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Evaluation of the Effectiveness of ROTC Army Cadet Exercise Training for the Army Combat Fitness Test

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EVALUATION OF THE EFFECTIVENESS OF ROTC ARMY CADET EXERCISE
TRAINING FOR THE ARMY COMBAT FITNESS TEST

by

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A THESIS

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in partial fulfillment of the requirements for the degree of
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2021

EVALUATION OF THE EFFECTIVENESS OF ROTC ARMY CADET EXERCISE TRAINING FOR THE ARMY COMBAT FITNESS TEST

SIMONE CANNON

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ABSTRACT

To see the effectiveness of a twelve-week exercise training program in relation to ACFT performance over time. With changes to the Army's standard physical test, the Army believes the ACFT will better prepare soldiers for combat. Physical Training is required and compared to the ACFT done by Army ROTC cadets for training purposes. Participants of this study were a part of the UAB ROTC program ranging from freshman to seniors. Height, weight, and body composition measurements were taken. Over twelve weeks, participants trained three days per week (MWF) at the ROTC building and executed the training protocol for one hour each day. There were four training stations (Strength, Conditioning, Core, and Endurance) and four groups (Red, White, Black, and Blue) of participants. Each station was conducted for fifteen minutes to account for the hour-long session. At the end of twelve weeks, cadets repeated the ACFT. Each was scored individually and as a composite. There was a significant difference in the 2MR score between time points ($p=0.016$). There was a significant difference between time point 1 and 3 ($p=0.02$). However, no significant differences existed between time point 1 and 2 ($p=0.773$) and time point 2 and 3 ($p=0.266$). No other variables displayed a significant change across the three time points: body mass ($p=0.741$), body fat percentage ($p=0.238$), MDL ($p=0.061$), SPT ($p=0.308$), HRP ($p=0.126$), SDC ($p=0.132$), LTK/PLK ($p=0.583$). The findings of this study suggest overall ineffectiveness of the Army ROTC exercise

training program to improve ACFT performance over the span of an academic year with the exception of a steady improvement in aerobic endurance with the 2MR. Though the training program consisted of exercises tailored specifically to the ACFT, results showed that it did not necessarily improve the overall score.

Keywords: tactical performance, military, physical fitness, human performance, exercise training, warfighter

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LIST OF ABBREVIATIONS

ACFT	Army Combat Fitness Test
CFT	Combat Fitness Test
DS	dietary supplement
HITT	High Intensity Interval Training
HRP	Hand Release Push-Up
LITT	Low Intensity Interval Training
LTK	Leg Tuck
MDL	Maximum Deadlift
PFA	Physical Fitness Assessment
PT	Physical Training
PRT	Physical Readiness Training
RM	Repeated Measures
ROTC	Reserve Officers' Training Corps
RPE	Rating of Perceived Exertion
SDC	Sprint Drag Carry
SPT	Standing Power Throw
2MR	2 Mile Run

INTRODUCTION

Physical fitness refers to the ability of a person's body to work efficiently in order to complete daily activities and remain healthy. There are five components of physical fitness, which include: cardiovascular endurance, muscular endurance, strength, flexibility, and body composition (American College of Sports Medicine, 2017). The Army Reserve Officers' Training Corps (ROTC) Program challenges students mentally as well as physically to develop certain skills pertaining to critical thinking as well as leadership. As a part of this program, students will become United States Army officers upon college graduation. The Army ROTC program has implemented exercise training to address each component of physical fitness in their twelve-week training plan. The aim is to prepare the cadets for the Army Combat Fitness Test (ACFT).

According to the Department of Defense's policy, physical fitness is essential to combat readiness and is an important part of the general health and well-being for Armed Forces personnel. Soldiers must be able to maintain cardiovascular endurance, muscular strength and endurance, flexibility, balance, agility, and explosive power (Department of Defense, 2002). Physical fitness is a crucial part of success in the military — especially in the beginning of one's military career. Individuals with low levels of physical fitness have shown to be more susceptible to injury (Knapik et al., 2006). Along with maintaining physical fitness requirements, military personnel become more prone to

injury risk. Age and prior injury are independent variables of injury risk, meaning they cannot be organically controlled (Knapik et al., 2013). Though injury risk is not completely preventable, precautionary measures are still in place in order to lessen the possibility of an individual being hurt during Physical Training (PT). Research has indicated rate of injury in training as a primary concern (Nimphius et al., 2016). Regular testing and monitoring of performance may be the most effective way to provide useful information to overseers about training state. This process is also used to adapt training programs to provide exceptional training motivation (Nimphius et al., 2016). In a study to identify the trends associated with dietary supplement (DS) use in the college setting, assess beliefs in health benefits, and compare beliefs of users with nonusers of DS as well as lifestyle behaviors amongst them, results exhibited that between undergraduates, student-athletes, and ROTC cadets, the ROTC sample showed the most confidence in efficacy of DS for health & wellness promotion, physical performance enhancement, muscle building, and physical appearance enhancement (Ma et al., 2018). Findings in this study also point out that the lifestyle behaviors of DS users and nonusers differed the most in the undergraduate population, which is quite logical. The undergraduates categorized in this specific study are not involved in any extracurriculars that obligate them to perform anything extra aside from academics in comparison to student-athletes and the ROTC population.

