

A Comparison of Regimented, Scheduled, and Individualized
Army Physical Fitness Test Training Programs

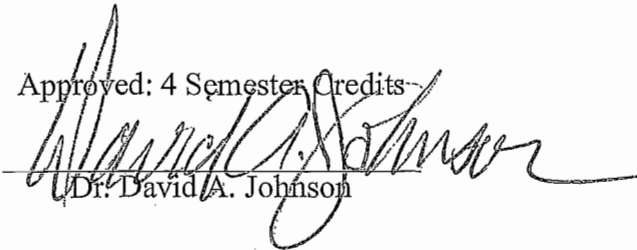
by

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A Research Paper
Submitted in Partial Fulfillment of the
Requirements for the
Master of Science Degree
in

Training and Development

Approved: 4 Semester Credits



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August, 2009

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Title: *A Comparison of Regimented, Scheduled, and Individualized Army
Physical Fitness Test Training Programs*

Graduate Degree/ Major: MS Training and Development

Research Advisor: David A. Johnson, Ph.D.

Month/Year: August, 2009

Number of Pages: 79

Style Manual Used: American Psychological Association, 5th edition

ABSTRACT

This study was conducted for two reasons. The first was to determine whether a formal, organized US Army physical training (PT) program would produce a better pass rate on the Army Physical Fitness Test (APFT) than either a program with limited or no PT requirements or no PT requirement. The second reason for the study was to compare the improvement in each APFT event and overall the APFT scores between four treatment groups.

A few years ago a recommendation was made that the Army Reserve Officer Training Corps (AROTC) discontinue required scheduled PT programs. It is mandatory that AROTC cadets pass an APFT at least once per year, and failure to meet this requirement could have adverse affects on the cadets' status not only in the AROTC program, but the military as well. A concern was raised that discontinuing the mandatory PT programs would adversely impact the APFT pass rate as well as the APFT scores.

The University of Wisconsin-Stout (UWS) AROTC cadets, which includes cadets from the University of Wisconsin-Eau Claire (UWEC) and the University of Wisconsin-River Falls (UWRF), were given an initial APFT in February, 2009. The cadets were then divided into four treatment groups. Three treatment groups had scheduled PT with different requirements. The fourth treatment group had no PT requirements. In May, 2009, a final APFT was to the cadets.

The difference in the pass rates between the treatment groups between the initial APFT and final APFT were compared. The APFT event and overall scores between the treatment groups and the initial APFT and final APFT were also compared. The three treatment groups which had scheduled PT had a dramatic increase in pass rates while the treatment group with on scheduled PT had no change on pass rate. There were only statistical differences between one of the scheduled PT treatment groups and the unscheduled PT treatment groups in the sit-ups event, the two mile run event, and the overall events scores between the initial and final APFTs.

Based upon the research and the results of this study the researcher recommends that the AROTC not discontinue the scheduled PT requirement.

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Acknowledgments

I need to express my sincere appreciation to my wife, Vicki, who has tolerated and supported me the past two years as I have pursued my Master's Degree. Without her support this study would not have been possible.

I am grateful to Dr. David A. Johnson, my thesis advisor, for motivating me the past two years while I've pursued my Master's Degree and for providing me guidance during this research project.

I need to express my appreciation to my daughter, Tessa, and her husband, Tim. Tessa is an alumnus of the University of Wisconsin-Stout Graduate School. She helped persuade me to pursue my Master's Degree and has provided support and guidance throughout my post-graduate journey.

My son Brian and his wife Tami have also been there to provide emotional support as I've worked my way through graduate school while working full time and pursuing other endeavors as well.

Lastly I need to thank Lieutenant Colonel (LTC) Scott Bolstad. LTC Bolstad was instrumental in helping me plan, organize, and execute this study. Without his support this study would not have happened.

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Chapter I: Introduction

The United States (US) Army Cadet Command is responsible for administering the Army Reserve Officer Training Corps (AROTC) programs at colleges and universities. The AROTC program is part of the college's curriculum and is designed to train AROTC cadets to be officers in the US Army. Upon graduation from college and successful completion of the AROTC program each cadet is eligible to be commissioned as a second lieutenant in the US Army, the US Army Reserves, or the US Army National Guard (US Army Cadet Command History, n.d.).

The US Army is a vast entity comprised of several subordinate organizations. These subordinate entities include the full time active duty units as well as the reserve component units. The reserve component units consist of the US Army Reserves and the Army National Guard. Army Regulation (AR) 350-1 (2007) mandates that active component soldiers pass the APFT at minimum, twice per year, while reserve component soldiers must pass the APFT at minimum, once per year.

AROTC cadets can be in the AROTC program as either a scholarship student or as a Simultaneous Membership Program (SMP) member. A scholarship student is assigned to the AROTC program, which places them under the command of the US Army Cadet Command. An SMP cadet is assigned to either an Army Reserve unit or a National Guard unit, so although they are in the AROTC program, they are outside of the US Army Cadet Command chain of command. However the US Army Cadet Command exercises control over SMP cadets while they are in the AROTC program (US AROTC Enlisted, n.d.).

The US Army Cadet Command has subordinate commanders at colleges and universities with AROTC programs. At the University of Wisconsin-Stout (UWS) the subordinate commander is Lieutenant Colonel (LTC) Scott Bolstad. LTC Bolstad is the Department Chair for

the Department of Military Science at UWS. He also has the title of Professor of Military Science (PMS). The researcher initially met with LTC Bolstad on November 13, 2008 and had subsequent conversations with him. Unless specified otherwise, the research regarding the UWS AROTC program and some research reference the AROTC program was provided by LTC Bolstad during these conversations.

The UWS AROTC program has subordinate AROTC programs at the University of Wisconsin-Eau Claire (UWEC) and the University of Wisconsin-River Falls (UWRF), which fall under the UWS AROTC program's chain of command. The UWS PMS is therefore the commander over these programs; however, the UWEC and UWRF AROTC programs have an Assistant Professor of Military Science (APMS) assigned to each program respectively (personal communication, November 13, 2008). Major (MAJ) Eric Beuerman is the APMS for the UWEC AROTC program and MAJ Tabb Benzinger is the APMS for the UWRF AROTC program.

This APFT requirement applies to AROTC cadets, whether scholarship cadets or SMP cadets. The UWS AROTC program, as do most AROTC programs, has a scheduled, mandatory PT program. While the US Army Field Manual (FM) 21-20 (1998) provides a sample PT program and mandates organized PT for active component soldiers, reserve component soldiers and AROTC programs do not have the same requirement mandated by the US Army. Reserve component and AROTC commands have the discretion and authority to establish PT programs; however, AR 350-1 (2007) holds commanders responsible for ensuring that soldiers in their commands are physically fit and able to perform their assigned responsibilities. This includes being able to pass the APFT.

The UWS, UWEC, and UWRF each have scheduled PT programs which meet three times per week. The UWRF AROTC PT program currently is being conducted using the FM 21-

20 (1998) training model. UWRF also requires all AROTC cadets and non-contracted AROTC students to attend PT three times per week. The UWS and UWEC AROTC programs use a combination of organized PT activities and individualized PT activities. UWS and UWEC do not require non-contracted AROTC students to participate in any scheduled PT events and typically freshmen and sophomores AROTC cadets must attend one or two scheduled PT activities per week, respectively.

Students are not accepted into the AROTC program, either through the scholarship program or as an SMP, until they have passed an APFT. The UWS, UWEC, and UWRF AROTC programs also require that all AROTC cadets pass an APFT monthly, either as a scheduled record test or a diagnostic test. If an AROTC cadet fails one of these tests, the cadet is counseled about the APFT failure. Continued failure can lead to cadets being removed from the AROTC program.

The processes for removing AROTC cadets are different for the scholarship program cadets than for SMP cadets. A PMS has the authority to remove an SMP cadet from the AROTC program, while only the Commander of the US Army Cadet Command can remove scholarship cadets from the AROTC program.

About five years ago, after complaints from several AROTC cadets about not having the time for organized PT due to busy college schedules, the then commander of the US Army Cadet Command, Major General (MG) Casey, suggested removing mandatory organized PT programs from the AROTC program. This caused some concern for PMSs, including the UWS PMS, who expressed his concern that the lack of mandatory PT would result in a rising APFT failure rate, which subsequently could affect the AROTC cadets' school and military careers. The UWS PMS

also emphasized that organized PT programs enhance the esprit de corps of the respective AROTC programs.

Statement of the Problem

A past commander of the US Army Cadet Command recommended that scheduled, organized PT programs not be a requirement for AROTC cadets. Because AR 350-1 (2007) mandates that all soldiers, AROTC cadets included, pass the APFT, there is a concern by the UWS AROTC program staff that discontinuing an organized, scheduled PT program will lead to an increase in APFT failures, subsequently jeopardizing the careers of those AROTC cadets who fail the APFT.

Will eliminating or reducing scheduled, organized PT program at UWS, UWEC, and UWRF lead to an increase in APFT failures in the respective AROTC programs?

Purpose of the Study

The purpose of this study is twofold. First this study will determine whether a formal, organized US Army PT program produces a better pass rate on the APFT than either no PT requirement or an individual PT program in which PT is required but AROTC cadets can physically train however they want to. The second part of the study will compare the improvement and/or decline in each APFT event to determine if a formal, organized US Army PT program enhances performance in each of the APFT events versus improvement or decline in each APFT event in the scheduled but individualized PT programs or the unscheduled, non-mandatory PT programs.

Assumptions of the Study

The scope of the study was limited to evaluating only the military mandated PT activities. Several participants were involved in other physical activities including organized sports and individualized physical activities. These extra-military physical activities would most certainly be beneficial for some, if not all, of the APFT events. However, these activities would most likely have been performed by the participants whether the study was being conducted or not. Therefore, the overall affect on the study should be minimal.

At the conclusion of the study, the participants were given a two page survey. The researcher assumed that the participants were honest and accurate when they completed the surveys.

The pre-APFTs and post-APFTs were conducted in different locations on different days with varying weather conditions. While the weather conditions were documented, the researcher assumed that there were negligible effects on the APFT results.

The AROTC cadets were advised of the research study prior to the pre-APFT being administered. While the PMS and respective APMSs cautioned the cadets to perform the best they could on the pre-APFTs, the researcher must assume that all of the cadets achieved the maximum scores they were capable of at both the pre-APFT and post-APFT.

Definition of Terms

AROTC Cadet. University student who is in the US Army and is contracted into the AROTC program, either through an AROTC scholarship or the SMP. (U. S. AROTC Enlisted Soldiers, n.d.)

Battle Drill. A collective action that is practiced until the action can be executed without applying a deliberate decision process for the action. (FM 5-0, 2005)

Chain of Command. “The succession of commanding officers from a superior to a subordinate through which command is exercised. Also called command channel” (JP 1-02, 2001).

Command and Control. “The exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission. Command and control functions are performed through an arrangement of personnel, equipment, communications, facilities, and procedures employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission. Also called C2” (JP 1-02, 2001).

Contracted Student. The UWS PMS defined a contracted cadet as a university student who has formally joined the AROTC program either as scholarship student or SMP student. (personal communication, November 13, 2008)

Flag. “An abbreviated term used to describe the initiation or removal of a suspension of favorable personnel actions” (AR 600-8-2, 2004).

Non-contracted Student. The UWS PMS defined a non-contracted cadet as a university student who has expressed interest in the AROTC program and attended AROTC events, but has not contracted into the AROTC program nor do they receive any benefits of the program. These students may or may not be in the military. (personal communication, November 13, 2008)

Simultaneous Membership Program (SMP). AROTC cadet that is a member of a reserve component unit. (US AROTC Enlisted, n.d.)

