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Clinical Public Health and Epidemiology Directorate
Injury Prevention Division**

**Evaluation of the Tactical Human Optimization, Rapid Rehabilitation,
and Reconditioning Program (THOR3)**

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14. ABSTRACT The Tactical Human Optimization, Rapid Rehabilitation, and Reconditioning Program (THOR3) is a Special Forces human performance and exercise rehabilitation program with its own facilities (fitness center with a physical therapy clinic) and personnel consisting of strength and conditioning coaches (human performance), physical therapist (rehabilitation) and a sports performance dietitian. The primary objectives of this evaluation are (1) to assess the THOR3 rehabilitation process, (2) compare training and human performance metrics among THOR3 and non-THOR3 participants, (3) establish and compare injury rates among THOR3 and non-THOR3 participants and (4) determine risk factors for injury. A survey inquiring about personal characteristics, musculoskeletal injuries, human performance and THOR3 participation during the previous 12 months was administered electronically to all active Army Special Operations Forces (ARSOF) Soldiers within the U.S. Army Special Operations Command (USASOC). Based on responses to physical training, Soldiers were categorized into three groups. The Traditional Physical Training (TPT) group generally performed more running and a minimal amount of cross-training (CT) during unit physical training. They did not participate in a supervised THOR3 fitness program. A second group performed a combination of CT and/or extreme conditioning programs and/or physical readiness training. They also did not participate in a supervised THOR3 fitness program. This group was referred to as the Cross-training group (CT). The THOR3 group (third group) performed a combination of exercise programs similar to the CT group and included THOR3 as part of their unit physical training program. There were 579 Soldiers who completed surveys and had medical record data from all five active SF Groups. Injury incidence (medical record) was 59% for men and 65% for women over a 12 month period. The 1 st SF Group had the lowest injury rates at 45% compared to the 5 th SF Group at 63% and 7 th SF Group at 71%. Over two thirds of the Soldiers reported participation in a THOR3 supervised physical training program. Approximately 52% of Soldiers provided additional comments about the THOR3 program with 87% of these Soldiers describing THOR3 as a very positive and beneficial program. A majority of the Soldiers with injuries were seen by the physical therapist within a day or less and on average completed physical therapy after 16 visits. Upon completing physical therapy 58% of the Soldiers reported complete recovery from their injuries. Around 75% of Soldiers who participated in any THOR3 training reported improvements in aerobic capacity, muscular strength, core strength and being more physically fit for the mission as a result of THOR3 training. In a multivariate model controlling for personal characteristics, unit training, and fitness, the TPT group had a marginally higher risk of being injured when compared to the THOR3 group (OR = 2.72 (0.86-8.59, p=0.09). Independent risk factors for injury for all Soldiers included older age (OR >41 years/ <27 years = 5.2, 95%CI, 1.9-14.1); specific SF groups (OR 5 th SFG / 1 st SFG = 3.7, 95%CI, 1.8-7.7 and 7 th SFG / 1 st SFG = 3.5, 95%CI, 1.8-6.9); more time spent performing unit resistance training (OR >160 minutes / 90-160 minutes =2.7, 95%CI, 1.5-5.1); and personal resistance training (OR >160 minutes / 90-160 minutes =1.7, 95%CI, 1.0-2.8); Protective factors for injury included total personal running distance per week (OR 8-10 miles / 2-4 miles = 0.53, 95%CI, 0.3-0.9). Evidence from this evaluation suggests that ARSOF Soldiers may benefit from participation in THOR3 compared to other human performance programs.					
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Technical Report No. S.0030637-16
Evaluation of the Tactical Human Optimization, Rapid Rehabilitation, and
Reconditioning Program (THOR3), July–September 2015

1 Summary

1.1 Purpose

The Tactical Human Optimization, Rapid Rehabilitation, and Reconditioning Program (THOR3) is a Special Forces (SF) human performance and exercise rehabilitation program. This Program has its own facilities (fitness center with a physical therapy clinic) and personnel consisting of strength and conditioning coaches (human performance), physical therapist (rehabilitation) and a sports performance dietitian. The THOR3 program focuses on optimizing physical and mental conditioning of SF Operators as well as elevating physical function, conditioning, and recovery of injured Operators to peak physical and mental performance. The primary objectives of this evaluation are to: (1) assess the THOR3 rehabilitation process, (2) compare training and human performance metrics among THOR3 and non-THOR3 participants, (3) establish and compare injury rates among THOR3 and non-THOR3 participants and (4) determine risk factors for injury.

1.2 Methods

A survey inquiring about personal characteristics, musculoskeletal injuries, human performance and THOR3 participation was administered electronically to Active Duty Army Special Operations Forces (ARSOF) Soldiers within the U.S. Army Special Operations Command (USASOC). Soldiers who completed the survey were both SF graduates and SF support staff. The survey was sent out electronically in the summer/fall of 2015 and inquired about participation in the THOR3 program during the previous 12 months. Responses were received from 23 July–9 September 2015. Descriptive statistics were calculated for demographics, physical training, human performance, and injury. Based on responses to physical training, Soldiers were categorized into three groups. The traditional physical training (TPT) group generally performed more running, a minimal amount of cross-training (CT) and did not participate in the THOR3 physical training program. The CT group performed a combination of CT and/or extreme conditioning programs and/or physical readiness training and did not participate in the THOR3 physical training program. The THOR3 group performed a combination of exercise programs similar to the CT group and included THOR3 as part of their unit and/or personal physical training program. Risk factors for injury were analyzed using univariate and multivariable logistic regression. Risk ratios (RR), odds ratios (OR), and 95 percent confidence intervals (CI) were calculated. The U.S. Army Public Health Center (APHC) Public Health Review Board approved this project.

