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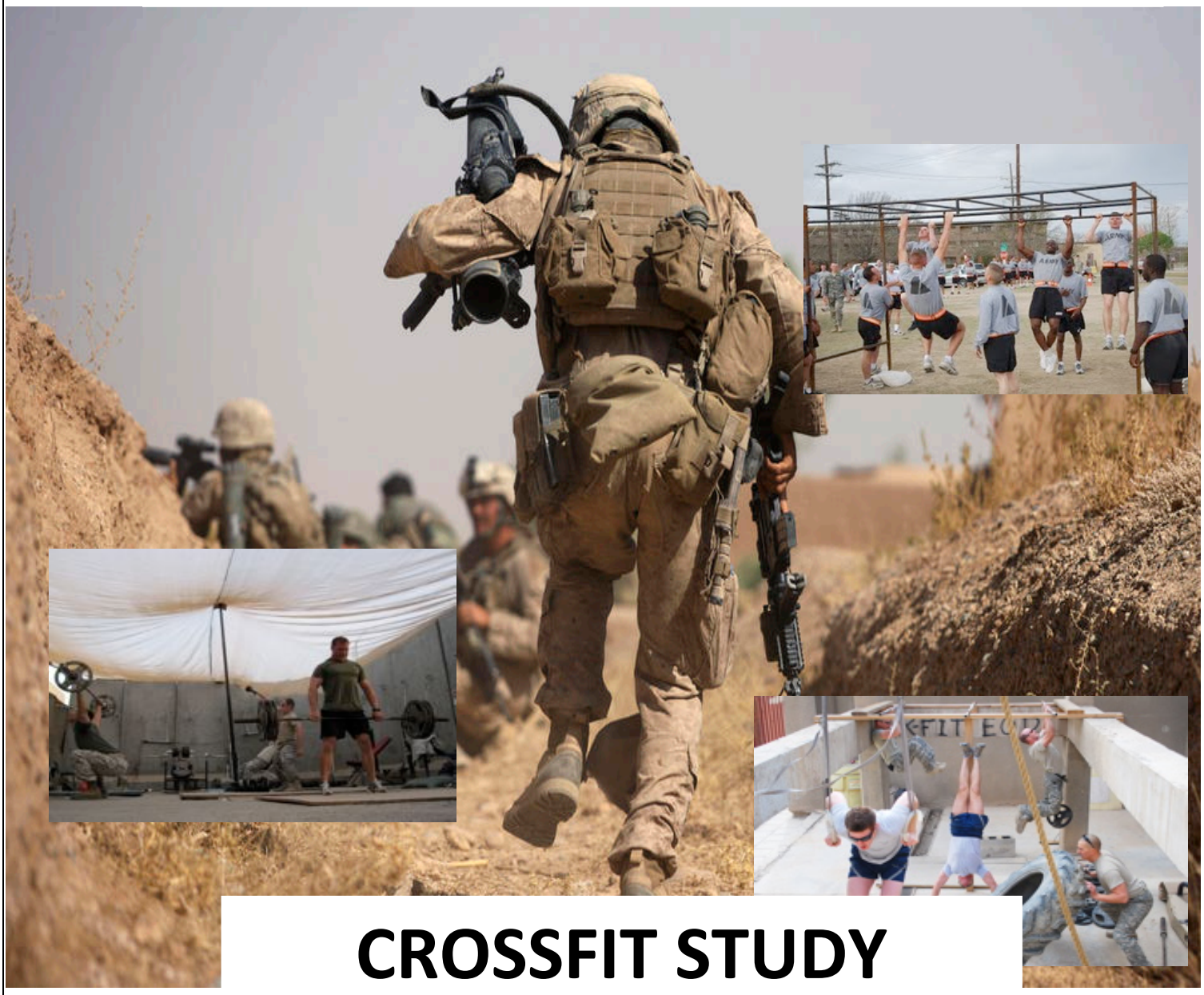

CROSSFIT STUDY

MAY 2010

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Executive Summary

The purpose of this study is to test the efficacy of the CrossFit fitness program and methodology to increase the physical fitness of U.S. Army Soldiers. Over the past several years, the CrossFit fitness program has gained popularity among U.S. Army Soldiers and leaders. In unit's across the U.S. Army, CrossFit is replacing or augmenting traditional physical training methods. CrossFit's growing popularity in the U.S. Army begs the question, is CrossFit an effective fitness program and does it match the U.S. Army's physical training requirements?

CrossFit is a core strength and conditioning program created in 1995 by Greg Glassman, a life-long physical fitness trainer and gymnast from Santa Cruz, CA. The stated goal of the CrossFit program is to develop a broad, general and inclusive fitness, the type of fitness that would best prepare trainees for any physical contingency. To achieve the aim of general, broad and inclusive fitness, the CrossFit program has athletes perform constantly varied, high intensity, functional movements. These movements generally fall into the three modalities of gymnastics, Olympic weightlifting, and metabolic conditioning or "cardio." In a typical CrossFit workout athletes conduct a warm-up, a skill or strength development segment and then a "Workout of the Day" or WOD. The WOD by design varies from day to day, but typically includes a mixture of functional exercises conducted at high intensity from anywhere between 5 and 20 minutes.

Since the creation of the U.S Army, physical fitness training has played an important role in combat readiness. However, throughout its history the U.S. Army's method for conducting physical fitness training has changed and evolved. Most recently, in the late 1990s, the U.S. Army began to see evidence that its method of conducting physical training was not producing Soldiers ready for the rigors of modern ground combat. This reality began a general move within the U.S. military towards functional fitness programs as many leaders and organizations began to rethink physical training and its relation to combat readiness. Take for example, the revision of FM 21-20 (*Physical Fitness Training*), the Ranger Athlete Warrior program, and the United States Marine Corps, Functional Fitness Program. The CrossFit program's growth in the U.S. military over the last decade is equally representative of the U.S. Military's move to functional fitness. In 2006, Glassman estimated that up to 7,000 members of the U.S. military were using the CrossFit program regularly. That number has grown exponentially since 2006 represented by the fact that there are now over 58 non-profit military CrossFit affiliates throughout the world, to include affiliates at many major U.S. Army installations like Fort Bragg, Fort Hood, Fort Polk, Fort Knox, Fort Meade, Fort Leavenworth, the Pentagon and the United States Military Academy.

In order to test the efficacy of the CrossFit program, this study measured the change in level of physical fitness (defined as an athletes' work capacity across broad time periods and modal domains) of fourteen athletes during eight-weeks of physical training utilizing the CrossFit program. The fourteen athletes were all students at the Command and General Staff College, and were a mix of men and women with varying levels of physical fitness and CrossFit experience. The athletes were given an initial assessment made-up of four physical evaluations (the APFT, and three CrossFit benchmark workouts; "Fran," "Fight Gone Bad," and "the CrossFit Total") that tested their ability to perform a variety of functional movements across modalities and for differing periods of time. These athletes were then introduced to the specific CrossFit movements and conducted a six-week CrossFit specific training program. During the last week of the program these athletes were re-assessed using the same evaluation tools in order to measure the change in their level of physical fitness. Athletes in the study were required to

complete each initial and final evaluation and attend an initial three hours of CrossFit Foundations instruction. During the six-week training period athletes were required to attend a minimum of four, one hour, training sessions per week.

Based on the results of the data we collected during the athletes' performance on the assessments, and our qualitative evaluations of the athletes during the six-weeks of training, we believe this study produced four important findings.

1) Over the eight-week study, every athlete experienced an increase in their work capacity, measured in terms of power output, with an average increase of 20%. Therefore, we believe the CrossFit program was successful in increasing every athlete's general level of physical fitness.

2) While those athletes that were least fit at the beginning of the study saw the largest net gains in work capacity, even the most-fit athletes in the study experienced significant gains. The results of our study indicate that above average athletes overall work capacity increased 14.38%. One of our most fit athletes, with considerable CrossFit experience, saw a gain of 28.32% in overall work capacity. From our perspective, these results considerably strengthen our assertion in the first finding by demonstrating the CrossFit program's ability to increase the level of physical fitness of above-average athletes who in theory would have less capacity for improvement. We believe that the CrossFit program's prescription of high intensity combined with constant variance is one of the primary reasons that the above-average athletes in the study experienced gains in work capacity. Additionally, based on our qualitative observations, individual motivation to both maintain intensity and develop new physical skills appears to be one of the major observed differences between above-average athletes and average or below average athletes.

3) Despite a generalized training program that did not specifically train the athletes for any of the assessments, the athletes' performance on the assessments improved. For example, on the one repetition maximum weight deadlift assessment, the athletes mean increase in work capacity increased 21.11%. Importantly, these results were achieved despite only performing the deadlift in a workout five times out of twenty-eight training sessions. The results from the shoulder press, back squat, push-up and sit-up assessments mirror the deadlift in that despite limited number of training sessions devoted specifically to these exercises, the athletes' performance during the assessments improved. These results lead us to the conclusion that generalized training can prepare athletes for unknown and unknowable events, a crucial capability in combat, and can produce improvement in specialized events despite non-specialized training.

4) Generally the athletes in the study experienced relatively equal increases in power output in each of the assessments. Based on how we devised the assessments, this indicates a balanced increase in performance across metabolic pathways and across the ten general physical skills. We believe the consistency of improvement across assessments validates the CrossFit program's claim that it produces a broad and inclusive brand of fitness. From the perspective of the U.S. Army, this is significant because capacity across metabolic pathways and modalities characterizes the type of versatility required of U.S. Army Soldiers.

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I. Purpose: The purpose of this study is to test the efficacy of the CrossFit fitness program and methodology to increase the physical fitness of U.S. Army Soldiers. Over the past several years, the CrossFit fitness program has gained popularity among U.S. Army Soldiers and leaders. In unit's across the U.S. Army, CrossFit is replacing or augmenting traditional physical training methods.[1] CrossFit's growing popularity in the U.S. Army begs the question, is CrossFit an effective program and does it match the U.S. Army's physical training requirements? Currently there exists a host of anecdotal evidence claiming that the CrossFit program is effective. [2] However, to date, only one formal study within the U.S. Army has attempted to add empirical evidence to these claims.[3] Our study seeks to contribute to the discussion by adding further analytical research on the CrossFit program in hopes of helping U.S. Army leaders make well-informed decisions regarding the future of U.S. Army physical fitness training.

II. Background:

a. What is CrossFit?

CrossFit is a core strength and conditioning program created in 1995 by Greg Glassman, a life-long physical fitness trainer and gymnast from Santa Cruz, CA. The stated goal of the CrossFit program is to develop a broad, general and inclusive fitness, the type of fitness that would best prepare trainees for any physical contingency, to include the unknown and the unknowable.[4] As Greg Glassman states in a CrossFit Training Guide, "Our specialty is not specializing. Combat, survival, many sports, and life reward this kind of fitness and, on average, punish the specialist." Additionally, Glassman states that the CrossFit method is unique in its focus on maximizing "neuroendocrine response, developing power, cross-training with multiple training modalities, constant training and practice with functional movements and the development of successful diet strategies."[5]

The CrossFit program's concepts of fitness rest on three standards. Athletes are held up to these standards to determine their level of fitness. The first standard is the 10 general physical skills, which include: cardio respiratory endurance, stamina, strength, flexibility, power, speed, coordination, agility, balance, and accuracy. By this standard an athlete is as fit as they are

[1] U.S. Army units using the CrossFit method include both conventional and special operations forces. U.S. Army installations, both in the continental United States and deployed, have established functional fitness training facilities that allow Soldiers to do CrossFit type workouts. Specifically, there are 58 non-profit military CrossFit affiliates located on U.S. military installations around the world (see the list of affiliates at www.CrossFit.com). For example, at Fort Hood there are two non-profit military affiliates. The first is the 20th Engineer Battalion whose leadership created Lumberjack CrossFit and use CrossFit for their battalion physical training (see http://lumberjackCrossFit.blogspot.com/). The second is CrossFit Centurion Fort Hood (see http://CrossFitforthood.blogspot.com/). For news reports that chronicle the rising popularity of CrossFit in the U.S. military see Rebekah Sanderlin, "Commando-style workout has cult following," *Fayetteville Observer* (December 18, 2006), and Bryan Mitchell, "CrossFit workout craze sweeps the Corps," *Marine Corps Times* (June 22, 2008).

[2] See for example, Major Dave Maxwell, "Winning the Battle of the Bulge." *CrossFit Journal* (November, 18 2008).

[3] The non-profit military affiliate at Fort Hood, CrossFit Centurion Fort Hood, conducted a study similar to this one in 2009. That study is unpublished.

[4] Greg Glassman, "Understanding CrossFit," *CrossFit Journal* 56 (April 2007), 1.

[5] Greg Glassman, "Foundations," *CrossFit Journal* (April 2002), 1.

competent across these 10 skills. The second standard encapsulates the idea that fitness is about performing well at a broad range of physical tasks. CrossFit refers to this standard as the "hopper." If one puts every physical task imaginable into a hopper, spins it around and then pulls out a random task, we would measure an athletes' level of fitness by their ability to consistently perform well at any of the tasks pulled from the hopper. The third standard is the ability of athletes to perform well across the three metabolic pathways that provide energy for all human activity. These are the phosphagen, glycolytic and oxidative pathways.[6] According to this standard, an athlete is as fit as they are conditioned in each of the metabolic pathways. To achieve the aim of general, broad and inclusive fitness, CrossFit has athletes perform constantly varied, high intensity, functional movements. These movements generally fall into the three categories, or modalities, of gymnastics, Olympic weightlifting, and metabolic conditioning or "cardio." In a typical CrossFit workout athletes conduct a warm-up, a skill or strength development segment and then a "Workout of the Day" or WOD. The WOD by design varies from day to day, but typically includes a mixture of functional exercises conducted at high intensity from anywhere between 5 and 20 minutes. Key to the CrossFit method is the idea that CrossFit is the "sport of fitness" -- it attempts to harness the, "natural camaraderie, competition, and fun of sport," by keeping score, timing workouts and defining rules and standards of performance.[7]

b. Functional Fitness – Back to the Future:

Since the creation of the U.S Army, physical fitness training has played an important role in combat readiness. However, throughout its history the U.S. Army's method for conducting physical fitness training has changed and evolved. Most recently, in the late 1990s, the U.S. Army began to see evidence that its method of conducting physical training was not producing Soldiers ready for the rigors of modern ground combat. The Army Physical Fitness School, then at Fort Benning, Georgia, began testing Soldiers using a 1946 Physical Efficiency Test. This test, created from the lessons of combat during WWII and intended to test U.S. Army Soldiers' readiness for combat, consisted of the following events: jumping over a 3ft wall, and an 8ft ditch, climbing a 12ft rope two times without pause, conducting a fireman's carry 100 yards in 1 minute, foot marching 5 miles in 1 hour, running 1 mile in 9 minutes, swimming 30yds and treading water for 2 minutes. After giving this older test to modern day Soldiers, the Army Physical Fitness School found that present day Soldiers were less fit than their WWII counterparts were. The director of the Army Physical Fitness School attributed this trend to the fact that the current APFT had become the focus of physical training in the Army and that the APFT did not accurately measure the skills necessary for combat, particularly anaerobic skills such as agility, strength and speed.[8] In response to these findings the Army Physical Fitness School at the time proposed changes to the APFT and a revision of FM 21-20, the Army physical training manual. That revision was recently published as TC 3-22.20 (*Army*

[6] Greg Glassman, "The CrossFit Training Manual, v4," http://www.CrossFit.com/cf-seminars/CertRefs/CF_Manual_v4.pdf (accessed January 13, 2010).15.
[7] Ibid, 2.
[8] Stephen Lee Myers, "The Old Army, It Turn Out, Was the Fitter One," June 25, 2000, http://www.ihrpa.orgnewyorktimes.htm (accessed January 13, 2010).

Physical Readiness Training) and outlines three fundamentals for U.S. Army physical training: strength, endurance and mobility.[9]

Throughout the past decade the realities of modern combat have caused many military leaders and organizations within the U.S. military, in addition to the U.S. Army Physical Fitness School, to rethink physical training and its relation to combat readiness. This thinking has lead to a resurgence of functional fitness programs in the U.S. Military. Two important cases in point demonstrate the U.S. military's recent move to functional, combat-focused fitness. The first case is the U.S. Army Ranger Regiment. In the summer of 2005, the Ranger Regiment initiated a program called the Ranger Athlete Warrior Program, or RAW. This program was intended, among other objectives, to "achieve a level of physical fitness that is commensurate with the physical requirements of Ranger missions."[10] The RAW program includes four primary components: functional fitness, performance nutrition, sports medicine and mental toughness. The perceived importance of this new fitness program to the U.S. Army is captured in the following statement from the editor of Infantry magazine in 2007, "The Ranger Athlete Warrior Program offers a means of improving Soldiers' conditioning well beyond anything we have tried up to now, and deserves our close attention."[11] The second case is the U.S. Marine Corps. In 2006, the U.S. Marine Corps leadership began to believe that its current physical fitness training regime was not adequately preparing Marines for the rigors of modern combat. In a paper entitled, "A Concept for Functional Fitness," the U.S. Marine Corps spelled out its move away from traditional military physical training with its focus on long distance running and other endurance training to functional fitness focused on combat readiness. As LTG James F. Amos explains in the introduction to this paper, "In recent decades we have not maintained our focus on combat when we designed our physical fitness programs. Our physical training was not 'functional' in this sense."[12] The U.S. Marine Corps reinforced its change in thinking by adding a Combat Fitness Test in addition to its traditional Physical Fitness Test in October 2008.

Although different than RAW and the U.S. Marine Corps' functional fitness concept because of its grassroots nature, the CrossFit fitness program's growth in the U.S. military over the last decade is equally representative of the U.S. Military's move to functional fitness. In 2006, Glassman estimated that up to 7,000 members of the U.S. military were using the CrossFit program regularly.[13] That number has grown exponentially since 2006 represented by the fact that there are now over 58 non-profit military CrossFit affiliates throughout the world, to include affiliates at many major U.S. Army installations like Fort Bragg, Fort Hood, Fort Polk, Fort Knox, Fort Meade, Fort Leavenworth, the Pentagon and the United States Military Academy.[14] The growth of CrossFit in the U.S. military mirrors the growth of the program throughout America in general. Glassman opened the first CrossFit affiliated gym in Santa Cruz in 1995. Then in 2001, he introduced his fitness program on the Internet at CrossFit.com, and began publishing a monthly journal and holding seminars at his local gym. Since that time, CrossFit

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[9] Department of the Army, *TC 3-22.20: Army Physical Readiness Training* (Washington, DC: Government Printing Office, 2010).

[10] RAW PT, v.3.0, 4, online at http://www.utoledo.edu/hshs/military_science/pdfs/RAW_PT_Manual%2C_v3.pdf ; accessed on 5/3/2010.

[11] Danny McMillian, "Ranger Athlete Warrior Program: A Systemic Approach to Conditioning," *Infantry*, May-June 2007. 5.

[12] U.S. Marine Corps Combat Development Command, "A Concept for Functional Fitness," November 2006, http://www.CrossFit.com/2007/01/a-concept-for-functinal-fitne.tpl (accessed May 14, 2010).

[13] Rebekah Sanderlin, "Commando-style workout has cult following," *Fayetteville Observer*, December 18, 2006.

[14] Study authors conducted a search on the CrossFit website, www.CrossFit.com, for military affiliates.

has grown from 18 affiliated gyms in 2005 to almost 1,700 in 2010.[15] Glassman attributes the growth of his fitness program to the confluence of the launch of his website and the start of the wars in Iraq and Afghanistan. From his perspective, at that time "people [began to take] fitness much more seriously."[16] In addition to its functional applications to the military, many attribute the CrossFit program's popularity to its simplicity and variety. Soldiers in deployed or austere environments have found that the CrossFit program, because it does not rely on a lot of equipment or distance running, can be performed almost anywhere.[17]

III. Research Methodology:

a. Overview: In order to test the efficacy of the CrossFit program this study measured the change in level of physical fitness of fourteen athletes during eight-weeks of physical training utilizing the CrossFit program. Athletes were given an initial assessment made-up of four physical evaluations that tested their ability to perform a variety of functional movements across modalities and for differing periods of time. These athletes were then introduced to the specific CrossFit movements and principles and conducted a six-week CrossFit specific training program. During the last week of the program these athletes were re-assessed using the same evaluation tools in order to measure the change in their level of physical fitness. Athletes in the study were required to complete each initial and final evaluation and attend an initial three hours of CrossFit Foundations instruction. During the six-week training period athletes were required to attend a minimum of four, one hour, training sessions per week.

b. Defining and Measuring Physical Fitness: We defined physical fitness as an athletes' work capacity across broad time periods and modal domains.[18] More plainly stated, physical fitness is an athlete's ability to successfully conduct a host of different physical tasks for varying periods of time at varying levels of intensity. We chose this definition because we believe it best articulates the type of fitness required of U.S. Army Soldiers. Soldiers need to be broadly trained athletes who can perform well across a full spectrum of athletic tasks, and who are competent across the ten general physical skills.[19] They cannot afford to be strictly endurance athletes or strictly strength athletes. We believe our definition of fitness captures these requirements. Therefore, by our definition, increases in an athlete's level of physical fitness can be measured by increases in an athlete's work capacity or average power output regardless of the physical activity being performed. Therefore, this metric of fitness allows for a comparison between traditionally incomparable activities such as running long distance and weight lifting.

By our definition, the ability to demonstrate a high level of work capacity (intensity) across varying time periods indicates an ability to perform using any three of the major metabolic pathways that provide energy for all human action. These three major engines are known as the phosphagen pathway, the glycolytic pathway and the oxidative pathway (see

[15] James Wagner, "Fitness is a Full-Time Pursuit," *The Wall Street Journal*, February 2, 2010.
[16] Bryan Mitchell, "CrossFit workout craze sweeps the Corps," *Marine Corps Times*, June 22, 2008.
[17] See for example, First Lieutenant Matthew Hoff, "The Panther Recon Downrange Gym," *The CrossFit Journal* (September 20, 2009).
[18] Greg Glassman, "The CrossFit Training Manual, v4," http://www.CrossFit.com/cf-seminars/CertRefs/CF_Manual_v4.pdf (accessed January 13, 2010)., 2.
[19] The ten general physical skills are outlined in Appendix C (General Physical Skills) and were taken from *The CrossFit Training Guide v4*, 17.

Figure 1). The phosphagen pathway is the pathway the human body predominately uses when conducting high-powered activities that last for only a few seconds; for example, a one-repetition maximum weight dead lift. The glycolytic pathway is the pathway the body predominately uses when conducting moderately powered activities that last up to several minutes; for example, an 800m sprint or two minutes of push-ups. The third metabolic pathway is the pathway that dominates low powered activities that last in excess of several minutes; for example, running two miles. The phosphagen and the glycolytic pathways generally power anaerobic exercises; these systems generate energy in the absence of oxygen. Conversely, the oxidative pathway is aerobic and generates energy using oxygen. The use of oxygen makes aerobic activity sustainable for long periods of time whereas anaerobic activity is unsustainable past several minutes. This leads to the natural observation that power or intensity and duration of physical activity are inversely related. Therefore, athletes will experience a decrease in average power output the longer they perform.[20] However, by our definition the most-fit athletes will be able to generate large amounts of power in short periods of time and maintain relatively higher power outputs for longer periods of time.

Modal domains are distinct categories of physical training tasks. In this study we define three modal domains: metabolic conditioning, gymnastics, and weight lifting. Metabolic conditioning or "cardio" refers to physical training tasks whose primary function is to improve cardio respiratory capacity and stamina. These include tasks such as running, biking, rowing, and jumping rope. The gymnastics modality comprises body weight exercises or tasks that require the ability to manipulate one's own body weight. The primary purpose of these types of exercises is to improve neurological dominated skills like coordination, agility, balance, and accuracy and improve functional upper body capacity and core strength. The weightlifting modality is made up of weight lifting, Olympic lifts and powerlifting. The primary purpose of training in this modality is to increase strength, power, and speed.[21] By our definition the ability to show work capacity across modal domains indicates an athlete's competence across the ten general physical skills (see Appendix C: General Physical Skills for a definitions) and, more generally, an ability to successfully execute a broad range of diverse physical tasks.

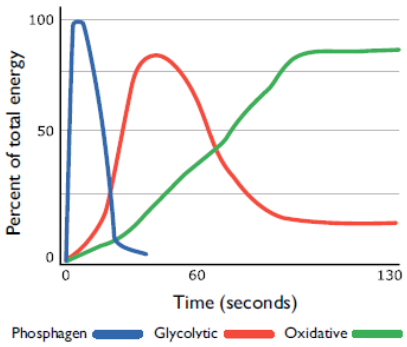


Figure 1

c. Selection of athletes:

1) We asked for volunteers for the study by sending out an e-mail to all of the Command and General Staff College Class 2010-01. We received over 150 applications from interested students. All members of the CGSC class are mid-grade officers in the U.S. Armed Forces between the ages of 30-45. Selected officers had to be in good health and without physical limitations that prohibited their ability to perform any of the required CrossFit movements.

[20] Greg Glassman, "Metabolic Conditioning," *CrossFit Journal*, June 2003, 1-2.
[21] Greg Glassman, "The CrossFit Training Manual, v4," http://www.CrossFit.com/cf-seminars/CertRefs/CF_Manual_v4.pdf (accessed January 13, 2010), 79.

2) We selected candidates in order to achieve a mix of both male and female athletes with widely varying levels of physical fitness and varying levels of previous CrossFit experience.[22] When applying for the study, athletes were asked to include their last Army Physical Fitness (APFT) score and their CrossFit experience described as: *No Experience* ("What is CrossFit?"); *Some Experience* ("I have done a few CrossFit workouts"); *Moderate Experience* ("I have attended a CrossFit Foundations class and/or I have been using CrossFit as my primary fitness program for at least two months"); or *Considerable Experience* ("I have been using CrossFit as my primary fitness program for over a year and I have attended or I am planning to attend in the near future a Level I CrossFit Certification"). We selected a broad range of athletes in order to evaluate the ability of CrossFit to improve physical fitness regardless of current level of fitness or experience with the program. We hypothesized that almost any fitness program would show improvement in athletes who prior to the study did not conduct physical fitness training regularly and scored below average on the APFT. We felt that the real test of the CrossFit program would be its ability to increase in the physical fitness level of average to above average athletes.

3) Study Participants demographics: We selected five females and nine males for the study. Four of the athletes had no CrossFit experience and had historically below average scores on the APFT (defined as 250 and below). Four of the athletes had little to no CrossFit experience and had historically average scores on the APFT (defined as 250-290). Six of the athletes had historically above average scores on the APFT (defined as 290 and above) of which two had significant CrossFit experience and two had moderate CrossFit experience. See Appendix A (Athlete Profiles) for a detailed description of each athlete's profile.

	Gender	**APFT (Below AVG)**	**APFT (AVG)**	**APFT (Above AVG)**	**CF Exp (None)**	**CF Exp (Some)**	**CF Exp (Mod)**	**CF Exp (Con)**
Male	9	3	2	4	3	2	2	2
Female	5	1	2	2	3	2	0	0

Figure 2

d. Assessments: During the initial and final week of the study, the athletes' physical fitness readiness was tested using four physical assessments. One of the assessments was the Army Physical Fitness Test (APFT). The APFT was chosen as an assessment in order to provide a traditional frame of reference to evaluate increases or decreases in physical fitness and to provide an assessment that was not a CrossFit workout. The other assessments were benchmark Workouts of the Day (WOD) from the CrossFit.com website. Each of the WODs was chosen based on their diversity from one another and their collective ability to test the athletes' performance across different metabolic pathways and modalities. All four assessments took place over the course of a week and athletes were given at least one day of recovery between assessments. Each assessment had prescribed weights to lift or repetitions to complete. When athletes could not complete the assessments as prescribed, they were allowed to scale the movement, or the weight as needed. Trained and certified trainers were present as graders during each of the assessments. They evaluated the athletes' correctness in performing the

[22] Varying levels of physical fitness should be understood in the context of the U.S. Army where everyone has to be fit enough to pass an Army Physical Fitness test.

required movements. Trainers had the ability to take away or not count repetitions if an athlete's form or technique was not accurate or if they did not properly complete a movement. Points of performance for each exercise were based on the Army APFT standards as described in FM 21-20 (*Physical Fitness Training)* and the CrossFit movement standards as outlined in the CrossFit Training Guide (see Appendix D: Movement Points of Performance for a detailed description of the CrossFit movement standards). Below is a detailed description of each assessment.