Scholarship Student. The UWS PMS defined the scholarship student as an AROTC cadet who is within the chain of command of the United States Army Cadet Command. (personal communication, November 13, 2008)

Methodology

Research was conducted on the historical relationship between physical fitness and the need for a degree of physical fitness in the military. Further research was conducted on the best methods and techniques available to improve shoulder, chest, and triceps muscles' endurance (push-ups), abdominal and hip-flexor muscles' endurance (sit-ups), and aerobic and leg muscles' endurance (two mile run).

Because goal setting is such an integral part in self-improvement, whether it is mentally or physically related, research was conducted on the use of goal setting for self improvement. Goal setting was not formally included in this study.

A pre-APFT was administered to the participants to determine their physical fitness level, as it pertained to them being able to perform the APFT events at the beginning of the study period. The participants were then divided into four separate treatment groups with different PT regimens. The participants were then administered a post-APFT to determine their physical fitness level, relative to the APFT events, at the conclusion of the study. The researcher then examined the relationships between the different PT regimens and the effects on the APFT results.

Chapter II: Literature Review

History of Military Physical Fitness Requirements

Countries and civilizations throughout history have required their military personnel to maintain various levels of physical fitness, as being physically fit could make the difference between life and death in combat situations. While technology has improved weapons by increasing range, lethality, and weight, moving those weapons and being able to physically endure days without rest requires that today's soldiers maintain a minimum standard of physical fitness.

Physical fitness requirements in the military date back to the Before Christ Era (BCE). According to Wuest and Bucher (1995) the Persian Empire required that male offspring, at the age of six, became property of the Persian Empire (as cited by Dalleck and Kravitz, n.d). These children were then required to participate in physical fitness regimens designed to increase their strength and stamina for the purpose of military service. These PT programs included hunting, marching, and throwing the javelin. According to Green (1989), other civilizations (Babylonia, Egypt, Palestine, and Syria) recognized the importance of physical fitness in the military and promoted fitness throughout the general public (as cited by Dalleck and Kravitz, n.d.).

During the same time period as the Persian Empire, the Spartans also required physical fitness programs. According to Barrow and Brown (1988) the Spartans required male children enter physical fitness programs at the age of six for the purpose of military service. The Spartans also required their women to be physically fit for the purpose of providing strong offspring who could serve the state and the military (as cited by Dalleck and Kravitz, n.d.).

According to Grant (1964), during the Roman Empire expansion, the Roman Empire required all Roman citizens between seventeen and sixty years of age be eligible for the military

draft. It was therefore imperative that all Roman citizens be physically fit. The Roman Empire's military training was similar to that of the previous Persian Empire, as the Roman's military training consisted of running, marching, jumping, and discus and javelin throwing (as cited by Dalleck and Kravitz, n.d.).

Recent History of the APFT Requirements

Frank Palkoska is the Director of the US Army Physical Fitness School (DUSAPFS), which is located at Fort Jackson, SC. According to the DUSAPFS (personal conversation, December 4, 2008) prior to 1980 the US Army used the Physical Combat Proficiency Test (PCPT). The last US Army Field Manual (FM) 21-20 (Physical Readiness Training) that described the events and grading standards for the PCPT was published in 1973. The researcher was unable to locate a 1973 version of FM 21-20; however, the researcher did acquire the previous version published in 1969.

There are four authorized tests the US Army used to measure the physical fitness of male personnel. These tests were the PCPT, the Army Physical Fitness Test – Male, the Airborne Trainee Physical Fitness Test, and the Inclement Weather Physical Fitness Test. The uniform for each of the tests was the prescribed US Army duty uniform, to include combat boots (FM 21-20, 1969).

The Army Physical Fitness Test – Male was used only for those US Army personnel assigned to duties which prevented them from participating in the PCPT or when the PCPT could not be administered due to a lack of facilities (FM 21-20, 1969). There were five primary events and five secondary events which made up the Army Physical Fitness Test – Male. These events included the squat bender or squat stretch, the push-up or eight count push-ups, the sit-up or

body twist, the legs over or the legs spreader, the squat thrust or the mountain climber, and the stationary run or the one-half mile run.

The Airborne Trainee Physical Fitness Test was used to determine if an applicant was physically qualified for acceptance into, or retention in, the airborne school. The physical events include six chin-ups, eighty knee bends in two minutes, twenty-two push-ups, twenty sit-ups, and a one mile run in eight and one half minutes or less (FM 21-20, 1969). There was no time limit in the FM 21-20 (1969) for the chin-ups, push-ups, or sit-ups.

The PCPT was a five event test which consisted of a forty yard low crawl event, a horizontal ladder event, a dodge, run, and jump event, a grenade throw event, and a one mile run. The test was very labor intensive as the course had to be set-up and/or constructed, and a minimum of twenty personnel (one officer and nineteen enlisted soldiers) were needed to administer the test. The scoring for the test was also dependent on whether the soldier being tested belonged to a “combat-ready” unit or a “combat support” unit (FM 21-20, 1969).

F. Palkoska (DUSAPFS) said that while the PCPT was labor intensive, it more accurately tested a soldier’s ability to perform his or her required battle drills. He added that the PCPT was an anaerobic test whereas the current APFT is an endurance or aerobic test. He also noted that very seldom does a military unit have to perform extended aerobic activities in combat situations (personal conversation, December 4, 2008).

The Inclement Weather Physical Fitness Test was a substitute test for the PCPT and was only used for Basic Combat Training, Advanced Individual Training, and for combat support training when severe weather prevented the use of the PCPT (FM 21-20, 1969).

Selection of Current APFT Events and Standards

The DUSAPFS (personal conversation, December 4, 2008) said there were two main factors which led to the selection of events for the current APFT. The first factor was that the APFT not require any equipment. The second factor was the inclusion of women into the military.

The DUSAPFS (personal conversation, December 4, 2008) said that military installations are required to maintain equipment needed to administer the APFT. The elimination of equipment to administer the APFT reduced installation requirements as well as made administering the APFT at remote locations easier.

The DUSAPFS (personal conversation, December 4, 2008) added that the expansion of women into the military led to the creation of an APFT which was believed to be more equitable for women. The US Army therefore eliminated events which were perceived as being too difficult for women to perform. The DUSAPFS does not agree with those perceptions or beliefs. Throughout his career in the field of US Army physical fitness he has found that women are highly capable of performing events such as the horizontal ladder, which historically women have been perceived as being unable to perform.

With the 1980 publication of FM 21-20, the US Army instituted the current APFT format, using the push-up event, the sit-up event, and the two mile run as the three events which make up the APFT. The other major change that was implemented with this publication was the shift from performing an APFT in a duty uniform, which included combat boots, to performing the APFT in PT uniform that included tennis shoes. A minimum score of sixty in each event was required to pass the APFT. A maximum score of one hundred was obtainable in each event unless the soldier being tested scored a minimum of one hundred in each event. If a soldier

scored at least one hundred in each event, then an extended scoring scale was authorized and participants could score in excess of three hundred points.

After concerns were raised in 1987 that the 1980 APFT scoring scale was too difficult, the United States Army Physical Fitness School (Fober, 1995) conducted a comprehensive study. The study had three goals, which were to ensure that the APFT measured baseline US Army physical fitness, to provide a scientific review of the APFT, and to ensure gender equality in the APFT scoring scales. Fober's study led to the 1998 version of FM 21-20, which is the most current version. The APFT event scoring scales in the 1998 FM 21-20 version sets the minimum event scores in the eighth percentile with the maximum score (one hundred without the extended scoring scale) at the ninetieth percentile.

The DUSAPFS (personal conversation, December 4, 2008) pointed out that while the US Army used scientific data to determine minimum APFT event passing scores (sixty points) and maximum APFT event scores (not including the extended scale) as determined by Fober's (1995) research, the scoring scale used between the minimum scores and maximum scores was determined mathematically. In reviewing the scoring scales, one will note that the scores between sixty and one hundred on each event are predictable in nature, rising measurably with increases in push-ups or sit-ups, or with decreasing two mile run times.

Performance Improvement Suggestions for the APFT Events

The APFT is used by the US Army to assess a soldier's muscular endurance and cardiorespiratory. The US Army has found that a soldier's performance on the APFT is directly proportional to their overall fitness and ability to perform physically demanding tasks (FM 21-20, 1998). The APFT consists of three events: the push-up event, the sit-up event, and the two

mile run. As discussed earlier, a soldier's performance on these events is evaluated with both his or her age and gender being considered.

Complete body conditioning. Throughout the fourteen chapters, eight appendices, and over two hundred pages of the FM 21-20 (1998), the US Army never mentions or alludes to focusing a PT program strictly on improving push-ups, sit-ups, or a two mile run time. Instead, the FM stresses the importance of having a varied workout regimen. Hanc (1994), the 1968 Boston Marathon winner whose book focuses on running, stresses the importance of a complete body PT regimen and provides several strengthening exercises. Phillips and D'Orso (1999) provide a twelve week, six day per week workout which uses an aerobic workout three times per week. The other three days per week the PT regimen should rotate between an upper body workout and a lower body workout. Stiefel's (2003) seven days, fifteen minutes per day, workout regimen also focuses on strengthening the entire body, which includes exercises for the mind.

FM 21-20 (1998) identifies four factors that constitute a successful physical fitness program. These four factors include frequency, intensity, time, and type, and can be remembered by the acronym FITT. Sandler (2003) uses these identical factors in his weight training principles, while Stiefel (2005) changes the terminology but uses the same concepts. Sandler (2003) defines frequency as the number of sets and repetitions a trainee performs. Intensity is defined as the amount of weight or resistance that is used in the respective sets and repetitions. Time is defined as the amount of time allotted to PT while type is the exercises that are performed.

FM 21-20 (1998) and Sandler (2003) are very similar in their recommended PT programs. Both sources state that to improve physical fitness a person must improve muscle

strength and muscle endurance. Sandler (2003) recommends that a person should perform PT three to five times per week with each session consisting of ten to twelve exercises and the PT lasting about one hour. Each muscle group should be rested twenty-four to forty-eight hours after a PT session. FM 21-20 (1998), meanwhile, has varying recommendations depending on if the PT session is focused on muscle strength, muscle endurance, or a combination of muscle strength and muscle endurance. Overall the recommendations made by FM 21-20 (1998) are very similar to Sandler's (2003) recommendations.

Stiefel (2005) advocates for short PT sessions lasting about fifteen minutes; however, PT should be done every day. His recommended schedule is to perform cardiovascular training on Mondays, upper body strengthening on Tuesdays, flexibility training on Wednesdays, lower body strengthening on Thursdays, cardiovascular training on Fridays, trainee select "targeted" training on Saturdays, and mind and body training on Sundays. Stiefel provides several recommended primary and secondary exercises for the Monday through Friday PT regimen.

FM 21-20 (1998), Stiefel (2005), as well as most other experts, agree on the importance of proper nutrition in a successful PT program. FM 21-20 (1998), as well as Hanc (1994), dedicate an entire chapter to proper nutrition in a PT program.

Proper form, or technique, is stressed by most PT experts, when a person is conducting any type of PT or exercise. Sandler (2005) stresses that to maximize strength training a joint must be made to go through its entire range of motion. Hanc (1994) also stresses and identifies proper running form. Proper form also reduces the likelihood of injuries while conducting PT activities.