1.3 Results

There were 579 Soldiers who completed surveys and had medical record data from five Active Duty SF Groups. Each SF group consisted of about 2500–2700 Soldiers. A majority of the surveys (97 percent) were completed by men who were

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on average 34 years old with an average body mass index (BMI) of 27. Only 3 percent of the surveys were completed by women who were on average younger with an average age of 28 and an average BMI of 24. About two thirds of the Soldiers reported participating in a THOR3 supervised physical training program. Around 75 percent of the Soldiers who participated in any THOR3 program (e.g., consulted with the dietitian and/or physical therapist and did/did not participate in a supervised training program) reported improvements in aerobic capacity, muscular strength, core strength, and being more physically fit for the mission as a result of the THOR3 program. More than half of the Soldiers also strongly agreed that leadership encourages supervised THOR3 performance training and encourages physical training in a safe way to increase fitness and reduce or minimize injuries. Approximately, 52 percent of the Soldiers provided additional comments about the THOR3 program, with 87 percent of these Soldiers describing THOR3 as a very positive and beneficial program. A majority of Soldiers with injuries were seen by the physical therapist within a day or less and on average completed physical therapy after 16 visits. Upon completing physical therapy, 58 percent of Soldiers reported complete recovery from their injuries. About one third of the Soldiers had a consultation with the dietitian.

Soldiers in both the CT and THOR3 groups outperformed those in the TPT group on all three Army physical fitness tests and performed a greater amount of unit sprinting, CT, agility training, and resistance training. Those in the THOR3 group spent less time performing unit running per week, compared to the TPT group. When comparing THOR3 to the CT group, those in the THOR3 group performed more agility training.

Injury incidence (from medical records) was 59 percent for men and 65 percent for women over the 12-month period. The 1st SF Group had the lowest injury rates at 45 compared to the 3rd Group at 51 percent, 5th at 63 percent, 7th at 71 percent, and the 10th at 58 percent. In a multivariate model controlling for personal characteristics, unit training, and fitness, the TPT group had a marginally higher risk of being injured when compared to the THOR3 group (OR = 2.72 (0.86-8.59, p=0.09).

Independent risk factors for injury for all Soldiers (regardless of fitness program) included older age (OR >41 years/ <27 years = 5.2, 95%CI, 1.9-14.1); the 5th and 7th SF Groups compared to the 1st SF Group (OR 5th SFG/1st SFG = 3.7, 95%CI, 1.8-7.7 and 7th SFG / 1st SFG = 3.5, 95%CI, 1.8-6.9); no-unit resistance training (OR none / 90–160 minutes = 2.22, (95%CI 1.04–4.77); more time spent performing unit resistance training (OR >160 minutes/90–160 minutes = 2.7, 95%CI, 1.5–5.1); and personal resistance training (OR >160 minutes/90–160 minutes = 1.7, 95%CI, 1.0–2.8). Protective factors for injury included total personal running of 8–10 miles per week (OR 8-10 miles/2-4 miles = 0.53, 95%CI, 0.3-0.9).

1.4 Conclusions and Recommendations

A majority of the Soldiers reported improvements in physical fitness and being more physically fit for the mission as a result of THOR3. Having an onsite Special Operations Forces (SOF) physical therapy clinic allowed a majority of the Soldiers with injuries to be seen within a day or less, with more than half of the Soldiers reporting complete recovery from their injuries. This

evaluation found that the THOR3 group had marginally lower self-reported injury rates when compared to the TPT group. Independent risk factors identified from this evaluation suggest that a moderate amount of unit and personal resistance training, personal distance running of 8–10 miles per week and being in the 1st SF Group will minimize injury risk. Older age was the only risk factor that was not modifiable and one of the strongest risk factors for injury. Evidence from this evaluation suggests that Soldiers may benefit from participation in THOR3 compared to other human performance programs.

2 References

See Appendix A for a listing of references used within this report.

3 Authority

The authority for APHC involvement in the evaluating the THOR3 program is Army Regulation (AR) 40-5, paragraph 2-19a (Department of the Army, AR 40-5, Preventive Medicine, 25 May 2007), which tasks the APHC to provide epidemiologic consultation and program evaluation services in the area of injury prevention and control to Army commands and direct reporting units upon request.

4 Background

4.1 Mission

The primary objectives of this evaluation are to: (1) assess the THOR3 rehabilitation process, (2) compare training and human performance metrics among THOR3 and non-THOR3 participants, (3) establish and compare baseline injury rates among THOR3 and non-THOR3 participants, and (4) determine risk factors for injury.

4.2 Oversight

The APHC has oversight of this evaluation.

4.3 Background

The THOR3 program is an SF human performance and exercise rehabilitation program; the Program has its own facilities (fitness center with a physical therapy clinic) and personnel consisting of strength and conditioning coaches (fitness performance), physical therapist (rehabilitation), and a sports performance dietitian. The THOR3 program focuses on optimizing physical and mental conditioning of SF Operators as well as elevating physical function, conditioning, and recovery of injured Operators to peak physical and mental performance. The U.S. Special Operations Command (USASOC) funded the THOR3 Program in 2009. However, the only evidence to support the effectiveness of the THOR3 Program is descriptive and

anecdotal. Therefore the USASOC who would like to verify if THOR3 is effective in reducing musculoskeletal injuries, decreasing rehabilitation times and enhancing human performance. However, THOR3 is voluntary and not all ARSOF Soldiers use this Program. The USASOC would like to scientifically determine the effectiveness of the THOR3 Program through an unbiased assessment conducted by the APHC.

5 Methods

5.1 Survey Design and Administration

The APHC designed the survey, with feedback and review from the USASOC Deputy Chief of Staff (DCS) Surgeon's Office. The APHC entered survey questions into the Verint® Systems Enterprise Edition survey software tool, which generated a link to the survey. The survey was sent out electronically by the USASOC DCS Surgeon's Office during the summer and fall of 2015. Responses were received from 23 July–9 September 2015 (49 days). An example of the survey is included in Appendix B.

5.2 APHC Human Protections Review

Prior to the administration of the survey, the APHC Public Health Review Board reviewed and approved this project as public health practice.

5.3 Data Collection and Analysis

5.3.1 Data Collection

A survey was used to collect personal characteristics from Soldiers such as sex, age, height, weight, rank, and most recent Army Physical Fitness Test (APFT) results. Close correlations have been found between actual APFT scores and self-reported APFT scores as well as actual and self-reported height and weight (1) (2). BMI was calculated as weight in kilograms divided by height in meters squared (kg/m^2). BMI was categorized according to the Centers for Disease Control and Prevention classifications for "normal", "overweight", and "obese." Predicted maximum volume of oxygen (VO_2max) was estimated for men from 2-mile run times using the following equation: $\text{predicted } \text{VO}_2\text{max} = 99.7 - (3.35 \times (2\text{-mile run time}))$ (3). The survey also collected physical training, THOR3 participation, health behavior, leadership, and injury data. The survey was completed by both SF graduates (an 18-series military occupational specialty (MOS)) and SF support staff. Questions were asked about the Soldiers' perception of leadership support as it relates to THOR3 and injury prevention. Operational Detachment Alpha (ODA) is used as an example in one of the leadership questions. An ODA is a highly trained 12-man team composed of SF Operators. Each ODA specializes in an infiltration skill or a specific mission-set such as combat diving, mountain warfare, and military free-fall. Physical training data was collected for both unit and personal physical training.