1) **APFT:**

For maximum repetitions/fastest time:

Maximum repetitions of Push-ups (2 minutes)

Rest 10 minutes

Maximum repetitions of Sit-ups (2 minutes)

Rest 10 minutes

Run 2 miles (as rapidly as possible)

The first workout that we had our athletes perform during the assessment week was the APFT. The APFT consists of three separate events; the push-up, the sit-up, and the two-mile run. These three events are conducted in sequence giving the athlete up to ten minutes of rest between events. For the push-up and sit-up portion of the test, an athlete has two minutes to perform as many repetitions of the exercise as possible. For the two-mile run, athletes attempt to complete a two-mile course in as short a time as possible. According to APFT standards, an athlete performs a push-up by starting in the plank position with arms fully extended and then lowering themselves as a single unit until their upper arm is parallel to the ground and then pushing their body weight back up until their arms are fully extended. During the two minutes, athletes are not allowed to rest by placing their chest or knees on the ground. The sit-up is performed by an athlete lying on their back with their knees bent and then sitting up to a position where their back is perpendicular to the ground. For the sit-up, athletes have their feet secured by another athlete and they must have their hands behind their head.

As previously mentioned the assessments were chosen because of their diversity from one another in terms of metabolic pathway and modality. As such, we classified each assessment based on these criteria in order to make clear their distinctions from one another. Regarding the APFT, we classified the push-up and sit-up events as workouts that predominately required athletes to use the glycolytic pathway because these events require exactly two minutes of maximum workout effort. We further classified these two events as gymnastic events because they require athletes to manipulate their own body weight. We classified the two-mile run as an event in the oxidative pathway and as a metabolic conditioning exercise.

2) **Fran:**

For Time:

21-15-9 repetitions of

Thrusters (96lbs/65lbs) and Pull-ups

The second workout that we had our athletes perform during the assessment weeks was "Fran." Fran consists of three rounds of a couplet of exercises: the thruster and the pull-up. Athletes perform the thruster by holding a barbell in their hands at shoulder height (resting on the front of their shoulders), executing a front squat followed immediately by an aggressive press of the barbell overhead. Athletes perform pull-ups by starting from a dead hang on a bar, arms straight, and pulling themselves upward until their chin is above the level of the bar. In Fran, each athlete performs twenty-one of each exercise, followed immediately by fifteen of each, then finishes with nine of each. Time does not stop during this workout and the exercises must be executed in order; thrusters then pull-ups. The prescribed weight for the thrusters is ninety-five pounds for men and sixty-five pounds for women. Depending on their level of fitness and confidence, athletes may choose to scale either exercise. Athletes scale thrusters by reducing the weight on the barbell. Athletes scale pull-ups by using resistance bands to assist them; bands offer either an estimated 20% assistance (blue band) or 30% assistance (green band) to the athlete. Athletes may also scale pull-ups by performing jumping pull-ups: using leg drive to gain momentum in order to get their chins above the bar.

We classified Fran as a WOD that required athletes to predominately rely on the glycolytic pathway because, if scaled properly, athletes complete the WOD in between three and eight minutes. We further classified Fran as a mixture of two modalities, gymnastic and weightlifting and those modalities' corresponding primary physical skills.

3) **Fight Gone Bad:**

3 Rounds for repetitions/calories of the following:

1 minute of wall ball shots (20lbs/14lbs)

1 minute of sumo deadlift high-pull (75lbs/55lbs)

1 minute of box jumps (20 inch)

1 minute of push press (75lbs/55lbs)

1 minute of rowing

1 minute rest

The third workout our athletes performed was "Fight Gone Bad." Fight Gone Bad consists of three rounds of five different exercises: wall ball shots, box jumps, sumo deadlift high pull, push press, and rowing on a Concept 2 rowing ergometer. Athletes perform each exercise for one minute, then move to the next exercise and immediately begin that exercise, then on to the next exercise, until all five exercises are complete. At the conclusion of each round, athletes get a one-minute break before beginning the next round. "Fight Gone Bad" takes exactly seventeen minutes to perform. Athletes count the number of repetitions performed for each

exercise and number of calories generated on the rowing machine (as displayed on its monitor). The total score is equal to the total number of repetitions plus total calories for rowing. The goal is for athletes to score as many points as possible.

Wall Ball Shots are performed by squatting with a medicine ball (20-lbs for men and 14-lbs for women) then throwing and hitting a ten-foot target line on a wall. Athletes perform box jumps by jumping on to a 20-inch box with both feet, standing up to fully open their hips once on top of the box, and then jumping down. Athletes execute sumo deadlift high pulls by grabbing a barbell (75-lbs for men and 55-lbs for women) with their arms inside their knees, dead lifting the barbell, and pulling it to a position even with their collarbones, then returning the barbell to the ground. Athletes push press by holding a barbell (75-lbs for men and 55-lbs for women) in their hands at shoulder height (resting on the front of shoulders), bending their knees slightly, then driving with their legs and hips and pressing the bar overhead with their arms and shoulders. Like Fran, athletes can scale portions of "Fight Gone Bad" to fit their physical and mental capacities. For Wall Ball shots, athletes can scale by either using a lighter ball or throwing to a lower target or both. Athletes can scale box jumps by using a lower box or performing "step-ups" in lieu of box jumps or both. Scaling for Sumo Deadlift High Pull and Push Press involves reducing the amount of weight on the barbell. Athletes cannot scale rowing.

We classified Fight Gone Bad as a WOD that required athletes to rely, relative to the other WODs, primarily on the oxidative pathway because in this athletes are required to sustain a relatively low-power output over longer periods of time. Although the athletes do get a one minute rest every five minutes, the lower work to rest ratio in this WOD requires athletes to rely on stamina and endurance to maintain their intensity. We further classified Fight Gone Bad as a mixture of all three modalities, gymnastic, weightlifting and metabolic conditioning.

4) **CrossFit Total:**

1 repetition maximum weight of the following:

Shoulder press

Back squat

Deadlift

The CrossFit Total is a strength assessment. It requires athletes to perform back squats, deadlifts, and shoulder presses to determine a one repetition maximum weight. Athletes generally were allowed three attempts before their one repetition maximum weight was determined. Athletes were allowed to rest as needed between lifts and between each attempt. In the back squat, the athletes placed a loaded barbell behind their neck on their shoulders and performed a squat reaching a depth where the crease of their hip was below the top of their kneecap and then standing back up to full extension of the hip and knees. In the dead lift, athletes lift a loaded barbell from the ground to a position just below their waist where they can achieve full extension of their knees and hip and then return the barbell back to the floor. In the shoulder press athletes start with a barbell across their chest and hands gripped around the bar just outside their shoulders. Then they press the bar overhead using only their arms and

shoulders until their elbows are locked out above the head. An athlete's score on the CrossFit total is the total weight lifted in pounds for all three exercises.

We classified the CrossFit Total as a WOD that required athletes to predominately rely on the phosphagen pathway because each lift required high power output for only seconds at a time with a large work to rest ratio. In terms of modality, we classified the CrossFit Total as a weight lifting task, which required competency in each of the physical skills related to that modality.

e. CrossFit Foundations classes: During the initial assessment week we conducted three hours of classes to train and educate the athletes participating in the study on the CrossFit methodology and specific CrossFit movements. The day prior to each assessment, athletes were trained in the specific movements required in that WOD. For example, the day prior to assessing the athletes on Fran, they received instruction and coaching on the front squat, the push press, the thruster, and the pull-up. They were also informed of the points of performance for each of these movements.

f. Training Plan: The training plan for the study was based on the CrossFit programming methodology as described in The CrossFit Training Guide.[23] The workout for each training session was designed to be varied, functional and have the ability to be executed at high intensity. Daily workouts varied in terms of their modality (gymnastics, Olympic weight lifting, metabolic conditioning), their time and intensity (generally between 5-20 minutes) and their structure (singlet, couplet, triplet, WODs of up to ten exercises). Several other specific considerations guided programming. The first consideration was the skill and experience level of the athletes. The programming took into account that many of the athletes in the study had very little if any CrossFit experience. Therefore, training sessions in the beginning of the study involved few if any tasks with a high skill level, specifically movements like muscle-ups, push-jerks, or snatch. High skill tasks were introduced to athletes in daily skill and strength portions of a training session with reduced intensity, and then only introduced into workouts later in the six-week period once the athletes had practiced those skills. The second consideration was the desire to allow for adequate recovery for athletes during the week, especially in the first two weeks of the program. For this reason, the training plan specifically sought to avoid the same type of movements multiple days in a row. This allowed athletes who had not been working out regularly before the study to maintain the intensity of their workouts throughout a week. The last consideration was weather. The study was conducted in the winter months in Kansas. Running outside became difficult during the latter parts of the six-week training period. Therefore, weather limited the types of metabolic conditioning that the athletes could perform. For the detailed six-week training plan, see Appendix B (Training Plan).

g. Training sessions: Training sessions during the study lasted for six-weeks and were conducted five days a week. Athletes were required to attend at least four training sessions each week during that six-week period. Each training session lasted approximately one hour and athletes could choose to attend a training session at either 0515 or 1600. All training session were lead by CrossFit Level I certified trainers from the Iron Major CrossFit affiliate at Fort Leavenworth, KS. Training sessions generally following the format; warm-up, skill or strength

[23] Greg Glassman, "The CrossFit Training Manual, v4," http://www.CrossFit.com/cf-seminars/CertRefs/CF_Manual_v4.pdf (accessed January 13, 2010), 7-86.

work and then a workout of the day or WOD. The warm-up consisted of a series of body weight or lightweight exercises and movements conducted at a slow to moderate pace. Typical warm-up exercises included rowing, squats, push-ups, pull-ups, sit-ups, back extensions, and stretching. Skill and strength work was also conducted at low to moderate intensity and was intended to build capacity in a single CrossFit movement. The athletes would move through each separate portion of the training session together and then begin the WOD at the same time. During the WOD, the trainer would help athletes record their time, reps or weight for each workout. All athletes were encouraged to maintain their own fitness logbook to record the results of their workouts.

IV. Presentation of Data:

a. Empirical Measurement of Workout Performance[24]:

In order to compare workout performance in a single athlete or between athletes, it is necessary to establish a common unit of measure. In terms of our functional fitness program, this common unit is *average power* (in foot-pounds per second or ft-lbs/s). This is the quantification of the general physical skill of *power*: the ability of a muscular unit or combination of muscular units, to apply a maximum force in minimum time.[25] Because average power is exactly equal to intensity, it is a great common unit to compare workout performances from the same athlete or between athletes. [26]

To begin, we must be able to mathematically define *average power*:

$$P_{AVG} = W \div t$$

P_{AVG} is average power.

W is work in ft-lbs.

t is time in seconds.

Work is:

$$W = F \times d.$$

[24] The mathematical formulas for calculating work and power of specific exercises were developed and given to the authors in an Excel Spreadsheet by Bill Abney from www.beyondthewhiteboard.com.
[25] Greg Glassman, "The CrossFit Training Manual, v4," http://www.CrossFit.com/cf-seminars/CertRefs/CF_Manual_v4.pdf (accessed January 13, 2010), 10.
[26] Ibid. 1.

Force (F) is weight, measured in pounds (lbs), distance (d) is measured in feet, and time is measured in seconds. Using these basic formulas, we can calculate the amount of average power generated in a workout performance. Therefore:

$$P_{AVG} = (F \times d) \div t$$

By calculating average power for a workout performance, we can compare performances regardless of any scaling of weight or repetitions the athlete might have done.

b. Empirical Data by Assessment:

1) Fran

The first workout that our athletes performed for record was "Fran." To calculate average power generated for Fran (P_{Fran}), we had to calculate the work performed by the athlete in performing thrusters ($P_{Thrusters}$) and the work performed in performing pull-ups ($P_{Pull\text{-}ups}$) and divide that by the total time of the WOD.

$$P_{Fran} = (W_{Thrusters} + W_{pull\text{-}ups}) \div t$$

The average power for thrusters is a combination of the work of moving the barbell and body weight through a known distance over a time period. The athlete must move the load, consisting of the weight of the barbell and the portion of the bodyweight moved in the thruster, from the bottom of the front squat position to the full overhead position.

$$W_{Thrusters} = n_{Thrusters} \times ([Weight_{Barbell} + (p_{Squat} \times Weight_{Athlete})] \times d_{Thruster})$$

$Weight_{Barbell}$ and $Weight_{Athlete}$ are the weights of the barbell and athlete in pounds.

p_{Squat} is the portion of the bodyweight moved in the squat.

$d_{Thruster}$ is the distance the barbell moves through the entire thruster range of motion.

$n_{Thrusters}$ is the total number of thruster repetitions performed by the athlete.

The distance the bar moves is determined by calculating the differences between the height of the barbell when standing as if for a squat and the height of the barbell at the bottom of the squat and adding to it the difference between the squat height and the full overhead height.

$$d_{Thruster} = (Height_{Squat} - Depth_{Squat}) + (Height_{Overhead} - Height_{Squat})$$

Therefore, the work performed for a given number of thrusters is:

$$W_{Thrusters} = n_{Thrusters} \times [([Weight_{Barbell} + (p_{Squat} \times Weight_{Athlete})] \times [(Height_{Squat} - Depth_{Squat}) + (Height_{Overhead} - Height_{Squat})]) \div t$$

We calculated the average power generated for pull-ups in a similar manner, resulting in the following formula:

$$W_{pull\text{-}up} = n_{pull\text{-}up} \times Weight_{Athlete} \times (Height_{Overhead} - Height_{Squat})$$

$n_{pull\text{-}up}$ is the number of pull-up repetitions performed by the

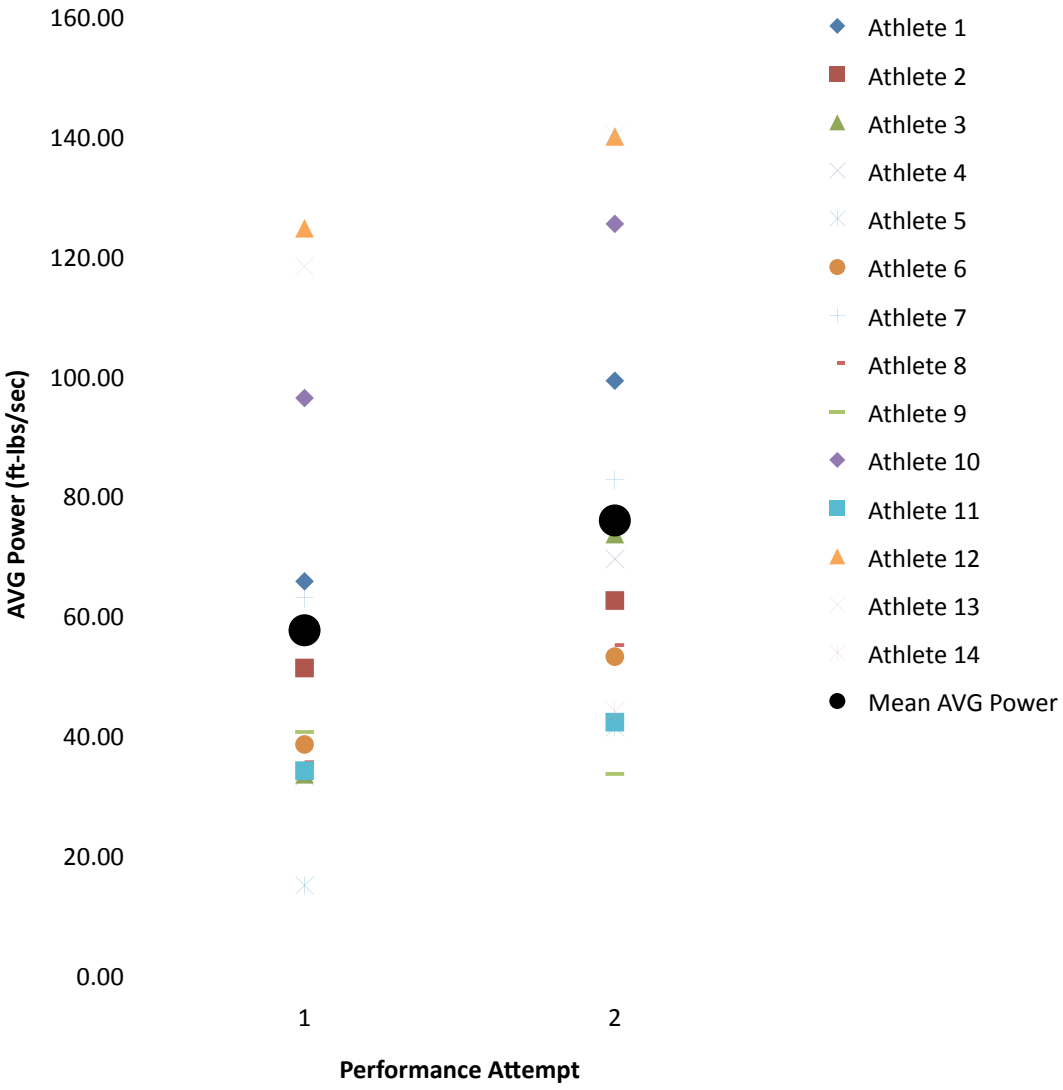
Combining each of these formulas into our original formula gives us a method of calculating the average power generated by the athlete for Fran.

$$P_{Fran} = [[n_{Thrusters} \times [([Weight_{Barbell} + (p_{Squat} \times Weight_{Athlete})] \times [(Height_{Squat} - Depth_{Squat}) + (Height_{Overhead} - Height_{Squat})]) + [n_{pull\text{-}up} \times Weight_{Athlete} \times (Height_{Overhead} - Height_{Squat})]] \div t$$

Figure 3 displays the athletes' performances of Fran during the pre- and post-assessment periods. In their first attempt at performing Fran prior to beginning the training period, athletes generated between 14.85 and 124.46 ft-lbs/sec with a group mean of 57.4 ft-lbs/sec. Fran performances from the post-training period assessment resulted in performances between 33.43 and 139.94 ft-lbs/sec and a group mean of 75.72. Generated average power increased by 24.2 % for the group mean in an eight-week period. Furthermore, some individuals experienced much greater gains in power: the greatest gain by a female athlete was 63.94% and the greatest gain by a male athlete was 35.56%. The least gains by female and male athletes were 18.05% and 10.96% respectively. Two athletes, one male and one female, experienced a decrease in generated power. Upon reviewing the specifics of their assessment performances, both had drastically reduced their scaling of exercises, resulting in a load and power requirement greater than their physical capacity.

Fran Average Power Generated

Figure 3



2) Fight Gone Bad

The second record workout our athletes performed was Fight Gone Bad (FGB). We calculate the average power generated by each athlete for FGB (P_{FGB}) in a similar manner to Fran, by combining the work performed for each exercise in the WOD and then dividing that sum by the total WOD time.

$$P_{FGB} = (W_{WB} + W_{Box} + W_{SDHP} + W_{PP} + W_{Row}) \div t$$

W_{WB} is the work performed in Wall Ball Shots.

W_{Box} is the work performed for Box Jumps.

W_{SDHP} is the work performed in Sumo Deadlift High Pulls.

W_{PP} is the work performed in the Push Press.

W_{Row} is the work performed in rowing.

t is time in seconds.

To calculate the work performed in Wall Ball Shots (W_{WB}), we determine the weight of the medicine ball and the portion of the athlete's bodyweight moved in the squat moved across the distance to the target.

$$W_{WB} = n_{WB} \times (W_{Squat} + W_{Throw})$$

$$W_{Squat} = (p_{Squat} \times Weight_{Athlete}) \times (Height_{Squat} - Depth_{Squat})$$

$$W_{Throw} = Weight_{WB} \times (Height_{Target} - Depth_{Squat})$$

n_{WB} is the number of Wall Ball Shot repetitions performed.

W_{Squat} is the work performed in the squat.

W_{Throw} is the work performed in the movement of the medicine ball in the throw.

p_{Squat} is the portion of the athlete's bodyweight moved in the squat.

$Weight_{Athlete}$ and $Weight_{WB}$ are the weights of the athlete and medicine ball in pounds.

$Height_{Target}$ is the height of the target in feet (prescribed as 10 feet).

The work performed in box jumps (W_{Box}) is determined by multiplying the weight of the athlete by the height of the box.

$$W_{Box} = n_{Box} \times (Weight_{Athlete} \times Height_{Box})$$

n_{Box} is the number of box jump repetitions performed by the athlete.

The work performed in executing a Sumo Deadlift High Pull (W_{SDHP}) is the sum of the work moving the bodyweight in a squat and the work moving the barbell from the floor to the high pull position.

$$W_{SDHP} = n_{SDHP} \times (W_{Squat} + W_{Pull})$$

$$W_{Pull} = Weight_{Barbell} \times (Height_{Shoulder} - Height_{Barbell})$$

n_{SDHP} is the number of Sum Deadlift High Pull repetitions performed.

$Weight_{Barbell}$ is the weight of the barbell in pounds.

$Height_{Shoulder}$ is the height of the athlete's shoulders.

$Height_{Barbell}$ is the height of the barbell while resting on the ground.

Work performed in a push press (W_{PP}) is the weight of the barbell moved through the difference between height of the overhead position and the rack or shoulder position.

$$W_{PP} = n_{PP} \times [Weight_{Barbell} \times (Height_{Overhead} = Height_{Shoulder})]$$

n_{PP} is the number of push press repetitions performed by the athlete.

$Weight_{Barbell}$ is the weight of the barbell in pounds.

$Height_{Overhead}$ is the height to the top of the athlete's shoulders.

For rowing, we already measured calories on the Concept 2 rowing machine. Because calories are already a unit of work, we merely needed to convert them to ft-lbs/s. What most people think of as a calorie is technically a kilocalorie: the amount of energy required to heat one kilogram of water one degree Celsius. The conversion factor is one kilocalorie is equal to 3088.3 ft-lbs. Because the rower displays effort as calories, but actually represents kilocalories, we can use this conversion factor to determine the work performed while rowing.

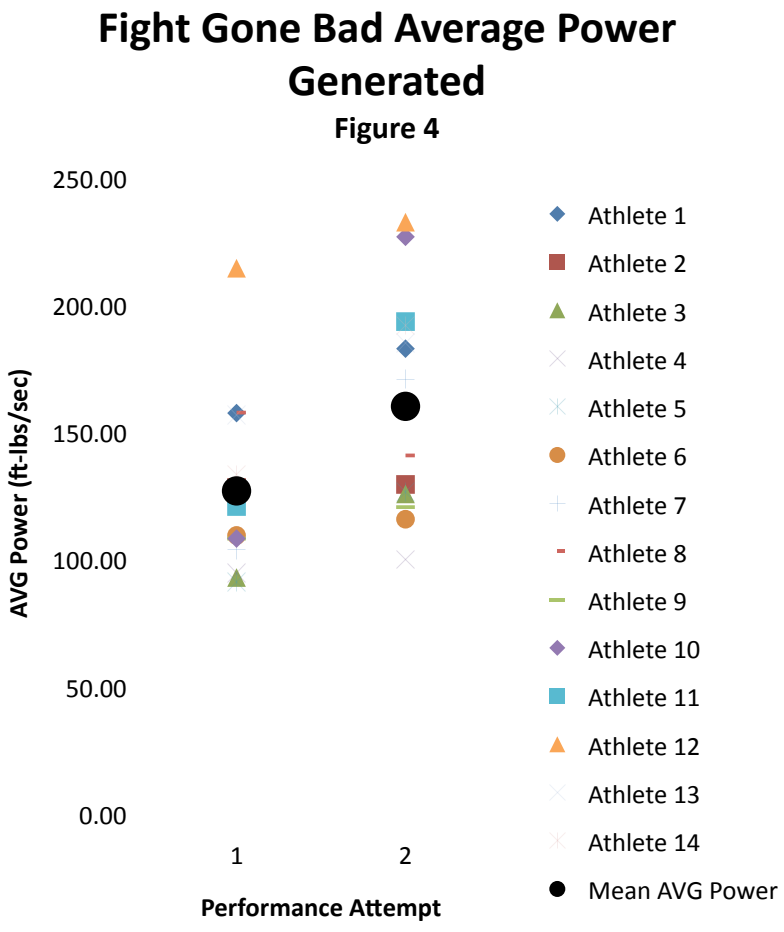
$$W_{Row} = 3.088.3 \times kCal_{Row}$$

$Kcal_{Row}$ is the number of kilocalories expended during rowing. It is displayed as *calories* on the C2 Rower display.

After calculating the work performed for each individual exercise in FGB, we can total them and divide by the total time for the WOD to determine the average power generated by an athlete for FGB.

$$P_{FGB} = [(n_{WB} \times (W_{Squat} + W_{Throw})) + (n_{Box} \times (Weight_{Athlete} \times Height_{Box})) + (n_{SDHP} \times (W_{Squat} + W_{Pull})) + (n_{PP} \times (Weight_{Barbell} \times (Height_{Overhead} = Height_{Shoulder}))) + (3.088.3 \times kCal_{Row})] \div t$$

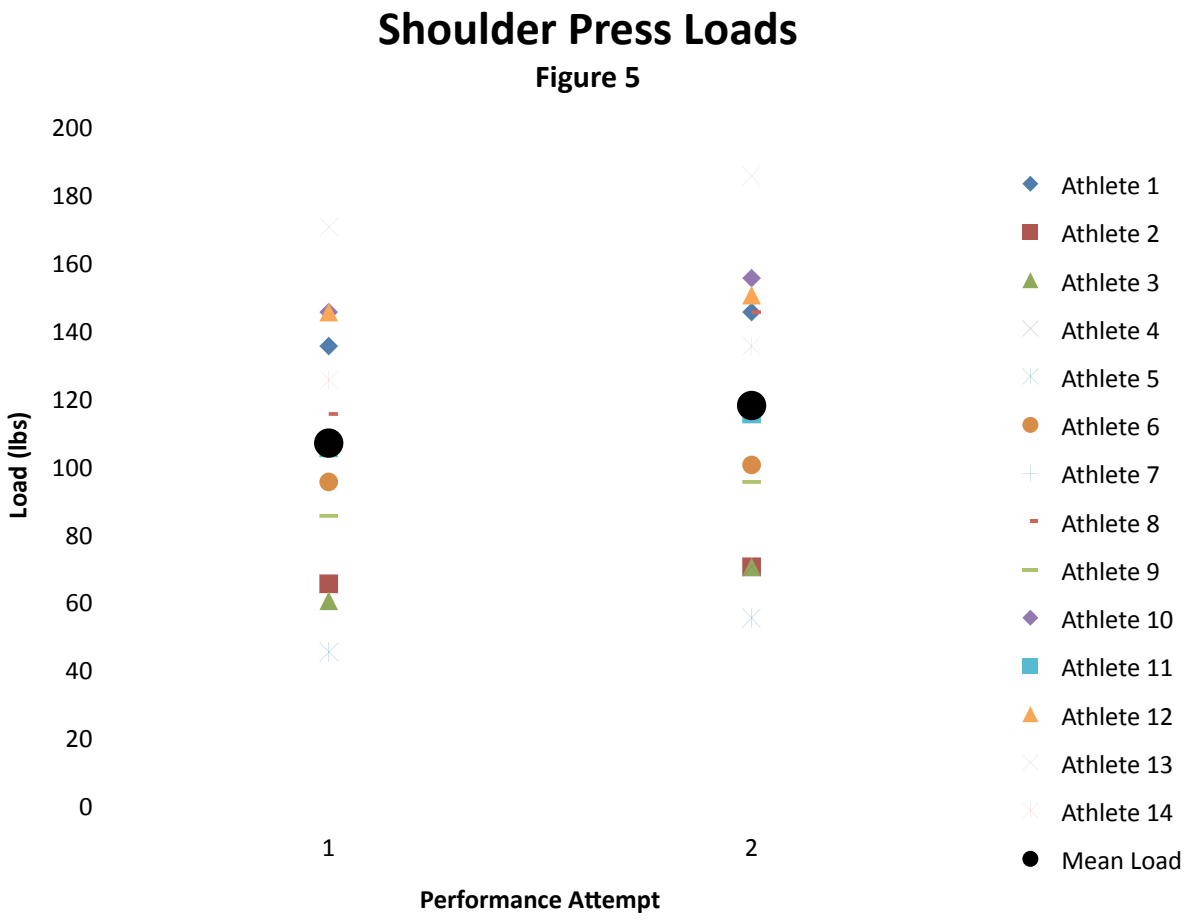
Figure 4 shows the athletes' performance of Fight Gone Bad from the pre- and post-assessment sessions. In the pre-training assessments, athletes generated between 90.84 and 214.14 ft-lbs/sec; the group mean for average power generated was 126.62 ft-lbs/sec. In the post-training assessment, athletes produced between 99.72 and 232.24 ft-lbs/sec, averaging 159.86 ft-lbs/sec for the group. This demonstrates a 20.79% increase in average power generated for the group. The highest increase for an individual male athlete was 52.37% and for an individual female athlete was 27.97%. The least increases for male and female, respectively, were 5.52% and 0.94%. One male athlete saw a decrease in average power generated, showing an 11.98% decrease. Again, this one



athlete's performance is most likely explained by an overzealous increase in load or reduction in scaling.