The ACFT is designed to improve overall soldier readiness, transform the fitness culture of the Army, reduce preventable injuries, and increase mental toughness and endurance (ACFT, 2020). The ACFT is better designed for specificity of training as well as being age and gender neutral as opposed to the previously implemented Army Physical

Fitness Test (APFT). The APFT was designed to test cardiovascular fitness, muscular strength, and muscular endurance by having cadets complete two minutes of push-ups, two minutes of sit-ups, and a two-mile run (Army Fitness & Nutrition, 2021). The ACFT promotes combat readiness by encouraging soldiers to develop and maintain a high level of physical fitness (Knapik, 1989, pg. 326). The APFT passing and failing scores were dependent upon gender and age – the highest score obtainable being a 300 (for both genders), whereas a score of 180 (60 points per event) was required in order to pass.

The ACFT consists of six events: 3-repetition maximum deadlift (MDL), standing power throw (SPT), hand release push-up (HRP), the sprint-drag-carry (SDC), leg tuck (LTK) or plank, and the two-mile run (2MR). The plank is an alternative to the LTK. The highest overall score that can be achieved on this test is a 600 (100 points per event) with the passing requirement being a score of 360. Scoring ranges from 0-100 points, with 60 points being the minimum score (per event) required in order to pass the event. The MDL is a test of muscular strength. It is a strong predictor of a soldier's ability to carry a fallen soldier, and to lift and move personnel as well as equipment. The SPT measures upper and lower body explosive power, flexibility, and dynamic balance. The HRP measures upper body muscular endurance and represents repetitive and continuous pushing used in combat tasks. A soldier's ability to push an opponent away during man-to-man contact, take cover, or low crawl are dependent upon these HRP related strengths. The SDC is a measure of muscular power and strength, and anaerobic capacity. All of these attributes are needed to succeed at high-intensity combat tasks. The SDC is also a marker of a soldier's ability to act quickly. The LTK tests muscular strength and endurance assets that

are beneficial to soldiers in all activities involving climbing. Lastly, the 2MR assesses the cardiovascular endurance capacity of the cadet (ACFT Field Testing Manual, 2018).

Faleiro and colleagues discussed hypertrophy-based training. They defined hypertrophy as an increase in muscle size and growth (Faleiro, et al., 2019). The Army ROTC training program is strength/ resistance based. The consistency and intensity of training allows muscles to grow over time. Though not hypertrophy-based, hypertrophy exercises were implemented into the program for the benefit of participant performance. According to Barrett et al., exercise training provides a manageable and acceptable approach for beneficial adaptations in body composition as well as risk of cardio-related diseases (2009). For the study conducted, body composition was measured. Good body composition is considered to be best gained through proper diet and exercise (Army Fitness & Nutrition, 2021). In the Army, soldiers have height and weight requirements they must meet in compliance with their age. If a soldier is overweight for their respected height, he or she will show a decline in performance and an increase in disease development as well as injury risk. Yet, those overweight may still be eligible by being below their body fat percentage for their respected age. It can be concluded that with appropriate exercise and proper nutrition, a soldier will ultimately have better performance ability as well as a healthier life.

Both the U.S. Air Force ROTC as well as U.S. Army ROTC are essentially designed to prepare cadets for the same outcome – educating and commissioning candidates officer through college campuses. The Air Force ROTC was a part of an assessment conducted in order to determine the effects of PT and performance. Results showed body composition was assessed then a Physical Fitness Assessment (PFA) was

completed, resulting that no changes in physical performance amongst Air Force ROTC cadets, concluding that Air Force PT may not improve physical fitness (DeFreitas and Mackey, 2019). Contrary to Army ROTC PT where physical fitness is conducted three times a week, Air Force conducts PT twice a week. Air Force ROTC components of fitness do not have to be performed at the same volume, duration, or intensity as Army ROTC, which are potential reasons for the lack of improvement in training. PT programs traditionally focus on aerobic endurance (Worden & White, 2012). The training protocol discussed below focuses on that in addition to the need for increased emphasis on balance, flexibility, and anaerobic power. Both the Marines and Army changed with the times to better accommodate combat fitness. The Air Force has yet to make changes to their current Physical Fitness Test. The Air Force PFT (AFPFT) is designed to promote physical health and overall fitness (Worden & White, 2012). After testing the high AFPFT scores in relation to a combat fitness assessment, the AFPFT was a poor prediction, which was to be expected. Worden and White (2012) conducted a study where the goal was to build a new Air Force test that would better correlate with airman combat fitness by combining the ACFT and the Combat Fitness Test (CFT). The general Air Force fitness test may ensure that health risk factors may remain low for personnel as well as control body composition standards. This program the Air Force has implemented is not beneficial in terms of airman combat readiness/ preparation.