Upper body muscle strength. FM 21-20 (1998) states that the US Army uses the push-up event to assess the endurance of a soldier's chest, shoulder, and triceps muscles. Because body

composition is influenced by age and gender, which in turn affects one's ability to perform this event, age and gender are considered in the scoring of the push-up event. Table 1 in Appendix 1, which was extracted from FM 21-20 (1998), shows the grading criteria for the APFT push-up event.

Sandler (2005) says that to increase physical strength muscles must "receive a stimulus greater than" what the muscle normally receives, or what he defines as the gradual progressive overload. To provide this overload the muscle, or muscle groups, must have increased tension, increased duration of stimulus, increased frequency of stimulus, a change in stimulus, or any combination of the four. Sandler's (2005) gradual progressive overload principle corroborates the US Army's FITT principle (FM 21-20, 1998).

FM 21-20 (1998) offers several exercises designed to improve the muscle strength and endurance of the chest, shoulder, and triceps muscles. Some of these exercises include bench press, the overhead press, the "lat" (latissimus dorsi) pull down or pull up, the triceps extension, the bicep curl, and many variations of the push-up. Sandler (2005) also provides many exercises to improve these same muscle groups. FM 21-20 (1998) also offers several strengthening exercises which can be done with a partner, some of which are the seated row, the overhead press, and the push-up with added weight, or resistance, created by the partner. Sandler (2005) also offers several strengthening exercises which will improve the chest, triceps and bicep muscles. Some of these exercises include the bench press, the incline press, the dumbbell bench press, the supine triceps extension, dips, and many variations of the curl.

Abdominal muscle strength. FM 21-20 (1998) states that the US Army uses the sit-up event to assess the endurance of a soldier's abdominal and hip-flexor muscles. Because body composition is influenced by age and gender, which in turn affects one's ability to perform this

event, age and gender are considered in the scoring of the sit-up event. Table 2 in Appendix 1, which was extracted from FM 21-20 (1998), shows the grading criteria for the APFT sit-up event.

FM 21-20 (1998) provides several exercises to improve the abdominal muscles strength and endurance. Some of these exercises include the abdominal curl, the abdominal crunch, and various modifications of the sit-up, to include the incline sit-up. Phillips and D'Orso (1999) recommend floor crunches, twist crunches, bent knee leg raises and decline sit-ups for improving abdominal muscle groups. Their decline sit-ups are done identically as FM 21-20 (1998) incline sit-ups.

Muscle endurance. FM 21-20 (1998) states that the US Army uses the two mile run to assess a soldier's aerobic fitness and leg muscles' endurance. Because body composition is influenced by age and gender, which in turn affects one's ability to perform this event, age and gender are considered in the scoring of the two mile event. Tables 3a and 3b in Appendix 1, which were extracted from FM 21-20 (1998), shows the grading criteria for the APFT two mile run event.

Although simply running can improve a soldier's two mile run time, there are many minor things that can be done that will improve the time faster and more efficiently. Because many reserve component soldiers have only a limited amount of time to train for the APFT, working smarter, not harder, can vastly improve their running event.

The first way to improve the two mile run time is by purchasing a good pair of running shoes. This can be such a factor that FM 21-20 (1998) devotes an entire appendix (Appendix E) dedicated to selecting a good pair of running shoes.

FM 21-20 (1998) identifies three foot type categories, rigid feet, normal feet, and floppy feet. Soldiers with rigid feet have joints that are tight and allow for minimal absorption of impact while running. At the other extreme are soldiers with floppy feet that “give” too much while absorbing the impact of running. Having the proper shoe will reduce the problems incurred by the type of feet a soldier has. Wearing the proper type of running shoes will also reduce the likelihood of suffering an injury while running (FM 21-20, 1998). Figure 1 in Appendix B is extracted from FM 21-20 Appendix E (1998) and describes different the three different feet type and how to select the proper running shoe for the different feet types.

Improving or correcting a soldier’s running form is the most efficient way to increase his or her two mile run time with the least amount of time and effort. Good running form also reduces the likelihood of injuries. This is accomplished by reducing the amount of vertical oscillation, or the amount of energy expended by moving the body in an upward motion (Russ, 2005). The more vertical rise the body has during running, the more force the feet and leg joints will have to absorb during the run. Good running form also improves the body’s center of gravity, which reduces the likelihood of falling while running.

Yessis (1998) explains that increasing your running time is done so by either increasing stride distance, stride frequency, or a combination of the two. Both of these can be accomplished by improving your stride. While most runners will agree that Yessis is correct, the two mile run tests not only speed, but endurance. Russ (2005) describes this as “running economy,” which he also says can be improved by good running form. Therefore, to maximize APFT results, a runner should also pursue improving his or her running endurance.

Developing good running form does not happen automatically. Unless a person is a natural born runner, runners need to train their muscles how to run in the most efficient running

fashion. This can be accomplished by starting at a slow, deliberate pace, ensuring that each step is as it should be. The most efficient running stride is when the ball of each foot strikes the ground along a direct line. Runners can ensure that their feet are striking the ground along a direct line by running along a line on the road, running track, or anywhere else where a straight line on the ground is available. Russ (2005) recommends that the foot strikes the ground just behind the ball of your foot as this reduces the amount of time the foot is on the ground, reducing deceleration forces.

Maintaining good posture while running will also improve running form and speed. Keeping your head and chest in an upright manner, without doing so in an animated fashion, will keep your lungs and diaphragm in the most efficient operating form (Ross, 2005). This keeps oxygen intake at the maximum level, which increases both stride distance and endurance.

Swinging the arms in a pendulum style motion, working just opposite of leg stride, acts as a counterbalance to the lower body. Arms should move forward and not side to side, as any motion that is not in a direct forward motion will impair form and efficiency.

While many of the aforementioned exercises and drills will improve stride frequency, Yessis (1998) provides some specific exercises which are intended for improving a runner's stride frequency. The arm drive, which consists of pulling a pulley with resistance to the pull, simulates a runner's arm swing and builds arm strength and coordination. The back extension, which consists of lying on a back extension machine which allows for a person to bend forward at the waist and then extend his or her upper body upward, strengthens the lower back muscles which assists in keeping the back straight while running. This improves running posture which improves both stride frequency and stride length.

Hanc (1993) stresses that to improve muscular and cardiovascular endurance, cross training is essential. Simply jogging or running everyday will increase endurance to a point, but that plateau will not be exceeded without including other types of strength training. Hanc (1993) cites a 1990 American College of Sports Medicine study that says that running, without resistance strength training, can lead to muscle loss. Cross training also provides injury reduction benefits.

Process for Sample US Army PT Program

FM 21-20 (1998) provides a seven step process that commanders and leaders can use to develop a PT program for their respective units. This process focuses on overall physical requirements needed for a unit to perform its assigned tasks and does not take into consideration preparation for the APFT. The seven steps are to analyze the mission, develop fitness objectives, assess the unit, determine fitness requirements, develop fitness tasks, develop a training schedule, and conduct and evaluate training. This seven-step-process is very similar to the ADDIE (Assess, Design, Develop, Implement, and Evaluate) instructional design model (Lee & Nelson, 2006).

FM 7-0, Training the Force (2002) mandates that a unit's wartime mission drives what that unit needs to focus its training on. Because different types of units have different physical fitness levels to meet their mission requirements, analyzing the physical requirements of a unit's mission is essential before that unit can develop a PT program. The UWS PMS specified that the AROTC mission statement is, "To commission confident, capable, and adaptive Warrior leaders for the U.S. Army and to motivate young people to become better citizens" (personal communication, December 4, 2008).

Step two, to develop fitness objectives, of FM 21-20 (1998) specifies that commanders must analyze those tasks that are essential for the unit to perform its mission, and to translate those tasks into specific physical objectives. Those objectives can be related to the APFT events, or other physical requirements may be identified, such as being able to swim a certain distance or to climb a rope a certain height.

FM 21-20 (1998) provides several tools that commanders may use to assess the current physical status of their unit (step three). The APFT is one tool, but any quantifiable physical activity, to include past records, can be used for a unit assessment. Once a commander knows the physical requirements and the physical fitness status of the required unit, then training requirements (step four) needed to bring the unit to the required fitness level can be determined.

The fifth step of the process in FM 21-20 (1998) is to develop the fitness tasks. These are specific tasks which meet training requirement needs. These tasks specifically identify all fitness deficiencies and are planned so that all those identified deficiencies are corrected. The tasks are then put into a training schedule, which specifies which tasks are going to be trained on when and who is responsible for training those tasks. The training schedule also includes when training will be rescheduled if for some unforeseen reason tasks cannot be trained on in the timeframe they were initially planned for.

FM 21-20 (1998) advises that there are three distinct steps in developing a training schedule, the sixth step of the process. Those steps include determining the minimum frequency of PT. The FITT factors should be used to assist in this step. Next the type of PT activity must be determined. This should be determined by what the goals and objectives of the PT regimen are. Lastly, the intensity of the PT program is determined. The FITT factors are helpful in making this determination.

The seventh step in the unit fitness plan process per FM 21-20 (1998) is to conduct and evaluate the training. Evaluating the training is of major significance, for without completing the evaluation, it is not known if the training met the intended objectives.

Goal Setting

Being physically prepared for the stressful demands, both physical and mental, that combat can have on a soldier should provide the motivation for any military person to maintain a level of physical fitness commensurate with his or her duty expectations. However, with soldiers being discharged for APFT failures from all components of the US Army, to include the Army Reserves, National Guard, and active Army, demonstrates that may not be the case. While this research did not focus specifically on motivation and goal setting, Phillips and D'Orso (1999) and Hanc (1995) cited the importance of goal setting in preparing a PT regimen.

Phillips and D'Orso (1999) assert that for a person to improve his or her physical fitness he or she must develop a vision as to where he or she wants to be, physically, in the future. The person then should write down five goals as to where they want to be in the future. These goals must be specific. Nikitina (2008) says that there are five factors that should be considered in setting goals. These factors are identified with the acronym SMART, which is Specific, Measurable, Attainable, Realistic, and Timely.

Nikitina (2008) says that goals, when being determined, must be specific and clearly defined. The goal setter needs to specify the what, why, and how the goal is to be achieved. The goals must be measurable so that the goal setter can see that they are actually achieving something. Without being measurable most people give up on achieving their desired results. Goals must be attainable as unachievable goals are usually quickly ended.

Nikitina (2008) further adds that goals, when being set, need to be realistic. Goals also need to be timely, as goals that are given an undetermined completion or expectation are seldom fully realized.

The Mayo Clinic website (n.d.) cites seven reasons to maintain physical activity. These reasons include that exercise improves a person's mood, combats chronic disease, helps control a person's weight, strengthens the heart and lungs, helps a person sleep which further adds more health benefits, improves a person's sex life, and is enjoyable. If these seven reasons are not sufficient in motivating a person to be physically active, the US Army adds two more reasons. The first reason is that a soldier's APFT scores are used, and weighted heavily, in performance evaluations (AR 623-3, 2007). The second reason is that adverse action can be taken against soldiers who fail an APFT.

AR 600-8-2 (2004) is the regulation which provides the process for placing and removing flags on a soldier's records. This AR addresses what actions require a flag, the categories of flags, and what favorable actions are suspended when a flag is placed on a soldier's personnel records.

AR 600-8-2 (2004) lists two categories of flags, transferrable flags and non-transferrable flags. A non-transferable flag cannot, generally, be transferred to another unit. A transferable flag can be transferred to another unit. Any soldier who fails to pass an APFT, or any soldier who fails to take an APFT during a required period, is cause for having a transferrable flag placed in his or her personnel records. Flags are not initiated if the soldier has a physical profile, signed by a doctor, which specifically prohibits the soldier from performing the APFT.