3) CrossFit Total

The third workout our athletes performed for assessment was the CrossFit Total, a combination of back squat, shoulder press, and deadlifts. Figure 5 shows the athletes' performance in the shoulder press event of the CrossFit Total. Athletes varied in the loads they could lift in each exercise. They lifted between 45 and 170 pounds during the pre-training assessment and between 55 and 185 pounds in the post-training assessment. The group mean loads for shoulder press were 106 pounds (pre-training assessment) and 118 pounds (post-training assessment). The mean increase in load was 9.42%. However, some athletes experience much greater gains of 18.18% (female athlete) and 20.69% (male athlete).



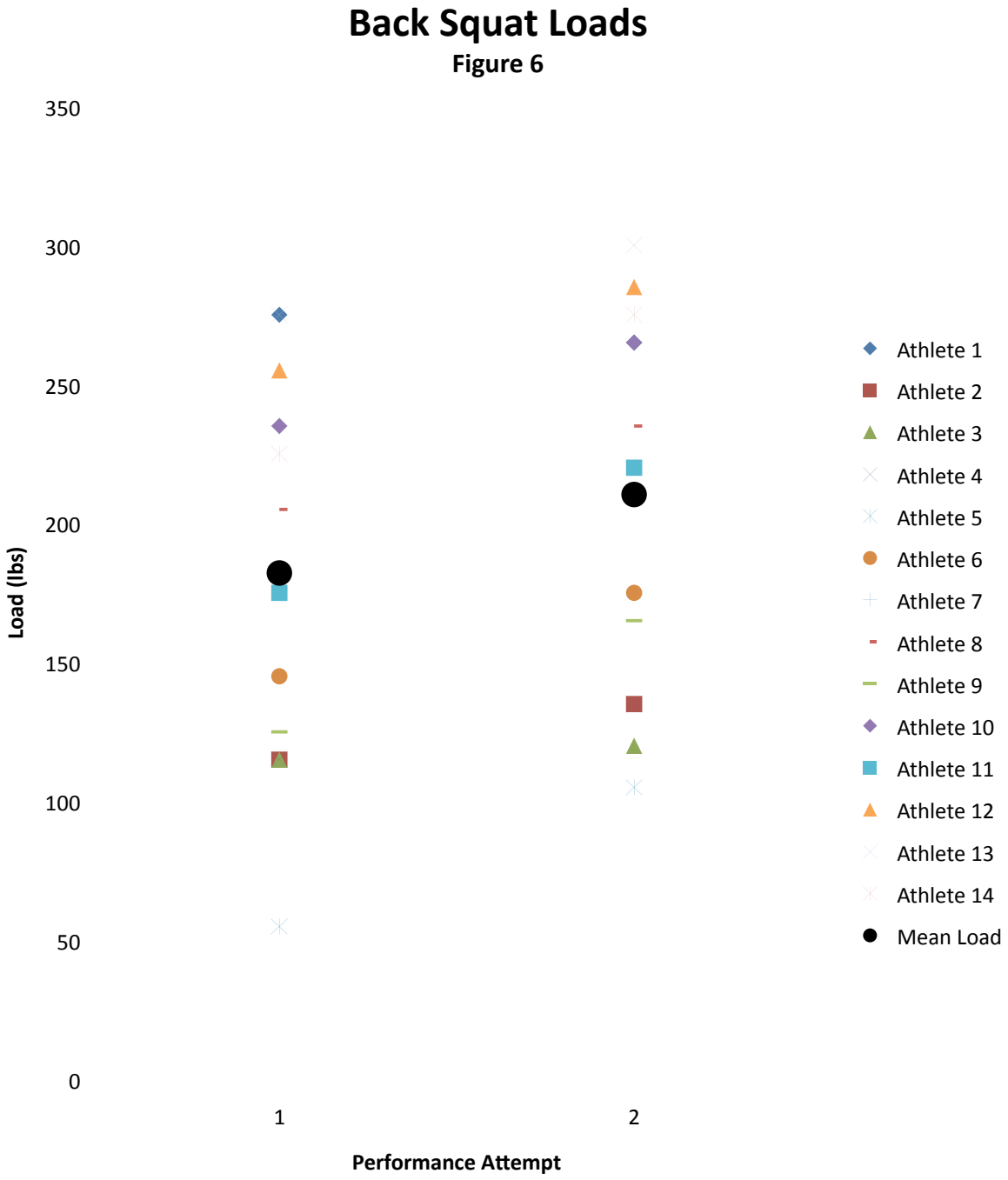


Figure 6 displays the athletes' performance in the back squat event of the CrossFit Total. Athletes lifted between 55 and 275 pounds during the pre-training assessment with a group mean of 182 pounds. During the post-training assessment, athletes lifted between 105 and 300 pounds; the group mean equaled 210 pounds. The group mean increase was 13.41%. The greatest individual increases were 47.62% (female athlete) and 20.45% (male athlete). The least individual increases were 8.33% (female athlete) and 4.17% (male athlete). One athlete saw a 3.17% decrease in back squat load.

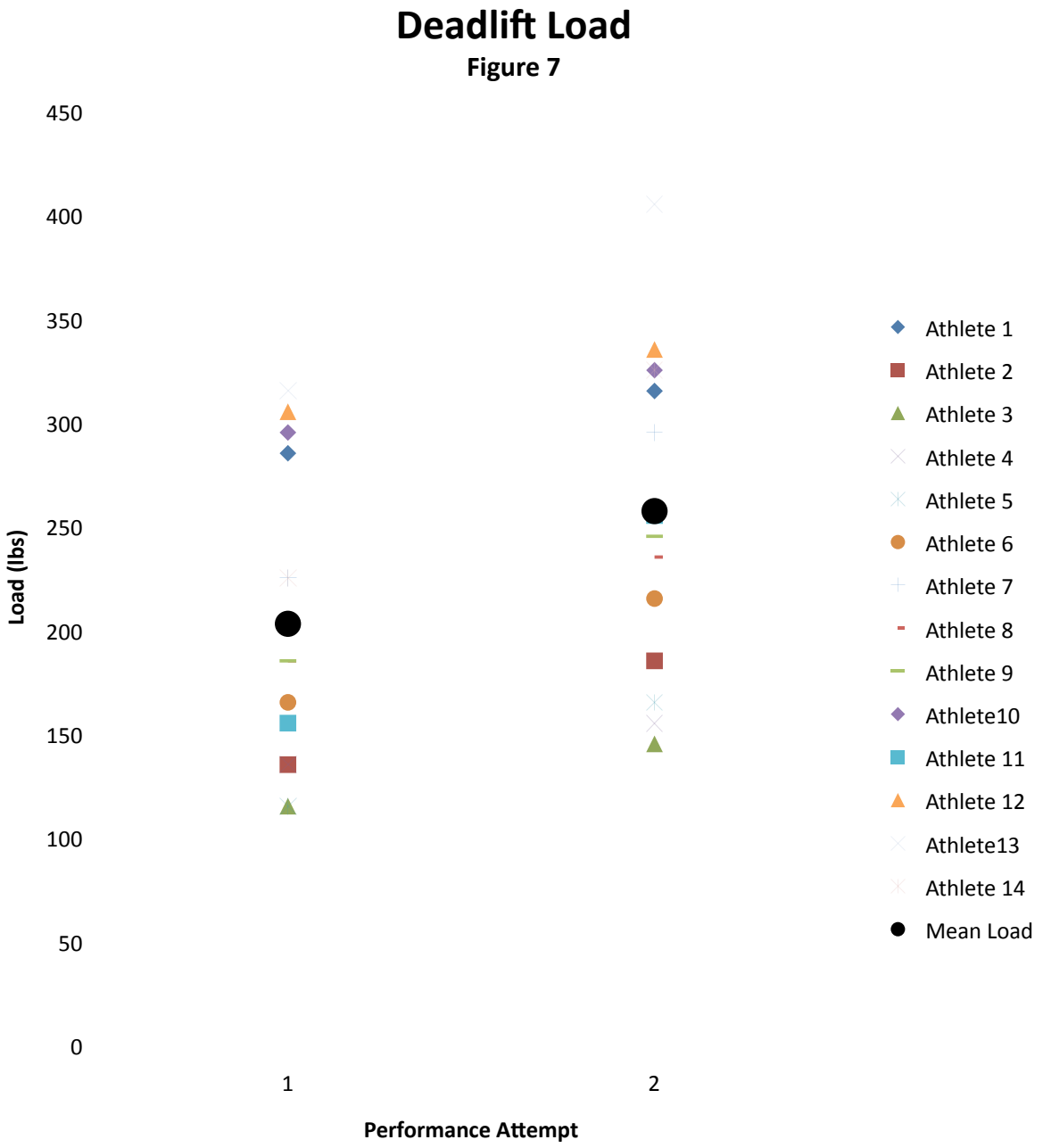


Figure 7 shows the athletes' loads lifted during the deadlift event of the CrossFit Total. Athletes lifted between 115 and 315 pounds on the initial attempts, with a group mean load of 203 pounds. Following the training period, athletes lifted between 100 and 405 pounds, averaging 257 pounds for the group. The mean increase was 21.11%. The largest individual improvements were 30.30% (female athlete) and 39.22% (male athlete). The smallest increases were 12.9% (female athlete) and 8.96% (male athlete). No athletes saw a decrease in load lifted on the deadlift.

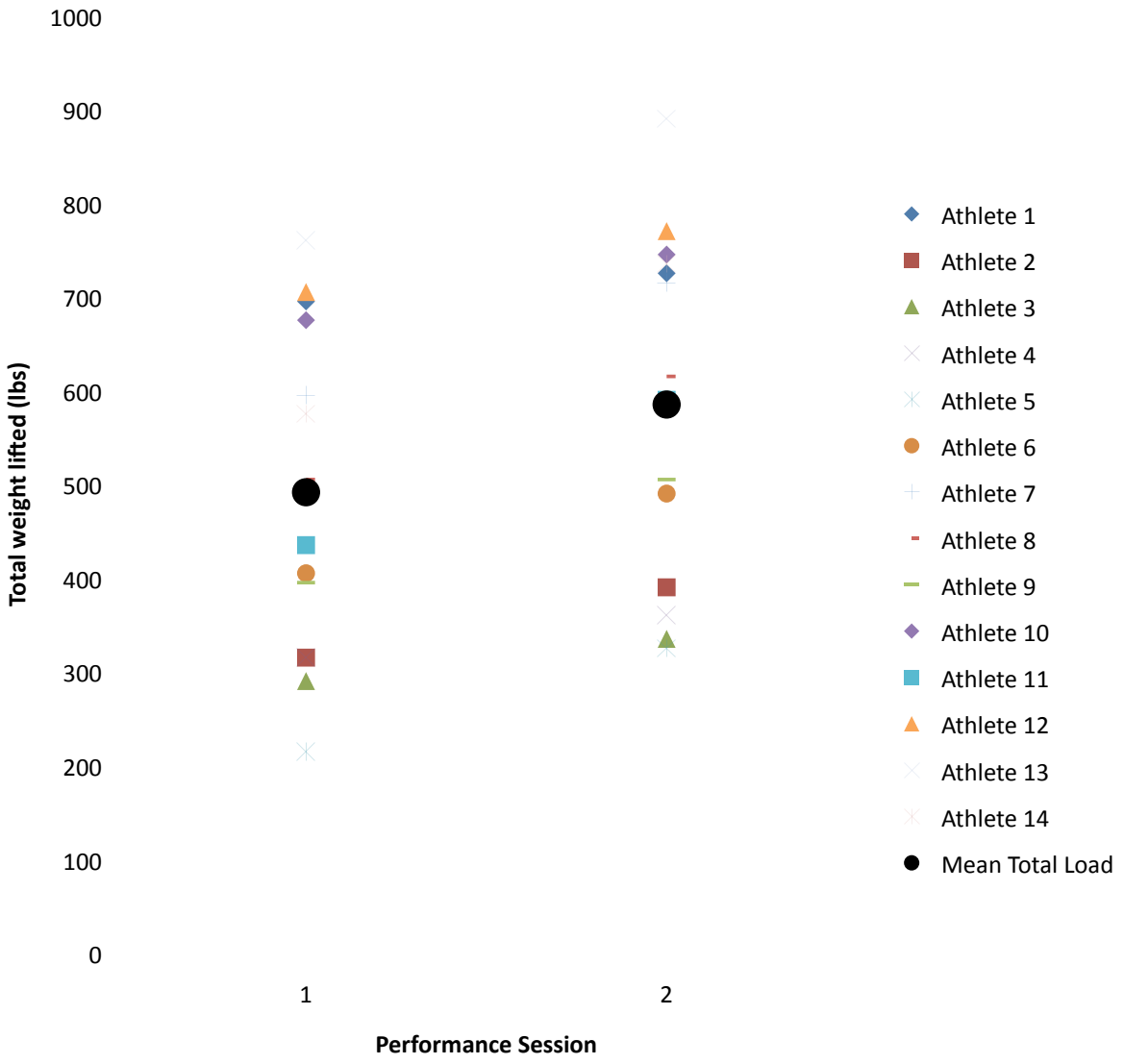
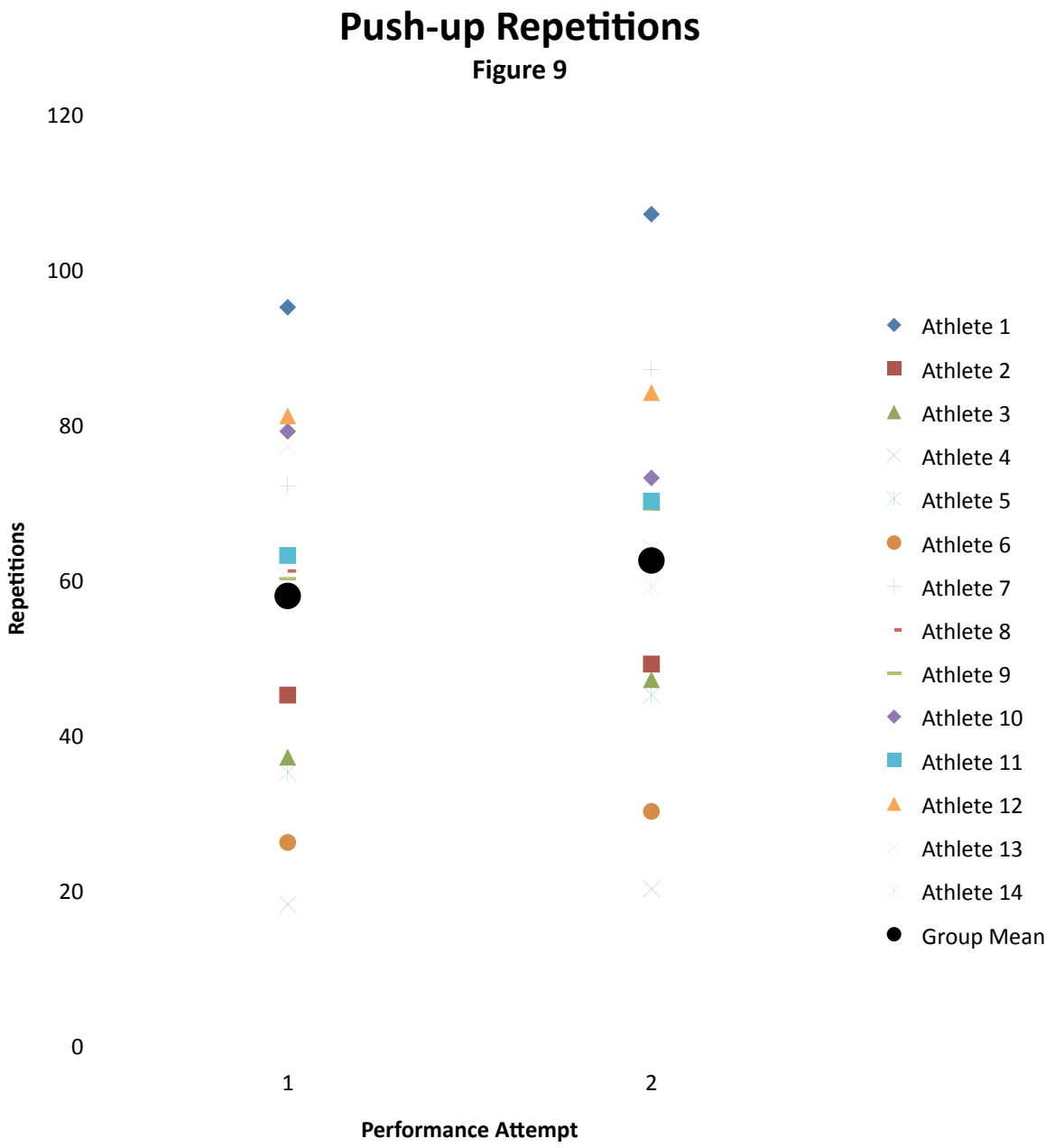


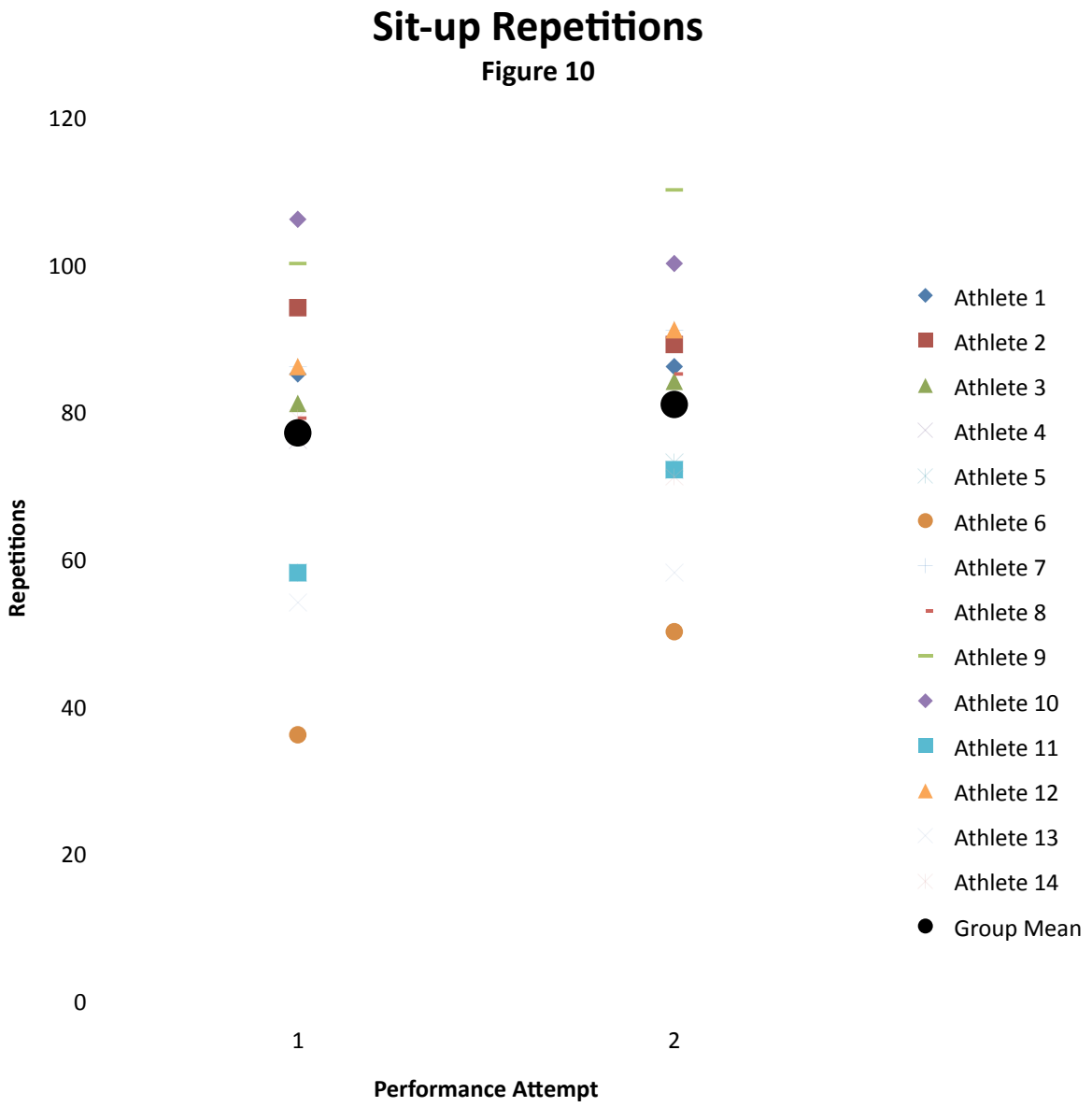
Figure 8 shows the overall increases in load lifted by the athletes in the CrossFit Total. Athletes lifted totals between 215 and 760 pounds, an average of 491 pounds, in the initial performance; they lifted between 325 and 890 pounds, averaging 585 pounds, in the final assessment. This demonstrates a mean improvement of 16.0%. The greatest individual improvement was 33.8% for a female athlete and 26.3% for a male athlete. All fourteen athletes saw a total increase in their performance on the CrossFit Total.

4) The Army Physical Fitness Test



In addition to the CrossFit assessment workouts, our athletes also performed two Army Physical Fitness Tests to provide a basis for comparison between the pre- and post-training assessments and serve as a common reference. Because we have an established standard for push-ups and sit-ups on the APFT and we provide no option for scaling them, we can compare repetitions rather than calculating average power. During the initial APFT, the athletes performed between 18 and 95 push-ups with a group mean of 57.79 repetitions. During the final APFT, athletes executed between 20 and 107 repetitions with a mean of 62.36. This represents an increase of 7.33%, or 4.57 push-ups (see Figure 9). One athlete experienced an increase of

11.21% (15 repetitions). Two male athletes experienced a decrease in total push-up repetitions during the final APFT.



During the pre-training APFT, athletes did between 36 and 106 sit-ups with a mean of 77.0. In the final APFT, they did between 50 and 110 repetitions. This shows a mean increase of 3.86 sit-ups, or 4.77% (see Figure 10). Two athletes saw significant improvement: a male athlete increased by 14 repetitions (28%) and a female athlete increase by 15 repetitions (20.55%). Several athletes experienced a decreased performance in sit-ups.

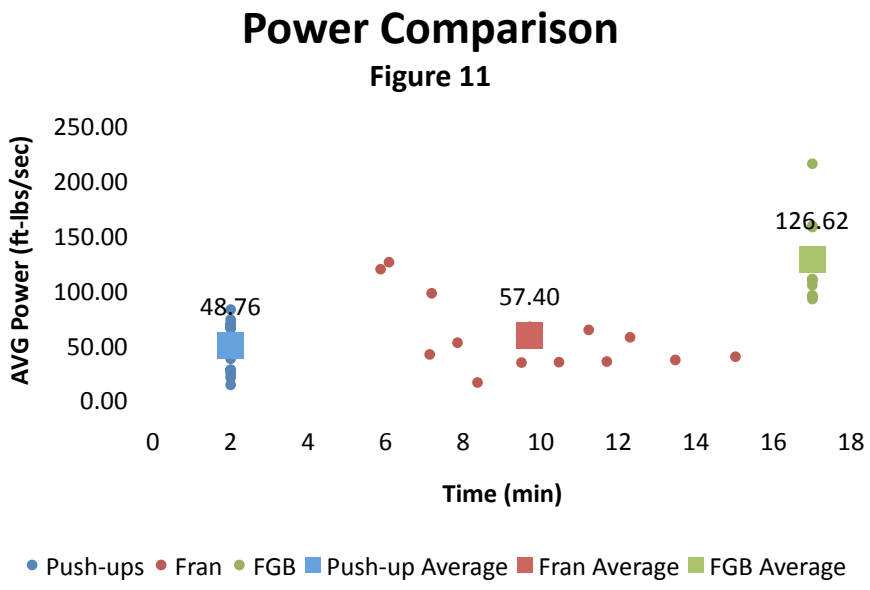
We did not include the data from the 2-mile run event of the APFT in our analysis. The primary reason for this was that the weather on the day of the final APFT was cold, icy and windy and did not offer the athletes the opportunity to perform at their peak levels. We did not feel that the conditions of the test fairly measured both the athletes and the conditioning program

in the study. The conditions on the day of the test may also partially explain some of the decreased performances by a few athletes on the push-up and sit-up events. There may be additional reasons as well, such as athlete fatigue, illness, or an "off day" – all variables for which we could not plan and could not control.

c. Comparison of Assessments

For comparison and a contextual frame of reference, consider figure 11 (Power Comparison). The chart plots time versus average power output for three standard workouts: 1) 2 minutes of standard Army push-ups; 2) Fran; and 3) Fight Gone Bad. The mean average power output for push-ups was 48.76 ft-lbs/sec and had a wide range of variance. The mean average power output for Fran was slightly higher at 57.4 ft-lbs/sec, but occurred over time ranging from approximately 6 minutes to 15 minutes. Finally, Fight Gone Bad produced a much greater amount of power (mean average power output of 126.62 ft-lbs/sec) over 17 minutes.

Depending on the athlete and the level of intensity he can maintain, 2 minutes of Army push-ups produces only slightly less power than Fran. However, athletes performing Fran maintained that power, interpreted as intensity, for a longer period of time. Furthermore, Fight Gone Bad produces greater average power outputs, and thus greater intensity, by an order of magnitude and sustains that power output across 17 minutes of work. By observing the performance of individual athletes, we can see that athletes with a higher number of push-up repetitions generally performed Fran faster and had a greater delta between their average power outputs. A similar observation can be made between push-ups and Fight Gone Bad. Conversely, athletes that performed fewer repetitions of push-ups generally produced less power on Fran and Fight Gone Bad, being unable to maintain a higher level of intensity over a greater period of time.



V. Findings:

Based on the results of the data we collected during the athletes' performance on the assessment, and our qualitative evaluations of the athletes during the six-weeks of training, we believe this study produced four important findings.

a. Each athlete in the study experienced an overall increase in his or her work capacity over the eight-week training period based on their performance during the assessments. These increases ranged from 3.71% to 41.92% with an average increase of 20.33% (see Appendix E Performance Data). Therefore, very generally, we can conclude that the CrossFit program is a successful method for increasing the level of physical fitness of U.S. Army Soldiers. That said, this initial finding comes with two important caveats. First, recognizing that some athletes' level of fitness at the beginning of the study was minimal, we acknowledge that *any* fitness program would likely achieve some increases in work capacity and fitness. Many of the athletes prior to the study were not working out four or five days a week. Therefore, simply conducting more physical training regardless of its quality would have produced positive gains in work capacity. Second, even for some of the more fit athletes in the study, the CrossFit program introduced new movements and new intensity levels. Therefore, we also acknowledge that a new stimulus is likely to cause positive adaptations in an athlete and produce increase work capacity for a period of time. These two caveats lead to the importance of our second finding.

b. Although the below average athletes in the study saw the largest gains in work capacity, even the above average athletes in the study experienced significant gains. At the beginning of the study we believed that the true test of the CrossFit program would be its ability to increase the work capacity of the average to above average athletes in the study.[27] Our hypothesis was that well-conditioned athletes would have less potential for improvement because they are closer to their genetic potential for performance. Whereas, less fit athletes with any advancement of metabolic and oxygen demand beyond their more sedentary lifestyle would provide a new stress to their body and, therefore, produce positive gains in performance.[28] Moreover, we hypothesized that some of our most fit athletes' previous fitness regimens may be more effective than the CrossFit program. Therefore, we believed that it would be possible for some of the above-average athletes to experience a decrease in work capacity. However, the results of our study indicate that above average athletes overall work capacity increased 14.38%, slightly below the group mean. One of our most fit athletes (Athlete # 10) saw a gain of 28.32% in overall work capacity. This is significant because this athlete was both in above-average physical conditioning prior to the study and came into the study with what we categorized as considerable CrossFit experience (see Appendix A, Athlete Profile). Both of these factors would indicate that the athlete had less capacity for improvement. However, because Athlete #10 experienced an increase of 28.32%, this demonstrates that considerable positive adaptations in metabolic conditioning and physical skill occurred over the six-week training period. Furthermore, none of the above average athletes saw decreases in overall work capacity. This is compared to the below average athletes who realized increases of 23.68%, with the biggest increase from Athlete #5 who showed a 41.92% improvement in work capacity.

