Functional Training Program Bridges Rehabilitation and Return to Duty

MAJ Donald L. Goss, DPT, OCS, ATC, CSCS; MAJ Greer E. Christopher, MSPT; SSG(P) Robert T. Faulk; COL Joe Moore, PT, PhD, SCS, ATC

Abstract

Traditional clinic-based rehabilitation programs often fall short of returning Soldiers to peak condition prior to releasing them for duty. With the higher physical demands placed on the Special Operations Soldier, a bridge program offers rehabilitation professionals a way to maximize recovery, enhance performance, and hopefully prevent injuries (or re-injury). A six week functional training program is outlined and data collection from over two years is presented. Statistically and operationally significant differences were noted in nearly every category tested. Functional Movement Screen™ scores improved an average of 2.5 points. T-test improvement was 0.5 seconds. Single leg hop time improved 10%. Hop for distance improved approximately 10%. Body fat improvement was statistically significant. Kip-ups improved 32%. Vertical jump height improvement was statistically significant. All subjective fitness category self-evaluations demonstrated statistically significant improvements, except for pain. Data suggests that a program like this may be beneficial to patients and non-patients seeking a safe, effective alternative training regimen.

Introduction

Previous injury and incomplete rehabilitation have been identified as risk factors for re-injury.[1] Supervised rehabilitation in various forms has been shown to prevent lower extremity and spinal re-injuries in several populations.[2-6] In an effort to connect traditional rehabilitation and return to full duty, we offer a functional training program to our patients. In the military medical setting, these programs take patients beyond traditional clinic-based rehabilitation and help to fill the void left when a Soldier leaves the physical therapy clinic and returns to his unit/team. Our program has existed at Fort Bragg, NC, for over two years. This manuscript will outline the rationale, design, and data collected from a USASOC evidence-based functional training program (FTP).

Program Outline

There are three goals of our program: 1) to serve as a stop-gap between clinical rehabilitation and return to duty; 2) to enhance performance, and; 3) ultimately, to prevent injuries. In an effort to design a program that provided the most benefit for active duty Soldiers, a variety of techniques were employed. The program has evolved to become an eclectic combination of methods, exercises, and techniques borrowed from nationally recognized subject matter experts in the rehabilitation and fitness professions. Some of these professionals include Don Chu, Gray Cook, Greg Glassman, Stuart McGill, Mark Rippetoe, Mark Verstegen, and Kevin Wilk to name a few.[7-14]

Participation is 100% voluntary, but patients who are about to be discharged from physical therapy following extensive rehabilitation are strongly encouraged to participate. The FTP is designed to prepare them for returning to full duty, resuming airborne jump status, and deployment to combat zones. Other participants are healthy individuals who have not been patients in the clinic. They appreciate the value of this type of training and seek to enhance their own physical performance or prevent future injuries.

Each FTP cohort meets three times per week for six weeks in duration. Classes are 75 minutes in duration to include warm-up and cool down. We have found that

running the classes prior to the duty day and cafeteria breakfast hours on Monday, Wednesday, and Thursday works best in our population. On Mondays, the focus is agility training, Wednesdays target core strength and balance, and Thursdays we work on power and explosiveness.

Along with the three organized group workouts each week, participants are given an individualized strength and conditioning program based on their personal goals and/or strengths and weaknesses. Prior to the start of the program, potential participants complete a subjective questionnaire (Appendix A) evaluating their confidence with a variety of fitness parameters. Additionally, they are asked about their personal fitness goals in order to better design an individualized strength and conditioning program to meet their needs. For instance, if a Soldier wants to lose 10 lbs, their cardiorespiratory and strength training program will look much different than someone who is trying to bulk up and gain 10 lbs. A one week example of a weight loss program (Appendix B) and a lower extremity strength/weight gain program (Appendix C) are provided.

Education is a cornerstone of the FTP. We strongly recommend all participants meet with a registered dietician from Womack Army Medical Center for at least one hour after completing a three to five day food diary. The information received during this session is invaluable in assisting participants to nutritionally augment their fitness and performance goals. In addition to the education they receive from the dietician, we focus every class session on teaching such principles as the importance of a dynamic warm-up, proper mechanics of movement, recovery techniques, and utilization of the trunk and core musculature to produce power and to prevent injuries.

Each 75 minute class session consists of a 15 minute dynamic warm-up, approximately 30 minutes of focused training specific to the day of the week as previously mentioned, 15 minutes of prehabilitative core work (exercises designed to prevent injuries),[8, 12, 15-20] and 15 minutes of cool down at the completion of each class. Since performing static stretching prior to sprinting or jumping has been shown to decrease performance,[21-26] a dynamic warm-up is used.[12, 27] The warm-up consists of 10 dynamic stretching exercises: cervical rotations; shoulder rotations to the front and rear; trunk rotations to a static lunge stance; walking lunges to the front, rear, and each side; walkouts; and alternating high knee walks for one length of a 40′ x 20′ racquetball court; and concludes with sumo squats and calf raises .[8, 12]

Immediately upon completion of the warm-up, the day specific exercise begins. On Mondays, the focus is on improving agility through a variety of quick feet drills conducted inside and outside on a grassy field with using agility ladders, cones, hurdles, and discs.[27, 28] To some extent everyday, but particularly on Wednesday, the focus is on the core musculature (i.e. large hip muscles, paravertebrals, transverse abdominus, periscapular musculature, and rotator cuff) and balance development.[7, 10, 12-18, 29-40] We utilize medicine balls and free-form resistance to assist in recruitment of core musculature for strength and balance development.[35, 41] Thursdays, the focus is on improving power and explosiveness through utilization of the core to perform bounding, hopping, jumping, and throwing.[28] In addition to utilizing complex training,[42] and depth jumps,[43] most individualized strength programs include one or more Olympic or power lifts[11] in an effort to improve lower extremity power and improve vertical jump height.[44-46] Classes begin at a basic level with an emphasis on proper form for all movement patterns. After a week of "crawling" we transition to the "walking" phase for weeks two and three prior to the "running" phase of the program for weeks four through six. See Appendices D, E, and F for a sample weeks one, three, and six.

Some form of prehabilitative core development is done at the end of each workout prior to the cool down. Various physioball exercises, planks, and other yoga or pilates exercises are utilized in an effort to clear lactate and enhance postural control.[47] Upon completion of the core development module, the cool down begins.

The cool down period consists of five minutes of foam roll use followed by 10 minutes of stretching. The foam roll is a type of self massage we utilize on the hips, thighs, and back.[12, 48-50] Stretching is performed using three bouts of contract-relax stretching[51-53] followed by 30 second static holds for hamstrings and hip flexors/quads using a stretch strap.[54-56] Ten prone press-ups are performed for lumbar disc maintenance.[57, 58] A side-lying posterior shoulder capsule stretch[59, 60] (Figure 1) is performed in addition to a 90° and 120° pectoralis stretch standing against a wall to improve posture and positioning of the humeral head within the glenoid fossa. Gastroc and soleus stretches are also done leaning against a wall. All static stretches are held for 30 seconds.[54-56] Static stretches are only performed at the completion of the workout with a goal of improving flexibility and joint range of motion.

