit. For the soldiers who had served 10 years or more the above table shows that for 12% (n=12) stated that they were very fit, 16% (n=16) stated that they were fit, 22% (n=22) stated that they were somewhat fit, 4% (n=4) stated that they were could not tell if they were fit or not and 36% (n=36) stated that they were not fit. The results denote a significant increase in muscle tissue of military standards in combat units set for soldiers. This study unravels the essence of physical fitness not just for men but women to be specific. It is clear, that in a friendly training environment, soldiers are capable to stand tall. All soldiers in the Active Army, Army National Guard, and Army Reserve must take the Army Physical Fitness Test (APFT) regardless of their age. A soldier's level of physical fitness has a direct impact on his combat readiness. The many battles in which troops have fought underscore the important role physical fitness plays. The interest in fitness has been accompanied by many research studies on the effects of regular participation in sound physical fitness programmes. The overwhelming conclusion is that such programmes enhance a person's quality of life, improve productivity, and bring about positive physical and mental changes. Not only are physically fit soldiers essential to the Army, they are also more likely to have enjoyable, productive lives.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This chapter summarizes the research findings and looks at the conclusions and recommendations made by the researcher.

5.1 Summary

The research was conducted, using questionnaires to investigate the impact of physical training on physical fitness of initial entry and personnel of the Ghana Armed Forces. A sample size of 200 trainees or IET soldiers and 200 personnel of the GAF were used. A majority of the respondents (70%) agreed that physical fitness was very important to them. A majority of the respondents (76%) also agreed that they were aware that possessing good health related fitness is related to lower risk of illness and improved quality of life. The findings from the study for research question 1 revealed that a majority (88%) of the personnel who had just passed out were fit. The data analysis also revealed that a majority of the IET soldiers (90%) were able to perform daily tasks with vigor. A majority (94%) of these IET soldiers were also able to run a 2 mile run below or in the stipulated time of 12 – 14 minutes.

The data analysis also revealed that a majority (90%) of these IET soldiers had a normal body weight. The findings of the data analysis revealed that a majority of the trainees or IET soldiers (68%) felt that the level of physical training was adequate whereas for the personnel of the GAF a majority of them (50%) felt the physical training for personnel was inadequate or needed improvement with only (30%) agreeing that it was adequate or somewhat adequate. The findings of the data analysis revealed that the resources available for trainees are of the strict training programmes, drill sergeants/trainers, diet plans, instructors/physio's, fitness training equipment and grass field's nature. The findings of the current study also

revealed that the fitness levels of female counterparts over 40 years was bad with about 50% of the respondents stating that they were not fit. For senior members and other ranks over 40 years a majority representing 70% stated that they were not fit or somewhat fit. A comparison of fitness levels of IET soldiers and other personnel of the GAF show that that the fitness levels of IET soldiers are not equal to the fitness levels of soldiers who have served 10 years or more. Therefore this lead the researcher to agree with perception that "Soldiers who have served 10 years or more will not maintain the same level of fitness compared to those who just passed out". Frequencies, percentages, cross tabulations, tables, and figures were used to analyze the responses.

5.2 Conclusion

The purpose of the study was to examine the impact of physical training on physical fitness of initial entry trainees and personnel of the Ghana Armed Forces. The descriptive statistical analysis revealed that indeed a majority of the respondents agreed that physical fitness was very important to them. A majority of the respondents also agreed that they were aware that possessing good health related fitness is related to lower risk of illness and improved quality of life. The study revealed that IET soldiers are fitter comparatively to other personnel of the GAF as their physical training regime in the academy ensures that they are very fit. Even though the personnel of the GAF were aware of the importance or benefits of physical training only a few of them actually exercised regularly. The data analysis also revealed that a majority of the IET soldiers were able to perform daily tasks with vigor. A majority of these IET soldiers were also able to run a 2 mile run below or in the stipulated time of 12 – 14 minutes. The data analysis also revealed that a majority of these IET soldiers had a normal body weight. These findings signify that the IET soldiers are indeed very fit when coming

out of the Academy. The findings of the data analysis revealed that a majority of the trainees or IET soldiers felt that the level of physical training was adequate whereas for the personnel of the GAF a majority of them felt the physical training for personnel was inadequate or needed improvement. The study further revealed that the resources available for trainees of the strict training programmes, drill sergeants/trainers, diet plans, instructors/physio's, fitness training equipment and grass fields. The findings of the current study also revealed that the fitness levels of female counterparts over 40 years was bad with about 50% of the respondents stating that they were not fit. For senior members and other ranks over 40 years a majority representing 70% stated that they were not fit or somewhat fit. A comparison of fitness levels of IET soldiers and other personnel of the GAF show that that the fitness levels of IET soldiers are not equal to the fitness levels of soldiers who have served 10 years or more with the IET soldier being more fit than the other soldiers.

This research work is a contribution to knowledge on the impact of physical training on the personnel of the Ghana Armed Forces i.e. both IET and other personnel. This study has documented a process of ascertaining whether there are gains or otherwise in the physical training regime used by both trainees and other staff. This is indeed necessary and consequently in Ghana where for many other GAF personnel and indeed other people, exercising is not their favorite part of the day. Learning how employing a strict physical training regime will impact positively on their health and life would go a long way make sure that GAF personnel are healthy and perform their jobs to the best of their ability. Teaching and learning of physical fitness activities which results in healthy students.

Finally, the researcher anticipates that this thesis has provided a useful framework and built a foundation for research across different approaches to examining the impact of physical training on personnel of the Ghana Armed Forces.