From our perspective, these results considerably strengthen our assertion in the first finding by demonstrating the CrossFit program's ability to increase the level of physical fitness of above-average athletes who in theory would have less capacity for improvement. We believe that the CrossFit program's prescription of high intensity combined with constant variance is one of the primary reasons that the above-average athletes in the study experienced gains in work

[27] Level of fitness was measured by APFT score prior to the study using the following classifications; above average (290-300), average (250-290), below average (below 250).

[28] This hypothesis is based on a discussion of the impact of exercise on beginning athletes in Lon Kilgore, "The Paradox of Aerobic Fitness Prescription," *The CrossFit Journal* 52 (December 2006), 3.

capacity. Based on our qualitative observations, individual motivation to both maintain intensity and develop new physical skills appears to be one of the major observed differences between above-average athletes and average or below average athletes. Above average athletes appear more willing to pay a higher price for bigger gains. Therefore, our findings suggest that while many fitness programs could potentially increase the work capacity of below average athletes, the CrossFit program might be unique in its ability to create increases in work capacity in above average athletes because of its reliance on high intensity workouts and task variance.

c. Despite a broad and generalized training program that did not specifically train the athletes for any of the assessments, the athletes' performance on the assessments improved. Several examples serve to illustrate this point. The first is the results from the Deadlift portion of the CrossFit total. On this assessment, the athletes mean increase in work capacity was 21.11%. The largest individual improvements were 30.30% (female athlete) and 39.22% (male athlete). The smallest increases were 12.9% (female athlete) and 8.96% (male athlete). No athletes saw a decrease in load lifted on the deadlift (see Figure 7). Importantly, these results were achieved despite a limited number of training sessions that involved the deadlift. During the six-week training period, athletes performed the deadlift only five times out of twenty-eight training sessions.[29] Moreover, only one of those training sessions was specifically focused on strength development.[30] The results from the shoulder press and push-up assessment mirror the deadlift. On the shoulder press the athletes mean increase in work capacity was 13.41 (see Figure 5). Similar to the deadlift, only seven training sessions included any one of the three presses (shoulder press, push press, push jerk), and of those seven only one was specifically focused on strength development. Additionally, the athletes did not specifically shoulder press during the six-week training period.[31] Lastly, the athletes experienced a mean increase in push-ups of 7.75 (See Figure 9). This increase occurred despite only conducting push-ups or burpees in seven training sessions.[32]

These results are significant for two reasons. First, they provide credibility to the CrossFit program's claim that CrossFit can prepare athletes for the unknown and unknowable. While the final assessments were not unknown to the athletes, they did not prepare specifically for these events and it had been six-weeks since they had completed these same WODs. This conclusion is important because this type of physical versatility is crucial for Soldiers in combat. While we can very generally predict some of the physical requirements of Soldiers in combat (carry heavy loads, move long distance with weight, sprint, climb etc.), it is impossible to predict with any accuracy the specific physical requirements (specific load, duration, sequence) of combat because the possibilities are virtually endless. Therefore, to be successful and to survive, Soldiers must have a broad and versatile type of physical fitness. Second, these results are significant because they demonstrate that an effective physical training program does not need to train Soldiers for specific events on a physical fitness test in order to achieve successful results

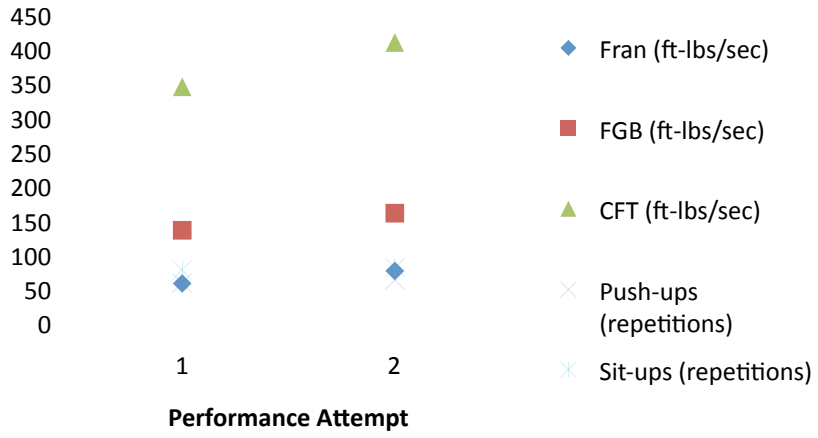
[29] Training sessions that included the deadlift were conducted on 29 October, 4 November, 11 November, 17 November and 30 November. See Appendix B (Training Plan). Strength workouts are defined as 3-6 sets of 5 repetitions or less of an Olympic or power lift.
[30] Strength workouts are defined as 3-6 sets of 5 repetitions or less of an Olympic or power lifting exercise.
[31] Training sessions that included any of the three presses occurred on 3 November, 11 November, 13 November, 23 November, 30 November, 2 December and 3 December. See Appendix B (Training Plan).
[32] Training sessions that included push-ups or burpees were conducted on 27 October, 2 November, 6 November, 10 November, 17 November, 24 November, 3 December.

on that test. For example, an effective program can improve Soldiers score on the push-up portion of the APFT without a specific push-up improvement focus, a commonplace filler on many units physical fitness calendar. This conclusion has important implications for how U.S. Army leaders approach their units' preparation for the APFT versus combat-focused fitness. The results suggest that the CrossFit program's generalized approach to fitness training can allow leaders to focus their physical training on combat readiness, but still achieve success on the APFT.[33]

d. The athletes in the study experienced relatively equal increases in power output across all four assessments. These results indicate a balanced increase in performance across metabolic pathways and modalities. Figure 12 shows a comparison of the four assessments in terms of increases in average power output. In the assessment Fran, athletes experienced a mean increase in work capacity of 24.2 %, compared to 20.9 % for Fight Gone Bad, 16.0% for the CrossFit Total and increases in repetitions of 7.7 % and 4.7% for push-ups and sit-ups.[34] As explained previously, we chose the assessments for the study based on their diversity from one another in terms of metabolic pathway and modality. Each assessment represented a different type of work capacity relative to these two criteria. For example, Fran represented a WOD in the glycolytic pathway using the gymnastic and weightlifting modalities. The CrossFit Total, on the other hand, represented a workout in the phosphagen pathway using strictly the weightlifting modality. If the assessments had produced disproportional increases

Overall Trends

Figure 12



[33] This is not to imply that U.S. Army Soldiers can in every case be successful with a generalized training program. Certain units in the Army conduct tasks that will require them to tailor they fitness program to achieve those specific tasks. Moving long distances on foot with moderate weight is a good example of this type of specialized requirement. Having the ability to move long distances on foot with weight would likely require specialized physical training in order for a unit to successfully accomplish this task in combat. This is no different than the type of specialized training required of athletes in many sports. In this case, the CrossFit program's generalized training would help to facilitate this specialized endurance training by adding a host of reinforcing physical skills like strength, stamina, endurance and flexibility.

[34] It is our assessment that the reason the increases in push-up and sit-ups were not as great as the other WODs is because all of the athletes in the study had significant experience doing push-ups and sit-ups as opposed to many of the other movements introduced in the study. This is because all of the athletes in the study were military officers who have been required to pass a physical fitness test throughout their career that included these two exercises. Therefore, these athletes had less potential for significant improvement in a short period of time in the APFT than in the other WODs.

from one another, for example an increase in power output on Fran, but a decrease on the CrossFit total, this would have signaled either an unbalanced methodology or improper programming. However, that the results demonstrate consistent improvement across assessments validates the CrossFit program's claim that it produces a broad and inclusive brand of fitness. From the perspective of the U.S. Army, this is significant because capacity across metabolic pathways and modalities characterizes the type of versatility required of U.S. Army Soldiers. Soldiers don't need to be world-class distance running athletes any more than they need to be the world's strongest man. In fact, the type of specialization required to achieve success on either of those fitness extremes could make a Soldier less combat capable. The U.S. Army requires well-balanced Soldier-athletes who can perform a variety of physical tasks at high intensity across varying time periods. The results of this study suggest that the CrossFit program's approach produces this type of Soldier-athlete.

VI. Conclusions and Recommendations:

a. The CrossFit program and other functional fitness programs present the U.S. Army with unparalleled opportunities to improve Soldiers' level of physical fitness. In this study, after only six-weeks of training using the CrossFit program, on average the athletes increased their level of physical fitness by 20%. One athlete increased her level of fitness by 41%. Moreover, the athletes in this study experienced relatively equal increases across all of the four assessments each of which required a different type of conditioning and skill set. This suggests that the CrossFit program produces the type of Soldier-athletes that the U.S. Army requires to succeed in the contemporary operating environment. That is, Soldier-athletes who can successfully perform a broad range of physical tasks and challenges, many of them unknown or unknowable.

b. Recommendations for implementing CrossFit into U.S. Army units.

We cannot over-emphasize the important role that we believe effective coaching played in the results the athletes achieved in this study. Similar to combatives training or rifle marksmanship training, CrossFit movements are only safe and effective when done correctly. The CrossFit mantra is "Mechanics, Consistency, Intensity."[35] This means that athletes should first develop the skill required to perform movements correctly and consistently before they attempt to add intensity when conducting those movements (i.e. do them with heavier weight or faster). Moreover, establishing an effective training plan is similarly important to effective results. Properly trained coaches are fundamentally important in both establishing an effective training program and developing proper movement mechanics in athletes. All of the trainers in this study were either Level I or Level II certified CrossFit trainers, meaning that they had received at least 16 hours of instruction on CrossFit movements. Additionally all of the trainers had considerable CrossFit experience in excess of two years.

Based on our experience in the study, for the U.S. Army to safely and effectively harness the power of functional fitness training it needs to relook how it trains small unit physical fitness trainers, like squad/section leaders, and how it implements functional fitness programs into tactical units. Across the U.S. Army, junior Non-Commissioned Officers (NCOs) and officers

[35] Authors' notes from the CrossFit Level I Certification held at West Point, NY in April 2009.

are expected to effectively conduct physical fitness training. Many times the only training these junior leaders have received to prepare them for this task is what they learned from their squad leader when they were a Private and what they learned in one of the NCO Academies, if they have had time to attend one of these schools. Similar to U.S. Army Combatives training, effective functional fitness training requires a high level of expertise from trainers. This signals a change from the past when physical training, relatively speaking, was low skill. However, unlike the U.S. Army Combatives program, the U.S. Army does not currently have a method for training physical fitness trainers and giving them the skills required to train and coach Soldiers using functional movements.[36] To fill this gap in expertise, the U.S. Army should establish a formal functional fitness trainer program similar to the Combatives program. In the meantime, we have outlined below how we believe tactical units can effectively implement a functional fitness training program into their physical training plan.

The following section describes a way to implement a functional fitness regimen as the primary physical fitness training program in a military unit. We make two major assumptions in outlining this plan for change. The first and most important is that the unit commander supports the ideas contained in the plan and is willing to commit time, personnel, and funds to achieve the transition to a functional fitness program. We hope that the data presented in this paper accompanied by personal observations and anecdotal evidence will be a start in convincing commanders of the need and advantages of this method. The second assumption is that this plan is designed to implement at the battalion level for a unit consisting of between 500 and 750 Soldiers. The principles described should be valid for a unit of any size, but may require some modification in numbers of trainers, quantity of equipment, etc., to be viable for a smaller or larger unit.

Implementation of a functional fitness program as a unit training program should be done in three phases: 1) Training a cadre of trainers and acquiring the necessary equipment; 2) building credibility through a test population; and 3) full implementation across the battalion. It is important to phase the implementation for several reasons. Units will need the time to nominate and train trainers; trainers will need time to practice and refine their training techniques. Additionally, this will give time for leaders in the unit to see, evaluate, and become accustomed to the idea of functional fitness.

During the first phase of implementation, units will select and train the primary physical training cadre and begin to assemble equipment sets necessary for functional fitness training. Trainers should be leaders within the battalion who are respected by the Soldiers in their unit. It is not necessary for the trainers to have previous experience in functional fitness programs such as of CrossFit, so long as they are generally physically fit. Initially, the battalion should have approximately one or two trainers per company, or about one trainer per fifty to seventy-five Soldiers, and one to two senior trainers at the battalion level to oversee the program. Ideally, these trainers should be serving squad leaders, platoon sergeants, and platoon leaders with the battalion goal being to train and certify all leaders at these levels through a CrossFit Level I Trainer certification. This would give them the requisite skills for teaching and training the functional movements as well as a basic understanding of nutrition, workout development, and programming. Ideally, the senior trainers would attend both a Level I certification and the

[36] For a description of the Army Combatives trainer certification program see, Department of the Army, FM 3-25.150, *Combatives* (Washington, DC.: Government Printing Office, April 2009).

CrossFit Coaches' Preparation course to educate them in techniques for managing the overall unit program.

Following the cadre's initial certification training, the senior trainers should conduct a dedicated program with only other trainers during normal unit PT hours for a period of 30 days. During this time, trainers will refine their teaching and training techniques, be given the opportunity to program workouts for a period of time for the trainer group, and further enhance their understanding of physical fitness. Each trainer would, depending on the size of the unit, be responsible for programming for the cadre and several days during which they would supervise and coach during the workout. The trainers and the battalion leadership must understand that there is an up-front investment of time and effort in this transition. It will take time for the trainers, and ultimately the Soldiers, to learn, become proficient, and master some of the movements and skills in the functional fitness program. Additionally, trainers will have to develop and improve their training style throughout this 30-day period and beyond in to the subsequent phases of the transition. One of the major points we identified in our study was that trainers had to make a significant investment of time and effort to train their athletes in the skills prior to seeing physical improvements – the more complex the movement and the poorer the condition of the athlete only extended this time. During Phase I, trainers should focus on building the skill sets -- both training the movements and executing the movements themselves -- before advancing to high intensity performance in workouts. Once the movements and teaching techniques are established, the improvements in physical performance will come.

Concurrently with the training and preparation for the cadre, the battalion must gather the necessary equipment sets to conduct functional fitness training. Units should purchase enough equipment for each company to have its own set. For an example of a company functional fitness equipment set see Appendix F (Sample Company Equipment Set). These sets should consist of Olympic barbells, "bumper" weights, kettlebells or dumbbells, squat racks and benches, medicine balls, and resistance bands (to assist in pull-ups). Companies should also own or have convenient access to pull-up bars and may purchase rings for use with their training programs. It is not necessary, however, for a unit to purchase all gym-quality equipment; units can use some of the equipment around them in lieu of dedicated weights and bars. For an example of how to make functional fitness equipment from military items, see Appendix G (Austere Company Equipment Set). For example, ammunition cans can be filled with dirt or sand and used for presses, lifts, and swings. Old basketballs or soccer balls can also be filled with sand and sealed, then used in throwing exercises in place of medicine balls. Truck tires can be used for lifting and "jerry" cans could be filled with water and lifted or carried. Using equipment and supplies that are at hand is especially useful in that these items are readily available while units are deployed or conducting field training, allowing a unit to easily maintain a high level of fitness while away from a garrison environment.

Key to the first phase is the management of programming and equipment. The senior trainers must be able to deconflict the training area used, as well as the equipment required for workouts. Furthermore, the trainers will gain an understanding of what equipment is available for use during physical training and how often they will be able to use specific equipment in training their companies. By developing and testing systems early in the process, senior trainers and unit leaders will make the transition run smoother and ensure that all companies and Soldiers get maximum benefit out of the training.

At the conclusion of the initial 30 days of cadre training, the battalion will transition into the second phase: building credibility through training a test population. This test population could be a single company or platoon out of the battalion on which the trainers focus their efforts. Another option would be to form two groups from across the battalion, one of physically weak Soldiers or APFT failures and one of physically strong Soldiers. The training cadre would assess, develop a program, and execute functional fitness training for 45 days with the test populations, carefully documenting performance and any progress. At the conclusion of the 45-day period, the test group would perform an APFT as well as another benchmark workout for the leadership of the battalion. As the leaders and Soldiers see the improvement of the fitness of the test group, their confidence in the new training program will increase, overcoming resistance to change.

The second phase is also the next step in the development and training of the training cadre. During the first phase, they practiced training Soldiers that had the same training and education; during the second phase, they would train Soldiers that had little or no experience in the movements, techniques, and philosophy of functional fitness, essentially starting from scratch with their Soldier-athletes. This would assist them in further developing and refining their training and teaching techniques. It would also require them to actively tailor and scale workouts based on the abilities of the training audience, whether on a group or individual basis. The increase in experience and training ability of the cadre will prepare them for the third phase, full implementation across the battalion.

In phase three, the training cadre would return to their companies and begin a transition similar to phase one, but at the company level. Trainers would teach fundamental movements and techniques to squad leaders, platoon sergeant, and platoon leaders and lead training sessions. Each company would designate a lead trainer for coordinating and managing equipment at the company level, advising the commander and other trainers on programming, and conducting quality control of the training program. Trainers should attend the Coaches' Preparation course or one of many specialty certifications to continue learning and building their knowledge base. Companies would send additional squad- and platoon-level leaders to attend Level 1 certifications. As additional trainers are certified, companies would integrate them into the training and programming efforts. The goal of the battalion and company would be to train and certify all squad leaders, platoon sergeants, and platoon leaders as functional fitness trainers; all squad leaders should be trained, certified, and capable of planning, programming, leading, and executing a functional fitness training program with their own Soldiers.

Battalions and other military units can take advantage of the techniques of functional fitness and implement them as the primary physical training regimen in the unit. Units begin by training cadre and acquiring equipment, then build credibility through training a test population and publicizing the results, and then finally proceed to full implementation throughout the battalion. As described above, the entire transition process should take around six months to complete. Leaders can accelerate the process by applying more resources of training time, leader attention, a greater number of initial trainers, and funds for certification and equipment purchase. Throughout the transition process, leaders and trainers work to overcome resistance to change by showing empirical and anecdotal results to convince Soldiers of benefits of a functional fitness program in building unit physical readiness.

c. Recommendations for further research

1) There are several areas in which more research would benefit our understanding of how a functional fitness regimen improves physical fitness. The first would be to expand the study in terms of length of the training period and the number of athletes. Allowing for a training period of six months, athletes could learn and practice the requisite skills for the movements and participate in multiple assessment periods, possibly every sixty days. This would provide those conducting the study a more accurate picture of the athletes' performance and improvement throughout the study, so that an "off" day during the assessment would only be one of many assessments and not invalidate any findings. As an example from our study, we conducted the post-training period assessment during the second week of December. On the day athletes performed the Army Physical Fitness Test, the temperature was approximately thirty degrees Fahrenheit and a twenty-mile-per-hour wind was blowing along the 2-mile run course. Wind and ice had a significant impact on the 2-mile run times for all athletes, resulting in slower run times. Because we only conducted two assessments periods, these slower times represented 50% of our APFT data and may give the impression that cardiovascular endurance (one of the ten physical skills) decreased during the functional fitness training. Multiple testing periods throughout a longer assessment would eliminate this data point as an outlier. With the data and training period that we had, we were unable to accurately assess increases in cardiovascular endurance in terms of the APFT because of the anomalous run times in 50% of the APFT scores.

Additionally, a longer training period would allow for a greater amount of time to build the physical skills in the athletes at the beginning of the study and then allow them to more effectively increase their intensity as the study progressed. For example, some of our athletes struggled to learn the proper technique for the clean after several weeks of training. As a result, any workout that involved cleans was a challenge for these athletes in terms of their ability to maintain intensity. Therefore, over a six-week period it is difficult to ascertain the true impact of the CrossFit program on metabolic conditioning because the low skill level of some athletes never allowed them to increase their intensity level to a point that would have produced positive adaptations in how their body used energy. Instead, they had to remain focused on movement mechanics.

A larger sample size and a control group would also increase the validity of our study. We made the conscious decision to forego a control group in this study because of the pool from which we chose our athletes. Drawing from students at the Command and General Staff College, where no organized physical training occurs and students conduct physical training individually, it was not feasible to form a control group with which to compare the functional fitness regimen. In an operational Army unit, we could simply remedy this by assigning a platoon or company as control group and have them continue with their standard physical training plan. Both a larger sample size and the addition of a control group would generate more data and a greater understanding of the impacts of a functional fitness program.

2) The second major recommendation for further research would be to study the impact of nutrition and diet control on the performance of the athletes. Athletes in the test group would be given instruction in basic nutrition and asked to record what they ate. The control group would merely record types and quantities of foods consumed during the study. The test group would

eat according to a programmed diet, possibly following the Zone Diet or the Paleo Diet[37]. During the assessment periods, both groups would be evaluated on changes in body composition, cholesterol level, and other chemical indicators in the body.

Conducting additional studies including the above considerations and adjustments to the planned program would greatly increase the quantity of data collected and contribute to a better understanding of the impact of a functional fitness program and the role nutrition and diet play in improved performance.

[37] For the Zone Diet, see Barry Sears, *The Zone: A Dietary Road Map* (New York, NY: Regan Books, 1995). For the Paleo Diet, see Loren Cordain and Joe Friel, *The Paleo Diet For Athletes* (Hoboken, NJ: John Wiley & Sons, 2005).

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Appendix A (Athlete Profiles)

	Sex	**Height (ft)**	**Weight (lbs)**	**APFT (or equiv)**	**CF Experience**
Athlete 1	M	5.66	165	300	Considerable
Athlete 2	F	5.33	136	300	None
Athlete 3	F	5.5	140	270	Some
Athlete 4	F	5.66	153	260	None
Athlete 5	F	5.16	132	247	None
Athlete 6	M	6	205	76.75 (AF)	None
Athlete 7	M	5.75	192	270	Some
Athlete 8	M	6.16	217	264	Some
Athlete 9	F	5.41	138	300	Some
Athlete 10	M	5.83	183	300	Considerable
Athlete 11	M	5.75	184	206	None
Athlete 12	M	6.33	195	297	Moderate
Athlete 13	M	5.83	184	300 (USMC)	Moderate
Athlete 14	M	6	220	220	None

Appendix B (Training Schedule)

CrossFit Study Training Calendar

25	26	27	28	29	30	31
	3 RFT 185 lbs Power Cleans x 5 Hand Stand PU x 5 Pull-Ups x 10	Tabata Something Else 20 sec of work / 10 sec rest Pull-ups push-ups sit-ups squats	4 Rounds 800m run rest exactly 2 min between sets	Diane 21-15-9 225lbs deadlift Hand Stand Push-Ups	20 min AMRAP Box jump x 5 (55/35) Kettlebell Swing x 10 Wallball x 15 Increase each exercise by one rep each round	
1	2	3	4	5	6	7
	100 burpees for time	The Bear Complex 5 rounds of 7 complexes 1 complex = Power Clean Front Squat Push press Back Squat Push Press	Deadlift 5-5-5-5-5 then... 3 RFT 10 pull-ups 10 GHD 10 KBS (55/35)	12 min AMRAP Medball cleans x 7 Burpees x 7 50 m sprint Do this WOD in the basketball court. Sprint = down and back on the court	JT 21-15-9 Handstand Push-ups Ring Dips Push-ups	
8	9	10	11	12	13	14
	The Crippler For time - (BW) back squat x 30 Run 1 mile	Barbara 5 RFT 20 pull-ups 30 push-ups 40 sit-ups 50 squats	Hero WOD DT 5 RFT (155lbs) Deadlift x 12 (155lbs) Hang P Clean x 9 (155lbs) Push jerk x 6	Front Squat 5-3-3-2-2-2-1-1-1-1	Triple Decker 8 min AMRAP Burpee broad jump x 10 Walking lunge x 15 Sprint 50 m rest exactly 2 min 8 min AMRAP Knees to elbows x 10 (35lbs) kettlebell swings x 15 (45lbs) Thruster x 20 rest exactly 2 min 8 min AMRAP Pull-ups x 10 box jump x 15 (20lbs) wallball x 20	
15	16	17	18	19	20	21
	Nastly Girls 3 RFT 50 squats 7 muscle ups 10 Hang P Cleans (135lbs)	3 RFT 10 Deadlift (275lbs) 10 burpees	12 x 25m sprints start each sprint every 20 seconds then... practice a gymnastics skill	15 rounds 2 x Front Squat (80% 1rm) 5 x pull-ups start each round on the minute	Full Mission Profile (will provide details at later date)	
22	23	24	25	26	27	28
	Shoulder Press 1-1-1-1-1 Push Press 3-3-3-3-3 Push Jerk 5-5-5-5-5	12 min AMRAP 3 x P Clean (185lbs) 1 x Cindy (5 PU/10 Push/15 Squat)	Annie 50-40-30-20-10 Double Unders sit-ups	Happy Thanksgiving	Run 5k	
29	30	1	2	3	4	5
	10 min AMRAP 15 x BW deadlift 9 x Pull-ups 21 x push press (75lbs)	5RFT 21 x SDHP (95/65) 21 x ring dips	Clean and Jerk 1-1-1-1-1-1-1-1	3 RFT 250m Row 5 x thrusters (135lbs) 10 Burpees	Chipper (TBD)	

CrossFit Study Training Plan (26-30 OCT)

26 OCT	27 OCT	28 OCT	29 OCT	30 OCT
Warm-Up: 3rds Squats Push-ups Sit-ups Back Extension Stretch **WOD:** "Fran" 21-15-9 Thrusters (95/35) Pull-ups Scaling Pull-ups 1) Bands 2) Jumping **Cool Down:** Stretching	**Warm-Up:** 2 rds 50 x Jump Rope / Row Stretch **Skill/Drill:** 1) Hand-stand Push-ups Introduce/Practice Scale 1) Band harness 2) Handstand hold 3) Feet on elevated bar 4) Feet on 24inch box, pike position **WOD:** "Tabata Something Else" 20sec work/10sec rest Pull-ups Push-ups Sit-ups Squats Scaling Pull-ups 1) Bands 2) Jumping **Cool Down:** Stretching	**Warm-Up:** 3rds Push-ups Sit-ups Squats Run (slow) x 400m **WOD (at the track):** 4 rounds for time 800m run Rest 2 mins between rds **Cool Down:** Stretching	**Warm-Up:** 3rds Squats Push-ups Sit-ups Pull-ups Back Extension Stretch **Skill/Drill:** 1) Kettle Bell Swing Introduce/practice **WOD:** "Diane" 21-15-9 Deadlift Handstand Push-ups Scale for HSPUs 1) Band harness 2) Handstand hold 3) Feet on elevated bar 4) Feet on 24inch box, pike position **Cool Down:** Stretching	**Warm-Up:** 3rds Squats Push-ups Sit-ups Pull-ups Back Extension Stretch **WOD:** 20 min AMRAP Box jump (24/20) x 5 KBS (55/35) x 10 Wallball (20/14) x 15 **Cool Down:** Stretching

CrossFit Study Training Plan (2 – 6 NOV OCT)