A flagging action (AR 600-8-2, 2004) resulting from an APFT failure, blocks a soldier from being promoted and from reenlisting or extending his or her military commitment. The UWS PMS advised that a cadet who fails an APFT can be removed from the AROTC program.

Chapter III: Methodology

Introduction

About five years ago, a recommendation was made by the Commander of the US Army Cadet Command to eliminate organized PT programs in the AROTC programs. There is a requirement that AROTC cadets pass an APFT at minimum once per year (AR 350-1, 2007). This study was conducted to identify the best method to improve overall APFT scores and to determine if individually selected PT regimens had better overall improvements in the APFT as well as more improvement in the individual events of the APFT.

Subject Selection and Description

While AR 350-1 (2007) mandates that rigorous PT will be done three to five days per week, commanders are given the authority to determine the PT regimen. Therefore, each AROTC program has different requirements and PT program activities.

There are four AROTC Military Student (MS) levels, numbered one through four. MS1 generally refers to freshmen students, MS2 generally refers to sophomores, MS3 generally refers to juniors, and MS4 generally refers to seniors. UWS and UWEC only require MS1 AROTC cadets to participate in scheduled PT once per week, MS2 AROTC cadets must participate in scheduled PT twice per week, and MS3 and MS4 AROTC cadets must participate in scheduled PT three times per week. UWRF requires all AROTC cadets, regardless of MS level, to participate in scheduled PT three times per week. UWRF also mandates that non-contracted AROTC students participate in scheduled PT three times per week, while UWS and UWEC do not require non-contracted AROTC students to participate in scheduled PT at all.

While UWS and UWEC have scheduled and organized PT three times per week, the PT events are not necessarily selected using FM 21-20 (1998). UWRF uses FM 21-20 (1998) in planning and implementing their PT program.

Planned treatment group. The planned treatment group consisted of the AROTC cadets and non-contracted AROTC students at UWRF. This treatment conducted PT three times per week using an organized, formal PT program. Chapter 10 (Developing the Unit Program) of FM 21-20 (1998) was used as the basis for developing, implementing, and executing their PT program. UWRF was selected as this treatment group based upon its existing PT program using the FM 21-20 (1998) model. There were seventeen participants in this treatment.

Individual treatment group. The individual treatment group consisted mainly of MS2, MS3, and MS4 AROTC cadets at UWEC. This treatment group was required to conduct PT two to three times per week on a prescribed schedule; however, the AROTC cadets selected their own individual PT regimen for two of the three scheduled PT sessions. The AROTC cadets were required by their APMS to outline what their PT regimen would be during those PT sessions. One scheduled PT session per week was directed by the APMS. There were nine participants in this treatment.

Combination treatment group. The combination treatment group consisted mainly of MS2, MS3, and MS4 cadets at UWS. This group used a combination of the planned group and the individual group. This group had required PT sessions (twice per week for MS2 AROTC cadets and three times per week for MS3 and MS4 AROTC cadets) in which some of the PT activities were organized for the group while the individual cadets selected other PT activities based upon what areas of physical fitness they wanted to work on. The organized activities

consisted mainly of team sports activities, in which the participants selected the sporting activities. There were twenty participants in this treatment.

Unplanned treatment group. The non-mandatory group consisted of the non-contracted AROTC students at UWS, UWEC, and UWRF. The participants for this group were selected based upon there being no requirement for them to perform PT and no requirement for them to pass an APFT. Cadets in the formal and informal treatments have a requirement to pass the APFT. There were twenty-one participants in this treatment with four participants from UWRF, four participants from UWEC, and thirteen participants from UWS.

Administering the APFT

The APFT is a three event test, which includes push-ups, sit-ups, and a two mile run. The APFT is administered per Chapter 14, FM 21-20 (1998) (Physical Fitness Training). To administer the test, a copy of FM 21-20 (1998) is required, as are two stopwatches which measure time in minutes and seconds. Also a sufficient number of scorers are needed to grade the soldiers who are taking the APFT.

The first event administered is the push-up event. The required reading from FM 21-20 (1998) is read to the participants. This reading explains the rules of the event as well as the acceptable push-up techniques. The participants are then given two minutes to perform as many push-ups as they are able to within the rules outlined in FM 21-20 (1998). Scorers are used to count and document the number of correct, authorized push-ups the participants perform.

After completing the push-up event, participants are given a minimum ten minute rest before beginning the sit-up event. While 20 minutes is the recommended rest time between APFT events, there is no specified maximum rest time, other than the entire APFT must be completed within two hours of beginning the push-up event. After the rest period the participants

are then administered the sit-up test. This event begins with the reading of the event rules from FM 21-20 (1998). The participants are then given two minutes to complete as many sit-ups as they can within the rules outlined in FM 21-20 (1998). Scorers are used to count and document the number of correct, authorized sit-ups each participant performs.

After completing the sit-up event, the participants are again given a minimum 10 minute rest period. After the rest period, they are read the rules regarding the two mile run from FM 21-20 (1998). The participants then run the specified two mile course in the fastest time they can. Two scorers with stopwatches are used, one to advise the participants of their run times at the one mile mark and the other to give them their final two mile run time. Scorers are used to document the run times.

After the APFT is completed, the scorers take the raw data from each participant, which is documented on a Department of the Army (DA) Form DA 705 (the APFT Scorecard) and determine the points awarded for each event from the charts listed on the back of the DA 705. Event scores are based upon gender and age group. A minimum of sixty points per event is required to pass that event. Participants must pass all three events to pass the APFT. Scores above one hundred points on an event are only awarded if the participant attained a minimum score of one hundred points in all three events.

Pre-APFT. Members of all three treatments were administered an APFT during the first week of February, 2009, at their respective college campuses. Their scores in each event, as well as their overall score, were documented and provided to the researcher. No other information to include push-up or sit-up repetitions or their two mile run time was provided.

The APFT extended scoring scale was used in each event, whether the cadet scored one hundred points or more in each event. The extended scoring scale is easy to tabulate as cadets

were awarded one point for each push-up and/or sit-up they performed in excess of the maximum per the applicable APFT table. Cadets were awarded one point for each six seconds under the minimum allowable two mile run time, again per the APFT two mile run standards table.

Prior to performing the pre-APFT, the AROTC cadets and non-contracted students were advised of this study. Those in the informal and non-mandatory treatments were requested to document the amount of time they dedicate to improving their muscle endurance (two mile run), their upper body muscle strength (push-ups), and their abdominal muscle strength (sit-ups), as the percentage of time dedicated to improving those areas were requested at the conclusion of the study.

PT program. Between the pre-APFT and the post-APFT the treatments performed their PT programs as described in the treatment section. The planned treatment group performed its scheduled PT regimen per the US Army PT doctrine as prescribed in FM 21-20 (1998). The informal treatment performed PT on a scheduled basis, but the participants selected their PT regimens. The non-mandatory treatment conducted PT on an unscheduled, individual basis.

All scheduled PT events, whether organized or individualized, began and ended with organized stretching which all participants were required to do. FM 21-20 (1998) emphasizes that by doing stretches before and after PT, the risk of injury is reduced. Stretching before PT increases blood flow to muscles and tendons and also increases flexibility and range of motion. Stretching after PT reduces the likelihood of blood pooling in the muscles and therefore not getting to the brain or other parts of the body as needed.

Post-APFT. During the first week of May, 2009, the members of the four treatment groups were administered the final APFT. Only the scores of each APFT event and overall APFT

score was provided to the researcher. Weather data was also collected but was not used as a factor in the research. The APFT extended scoring scale was used the same as it was in the pre-APFT.

Instrumentation

Quantitative data was collected by the UWS PMS and his assistants through the APFT process as established by the US Army. Qualitative data was collected through a survey (see Figure 2). The researcher developed the survey explicitly for this study.

The surveys were given electronically to all of the participants. The survey identified physical education courses the participants were involved in. The survey was designed for the planned treatment group to be completed with the survey at that time. The survey then asked the remaining participants about the physical activities they selected to focus on during their scheduled PT and what percentage of that time was dedicated to improving which APFT events. The non-mandatory treatment group was also surveyed about the amount of time each participant dedicated to a PT regimen, as this group was not required to perform PT.

Data Collection Procedures

A pre-APFT was administered to all the participants during the first week of February, 2009. The pre-APFT scores and pre-APFT individual event scores were collected to establish the beginning physical abilities of the participants. A post-APFT was later administered to all the participants during the first week of May, 2009. The post-APFT scores and the post-APFT individual event scores were collected to determine how much each treatment group improved the overall APFT scores and a comparison was conducted to determine which treatment group had the best improvement in the overall APFT scores. Individual post-APFT event scores were

also collected to determine which treatment group improved on each APFT event and a comparison was conducted to determine which treatment group had the best improvement in each APFT event.

The APFT has a maximum score of three hundred points, one hundred points per event. FM 21-20 (1998) has an extended scoring scale which is used for those soldiers who score at least one hundred points per event, which allows for scores higher than three hundred. This study used the extended scoring scale for each event, whether the participant scored one hundred points in all three events or not to allow for comparisons in improvement in each event between the pre-APFT and the post-APFT.

Surveys were also given to the participants. These surveys were used to determine what percentage of PT time the participants, who were not part of the planned treatment group, used to improve which APFT event. The surveys were also used to determine how much time, on average per week, the unplanned treatment group dedicated to PT activities, as that group was not required to perform any PT during the study period.

There was no personal information collected by this researcher during this process. Each AROTC cadet and non-contracted student was identified by a number issued by the PMS or respective APMS. Only the APFT overall scores and APFT individual event scores were provided to the researcher, without the actual number of repetitions of push-ups or sit-ups, or times for the two mile run, so as to prevent this researcher from being able to determine the participants' age groups or gender.

Data Analysis

The study served two purposes. The first purpose was to determine whether a formal, organized US Army PT program produced a better pass rate on the APFT than either no PT

requirement or an individual PT program in which PT is required but AROTC cadets can physically train however they want to. To accomplish this purpose the data was analyzed by determining the pass percentage rate for each treatment group in each of the initial APFT events and the final APFT event, to include the overall scores. This data was placed into a table for comparative observation. Due to the limited amount of data available for this comparison no hypothesis was established and no formal scientific statistical analysis was completed.

The second purpose of the study compared the improvement and/or decline of each treatment group in each APFT event to determine if a formal organized US Army PT program better enhanced performance in each of the APFT events versus improvement or decline in each APFT event in the scheduled but individualized PT programs or the unscheduled, non-mandatory PT programs.

The research supporting this study found that physical activity is important for physical fitness; however, there were several different, but accepted methods to improve physical fitness. The one consistent requirement for physical fitness was PT. Goal setting was also important as the research supported that without goals and motivation, many individuals do not begin or maintain a regular physical regimen. Based upon this research the null hypothesis is there will be no significant difference between the three treatment groups that have a PT requirement (the planned treatment group, the individual treatment group, and the combination treatment group); however, there will be a significant difference between those three treatment groups and the treatment group which has no PT requirement (the unplanned treatment group).

Four, one-way analysis of variance (ANOVA) were conducted to compare the improvement or decline of each APFT event and overall APFT score between each treatment group. The one-way ANOVA tests were general linear model (GLM) univariate type ANOVA

tests, as these tests also provide regression analyses (Jiang, n.d.). To identify type I errors, a Tukey's HSD post hoc test was conducted in conjunction with each one way ANOVA test. The data extracted from these tests included the group means, the f-value and degrees of freedom, and the p-values. These tests were conducted using the Statistical Program for Social Sciences (SPSS) version 17.0 (SPSS, 2008).