At the completion of the six week program, participants are given a bag which contains material to assist them with performing similar exercises at home or while traveling. The bag includes a physioball, a

Figure 1: A side-lying posterior shoulder capsule stretch

foam roll, a stretch strap, a copy of Core Performance,[12] mini-bands, thera-tubing, and an agility ladder. In the event a participant must leave the program due to work constraints prior to the completion of six weeks, the bag and a copy of the workout program allows the participant to follow along with most of the exercises.

Data Collection

As part of an ongoing evaluation and validation of the FTP, we began collecting data with our first class in August 2006. This data sample represents participants from August 2006 to December 2008. 155 participants attempted the program and 65 participants dropped out of the training or were lost to follow-up resulting in complete data on 90 participants. Due to the nature of our current military OPTEMPO, it is difficult for individuals to commit six full weeks of training, and job requirements often precluded their ability to complete the training and testing. Dropouts were not included in the statistical analysis.

The data set included 80 males and 10 females. The mean age of participants was 35 yrs (± 5.0 yrs) with a mean weight of 88.2 kg (± 7.1kg).

Performance testing included the Functional Movement Screen™(FMS), functional tests of power, speed, balance, and core strength, and body fat testing. The FMS is a screening tool of seven different tests: squat, in-line lunge, hurdle step, shoulder flexibility, hamstring flexibility, core push-up, and rotary stability. Screening of these fundamental movements can help identify deficits in flexibility, quality of movement, core stability, and balance.[61, 62] Even though it has not yet been validated in a military population, it shows promise in the National Football League for predicting injuries.[63, 64] By validation, we mean demonstration that FMS scores predict injury or performance. Several military studies are currently ongoing or in various planning stages.[65]

In addition to the FMS, several validated functional measures were selected. These include the T-test for agility,[66, 67] six meter hop for time,[68, 69] single leg hop for distance,[68-70] Vertec vertical jump,[71] seven site skin fold body fat measures,[66,72-76] MAST balance test,[77] and a locally used test of core strength: the kip-up (feet over the bar, Figure 2).

Figure 2: *Kip-up*

Classes ran year round for six weeks with two to three weeks off between classes for testing. This allows for six iterations per year. A subjective questionnaire and the pre-testing were completed one to two weeks prior to the start of each class. (See Appendix G for the data collection form.) Testing was conducted at the same time of day as the class sessions (roughly 0600 – 0730). Complete testing on one individual took approximately 30 minutes. Participants were instructed to warm-up for five minutes on a stationary bike or elliptical trainer, but no stretching recommendations were made. Post-testing was also conducted at the same time of day with the same instructions. All testing was conducted by the same four physical therapy staff members. Testers and participants were purposely not reminded of the pre-test results at post-test time.

Data Analysis

Descriptive statistics were summarized for subject demographic data. Pre to post differences on FMS and functional tests within subjects was analyzed with separate dependent T-tests. Alpha level for all statistical tests was set at 0.05. Microsoft Excel (Office 2000) and SPSS for Windows (v. 12.0) software were used for statistical analysis.

Results

Pre and post testing results are represented in Tables 1 through 8 (shown at the end of the article). Right leg hop for time and distance data are represented in Tables 3 and 4. Left leg data were similar. Statistically and operationally significant differences were noted in nearly every category tested. FMS scores improved an average of 2.5 points (Table 1). T-test improvement was 0.5 seconds (Table 2). Single

leg hop time improved 10% (Table 3). Hop for distance improved approximately 10% (Table 4). Body fat improvement was statistically significant (Table 5). Kip-ups improved 32% (Table 6). Vertical jump height improvement was statistically significant (Table 7). All subjective fitness category self-evaluations demonstrated statistically significant improvements, except for pain (Table 8).

Discussion

The FMS measures flexibility, core stability, and balance.[61, 62] A mean improvement of three points took participants away from the high risk injury cut line of 14 that Keisel identified in professional football players,[63] and theoretically decreased their risk of injury. In our population, most improvements occurred in the active straight leg raise (hamstring flexibility), shoulder mobility, and deep squat technique. These components were commonly addressed during the FTP.

For the T-test, improvement of 0.5 seconds translates into five feet since participants traversed the 40 yard (120 ft) test in approximately 12 seconds. In a war when inches sometimes separate Soldiers from shrapnel or bullet wounds, we feel this merits operational significance.

Single leg hop for distance improved approximately 13cm or 5in. Sometimes 5 or 6in enables a Soldier to clear an obstacle he is jumping over. This can be the difference between injury and success.

While vertical jump height improved statistically, we were disappointed with the 1.5 cm (1/2 inch) improvement. When we first analyzed this data in late 2007 after one year of the FTP, there was no change in vertical jump height from pre- to post-testing. At that time, we added Olympic and power lifts such as the squat, deadlift, and power clean to the individualized strength programs of many of our participants.[44-46] However, participant compliance with these strength program recommendations was not tracked. After discussing this frustration with several leading strength and conditioning specialists from the National Strength and Conditioning Association, we realize it may be unrealistic to expect large gains in power production (vertical leap) in this population that frequently runs five miles or greater. Performing long runs and extended cardiorespiratory training has been shown to negate the effects of weight training for power production.[78, 79]

Core strength is difficult to measure. The U.S. Army utilizes sit-ups which utilize the hip flexors and abdominals.[80] We think a more comprehensive core strength test is the "kip-up". A kip-up is performed from a standing position by holding onto an overhead bar with hands in line and body parallel to the bar while raising the body and clapping the feet together over the bar (Figure 2). The "kip-up" requires excellent upper body and core strength and mimics movements needed to excel on the obstacle course. We were pleased with the improvement noted with kip-ups even though we did not specifically practice them more than once per week. A 32% improvement in this measure seemed very significant and demonstrative of the core focus of the program.

While percent body fat demonstrated a statistically significant pre to post reduction, we realize that the accuracy of skin fold measures do not warrant any improvement claims given the possibility of +/-3 to 4% reliability errors.[72-74] Additionally, most participants were not actively attempting to decrease percentage of body fat as they were already in a healthy zone.

Along with the anecdotal comments like, "…my back no longer hurts when I wear body armor for eight hours," it was encouraging to see statistical improvement in all subjective measures of physical confidence. The program has grown in popularity and classes fill without a need for advertisement. We believe pain scores did not demonstrate significance due to a narrow effect size with low pain numbers to begin with. Obviously, we do not subject someone with significant complaints of pain to agility drills and box jumps. Patients are treated first in the clinic and they are referred to the program upon reaching the 85-90% recovery point.

Some limitations of this study are the number of participants lost to follow-up. As with any voluntary program, compliance to completion was not 100%. There are a variety of reasons why participants fell out of the program to include job requirements, time of day choice, and lack of interest. Our mean number of classes attended was 10/18 for the group that completed both pre-and post-testing.