Prior to implementation of the ACFT, push-ups and sit-ups were valid measures of muscular strength and endurance. These exercises had been replaced with the MDL, HRP, SDC, and LTK. According to Nindl (2015), muscular strength and power are the primary fitness components considered necessary to accomplish most tasks required of

military members. In addition, Nindl (2015) stated female soldiers in the military are at a higher risk of musculoskeletal injuries than their male counterparts. Injury risks can be reduced by effective PT optimization programs. It was of the utmost importance to have a program that would accommodate and benefit each cadet regardless of gender. Nindl (2015) recommended a PT program incorporating and emphasizing progressive load carriage training, resistance training in the range of 3-8 repetition sets targeting type II motor units and muscle fibers, and low-volume, high-intensity interval training incorporated to improve aerobic fitness while protecting against musculoskeletal injuries specifically associated with the lower body and long-distance running. As stated previously, in the Army ROTC program, three hours per week of PT are required as well as a Physical Fitness Test (PFT) once or twice per semester. In modern times, the Army PFT test is converted to a CFT, the same as the Marine Corps. The implementation of the newer ACFT is not without potential drawbacks. As Nimphius et al., stated, introducing new training methods may not be accepted well. According to Olson and Stophel (2008), there are three potential arguments against implementing a new fitness test. These authors reason the APFT was assessing what it aims to assess and was not necessary to be replaced with a new test. This has continued to influence a lack of combat readiness in soldiers. The ACFT takes longer to perform which introduces new timing issues (Olson & Stophel, 2008). Timing had to be adjusted in order to allow for the maximum amount of time to complete the test. There was also additional equipment required to complete the ACFT, which led to testing issues based on cost and availability of equipment (Olson & Stophel, 2008).

Based on the study discussed by Raleigh et al., the training along with the tests was overly intense for most soldiers in general. Participants felt vulnerable and were under negative influence of their own cadre (ROTC faculty members). Using uncommon physical fitness scores to influence ROTC cadet peer ranking is inconsistent with the policy put in place by Army ROTC command (Raleigh et al., 2018 pg. 518). Training was overseen by cadre to ensure cadets are performing in a safe environment and doing it properly to avoid more injury. Considering military personnel are already more vulnerable to injury, it was most logical to implement a program that varies in intensity to the point where it is enough to see improvement over the course of it. The purpose of this study was to assess the effectiveness of the training program to improve the performance capabilities of cadets in the events that were tested by the ACFT. Based on the design of the UAB Army ROTC training protocol, we believed the ACFT was a proper marker to assess performance capabilities.

METHODS

Participants

The participants involved in this study were all cadets in the University of Alabama at Birmingham's (UAB) Army Reserve Officers' Training Corps (ROTC) program. Out of 74 male and female cadets between the ages of 18 and 30, 26 were evaluated. Inclusion criteria include: approved for PT by both the Department of Defense Medical Exam Review Board (DoDMERB) and the UAB ROTC program, as well as absence of any suspected/diagnosed with any type of pulmonary or cardiovascular related disease(s). Recruitment occurred anywhere between the summer and the drop/add date of the fall semester of 2020 and again in the spring semester of 2021. "Zero Day" is a day primarily set aside for recruitment and is typically during the first week of class each semester. On this day students learn about the Army ROTC program and its events throughout the semester as well as opportunities available as a part of the program. It is during this initial meeting when participant recruitment for the study was performed. Participants were informed of the tasks to be executed in the study and provided informed consent.

Prior to beginning the training program, body composition was estimated using a bioelectrical impedance analysis (BIA) device (Omron Healthcare, 2012). Height and weight were also measured using standard scales. Each of these three measurements were taken again at the end of the twelve-week program. In addition to the body composition, height, and weight measurements, each participant completed the ACFT.