The ANOVA tests and Tukey's HSD tests were conducted for comparative purposes. All of the treatment groups experienced overall positive means in each of the APFT events and overall APFT scores. None of the dependent or independent variables in this study had any direct effect on any other variables; therefore, no direction of effect was calculated.

Limitations

To ensure anonymity among the participants, the study did not consider physical ailments or injuries which may affect a participant's improvement, whether it was in a specific APFT event or their overall APFT score.

Participants were advised of the study prior to performing the pre-APFT. The assumption was made that participants would not intentionally perform below their maximum potential on the pre-APFT, so as to have a better improvement rate on the post-APFT.

The weather conditions for each administered APFT were documented and recorded in the study. However, the effects of how the weather conditions may have affected a participant's APFT score, whether it be in an individual event or the overall APFT, were not considered. The UWS PMS advised that all of the pre-APFTs were conducted indoors due to winter conditions. The UWS PMS further advised that all the post-APFTs were conducted in mild temperatures which should have had little if any impact on the APFT results (personal communication, May 15, 2009).

The size, geography, and time of year the study was conducted may not represent the AROTC program in its entirety. Wisconsin's weather during the first four months of the year is not conducive for extensive, outdoor training. While treadmills and elliptical machines were available to the participants and those machines do simulate running to some degree, outdoor running was limited by the weather and running conditions. Push-up and sit-up training should not have been affected by the weather conditions.

Chapter IV: Results

This study was conducted for two reasons. The first was to determine whether a formal, organized US Army PT program would produce a better pass rate on the APFT than either a program with limited or no PT requirements or no PT requirement. The second reason for the study was to compare the improvement in each APFT event and overall APFT score between four treatment groups.

The unplanned treatment group had twenty-one total participants in this study. One participant, Cadet ID Number 397, had a score of zero in five of the six measured events. In the sixth event the participant had a score of two, which gave that participant a score of two in six of the eight total events (two in final sit-ups and two in final overall score). That participant was removed from the data set analysis to avoid negatively skewing the final results.

APFT Pass Rate Analysis

Of the total of sixty-six participants in this study whose data was analyzed, forty (60.6%) passed the initial APFT and fifty-three (80.6%) passed the final APFT. The individual treatment group had all nine participants pass the final APFT after only five (55.56%) passed the initial APFT. The combination treatment group had nineteen (95%) pass the final APFT after only thirteen (65%) passed the initial APFT. The planned treatment group had sixteen (94.11%) pass the final APFT after thirteen (76.46%) passed the initial APFT. No cadet in these three treatment groups who passed the initial APFT failed the final APFT.

The unplanned treatment group had nine (45%) pass the final APFT after the same number passed the initial APFT. Of the nine who passed the final APFT, two failed the initial APFT. Two who had passed the initial APFT failed the final APFT while two participants who

had failed the initial APFT passed the final APFT. Table 8 in Appendix D shows the pass rate for each treatment group in each event, to include the final overall pass rate.

Planned treatment group. The planned treatment group had four persons fail the initial APFT while only one failed the final APFT, an increase of 17.64% pass rate. The participant that failed the final APFT failed every event except the final push-ups event.

Each participant that failed the initial APFT failed the sit-ups event, while three of those participants also failed other events (one failed the push-ups event, one failed the two mile run, while the other failed both the push-ups event and the two mile run event). The largest pass rate increase in this treatment group in an individual event was in the sit-ups, as the three participants that failed the initial sit-ups event and passed the final sit-ups event, were the same participants that failed the initial overall APFT score and then passed the final overall APFT.

Individual treatment group. The individual treatment group had the largest percentage increase in the overall APFT pass rate from the initial APFT to the final APFT. This treatment group had four participants fail the initial APFT with every participant passing the final APFT. This is a pass rate increase of 44.44%. This group had two participants fail the initial push-ups event, one participant failed the initial sit-ups event, and one participant failed the initial two mile run event. None of these participants failed multiple events. The lowest failing event score was fifty points (occurred twice) and the lowest overall failing score was 193 points.

Combination treatment group. The combination treatment group had the largest increase in the numbers of participants who passed the initial APFT compared with the number of participants who passed the final APFT. This group had thirteen participants (65%) pass the initial APFT and nineteen (95%) pass the final APFT. Two participants that failed the initial APFT failed two events, while the other seven failed only one event.

The participant that failed the final APFT also failed the initial APFT. In both APFTs the participant failed the two mile run event. The participants score in the event climbed dramatically, scoring zero in the initial two mile run event and then fifty-one in the final two mile run event. This participant completed a survey but did not include any information regarding physical impairments in the comments of the survey. The researcher therefore can only speculate as to the differences

Unplanned treatment group. The unplanned treatment group had twenty participants, not including the one participant whose data was deleted from the study. This group had nine participants (45%) pass the initial APFT and nine (45%) pass the final APFT, for no change in the pass rate.

Unlike the other three treatment groups, in which no participant that passed the initial APFT failed the final APFT, the unplanned treatment group had two participants pass the initial APFT then fail the final APFT. One of these participants failed the final push-ups event after having passed the initial push-up event. The participant's push-ups scores decreased from sixty to fifty-six. The other participant that passed the initial APFT but failed the final APFT failed two events on the final APFT. Those events were the push-ups event (decreasing from sixty-four to fifty-four) and the sit-ups event (decreasing from sixty-three to thirty-three). The first participant did not complete a survey and the second participant completed a survey but only marked the survey indicating that the participant was not allowed to perform an individually selected PT regimen.

The unplanned treatment group had twelve participants (60%) pass the initial push-ups event and twelve participants (60%) pass the final push-ups event. Two of the participants that

passed the initial push-ups event failed the final push-ups event while two of the participants that failed the initial push-ups event passed the final push-ups event.

The unplanned treatment group had eleven participants (55%) pass the initial sit-ups event while only ten (50%) passed the final sit-ups event. Two of the participants that passed the initial sit-ups event failed the final sit-ups event while one of the participants that failed the initial sit-ups event passed the final sit-ups event.

The unplanned treatment group did have the largest increase, both by numbers of participants and percentage of pass rate, in the two mile run pass rate between the initial two mile run event and the final two mile run event. Ten participants (50%) passed the initial two mile run event while seventeen participants (85%) passed the final two mile run event. None of the participants who passed the initial two mile run event failed the final two mile run event.

The unplanned treatment group only returned two surveys, which had limited information each. With such little qualitative data the researcher is unable to provide any reasons, other than speculative ones, for the large increase in the two mile run pass rate with little change in the push-ups event or the sit-ups event.

APFT Event Comparison Analysis

Four, GLM univariate ANOVA tests were conducted and analyzed. Each ANOVA test was followed with a post hoc Tukey HSD test to identify potential type I errors. The four ANOVA tests and post hoc tests were conducted to compare the improvement or decline of each APFT event and overall APFT score between each treatment group. The differences between each participant's initial event and overall scores and the participant's final event and overall scores were used to conduct the tests. While some participants did experience a decrease in some

events and overall scores, no treatment groups as a whole experienced decreases in any of the APFT events or overall APFT scores.

A p-value of 0.05 was used for each test. A 0.05 p-value is considered the standard level of significance (Dallal, 2008). The statistical tables created by the GLM Univariate ANOVA tests and the Tukey HSD tests are found in Appendices E, F, G, and H. The planned treatment group is represented by 1, the individual treatment group is represented by 2, the combination treatment group is represented by 3 and the unplanned treatment group is represented by 4 in the statistical tables.

The degrees of freedom-between and the degrees of freedom-within, for each of the four ANOVA tests remained constant. For each test the degrees of freedom-between was three and the degrees of freedom-within was sixty-two.

Push-ups. The group mean for the difference in push-ups scores between the initial APFT and the final APFT was 5.08. The individual treatment group experienced the greatest increase in mean of 8.56. The unplanned treatment group experienced the least increase in mean, with a 2.6 increase. The p-value for this test was .40, indicating that there was no significant statistical differences in the increase in push-ups within the treatment groups. The f-value was .993. The statistical tables for the push-ups scores are found in Appendix E.

Sit-ups. The group mean for the difference in sit-ups scores between the initial APFT and the final APFT was 8.67, with the combination treatment group experiencing the greatest increase in mean of 13.3. The unplanned treatment group experienced the least increase in mean, with a 1.8 increase. The p-value for this test was .025, indicating there was a significant statistical difference in the increase in sit-ups within the groups. The only significant statistical difference between the treatment groups occurred between the combination treatment group and

the unplanned treatment group. The p-value was .045 with a mean difference of 11.5 between the combination treatment group and the unplanned treatment group. The f-value was 3.35. The statistical tables for the sit-ups scores are found in Appendix F.

Two mile run. The group mean for the difference in two mile run scores between the initial APFT and the final APFT was 11.77, with the combination treatment group experiencing the greatest increase in mean of 21.7. The unplanned treatment group experienced the least increase in mean, with a 7.2 increase. The p-value for this test was .023, indicating there was a significant statistical difference in the increase in two mile run scores within the groups. The only significant statistical difference between the treatment groups occurred between the combination treatment group and the unplanned treatment group. The p-value was .038 with a mean difference of 14.5 between the combination treatment group and the unplanned treatment group. The f-value was 3.35. The statistical tables for the two mile run scores are found in Appendix G.

Overall APFT scores. The group mean for the difference in the overall APFT scores between the initial APFT and the final APFT was 25.52, with the combination treatment group experiencing the greatest increase in mean of 42.2. The unplanned treatment group experienced the least increase in mean, with an 11.6 increase in mean. The p-value for this test was .015, indicating there was a significant statistical difference in the increase in the overall APFT scores within the groups. The only significant statistical difference between the treatment groups occurred between the combination treatment group and the unplanned treatment group. The p-value was .008 with a mean difference of 30.6 between the combination treatment group and the unplanned treatment group. The f-value was 3.78. The statistical tables for the overall APFT scores are found in Appendix H.

Survey Analysis

Out of the sixty-six participants whose data was used in this study, twenty-five (37.88%) participants returned surveys. Four surveys were returned from the planned treatment group, seven surveys were returned from the individual treatment group, twelve surveys were returned from the combination treatment group, and two surveys were returned from the unplanned treatment group.

Planned treatment group. One participant indicated that he or she had participated in a physical education class (softball) during the study period. Two indicated they had not participated in any physical education courses and the fourth did not answer that question. One respondent indicated he or she had dedicated about eight hours per week to PT activities, of which thirty-five percent was dedicated to upper body muscular strength, thirty percent was dedicated to abdominal muscular strength, and thirty-five percent was dedicated to muscle endurance.

Individual treatment group. None of the survey respondents from the individual treatment group indicated participation in any physical education courses during the study period. Six of the respondents included PT activities they performed, with all six performing sit-ups. Five performed push-ups and five performed running activities.

Of the two participants that failed the initial push-ups event but passed the final push-ups event, one dedicated fifty percent and the other dedicated forty-five percent of their PT activities to upper body muscle strengthening. The participant that failed the initial sit-ups event but passed the final sit-ups event dedicated sixty percent of his or her PT activities to abdominal muscle strengthening. The participant that failed the initial two mile run event but passed the

final two mile run event dedicated an equal thirty-three percent of his or her PT activities to upper body muscle strengthening, abdominal muscle strengthening, and muscle endurance.

Combination treatment group. Four of the combination treatment group participant respondents participated in physical education courses during the study period. Those courses included rugby, boxing, baseball, snowboarding, and flag football. Five respondents included PT activities they performed, with all five performing sit-ups. Four performed push-ups and running.