Based on responses to unit physical training, the Soldiers could be categorized into three groups. However, if their responses to the unit physical training questions were unclear as to which group they should be categorized [even though they may have initially answered up front in the survey that they did or did not participate in THOR3], then no determination was made.

- **First Group—Traditional Physical Training (TPT) Group**

The TPT generally performed more running and a minimal amount of CT during unit physical training (compared to the other two groups). However, they did not participate in THOR3 during unit or personal physical training.

- **Second Group—Cross-Training (CT) Group**

A CT group performed a combination of CT and/or extreme conditioning programs and/or physical readiness training and did not participate in THOR3 during unit or personal physical training.

- **Third Group—THOR3 Group**

The THOR3 group also performed a combination of exercise programs similar to the CT group. However, they included THOR3 as part of their unit physical training program and/or personal training program.

Health behavior questions inquired about dietary supplement use. Leadership questions asked about encouragement of THOR3, safety, and injuries. Soldiers were asked about injuries occurring within the last 12 months. They could list up to two injuries and were asked where the injury occurred (body area), cause, associated activities, whether they sought medical attention, and the number of limited duty days, if applicable.

The Armed Forces Health Surveillance Branch (AFHSB) provided Defense Medical Surveillance System data, including personal characteristics (e.g., sex, date of birth), visit dates and International Classification of Diseases 9th Revision (ICD-9) diagnosis codes for all outpatient and hospitalized injury medical encounters for the 12 months prior to survey administration. Injuries were categorized into three groups (overall, overuse, and traumatic) using the primary (first) ICD-9 diagnosis code. The overall injury index captures all ICD-9 injury related codes, both overuse and traumatic injuries. The overuse injury index captures the subset of musculoskeletal injuries presumably resulting from cumulative micro-trauma (700–739 ICD-9 codes). The traumatic injury index captures the subset of musculoskeletal injuries presumably resulting from a strong sudden force or forces being applied to the body (800–999 ICD-9 codes). These injury indices are consistent with prior studies of military training injuries(4) (5) (6) and with recommendations of the Department of Defense (DoD) Military Injury Metrics Work group. (7) Injury incidence was calculated as the number of Soldiers with one or more injuries divided by the total number of Soldiers surveyed, with and without medical record data, in the previous 12 months from the survey date.

5.3.2 Data Analysis

The Statistical Package for the Social Sciences (or SPSS®), Version 19.0, was used for statistical analysis. Descriptive statistics (frequencies, distributions, means, standard deviations (SD)) were calculated for personal characteristics and the APFT. An analysis of variance (ANOVA) with a post-hoc Tukey test was performed to investigate any differences in time spent performing unit or personal physical training as well as other variables such as miles run, age, and BMI. A T-test was run to look at any differences between men and women.

To identify potential injury risk factors among Soldiers, injury risk ratios and 95 percent confidence intervals (95% CI) were calculated using the electronic medical record data on overall injuries. A backward-stepping, multivariable logistic regression model was used to assess key factors for association with injury risk in this population. Variables entered into the backward-stepping model were chosen from the univariate models and had a significance of ≤ 0.05 or were determined necessary to control for specific known risk factors. Odds ratios and 95 percent CI were calculated for each potential risk factor.

6 Results

6.1 Demographics

There were 579 Soldiers who completed surveys and had medical record data from all five Active Duty SF Groups. Each SF Group consisted of approximately 2500–2700 Soldiers. A majority of the surveys (97%) were completed by men who were on average 34 years old with an average BMI of 27. Only 3 percent of the surveys were completed by women who were on average younger with an average age of 28 and an average BMI of 24. The distribution of survey respondents between SF Groups was fairly similar with the 7th SF Group completing the largest number of surveys at 26 percent and the 10th Group completing the least amount of surveys at 13 percent. On average, Soldiers were deployed for 78 days during the last 12 months.

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Variable	Variable Level	Men (%)	Mean	Women (%)	Mean
Sex		562 (97)		17 (3)	
Age	≤21 22-26 27-31 32-36 37-41 42-46 ≥47	12 (2) 49 (9) 179 (32) 157 (28) 91 (16) 58 (10) 16 (3)	33.6±6.3	1 (6) 8 (47) 5(29) 2 (12) 1 (6) 0 (0) 0 (0)	27.9±5.2
Height (in)	≤ 69 70 71-72 ≥73	207 (37) 74 (13) 156 (28) 123 (22)	70.6±2.8	16 (100)	63.9±2.4
Weight (lbs)	≤175 176-190 191-205 ≥206	139 (25) 155 (28) 122 (22) 146 (26)	192.8±22.7	16 (94) 1 (6)	137.6±16.4
BMI (kg/m ²)	< 25 25.0-29.9 ≥30	85 (15) 393 (70) 82 (15)	27.2±2.5	12 (75) 3 (19) 1 (6)	23.8±2.3
Unit	1 st SFG 3 rd SFG 5 th SFG 7 th SFG 10 th SFG	105 (19) 103 (18) 136 (24) 146 (26) 69 (12)		3 (18) 0 (0) 4 (24) 3 (18) 7 (41)	
Graduated SF Qualification Course (18 series)	Yes No	433 (77) 129 (23)		17 (100)	
Days Deployed in the Last Year	None < 30 days 30-60 days > 60 days	190 (36) 31 (6) 41 (8) 267 (51)	78.5 ±77.3	8 (73) 0 (0) 0 (0) 3 (27)	74.1 ± 133.5

Over two thirds of Soldiers reported participating in a THOR3-supervised unit physical training program. A majority of these Soldiers reported improvements in aerobic capacity, muscular strength, core strength, and being more physically fit for the mission as a result of THOR3 training. Over half of the Soldiers with injuries were seen by the physical therapist within a day or less and on average completed physical therapy within 16 visits. Upon completing physical therapy, a majority of the Soldiers reported complete recovery from their injuries. About 33 percent of Soldiers had a consultation with the dietitian. The top two reasons for visiting the dietitian were improved performance and healthier eating. More than half of the Soldiers reported taking dietary supplements. When given the opportunity to provide any additional written comments about the THOR3 program, 53 percent provided comments with 87 percent describing THOR3 as very positive and beneficial.