02 NOV	03 NOV	04 NOV	05 NOV	06 NOV
Warm-Up: 3rds Squats Sit-ups Back Extension HSPU Stretch **Skill/Drill:** 1) Medball clean 2) Burgener clean warm-up 3) Barbell Clean **WOD:** 100 x Burpees for time **Cool Down:** Stretching	**Warm-Up:** 3rds Squats Push-up Sit-ups Back Extension HSPU Stretch **Skill/Drill:** GHD sit-up **WOD:** The "Bear" Complex 5 rds of 7 complexes 1 complex = Power Clean Front Squat Push Press Back Squat Push Press Rules – 1) During the round the weight cannot remain on the Floor (touch and go) 2) Rest as needed between Rounds 3) Attempt to increase weight on each round **Cool Down:** Stretching	**Warm-Up:** 3rds Row 1 min or Jump rope Burgener Warm-Up Push-ups Squats HSPUs stretch **WOD (at the track):** 1) Deadlift: 5-5-5-5-5 2) 3 RFT 10 pull-ups 10 GHD 10 KBS (55/35) **Cool Down:** Stretching	**Warm-Up:** 3rds Squats Push-ups Sit-ups Pull-ups Back Extension Stretch **Skill/Drill:** Push Jerk **WOD:** (recommend using the b-ball court) 12 min AMPRAP 7 x medball cleans (20/14) 7 x burpess 50m run (down and back on the basketball court is approx 50m) **Cool Down:** Stretching	**Warm-Up:** 3rds Squats GHD sit-ups Pull-ups Burgener Warm-Up Stretch **Skill/Drill:** Double Unders **WOD:** "JT" 21-15-9 HSPU Ring Dips Push-Ups **Cool Down:** Stretching

CrossFit Study Training Plan (9 – 13 NOV OCT)

09 NOV	10 NOV	11 NOV	12 NOV	13 NOV
Warm-Up: 3rds Double Unders Squats Sit-ups Push-ups Back Extension HSPU Stretch **WOD:** "The Crippler" For Time: 30 x (BW) Back Squat Run 1 mile **Skill/Drill:** 1) Knees to Elbows Beginner = just practice Intermediate = 5-5-5-5-5 Advanced = 15-12-9-6-3 2) L-sit (paraletes) **Cool Down:** Stretching	**Warm-Up:** 3rds Bergner Warm-Up Squats Push-up Sit-ups Back Ext HSPU Stretch **Skill/Drill:** Hang P Clean Review - Push Jerk **WOD:** Hero WOD for Veteran's Day "DT" 5RFT Deadlift x 12 (155) Hang p Clean x 9 (155) O/H Anyway x 6 (155) **Cool Down:** Stretching	**No scheduled Sessions!!!** **WOD:** "Barbara" 20 Pull-ups 30 Push-ups 40 Sit-ups 50 Squats **Cool Down:** Stretching	**Warm-Up:** 3rds Squats Push-ups Sit-ups Back Extension HSPUs Stretch **WOD:** Front Squat 5-3-3-2-2-2-1-1-1-1 **Skill/Drill:** Muscle Up 1) Show Muscle Up progression 2) Practice or work component parts based on skill level (pull-ups and ring dips) **Cool Down:** Stretching	**Warm-Up:** 50 jump rope or 1 min row 3 rds Squat Push-up Sit-up **WOD:** "Triple Decker" 8min AMRAP Burpee broad Jump x 10meters Walking lunge x 15 Double Unders x 20 Rest Exactly 3 minutes 8min AMRAP Knees to Elbows x 10 KBS (55/35) x 15 Thrusters (45/25) x 20 Rest Exactly 3 minutes 8min AMRAP Pull-ups x 10 Box Jump x 15 Wallball (20/14) x 20 **Cool Down:** Stretching

CrossFit Study Training Plan (16-20 NOV OCT)

16 NOV	17 NOV	18 NOV	19 NOV	20 NOV
Warm-Up: 50 Jump ropes or DUs Then… 3rds Squats Sit-ups Push-ups Back Extension HSPU Stretch **WOD:** "Nasty Girls" 3 rds For Time: 50 squats 7 muscle ups 10 hang p cleans (135/95) (Sub for MU is 3 pull-up and 3 dips) **Skill/Drill:** O/H Squat Instruction and Practice Beg = just practice Int /Adv= 5-5-5-5-5 (not five rep max / choose a weight and stick with it for all sets) **Cool Down:** Stretching	**Warm-Up:** 3rds Squats Push-up Pull-ups Sit-ups Back Ext HSPU Stretch **WOD:** 3 rds For Time 10 deadlift (275) 10 burpees **Skill/Drill:** Snatch Instruction and Practice Beg = just practice Int /Adv= 5-5-5-5-5 (not five rep max / choose a weight and stick with it for all sets) **Cool Down:** Stretching	**CF 101 1330-1730 (no afternoon training session)!!!** **Warm-Up:** 3rds Squats Push-up Pull-ups Sit-ups Back Ext HSPU Stretch **WOD:** 12 x 25m sprints (start each sprint every 20 seconds until complete **Skill/Drill:** Practice a gymnastic skill Handstand / HSPU Rings Muscle up L-Sit **Cool Down:** Stretching	**Harney Gym closed 0730-1700!!!** **Warm-Up:** 3rds Squats Push-ups Sit-ups Back Extension HSPUs Stretch **WOD:** **Morning Session (Harney)** – 15 rds 2 x Front Squat 5 pull-ups Start each round on the minute **Afternoon Session (Gruber)**- 100 pull-ups ***Each time you drop/or come off the bar 10 push-ups 25 squats 50m run (b-ball court) **Cool Down:** Stretching	**Harney Gym closed 0730-1700!!!!** **Meet at Track** **Warm-Up:** Run 400m 30 squats stretch **WOD:** 4 rds For Time: 800m run 25 push-ups 25 sit-ups **Cool Down:** Stretching

CrossFit Study Training Plan (23-27 NOV)

23 NOV	24 NOV	25 NOV	26 NOV	27 NOV
Warm-Up: 3rds Squats Sit-ups Push-ups Back Extension HSPU Stretch **WOD:** Shoulder Press 1-1-1-1-1 Push Press 3-3-3-3-3 Push Jerk 5-5-5-5-5 **Skill/Drill:** K2E or A2B 20-15-10-5 Or L-St (reverse tabata) **Cool Down:** Stretching	**Warm-Up:** 3rds Squats Push-up Pull-ups Sit-ups Back Ext HSPU Stretch **Strength:** Back Squat 40% 1rm 1 x 5 50% 1rm 1 x 5 60% 1rm 1 x 5 75% 1rm 1 x 5 80% 1rm 1 x 5 85% 1rm 1 x 5 **WOD:** 12 min AMRAP 3x P Clean (185) 5 pull-ups 10 push-ups 15 squats **Cool Down:** Stretching	**Warm-Up:** 3rds Squats Push-up Pull-ups Sit-ups Back Ext HSPU Stretch **WOD:** Annie 50-40-30-20-10 Double Unders Sit-ups **Skill/Drill:** Muscle Ups **Cool Down:** Stretching	**Thanksgiving**	**Run 5k**

CrossFit Study Training Plan (30 NOV– 4 DEC)

30 NOV	1 DEC	2 DEC	3 DEC	4 DEC
Warm-Up: 3rds Squats Sit-ups Push-ups Back Extension HSPU Stretch **Strength:** Overhead Squat 40% 1rm 1x 5 50% 1rm 1x 5 60% 1rm 1x 3 75% 1rm 1x 5 80% 1rm 1x 5 85% 1rm 1x 5 **WOD:** 10 min AMRAP 15 x Deadlift (BW) 9 x Pull-ups 21 x Push Press (75/45) **Cool Down:** Stretching	**Warm-Up:** 3rds Squats Push-up Pull-ups Sit-ups Back Ext HSPU Stretch **Skill/Drill:** Review SDHP **WOD:** 5RFT 21 x SDHP (95/65) 21 x Ring Dips **Cool Down:** Stretching	**Warm-Up:** 3rds Squats Push-up Pull-ups Sit-ups Back Ext HSPU Stretch **Skill/Drill:** Review Clean and Push Jerk **WOD:** Clean and Jerk 1-1-1-1-1-1-1-1 **Cool Down:** Stretching	**Warm-Up:** 3rds Squats Push-up Pull-ups Sit-ups Back Ext HSPU Stretch **Strength:** Deadlift 40% 1rm 1x 5 50% 1rm 1x 5 60% 1rm 1x 3 75% 1rm 1x 5 80% 1rm 1x 5 85% 1rm 1x 5 **WOD:** 3RFT 250m row 5 x thrusters (135/95) 10 burpees **Cool Down:** Stretching	**Full Mission Profile** "Up in Smoke" Insertion – Swim 500m Run 1 mile Contact – 3rds 10 burpees 10 pull-ups Action on OBJ – 21-15-9 Thrusters (45lbs) pull-ups KBS (55) 50 Double-unders /rd Extraction – Run 2 miles (drop every min for 10 push-ups) ***Have to complete this mission in 1 hour or you miss extraction

APPENDIX C (General Physical Skills)

1. Cardiovascular/respiratory endurance- The ability of body systems to gather, process, and deliver oxygen.

2. Stamina - The ability of body systems to process, deliver, store, and utilize energy.

3. Strength - The ability of a muscular unit, or combination of muscular units, to apply force.

4. Flexibility - the ability to maximize the range of motion at a given joint.

5. Power - The ability of a muscular unit, or combination of muscular units, to apply maximum force in minimum time.

6. Speed - The ability to minimize the time cycle of a repeated movement.

7. Coordination - The ability to combine several distinct movement patterns into a singular distinct movement.

8. Agility - The ability to minimize transition time from one movement pattern to another.

9. Balance - The ability to control the placement of the body's center of gravity in relation to its support base.

10. Accuracy - The ability to control movement in a given direction or at a given intensity.[i]

Appendix D (Movement Standards)

AIR SQUAT

The Air Squat is Foundational to the Front Squat and Overhead Squat

I. TEACHING THE MOVEMENT

SETUP:

- Stance = shoulder width
- Full extension at hips and knees

EXECUTION:

- Weight on heels
- Lumbar curve maintained
- Chest up
- Butt travels back and down
- Bottom of squat is below parallel (hip crease is below the top of the kneecap)
- Knees track parallel to feet
- Return to full extension at the hips and knees to complete the move
- Head position is neutral

2. SEEING THE MOVEMENT

PRIMARY POINTS OF PERFORMANCE:

- Lumbar curve maintained
- Weight in heels
- Depth below parallel
- Knees track over feet

3. CORRECTING THE MOVEMENT

FAULT: LAZY LUMBAR CURVE, OR LOSING IT (I.E., "BUTT WINK")

- Fix – Lift the chest while engaging the hip flexors by anteriorly rotating the pelvis strongly.
- Fix – Raise the arms as you descend to the bottom of the squat.

FAULT – WEIGHT SHIFTS FORWARD TO BALLS OF FEET.

- Fix – Exaggerate weight in the heels by floating the toes slightly throughout the entire movement.

FAULT – NOT LOW ENOUGH.

- Fix – Cue "Lower!" and do not relent.
- Fix – Squat to a 10" box or medicine ball to develop awareness of depth.

FAULT – KNEES ROLL IN.

- Fix – Cue "Push your knees out" or "Spread the ground apart with your feet."
- Fix – Touch the outside of the knee and have the athlete press into your hand.

FAULT – TRAIN WRECK SQUAT: INABILITY TO MAINTAIN LUMBAR CURVE, STAY ON HEELS, AND GET TO DEPTH ALL AT THE SAME TIME.

FAULT – IMMATURE SQUAT: LUMBAR CURVE IS MAINTAINED, DEPTH MIGHT BE THERE, AND HEELS ARE IN CONTACT WITH THE GROUND, BUT THE ATHLETE HAS TO CANTILEVER FORWARD EXCESSIVELY ONTO THE QUADS TO MAINTAIN BALANCE.

- Fix – Squat Therapy: Set up the athlete facing a wall or pole with a 10" box under their butt. Set them up in the proper stance, with heels to the box, chest close to wall. Have them squat to the box slowly, maintaining control and weight in the heels.

FRONT SQUAT

The Setup, Execution, Points of Performance, and Corrections carry over exactly from the Air Squat. We now add to those a load in the FRONT RACK POSITION.

1. TEACHING THE MOVEMENT

SETUP:

- Stance = shoulder Width
- Full extension at hips and knees
- Bar "racked" on the shoulders (create a shelf with the shoulders for bar to sit on), hands outside shoulders, loose fingertip grip.
- Elbows high, upper arm parallel to the ground.

EXECUTION:

- Weight on heels
- Lumbar curve maintained
- Chest up
- Elbows high; arms stay parallel to the ground throughout the whole movement
- Butt travels back and down
- Bottom of squat is below parallel (hip crease is below the top of the kneecap)
- Knees track parallel to feet
- Return to full extension at the hips and knees to complete the move
- Head position is neutral

2. SEEING THE MOVEMENT

PRIMARY POINTS OF PERFORMANCE:

- Bar racked properly: elbows high, hands just outside shoulders, bar rests on shoulders with a loose fingertip grip
- Elbows high throughout the movement

3. CORRECTING THE MOVEMENT

ALL FAULTS AND FIXES FROM THE **AIR SQUAT** APPLY TO THIS MOVEMENT, PLUS THE FOLLOWING:

FAULT – BAR NOT IN CONTACT WITH THE TORSO OR HOLDING BAR OUT IN FRONT.

- Fix – Cue "Elbows high and allow bar to roll back onto fingertips."

FAULT – ELBOWS DROP AND CHEST COMES FORWARD.

- Fix – Cue "Elbows UP UP UP! And big chest."
- Fix – Tactile Cue – Place a hand or arm under the athlete's elbows to help keep them lifted.

SHOULDER PRESS

The key elements of the Shoulder Press, and all the overhead lifts, are the setup position, the overhead position, tight belly, and the bar path. These are foundational to all the overhead lifts.

1. TEACHING THE MOVEMENT

SETUP (THIS SETUP IS EXACTLY THE SAME FOR ALL THREE OVERHEAD LIFTS):

- Stance = hip width
- Hands just outside the shoulders
- Bar in front, resting on the "rack" or "shelf" created by the shoulders
- Elbows down and in front of bar; elbows are lower than in the front squat
- Tight midsection
- Closed grip, with thumbs around the bar

EXECUTION:

- The cue for the action is "Press"
- Drive through heels; keep the whole body rigid; tight belly
- Bar travels straight up to locked out, with active shoulders, directly overhead
- Head accommodates bar (bar path is a straight line)

2. SEEING THE MOVEMENT

PRIMARY POINTS OF PERFORMANCE:

- Good setup
- Constant tightness in the midsection, ribs locked down
- Overhead and active shoulder at the top of the press; overhead means that the bar is over or just behind the arch of the foot, with the shoulder angle fully open
- Bar travels straight up

3. CORRECTING THE MOVEMENT

FAULT – BAR FORWARD OF FRONTAL PLANE.

- Fix – Press up and pull back on the bar as it travels to overhead.

FAULT – LEANING BACK, RIBS STICKING OUT.

- Fix – Tighten abs / suck rib cage down (be sure to check the overhead position again after this fix).

FAULT – PASSIVE SHOULDERS OR BENT ELBOWS.

- Fix – Cue "Press up!" "Shoulders into ears."

FAULT – BAR ARCS OUT AROUND THE FACE.

- Fix – Pull head back out of the way of the bar.
- Fix – Check that elbows are not too low in the setup.

PUSH PRESS

The Push Press builds on the same setup and overhead position as the Shoulder Press. We add velocity with the dip and drive of the hip. The focus here is on a dip and drive that is explosive and straight down and up.

1. TEACHING THE MOVEMENT

SETUP:

- Stance = hip width
- Hands just outside the shoulders
- Bar in front, resting on the "rack" or "shelf" created by the shoulders
- Elbows down and in front of bar; elbows are lower than in the front squat
- Tight midsection
- Closed grip, with thumbs around the bar

EXECUTION:

- The cue for the action is "Dip, drive, press"
- Dip: perform a shallow dip (flexion) of the hips, where the knees push forward slightly, the butt goes back, and the chest stays upright
- Drive: extend the hip rapidly and fully
- Press: press the bar to overhead, with locked arms

PROGRESSION (WITH STICK):

1. Dip (check chest and hip)
2. Dip-drive slow
3. Dip-drive fast
4. Dip-drive-press (full Push Press)

2. SEEING THE MOVEMENT

PRIMARY POINTS OF PERFORMANCE:

- Torso drops straight down on the dip. There is no forward inclination of the chest and no muting of the hip.
- Aggressive turn around from the dip to the drive.

3. CORRECTING THE MOVEMENT

ALL FAULTS AND FIXES FROM THE **SHOULDER PRESS** APPLY TO THIS MOVEMENT, PLUS THE FOLLOWING:

FAULT – OUT OF SEQUENCE: PRESS BEGINS BEFORE HIP OPENS UP

- Fix – Take back to step 3 in progression—dip-drive fast

FAULT – COCKING: PAUSING IN THE DIP

- Fix – Cue for dip-drive and more aggressive turnaround of the hip

FAULT – FORWARD INCLINATION OF THE CHEST

- Fix – Have athlete hold in the dip position and then manually adjust them to true upright torso
- Fix – Cue a shallower dip
- Fix – Cue knees forward more
- Fix – Stand in front of athlete to prevent the chest from coming forward
- Fix – Dip therapy: Stand with back against a wall, with heels, butt, and shoulder blades all touching the wall; then dip and drive, keeping everything in contact with wall

FAULT – MUTED HIP

- Fix – Turn the pelvis over (anterior rotation) strongly

DEADLIFT

The Deadlift is foundational to the Sumo Deadlift High Pull and the Medicine Ball Clean.

1. TEACHING THE MOVEMENT

SETUP:

- Stance = between hip width and shoulder width
- Weight in heels
- Back arched/lumbar curve locked in
- Shoulders slightly in front of the bar
- Bar in contact with the shins
- Arms locked straight
- Symmetrical grip outside the knees, just wide enough to not interfere with knees

EXECUTION:

- Drive through the heels
- Extend legs while hips and shoulders rise at the same rate
- Once the bar passes the knees, the hip opens all the way up
- Bar maintains contact with the legs the entire time
- Head neutral
- On return to the floor, push hips back and shoulders forward slightly; delay the knee bend
- Once bar descends below the knees and the torso angle is set, return the bar down to the setup position

2. SEEING THE MOVEMENT

PRIMARY POINTS OF PERFORMANCE:

- Lumbar curve maintained
- Weight on heels
- Shoulders slightly in front of bar on setup
- Hips and shoulders rise at same rate
- Bar stays in contact with legs throughout the movement
- At the top the hip is completely open and knees are straight

3. CORRECTING THE MOVEMENT

FAULT – LOSS OF LUMBAR CURVE

- Fix – Cue to pull hips back and lift the chest
- Fix – Touch person at lumbar curve and say, "Arch!" Do not relent.
- Fix – Abort and decrease the load to where the lumbar arch can be maintained.

FAULT – WEIGHT ON OR SHIFTING TO TOES.

- Fix – Have athlete settle into the heels and pull hips back, maintaining tension in the hamstrings at start of movement, and focus on driving through heels.
- Fix – Check that the bar stays in contact with legs throughout the movement.

FAULT – SHOULDERS BEHIND BAR ON SETUP.

- Fix – Raise hips to move shoulder over or slightly in front of the bar.

FAULT – HIPS RISE BEFORE THE CHEST (STIFF-LEGGED DEADLIFT).

- Fix – Allow the shoulders and chest to rise sooner. Cue "Lift your chest more aggressively" or "Lift the chest and hips at the same rate until the bar passes your knees."

FAULT – SHOULDERS RISE WITHOUT THE HIPS. BAR TRAVELS AROUND THE KNEES INSTEAD OF STRAIGHT UP.

- Fix – Be sure athlete is set up correctly: weight in heels and with shoulders in front of the bar. Cue "Push knees back as your chest rises."
- Fix – Block the knees' travel with your hand.
- Fix – Stick trick: Lock the person in between two sticks on either side of the bar and have them execute the move without hitting the sticks.

FAULT – BAR COLLIDES WITH KNEES ON THE DESCENT.

- Fix – Initiate the return by pushing the hips back and delay the knee bend.

FAULT – BAR LOSES CONTACT WITH LEGS.

- Fix – Cue "Pull the bar in to your legs the whole time."
- Fix – Tactile cue: Touch the athlete's leg where the bar should touch from thigh to shin.

SUMO DEADLIFT HIGH PULL

The Sumo Deadlift High Pull (SDHP) builds on the Deadlift, widening the stance, bringing the grip inside the knees, adding a shrug, an upward pull with the arms, but, most importantly velocity. The move requires an aggressive extension of the hips and legs before the arms pull.

1. TEACHING THE MOVEMENT

SETUP:

- Stance = wider than shoulder width, but not so wide that the knees roll inside the feet
- Weight in heels
- Back arched/lumbar curve locked in
- Shoulders slightly in front of the bar
- Bar in contact with the shins
- Arms locked straight
- Symmetrical grip inside the knees

EXECUTION:

- Accelerate through the heels from the ground to full extension of the hips and legs
- Shrug, with straight arms
- Arms follow through by pulling bar to the chin with elbows high and outside
- Return the bar down fluidly in the reverse sequence: arms, then traps, then hips, then knees, back to the setup position

PROGRESSION:

1. Sumo deadlift
2. Sumo deadlift shrug, slow
3. Sumo deadlift shrug, fast
4. Full Sumo Deadlift High Pull

2. SEEING THE MOVEMENT

PRIMARY POINTS OF PERFORMANCE:

- Hips open before shrug and arm bend
- Bar is pulled up to just below the chin
- Fast and aggressive
- Elbows travel and finish high and outside; elbows are higher than the hands at all times during the movement

3. CORRECTING THE MOVEMENT

ALL FAULTS AND FIXES FROM THE **DEADLIFT** APPLY TO THIS MOVEMENT, PLUS THE FOLLOWING:

FAULT - PULLING TOO EARLY WITH THE ARMS. HIP NOT COMPLETELY OPEN BEFORE SHRUG OR ARM PULL.

- Fix - Take the athlete to step 3 in the progression (Sumo Deadlift Shrug). Emphasize that the hip needs to fire first, before arms. Try two Sumo Deadlift Shrugs for every full SDHP; do as many times as needed to get it right.

FAULT - NO SHRUG.

- Fix - Back to progression. Do two Sumo Deadlift Shrugs and one High Pull; do as many times as needed to get it right.

FAULT - ELBOWS LOW AND INSIDE.

- Fix - Cue: "Elbows high!"

FAULT - INCORRECT DESCENT (HIPS BEFORE ARMS).

- Fix - Slow down the movement; return arms then hips, then legs; then speed it up again.

FAULT - TOO SLOW.

- Fix- Cue "Faster!"

FAULT - SEGMENTING THE MOVEMENT.

- Fix - Cue to accelerate or jump the bar off the ground.

FAULT - LOSING CONTROL AND LEVELNESS OF BAR.

- Fix - Widen the grip a bit. Make sure the grip is symmetrical on the bar.

FAULT - RUNNING INTO THE KNEES

- Fix - Narrow the grip and make sure the hips aren't too low in the setup position.

Appendix E (Start-up Company Equipment Set)[38]

- ☐ 10 ea Olympic Barbells (45 lbs)
- ☐ Olympic Bumper plates of various weights (45, 35, 25, 10, 5 lbs plates)
- ☐ 10 ea Squat Racks
- ☐ 5 ea Flat Bench
- ☐ 5 ea Kettlebells – 55 lbs
- ☐ 5 ea Kettlebells – 35 lbs
- ☐ 5 ea Kettlebells – 20 lbs
- ☐ Pull-up Bars
- ☐ 5 ea Medicine Balls – 20 lbs
- ☐ 5 ea Medicine Balls – 14 lbs
- ☐ 3 ea Medicine Balls – 10 lbs
- ☐ 10 ea AbMat®
- ☐ 5 pr Parallettes
- ☐ 10 ea Tumbling Mats
- ☐ 5 pr Gymnastics Still Rings with Straps
- ☐ 10 ea Plyometric Boxes – 24-in
- ☐ 5 ea Plyometric Boxes – 20-in
- ☐ 20 ea Jump Ropes

[38] Adapted from Greg Glassman, "The Garage Gym," *CrossFit Journal* (September, 2002), online at http://journal.CrossFit.com/2002/09/the-garage-gym-sept-02-cfj.tpl; accessed 05/18/ 2010.

Appendix F (Austere Equipment List)[39]

- ☐ 10 ea Ammunition Cans, 7.62 mm filled with Sand (20 lbs)
- ☐ 10 ea Ammunition Cans, 5.56 mm filled with Sand (30 lbs)
- ☐ 10 ea Ammunition Cans, .50 Caliber filled with Sand (50 lbs)
- ☐ 10 ea Ammunition Cans, 25mm filled with Sand (70 lbs)
- ☐ 10 ea 5-gal Jerry Cans, filled with water (45 lbs)
- ☐ 30 ea Sandbags, filled with Sand (50 lbs)
- ☐ 4 ea 5-ton/MTV truck tires with rims (350 lbs)
- ☐ 10 ea medicine balls (soccer balls filled with sand and sealed with duct tape)
- ☐ Pull-up bars (battalion mechanics/welders can construct)
- ☐ 10 ea Plyometric Boxes – 24-in
- ☐ 20 ea Jump Ropes

[39] Adapted from Greg Glassman, Wade Rutland, and JT Williams, "AOFP Austere Program," *CrossFit Journal*, (August, 2006), online at http://journal.CrossFit.com/2006/08/the-aofp-CrossFit-austere-prog-1.tpl; accessed on 05/18/2010.