The only participant in the combination treatment group that failed the final two mile run (and the overall final APFT) indicated that he or she had a medical issue which prevented participation in running events. This participant spent an equal fifty percent of PT activities on upper body muscle strengthening and abdominal muscle strengthening. The participant's push-ups score increased from eighty-three to one hundred and ten and the participant's sit-ups score increased from sixty-nine to eighty-one from his or her initial APFT to the final APFT.

One participant dedicated forty percent of his or her PT activities to upper body muscle strengthening, but had a decrease from sixty-eight to sixty-seven from his or her initial APFT and final APFT. The participant did not indicate the number of hours per week that he or she dedicated to PT activities.

Unplanned treatment group. The unplanned treatment group had only two participants return surveys. Those surveys revealed nothing significant.

Chapter V: Discussion

In February, 2009, an initial APFT was administered to sixty-seven participants. The participants were divided into four treatments: the planned treatment group, the individual treatment group, the combination treatment group, and the unplanned treatment group. The planned treatment group, individual treatment group, and combination treatment group each had a requirement to perform PT activities. The planned treatment group performed PT activities as outlined in FM 21-20 (1998), the individual treatment group participants individually selected the PT activities that each individual desired to perform, and the combination treatment group was directed to perform some PT activities and individually selected some of the PT activities. The unplanned treatment group had no PT requirements. In May, 2009, a final APFT was administered to the participants.

The purpose of this study was twofold. First this study determined whether a formal, organized US Army PT program produced a better pass rate on the APFT than either no PT requirement or an individual PT program in which PT is required but AROTC cadets could physically train however they want to. The second part of the study compared the improvement in each APFT event to determine if a formal, organized US Army PT program enhanced performance in each of the APFT events versus improvement in each APFT event in the scheduled but individualized PT programs or the unscheduled, non-mandatory PT programs.

The three treatment groups that had mandatory PT each experienced a dramatic increase in the pass rate between the initial APFT and the final APFT. The unplanned treatment group, which had no PT requirement, experienced no change in pass rate between the initial APFT and the final APFT.

The null hypothesis was rejected in regards to the sit-ups event, as there was no statistical difference between the sit-ups event scores between the initial APFT and the final APFT. The null hypothesis was accepted in regards to the push-ups event, the two mile run event, and the overall APFT scores as there was a significant statistical difference between the scores in those events between the initial APFT and the final APFT.

Limitations

To ensure anonymity among the participants, the study did not consider physical ailments or injuries which may affect a participant's improvement, whether the improvement was in a specific APFT event or their overall APFT score.

Participants were advised of the study prior to performing the pre-APFT. The assumption was made that participants would not intentionally perform below their maximum potential on the pre-APFT, so as to have a better improvement rate on the post-APFT.

The weather conditions for each administered APFT were documented and recorded in the study. However, the effects of how the weather conditions may have affected a participant's APFT score, whether it was in an individual event or the overall APFT, were not considered. The UWS PMS advised that all of the pre-APFTs were conducted indoors due to winter conditions. The UWS PMS further advised that all the post-APFTs were conducted in mild temperatures which should have had little if any impact on the APFT results (personal communication, May 15, 2009).

The size, geography, and time of year the study was conducted may not represent the AROTC program in its entirety. Wisconsin's weather during the first four months of the year is not conducive for extensive, outdoor training. While treadmills and elliptical machines were available to the participants and those machines do simulate running to some degree, outdoor

running was limited by the weather and running conditions. Push-up and sit-up training should not have been affected by the weather conditions.

Conclusions

The results of this study are consistent with the literature review. While there were differing opinions on what PT activities should be performed and how often PT should be performed, there was consensus that PT was required to maintain physical fitness.

The three treatment groups (planned, individual, and combination) that had required PT each experienced a significant increase in the APFT pass rate between the initial APFT and the final APFT. The unplanned treatment group, which had no PT requirement, experienced no change in the APFT pass rate. There were no statistical differences between any of the initial APFT scores (both events and overall) and the final APFT scores between the three treatment groups which had required PT activities. There was a statistical difference in the increases in the sit-ups event scores, two mile run scores, and overall scores between the initial APFT and the final APFT between the combination treatment group and the unplanned treatment group.

The researcher concludes that the AROTC program should not discontinue the PT program requirement.

Recommendations

Due to time constraints that the researcher was under to get the University of Wisconsin-Stout Institutional Review Board approval for this study, the researcher was unable to have individuals not participating in the study take the survey prior to it being given to the participants. The survey responses were inconsistent with what the researcher had expected, as both respondents in the unplanned treatment group indicated that they were not allowed to

perform individually selected PT activities. The combination treatment group had six respond that they had planned PT activities while two others indicated they had individually selected activities. There was minimal response by any of the respondents regarding the number of hours outside of the AROTC PT activities that those participants performed individual PT activities. There was also minimal response regarding the percentage of PT activity time that was dedicated to improving which PT events.

While the researcher believes this study to be valid and reliable, the reliability could be increased by extending the study to one year in length. While AROTC cadets are required to pass at minimum one APFT per year, extending the study to one year would allow for both the initial APFT and the final APFT to be tests that the participants must pass. This would reduce the possibility of participants intentionally performing poorer on the initial APFT so as to show greater improvement on the final APFT. It would also allow for approximately eight additional months of PT activities which should increase the reliability of the statistical comparisons.

In conjunction with extending the study to one year, a website should be created which would allow participants to track the amount of time and the types of PT activities they perform. A website would allow for more accurate tracking of the participant's PT activities and time, which would enhance the reliability of the surveys.

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Table 2

APFT Sit-up Standards

SIT-UP STANDARDS												
AGE GROUP	17-21	22-26	27-31	32-36	37-41	AGE GROUP	42-46	47-51	52-56	57-61	62+	AGE GROUP
Repetitions	MF	MF	MF	MF	MF	Repetitions	MF	MF	MF	MF	MF	Repetitions
82			100			82						82
81			99			81						81
80		100	98			80						80
79		99	97			79						79
78	100	97	96			78						78
77	99	96	95			77						77
76	97	95	94	100	100	76						76
75	95	93	92	99	89	75						75
74	94	92	91	98	88	74						74
73	92	91	90	96	87	73						73
72	90	89	89	95	86	72	100					72
71	89	88	88	94	85	71	98					71
70	87	87	87	93	84	70	98					70
69	85	85	85	92	83	69	97					69
68	84	84	85	91	82	68	96					68
67	82	83	84	89	81	67	95					67
66	81	81	83	88	80	66	94	100	100			66
65	79	80	82	87	80	65	93	99	99			65
64	78	79	81	86	87	64	92	98	98	100		64
63	78	77	79	85	86	63	91	97	97	99	100	63
62	74	78	78	84	85	62	90	96	96	99	99	62
61	73	75	77	82	84	61	89	94	95	97	98	61
60	71	73	76	81	83	60	88	93	94	96	97	60
59	70	72	75	80	82	59	87	92	93	95	96	59
58	68	71	74	79	81	58	86	91	92	94	95	58
57	66	69	73	78	80	57	85	90	91	92	94	57
56	65	68	72	76	79	56	84	89	89	91	92	56
55	63	67	71	75	78	55	83	88	88	90	91	55
54	62	65	70	74	77	54	82	87	87	89	90	54
53	60	64	68	73	76	53	81	86	86	88	89	53
52	58	63	68	72	75	52	80	84	85	87	88	52
51	57	61	66	71	74	51	79	83	84	86	87	51
50	55	60	65	69	73	50	78	82	83	85	86	50
49	54	58	64	68	72	49	77	81	82	84	85	49
48	52	57	63	67	71	48	76	80	81	83	84	48
47	50	56	62	66	69	47	75	79	80	82	83	47
46	49	55	61	65	68	46	74	78	79	81	82	46
45	47	53	60	64	67	45	73	77	78	79	81	45
44	46	52	59	62	66	44	72	76	77	78	79	44
43	44	50	58	61	65	43	71	74	76	77	78	43
42	42	49	57	60	64	42	70	73	75	76	77	42
41	41	48	56	59	63	41	69	72	74	75	76	41
40	39	47	55	58	62	40	68	71	73	74	75	40
39	38	45	54	56	61	39	67	70	72	73	74	39
38	36	44	52	55	60	38	66	69	71	72	73	38
37	34	43	51	54	59	37	65	68	69	71	72	37
36	33	41	50	53	58	36	64	67	68	70	71	36
35	31	40	48	52	57	35	63	66	67	69	70	35
34	30	39	48	50	56	34	62	64	66	68	69	34
33	28	37	47	49	55	33	61	63	65	66	68	33
32	27	36	46	48	54	32	60	62	64	65	66	32
31	25	34	45	47	53	31	59	61	63	64	65	31
30	25	33	44	46	52	30	58	60	62	63	64	30
29	22	32	43	45	50	29	57	59	61	62	63	29
28	20	31	42	44	49	28	56	58	60	61	62	28
27	18	29	41	42	48	27	55	57	59	60	61	27
26	17	28	39	41	47	26	54	56	58	59	60	26
25	15	27	38	40	46	25	53	54	57	58	59	25
24	14	25	37	39	45	24	52	53	56	57	58	24
23	12	24	36	38	44	23	51	52	55	56	57	23
22	10	23	35	36	43	22	50	51	54	55	56	22
21	9	21	34	35	42	21	49	50	53	54	55	21
Repetitions	MF	MF	MF	MF	MF	Repetitions	MF	MF	MF	MF	MF	Repetitions
AGE GROUP	17-21	22-26	27-31	32-36	37-41	AGE GROUP	42-46	47-51	52-56	57-61	62+	AGE GROUP

Scoring standards are used to convert raw scores to point scores after test events are completed. To convert raw scores to point scores, find the number of repetitions performed in the left-hand column. Next, move right along that row and locate the intersection of the soldier's appropriate age column. Record that number in the Sit-Up points block on the front of the scorecard.