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Table 2. Participation in the THOR3 Program					
Variable	Variable Level	Men (%)	Mean	Women (%)	Mean
Have you participated in any THOR3 training programs	Training	84 (15)		3 (18)	
	Training and Physical Therapy	164 (29)		4 (24)	
	Training and Dietitian	14 (3)		0 (0)	
	Training, Physical Therapy and Dietitian	119 (21)		3 (18)	
	Physical Therapy	91 (16)		4 (24)	
	Dietitian	8 (1)		0 (0)	
	PT and Dietitian	29 (5)		0 (0)	
	No THOR3 Programs	53 (9)		3 (18)	
Participated in any THOR3 Program	No	53 (9)		4 (24)	
	Yes	509 (91)		13 (76)	
Reported Participating in a THOR3 Supervised Unit Fitness Training Program	No	181 (3%)		7 (41)	
	Yes	381 (68)		10 (59)	
Self-Reported Human Performance Improvements as a Result of Participating in any THOR3 training Programs* (Men= 509, Women=14)	Improved Aerobic Capacity	379 (75)		9 (64)	
	Increased Muscular Strength	387 (76)		11 (79)	
	Increased Core Strength	397 (78)		10 (71)	
	More Physically Fit for Mission	371 (73)		11 (79)	
	No Physical Changes	18 (4)		0 (0)	
Had an Appointment or Consulted with a THOR3 Physical Therapist	No	160 (28)		6 (35)	
	Yes	402 (72)		11 (65)	
How Long to be Seen by the Physical Therapist once the THOR3 Staff was Notified	≤ 1 day	221 (59)	3.4±	7 (70)	1.4±
	2-3 days	85 (23)	12.2	2 (20)	1.6
	≥ 4 days	66 (18)		1 (10)	
Number of Visits to the Physical Therapist	≤ 4 days	107 (29)	16.3±	3 (30)	15.5±
	5-8 days	77 (21)	21.5	5 (50)	29.9
	9-20 days	119 (32)		1 (10)	
	≥ 21 days	69 (19)		1 (10)	
Do you feel Completely Recovered from your Injury	No	158 (43)		3 (30)	
	Yes	214 (57)		7 (70)	
Believe your injury recovery time was more rapid through THOR3 Physical Therapy compared to treatment at the Clinic	No	16 (4)		0 (0)	
	Yes	356 (96)		10 (100)	
Self-Reported Estimated Number of Days Recovery Shortened by seeing the THOR3 Physical Therapist	≤ 10 days	99 (27)	67.7±	4 (40)	143.1±
	11-30 days	123 (33)	124.9	1 (10)	306.2
	31-60 days	60 (16)		2 (20)	
	≥ 61 days	90 (24)		3 (30)	
Consultation or Appointment with the Dietitian	No	339 (67)		11 (79)	
	Yes	170 (33)		3 (21)	

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Variable	Variable Level	Men (%)	Mean	Women (%)	Mean
Goal of Dietary Consultation / Meeting* (Men= 170, Women=3)	Healthier Eating	90 (53)		1 (33)	
	Improve Performance	106 (63)		2 (66)	
	Gain Muscle	56 (33)		2 (66)	
	Lose Weight	53 (31)		1 (33)	
	Learn about Dietary Supplements	46 (27)		0 (0)	
Do you take Dietary Supplements	No	260 (46)		12 (71)	
	Yes	302 (54)		5 (29)	
What Dietary Supplements do you take?*	Vitamins/Multi-Vitamin	255 (84)		4 (80)	
	Dietary	30 (10)		1 (20)	
	Performance/Muscle Enhancement	168 (56)		3 (60)	
	Nutrition Enhancements	127 (42)		2 (40)	
	Healthy Joint	144 (48)		2 (40)	
Additional Comments about the THOR3 program that Soldiers could write in a comment box	Negative Comments	11 (4)		0 (0)	
	Positive Comments	261 (87)		8 (100)	
	Neutral Comments	29 (10)		0 (0)	

Note: *More than one answer may have been selected

6.2 Leadership Support of THOR3 and Injury Prevention

The survey asked Soldiers about their perception of leadership support as it relates to THOR3 and injury prevention. A majority of Soldiers strongly agreed that leadership encourages supervised THOR3 performance training and encourages physical training in a safe way to increase fitness but reduce or minimize injuries.

Question	Variable Level	n (%)
Your unit leadership (e.g., Operational Detachment Alpha company, battalion, or group level) encourages use of supervised THOR3 performance training	Strongly Agree	367 (63)
	Agree	182 (31)
	Disagree	24 (4)
	Strongly Disagree	6 (1)
Your unit leadership encourage physical training in a safe way that strives to increase fitness but reduce or minimize injuries	Strongly Agree	378 (65)
	Agree	177 (31)
	Disagree	18 (3)
	Strongly Disagree	6 (1)
Does your unit leadership, medical sergeants, or physical training leader describe common causes of training injury and provide recommendations to reduce injury	Routinely	260 (45)
	Occasionally	232 (40)
	Rarely	68 (12)
	Never	19 (3)
Does your unit leadership, medical sergeants, or physical training leader provide information about status of team injuries and causes	Routinely	207 (36)
	Occasionally	241 (42)
	Rarely	94 (16)
	Never	37(6)
You think your current unit has a higher than normal rate of physical training related injuries	Strongly Agree	39 (7)
	Agree	95 (16)
	Disagree	225 (39)
	Strongly Disagree	74 (13)
	Not Sure	146 (25%)

6.3 Army Physical Fitness Test Performance

Men performed more push-ups and had faster average 2-mile run times when compared to women. However, men and women performed a similar amount of sit-ups (Table 4). When comparing APFT performance to other operational brigades in the Army for men, ARSOF Soldiers outperformed the other brigades on all three fitness tests (Table 5). Since the women's APFT scores appeared higher (better performance) than previously seen in other infantry brigades, we compared their results to another study of women in three light infantry brigades who were categorized by the activity they performed during personal training (8) (this was in addition to mandatory physical training) (Table 6).