Army Combat Fitness Test

The ACFT began with the deadlift. To perform the MDL, the participant would step inside a hexagon shaped bar with feet shoulder width apart and placed their hands on the midpoint of the bar for even weight distribution. The participant would slightly bend their knees and hips to grasp the bar all while arms were fully extended with back flat and head straight. With heels remaining on the ground, and bar in hands, the participant would then lift while keeping the back straight until standing in the upright position. The participant then lowered the bar onto the ground before beginning the next repetition. This event was complete when 3 repetitions had been done correctly and consistently. Next for the SPT, the participant would face opposite of the start line and firmly pick up a 10-pound medicine ball with both hands, grasping it on both sides. The participant would proceed to throw the medicine ball backward and overhead for distance. Each participant would have two attempts with no additional warm-up throw. Following the SPT was the HRP event. Soldiers began in the prone position with hands flat on the ground. Feet could be together or boots width apart with flexed ankles. The head is not required to be on the ground. The soldier would push their body up from the ground as a whole and maintain straight body alignment with elbows fully extended at the top. The soldier then came down by bending the elbows until they were at the starting position. Once the participant was back on the ground, he or she immediately moved both arms out laterally, putting the elbows into a T position then, bent them to move the hands back under the shoulders. Soldiers had two minutes to complete as many HRP as possible. After the HRP was the SDC event. The cadet began in prone once again. This was a timed event where time started once the cadet began. When ready, the cadet would sprint 25 meters, touch the

line with both hand and foot, and then sprint back to the start where they completed the drag. The cadet would then grab the handles of the sled and pull it backwards for 25m and then turn around and repeat the same process until the start line was reached again. At this time the cadet performed a lateral slide for 25m touching with both hand and foot, then completed the same movement (facing the same way) back to the start. Next, the soldier would pick up two 40-pound kettlebells (one in each hand) and proceeded to carry them for 25m and turn to repeat the same movement to the start line. The cadet would then place each kettlebell down and proceeded to sprint 25m for the final time, touching with hand and foot again, then returned to the start. Time stopped after the soldier crossed the line of the final sprint. Following the SDC was the LTK or plank. For the LTK, the participant hung from a bar with feet off the ground and arms fully extended. When hanging from the bar, hands are placed alternately. The participant lifted knees by flexing at the elbow until knees or thighs touch the elbows. To begin the next repetition, the participant returned to the hanging start position. The goal was to maintain a relative vertical posture while moving hips and knees up and down without excessive swinging of the lower extremities. For the plank, the cadet maintained proper plank position for as long as possible. 129 seconds (about two minutes) was the minimum time needed to obtain in order to pass this event. Before beginning the last event, ten minutes of rest is given. The last event was the two-mile run (2MR). Participants ran two miles on a quarter mile (0.25) long track and were timed. Each participant was allowed 21 minutes in order to complete the run with a passing score.

Training Intervention

UAB Army ROTC cadets training program was a twelve-week long program conducted three days a week (Monday, Wednesday, and Friday). If cadets were absent during training, they would receive a negative counseling and would not get attendance credit, which went towards their final grade in ROTC. The program included exercises within the ACFT as well as exercises beneficial to the ACFT in order to help cadets improve their overall score. The training program exercises varied on a weekly basis, but all stayed consistent with the ACFT. Each session included: endurance, conditioning, resistance (strengthening), and core.

1. Endurance consisted of a run to improve the 2-mile run time.
2. Conditioning consisted of some type of High/Low Intensity Interval Training (HITT/LITT) to benefit the Standing Power Throw and Sprint-Drag-Carry event.
3. Resistance consisted of strengthening exercises to specifically improve the deadlift and push-up events of the ACFT.
4. Core consisted of abdominal exercises to strengthen the core and ideally improve the leg tuck event, but it is universal—being valuable to each event.

Senior level cadets led the training sessions, while being overseen by cadre. Sessions were either of low, moderate or high exertion every other day. This was to ensure that cadets receive sufficient and proper recovery between sessions so that they would be able to perform at their best each training session.

Cadets were split into four groups by color (Red, White, Blue, and Black). The Red group consisted of 19 cadets, White consisted of 18 cadets, Blue consisted of 19 cadets, and the Black group consisted of 18 cadets. There were three training variations

that each cadet performed over a twelve-week period, alternating variations each week. The training program consisted of four stations to accommodate for each of the four groups: Strength, Conditioning, Endurance, and Core. Figure 1 displays a summary of the daily training program.