Table 3a


APFT Two Mile Run Standards Part One

2-MILE RUN STANDARDS																										
TIME	17-21		22-26		27-31		32-36		37-41		AGE GROUP	42-46		47-51		52-56		57-61		62+		TIME				
	M	F	M	F	M	F	M	F	M	F		M	F	M	F	M	F	M	F	M	F		M	F		
12:54											12:54												12:54			
13:00	100		100								13:00												13:00			
13:06	89		89								13:06												13:06			
13:12	87		88								13:12												13:12			
13:18	86		87		100		100				13:18												13:18			
13:24	84		86		89		89				13:24												13:24			
13:30	83		84		88		88				13:30												13:30			
13:36	82		83		87		87		100		13:36												13:36			
13:42	80		82		85		85		89		13:42												13:42			
13:48	89		91		95		95		98		13:48												13:48			
13:54	88		90		94		95		97		13:54												13:54			
14:00	86		89		92		94		97		14:00												14:00			
14:06	85		88		91		93		96		14:06	100											14:06			
14:12	83		87		90		92		95		14:12	89											14:12			
14:18	82		85		88		91		94		14:18	88											14:18			
14:24	81		84		88		90		93		14:24	87		100									14:24			
14:30	79		83		87		89		92		14:30	87		98									14:30			
14:36	78		82		85		88		91		14:36	86		98									14:36			
14:42	77		81		85		87		91		14:42	85		98		100							14:42			
14:48	76		80		84		86		90		14:48	84		97		99							14:48			
14:54	74		78		83		85		89		14:54	83		96		98							14:54			
15:00	72		78		82		85		88		15:00	82		95		98							15:00			
15:06	71		77		81		84		87		15:06	81		95		97							15:06			
15:12	70		76		79		83		86		15:12	80		94		96							15:12			
15:18	88		74		78		82		86		15:18	80		93		95		100					15:18			
15:24	87		73		77		81		85		15:24	89		92		95		99					15:24			
15:30	86		72		76		80		84		15:30	88		91		94		97					15:30			
15:36	84	100	71	100	75		79		83		15:36	87		91		93		97					15:36			
15:42	83	99	70	99	74		78		82		15:42	86		90		92		97		100			15:42			
15:48	81	98	69	98	73	100	77		81		15:48	85		89		91		96		99			15:48			
15:54	80	96	68	97	72	99	76	100	80		15:54	84		88		91		95		98			15:54			
16:00	89	96	67	96	71	98	75	99	80		16:00	83		87		90		94		97			16:00			
16:06	87	94	66	95	70	97	75	99	79		16:06	83		87		89		93		96			16:06			
16:12	86	93	64	94	69	97	74	98	78		16:12	82		86		88		92		95			16:12			
16:18	84	92	63	93	68	96	73	97	77		16:18	81		85		87		91		94			16:18			
16:24	83	90	62	92	66	95	72	97	76		16:24	80		84		87		90		93			16:24			
16:30	82	89	61	91	65	94	71	96	75		16:30	79		84		86		90		93			16:30			
16:36	80	88	60	90	64	93	70	95	74		16:36	78		83		85		89		92			16:36			
16:42	79	87	59	89	63	92	69	94	74		16:42	77		82		84		88		91			16:42			
16:48	78	85	58	88	62	91	68	94	73		16:48	77		81		84		87		90			16:48			
16:54	76	84	57	87	61	91	67	93	72		16:54	76		80		83		86		89			16:54			
17:00	75	83	56	86	60	90	66	92	71	100	17:00	75		80		82		85		88			17:00			
17:06	74	82	54	85	59	89	65	92	70	99	17:06	74		79		81		84		87			17:06			
17:12	73	81	53	84	58	88	65	91	69	98	17:12	73		78		80		83		86			17:12			
17:18	71	79	52	83	57	87	64	90	68	98	17:18	72		77		79		82		85			17:18			
17:24	69	78	51	82	56	86	63	90	67	97	17:24	71	100	76		78		81		84			17:24			
17:30	68	77	50	81	55	85	62	89	67	96	17:30	70	99	76		77		80		83			17:30			
17:36	67	76	49	80	54	85	61	88	66	96	17:36	70	99	75	100	77		80		82			17:36			
17:42	65	75	48	79	53	84	60	88	65	95	17:42	69	98	74	99	76		79		81			17:42			
17:48	64	73	47	78	51	83	59	87	64	94	17:48	68	97	73	98	76		78		80			17:48			
17:54	62	72	46	77	50	82	58	86	63	94	17:54	67	97	73	98	75		77		80			17:54			
18:00	61	71	44	76	49	81	57	85	63	93	18:00	66	96	72	97	74		77		79			18:00			
18:06	60	70	43	75	48	80	56	85	62	92	18:06	65	96	71	97	73		76		78			18:06			
18:12	58	68	42	74	47	80	55	84	61	92	18:12	64	95	70	96	73		75		77			18:12			
18:18	57	67	41	73	46	79	55	83	60	91	18:18	63	94	69	96	72		74		76			18:18			
18:24	56	66	40	72	45	78	54	83	59	90	18:24	63	94	69	95	71		73		75			18:24			
18:30	55	65	39	71	44	77	53	82	58	89	18:30	62	93	68	94	70		72		74			18:30			
18:36	54	64	38	70	43	76	52	81	57	89	18:36	61	92	67	94	69		71		73			18:36			
18:42	21	62	37	69	42	75	51	81	57	88	18:42	60	92	66	93	69		70		72			18:42			
18:48	20	61	36	68	41	74	50	80	56	87	18:48	59	91	65	92	68		70		71			18:48			
18:54	19	60	34	67	39	74	49	79	56	87	18:54	58	90	65	92	67		69		70			18:54			
19:00	17	59	33	66	38	73	49	79	54	86	19:00	57	89	64	91	66	100	69		69			19:00			
19:06	16	58	32	65	37	72	47	78	53	85	19:06	57	89	63	91	65	99	67		69			19:06			
19:12	14	56	31	64	36	71	46	77	52	85	19:12	56	89	62	90	65	99	66		67			19:12			
19:18	13	55	30	63	35	70	45	77	51	84	19:18	55	88	62	89	64	98	65		67			19:18			
19:24	12	54	29	62	34	69	45	76	51	83	19:24	54	87	61	89	63	97	64		66			19:24			
19:30	10	53	28	61	33	68	44	75	50	82	19:30	53	87	60	88	62	96	63		65			19:30			
19:36	9	52	27	60	32	68	43	74	49	82	19:36	52	86	59	87	62	96	63		64			19:36			
19:42	8	50	26	59	31	67	42	74	48	81	19:42	51	85	58	87	61	95	62	100	63			19:42			
19:48	6	49	24	58	30	66	41	73	47	80	19:48	50	85	58	86	60	94	61	99	62			19:48			
19:54	6	48	23	57	29	65	40	72	46	80	19:54	50	84	57	86	59	93	60	99	61			19:54			
20:00	3	47	22	56	28	64	39	72	46	79	20:00	49	83	56	85	58	93	59	98	60	100		20:00			
20:06		45	21	55	27	63	38	71	45	78	20:06	48	83	55	84	58	92	58	97	59			20:06			

Appendix B: Foot and Shoe Types

Figure 1

Foot and Shoe Types

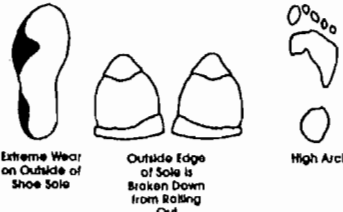


FOOT AND SHOE TYPES

HOW TO SELECT THE RIGHT SHOE

Rigid Foot

Foot tends to stay rigid and does not conform to the ground.



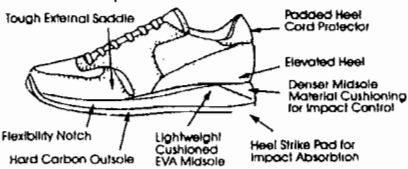

Typical Injuries

Impact Injuries	Hip Pain
Shin Splints	Heel Pain
Stress Fractures	Ankle Sprains
Knee Pain	

Select a Shoe with these Features

- Maximum Shock Absorption and Cushioning
- Dual Density Midsole with the Firmer, Denser Portion on the Outer Edge
- Curved Last
- Flexible Sole
- Elevated Heel
- Avoid Flared Heel

Impact Control Shoe





Denser Midsole Material

Curved Last

Normal Foot

Foot tends to conform to the ground without excess motion.

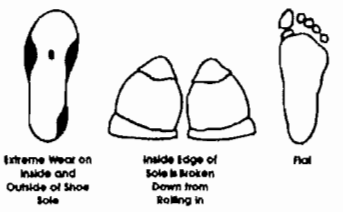


Select a Shoe with these Features

- Balance of Motion Control and Cushioning
- Flexible Sole
- Durable Outsole Appropriate for the Running Surface

Floppy Foot

Foot rolls in excessively toward the midline of the body as it bears weight.



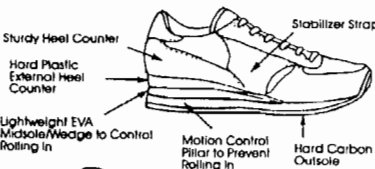
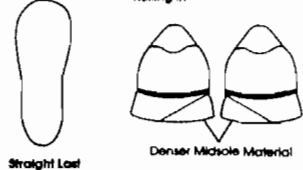
Typical Injuries

Instability Injuries	Knee Pain (knee cap or inside of knee)
Arch Pain	
Heel Cord Pain	
Shin Pain	

Select a Shoe with these Features

- Dual Density Midsole with the Firmer, Denser Area on the Inside
- External Heel Counter
- Good Arch Support
- Maximum Support
- Straight last

Motion Control Shoe

Straight Last

Denser Midsole Material

Use this chart to determine the special fit needs you have — then check our selection of shoes.

Appendix C: Sample Survey

Figure 2

Sample Survey

SURVEY

PURPOSE: The purpose of this survey is to determine any correlation between the amount of physical training time dedicated to improving any APFT event(s) and the improvement in those event(s) as well as any overall APFT improvement. The study also examines the differences between a doctrinal US Army physical fitness program and an individualized physical fitness program.

CONFIDENTIALITY: To ensure that no PERSONAL IDENTIFYING information is provided to the researcher, please use your AROTC identifier.

AROTC IDENTIFIER: _____

Please complete the following questions.

1. List any university physical education classes or sports you participated in between 01FEB09 and today.

2. Did your AROTC program allow you to perform an individually selected physical training regimen during scheduled ROTC physical training time?

Yes - Go on to question 3

No - You have finished the survey

3. On the back of this survey is a list of physical training activities. Please circle the types of physical training activities you used to improve your APFT event scores:

4. Please indicate next to each event the approximate percentage of physical fitness training time you used specifically to train for each event: (Total should not equal more than 100%)

Push-ups (chest, shoulder, and triceps muscles' endurance) _____%

Sit-ups (abdominal and hip-flexor muscles' endurance) _____%

Two mile run (aerobic and leg muscles' endurance) _____%

5. Were you required to attend on average at least two AROTC physical training sessions per week: (Please circle your response)

Yes - You have finished the survey

No - Please answer question 6

6. Not including university enrolled physical education classes or sports, on average how many hours per week between 1FEB09 and today did you perform physical fitness training activities to improve cardiovascular endurance and/or muscular strength?

_____ hours/week

PHYSICAL TRAINING ACTIVITIES:

SHOULDER, CHEST, AND TRICEPS MUSCLES' ENDURANCE (Push-ups)

Push-ups

Weightlifting

Other (Please list)

ABDOMINAL AND HIP-FLEXOR MUSCLES' ENDURANCE (Sit-ups)

Sit-ups

Weight Training

Other (Please list)

AEROBIC AND LEG MUSCLES' ENDURANCE (Two Mile Run)

Running

Aerobics

Bicycling

Cross Country Skiing

Other (Please list)

Appendix D: Raw Data and Pass Rate Tables

Table 4

Planned Treatment Group Raw Data

Cadet	Initial	Final	Initial	Final	Initial	Final	Initial	Final
ID	PU	PU	SU	SU	2 mile	2 mile	Overall	Overall
Number	Score	Score	Score	Score	Score	Score	Score	Score
101	37	60	30	37	39	16	106	113
102	82	86	104	107	106	106	292	299
103	60	72	69	87	68	84	197	243
104	61	61	64	67	69	77	194	205
105	79	72	54	74	60	64	193	210
106	74	91	77	97	83	103	234	291
107	73	79	96	96	89	94	258	269
108	53	62	9	60	73	87	135	209
109	63	70	82	102	63	79	208	251
110	81	64	66	76	75	78	222	218
111	97	97	63	76	76	85	236	258
112	98	88	100	100	82	88	280	276
113	86	87	80	83	86	92	252	262
114	63	67	81	87	80	89	224	243
115	62	69	71	83	91	102	224	254
116	108	101	46	73	53	73	207	247
117	70	83	70	82	65	71	205	236