Men				Women			T-Test Comparing men and women
Variable	Level	n (%)	Mean	Variable Level	n (%)	Mean	
Push-Ups	≤72	148 (28)	77.6±10.4	≤ 45	5 (29)	47.7±7.9	<0.01
	73-78	125 (23)		46-50	6 (35)		
	79-84	132 (25)		51-53	3 (18)		
	≥ 85	131 (24)		≥ 54	3 (18)		
Sit-Ups	≤ 75	151 (28%)	80.4±9.6	≤70	5 (31)	76.7±9.5	0.20
	76-80	126 (24)		71-77	4 (25)		
	81-85	140 (26)		78-84	3 (19)		
	≥86	119 (22)		≥85	4 (25)		
2-Mile Run in Minutes and Seconds	≤13:00	137 (26)	13:54±1:12	≤ 14:40	4 (25)	15:48±1:12	<0.01
	13:01-13:41	123 (24)		14:41-15:35	4 (25)		
	13:42-14:30	145 (28)		15:36-16:54	4 (25)		
	≥ 14:31	119(23)		≥ 16:55	4 (25)		

	SF (Current Study)		2-4 ID Infantry Brigade		4-4 ID Infantry Brigade		48 th Chemical Brigade		ANOVA
	n	average	n	average	n	average	n	average	
Push-Ups (reps)	543	77.6±10.4	989	68±14.2	1662	65.2±13.3	1033	64.4±12.8	<0.01
Sit-Ups (reps)	543	80.4±9.6	1,044	69±12.6	1650	67.6±11.8	1019	68.4±11.6	<0.01
2-Mile Run in Minutes and Seconds	531	13:54±1:12	1,042	14:54±1:36	1555	15.0±1:41	875	14:54 ±1:30	<0.01

Table 6. Army Physical Fitness Test Performance Comparison of Average Scores for Women

	SF (Current Study)		Women from three Infantry brigades		Women from three infantry brigades		Women from three Infantry brigades		ANOVA
			Performed CT for Personal Physical Training*		Running only for Personal Physical Training		Weight Training only for Personal Physical Training		
	n	average	n	average	n	average	n	average	
Push-Ups (reps)	17	47.7±7.9	243	41.8±12.2	85	37.7±13.8	80	35.4±10.9	<0.01
Sit-Ups (reps)	17	76.7±9.5	244	67.8±13.5	86	63.4±15.1	76	61.7±11.0	<0.01
2-Mile Run in Minutes and Seconds	16	15:48±1:12	230	17:24±2:06	76	18:00±2:06	49	17:48±2:36	<0.01

*CT consisted of running or sprinting and performing weight training at least once a week

6.4 Physical Training

Tables for participation in unit and personal physical training for men (n=614) and women (n=18) (survey data) are located in Appendix C. There are 12 tables showing the frequency of multiple physical training activities as either continuous or categorical variables. There is also a table displaying average APFT scores by age for men.

6.5 Human Performance and Average Physical Training Time for Soldiers Participating in Three Different Exercise Programs

Based on the participants' response to unit training survey questions and those for whom medical record data could be obtained, 328 men were categorized into three unit physical training exercise groups based on the type of training they had been performing over the last twelve months. The three groups consisted of the TPT group, the CT group, and the THOR3 group. Besides the low percentage of those participating in TPT, over 50 percent were not SF graduates. A majority of the CT and THOR3 groups consisted of SF Graduates (Table 7).

Table 7. Distribution of Soldier Status by Unit Physical Training Program for Men

Exercise Program	SF Grad (18 Series) (%)	Support (%)	Total
TPT	11 (41)	16 (59)	27
CT	61 (71)	25 (29)	86
THOR3	177 (82)	38 (18)	215
Total	249 (76)	79 (24)	328

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Table 8 displays means and standard deviations for men in all three unit physical training groups (TPT, CT, and THOR3) by age, BMI, fitness performance tests, and unit physical training activities. Soldiers in both the CT and THOR3 groups outperformed those in the TPT group on all three physical fitness tests and performed a greater amount of sprinting, CT, agility training, and resistance training. Those in the THOR3 group also spent less time running and more time stretching per week when compared to the TPT group. When comparing the THOR3 to the CT group, those in the THOR3 group performed more agility training and stretching.

Table 8. Average Age, BMI, Fitness Performance, and Physical Training by Unit Fitness Training Program					
Demographics, Fitness Performance and Unit Physical Training (PT)	TPT	CT	THOR3	ANOVA	ANOVA With Tukey (Specific Interactions)
Age (years)	34.2±7.9	32.3±6.3	33.4±6.1	0.26	
BMI	27.3±3.5	27.2±2.6	27.1±2.4	0.93	
2-Mile Run (minutes and seconds)	14:40±1:17	13:50±1:07	13:42±1:08	<0.01	TPT – CT p<0.01 TPT – THOR3 p<0.01
Push-ups (reps)	69.9±11.8	77.5±9.2	78.3±11.1	<0.01	TPT – CT p<0.01 TPT – THOR3 p<0.01
Sit-ups (reps)	73.3±11.5	80.5±8.9	81.4±8.9	<0.01	TPT – CT p<0.01 TPT – THOR3 p<0.01
Unit PT Running Distance per Week (miles)	8.6±4.2	7.9±4.6	7.2±4.0	0.13	
Unit PT Running Pace per Mile (min)	8.0±0.9	7.6±1.6	7.3±1.7	0.14	
Unit PT Running Time per Week (min)	69.5±36.6	61.6±37.1	54.5±31.8	0.05	TPT – THOR3 p=.08
Unit PT Minutes per Week of Sprinting (min)	10.3±15.6	29.2±31.2	36.1±29.9	<0.01	TPT – CT p=0.01 TPT – THOR3 p<0.01
Unit PT CT Minutes per Week (min)	14.6±38.1	73.1±73.0	88.3±72.4	<0.01	TPT – CT p<0.01 TPT – THOR3 p<0.01
Unit PT Minutes per Week of Agility Training (min)	4.0±10.4	19.5±25.8	28.9±26.8	<0.01	TPT – CT p=0.02 TPT – THOR3 p<0.01 CT – THOR3 p<0.01
Unit PT Minutes per Week of Aerobic Activity excluding Running (min)	22.3±32.1	44.7±69.9	47.3±51.2	0.13	
Unit PT Minutes per Week of Resistance Training (min)	42.7±64.3	144.2±153.0	134.5±95.0	<0.01	TPT – CT p<0.01 TPT – THOR3 p<0.01
Unit PT Road Marching Miles per Month	15.0±10.3	16.1±11.9	14.6±9.8	0.60	
Unit PT Road Marching Time per Month (min) (estimated at 4 miles per hour (mph))	224.3±155.2	240.9±178.2	219.5±147.4	0.60	
Unit PT Times per Week Stretching	3.4±2.2	3.7±1.8	4.3±2.0	<0.01	TPT – THOR3 p=0.03 CT – THOR3 p=0.02
TPT = Traditional Physical Training, which excludes THOR3/CT = Cross-training which excludes THOR3/THOR3 = Combination of Exercise Programs including THOR3					