5.3 Implications

As previous and current studies have established, the impact of physical training has been known since antiquity. Marcus Cicero, around 65 BC, stated: "It is exercise alone that supports the spirits, and keeps the mind in vigor." This establishes the very essence of physical training for man as an active being. Physical activity enjoyment is a positive incentive for consistent engagement in physical activity, which will ultimately affect the health and quality of life of soldiers in the GAF. Results of this study have further indicated that physical training plays an important role in the lives of personnel of the GAF.

Research has proven that people who are physically fit feel better about themselves and live longer than those who do not exercise. Physical fitness as related to health is characterized as the ability to perform daily tasks with vigor (Dumith; Junior; Rombaldi, 2008 as cited in EF Deportes, 2012). These demonstrated traits and characteristics are associated with a lower risk of premature development of hypo-kinetic disease (Pate, 1988 as cited in EF Deportes, 2012). This conclusion was derived primarily from clinical studies that showed that this was the highest incidence of health problems among the elderly, young adults and sedentary lifestyles (Lunardi; Kaipper; Santos, 2007 as cited in EF Deportes, 2012).

Results of the study indicated the obvious need for physical training to be emphasized and encouraged for personnel of the GAF who are out of the training institutions. This will go a long way to ensure that personnel of the GAF are healthier, have improved quality of health

and ensure that they give off their best in their various roles in protecting and safe-guarding the interests of the nation at large.

5.4 Recommendations

It is therefore recommended that:

1. Ghana Armed Forces should come out well with a policy on fitness.
2. Personnel of forty years and above should be subjected to compulsory weekly physical training programme.
3. Ghana Armed Forces should institute compulsory physical fitness test for all personnel.
4. Ghana Armed Forces should review the physical training curriculum at the physical training school.

5.5 Suggestion(s) for Further Research

It is also believed that this study has provided an insight into the impact of physical training on physical fitness of personnel of the GAF. This study was limited to members of the Ghana Armed Forces only in the 1st and 2nd Garrisons of the Ghana Armed Forces. However, there could be other factors that need to be identified or evaluated. For instance specific physical training activities and their specific impact on soldiers e.g. running, stretching, push-ups etc. Hence, it is felt that further research needs to be carried out in the area and expanded to include specific specialization for other arms of the military like the Navy, Air force and possibly the police. The study can also be carried out in other regions to ascertain whether the same results would be gotten.

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APPENDIX A

PHYSICAL TRAININGQUESTIONNAIRE

SECTION A

Background Information

Kindly provide the needed information as accurately as possible by placing a tick (√) in the appropriate box.

1. **Sex:** Male [ ] Female [ ]

2. **Age:**less than 20 [ ] 20-29 [ ] 30-39 [ ] 40-49 [ ] 50 and above [ ]

3. **Rank:** _____

4. Educational Status: [ ] Masters Degree [ ] First Degree [ ] Diploma [ ] SSSCE/WASSCE

5. **Working Experience**. [ ] 1 – 5 years [ ] 6-10 years [ ] 11-15 years [ ] 16-20 years [ ] 20 years and above.

SECTION B

Kindly provide answers to the questions below by putting check marks in the appropriate boxes.

1. Physical fitness is very important to me?
   Strongly Agree [ ] Agree [ ] Neutral [ ] Disagree [ ] Strongly Disagree [ ]

2. I am aware that possessing good health related fitness is related to lower risk of illness and improved quality of life?
   Strongly Agree [ ]Agree [ ] Neutral [ ] Disagree [ ] Strongly Disagree [ ]

3. I am able to perform daily tasks with vigor?
   Strongly Agree [ ]Agree [ ] Neutral [ ] Disagree [ ] Strongly Disagree [ ]

4. How often do you exercise or involve yourself in physical training?

Daily [ ] Weekly [ ] Bi Weekly [ ] Monthly [ ] Once in a while [ ] Never [ ]

5. What are your reasons for not exercising regularly

It is not necessary [ ]

No time for it as work is too demanding [ ]

I feel lazy [ ]

My health condition does not allow me [ ]

My age does not allow me [ ]

Other (state): _____

6. In your opinion what is your fitness level as a member of the GAF?

Very Fit [ ] Fit [ ] Somewhat Fit [ ] Cannot Tell [ ] Unfit [ ]

7. In your opinion how fast can you run a 2mile run?

Less than 8 minutes [ ]

9 – 11 minutes [ ]

12 – 14 minutes [ ]

More than 15 minutes [ ]

8. Do you feel that the level of physical training as a trainee/personnel of the Ghana Armed Forces is adequate for you?

Adequate [ ] Somewhat Adequate [ ] Undecided [ ] Not Adequate [ ]

9. What resources are available for you as a trainee of the GAF with regards to physical training?

_____

_____

_____

10. Are the resources provided adequate in facilitating physical fitness?

Adequate [ ] Somewhat Adequate [ ] Undecided [ ] Inadequate [ ]

11. What is your perception about physical training in the GAF?

_____

_____

_____

12. How would you classify your body weight?

Ok [ ]

Fat [ ]

Obese [ ]

Unware [ ]

13. How would you describe your attention to your nutrition?

Excellent [ ]

Very Good [ ]

Good [ ]

Satisfactory [ ]

Poor [ ]

APPENDIX B

INTERVIEW GUIDE QUESTIONS

INSTRUCTION: Please kindly give your candid opinion on the following questions.

1. How can you classify your body weight from the initial entry training and present as a soldier in the Ghana Army Forces (GAF)?
2. How can you describe your being able to perform daily task with vigor at initial entry training as a soldiers?
3. What is your fitness level based on your ranking?
4. How can you describe your being able to perform daily task with vigor at the age of 40 and above?
5. How have your experiences as an initial entry training soldiers influenced or not influenced you in the decisions that you have made in physical fitness?
6. What recommendations would you give concerning physical educational training in the GAF?