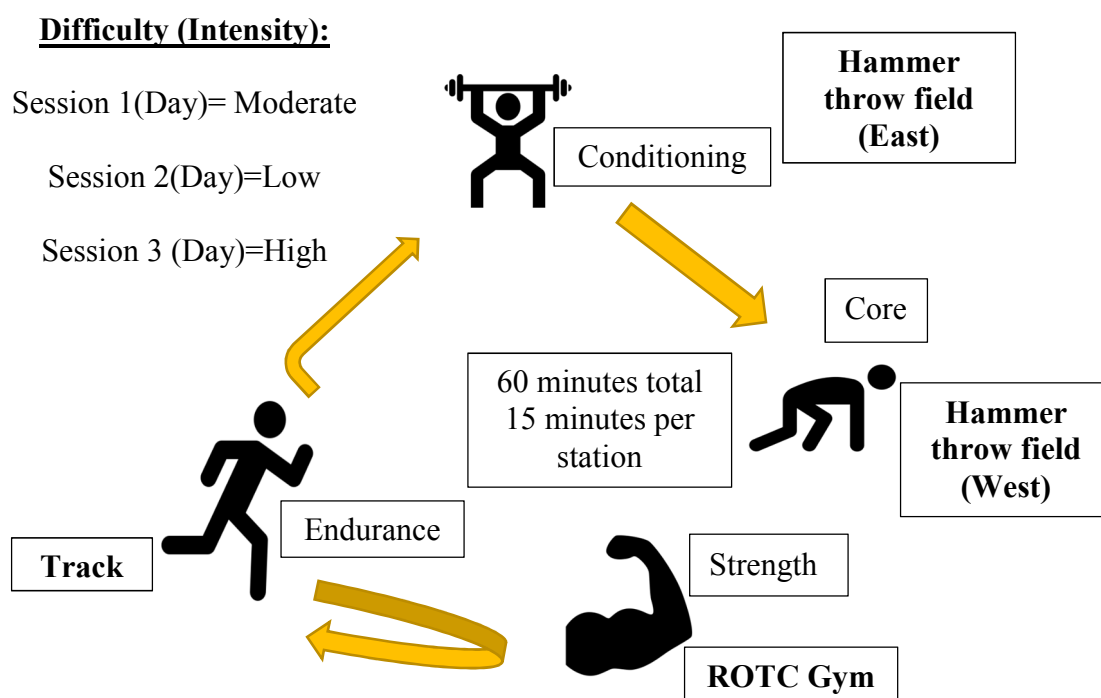


Figure 1. Visual illustration of the four stations cadets

rotate through each training protocol

Prior to training and testing, ROTC conducted Physical Readiness Training (PRTs) exercises as a “warm-up” to support performance. The rating of perceived exertion (RPE) is an estimate of exercise intensity and has a direct relationship with training experience (Allman et al., 2019). For the study discussed by Allman et al., (2019) the training protocol began with a warm-up to ensure adequate preparation. The exercises included the bend and reach, the rear lunge, the high jumper, the rower, the

squat bender, the windmill, the forward lunge, prone row, the bent leg body twist, and the push up. Each exercise is performed five to ten times (repetitions) before moving on to the next. For the first exercise, the bend and reach, cadets began with feet spread shoulder width apart, and arms overhead with elbows fully extended and palms inward. To start, cadet would bend at the knees and reach as far as possible between the legs before returning to the starting position. Next was the rear lunge. The cadet began in straddle stance with hands on hips. While keeping hands on hips, individual stepped back with one leg and slightly bent the back knee. The back heel should not on the ground. The individual would return to the start position and repeat movement with alternating legs.

Following the forward lunge was the high jumper, the cadet began in position with feet shoulder width, slight forward lean, with palms inward. The cadet swung his/her arms forward while slightly lifting feet off the ground and repeated the same movement of the arms, this time with more force and while jumping forcefully and landing on the balls of the feet. These four movements counted as one repetition. For the rower, the individual began on the ground in supine position with arms overhead, feet together and head lifted off the ground. To start, the individual sat up while bending knees and brought arms forward on the outside of the knees. Then the individual would reverse movement going back down to start position.

For the squat bender, the participant began with hands on hips, feet shoulder width apart. To start, the individual would squat with both arms extending forward and palms facing inward, then return to start position. The individual then bent forward at the waist with knees slightly bent reaching towards the ground until it was felt in the back of the thigh. This counted as one repetition. For the windmill, the cadet began in straddle

stance with arms fully extended straight out. To start, the cadet would reach down across the body to the opposite side ankle and touch while looking to the rear. The cadet would then return to the starting position and repeat movements on the other side until five to ten repetitions were complete. The forward lunge was performed the same as the rear lunge but stepping forward as opposed to backwards.