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We also considered any differences in personal physical training between those performing TPT, CT, and THOR3 for unit physical training (Table 9). Those in the THOR3 group performed less running and aerobic activity (excluding running per week) when compared to the CT group.

Table 9. Average Personal Physical Training by unit Physical Training Groups					
Personal Physical Training	TPT	CT	THOR3	ANOVA	ANOVA With Tukey (Specific Interactions)
Personal PT Running Distance per Week	9.3±6.5	9.3±7.1	7.0±5.2	<0.01	CT – THOR3 p<0.01
Personal PT Running Time per Week (Est - 7.4-min mile)	68.8±48.1	68.5±52.5	51.7±38.5	<0.01	CT – THOR3 p<0.01
Personal PT Minutes per Week of Sprinting	26.5±36.0	25.2±34.7	25.4±40.8	0.99	
Personal PT CT Minutes per Week	26.8±48.1	70.0±98.6	57.8±81.8	0.09	
Personal PT Minutes per Week of Agility Training	15.4±32.3	16.4±30.1	17.0±27.9	0.96	
Personal PT Minutes per Week of Aerobic Activity excluding Running	37.9±61.3	62.6±97.1	42.5±59.4	0.05	CT – THOR3 p=0.08
Personal PT Minutes per Week of Resistance Training	99.5±131.6	149.4±136.8	122.0±118.3	0.12	
TPT = Traditional Physical Training which excludes THOR3 CT = Cross-Training which excludes THOR3 THOR3 = Combination of Exercise Programs including THOR3					

Soldiers in the CT and THOR3 programs performed approximately two times more unit physical training and 20–50 percent more personal physical training compared to the TPT group. Overall, both the CT and THOR3 fitness groups performed 1.8 and 1.6 times more physical training (unit and personal physical training), respectively, per week when compared to the TPT group. There were no differences in the overall amount of physical training (both unit and personal physical training) performed by the CT and THOR3 groups (Table 10).

Table 10. Total Average Unit and Personal Training Time in Minutes by Unit Fitness Training Program: TPT, CT, and THOR3					
Physical Training	TPT	CT	THOR3	ANOVA	ANOVA With Tukey (Specific Interactions)
Total Average Unit Physical Training Time per Week in Minutes (Running, Sprinting, Cross-Training, Agility Drills, Aerobic Endurance Training (Excluding Running), Resistance Training and Road Marching)	203.9±118.2	422.9±216.7	424.8±196.0	<0.01	TPT – CT p<0.01 TPT – THOR3 p<0.01
Total Average Personal Physical Training Time per Week in Minutes (Running, Sprinting, Cross-Training, Agility Drills, Aerobic Endurance Training (Excluding Running), Resistance Training)	253.7±247.4	386.8±243.3	297.6±221.5	<0.01	CT – TPT p=0.03 CT – THOR3 p<0.01
Total Average Unit and Personal Training per Week in minutes	448.2±278.2 (7.5 hours)	809.7±372.4 (13.5 hours)	718.2±336.9 (12 hours)	<0.01	TPT – CT p<0.01 TPT – THOR3 p<0.01
TPT = Traditional Physical Training which excludes THOR3 CT = Cross-Training which excludes THOR3 THOR3 = Combination of Exercise Programs including THOR3					

6.6 Unit and Personal Physical Training Exposure for Personal Characteristics, Running, and Fitness Performance

Men performed two times as much unit physical training compared to women. However, no differences in the time spent performing personal and overall physical training by men and women were shown. For age group and BMI, there was no difference in unit, personal, and overall amount of training performed per week. Special Forces (SF) graduates performed more unit physical training when compared to SF Support Soldiers. In general, those who ran the most miles per week and those who were fit, as determined by the APFT, performed the highest amount of physical training per week (Table 11).

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Table 11. Physical Training by Unit and Personal Training Programs for Men (except comparison between men and women)							
Gender	Men	Women				T-Test	
Average Unit PT per Week in Minutes	277.0±243.8	138.7±154.2				<0.01	
Average Personal PT per Week in Minutes	372.1±270.6	418.9±277.0				0.50	
Total Average Unit and Personal Training per Week (minutes)	643.0±364.7	585.5±323.4				0.55	
Age	< 27	27-31	32-41	> 41		ANOVA	ANOVA With Tukey (Specific Interactions)
Average Unit PT per Week in Minutes	309.2±256.1	301.0±232.9	254.1±243.6	269.3±275.3		0.17	
Average Personal PT per Week in Minutes	420.5±247.4	350.3±237.8	380.9±284.2	356.6±311.8		0.32	
Total Average Unit and Personal Training per Week (minutes)	717.5±376.7	647.7±331.2	627.8±364.5	622.2±427.2		0.36	
BMI	< 25	25-29.9	≥ 30			ANOVA	ANOVA With Tukey (Specific Interactions)
Average Unit PT per Week in Minutes	260.7±214.5	277.8±246.5	294.4±261.7			0.67	
Average Personal PT per Week in Minutes	364.5±270.6	374.1±276.2	372.0±246.3			0.96	
Total Average Unit and Personal Training per Week (minutes)	617.8±335.8	646.7±364.5	657.3±398.4			0.75	
Duty Status	SF Graduate	SF Support				T-Test	
Average Unit PT per Week in Minutes	308.3±245.1	214.1±229.2				<0.01	
Average Personal PT per Week in Minutes	369.8±273.3	379.9±262.0				0.71	
Total Average Unit and Personal Training per Week (minutes)	649.7±371.7	620.7±364.7				0.43	