Appendix G (Assessment Data)

Athlete 1 (Male)

Variables			Estimates	Formula
BW	165	lbs		
H	5.667	ft		
SOD	1	ft	SOH-SOD=	0.264690312334569 *H
SOH	2.5	ft	OHH-SHH=	0.375 *H
SHH	4.958625	ft	OHH-H=	0.25 *H
OHH	7.08375	ft	OHH-DLH=	0.808849479442386 *H
DLH	2.5	ft	SHH-BHH=	0.742654843832716 *H
BBH	0.75	ft	OHH-BHH=	1.11765484383272 *H
WBB_Thr	95	lbs	DLH-BHH=	0.308805364 *H
WBB_FGB	75	lbs	SHH-SOH+SOD=	0.610309688 *H
P_SO	0.744		H-DLH=	0.558849479 *H
P_PULL	0.915			
P_D	0.915			
P_PUSH	0.65			
WBH	10	ft		
BOXH	2	ft		
H-PUSH	0.15	% of Height		
kCal_ftLb_Conv	3088.025			

Thruster	(P_SO*BW)*(SOH-SOD) + WBB*((SOH-SOD)+(OHH-SHH))	528.526875 ft-lbs	23783.70938	38221.54298
Pull-up	(P_PULL*BW)*(OHH-SHH)	320.8407469 ft-lbs	14437.83361	
Wall Ball Shot	(P_SQ*BW)*(SQH-SQD) + WMB*(WBH-(SHH-(SQH-SQD)))			
Push Press	WBB*(OHH-SHH)			
SDHP	(P_SO*BW)*((SOH-SOD)/2) +			
Box Jump	BW*BOXH			
Row	Row_Cal * kCal_ftlb_Conv			

Army Push-Ups (p

Reps	95	
Time	120	
AVG Power	72.17	ft-lbs/s
Work	8660.947	ft-lbs

Assumptions:
H_Push = .15% of Height
P_PUSH = .73 * BW (Men); .65 (Women)

Army Push-Ups (post)

Reps	107	
Time	120	
AVG Power	81.29	ft-lbs/s
Work	9754.961288	ft-lbs

Assumptions:
H_Push = .15% of Height
P_PUSH = .73 * BW (Men); .65 (Women)

FRAN (Pre)

Thruster Reps	45	
Pullups	45	
Time (min:sec)	9:43	
Time (sec)	583	
Avg Power	65.56011	ft-lbs/sec

FRAN (Post)

Thruster Reps	45	
Pullups	45	
Time (min:sec)	6:26	
Time (sec)	386	
Avg Power	99.01954141	ft-lbs/sec

Fight Gone Bad (Pre)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	160353	ft-lbs
FGB_Power	157.2089	ft-lbs/s

Round 1			
Wall Ball	19	WMB1	20
Push Press	31	WPP1	75
SDHP	15	WSDHP1	75
Box Jump	26	H_Jump1	2
Row	14		
Round 2			
Wall Ball	15	WMB2	20
Push Press	24	WPP2	75
SDHP	10	WSDHP2	75
Box Jump	15	H_Jump2	2
Row	10		
Round 3			
Wall Ball	10	WMB3	20
Push Press	22	WPP3	75
SDHP	10	WSDHP3	75
Box Jump	11	H_Jump3	2
Row	12		
FGB_Total_Score	244		

Work_WB1	6728.66	ft-lbs
Work_PP1	4940.916	ft-lbs
Work_SDHP1	1696.697	ft-lbs
Work_Jump1	8580	ft-lbs
Work_Row1	43232.35	ft-lbs
Work_WB2	5312.1	ft-lbs
Work_PP2	3825.225	ft-lbs
Work_SDHP2	1236.347	ft-lbs
Work_Jump2	4950	ft-lbs
Work_Row2	30880.25	ft-lbs
Work_WB3	3541.4	ft-lbs
Work_PP3	3506.456	ft-lbs
Work_SDHP3	1236.347	ft-lbs
Work_Jump3	3630	ft-lbs
Work_Row3	37056.3	ft-lbs

Fight Gone Bad (Post)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	186178.425	ft-lbs
FGB_Power	182.5278676	ft-lbs/s

Round 1			
Wall Ball	20	WMB1	20
Push Press	30	WPP1	75
SDHP	20	WSDHP1	75
Box Jump	35	H_Jump1	2
Row	15		
Round 2			
Wall Ball	15	WMB2	20
Push Press	20	WPP2	75
SDHP	15	WSDHP2	75
Box Jump	27	H_Jump2	2
Row	11		
Round 3			
Wall Ball	15	WMB3	20
Push Press	15	WPP3	75
SDHP	15	WSDHP3	75
Box Jump	26	H_Jump3	2
Row	14		
	293		

Work_WB1	7082.8	ft-lbs
Work_PP1	4781.53125	ft-lbs
Work_SDHP1	2157.046875	ft-lbs
Work_Jump1	11550	ft-lbs
Work_Row1	46320.375	ft-lbs
Work_WB2	5312.1	ft-lbs
Work_PP2	3187.6875	ft-lbs
Work_SDHP2	1696.696875	ft-lbs
Work_Jump2	8910	ft-lbs
Work_Row2	33968.275	ft-lbs
Work_WB3	5312.1	ft-lbs
Work_PP3	2390.765625	ft-lbs
Work_SDHP3	1696.696875	ft-lbs
Work_Jump3	8580	ft-lbs
Work_Row3	43232.35	ft-lbs

CFT (Pre)

Back Squat	275	lbs
Shoulder Press	135	lbs
Deadlift	285	lbs
Work_Squat	412.5	ft-lbs
P_Squat	165	ft-lbs/sec
Work_Sh Press	286.8919	ft-lbs
P_Sh Press	114.7568	ft-lbs/sec
Work_Deadlift	498.75	ft-lbs
P_Deadlift	199.5	ft-lbs/sec
P_CFT	479.2568	ft-lbs/sec

CFT (Post)

Back Squat	265	lbs
Shoulder Press	145	lbs
Deadlift	315	lbs
Work_Squat	397.5	ft-lbs
P_Squat	159	ft-lbs/sec
Work_Sh Press	308.14	ft-lbs
P_Sh Press	123.26	ft-lbs/sec
Work_Deadlift	551.25	ft-lbs
P_Deadlift	220.5	ft-lbs/sec
P_CFT	502.75725	ft-lbs/sec

Athlete 2 (Female)

Variables			Estimates	Formula
BW	136	lbs		
H	5.333	ft		
SOD	1	ft	SOH-SOD=	0.281267579223701 *H
SOH	2.5	ft	OHH-SHH=	0.375 *H
SHH	4.666375	ft	OHH-H=	0.25 *H
OHH	6.66625	ft	OHH-DLH=	0.781220701293831 *H
DLH	2.5	ft	SHH-BHH=	0.734366210388149 *H
BBH	0.75	ft	OHH-BHH=	1.10936621038815 *H
WBB_Thr	45	lbs	DLH-BHH=	0.328145509 *H
WBB_FGB	55	lbs	SHH-SOH+SOD=	0.593732421 *H
P_SO	0.744		H-DLH=	0.531220701 *H
P_PULL	0.915			
P_D	0.915			
P_PUSH	0.65			
WBH	10	ft		
BOXH	2	ft		
H-PUSH	0.15	% of Height		
kCal_ftLb_Conv	3088.025			

Thruster	(P_SO*BW)*(SOH-SOD) + WBB*((SOH-SOD)+(OHH-SHH))		
	309.270375 ft-lbs	13917.16688	24070.83623
Pull-up	(P_PULL*BW)*(OHH-SHH)		
	248.864445 ft-lbs	10153.66936	
Wall Ball Shot	(P_SQ*BW)*(SQH-SQD) + WMB*(WBH-(SHH-(SQH-SQD)))		
Push Press	WBB*(OHH-SHH)		
SDHP	(P_SO*BW)*((SOH-SOD)/2) +		
Box Jump	BW*BOXH		
Row	Row_Cal * kCal_ftlb_Conv		

Army Push-Ups

			Assumptions:
Reps	45		H_Push = .15% of Height
Time	120		P_PUSH = .73 * BW (Men); .65 (Women)
AVG Power	26.52	ft-lbs/s	
Work	3182.201	ft-lbs	

Army Push-Ups (post)

			Assumptions:
Reps	49		H_Push = .15% of Height
Time	120		P_PUSH = .73 * BW (Men); .65 (Women)
AVG Power	28.88	ft-lbs/s	
Work	3465.06342	ft-lbs	

FRAN (Pre)

Thruster Reps	45	45#
Pullups	45	Blue Band 20% assist
Time (min:sec)	7:51	
Time (sec)	471	
Avg Power	51.10581	ft-lbs/sec

FRAN (Post)

Thruster Reps	45	
Pullups	45	
Time (min:sec)	6:26	
Time (sec)	386	
Avg Power	62.35967935	ft-lbs/sec

Fight Gone Bad (Pre)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	130503.2	ft-lbs
FGB_Power	127.9443	ft-lbs/s

Fight Gone Bad (Post)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	131742.8941	ft-lbs
FGB_Power	129.1597001	ft-lbs/s

Round 1				
Wall Ball	27	WMB1	14	
Push Press	15	WPP1	55	
SDHP	17	WSDHP1	55	
Box Jump	13	H_Jump1	2	
Row	10			
Round 2				
Wall Ball	21	WMB2	14	
Push Press	14	WPP2	55	
SDHP	15	WSDHP2	55	
Box Jump	15	H_Jump2	2	
Row	10			
Round 3				
Wall Ball	21	WMB3	14	
Push Press	12	WPP3	55	
SDHP	13	WSDHP3	55	
Box Jump	11	H_Jump3	2	
Row	10			
FGB_Total_Score	224			

Work_WB1	7310.952	ft-lbs
Work_PP1	1649.897	ft-lbs
Work_SDHP1	1505.497	ft-lbs
Work_Jump1	3536	ft-lbs
Work_Row1	30880.25	ft-lbs
Work_WB2	5686.296	ft-lbs
Work_PP2	1539.904	ft-lbs
Work_SDHP2	1353.721	ft-lbs
Work_Jump2	4080	ft-lbs
Work_Row2	30880.25	ft-lbs
Work_WB3	5686.296	ft-lbs
Work_PP3	1319.918	ft-lbs
Work_SDHP3	1201.945	ft-lbs
Work_Jump3	2992	ft-lbs
Work_Row3	30880.25	ft-lbs

Round 1				
Wall Ball	19	WMB1	14	
Push Press	11	WPP1	55	
SDHP	20	WSDHP1	55	
Box Jump	15	H_Jump1	2	
Row	11			
Round 2				
Wall Ball	20	WMB2	14	
Push Press	12	WPP2	55	
SDHP	18	WSDHP2	55	
Box Jump	18	H_Jump2	2	
Row	10			
Round 3				
Wall Ball	21	WMB3	14	
Push Press	11	WPP3	55	
SDHP	19	WSDHP3	55	
Box Jump	19	H_Jump3	2	
Row	9			
	233			

Work_WB1	5144.744	ft-lbs
Work_PP1	1209.924375	ft-lbs
Work_SDHP1	1733.160625	ft-lbs
Work_Jump1	4080	ft-lbs
Work_Row1	33968.275	ft-lbs
Work_WB2	5415.52	ft-lbs
Work_PP2	1319.9175	ft-lbs
Work_SDHP2	1581.384625	ft-lbs
Work_Jump2	4896	ft-lbs
Work_Row2	30880.25	ft-lbs
Work_WB3	5686.296	ft-lbs
Work_PP3	1209.924375	ft-lbs
Work_SDHP3	1657.272625	ft-lbs
Work_Jump3	5168	ft-lbs
Work_Row3	27792.225	ft-lbs

CFT (Pre)

Back Squat	115	lbs
Shoulder Press	65	lbs
Deadlift	135	lbs
Work_Squat	172.5	ft-lbs
P_Squat	69	ft-lbs/sec
Work_Sh Press	129.9919	ft-lbs
P_Sh Press	51.99675	ft-lbs/sec
Work_Deadlift	236.25	ft-lbs
P_Deadlift	94.5	ft-lbs/sec
P_CFT	215.4968	ft-lbs/sec

CFT (Post)

Back Squat	135	lbs
Shoulder Press	70	lbs
Deadlift	185	lbs
Work_Squat	202.5	ft-lbs
P_Squat	81	ft-lbs/sec
Work_Sh Press	139.99	ft-lbs
P_Sh Press	56.00	ft-lbs/sec
Work_Deadlift	323.75	ft-lbs
P_Deadlift	129.5	ft-lbs/sec
P_CFT	266.4965	ft-lbs/sec

Athlete 3 (Female)

Variables			Estimates	Formula
BW	140	lbs		
H	5.5	ft		
SOD	1	ft	SOH-SOD=	0.272727272727273 *H
SOH	2.5	ft	OHH-SHH=	0.375 *H
SHH	4.8125	ft	OHH-H=	0.25 *H
OHH	6.875	ft	OHH-DLH=	0.795454545454545 *H
DLH	2.5	ft	SHH-BHH=	0.738636363636364 *H
BBH	0.75	ft	OHH-BHH=	1.11363636363636 *H
WBB Thr	35	lbs	DLH-BHH=	0.318181818 *H
WBB FGB	55	lbs	SHH-SOH+SOD=	0.602272727 *H
P SO	0.744		H-DLH=	0.545454545 *H
P PULL	0.915			
P_D	0.915			
P_PUSH	0.65			
WBH	10	ft		
BOXH	2	ft		
H-PUSH	0.15	% of Height		
kCal_ftLb_Conv	3088.025			

		Pre			Post
Thruster	(P SO*BW)*(SOH-SOD) + WBB*((SOH-SOD)+(OHH-SHH))	12641.7375	12641.7375	24531.01875	Post
	280.9275 ft-lbs				
Pull-up	(P_PULL*BW)*(OHH-SHH)	8322.496875	11889.28125	20964.23438	Pre
	264.20625 ft-lbs				
Wall Ball Shot	(P_SQ*BW)*(SQH-SQD) + WMB*(WBH-(SHH-(SQH-SQD)))				
Push Press	WBB*(OHH-SHH)				
SDHP	(P SO*BW)*((SOH-SOD)/2) +				
Box Jump	BW*BOXH				
Row	Row_Cal * kCal_ftlb_Conv				

Army Push-Ups

		Assumptions:
Reps	37	H_Push = .15% of Height
Time	120	P_PUSH = .73 * BW (Men); .65 (Women)
AVG Power	23.15	ft-lbs/s
Work	2777.775	ft-lbs

Army Push-Ups (post)

		Assumptions:
Reps	47	H_Push = .15% of Height
Time	120	P_PUSH = .73 * BW (Men); .65 (Women)
AVG Power	29.40	ft-lbs/s
Work	3528.525	ft-lbs

FRAN (Pre)

Thruster Reps	45	
Pullups	45	Green Bamd 30% assist
Time (min:sec)	10:28	
Time (sec)	628	
Avg Power	33.38254	ft-lbs/sec

FRAN (Post)

Thruster Reps	45	
Pullups	45	Jumping Pull-ups
Time (min:sec)	5:34	
Time (sec)	334	
Avg Power	73.44616392	ft-lbs/sec

Fight Gone Bad (Pre)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	94434.56	ft-lbs
FGB_Power	92.5829	ft-lbs/s

Fight Gone Bad (Post)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	127949.95	ft-lbs
FGB_Power	125.4411275	ft-lbs/s

Round 1				
Wall Ball	11	WMB1	14	
Push Press	14	WPP1	55	
SDHP	8	WSDHP1	55	
Box Jump	10	H_Jump1	2	
Row	7			
Round 2				
Wall Ball	12	WMB2	14	
Push Press	14	WPP2	55	
SDHP	5	WSDHP2	55	
Box Jump	8	H_Jump2	2	
Row	8			
Round 3				
Wall Ball	12	WMB3	10	
Push Press	12	WPP3	75	
SDHP	8	WSDHP3	75	
Box Jump	7	H_Jump3	2	
Row	8			
FGB_Total_Score	144			
Work_WB1	3027.64	ft-lbs		
Work_PP1	1588.125	ft-lbs		
Work_SDHP1	848.3975	ft-lbs		
Work_Jump1	2800	ft-lbs		
Work_Row1	21616.18	ft-lbs		
Work_WB2	3302.88	ft-lbs		
Work_PP2	1588.125	ft-lbs		
Work_SDHP2	614.0375	ft-lbs		
Work_Jump2	2240	ft-lbs		
Work_Row2	24704.2	ft-lbs		
Work_WB3	2654.88	ft-lbs		
Work_PP3	1856.25	ft-lbs		
Work_SDHP3	929.6475	ft-lbs		
Work_Jump3	1960	ft-lbs		
Work_Row3	24704.2	ft-lbs		

Round 1				
Wall Ball	13	WMB1	14	
Push Press	12	WPP1	55	
SDHP	10	WSDHP1	55	
Box Jump	18	H_Jump1	2	
Row	12			
Round 2				
Wall Ball	14	WMB2	14	
Push Press	10	WPP2	55	
SDHP	10	WSDHP2	55	
Box Jump	17	H_Jump2	2	
Row	9			
Round 3				
Wall Ball	13	WMB3	14	
Push Press	9	WPP3	55	
SDHP	15	WSDHP3	45	
Box Jump	16	H_Jump3	2	
Row	10			
	188			
Work_WB1	3578.12	ft-lbs		
Work_PP1	1361.25	ft-lbs		
Work_SDHP1	1004.6375	ft-lbs		
Work_Jump1	5040	ft-lbs		
Work_Row1	37056.3	ft-lbs		
Work_WB2	3853.36	ft-lbs		
Work_PP2	1134.375	ft-lbs		
Work_SDHP2	1004.6375	ft-lbs		
Work_Jump2	4760	ft-lbs		
Work_Row2	27792.225	ft-lbs		
Work_WB3	3136.12	ft-lbs		
Work_PP3	1392.1875	ft-lbs		
Work_SDHP3	1476.4875	ft-lbs		
Work_Jump3	4480	ft-lbs		
Work_Row3	30880.25	ft-lbs		

CFT (Pre)

Back Squat	115	lbs
Shoulder Press	60	lbs
Deadlift	115	lbs
Work_Squat	172.5	ft-lbs
P_Squat	69	ft-lbs/sec
Work_Sh Press	123.75	ft-lbs
P_Sh Press	49.5	ft-lbs/sec
Work_Deadlift	201.25	ft-lbs
P_Deadlift	80.5	ft-lbs/sec
P_CFT	199	ft-lbs/sec

CFT (Post)

Back Squat	120	lbs
Shoulder Press	70	lbs
Deadlift	145	lbs
Work_Squat	180	ft-lbs
P_Squat	72	ft-lbs/sec
Work_Sh Press	144.38	ft-lbs
P_Sh Press	57.75	ft-lbs/sec
Work_Deadlift	253.75	ft-lbs
P_Deadlift	101.5	ft-lbs/sec
P_CFT	231.25	ft-lbs/sec

Athlete 4 (Female)

Variables			Estimates	Formula
BW	153	lbs		
H	5.6667	ft		
SOD	1	ft	SOH-SOD=	0.264704325268675 *H
SOH	2.5	ft	OHH-SHH=	0.375 *H
SHH	4.958363	ft	OHH-H=	0.25 *H
OHH	7.083375	ft	OHH-DLH=	0.808826124552208 *H
DLH	2.5	ft	SHH-BHH=	0.742647837365663 *H
BBH	0.75	ft	OHH-BHH=	1.11764783736566 *H
WBB Thr	45	lbs	DLH-BHH=	0.308821713 *H
WBB FGB	55	lbs	SHH-SOH+SOD=	0.610295675 *H
P SO	0.744		H-DLH=	0.558826125 *H
P PULL	0.915			
P_D	0.915			
P_PUSH	0.65			
WBH	9	ft		
BOXH	2	ft		
H-PUSH	0.15	% of Height		
kCal_ftLb_Conv	3088.025			

		Pre	Post		
Thruster	(P SQ*BW)*(SOH-SOD) + WBB*((SOH-SOD)+(OHH-SHH))				
	333.8735625 ft-lbs	5880.142688	15024.31031	28411.41093	Post
Pull-up	(P_PULL*BW)*(OHH-SHH)				
	297.4911249 ft-lbs	12940.86393	13387.10062	18821.00662	Pre
Wall Ball Shot	(P_SQ*BW)*(SQH-SQD) + WMB*(WBH-(SHH-(SQH-SQD)))				
Push Press	WBB*(OHH-SHH)				
SDHP	(P SQ*BW)*((SOH-SOD)/2) +				
Box Jump	BW*BOXH				
Row	Row_Cal * kCal_ftlb_Conv				

Army Push-Ups

		Assumptions:
Reps	18	H_Push = .15% of Height
Time	120	P_PUSH = .73 * BW (Men); .65 (Women)
AVG Power	12.68	ft-lbs/s
Work	1521.594	ft-lbs

Army Push-Ups (post)

		Assumptions:
Reps	20	H_Push = .15% of Height
Time	120	P_PUSH = .73 * BW (Men); .65 (Women)
AVG Power	14.09	ft-lbs/s
Work	1690.659945	ft-lbs

FRAN (Pre)

Thruster Reps	45	
Pullups	45	Green - 5 reps, J. Pulls - 40
Time (min:sec)	9:30	
Time (sec)	570	
Avg Power	33.01931	ft-lbs/sec

FRAN (Post)

Thruster Reps	45	
Pullups	45	Jumping Pull-ups
Time (min:sec)	6:50	
Time (sec)	410	
Avg Power	69.29612423	ft-lbs/sec

Fight Gone Bad (Pre)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	96123.17	ft-lbs
FGB_Power	94.2384	ft-lbs/s

Fight Gone Bad (Post)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	101718.0527	ft-lbs
FGB_Power	99.72358107	ft-lbs/s

Round 1			
Wall Ball	8	WMB1	14
Push Press	8	WPP1	55
SDHP	12	WSDHP1	55
Box Jump	11	H_Jump1	2
Row	8		
Round 2			
Wall Ball	11	WMB2	14
Push Press	12	WPP2	55
SDHP	12	WSDHP2	55
Box Jump	9	H_Jump2	2
Row	9		
Round 3			
Wall Ball	14	WMB3	10
Push Press	13	WPP3	75
SDHP	16	WSDHP3	75
Box Jump	6	H_Jump3	2
Row	6		
FGB_Total_Score	155		

Round 1			
Wall Ball	13	WMB1	14
Push Press	10	WPP1	55
SDHP	12	WSDHP1	55
Box Jump	10	H_Jump1	2
Row	9		
Round 2			
Wall Ball	14	WMB2	14
Push Press	9	WPP2	55
SDHP	13	WSDHP2	55
Box Jump	11	H_Jump2	2
Row	8		
Round 3			
Wall Ball	11	WMB3	14
Push Press	7	WPP3	55
SDHP	13	WSDHP3	55
Box Jump	12	H_Jump3	2
Row	7		
	159		

Work_WB1	2205.984	ft-lbs
Work_PP1	935.0055	ft-lbs
Work_SDHP1	1255.948	ft-lbs
Work_Jump1	3366	ft-lbs
Work_Row1	24704.2	ft-lbs
Work_WB2	3033.228	ft-lbs
Work_PP2	1402.508	ft-lbs
Work_SDHP2	1255.948	ft-lbs
Work_Jump2	2754	ft-lbs
Work_Row2	27792.23	ft-lbs
Work_WB3	3300.472	ft-lbs
Work_PP3	2071.887	ft-lbs
Work_SDHP3	1681.611	ft-lbs
Work_Jump3	1836	ft-lbs
Work_Row3	18528.15	ft-lbs

Work_WB1	3584.724	ft-lbs
Work_PP1	1168.756875	ft-lbs
Work_SDHP1	1255.947938	ft-lbs
Work_Jump1	3060	ft-lbs
Work_Row1	27792.225	ft-lbs
Work_WB2	3860.472	ft-lbs
Work_PP2	1051.881188	ft-lbs
Work_SDHP2	1341.321938	ft-lbs
Work_Jump2	3366	ft-lbs
Work_Row2	24704.2	ft-lbs
Work_WB3	2703.228	ft-lbs
Work_PP3	1115.631563	ft-lbs
Work_SDHP3	1425.489188	ft-lbs
Work_Jump3	3672	ft-lbs
Work_Row3	21616.175	ft-lbs

CFT (Pre)

Back Squat	115	lbs
Shoulder Press	65	lbs
Deadlift	135	lbs
Work_Squat	172.5	ft-lbs
P_Squat	69	ft-lbs/sec
Work_Sh Press	138.1258	ft-lbs
P_Sh Press	55.25033	ft-lbs/sec
Work_Deadlift	236.25	ft-lbs
P_Deadlift	94.5	ft-lbs/sec
P_CFT	218.7503	ft-lbs/sec

CFT (Post)

Back Squat	135	lbs
Shoulder Press	70	lbs
Deadlift	155	lbs
Work_Squat	202.5	ft-lbs
P_Squat	81	ft-lbs/sec
Work_Sh Press	148.75	ft-lbs
P_Sh Press	59.50	ft-lbs/sec
Work_Deadlift	271.25	ft-lbs
P_Deadlift	108.5	ft-lbs/sec
P_CFT	249.00035	ft-lbs/sec

Athlete 5 (Female)

Variables			Estimates	Formula	
BW	132	lbs			
H	5.1667	ft			
SOD	1	ft	SOH-SOD=	0.290320707608338	*H
SOH	2.5	ft	OHH-SHH=	0.375	*H
SHH	4.520863	ft	OHH-H=	0.25	*H
OHH	6.458375	ft	OHH-DLH=	0.766132153986103	*H
DLH	2.5	ft	SHH-BHH=	0.729839646195831	*H
BBH	0.75	ft	OHH-BHH=	1.10483964619583	*H
WBB Thr	45	lbs	DLH-BHH=	0.338707492	*H
WBB FGB	55	lbs	SHH-SOH+SOD=	0.584679292	*H
P SO	0.744		H-DLH=	0.516132154	*H
P PULL	0.915				
P_D	0.915				
P_PUSH	0.65				
WBH	8	ft			
BOXH	2	ft			
H-PUSH	0.15	% of Height			
kCal_ftLb_Conv	3088.025				

		Pre			Post
Thruster	(P_SQ*BW)*(SQH-SQD) + WBB*((SQH-SQD)+(OHH-SHH))				
	302.0000625 ft-lbs	4014.513563	13590.00281	20961.40474	Post
Pull-up	(P_PULL*BW)*(OHH-SHH)				
	234.0127598 ft-lbs	3439.987568	7371.401932	7454.501131	Pre
Wall Ball Shot	(P_SQ*BW)*(SQH-SQD) + WMB*(WBH-(SHH-(SQH-SQD)))				
Push Press	WBB*(OHH-SHH)				
SDHP	(P_SQ*BW)*((SQH-SQD)/2) +				
Box Jump	BW*BOXH				
Row	Row_Cal * kCal_ftlb_Conv				

Army Push-Ups

		Assumptions:
Reps	35	H_Push = .15% of Height
Time	120	P_PUSH = .73 * BW (Men); .65 (Women)
AVG Power	19.39	ft-lbs/s
Work	2327.34	ft-lbs

Army Push-Ups (post)

		Assumptions:
Reps	45	H_Push = .15% of Height
Time	120	P_PUSH = .73 * BW (Men); .65 (Women)
AVG Power	24.94	ft-lbs/s
Work	2992.294305	ft-lbs

FRAN (Pre)

Thruster Reps	45	25#
Pullups	45	Green - 21, did not complete pulls
Time (min:sec)	8:22	
Time (sec)	502	
Avg Power	14.8496	ft-lbs/sec

FRAN (Post)

Thruster Reps	45	
Pullups	45	Green Band (30% assist)
Time (min:sec)	8:29	
Time (sec)	509	
Avg Power	41.18154174	ft-lbs/sec

Fight Gone Bad (Pre)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	92658.73	ft-lbs
FGB_Power	90.84189	ft-lbs/s

Fight Gone Bad (Post)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	128641.0672	ft-lbs
FGB_Power	126.1186933	ft-lbs/s

Round 1			
Wall Ball	10	WMB1	14
Push Press	22	WPP1	55
SDHP	14	WSDHP1	15
Box Jump	9	H_Jump1	2
Row	6		
Round 2			
Wall Ball	10	WMB2	10
Push Press	20	WPP2	55
SDHP	17	WSDHP2	15
Box Jump	10	H_Jump2	2
Row	7		
Round 3			
Wall Ball	11	WMB3	10
Push Press	22	WPP3	55
SDHP	19	WSDHP3	15
Box Jump	20	H_Jump3	2
Row	8		
FGB_Total_Score	205		

Work_WB1	2383.12	ft-lbs
Work_PP1	2344.39	ft-lbs
Work_SDHP1	1087.747	ft-lbs
Work_Jump1	2376	ft-lbs
Work_Row1	18528.15	ft-lbs
Work_WB2	2123.12	ft-lbs
Work_PP2	2131.264	ft-lbs
Work_SDHP2	1308.715	ft-lbs
Work_Jump2	2640	ft-lbs
Work_Row2	21616.18	ft-lbs
Work_WB3	2335.432	ft-lbs
Work_PP3	2344.39	ft-lbs
Work_SDHP3	1456.027	ft-lbs
Work_Jump3	5280	ft-lbs
Work_Row3	24704.2	ft-lbs

Round 1			
Wall Ball	10	WMB1	14
Push Press	6	WPP1	55
SDHP	9	WSDHP1	55
Box Jump	21	H_Jump1	2
Row	11		
Round 2			
Wall Ball	10	WMB2	14
Push Press	6	WPP2	55
SDHP	9	WSDHP2	55
Box Jump	20	H_Jump2	2
Row	11		
Round 3			
Wall Ball	10	WMB3	14
Push Press	6	WPP3	55
SDHP	8	WSDHP3	55
Box Jump	20	H_Jump3	2
Row	11		
	168		

Work_WB1	2383.12	ft-lbs
Work_PP1	639.379125	ft-lbs
Work_SDHP1	719.4669375	ft-lbs
Work_Jump1	5544	ft-lbs
Work_Row1	33968.275	ft-lbs
Work_WB2	2123.12	ft-lbs
Work_PP2	639.379125	ft-lbs
Work_SDHP2	719.4669375	ft-lbs
Work_Jump2	5280	ft-lbs
Work_Row2	33968.275	ft-lbs
Work_WB3	2123.12	ft-lbs
Work_PP3	639.379125	ft-lbs
Work_SDHP3	645.8109375	ft-lbs
Work_Jump3	5280	ft-lbs
Work_Row3	33968.275	ft-lbs

CFT (Pre)

Back Squat	55	lbs
Shoulder Press	45	lbs
Deadlift	115	lbs
Work_Squat	82.5	ft-lbs
P_Squat	33	ft-lbs/sec
Work_Sh Press	87.18806	ft-lbs
P_Sh Press	34.87523	ft-lbs/sec
Work_Deadlift	201.25	ft-lbs
P_Deadlift	80.5	ft-lbs/sec
P_CFT	148.3752	ft-lbs/sec

CFT (Post)

Back Squat	105	lbs
Shoulder Press	55	lbs
Deadlift	165	lbs
Work_Squat	157.5	ft-lbs
P_Squat	63	ft-lbs/sec
Work_Sh Press	106.56	ft-lbs
P_Sh Press	42.63	ft-lbs/sec
Work_Deadlift	288.75	ft-lbs
P_Deadlift	115.5	ft-lbs/sec
P_CFT	221.125275	ft-lbs/sec

Athlete 6 (Male)