For the prone row, cadets began in prone position with arms overhead, fully extended. Arms were lifted one to two inches off the ground with head facing downward and toes pointed to rear. To start, cadets pulled arms towards chest and hands were in a fist, then reversed movement to return to start. Arms and hands would stay off ground until exercise is complete. To begin the bent leg body twist, the cadet would lie on the ground in supine with hips and knees bent at 90 degrees and arms straight out to the ground, palms flat with knees and feet together. To start, the cadet rotated legs to one side while keeping upper back and arms on the ground. Both legs should have dropped simultaneously toward the ground. The cadet then rotated back to the middle which was the starting point. From here, the cadet repeated the same motion to the other side. Each side equaled one repetition. Lastly, for the push-up, the cadet would begin on all fours, placing the hands wider than the shoulders with both arms and legs straight. To start, the cadet lowered his/her body by bending elbows until the chest is as close to the ground as can be. The cadet then proceeded to push his/her body back up the starting position.

The first variation was tailored to mimic the ACFT specifically, with the addition of the core session. The second variation was designed for UAB Army ROTC cadets to focus on two ACFT events each session. There are six events in the ACFT. To accommodate for all events, each training session was dedicated to two of the six events

to ensure all receive the same amount of focus. The Strengthening (Resistance) session consisted of both compound (Deadlifts, Forward Lunge, Shoulder Press, etc.) and accessory movements (Pull ups, Bicep Curls, Leg Tuck, etc.). Conditioning consisted of Burpees, Power Jumps, 25-meter sled drag, 40lb kettlebell carry, kettlebell swings, and others. The work to rest ratio was consistent in both the conditioning and core stations, whereas it varied with the strengthening and endurance stations due to the amount and type of work. Conditioning and Core stations worked at a 30:30 ratio — 30 seconds of work, 30 seconds rest for each set. Each session was 15 minutes. The participants of the study would start at a different station each session and would rotate every 15 minutes until the hour is complete to ensure they did each station. The day before each session, senior leaders were provided with the training session for the following day. Each morning of training, the senior class leaders of the UAB Army ROTC program went over proper exercise form, repetition, and sets prior to breaking off with their PT groups and beginning the session for the day. Cadets were provided with an exercise library for reference. At the end of the week, the same leaders provided a summary and feedback of the week's training. This was done on a weekly basis.

Table 1

Strength		
Day 1	Day 2	Day 3
3 sets x 6-10 reps	3 sets x 12-15 reps	3 x 4-6 reps
RPE 8.5	RPE 8	RPE 9

*Reps= Repetitions

*RPE= Rating of perceived exertion

Table 2

Conditioning/Core
Work to Rest Ratio
30:30
3-6 rounds per session

Exercises Include: Power Jumps, Burpees, Plate Pushes, Medicine Ball Slams, Bodyweight Squats, Jump Ropes, Box Jumps, Power Clean, T Test, Lateral Lunge, Staggered Jump Squat, Tuck Jump, Burpees, Mountain Climbers, Single Leg Hops, Sprint/Shuffle (50m), Power Throw, Drag, Carry, Crawl, and Swing

Endurance:

Sprints (10 to 25 meters) and distance (0.5mile up to 3 miles) running on track.

*4 laps = 1 mile.

Statistical Analysis

A repeated-measures ANOVA was used to compare all dependent variables for each cadet over time. If significant differences were found, a post-hoc analysis with Bonferroni correction was used to determine differences between groups. If the homogeneity of variances assumption was violated, a Greenhouse-Geisser correction was utilized. All analyses were conducted using SPSS software (Version 25, SPSS, Inc., Chicago, IL). Statistical significance was defined as a p -level less than 0.05 and partial eta squared values were calculated to determine effect size.

RESULTS

Table 3 displays the results of exercise training data (mean and standard deviation) for Army ROTC cadets for the ACFT. There was a significant difference in the 2MR score between time points [$F(2,50) = 4.530, p = 0.016, \eta^2 = 0.153$]. Upon using a Bonferroni correction to determine differences between groups, there was a significant difference between time point 1 and 3 ($p = 0.02$). However, no significant differences existed between time point 1 and 2 ($p = 0.773$) and time point 2 and 3 ($p = 0.266$). No other variables displayed a significant change across the three time points: body mass ($p = 0.741$), body fat percentage ($p = 0.238$), MDL ($p = 0.061$), SPT ($p = 0.308$), HRP ($p = 0.126$), SDC ($p = 0.132$), LTK/PLK ($p = 0.583$).