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Table 11. Physical Training by Unit and Personal Training Programs for Men (except comparison between men and women) (continued)							
Unit PT Mileage Run per Week	None	2-4 miles	5-7 miles	8-10 miles	> 10 miles	ANOVA	ANOVA With Tukey (Specific Interactions)
Average Unit PT per Week in Minutes	301.2±209.9	328.2±210.4	325.0±205.2	398.4±201.0	487.7±222.5	<0.01	>10 – none p=0.01 > 10 -2-4 p<0.01 >10 – 5-7 p<0.01 >10 – 8-10 p=0.05 8-10 – 5-7 p=0.05
Average Personal PT per Week in Minutes	336.1±333.6	330.9±213.7	344.3±303.8	345.4±238.0	428.9±266.9	0.21	
Total Average Unit and Personal Training per Week in Minutes	589.7±329.3	659.2±329.3	666.4±403.4	735.0±332.4	916.6±373.8	<0.01	>10 – none p<0.01 > 10 -2-4 p<0.01 >10 – 5-7 p<0.01 >10 – 8-10 p=0.01
Personal PT Mileage Run per Week in Minutes	None	2-4 miles	5-7 miles	8-10 miles	> 10 miles	ANOVA	ANOVA With Tukey (Specific Interactions)
Average Unit PT per Week in Minutes	305.1±246.3	266.5±232.6	310.2±236.4	261.5±244.3	267.4±257.2	0.47	
Average Personal PT per Week in Minutes	358.0±216.2	343.1±292.9	340.5±216.7	386.4±249.8	497.9±280.5	<0.01	>10 – none p=0.02 > 10 -2-4 p<0.01 >10 – 5-7 p<0.01 >10 – 8-10 p<0.01
Total Average Unit and Personal Training per Week in Minutes	632.6±340.6	604.7±365.2	650.7±314.2	643.8±357.2	761.1±392.6	0.01	> 10 -2-4 p<0.01 >10 – 8-10 p<0.07
Two Mile Run (min and seconds)	≤ 13:00	13:01-13:41	13:42-14:30	>14:30		ANOVA	ANOVA With Tukey (Specific Interactions)
Average Unit Physical Training per Week in Minutes	305.9±249.8	287.5±240.4	275.8±235.2	240.9±245.4		0.20	
Average Personal Physical Training per Week in Minutes	419.0±294.5	366.8±220.7	347.4±284.4	355.2±273.8		0.13	
Total Average Unit and Personal Training per Week in Minutes	715.2±379.0	640.6±282.5	623.2±392.7	594.1±377.7		.047	≤ 13:00 – > 14:30 p<0.01
Push-ups (reps)	> 84	79-84	73-78	≤ 72		ANOVA	ANOVA With Tukey (Specific Interactions)
Average Unit Physical Training per Week in Minutes	312±260.2	296.5±228.0	299.9±269.2	211.6±201.0		<0.01	≤ 72 – 73-78 p=0.01 ≤ 72 – 79-84 p=0.02 ≤ 72 - >84 p<0.01
Average Personal Physical Training per Week in Minutes	439.5±298.6	347.6±261.6	379.5±252.1	327.9±264.6		<0.01	>84 -≤ 72 - p<0.01 >84 - 79-84–p=0.03
Total Average Unit and Personal Training per Week in Minutes	744.5±366.2	629.4±344.9	679.4±383.0	537.3±335.6		<0.01	≤ 72 – 73-78 <0.01 ≤ 72 – >84 p=0.01 79-84 - >84 p=0.05

Table 11. Physical Training by Unit and Personal Training Programs for Men (except comparison between men and women) (continued)

Sit-ups (reps)	> 85	81-85	76-80	≤ 75		ANOVA	ANOVA With Tukey (Specific Interactions)
Average Unit Physical Training per Week in Minutes	332.9±269.4	292.6±235.1	277.3±233.8	219.0±224.4		<0.01	≤ 75 -81-85 p=0.05 ≤ 75 -< 85 p <0.01
Average Personal Physical Training per Week in Minutes	436.9±299.4	383.5±270.4	355.0±269.6	325.0±244.5		<0.01	< 85 -76-80 p=0.09 < 85 - ≤ 75 p<0.01
Total Average Unit and Personal Training per Week in Minutes	764.2±380.3	667.0±363.8	626.6±345.9	540.4±330.0		<0.01	≤ 75 -81-85 p=0.01 ≤ 75 -< 85 p <0.01 > 85 – 76-80 p=0.01

6.7 Comparing Injury Rates, Personal Characteristics, Fitness Performance, and Physical Fitness Training between Special Forces Groups

The 1st SF Group had the lowest injury rates, while the 7th Group had the highest injury rates among the five SF groups. There were no differences in fitness performance and unit physical fitness training except for road marching load. The 1st and the 3rd SF Groups carried more weight, on average, while road marching when compared to the 10th SF Group. For personal fitness training, the 1st Group did the least amount of sprint training compared to the 5th and 10th SF Groups. The 10th SF Group performed the most personal agility training and performed significantly more personal agility training compared to the 3rd SF Group. The 3rd SF Group performed the most personal resistance training and performed significantly more personal resistance training compared to the 1st SF Group. The 3rd SF Group performed the most unit physical training per week, while the 5th SF Group performed the least amount of unit physical training per week. The 10th SF Group performed the most personal physical training per week, while the 1st SF Group performed the least amount of personal physical training per week. For overall physical training performed per week (both unit and personal physical training) the 3rd SF Group performed the most overall training per week, while the 1st SF Group performed the least amount of overall physical training. It is interesting to note that the 1st SF Group performed the least amount of overall physical fitness training, yet had similar fitness performance scores and the lowest injury rate among the five SF Groups (Table 12).