Variables			Estimates	Formula
BW	205	lbs		
H	6	ft		
SOD	1	ft	SOH-SOD=	0.25 *H
SOH	2.5	ft	OHH-SHH=	0.375 *H
SHH	5.25	ft	OHH-H=	0.25 *H
OHH	7.5	ft	OHH-DLH=	0.833333333333333 *H
DLH	2.5	ft	SHH-BHH=	0.75 *H
BBH	0.75	ft	OHH-BHH=	1.125 *H
WBB Thr	65	lbs	DLH-BHH=	0.291666667 *H
WBB FGB	75	lbs	SHH-SOH+SOD=	0.625 *H
P SO	0.744		H-DLH=	0.583333333 *H
P PULL	0.915			
P_D	0.915			
P_PUSH	0.65			
WBH	10	ft		
BOXH	2	ft		
H-PUSH	0.15	% of Height		
kCal_ftLb_Conv	3088.025			

Thruster	(P SO*BW)*(SOH-SOD) + WBB*((SOH-SOD)+(OHH-SHH))		
	472.53 ft-lbs	21263.85	34558.22813
Pull-up	(P_PULL*BW)*(OHH-SHH)		
	422.04375 ft-lbs	13294.37813	
Wall Ball Shot	(P_SQ*BW)*(SQH-SQD) + WMB*(WBH-(SHH-(SQH-SQD)))		
Push Press	WBB*(OHH-SHH)		
SDHP	(P SO*BW)*((SOH-SOD)/2) +		
Box Jump	BW*BOXH		
Row	Row_Cal * kCal_ftlb_Conv		

Army Push-Ups

		Assumptions:
Reps	26	H_Push = .15% of Height
Time	120	P_PUSH = .73 * BW (Men); .65 (Women)
AVG Power	25.98	ft-lbs/s
Work	3118.05	ft-lbs

Army Push-Ups (post)

		Assumptions:
Reps	30	H_Push = .15% of Height
Time	120	P_PUSH = .73 * BW (Men); .65 (Women)
AVG Power	29.98	ft-lbs/s
Work	3597.75	ft-lbs

FRAN (Pre)

Thruster Reps	45	65#
Pullups	45	Green Band 30% assist
Time (min:sec)	15:01	
Time (sec)	901	
Avg Power	38.35541	ft-lbs/sec

FRAN (Post)

Thruster Reps	45	65#
Pullups	45	Green Band (30% assist)
Time (min:sec)	10:52	
Time (sec)	652	
Avg Power	53.00341737	ft-lbs/sec

Fight Gone Bad (Pre)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	111305	ft-lbs
FGB_Power	109.1226	ft-lbs/s

Fight Gone Bad (Post)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	117805.735	ft-lbs
FGB_Power	115.4958186	ft-lbs/s

Round 1				
Wall Ball	9	WMB1	14	
Push Press	13	WPP1	75	
SDHP	6	WSDHP1	75	
Box Jump	8	H_Jump1	2	
Row	8			
Round 2				
Wall Ball	12	WMB2	14	
Push Press	13	WPP2	75	
SDHP	6	WSDHP2	75	
Box Jump	5	H_Jump2	2	
Row	10			
Round 3				
Wall Ball	10	WMB3	14	
Push Press	13	WPP3	75	
SDHP	7	WSDHP3	75	
Box Jump	5	H_Jump3	2	
Row	9			
FGB_Total_Score	134			
Work_WB1	3130.02	ft-lbs		
Work_PP1	2193.75	ft-lbs		
Work_SDHP1	1023.84	ft-lbs		
Work_Jump1	3280	ft-lbs		
Work_Row1	24704.2	ft-lbs		
Work_WB2	4173.36	ft-lbs		
Work_PP2	2193.75	ft-lbs		
Work_SDHP2	1023.84	ft-lbs		
Work_Jump2	2050	ft-lbs		
Work_Row2	30880.25	ft-lbs		
Work_WB3	3477.8	ft-lbs		
Work_PP3	2193.75	ft-lbs		
Work_SDHP3	1138.23	ft-lbs		
Work_Jump3	2050	ft-lbs		
Work_Row3	27792.23	ft-lbs		

Round 1				
Wall Ball	17	WMB1	20	
Push Press	10	WPP1	75	
SDHP	8	WSDHP1	75	
Box Jump	11	H_Jump1	2	
Row	9			
Round 2				
Wall Ball	12	WMB2	20	
Push Press	7	WPP2	75	
SDHP	9	WSDHP2	75	
Box Jump	10	H_Jump2	2	
Row	9			
Round 3				
Wall Ball	11	WMB3	20	
Push Press	7	WPP3	75	
SDHP	7	WSDHP3	75	
Box Jump	10	H_Jump3	2	
Row	9			
	146			
Work_WB1	5912.26	ft-lbs		
Work_PP1	1687.5	ft-lbs		
Work_SDHP1	1252.62	ft-lbs		
Work_Jump1	4510	ft-lbs		
Work_Row1	27792.225	ft-lbs		
Work_WB2	4173.36	ft-lbs		
Work_PP2	1181.25	ft-lbs		
Work_SDHP2	1367.01	ft-lbs		
Work_Jump2	4100	ft-lbs		
Work_Row2	27792.225	ft-lbs		
Work_WB3	3825.58	ft-lbs		
Work_PP3	1181.25	ft-lbs		
Work_SDHP3	1138.23	ft-lbs		
Work_Jump3	4100	ft-lbs		
Work_Row3	27792.225	ft-lbs		

CFT (Pre)

Back Squat	145	lbs
Shoulder Press	95	lbs
Deadlift	165	lbs
Work_Squat	217.5	ft-lbs
P_Squat	87	ft-lbs/sec
Work_Sh Press	213.75	ft-lbs
P_Sh Press	85.5	ft-lbs/sec
Work_Deadlift	288.75	ft-lbs
P_Deadlift	115.5	ft-lbs/sec
P_CFT	288	ft-lbs/sec

CFT (Post)

Back Squat	175	lbs
Shoulder Press	100	lbs
Deadlift	215	lbs
Work_Squat	262.5	ft-lbs
P_Squat	105	ft-lbs/sec
Work_Sh Press	225.00	ft-lbs
P_Sh Press	90.00	ft-lbs/sec
Work_Deadlift	376.25	ft-lbs
P_Deadlift	150.5	ft-lbs/sec
P_CFT	345.5	ft-lbs/sec

Athlete 7 (Male)

Variables			Estimates	Formula
BW	192	lbs		
H	5.75	ft		
SOD	1	ft	SOH-SOD=	0.260869565217391 *H
SOH	2.5	ft	OHH-SHH=	0.375 *H
SHH	5.03125	ft	OHH-H=	0.25 *H
OHH	7.1875	ft	OHH-DLH=	0.815217391304348 *H
DLH	2.5	ft	SHH-BHH=	0.744565217391304 *H
BBH	0.75	ft	OHH-BHH=	1.1195652173913 *H
WBB Thr	95	lbs	DLH-BHH=	0.304347826 *H
WBB FGB	75	lbs	SHH-SOH+SOD=	0.614130435 *H
P SO	0.744		H-DLH=	0.565217391 *H
P PULL	0.915			
P_D	0.915			
P_PUSH	0.65			
WBH	10	ft		
BOXH	2	ft		
H-PUSH	0.15	% of Height		
kCal_ftLb_Conv	3088.025			

Thruster	(P SO*BW)*(SOH-SOD) + WBB*((SOH-SOD)+(OHH-SHH))		
	561.61575 ft-lbs	25272.70875	42319.15875
Pull-up	(P_PULL*BW)*(OHH-SHH)		
	378.81 ft-lbs	17046.45	
Wall Ball Shot	(P_SQ*BW)*(SQH-SQD) + WMB*(WBH-(SHH-(SQH-SQD)))		
Push Press	WBB*(OHH-SHH)		
SDHP	(P SO*BW)*((SOH-SOD)/2) +		
Box Jump	BW*BOXH		
Row	Row_Cal * kCal_ftlb_Conv		

Army Push-Ups

		Assumptions:
Reps	72	H_Push = .15% of Height
Time	120	P_PUSH = .73 * BW (Men); .65 (Women)
AVG Power	64.58	ft-lbs/s
Work	7750.08	ft-lbs

Army Push-Ups (post)

		Assumptions:
Reps	87	H_Push = .15% of Height
Time	120	P_PUSH = .73 * BW (Men); .65 (Women)
AVG Power	78.04	ft-lbs/s
Work	9364.68	ft-lbs

FRAN (Pre)

Thruster Reps	45	
Pullups	45	
Time (min:sec)	11:14	
Time (sec)	674	
Avg Power	62.78807	ft-lbs/sec

FRAN (Post)

Thruster Reps	45	
Pullups	45	
Time (min:sec)	8:33	
Time (sec)	513	
Avg Power	82.49348684	ft-lbs/sec

Fight Gone Bad (Pre)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	105513.3	ft-lbs
FGB_Power	103.4444	ft-lbs/s

Fight Gone Bad (Post)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	173891.6025	ft-lbs
FGB_Power	170.4819632	ft-lbs/s

Round 1				
Wall Ball	21	WMB1	20	
Push Press	13	WPP1	75	
SDHP	11	WSDHP1	75	
Box Jump	11	H_Jump1	2	
Row	7			
Round 2				
Wall Ball	14	WMB2	20	
Push Press	12	WPP2	75	
SDHP	9	WSDHP2	75	
Box Jump	11	H_Jump2	2	
Row	6			
Round 3				
Wall Ball	17	WMB3	20	
Push Press	12	WPP3	75	
SDHP	8	WSDHP3	75	
Box Jump	14	H_Jump3	2	
Row	7			
FGB_Total_Score	173			

Work_WB1	8069.712	ft-lbs
Work_PP1	2102.344	ft-lbs
Work_SDHP1	1499.59	ft-lbs
Work_Jump1	4224	ft-lbs
Work_Row1	21616.18	ft-lbs
Work_WB2	5379.808	ft-lbs
Work_PP2	1940.625	ft-lbs
Work_SDHP2	1285.318	ft-lbs
Work_Jump2	4224	ft-lbs
Work_Row2	18528.15	ft-lbs
Work_WB3	6532.624	ft-lbs
Work_PP3	1940.625	ft-lbs
Work_SDHP3	1178.182	ft-lbs
Work_Jump3	5376	ft-lbs
Work_Row3	21616.18	ft-lbs

Round 1				
Wall Ball	23	WMB1	20	
Push Press	15	WPP1	75	
SDHP	17	WSDHP1	75	
Box Jump	17	H_Jump1	2	
Row	16			
Round 2				
Wall Ball	19	WMB2	20	
Push Press	15	WPP2	75	
SDHP	15	WSDHP2	75	
Box Jump	15	H_Jump2	2	
Row	13			
Round 3				
Wall Ball	18	WMB3	20	
Push Press	13	WPP3	75	
SDHP	13	WSDHP3	75	
Box Jump	14	H_Jump3	2	
Row	10			
	233			

Work_WB1	8838.256	ft-lbs
Work_PP1	2425.78125	ft-lbs
Work_SDHP1	2142.40575	ft-lbs
Work_Jump1	6528	ft-lbs
Work_Row1	49408.4	ft-lbs
Work_WB2	7301.168	ft-lbs
Work_PP2	2425.78125	ft-lbs
Work_SDHP2	1928.13375	ft-lbs
Work_Jump2	5760	ft-lbs
Work_Row2	40144.325	ft-lbs
Work_WB3	6916.896	ft-lbs
Work_PP3	2102.34375	ft-lbs
Work_SDHP3	1713.86175	ft-lbs
Work_Jump3	5376	ft-lbs
Work_Row3	30880.25	ft-lbs

CFT (Pre)

Back Squat	235	lbs
Shoulder Press	135	lbs
Deadlift	225	lbs
Work_Squat	352.5	ft-lbs
P_Squat	141	ft-lbs/sec
Work_Sh Press	291.0938	ft-lbs
P_Sh Press	116.4375	ft-lbs/sec
Work_Deadlift	393.75	ft-lbs
P_Deadlift	157.5	ft-lbs/sec
P_CFT	414.9375	ft-lbs/sec

CFT (Post)

Back Squat	265	lbs
Shoulder Press	155	lbs
Deadlift	295	lbs
Work_Squat	397.5	ft-lbs
P_Squat	159	ft-lbs/sec
Work_Sh Press	334.22	ft-lbs
P_Sh Press	133.69	ft-lbs/sec
Work_Deadlift	516.25	ft-lbs
P_Deadlift	206.5	ft-lbs/sec
P_CFT	499.1875	ft-lbs/sec

Athlete 8 (Male)

Variables			Estimates	Formula
BW	217	lbs		
H	6.1667	ft		
SOD	1	ft	SOH-SOD=	0.243241928422009 *H
SOH	2.5	ft	OHH-SHH=	0.375 *H
SHH	5.395863	ft	OHH-H=	0.25 *H
OHH	7.708375	ft	OHH-DLH=	0.844596785963319 *H
DLH	2.5	ft	SHH-BHH=	0.753379035788996 *H
BBH	0.75	ft	OHH-BHH=	1.128379035789 *H
WBB Thr	95	lbs	DLH-BHH=	0.28378225 *H
WBB FGB	75	lbs	SHH-SOH+SOD=	0.631758072 *H
P SO	0.744		H-DLH=	0.594596786 *H
P PULL	0.915			
P_D	0.915			
P_PUSH	0.65			
WBH	10	ft		
BOXH	2	ft		
H-PUSH	0.15	% of Height		
kCal_ftLb_Conv	3088.025			

		Pre			
Thruster	(P SO*BW)*(SOH-SOD) + WBB*((SOH-SOD)+(OHH-SHH))				Post
	604.3606875 ft-lbs	13109.40169	27196.23094	43726.02404	Post
Pull-up	(P_PULL*BW)*(OHH-SHH)				
	459.1609194 ft-lbs	15703.30344	16529.7931	28812.70513	Pre
Wall Ball Shot	(P_SQ*BW)*(SQH-SQD) + WMB*(WBH-(SHH-(SQH-SQD)))				
Push Press	WBB*(OHH-SHH)				
SDHP	(P SO*BW)*((SOH-SOD)/2) +				
Box Jump	BW*BOXH				
Row	Row_Cal * kCal_ftlb_Conv				

Army Push-Ups

		Assumptions:
Reps	61	H_Push = .15% of Height
Time	120	P_PUSH = .73 * BW (Men); .65 (Women)
AVG Power	66.32	ft-lbs/s
Work	7958.789	ft-lbs

Army Push-Ups (post)

		Assumptions:
Reps	69	H_Push = .15% of Height
Time	120	P_PUSH = .73 * BW (Men); .65 (Women)
AVG Power	75.02	ft-lbs/s
Work	9002.564912	ft-lbs

FRAN (Pre)

Thruster Reps	45	75#
Pullups	45	Blue-18, 3 j.pulls, Green 24
Time (min:sec)	13:28	
Time (sec)	814	
Avg Power	35.39644	ft-lbs/sec

FRAN (Post)

Thruster Reps	45	
Pullups	45	Blue Band (20% assist)
Time (min:sec)	13:16	
Time (sec)	796	
Avg Power	54.932191	ft-lbs/sec

Fight Gone Bad (Pre)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	160556.8	ft-lbs
FGB_Power	157.4087	ft-lbs/s

Fight Gone Bad (Post)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	143373.9604	ft-lbs
FGB_Power	140.5627063	ft-lbs/s

Round 1				
Wall Ball	17	WMB1	14	
Push Press	17	WPP1	45	
SDHP	11	WSDHP1	75	
Box Jump	12	H_Jump1	2	
Row	14			
Round 2				
Wall Ball	13	WMB2	14	
Push Press	11	WPP2	45	
SDHP	7	WSDHP2	75	
Box Jump	8	H_Jump2	2	
Row	14			
Round 3				
Wall Ball	11	WMB3	14	
Push Press	10	WPP3	45	
SDHP	6	WSDHP3	75	
Box Jump	13	H_Jump3	2	
Row	12			
FGB_Total_Score	176			
Work_WB1	6139.924	ft-lbs		
Work_PP1	1769.072	ft-lbs		
Work_SDHP1	1680.386	ft-lbs		
Work_Jump1	5208	ft-lbs		
Work_Row1	43232.35	ft-lbs		
Work_WB2	4695.236	ft-lbs		
Work_PP2	1144.694	ft-lbs		
Work_SDHP2	1196.042	ft-lbs		
Work_Jump2	3472	ft-lbs		
Work_Row2	43232.35	ft-lbs		
Work_WB3	3972.892	ft-lbs		
Work_PP3	1040.631	ft-lbs		
Work_SDHP3	1074.956	ft-lbs		
Work_Jump3	5642	ft-lbs		
Work_Row3	37056.3	ft-lbs		

Round 1				
Wall Ball	26	WMB1	20	
Push Press	15	WPP1	75	
SDHP	15	WSDHP1	75	
Box Jump	18	H_Jump1	2	
Row	9			
Round 2				
Wall Ball	15	WMB2	20	
Push Press	11	WPP2	75	
SDHP	11	WSDHP2	75	
Box Jump	13	H_Jump2	2	
Row	10			
Round 3				
Wall Ball	13	WMB3	20	
Push Press	12	WPP3	75	
SDHP	11	WSDHP3	75	
Box Jump	12	H_Jump3	2	
Row	12			
	203			
Work_WB1	9390.472	ft-lbs		
Work_PP1	1560.945938	ft-lbs		
Work_SDHP1	2164.729688	ft-lbs		
Work_Jump1	7812	ft-lbs		
Work_Row1	27792.225	ft-lbs		
Work_WB2	5417.58	ft-lbs		
Work_PP2	1144.693688	ft-lbs		
Work_SDHP2	1680.385688	ft-lbs		
Work_Jump2	5642	ft-lbs		
Work_Row2	30880.25	ft-lbs		
Work_WB3	4695.236	ft-lbs		
Work_PP3	1248.75675	ft-lbs		
Work_SDHP3	1680.385688	ft-lbs		
Work_Jump3	5208	ft-lbs		
Work_Row3	37056.3	ft-lbs		

CFT (Pre)

Back Squat	205	lbs
Shoulder Press	115	lbs
Deadlift	185	lbs
Work_Squat	307.5	ft-lbs
P_Squat	123	ft-lbs/sec
Work_Sh Press	265.9389	ft-lbs
P_Sh Press	106.3756	ft-lbs/sec
Work_Deadlift	323.75	ft-lbs
P_Deadlift	129.5	ft-lbs/sec
P_CFT	358.8756	ft-lbs/sec

CFT (Post)

Back Squat	235	lbs
Shoulder Press	145	lbs
Deadlift	235	lbs
Work_Squat	352.5	ft-lbs
P_Squat	141	ft-lbs/sec
Work_Sh Press	335.31	ft-lbs
P_Sh Press	134.13	ft-lbs/sec
Work_Deadlift	411.25	ft-lbs
P_Deadlift	164.5	ft-lbs/sec
P_CFT	439.625725	ft-lbs/sec

Athlete 9 (Female)

Variables			Estimates	Formula
BW	138	lbs		
H	5.41667	ft		
SOD	1	ft	SOH-SOD=	0.276922906508981 *H
SOH	2.5	ft	OHH-SHH=	0.375 *H
SHH	4.739586	ft	OHH-H=	0.25 *H
OHH	6.770838	ft	OHH-DLH=	0.788461822485032 *H
DLH	2.5	ft	SHH-BHH=	0.73653854674551 *H
BBH	0.75	ft	OHH-BHH=	1.11153854674551 *H
WBB Thr	65	lbs	DLH-BHH=	0.323076724 *H
WBB FGB	55	lbs	SHH-SOH+SOD=	0.598077093 *H
P SO	0.744		H-DLH=	0.538461822 *H
P PULL	0.915			
P_D	0.915			
P_PUSH	0.65			
WBH	8	ft		
BOXH	2	ft		
H-PUSH	0.15	% of Height		
kCal_ftLb_Conv	3088.025			

Thruster	(P SQ*BW)*(SOH-SOD) + WBB*((SOH-SOD)+(OHH-SHH))	Pre		Post	
	383.5393313 ft-lbs		7304.791781	9789.425606	21331.2999 Post
Pull-up	(P_PULL*BW)*(OHH-SHH)				
	256.4860953 ft-lbs		10002.95772	11541.87429	17307.7495 Pre
Wall Ball Shot	(P_SQ*BW)*(SQH-SQD) + WMB*(WBH-(SHH-(SQH-SQD)))				
Push Press	WBB*(OHH-SHH)				
SDHP	(P SQ*BW)*((SOH-SOD)/2) +				
Box Jump	BW*BOXH				
Row	Row_Cal * kCal_ftlb_Conv				

Army Push-Ups

		Assumptions:
Reps	60	H_Push = .15% of Height
Time	120	P_PUSH = .73 * BW (Men); .65 (Women)
AVG Power	36.44	ft-lbs/s
Work	4372.878	ft-lbs

Army Push-Ups (post)

		Assumptions:
Reps	69	H_Push = .15% of Height
Time	120	P_PUSH = .73 * BW (Men); .65 (Women)
AVG Power	41.91	ft-lbs/s
Work	5028.809345	ft-lbs

FRAN (Pre)

Thruster Reps	45	45#
Pullups	45	Blue-30, j.pulls-15
Time (min:sec)	7:08	
Time (sec)	428	
Avg Power	40.43867	ft-lbs/sec

FRAN (Post)

Thruster Reps	45	65#-1st rd, 55#2d,3d Rd
Pullups	45	
Time (min:sec)	10:38	
Time (sec)	638	
Avg Power	33.43463934	ft-lbs/sec

Fight Gone Bad (Pre)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	110046.5	ft-lbs
FGB_Power	107.8888	ft-lbs/s

Fight Gone Bad (Post)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	122659.0826	ft-lbs
FGB_Power	120.2540025	ft-lbs/s

Round 1			
Wall Ball	22	WMB1	14
Push Press	14	WPP1	55
SDHP	11	WSDHP1	55
Box Jump	10	H_Jump1	2
Row	8		
Round 2			
Wall Ball	18	WMB2	14
Push Press	10	WPP2	55
SDHP	13	WSDHP2	55
Box Jump	11	H_Jump2	2
Row	10		
Round 3			
Wall Ball	17	WMB3	14
Push Press	8	WPP3	55
SDHP	15	WSDHP3	55
Box Jump	10	H_Jump3	2
Row	8		
FGB_Total_Score	185		

Work_WB1	5390.176	ft-lbs
Work_PP1	1564.063	ft-lbs
Work_SDHP1	1066.471	ft-lbs
Work_Jump1	2760	ft-lbs
Work_Row1	24704.2	ft-lbs
Work_WB2	4410.144	ft-lbs
Work_PP2	1117.188	ft-lbs
Work_SDHP2	1220.479	ft-lbs
Work_Jump2	3036	ft-lbs
Work_Row2	30880.25	ft-lbs
Work_WB3	4165.136	ft-lbs
Work_PP3	893.7506	ft-lbs
Work_SDHP3	1374.487	ft-lbs
Work_Jump3	2760	ft-lbs
Work_Row3	24704.2	ft-lbs

Round 1			
Wall Ball	22	WMB1	14
Push Press	13	WPP1	45
SDHP	13	WSDHP1	45
Box Jump	13	H_Jump1	2
Row	11		
Round 2			
Wall Ball	20	WMB2	14
Push Press	11	WPP2	45
SDHP	12	WSDHP2	45
Box Jump	13	H_Jump2	2
Row	9		
Round 3			
Wall Ball	20	WMB3	14
Push Press	10	WPP3	45
SDHP	10	WSDHP3	45
Box Jump	13	H_Jump3	2
Row	9		
	199		

Work_WB1	5390.176	ft-lbs
Work_PP1	1452.344644	ft-lbs
Work_SDHP1	1220.479244	ft-lbs
Work_Jump1	3588	ft-lbs
Work_Row1	33968.275	ft-lbs
Work_WB2	4900.16	ft-lbs
Work_PP2	1228.907006	ft-lbs
Work_SDHP2	1143.475244	ft-lbs
Work_Jump2	3588	ft-lbs
Work_Row2	27792.225	ft-lbs
Work_WB3	4900.16	ft-lbs
Work_PP3	1117.188188	ft-lbs
Work_SDHP3	989.4672438	ft-lbs
Work_Jump3	3588	ft-lbs
Work_Row3	27792.225	ft-lbs

CFT (Pre)

Back Squat	125	lbs
Shoulder Press	85	lbs
Deadlift	185	lbs
Work_Squat	187.5	ft-lbs
P_Squat	75	ft-lbs/sec
Work_Sh Press	172.6564	ft-lbs
P_Sh Press	69.06254	ft-lbs/sec
Work_Deadlift	323.75	ft-lbs
P_Deadlift	129.5	ft-lbs/sec
P_CFT	273.5625	ft-lbs/sec

CFT (Post)

Back Squat	165	lbs
Shoulder Press	95	lbs
Deadlift	245	lbs
Work_Squat	247.5	ft-lbs
P_Squat	99	ft-lbs/sec
Work_Sh Press	192.97	ft-lbs
P_Sh Press	77.19	ft-lbs/sec
Work_Deadlift	428.75	ft-lbs
P_Deadlift	171.5	ft-lbs/sec
P_CFT	347.6875475	ft-lbs/sec

Athlete 10 (Male)

Variables			Estimates		Formula
BW	183	lbs			
H	5.833	ft			
SOD	1	ft	SOH-SOD=	0.257157551860106	*H
SOH	2.5	ft	OHH-SHH=	0.375	*H
SHH	5.103875	ft	OHH-H=	0.25	*H
OHH	7.29125	ft	OHH-DLH=	0.821404080233156	*H
DLH	2.5	ft	SHH-BHH=	0.746421224069947	*H
BBH	0.75	ft	OHH-BHH=	1.12142122406995	*H
WBB Thr	95	lbs	DLH-BHH=	0.300017144	*H
WBB FGB	75	lbs	SHH-SOH+SOD=	0.617842448	*H
P SO	0.744		H-DLH=	0.57140408	*H
P PULL	0.915				
P_D	0.915				
P_PUSH	0.65				
WBH	10	ft			
BOXH	2	ft			
H-PUSH	0.15	% of Height			
kCal_ftLb_Conv	3088.025				

Thruster	(P SO*BW)*(SOH-SOD) + WBB*((SOH-SOD)+(OHH-SHH))		
	554.528625 ft-lbs	24953.78813	41435.71343
Pull-up	(P_PULL*BW)*(OHH-SHH)		
	366.2650069 ft-lbs	16481.92531	
Wall Ball Shot	(P_SQ*BW)*(SQH-SQD) + WMB*(WBH-(SHH-(SQH-SQD)))		
Push Press	WBB*(OHH-SHH)		
SDHP	(P SO*BW)*((SOH-SOD)/2) +		
Box Jump	BW*BOXH		
Row	Row_Cal * kCal_ftlb_Conv		

Army Push-Ups

		Assumptions:
Reps	79	H_Push = .15% of Height
Time	120	P_PUSH = .73 * BW (Men); .65 (Women)
AVG Power	68.52	ft-lbs/s
Work	8221.949	ft-lbs

Army Push-Ups (post)

		Assumptions:
Reps	73	H_Push = .15% of Height
Time	120	P_PUSH = .73 * BW (Men); .65 (Women)
AVG Power	63.31	ft-lbs/s
Work	7597.497083	ft-lbs

FRAN (Pre)

Thruster Reps	45	
Pullups	45	
Time (min:sec)	7:11	
Time (sec)	431	
Avg Power	96.13855	ft-lbs/sec

FRAN (Post)

Thruster Reps	45	
Pullups	45	
Time (min:sec)	5:31	
Time (sec)	331	
Avg Power	125.1834243	ft-lbs/sec

Fight Gone Bad (Pre)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	228735.3	ft-lbs
FGB_Power	224.2503	ft-lbs/s

Fight Gone Bad (Post)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	231025.0661	ft-lbs
FGB_Power	226.4951629	ft-lbs/s

Round 1			
Wall Ball	15	WMB1	20
Push Press	21	WPP1	75
SDHP	17	WSDHP1	75
Box Jump	37	H_Jump1	2
Row	18		
Round 2			
Wall Ball	11	WMB2	20
Push Press	18	WPP2	75
SDHP	15	WSDHP2	75
Box Jump	26	H_Jump2	2
Row	18		
Round 3			
Wall Ball	9	WMB3	20
Push Press	21	WPP3	75
SDHP	13	WSDHP3	75
Box Jump	20	H_Jump3	2
Row	19		
FGB_Total_Score	278		