Another limitation is lack of a control group. While a conscious effort was made not to review pre-test results, participants and therapists were not actively blinded from the results of six to eight weeks prior. It is possible they could have remembered what they scored previously and that could have affected the post-test. Additionally, the testers were also the trainers for the six-week program and this could have caused some bias during the post testing.

This group of participants represents a mixed sample of patients and healthy individuals training together for six weeks. This could be seen as a limitation of this study. When we grossly compared means from patients and non-patients, the improvements were similar. Therefore, we did not feel it necessary to analyze the data separately.

Conclusion

This manuscript outlines an example of a physical therapy-based functional training program that serves to bridge traditional clinic-based rehabilitation and return to duty. Programs like this one can be beneficial for Soldiers returning to duty and those looking for safe, effective ways to train. Rehabilitative professionals in military settings should consider offering something similar for their active duty servicemembers.

Appendix A

Questionnaire

Name _____ Age _____ Date_____

How confident or satisfied are you with yourself in the following categories?
1=not confident/satisfied, 10= extremely confident/satisfied

Balance	1	2	3	4	5	6	7	8	9	10
Agility	1	2	3	4	5	6	7	8	9	10
Strength	1	2	3	4	5	6	7	8	9	10
Core Strength	1	2	3	4	5	6	7	8	9	10
Mobility/Flexibility	1	2	3	4	5	6	7	8	9	10
Training knowledge	1	2	3	4	5	6	7	8	9	10
Speed	1	2	3	4	5	6	7	8	9	10
Endurance	1	2	3	4	5	6	7	8	9	10

Do you have muscle and/or joint tightness? 1=lots, 10=none

1	2	3	4	5	6	7	8	9	10

If so, where_____

Do you currently have any pain, discomfort, or injuries? YES NO If no, skip to next ?

If yes, rate your pain 0 (no pain), 10 (excruciating pain)

0	1	2	3	4	5	6	7	8	9	10

Where and when does it hurt?

What is your height? _____ Current Weight? _____ What do you think is your ideal weight? _____

What are your goals for this program? (Pre-test only) Weight Loss Build Core Strength

Increase Endurance Increased Foot Speed/Agility Strength Gain/Weight Gain

Other _____

Appendix B

Name: _____

Strength and Conditioning Plan

Monday	Week 1		Week 2		Week 3		Week 4		Week 5		Week 6	
Cardio:												
Intervals												
HR 80-100%												
30 Minutes												
Tuesday	**Week 1**		**Week 2**		**Week 3**		**Week 4**		**Week 5**		**Week 6**	
DB Press 0 degree	1x15		1x15		1x15		1x15		1x15		1x15	
DB Press 30 degree	1x15		1x15		1x15		1x15		1x15		1x15	
DB Press 60 degree	1x15		1x15		1x15		1x15		1x15		1x15	
DB Press Flat	1x15		1x15		1x15		1x15		1x15		1x15	
Glute Ham developer (front/back)	3x15		3x15		3x15		3x15		3x15		3x15	
Rotary Torso Machine	3x15		3x15		3x15		3x15		3x15		3x15	
Pull Ups/Gravitron (wide/normal/parallel)	3x15		3x15		3x15		3x15		3x15		3x15	
Leg Press (high/reg/toe out)	3x15		3x15		3x15		3x15		3x15		3x15	
Calf Raises	3x15		3x15		3x15		3x15		3x15		3x15	
Eccentric HS	3x15		3x15		3x15		3x15		3x15		3x15	
Cardio:												
Long Fat Burn												
HR 65%-75%												
>40 Minutes												
Comments												

Appendix C

Name: _____

LE Strength and Conditioning Plan

Monday	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
Cardio: Long						
Fat Burn						
HR 65-75%						
>40 Minutes						
Tuesday	**Week 1**	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**
Chest Press	3x15	3x15	3x15	3x15	3x15	3x15
Squat	3x15	3x15	3x15	3x15	3x15	3x15
Hang Clean	3x15	3x15	3x15	3x15	3x15	3x15
Deadlift	3x15	3x15	3x15	3x15	3x15	3x15
Glute Ham developer (front/back)	3x15	3x15	3x15	3x15	3x15	3x15
Rotary Torso Machine	3x15	3x15	3x15	3x15	3x15	3x15
Pull Ups/Gravitron (wide/normal/parallel)	3x15	3x15	3x15	3x15	3x15	3x15
Leg Press (high/reg/toe out)	3x15	3x15	3x15	3x15	3x15	3x15
Calf Raises	3x15	3x15	3x15	3x15	3x15	3x15
Eccentric HS	3x15	3x15	3x15	3x15	3x15	3x15
Cardio: Intervals						
HR 80-100%						
30 Minutes						
STRETCH!!!						
Comments						
	HS = Hamstrings, MB = Medball, KB = Kettlebell					
Wednesday	**Week 1**	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**
Cardio: Long Fat Burn						
HR 65-75%						
>40 Minutes						
Thursday	**Week 1**	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**
Cardio: Intervals						
HR 80-100%						
30 Minutes						
Friday	**Week 1**	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**
3 way crunch on physioball	2x45s	2x45s	2x1m	2x1m	3x1m	3x1m
Walking lunges	2x45s	2x45s	2x1m	2x1m	3x1m	3x1m
HS curl on ball	2x45s	2x45s	2x1m	2x1m	3x1m	3x1m
Monster walks	2x45s	2x45s	2x1m	2x1m	3x1m	3x1m
4 way hip	2x45s	2x45s	2x1m	2x1m	3x1m	3x1m
Triceps blaster	2x45s	2x45s	2x1m	2x1m	3x1m	3x1m
Wall Ball	2x45s	2x45s	2x1m	2x1m	3x1m	3x1m
Single Arm Row in Airplane Position	2x45s	2x45s	2x1m	2x1m	3x1m	3x1m
Push ups w/med balls	2x45s	2x45s	2x1m	2x1m	3x1m	3x1m
KB Swing & Press	2x45s	2x45s	2x1m	2x1m	3x1m	3x1m
Bosu squat w/MB	2x45s	2x45s	2x1m	2x1m	3x1m	3x1m
Cardio: Intervals						
HR 80-100%						
30 Minutes						
STRETCH!!!						
Saturday						
Cardio: Long						
Fat Burn						
HR 65%-75%						
>40 Minutes						
Sunday	**Day Off**	**Day Off**	**Day Off**	**Day Off**	**Day Off**	**Day Off**