Table 3

ACFT Performance Variables			
Variable	Time Point 1 (Baseline)	Time Point 2 (Midpoint)	Time Point 3 (Post)
Body Mass	70.4(kg)±14.8	70.2(kg)±14.7	70.8(kg)±15.3
Body Fat Percentage	24.5±4.1	25.1±5.7	23.5±7.7
Maximum Deadlift	70.8±19.4	77.9±14.0	74.0±19.9
Standing Power Throw	71.3±13.3	68.9±14.8	71.7±12.3
Hand Release Push Up	77.5±14.7	78.2±10.7	74.2±12.3
Sprint-Drag- Carry	79.6±22.4	83.6±14.4	85±12.6
Leg Tuck/Plank	68.7±23.9	72.2±19.7	67.9±23.3
2 Mile Run	67.0±27.1 ^{ab}	71.6±28.0 ^{ac}	80.0±12.1 ^b
Total Score	434.4±94.8	453.1±76.4	452.1±68.8

**Different letters indicate significance*

*** The mean for each of the following variables is scored on a scale from 0-100 and is not the raw score (Training for 600, 2021).*

DISCUSSION

The findings of this study suggest overall ineffectiveness of the Army ROTC exercise training program to improve ACFT performance over the span of an academic year with the exception of a steady improvement in aerobic endurance with the 2MR. Though the training program consisted of exercises tailored specifically to the ACFT, results showed that it did not necessarily improve the overall score. The only variable that the current training program appears to be effective at improving is aerobic endurance (ACFT, 2020). However, it is possible that there is insufficient training in areas of specific muscular endurance and muscular strength in order to improve those outcome variables. The level of training appeared to be enough to at least maintain levels of specific muscular endurance and muscular strength, which can certainly be important. However, if the aim during the training program is to improve these outcome variables, then it appears the current training regimen is insufficient or that different training approaches are required.

There was a consistent frequency of exercise training three times a week for sixty minutes, with the exception of unforeseen inclement weather, holidays, and “rest days” that were given by instructors. It is certainly possible that this volume of training is insufficient to lead to marked improvement, but enough to at a minimum maintain fitness levels. Previous findings by Mackey and DeFreitas (2019) advised that two days of physical training per week are insufficient to lead to improvements. Modifying the

training protocol to increase PT effectiveness was specified in order to see overall progression. The current study supports this prior finding, as well as expands on that study to suggest that training of three days per week is insufficient to lead to substantial improvements. Future studies should consider including an additional fourth training day to determine if significant improvements in fitness can be experienced then.

There are a number of possible considerations for how inconsistencies of exercise testing could factor into how well the cadets perform. PT attire changes in relation to the time of year. Clothing is an external factor that influences thermoregulation (Allen et al., 2017). In the cooler months (the midpoint test in the current study), the PT uniform is a long-sleeve t-shirt with windbreaker pants and jacket, gloves, and the option of a wool hat worn on the head. During the warmer months (baseline and post-test in the current study), the PT attire is a short sleeve t-shirt and shorts.

Progressive overload training was emphasized to be incorporated in a physical training program (Nindl, 2015). Principles of progressive overload seemed to be inconsistent in the current PT program. The weight used for exercise training was dependent upon the individual. The number of reps would vary starting at 8, but never exceeded 15. In the future, cadets will have recorded their maximum exercise-specific training weight(s) on a weekly basis and will proceed to increase it or do percentages of the desired weight each week. This way they will be able to see their improvements. Depending on the intensity of the workout, will also determine the repetitions. A 1-RM is suggested as well to track progression. This should be done prior to beginning the training program, and on a monthly basis (every 4 weeks) of the program until it is

complete. Recommendations of doing various muscle specific exercises on certain days will allow more focus on one particular area for improvements.

An activity log would be required from each cadet to exhibit their physical fitness outside of PT. Workouts can be given as well to be completed outside of PT. A change in exercise as well as variation(s) in the protocol could show potential improvement. The workouts given will be similar to those at PT, so cadets know what to expect and can potentially see more improvement. These activity logs will hold cadets accountable and should be clear identifiers of those who are not actively logging their physical activity—it will relay in performance.

As with any pilot studies, there are a number of limitations with the current study. It was expected that the twelve-week training program would improve event scores and overall scores in relation to the ACFT over time. The current findings do not support this, whereas the 2MR event was the only variable that exhibited significant improvement over the time period. This may be due to the amount of effort each cadet put in towards training as well as toward the test itself. Due to the time period that the data was collected, the ACFT does not have any punitive nature with failure of the test, this may have been taken into consideration by cadets as well in regard to effort. Time was a factor as well. With PT only being an hour long, the amount of focus spent on each session had to be divided equally. Certain sessions could have used more attention dependent on the exercise but could not be allowed the time to do so. It is simpler on the 2MR to differentiate and clarify, because everyone starts at the same time and gets the exact same amount of time to complete the event. In regard to the BIA, granted the same device was used every time, there is the question of validity of the scale (Fletcher, 2020). There was

also the issue of remote training vs. in-person. These differences in training style could have very well impacted scores, as well as the influence of different environmental temperatures during testing. Remote training allowed for lack of accountability more so than in-person training. Remote training also could have related to lack of equipment, whereas with in-person everything needed to complete the training is accessible to all cadets.