Table 5

Individual Treatment Group Raw Data

Cadet	Initial	Final	Initial	Final	Initial	Final	Initial	Final
ID	PU	PU	SU	SU	2 mile	2 mile	Overall	Overall
Number	Score	Score	Score	Score	Score	Score	Score	Score
201	103	99	74	73	94	99	271	271
202	78	100	68	71	83	86	229	257
203	59	64	82	79	88	100	229	243
204	78	85	87	93	79	79	244	257
205	69	70	73	79	64	73	206	222
206	79	79	84	79	87	82	250	240
207	75	89	80	89	57	84	212	262
208	63	70	50	76	62	81	175	227
209	50	75	61	65	82	81	193	221

Table 6

Combination Treatment Group Raw Data

Cadet ID Number	Initial PU Score	Final PU Score	Initial SU Score	Final SU Score	Initial 2 mile Score	Final 2 mile Score	Initial Overall Score	Final Overall Score
301	63	72	62	90	79	89	204	251
302	68	67	100	100	66	75	234	242
303	99	102	86	98	75	78	260	278
304	88	79	94	95	64	78	246	252
305	69	75	69	72	68	94	206	241
306	75	79	86	79	60	81	221	239
307	71	95	61	93	65	80	197	268
308	64	64	21	61	14	63	99	188
309	79	67	89	97	26	60	194	224
310	74	81	95	105	102	104	271	290
311	70	85	70	84	39	72	179	241
312	61	73	62	72	82	98	205	243
313	60	71	60	81	32	63	152	215
314	105	126	95	108	83	107	283	341
315	71	66	100	102	74	89	245	257
316	96	103	89	107	72	78	257	288
317	68	72	68	81	97	103	233	256
318	65	81	52	76	65	84	182	241
319	59	64	66	78	27	77	152	219
320	83	110	69	81	0	51	152	242

Table 7

Unplanned Treatment Group Raw Data

Cadet ID Number	Initial PU Score	Final PU Score	Initial SU Score	Final SU Score	Initial 2 mile Score	Final 2 mile Score	Initial Overall Score	Final Overall Score
194	94	71	78	68	101	101	273	240
195	68	71	76	70	71	60	215	201
196	106	104	101	105	82	99	289	308
198	104	88	81	82	79	76	264	246
296	42	48	44	49	60	60	146	157
297	12	34	71	58	59	28	142	120
298	98	88	60	66	64	72	222	226
299	60	56	89	89	97	75	246	220
386	60	71	70	66	27	61	157	198
387	50	78	28	76	41	78	119	232
388	32	37	57	25	0	0	89	62
389	45	50	18	26	27	66	90	142
390	64	54	63	33	96	97	223	184
391	63	60	78	95	79	89	220	244
392	50	60	33	33	24	0	107	93
393	62	79	34	41	59	64	155	184
395	52	47	26	45	59	67	137	159
396	86	88	84	84	88	84	258	256
397	0	0	0	2	0	0	0	2
398	68	83	30	49	54	68	152	200
399	48	49	42	39	0	66	90	154

Table 8

APFT Pass Rate Percentages

Treatment Group	Treatment Size	Initial PU	Final PU	Initial SU	Final SU	Initial 2 mile	Final 2 mile	Overall Initial	Overall Final
Planned	17	88.23%	100%	76.47%	94.11%	88.23%	94.11%	76.47%	94.11%
Individual	9	77.78%	100%	88.89%	100%	88.89%	100%	55.54%	100%
Combination	20	95%	100%	90%	100%	70%	95%	65%	95%
Unplanned	20	60%	60%	55%	50%	50%	85%	45%	45%

Appendix E: Push-ups Statistical Tables

Table 9

Push-ups Descriptive Statistics

 Physical

Training

Type	Mean	Std. Deviation	N
1	3.6471	10.12387	17
2	8.5556	9.91351	9
3	7.2000	10.22690	20
4	2.6000	12.57985	20
Total	5.0758	10.93802	66

Table 10

Push-ups Tests of Between-Subjects Effects

Source	Type III Sum of		Mean Square	F	Sig.	Partial Eta Squared
	Squares	df				
Corrected Model	356.517 ^a	3	118.839	.993	.402	.046
Intercept	1793.453	1	1793.453	14.986	.000	.195
Group	356.517	3	118.839	.993	.402	.046
Error	7420.105	62	119.679			
Total	9477.000	66				
Corrected Total	7776.621	65				

a. R Squared = .046 (Adjusted R Squared = .000)

Table 11

Push-ups Tukey Honestly Significant Difference (HSD) Post Hoc Test

	(I)	(J)	95% Confidence Interval				
	Physical Training Type	Physical Training Type	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
Tukey HSD	1	2	-4.9085	4.50973	.698	-16.8146	6.9976
		3	-3.5529	3.60886	.759	-13.0807	5.9748
		4	1.0471	3.60886	.991	-8.4807	10.5748
	2	1	4.9085	4.50973	.698	-6.9976	16.8146
		3	1.3556	4.39109	.990	-10.2374	12.9485
		4	5.9556	4.39109	.531	-5.6374	17.5485
	3	1	3.5529	3.60886	.759	-5.9748	13.0807
		2	-1.3556	4.39109	.990	-12.9485	10.2374
		4	4.6000	3.45947	.548	-4.5333	13.7333
	4	1	-1.0471	3.60886	.991	-10.5748	8.4807
		2	-5.9556	4.39109	.531	-17.5485	5.6374
		3	-4.6000	3.45947	.548	-13.7333	4.5333

Based on observed means.

The error term is Mean Square (Error) = 119.679.

Appendix F: Sit-ups Statistical Tables

Table 12

Sit-ups Descriptive Statistics

Physical Training			
Type	Mean	Std. Deviation	N
1	13.2353	12.61214	17
2	5.0000	9.11043	9
3	13.3000	11.48042	20
4	1.8000	17.31321	20
Total	8.6667	14.28106	66

Table 13

Sit-ups Tests of Between-Subjects Effects

Source	Type III Sum of		Mean Square	F	Sig.	Partial Eta Squared
	Squares	df				
Corrected Model	1848.208 ^a	3	616.069	3.348	.025	.139
Intercept	4116.707	1	4116.707	22.373	.000	.265
Group	1848.208	3	616.069	3.348	.025	.139
Error	11408.459	62	184.007			
Total	18214.000	66				
Corrected Total	13256.667	65				

a. R Squared = .139 (Adjusted R Squared = .098)

Table 14

Sit-ups Tukey Honestly Significant Difference (HSD) Post Hoc Test

	(I)	(J)	95% Confidence Interval				
	Physical	Physical	Mean				
	Training	Training	Difference				
	Type	Type	(I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
Tukey HSD	1	2	8.2353	5.59189	.460	-6.5279	22.9985
		3	-.0647	4.47486	1.000	-11.8788	11.7494
		4	11.4353	4.47486	.061	-.3788	23.2494
	2	1	-8.2353	5.59189	.460	-22.9985	6.5279
		3	-8.3000	5.44478	.429	-22.6748	6.0748
		4	3.2000	5.44478	.935	-11.1748	17.5748
	3	1	.0647	4.47486	1.000	-11.7494	11.8788
		2	8.3000	5.44478	.429	-6.0748	22.6748
		4	11.5000*	4.28961	.045	.1750	22.8250
	4	1	-11.4353	4.47486	.061	-23.2494	.3788
		2	-3.2000	5.44478	.935	-17.5748	11.1748
		3	-11.5000*	4.28961	.045	-22.8250	-.1750

Based on observed means.

The error term is Mean Square (Error) = 184.007.

*. The mean difference is significant at the .05 level.

Appendix G: Two Mile Run Statistical Tables

Table 15

Two Mile Run Descriptive Statistics

Physical

Training

Type	Mean	Std. Deviation	N
1	7.6471	9.83578	17
2	7.6667	10.28348	9
3	21.7000	15.41052	20
4	7.2000	23.25058	20
Total	11.7727	17.54449	66

Table 16

Two Mile Run Tests of Between-Subjects Effects

Source	Type III Sum of		Mean Square	F	Sig.	Partial Eta Squared
	Squares	df				
Corrected Model	2830.309 ^a	3	943.436	3.405	.023	.141
Intercept	7241.951	1	7241.951	26.139	.000	.297
Group	2830.309	3	943.436	3.405	.023	.141
Error	17177.282	62	277.053			
Total	29155.000	66				
Corrected Total	20007.591	65				

a. R Squared = .141 (Adjusted R Squared = .100)

Table 17

Two Mile Run Tukey Honestly Significant Difference (HSD) Post Hoc Test

		(I)	(J)	95% Confidence Interval				
		Physical Physical						
		Training	Training	Mean	Std.			
		Type	Type	Difference (I-J)	Error	Sig.	Lower Bound	Upper Bound
Tukey HSD	1	2		-.0196	6.86155	1.000	-18.1348	18.0956
		3		-14.0529	5.49089	.061	-28.5495	.4436
		4		.4471	5.49089	1.000	-14.0495	14.9436
	2	1		.0196	6.86155	1.000	-18.0956	18.1348
		3		-14.0333	6.68104	.164	-31.6720	3.6053
		4		.4667	6.68104	1.000	-17.1720	18.1053
	3	1		14.0529	5.49089	.061	-.4436	28.5495
		2		14.0333	6.68104	.164	-3.6053	31.6720
		4		14.5000*	5.26358	.038	.6036	28.3964
	4	1		-.4471	5.49089	1.000	-14.9436	14.0495
		2		-.4667	6.68104	1.000	-18.1053	17.1720
		3		-14.5000*	5.26358	.038	-28.3964	-.6036

Based on observed means.

The error term is Mean Square (Error) = 277.053.

*. The mean difference is significant at the .05 level.

Appendix H: Overall APFT Statistical Tables

Table 18

Overall APFT Scores Descriptive Statistics

Physical			
Training			
Type	Mean	Std. Deviation	N
1	24.5294	21.69135	17
2	21.2222	20.73510	9
3	42.2000	26.27106	20
4	11.6000	38.71679	20
Total	25.5152	30.93031	66

Table 19

Overall APFT Scores of Between-Subjects Effects

Source	Type III Sum of		Mean Square	F	Sig.	Partial Eta Squared
	Squares	df				
Corrected Model	9622.694 ^a	3	3207.565	3.784	.015	.155
Intercept	36714.546	1	36714.546	43.307	.000	.411
Group	9622.694	3	3207.565	3.784	.015	.155
Error	52561.791	62	847.771			
Total	105152.000	66				
Corrected Total	62184.485	65				

a. R Squared = .155 (Adjusted R Squared = .114)

Table 20

Overall APFT Scores Honestly Significant Difference (HSD) Post Hoc Test

	(I)	(J)	95% Confidence Interval			
	Physical Physical					
	Training	Training	Mean	Std.		
	Type	Type	Difference (I-J)	Error	Sig.	Lower Bound Upper Bound
Tukey HSD	1	2	3.3072	12.00273	.993	-28.3813 34.9956
		3	-17.6706	9.60507	.265	-43.0290 7.6878
		4	12.9294	9.60507	.538	-12.4290 38.2878
	2	1	-3.3072	12.00273	.993	-34.9956 28.3813
		3	-20.9778	11.68697	.285	-51.8326 9.8770
		4	9.6222	11.68697	.843	-21.2326 40.4770
	3	1	17.6706	9.60507	.265	-7.6878 43.0290
		2	20.9778	11.68697	.285	-9.8770 51.8326
		4	30.6000*	9.20745	.008	6.2914 54.9086
4	1	-12.9294	9.60507	.538	-38.2878 12.4290	
	2	-9.6222	11.68697	.843	-40.4770 21.2326	
	3	-30.6000*	9.20745	.008	-54.9086 -6.2914	

Based on observed means.

The error term is Mean Square (Error) = 847.771.

*. The mean difference is significant at the .05 level.