Appendix D

Week 1

1 Monday (quick feet, agility)	min	2 Wednesday (balance/core)	min	3 Thursday (power, explosiveness)	min
Intro	10				
Dynamic Warm up	15	**Dynamic Warm up**	15	**Dynamic Warm up**	15
Shoulder rotation, neck rotation, trunk rot. Lunge to World's Greatest Stretch Backward lunge with twist Side lunge Walk out to calf stretch Knee up/out walking Sumo squat to stand		Shoulder rotation, neck trunk rot Lunge to World's Greatest Stretch Backward lunge with twist Side lunge Walk out to Calf stretch Knee up/out walking Sumo squat to stand		Shoulder rotation, neck, trunk rot Lunge to World's Greatest Stretch Backward lunge with twist Side lunge Walk out to Calf stretch Knee up/out walking Sumo squat to stand	
Quick feet / agility	20	**Core / balance**	10	**Plyometrics**	20
Quick feet clock Quick feet directional Ladder: run through, 2 feet in R first, left first, side shuffle R, L, Hokey Pokey R, L, Icky shuffle, Hops with 90 deg turn, scissors R, L, hop scotch 2,1 Other side: A skip, shuffle R/L, Carioca R/L, back peddle, low shuffle R/L, hi knees, power skip, side skip R/L, heel kicks Dips and pull-ups		Monster walking w/bands Lateral R/L jumps with bands 1 leg up to box soft landings "sticking it," forward and side (5 Reps) Kip-ups		A-skip, Bounding Jump drill with ladder (9 passes): 2 feet straight/R/L, 1 foot straight/R/L Rings (5 passes): 2 feet long jump, 1 feet long jump, 2 feet R/L Hurdles: (4 passes) Straight, tuck, mule kick, squat jump Pull-ups / Dips Pyramid box jumps: pushoffs, alternating push offs, lateral pushoffs, alternating lateral pushoffs, multiple box-to-box jump, depth jumps Plyo pushups	
Medicine Balls	0	**Medicine Balls**	5	**Medicine Balls**	5
		Sitting on physioballs diagonal chops, rotations High Kneeling: overhead, low R, low L, low R, high R, floor		Squat jump and throw	
Keiser machines	0	**Keiser machines**	5	**Keiser machines**	5
		5 way leg lifts		Front squats (3/15reps) [Intermix with crunches]	
Physioball / core	10	**Physioball / core**	20	**Physioball / core**	10
Y, T, W, L 3-way crunch Push-ups feet on ball, hands on ball, pushup + on ball Reverse hypers		3-way crunch Reverse crunch cent/R/L Hamstring curl on ball Front Plank (floor elbows and toes) push-up +, alt. leg lifts Side Planks (30 sec hold, reps) Bridging with alt leg lifts		Y, T, W, L 3-way crunch Knee Tucks →progress single leg Bridge with med ball toss to chest Push-up + (If time permits)	

Cool down / recovery 20	**Cool down / recovery 20**	**Cool down / recovery 20**
Foam roller: hamstrings, glutes, IT band, quad, t-spine Quad / hip flexor stretch prone with rope and bolster Hamstring stretch supine with band Prone press-ups Shoulder "sleeper" stretch (sidelying) Gastroc / Soleus stretch against wall Pec stretch at 90 deg and 120 deg	Foam roller: hamstrings, glutes, IT band, quad, t-spine Quad / hip flexor stretch prone with rope and bolster Hamstring stretch supine with band Prone press-ups Shoulder "sleeper" stretch (sidelying) Gastroc / Soleus stretch against wall Pec stretch at 90 deg and 120 deg	Foam roller: hamstrings, glutes, IT band, quad, t-spine Quad / hip flexor stretch prone with rope and bolster Hamstring stretch supine with band Prone press-ups Shoulder "sleeper" stretch (sidelying) Gastroc / Soleus stretch against wall Pec stretch at 90 deg and 120 deg

Appendix E

Week 3

1 Monday (quick feet, agility) min	**2 Wednesday (balance/core) min**	**3 Thursday (power, explosiveness) min**
Dynamic Warm up 15	**Dynamic Warm up 15**	**Dynamic Warm up 15**
Shoulder rotation, neck rotation, trunk rot Lunge to World's Greatest Stretch Backward lunge with twist Side lunge Walk out to Calf stretch Knee up/out walking Sumo squat to stand	Shoulder rotation, neck trunk rot Lunge to World's Greatest Stretch Backward lunge with twist Side lunge Walk out to Calf stretch Knee up/out walking Sumo squat to stand	Shoulder rotation, neck, trunk rot Lunge to World's Greatest Stretch Backward lunge with twist Side lunge Walk out to Calf stretch Knee up/out walking Sumo squat to stand
Quick feet / agility 30	**Core / balance 30**	**Plyometrics 15**
Quick feet clock Quick feet directional Outside Circuit: ladder, cones, discs, hurdles	Circuit: 1. Kip up 2. Airplane single arm row 3. Bosu ball squat press 4. Ab wheel 5. Lunge walk/rotate 6. Single leg balance with ball toss against wall 7. Medicine ball walking push ups 8. Triceps blaster on physioball 9. Seated RC external rotation 10. Split squat on ball	Jump drill with ladder(9 passes): 2 feet straight/R/L, 1 foot straight/R/L Rings (5 passes): 2 feet long jump, 1 feet long jump, 2 feet R/L Hurdles: (4 passes) Straight, tuck, mule kick, squat jump Pull-ups / Dips Pyramid box jumps: pushoffs, alternating push offs, lateral pushoffs, alternating lateral pushoffs, multiple box-to-box jump, depth jumps Plyo push-up
Medicine Balls 0	**Medicine Balls 0**	**Medicine Balls 5**
		Squat jump and throw

Keiser machines	**0**	**Keiser machines**	**0**	**Triplet**	**15**
				15 push-ups 15 body weight squats 30 jumps on jump rope Repeat 10 times	
Physioball / core	**15**	**Physioball / core**	**15**	**Physioball / core**	**10**
Y, T, W, L 3-way crunch Push-ups feet on ball, hands on ball, pushup + on ball Reverse hypers		Plank on ball or floor (1 set push-up +, knee tucks, single leg push-ups) combine with side plank (1 set hold, 1 set leg up) Russian twist Crunches straight/diagonal/reverse V-up with ball pass Hamstring curl		Y, T, W, L 3-way crunch Bridge with med ball toss to chest Bridging - with chest pass Kneel on ball Push-up + (If time permits)	
Cool down / recovery	**15**	**Cool down / recovery**	**15**	**Cool down / recovery**	**15**
Foam roller: hamstrings, glutes, IT band, quad, t-spine Quad / hip flexor stretch prone with rope and bolster Hamstring stretch supine with band Prone press-ups Shoulder "sleeper" stretch (sidelying) Gastroc / Soleus stretch against wall Pec stretch at 90 deg and 120 deg		Foam roller: hamstrings, glutes, IT band, quad, t-spine Quad / hip flexor stretch prone with rope and bolster Hamstring stretch supine with band Prone press-ups Shoulder "sleeper" stretch (sidelying) Gastroc / Soleus stretch against wall Pec stretch at 90 deg and 120 deg		Foam roller: hamstrings, glutes, IT band, quad, t-spine Quad / hip flexor stretch prone with rope and bolster Hamstring stretch supine with band Prone press-ups Shoulder "sleeper" stretch (sidelying) Gastroc / Soleus stretch against wall Pec stretch at 90 deg and 120 deg	