It was hypothesized that the ROTC training protocol was a proper marker to access performance capabilities. The 2MR being the only variable to show significant improvement, it could be concluded that since one of the designs of the ACFT is to improve endurance, the training program was successful in improving this specific variable. However, the training program was ineffective for improvement in every other measure. As the ACFT continues to develop and change over time, the training involved should correlate with the test. An effective training protocol is essential to performance progression.

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APPENDIX A
SCORING STANDARDS

APPENDIX A: SCORING STANDARDS

Table 4

Points	MDL	SPT	HRP	SDC	LTK	PLK	2MR
100	340lbs	12.5m	60	1:33	20	4:20	13:30
99		12.4m	59	1:36		4:17	13:39
98		12.2m	58	1:39	19	4:14	13:48
97	330lbs	12.1m	57	1:41		4:11	13:57
96		11.9m	65	1:43	18	4:07	14:06
95		11.8m	55	1:45		4:04	14:15
94	320lbs	11.6m	54	1:46	17	4:01	14:24
93		11.5m	53	1:47		3:58	14:33
92	310lbs	11.3m	52	1:48	16	3:54	14:42
91		11.2m	51	1:49		3:51	14:51
90	300lbs	11.0m	50	1:50	15	3:48	15:00
89		10.9m	49	1:51		3:44	15:09
88	290lbs	10.7m	48	1:52	14	3:41	15:18
87		10.6m	47	1:53		3:38	15:27
86	280lbs	10.4m	46	1:54	13	3:35	15:36
85		10.3m	45	1:55		3:31	15:45
84	270lbs	10.1m	44	1:56	12	3:28	15:54
83		10.0m	43	1:57		3:25	16:03
82	260lbs	9.8m	42	1:58	11	3:21	16:12
81		9.7m	41	1:59		3:18	16:21
80	250lbs	9.5m	40	2:00	10	3:15	16:30
79		9.4m	39	2:01		3:12	16:39
78	240lbs	9.2m	38	2:02	9	3:08	16:48
77		9.1m	37	2:03		3:05	16:57
76	230lbs	8.9m	36	2:04	8	3:02	17:06
75		8.8m	35	2:05		2:58	17:15
74	220lbs	8.6m	34	2:06	7	2:55	17:24
73		8.5m	33	2:07		2:52	17:33
72	210lbs	8.3m	32	2:08	6	2:49	17:42
71		8.2m	31	2:09		2:45	17:51
70	200lbs	8.0m	30	2:10	5	2:42	18:00
69		7.8m	28	2:14		2:39	18:12
68	190lbs	7.5m	26	2:18	4	2:35	18:24
67		7.1m	24	2:22		2:32	18:36
66		6.8m	22	2:26		2:29	18:48
65	180lbs	6.5m	20	2:30	3	2:26	19:00
64	170lbs	6.2m	18	2:35		2:22	19:24
63	160lbs	5.8m	16	2:40		2:19	19:48
62	150lbs	5.4m	14	2:45	2	2:16	20:12
61		4.9m	12	2:50		2:12	20:36
60	140lbs	4.5m	10	3:00	1	2:09	21:00

(Training for 600, 2021)

APPENDIX B

IRB LETTER

APPENDIX B: IRB LETTER

TO: Morris, Cody; Cannon, Simone

FROM: University of Alabama at Birmingham Institutional Review Board Federalwide Assurance # FWA00005960
IORG Registration on # IRB00000196 (IRB 01)
IORG Registration on # IRB00000726 (IRB 02)
IORG Registration on # IRB00012550 (IRB 03)

DATE: 29-Dec-2020

RE: IRB-300004546
IRB-300004546-007
ROTC Army Cadets and Exercise Performance

470 Administration on Building 701 20th Street South Birmingham, AL 35294-0104
205.934.3789 | Fax 205.934.1301 | irb@uab.edu

The IRB reviewed and approved the Personnel Amendment submitted on 23-Dec-2020 for the above referenced project. The review was conducted in accordance with UAB's Assurance of Compliance approved by the Department of Health and Human Services.

Type of Review: Expedited
Categories: 4, 7,
Determination: Approved
Approval Date: 29-Dec-2020
Expiration on Date: 28-Dec-2023

Although annual continuing review is not required for this project, the principal investigator is still responsible for (1) obtaining IRB approval for any modifications before implementing those changes except when necessary to eliminate apparent immediate hazards to the subject, and (2) submitting reportable problems to the IRB. Please see the IRB Guidebook for more information on these topics.

Documents Included in Review:

IRB PERSONNEL EFORM