Work_WB1	5613.42	ft-lbs
Work_PP1	3445.116	ft-lbs
Work_SDHP1	2062.479	ft-lbs
Work_Jump1	13542	ft-lbs
Work_Row1	55584.45	ft-lbs
Work_WB2	4116.508	ft-lbs
Work_PP2	2952.956	ft-lbs
Work_SDHP2	1858.251	ft-lbs
Work_Jump2	9516	ft-lbs
Work_Row2	55584.45	ft-lbs
Work_WB3	3368.052	ft-lbs
Work_PP3	3445.116	ft-lbs
Work_SDHP3	1654.023	ft-lbs
Work_Jump3	7320	ft-lbs
Work_Row3	58672.48	ft-lbs

Round 1			
Wall Ball	16	WMB1	20
Push Press	30	WPP1	75
SDHP	20	WSDHP1	75
Box Jump	32	H_Jump1	2
Row	19		
Round 2			
Wall Ball	12	WMB2	20
Push Press	24	WPP2	75
SDHP	21	WSDHP2	75
Box Jump	29	H_Jump2	2
Row	17		
Round 3			
Wall Ball	12	WMB3	20
Push Press	20	WPP3	75
SDHP	21	WSDHP3	75
Box Jump	29	H_Jump3	2
Row	17		
	319		

Work_WB1	5987.648	ft-lbs
Work_PP1	4921.59375	ft-lbs
Work_SDHP1	2368.820625	ft-lbs
Work_Jump1	11712	ft-lbs
Work_Row1	58672.475	ft-lbs
Work_WB2	4490.736	ft-lbs
Work_PP2	3937.275	ft-lbs
Work_SDHP2	2470.934625	ft-lbs
Work_Jump2	10614	ft-lbs
Work_Row2	52496.425	ft-lbs
Work_WB3	4490.736	ft-lbs
Work_PP3	3281.0625	ft-lbs
Work_SDHP3	2470.934625	ft-lbs
Work_Jump3	10614	ft-lbs
Work_Row3	52496.425	ft-lbs

CFT (Pre)

Back Squat	235	lbs
Shoulder Press	145	lbs
Deadlift	295	lbs
Work_Squat	352.5	ft-lbs
P_Squat	141	ft-lbs/sec
Work_Sh Press	317.1694	ft-lbs
P_Sh Press	126.8678	ft-lbs/sec
Work_Deadlift	516.25	ft-lbs
P_Deadlift	206.5	ft-lbs/sec
P_CFT	474.3678	ft-lbs/sec

CFT (Post)

Back Squat	265	lbs
Shoulder Press	155	lbs
Deadlift	325	lbs
Work_Squat	397.5	ft-lbs
P_Squat	159	ft-lbs/sec
Work_Sh Press	339.04	ft-lbs
P_Sh Press	135.62	ft-lbs/sec
Work_Deadlift	568.75	ft-lbs
P_Deadlift	227.5	ft-lbs/sec
P_CFT	522.11725	ft-lbs/sec

Athlete 11 (Male)

Variables			Estimates	Formula
BW	184	lbs		
H	5.75	ft		
SOD	1	ft	SOH-SOD=	0.260869565217391 *H
SOH	2.5	ft	OHH-SHH=	0.375 *H
SHH	5.03125	ft	OHH-H=	0.25 *H
OHH	7.1875	ft	OHH-DLH=	0.815217391304348 *H
DLH	2.5	ft	SHH-BHH=	0.744565217391304 *H
BBH	0.75	ft	OHH-BHH=	1.1195652173913 *H
WBB Thr	95	lbs	DLH-BHH=	0.304347826 *H
WBB FGB	75	lbs	SHH-SOH+SOD=	0.614130435 *H
P SO	0.744		H-DLH=	0.565217391 *H
P PULL	0.915			
P_D	0.915			
P_PUSH	0.65			
WBH	10	ft		
BOXH	2	ft		
H-PUSH	0.15	% of Height		
kCal_ftLb_Conv	3088.025			

		Pre			Post
Thruster	(P SO*BW)*(SOH-SOD) + WBB*((SOH-SOD)+(OHH-SHH))				
	552.68775 ft-lbs	12421.46925	15492.71925	26928.04613	Post
Pull-up	(P_PULL*BW)*(OHH-SHH)				
	363.02625 ft-lbs	11435.32688	11435.32688	23856.79613	Pre
Wall Ball Shot	(P_SQ*BW)*(SQH-SQD) + WMB*(WBH-(SHH-(SQH-SQD)))				
Push Press	WBB*(OHH-SHH)				
SDHP	(P SO*BW)*((SOH-SOD)/2) +				
Box Jump	BW*BOXH				
Row	Row_Cal * kCal_ftlb_Conv				

Army Push-Ups

		Assumptions:
Reps	63	H_Push = .15% of Height
Time	120	P_PUSH = .73 * BW (Men); .65 (Women)
AVG Power	54.16	ft-lbs/s
Work	6498.765	ft-lbs

Army Push-Ups (post)

		Assumptions:
Reps	70	H_Push = .15% of Height
Time	120	P_PUSH = .73 * BW (Men); .65 (Women)
AVG Power	60.17	ft-lbs/s
Work	7220.85	ft-lbs

FRAN (Pre)

Thruster Reps	45	75#-36, 65#-9
Pullups	45	Green Band 30% assist
Time (min:sec)	11:42	
Time (sec)	702	
Avg Power	33.98404	ft-lbs/sec

FRAN (Post)

Thruster Reps	45	95#-30, 85#-15
Pullups	45	Green Band 30% assist
Time (min:sec)	10:40	
Time (sec)	640	
Avg Power	42.07507207	ft-lbs/sec

Fight Gone Bad (Pre)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	122895.4	ft-lbs
FGB_Power	120.4857	ft-lbs/s

Fight Gone Bad (Post)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	197035.585	ft-lbs
FGB_Power	193.1721422	ft-lbs/s

Round 1				
Wall Ball	10	WMB1	20	
Push Press	18	WPP1	75	
SDHP	13	WSDHP1	75	
Box Jump	10	H_Jump1	2	
Row	12			
Round 2				
Wall Ball	12	WMB2	14	
Push Press	15	WPP2	75	
SDHP	13	WSDHP2	45	
Box Jump	8	H_Jump2	2	
Row	9			
Round 3				
Wall Ball	11	WMB3	14	
Push Press	12	WPP3	75	
SDHP	15	WSDHP3	45	
Box Jump	9	H_Jump3	2	
Row	8			
FGB_Total_Score	175			

Work_WB1	3753.44	ft-lbs
Work_PP1	2910.938	ft-lbs
Work_SDHP1	1655.83	ft-lbs
Work_Jump1	3680	ft-lbs
Work_Row1	37056.3	ft-lbs
Work_WB2	3892.128	ft-lbs
Work_PP2	2425.781	ft-lbs
Work_SDHP2	1527.392	ft-lbs
Work_Jump2	2944	ft-lbs
Work_Row2	27792.23	ft-lbs
Work_WB3	3567.784	ft-lbs
Work_PP3	1940.625	ft-lbs
Work_SDHP3	1732.736	ft-lbs
Work_Jump3	3312	ft-lbs
Work_Row3	24704.2	ft-lbs

Round 1				
Wall Ball	13	WMB1	20	
Push Press	17	WPP1	75	
SDHP	14	WSDHP1	75	
Box Jump	16	H_Jump1	2	
Row	18			
Round 2				
Wall Ball	11	WMB2	20	
Push Press	14	WPP2	75	
SDHP	12	WSDHP2	75	
Box Jump	16	H_Jump2	2	
Row	16			
Round 3				
Wall Ball	9	WMB3	20	
Push Press	14	WPP3	75	
SDHP	13	WSDHP3	75	
Box Jump	12	H_Jump3	2	
Row	17			
	212			

Work_WB1	4879.472	ft-lbs
Work_PP1	2749.21875	ft-lbs
Work_SDHP1	1758.50175	ft-lbs
Work_Jump1	5888	ft-lbs
Work_Row1	55584.45	ft-lbs
Work_WB2	3567.784	ft-lbs
Work_PP2	2264.0625	ft-lbs
Work_SDHP2	1424.72025	ft-lbs
Work_Jump2	5888	ft-lbs
Work_Row2	49408.4	ft-lbs
Work_WB3	2919.096	ft-lbs
Work_PP3	2264.0625	ft-lbs
Work_SDHP3	1527.39225	ft-lbs
Work_Jump3	4416	ft-lbs
Work_Row3	52496.425	ft-lbs

CFT (Pre)

Back Squat	175	lbs
Shoulder Press	105	lbs
Deadlift	155	lbs
Work_Squat	262.5	ft-lbs
P_Squat	105	ft-lbs/sec
Work_Sh Press	226.4063	ft-lbs
P_Sh Press	90.5625	ft-lbs/sec
Work_Deadlift	271.25	ft-lbs
P_Deadlift	108.5	ft-lbs/sec
P_CFT	304.0625	ft-lbs/sec

CFT (Post)

Back Squat	220	lbs
Shoulder Press	115	lbs
Deadlift	255	lbs
Work_Squat	330	ft-lbs
P_Squat	132	ft-lbs/sec
Work_Sh Press	247.97	ft-lbs
P_Sh Press	99.19	ft-lbs/sec
Work_Deadlift	446.25	ft-lbs
P_Deadlift	178.5	ft-lbs/sec
P_CFT	409.6875	ft-lbs/sec

Athlete 12 (Male)

Variables			Estimates	Formula
BW	195	lbs		
H	6.333	ft		
SOD	1	ft	SOH-SOD=	0.236854571293226 *H
SOH	2.5	ft	OHH-SHH=	0.375 *H
SHH	5.541375	ft	OHH-H=	0.25 *H
OHH	7.91625	ft	OHH-DLH=	0.855242381177957 *H
DLH	2.5	ft	SHH-BHH=	0.756572714353387 *H
BBH	0.75	ft	OHH-BHH=	1.13157271435339 *H
WBB Thr	95	lbs	DLH-BHH=	0.276330333 *H
WBB FGB	75	lbs	SHH-SOH+SOD=	0.638145429 *H
P SO	0.744		H-DLH=	0.605242381 *H
P PULL	0.915			
P_D	0.915			
P_PUSH	0.65			
WBH	10	ft		
BOXH	2	ft		
H-PUSH	0.15	% of Height		
kCal_ftLb_Conv	3088.025			

Thruster	(P SO*BW)*(SOH-SOD) + WBB*((SOH-SOD)+(OHH-SHH))		
	585.733125 ft-lbs	26357.99063	45426.15886
Pull-up	(P_PULL*BW)*(OHH-SHH)		
	423.7370719 ft-lbs	19068.16823	
Wall Ball Shot	(P_SQ*BW)*(SQH-SQD) + WMB*(WBH-(SHH-(SQH-SQD)))		
Push Press	WBB*(OHH-SHH)		
SDHP	(P SO*BW)*((SOH-SOD)/2) +		
Box Jump	BW*BOXH		
Row	Row_Cal * kCal_ftlb_Conv		

Army Push-Ups

		Assumptions:
Reps	81	H_Push = .15% of Height
Time	120	P_PUSH = .73 * BW (Men); .65 (Women)
AVG Power	81.27	ft-lbs/s
Work	9752.899	ft-lbs

Army Push-Ups (post)

		Assumptions:
Reps	84	H_Push = .15% of Height
Time	120	P_PUSH = .73 * BW (Men); .65 (Women)
AVG Power	84.28	ft-lbs/s
Work	10114.11765	ft-lbs

FRAN (Pre)

Thruster Reps	45	
Pullups	45	
Time (min:sec)	6:05	
Time (sec)	365	
Avg Power	124.4552	ft-lbs/sec

FRAN (Post)

Thruster Reps	45	
Pullups	45	
Time (min:sec)	5:25	
Time (sec)	325	
Avg Power	139.7727965	ft-lbs/sec

Fight Gone Bad (Pre)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	218427.6	ft-lbs
FGB_Power	214.1447	ft-lbs/s

Fight Gone Bad (Post)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	236888.8338	ft-lbs
FGB_Power	232.2439547	ft-lbs/s

Round 1				
Wall Ball	31	WMB1	20	
Push Press	21	WPP1	75	
SDHP	27	WSDHP1	75	
Box Jump	24	H_Jump1	2	
Row	18			
Round 2				
Wall Ball	21	WMB2	20	
Push Press	13	WPP2	75	
SDHP	20	WSDHP2	75	
Box Jump	17	H_Jump2	2	
Row	14			
Round 3				
Wall Ball	20	WMB3	20	
Push Press	13	WPP3	75	
SDHP	15	WSDHP3	75	
Box Jump	18	H_Jump3	2	
Row	17			
FGB_Total_Score	289			

Work_WB1	12016.22	ft-lbs
Work_PP1	3740.428	ft-lbs
Work_SDHP1	3297.223	ft-lbs
Work_Jump1	9360	ft-lbs
Work_Row1	55584.45	ft-lbs
Work_WB2	8140.02	ft-lbs
Work_PP2	2315.503	ft-lbs
Work_SDHP2	2535.553	ft-lbs
Work_Jump2	6630	ft-lbs
Work_Row2	43232.35	ft-lbs
Work_WB3	7752.4	ft-lbs
Work_PP3	2315.503	ft-lbs
Work_SDHP3	1991.503	ft-lbs
Work_Jump3	7020	ft-lbs
Work_Row3	52496.43	ft-lbs

Round 1				
Wall Ball	27	WMB1	20	
Push Press	26	WPP1	75	
SDHP	25	WSDHP1	75	
Box Jump	20	H_Jump1	2	
Row	20			
Round 2				
Wall Ball	20	WMB2	20	
Push Press	20	WPP2	75	
SDHP	20	WSDHP2	75	
Box Jump	17	H_Jump2	2	
Row	17			
Round 3				
Wall Ball	20	WMB3	20	
Push Press	25	WPP3	75	
SDHP	20	WSDHP3	75	
Box Jump	15	H_Jump3	2	
Row	18			
	310			

Work_WB1	10465.74	ft-lbs
Work_PP1	4631.00625	ft-lbs
Work_SDHP1	3079.603125	ft-lbs
Work_Jump1	7800	ft-lbs
Work_Row1	61760.5	ft-lbs
Work_WB2	7752.4	ft-lbs
Work_PP2	3562.3125	ft-lbs
Work_SDHP2	2535.553125	ft-lbs
Work_Jump2	6630	ft-lbs
Work_Row2	52496.425	ft-lbs
Work_WB3	7752.4	ft-lbs
Work_PP3	4452.890625	ft-lbs
Work_SDHP3	2535.553125	ft-lbs
Work_Jump3	5850	ft-lbs
Work_Row3	55584.45	ft-lbs

CFT (Pre)

Back Squat	255	lbs
Shoulder Press	145	lbs
Deadlift	305	lbs
Work_Squat	382.5	ft-lbs
P_Squat	153	ft-lbs/sec
Work_Sh Press	344.3569	ft-lbs
P_Sh Press	137.7428	ft-lbs/sec
Work_Deadlift	533.75	ft-lbs
P_Deadlift	213.5	ft-lbs/sec
P_CFT	504.2428	ft-lbs/sec

CFT (Post)

Back Squat	285	lbs
Shoulder Press	150	lbs
Deadlift	335	lbs
Work_Squat	427.5	ft-lbs
P_Squat	171	ft-lbs/sec
Work_Sh Press	356.23	ft-lbs
P_Sh Press	142.49	ft-lbs/sec
Work_Deadlift	586.25	ft-lbs
P_Deadlift	234.5	ft-lbs/sec
P_CFT	547.9925	ft-lbs/sec

Athlete 13 (Male)

Variables			Measurement Estimates	Formula		
BW	184	lbs				
H	5.83	ft				
SOD	1	ft	SOH-SOD=	0.257289879931389	*H	
SQH	2.5	ft	OHH-SHH=	0.375	*H	
SHH	5.10125	ft	OHH-H=	0.25	*H	
OHH	7.2875	ft	OHH-DLH=	0.821183533447684	*H	
DLH	2.5	ft	SHH-BHH=	0.746355060034305	*H	
BBH	0.75	ft	OHH-BHH=	1.12135506003431	*H	
WBB_Thr	95	lbs	DLH-BHH=	0.300171527	*H	
WBB_FGB	75	lbs	SHH-SOH+SOD=	0.61771012	*H	
P_SQ	0.744		H-DLH=	0.571183533	*H	
P_PULL	0.915					
P_D	0.915					
P_PUSH	0.65					
WBH	10	ft				
BOXH	2	ft				
H-PUSH	0.15	% of Height				
kCal_ftLb_Conv	3088.025					

Thruster	(P_SQ*BW)*(SQH-SOD) + WBB*((SQH-SOD)+(OHH-SHH))	555.53775 ft-lbs	24999.19875	41562.666
Pull-up	(P_PULL*BW)*(OHH-SHH)	368.07705 ft-lbs	16563.46725	
Wall Ball Shot	(P_SQ*BW)*(SQH-SOD) + WMB*(WBH-(SHH-(SQH-SOD)))			
Push Press	WBB*(OHH-SHH)			
SDHP	(P_SQ*BW)*((SQH-SQD)/2) + WBB*(SHH-BBH)			
Box Jump	BW*BOXH			
Row	Row_Cal * kCal_ftlb_Conv			

Army Push-Ups

Assumptions:

Reps	77	H_Push = .15% of Height
Time	120	P_PUSH = .73 * BW (Men); .65 (Women)
AVG Power	67.11	ft-lbs/s
Work	8053.445	ft-lbs

Army Push-Ups (post)

Assumptions:

Reps	64	H_Push = .15% of Height
Time	120	P_PUSH = .73 * BW (Men); .65 (Women)
AVG Power	55.78	ft-lbs/s
Work	6693.7728	ft-lbs

FRAN (Pre)

Thruster Reps	45	
Pullups	45	
Time (min:sec)	5:52	
Time (sec)	352	
Avg Power	118.0758	ft-lbs/sec

FRAN (Post)

Thruster Reps	45	
Pullups	45	
Time (min:sec)	4:57	
Time (sec)	297	
Avg Power	139.9416364	ft-lbs/sec

Fight Gone Bad (Pre)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	159532.8	ft-lbs
FGB_Power	156.4047	ft-lbs/s

Round 1			
Wall Ball	14	WMB1	20
Push Press	20	WPP1	75
SDHP	32	WSDHP1	75
Box Jump	19	H_Jump1	2
Row	9		
Round 2			
Wall Ball	9	WMB2	20
Push Press	21	WPP2	75
SDHP	22	WSDHP2	75
Box Jump	18	H_Jump2	2
Row	13		
Round 3			
Wall Ball	10	WMB3	20
Push Press	20	WPP3	75
SDHP	21	WSDHP3	75
Box Jump	10	H_Jump3	2
Row	14		
FGB_Total_Score	252		

Work_WB1	5254.816	ft-lbs
Work_PP1	3279.375	ft-lbs
Work_SDHP1	3611.848	ft-lbs
Work_Jump1	6992	ft-lbs
Work_Row1	27792.23	ft-lbs
Work_WB2	3378.096	ft-lbs
Work_PP2	3443.344	ft-lbs
Work_SDHP2	2585.128	ft-lbs
Work_Jump2	6624	ft-lbs
Work_Row2	40144.33	ft-lbs
Work_WB3	3753.44	ft-lbs
Work_PP3	3279.375	ft-lbs
Work_SDHP3	2482.456	ft-lbs
Work_Jump3	3680	ft-lbs
Work_Row3	43232.35	ft-lbs

Fight Gone Bad (Post)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	188416.475	ft-lbs
FGB_Power	184.7220343	ft-lbs/s

Round 1			
Wall Ball	15	WMB1	20
Push Press	25	WPP1	75
SDHP	21	WSDHP1	75
Box Jump	25	H_Jump1	2
Row	17		
Round 2			
Wall Ball	11	WMB2	20
Push Press	14	WPP2	75
SDHP	16	WSDHP2	75
Box Jump	20	H_Jump2	2
Row	14		
Round 3			
Wall Ball	10	WMB3	20
Push Press	14	WPP3	75
SDHP	16	WSDHP3	75
Box Jump	20	H_Jump3	2
Row	13		
	251		

Work_WB1	5630.16	ft-lbs
Work_PP1	4099.21875	ft-lbs
Work_SDHP1	2482.45575	ft-lbs
Work_Jump1	9200	ft-lbs
Work_Row1	52496.425	ft-lbs
Work_WB2	4128.784	ft-lbs
Work_PP2	2295.5625	ft-lbs
Work_SDHP2	1969.09575	ft-lbs
Work_Jump2	7360	ft-lbs
Work_Row2	43232.35	ft-lbs
Work_WB3	3753.44	ft-lbs
Work_PP3	2295.5625	ft-lbs
Work_SDHP3	1969.09575	ft-lbs
Work_Jump3	7360	ft-lbs
Work_Row3	40144.325	ft-lbs

CFT (Pre)

Back Squat	275	lbs
Shoulder Press	170	lbs
Deadlift	315	lbs
Work_Squat	412.5	ft-lbs
P_Squat	165	ft-lbs/sec
Work_Sh Press	371.6625	ft-lbs
P_Sh Press	148.665	ft-lbs/sec
Work_Deadlift	551.25	ft-lbs
P_Deadlift	220.5	ft-lbs/sec
P_CFT	534.165	ft-lbs/sec

CFT (Post)

Back Squat	300	lbs
Shoulder Press	185	lbs
Deadlift	405	lbs
Work_Squat	450	ft-lbs
P_Squat	180	ft-lbs/sec
Work_Sh Press	404.46	ft-lbs
P_Sh Press	161.78	ft-lbs/sec
Work_Deadlift	708.75	ft-lbs
P_Deadlift	283.5	ft-lbs/sec
P_CFT	625.2825	ft-lbs/sec

Athlete 14 (Male)

Variables			Measurement Estimates	Formula	
BW	220	lbs			
H	6	ft			
SOD	1	ft	SOH-SOD=	0.25	*H
SQH	2.5	ft	OHH-SHH=	0.375	*H
SHH	5.25	ft	OHH-H=	0.25	*H
OHH	7.5	ft	OHH-DLH=	0.833333333333333	*H
DLH	2.5	ft	SHH-BHH=	0.75	*H
BBH	0.75	ft	OHH-BHH=	1.125	*H
WBB_Thr	95	lbs	DLH-BHH=	0.291666667	*H
WBB_FGB	75	lbs	SHH-SOH+SOD=	0.625	*H
P_SQ	0.744		H-DLH=	0.583333333	*H
P_PULL	0.915				
P_D	0.915				
P_PUSH	0.65				
WBH	10	ft			
BOXH	2	ft			
H-PUSH	0.15	% of Height			
kCal_ftLb_Conv	3088.025				

Thruster	(P_SQ*BW)*(SQH-SOD) + WBB*((SQH-SOD)+(OHH-SHH))	Pre	14834.79	27079.65	41346.7875 Post
	601.77 ft-lbs				
Pull-up	(P_PULL*BW)*(OHH-SHH)				
	452.925 ft-lbs		19566.36	14267.1375	34401.15 Pre
Wall Ball Shot	(P_SQ*BW)*(SQH-SOD) + WMB*(WBH-(SHH-(SQH-SOD)))				
Push Press	WBB*(OHH-SHH)				
SDHP	(P_SQ*BW)*((SQH-SQD)/2) + WBB*(SHH-BBH)				
Box Jump	BW*BOXH				
Row	Row_Cal * kCal_ftlb_Conv				

Army Push-Ups

		Assumptions:
Reps	60	H_Push = .15% of Height
Time	120	P_PUSH = .73 * BW (Men); .65 (Women)
AVG Power	64.35	ft-lbs/s
Work	7722	ft-lbs

Army Push-Ups (post)

		Assumptions:
Reps	59	H_Push = .15% of Height
Time	120	P_PUSH = .73 * BW (Men); .65 (Women)
AVG Power	63.28	ft-lbs/s
Work	7593.3	ft-lbs

FRAN (Pre)

Thruster Reps	45	95#-30, 65#-15
Pullups	45	Blue-9, j.pulls-36
Time (min:sec)	12:18	
Time (sec)	738	
Avg Power	56.02546	ft-lbs/sec

FRAN (Post)

Thruster Reps	45	
Pullups	45	Green Band 30% assist
Time (min:sec)	15:41	
Time (sec)	941	
Avg Power	43.93920032	ft-lbs/sec

Fight Gone Bad (Pre)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	135763.1	ft-lbs
FGB_Power	133.1011	ft-lbs/s

Round 1				
Wall Ball	12	WMB1	20	
Push Press	13	WPP1	75	
SDHP	9	WSDHP1	75	
Box Jump	10	H_Jump1	2	
Row	12			
Round 2				
Wall Ball	8	WMB2	20	
Push Press	9	WPP2	45	
SDHP	7	WSDHP2	75	
Box Jump	11	H_Jump2	2	
Row	11			
Round 3				
Wall Ball	10	WMB3	14	
Push Press	8	WPP3	45	
SDHP	4	WSDHP3	75	
Box Jump	12	H_Jump3	2	
Row	10			
FGB_Total_Score	146			

Work_WB1	4986.24	ft-lbs
Work_PP1	2193.75	ft-lbs
Work_SDHP1	1442.34	ft-lbs
Work_Jump1	4400	ft-lbs
Work_Row1	37056.3	ft-lbs
Work_WB2	3324.16	ft-lbs
Work_PP2	911.25	ft-lbs
Work_SDHP2	1196.82	ft-lbs
Work_Jump2	4840	ft-lbs
Work_Row2	33968.28	ft-lbs
Work_WB3	3645.2	ft-lbs
Work_PP3	810	ft-lbs
Work_SDHP3	828.54	ft-lbs
Work_Jump3	5280	ft-lbs
Work_Row3	30880.25	ft-lbs

Fight Gone Bad (Post)

Time (min:sec)	17:00	
Time (sec)	1020	
FGB_Total_Work	195503.23	ft-lbs
FGB_Power	191.6698333	ft-lbs/s

Round 1				
Wall Ball	10	WMB1	20	
Push Press	12	WPP1	75	
SDHP	17	WSDHP1	75	
Box Jump	13	H_Jump1	2	
Row	22			
Round 2				
Wall Ball	9	WMB2	20	
Push Press	12	WPP2	75	
SDHP	12	WSDHP2	75	
Box Jump	11	H_Jump2	2	
Row	16			
Round 3				
Wall Ball	7	WMB3	20	
Push Press	11	WPP3	75	
SDHP	12	WSDHP3	75	
Box Jump	8	H_Jump3	2	
Row	14			
	186			

Work_WB1	4155.2	ft-lbs
Work_PP1	2025	ft-lbs
Work_SDHP1	2424.42	ft-lbs
Work_Jump1	5720	ft-lbs
Work_Row1	67936.55	ft-lbs
Work_WB2	3739.68	ft-lbs
Work_PP2	1215	ft-lbs
Work_SDHP2	1810.62	ft-lbs
Work_Jump2	4840	ft-lbs
Work_Row2	49408.4	ft-lbs
Work_WB3	2551.64	ft-lbs
Work_PP3	1113.75	ft-lbs
Work_SDHP3	1810.62	ft-lbs
Work_Jump3	3520	ft-lbs
Work_Row3	43232.35	ft-lbs

CFT (Pre)

Back Squat	225	lbs
Shoulder Press	125	lbs
Deadlift	225	lbs
Work_Squat	337.5	ft-lbs
P_Squat	135	ft-lbs/sec
Work_Sh Press	281.25	ft-lbs
P_Sh Press	112.5	ft-lbs/sec
Work_Deadlift	393.75	ft-lbs
P_Deadlift	157.5	ft-lbs/sec
P_CFT	405	ft-lbs/sec

CFT (Post)

Back Squat	275	lbs
Shoulder Press	135	lbs
Deadlift	325	lbs
Work_Squat	412.5	ft-lbs
P_Squat	165	ft-lbs/sec
Work_Sh Press	303.75	ft-lbs
P_Sh Press	121.50	ft-lbs/sec
Work_Deadlift	568.75	ft-lbs
P_Deadlift	227.5	ft-lbs/sec
P_CFT	514	ft-lbs/sec