Appendix F

Week 6

1 Monday (quick feet, agility)	**min**	**2 Wednesday (balance/core)**	**min**	**3 Thursday (power, explosiveness)**	**min**
Dynamic Warm up	**15**	**Dynamic Warm up**	**15**	**Dynamic Warm up**	**15**
Shoulder rotation, neck rotation, trunk rot Lunge to World's Greatest Stretch Backward lunge with twist Side lunge Walk out to calf stretch Knee up/out walking Sumo squat to stand		Shoulder rotation, neck trunk rot Lunge to World's Greatest Stretch Backward lunge with twist Side lunge Walk out to calf stretch Knee up/out walking Sumo squat to stand		Shoulder rotation, neck, trunk rot Lunge to World's Greatest Stretch Backward lunge with twist Side lunge Walk out to calf stretch Knee up/out walking Sumo squat to stand	

Quick feet / agility 30

Quick feet clock
Quick feet directional
Outside circuit with weighted vests

Core circuit 30

1. Bosu ball squat press
2. Kip ups
3. Airplane single arm row on airex pad
4. Ab wheel
5. Slide board lunges
6. Single leg balance med ball toss
7. PNF med ball diagonals
8. Keiser diagonal pulley pulls up
9. Keiser diagonal pulley pulls down
10. Keiser punch
11. Med ball rotation back to wall

Prison yard workout: 45

Jog there and back approx 400 meters each way
400 meter run (pacer) with other stations below:
Sled pull 100 meters with 100# fwd and backward with scapular retraction
Heavy ball carry (50-100 lbs x 50 meters)
Plyometric box jumps
Pull-ups / push-ups to muscle failure
Dips / supine ring pull-ups to muscle failure
Kettle bell swings 20 each side
Tire flips x 50 meters (200-400# tires)

Medicine Balls 0

Medicine Balls 0

Medicine Balls 0

Keiser machines 0

Keiser machines 0

Keiser machines 0

Physioball / core 15

Y, T, W, L
3-way crunch
Push-ups feet on ball, hands on ball, pushup + on ball
Reverse hypers
V ups

100/200/300 workout 15

100 pull-ups
200 push-ups
300 crunches
In 10 sets of 10/20/30 for time

Physioball / core 0

Cool down / recovery 15

Foam roller: hamstrings, glutes, IT band, quad, t-spine
Quad / hip flexor stretch prone with rope and bolster
Hamstring stretch supine with band
Prone press-ups
Shoulder “sleeper” stretch (sidelying)
Gastroc / Soleus stretch against wall
Pec stretch at 90 deg and 120 deg

Cool down / recovery 15

Foam roller: hamstrings, glutes, IT band, quad, t-spine
Quad / hip flexor stretch prone with rope and bolster
Hamstring stretch supine with band
Prone press-ups
Shoulder “sleeper” stretch (sidelying)
Gastroc / Soleus stretch against wall
Pec stretch at 90 deg and 120 deg

Cool down / recovery 15

Foam roller: hamstrings, glutes, IT band, quad, t-spine
Quad / hip flexor stretch prone with rope and bolster
Hamstring stretch supine with band
Prone press-ups
Shoulder “sleeper” stretch (sidelying)
Gastroc / Soleus stretch against wall
Pec stretch at 90 deg and 120 deg

Appendix G

Data Collection Form

Name, # _____ Age _____ Date_____

Is this test: Pre-test Post-test General evaluation

Dominant Hand: right or left (circle) Dominant foot: right or left

———————————-To be completed by physical therapist————————————————————-

Functional Movement Screen (from reverse) _____

T-test _____ sec

Single leg hop for time R _____ sec

Single leg hop for time L _____ sec

Single leg hop for distance R _____ cm

Single leg hop for distance L _____ cm

Kip-ups _____

Vertical Leap _____in x 2.54 = _____cm

MAST
R _____ = _____
L _____ = _____

Skin fold:
Chest _____
Abdominal _____
Iliac _____
Mid-axillary _____
Triceps_____
Scapular_____
Thigh _____
Sum _____
% BF _____

Appendix G (continued)

Functional Movement Screen

Test	Raw Score	Final Score	Comments
Deep Squat			
Hurdle Step L			
Hurdle Step R			
In Line Lunge L			
In Line Lunge R			
Shoulder Mobility L			
Shoulder Mobility R			
Active Straight Leg Raise L			
Active Straight Leg Raise R			
Trunk Stability Push Up			
Rotary Stability L			
Rotary Stability R			
Total			
Active Impingement Right			
Active Impingement Left			
Extension			
Flexion			

Table 1

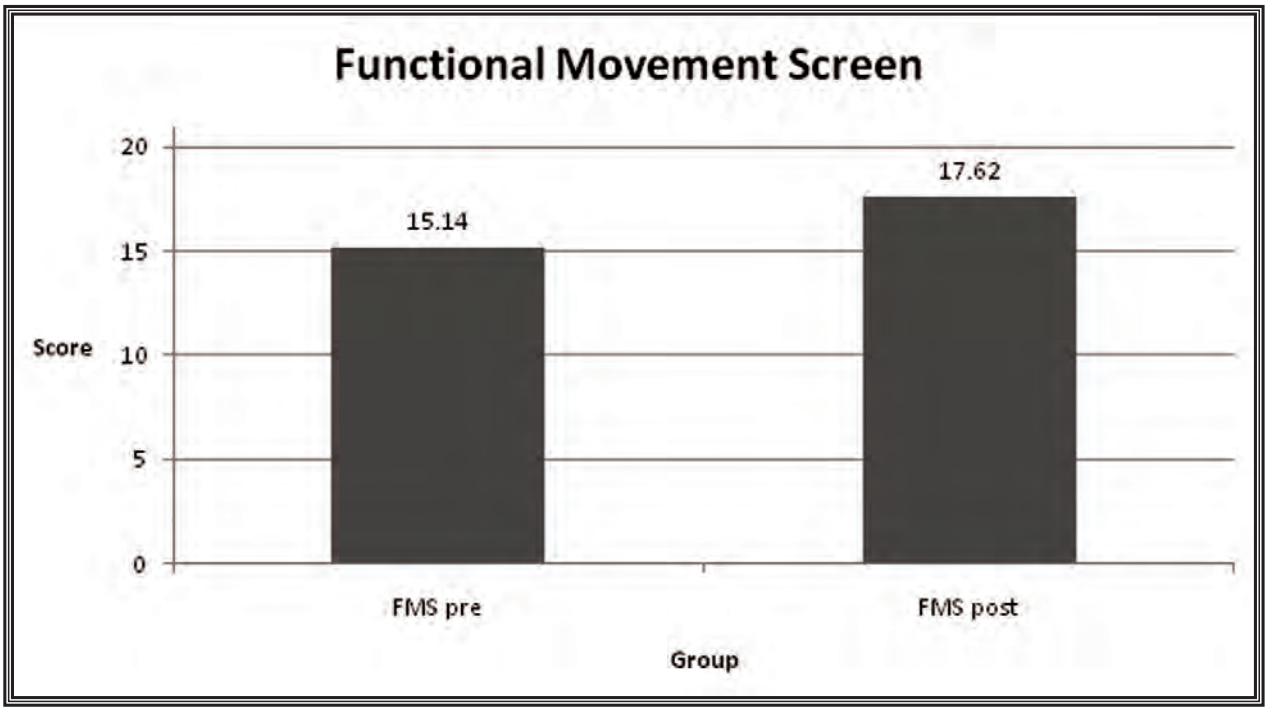

Table 2

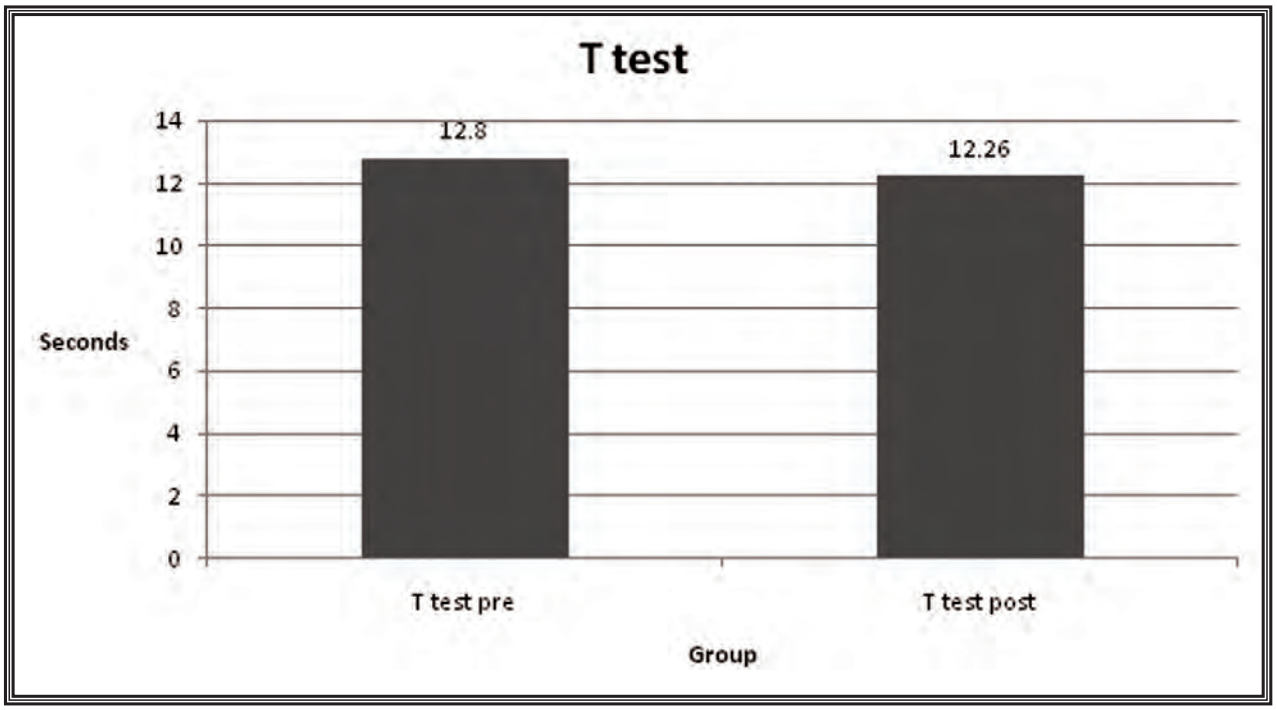

Table 3

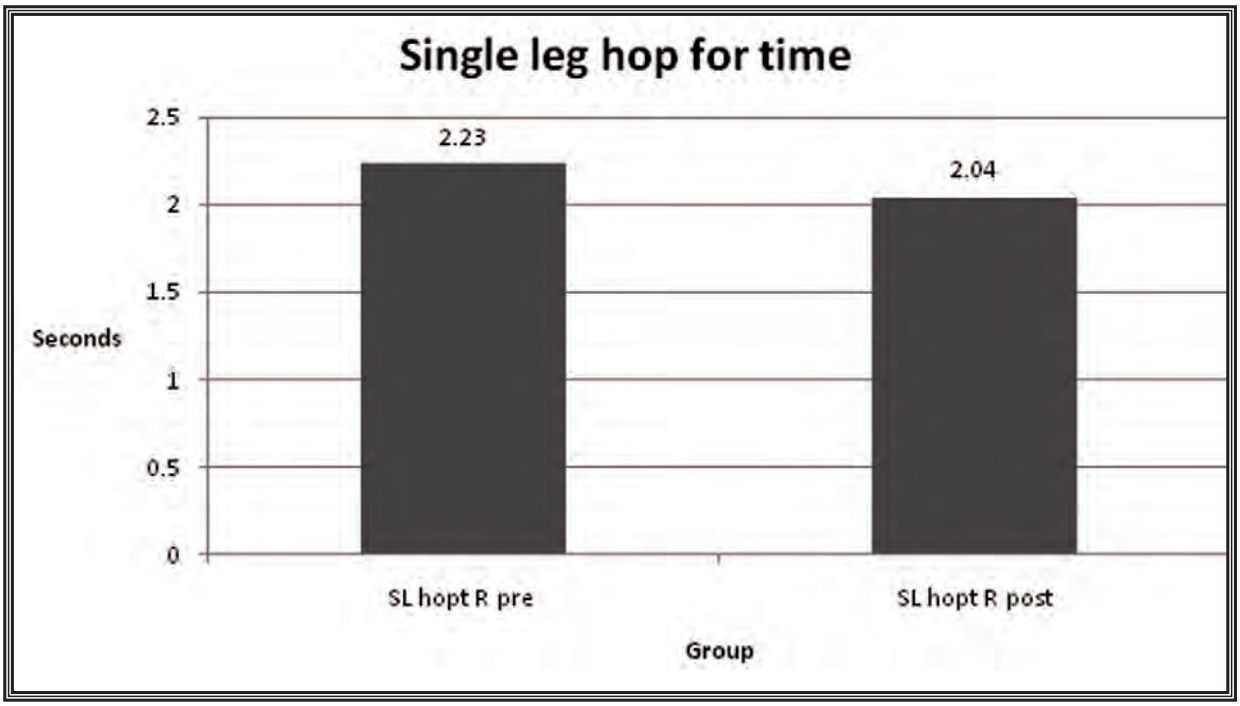

Table 4

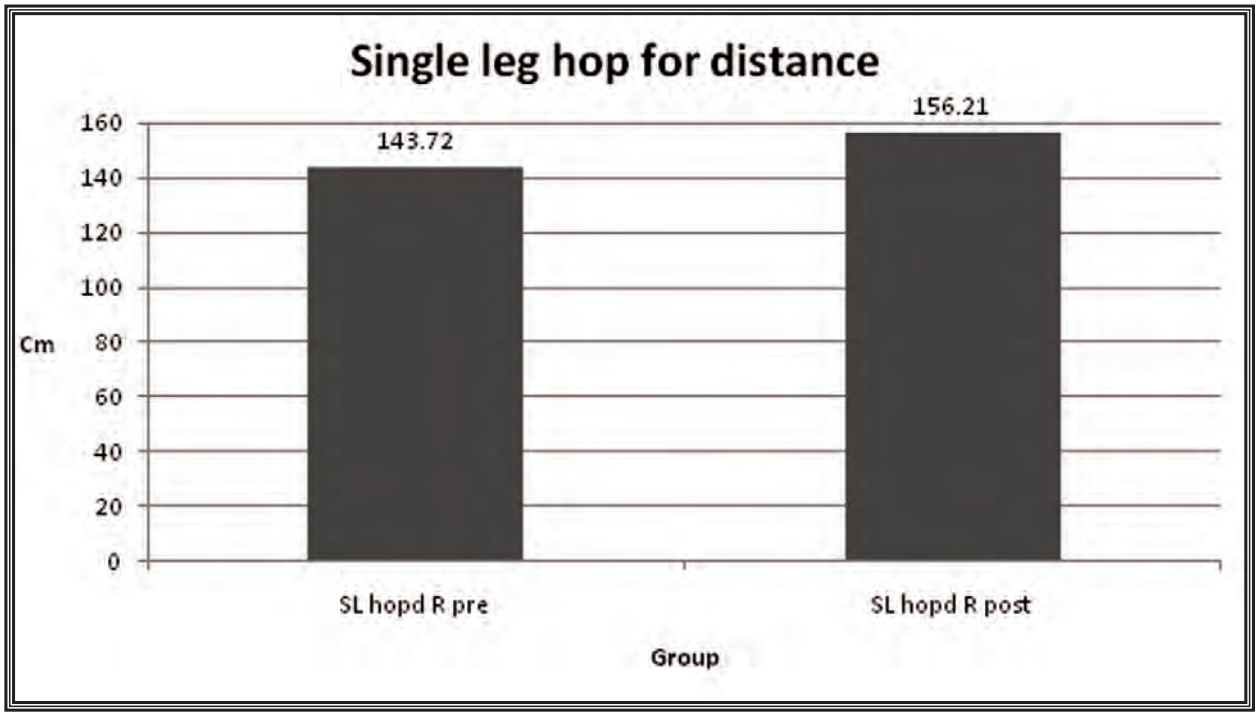

Table 5

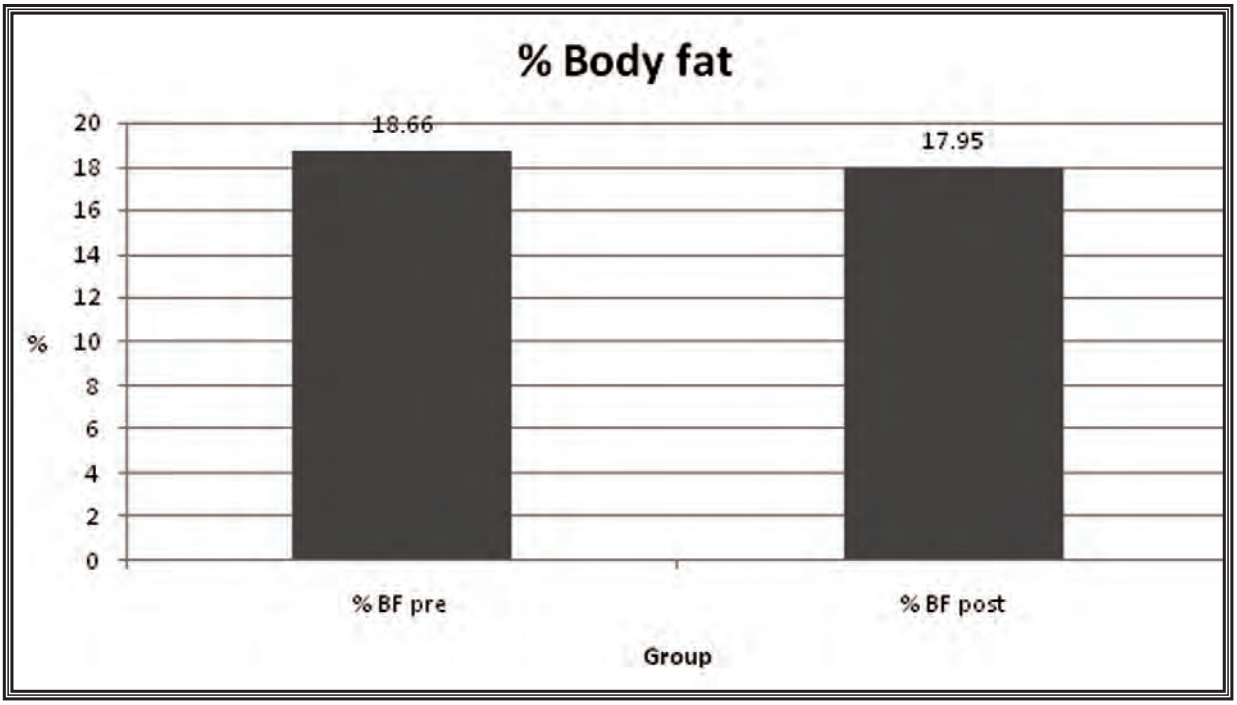

Table 6

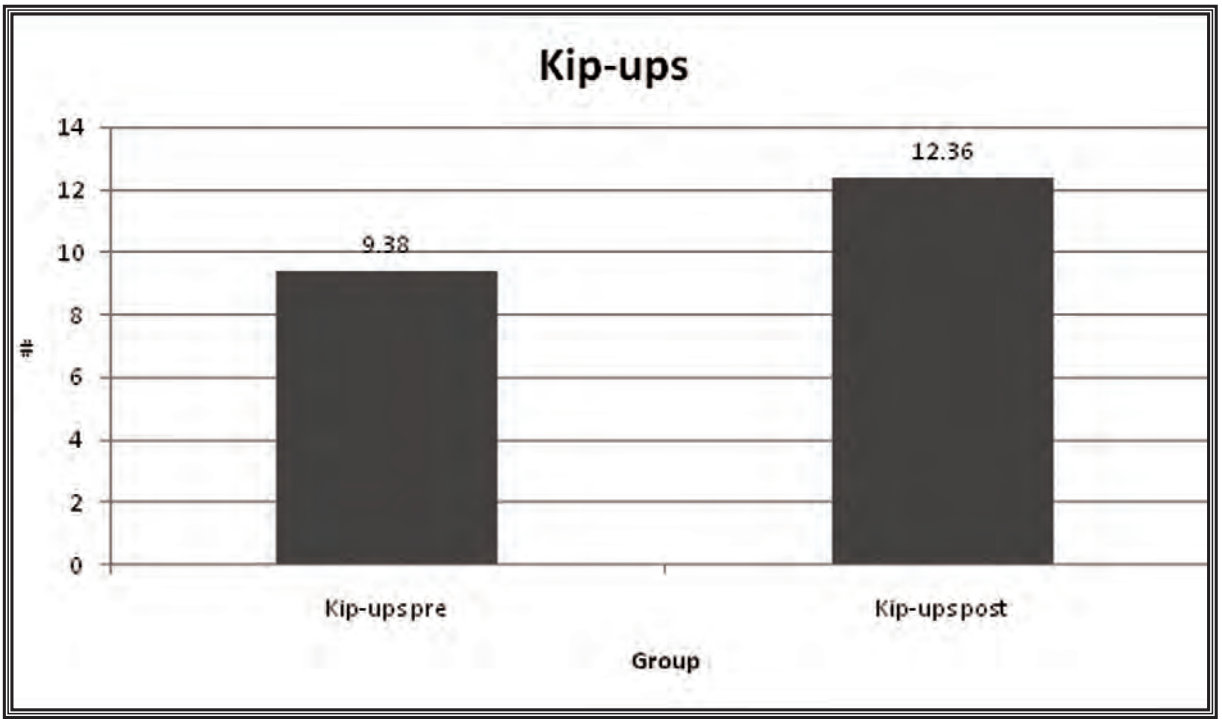

Table 7

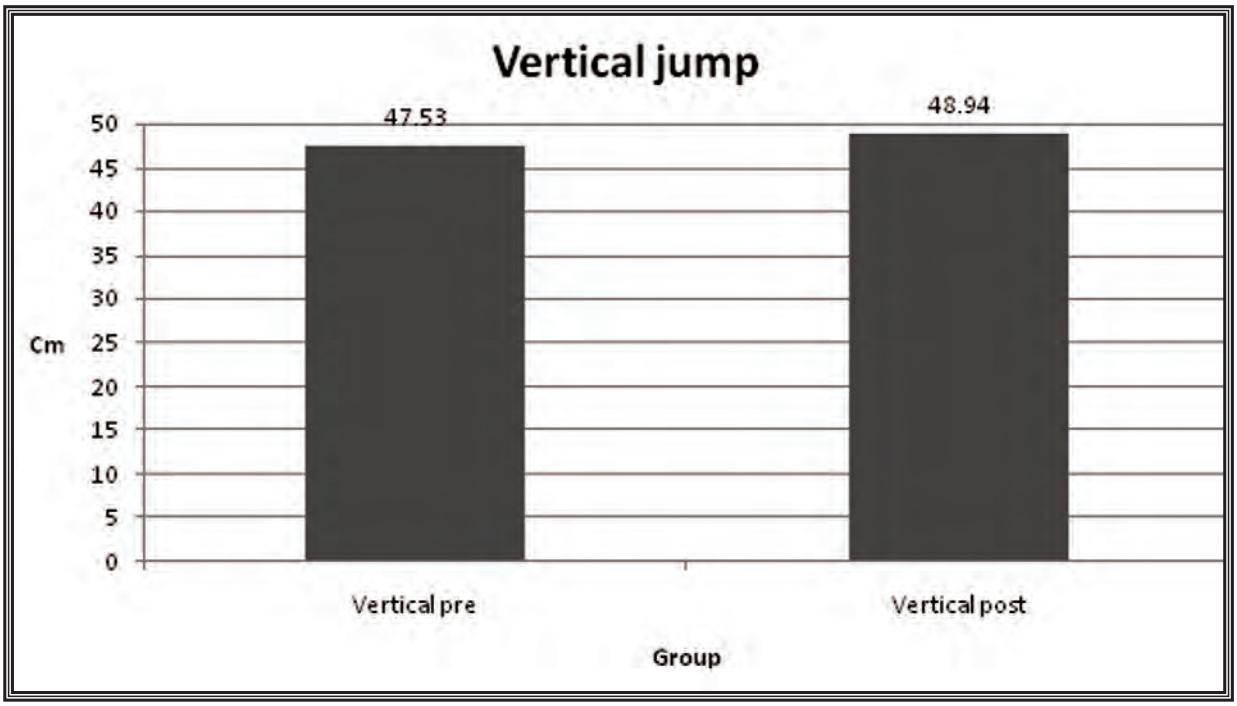

Table 8

	Pre	Post	Diff
Balance	6.0	7.1	1.1*
Agility	6.0	6.9	0.9*
Strength	6.3	7	0.7*
Core Strength	5.7	7.0	1.3*
Mobility/Flexibility	4.9	6.4	1.5*
Training knowledge	6.2	7.1	0.9*
Speed	5.3	6.7	1.4*
Endurance	5.6	6.8	1.2*
Tightness (higher number better)	5.4	6.4	1.0*
Pain	1.9	1.5	-0.4**

*p<0.05
**p>0.05

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MAJ Donald Lee Goss is a 1997 MPT graduate of the U.S. Army/Baylor University graduate program in physical therapy. He received a doctorate in physical therapy from Baylor in 2007. He has held a variety of physical therapy assignments over the last 12 years to include his present assignment at USASOC for three years. He is board certified in orthopaedic physical therapy, a certified athletic trainer, and a certified strength and conditioning specialist. MAJ Goss has 13 previous publications in peer-reviewed journals and over 20 professional presentations in the United States and abroad.

MAJ Greer Evans Christopher earned her master's degree in physical therapy from Boston University in 1996 and is a doctoral candidate working towards a sports and orthopedics physical therapy degree from Rocky Mountain University of Health Professions. She was commissioned in 1993 and has been on active duty in the United States Army for the last 12 years, providing rehabilitation services to Soldiers in TRADOC, the 82d Airborne Division, and USASOC. She is currently assigned to the United States Army Special Operations Command where she has served for the last seven years building a physical therapy and rehabilitation program for elite warriors. She has been instrumental in creating a functional training program for Special Forces Soldiers, designed for end point rehabilitation, injury prevention, and performance enhancement.

SSG(P) Robert T. Faulk is a physical therapy technician. Over his eight year career in the U.S. Army, he has served three years as a Combat Medic and the past five in physical therapy. His assignments include Senior Line Medic with 1/87th IN BN, 10th MTN DIV, Fort Drum, NY; NCOIC, Amputee Section of Physical Therapy at Walter Reed Army Medical Center; NCOIC, Physical Therapy at Reynolds Army Community Hospital, Fort Sill, OK; and his present assignment at USASOC for one year.

COL Joe Moore is currently Dean, Graduate School, Academy of Health Sciences as well as Director and Professor, U.S. Army-Baylor University Doctoral Program in physical therapy. He has spent the last 23 years in varied assignments around the Army, including a tour in 2004 as the Chief, Sports Medicine with the 67th Combat Support Hospital in Tikrit, Iraq. He also recently served as the Director, U.S. Military Sports Medicine-PT Doctoral Program at West Point, NY for four years, a program he established in 2001. He has a PhD in sports medicine from the University of Virginia, a Masters of Strategic Studies from the Army War College, a MEd in education management, and a BHS in physical therapy from the University of Kentucky. He is board certified in sports physical therapy. He has over 50 publications in peer-reviewed journals and has received numerous research awards. He is an invited speaker to national and international conferences on topics related to military physical therapy deployments and sports medicine.