Table 12. Comparison of Injury Rates, Personal Characteristics, Fitness Performance, and Physical Fitness Training between Special Forces Groups

Unit	1 st SF (n=105)	3 rd SF (n=103)	5 th SF (n=136)	7 th SF (n=146)	10 th SF (n=69)	ANOVA	ANOVA With Tukey (Specific Interactions)
Injury Rate for Men with Survey and AFHSB Data	45%	51%	63%	71%	58%	_____	_____
Average BMI (kg/m ²)	27.4±2.5	27.1±2.0	27.3±2.4	27.3±2.6	26.8±3.1	0.59	
APFT 2-Mile Run Time (min)	13.8±1.2	13.8±1.1	13.9±1.1	13.9±1.1	13.8±1.3	0.98	
APFT Push-ups (reps)	76.3±10.5	77.9±9.9	77.4±10.9	78.9±9.9	77.1±10.9	0.43	
APFT Sit-ups (reps)	80.1±9.0	80.7±8.8	79.6±9.8	80.7±10.1	78.8±10.1	0.61	

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Table 12. Comparison of Injury Rates, Personal Characteristics, Fitness Performance, and Physical Fitness Training between Special Forces Groups (continued)							
Unit	1st SF (n=105)	3rd SF (n=103)	5th SF (n=136)	7th SF (n=146)	10th SF (n=69)	ANOVA	ANOVA With Tukey (Specific Interactions)
Unit PT Running Distance per Week (miles)	7.2±4.2	7.4±3.8	7.6±3.6	7.0±4.4	6.1±3.9	0.34	
Unit PT Running Pace per Mile (min)	7.3±1.8	7.4±1.8	7.8±0.6	7.2±2.0	7.0±2.5	0.08	
Unit PT Running Time per Week (min)	54.6±34.0	57.6±30.1	58.6±29.8	54.2±35.4	48.1±32.1	0.49	
Unit PT per Week of Sprinting (min)	32.3±32.0	24.7±23.2	25.8±21.7	28.4±33.7	24.5±37.0	0.43	
Unit PT CT per Week (min)	78.3±70.0	72.0±63.5	65.0±76.9	77.1±75.6	64.3±62.6	0.66	
Unit PT per Week of Agility Training (min)	22.3±23.5	20.0±25.8	19.7±27.7	19.2±22.1	23.4±30.3	0.84	
Unit PT per Week of Aerobic Activity excluding Running (min)	38.3±38.6	45.6±72.8	43.6±47.8	38.2±46.9	46.0±61.5	0.82	
Unit PT per Week of Resistance Training (min)	100.0±96.4	135.6±154.4	108.6±92.5	113.4±111.2	98.3±106.3	0.25	
Unit PT Road Marching Distance per Month	13.7±8.8	15.0±9.4	14.2±8.9	15.0±11.3	16.5±13.3	0.70	
Unit PT Road Marching Time per Month (4 mph)	205.8±131.5	225.4±141.0	212.9±133.7	224.9±169.2	247.5±199.5	0.70	
Unit PT Road Marching Load (lbs)	50.9±7.7	50.5±9.8	48.9±9.3	48.1±8.6	45.6±7.0	0.01	10 th - 1 st p=0.02 10 th - 3 rd p=0.03
Unit PT Times per Week Stretching	4.3±2.2	4.1±1.8	3.9±2.1	3.7±2.0	4.1±2.2	0.30	
Personal PT Running Distance per Week	7.7±6.5	7.6±5.2	8.5±6.7	7.8±6.3	10.0±8.4	0.13	
Personal PT Running Time per Week (Est - 7.4-min mile)	57.0±48.1	56.0±38.8	62.9±49.4	57.8±46.4	74.0±62.1	0.13	
Personal PT Minutes per Week of Sprinting	19.4±31.0	25.5±32.6	32.4±29.4	26.5±31.7	39.3±63.2	<0.01	1 st -5 th p=0.06 1 st -10 th p<0.01
Personal PT CT Minutes per Week	53.5±72.0	84.1±120.5	66.1±79.9	83.1±102.2	71.6±83.9	0.10	
Personal PT Minutes per Week of Agility Training	14.8±25.4	11.5±20.2	21.5±47.8	20.7±36.7	28.0±41.2	0.03	3 rd -10 th p=0.04
Personal PT Minutes per Week of Aerobic Activity excluding Running	46.1±68.4	54.1±79.8	61.2±71.9	61.4±100.2	62.0±88.0	0.60	
Personal PT Minutes per Week of Resistance Training	125.9±135.5	190.9±181.3	149.8±110.4	146.4±133.7	147.9±141.7	0.02	1 st -3 rd p=0.01
Average Unit PT per Week (min)	289.3±220.7	331.9±258.9	221.9±230.6	299.5±244.3	248.7±257.9	P<0.01	3 rd - 5 th p<0.01 7 th - 5 th p=0.08
Average Personal PT per Week (min)	300.3±239.2	408.6±320.8	373.6±244.1	377.9±271.0	413.3±273.8	P=0.05	1 st - 3 rd p=0.05 1 st - 10 th p=0.08
Total Average Unit and Personal Training per Week (min)	581.1±311.2	740.5±389.8	593.8±330.1	668.1±408.8	648.8±341.3	P<0.01	3 rd - 1 st p=0.02 3 rd - 5 th p=0.02

6.8 Self-Reported Injury Rates for Men and Women

Table 13 displays self-reported injuries for all men and women who completed the survey. Women were marginally less likely to be injured when compared to men. However, these results are most likely influenced by the small number of women in this evaluation.

Variable	Variable Level	n	(%) Injured	Risk Ratio 95% CI	p-value
Self-Reported Injury from the Survey	Men	614	51	1.00	
	Women	18	28	0.55 (0.26-1.16)	0.06

Table 14 displays self-reported injuries for men and women by injury type. The most common types of injuries were overuse sprains and strains, followed by muscle and ligament tears. Table 15 displays the distribution of injury types for men by fitness program. The TPT group had a lower percentage of sprain/strain overuse injuries and a greater percentage of fractures when compared to the CT and THOR3 groups. The THOR3 group had a greater percentage of spinal injuries and lower percentage of sprain/strain traumatic injuries compared to the CT group.

Type of Injury	n	Men (%)	n	Women (%)
Sprain/Strain Overuse	92	30	1	20
Tear (muscle/ ligaments)	64	21	1	20
Spinal Injury (e.g., bulging or slipped disk)	39	13		
Sprain/Strain Traumatic	36	12	1	20
Fracture/Break	24	8		
Nerve Injury	13	4		
Blunt Force Trauma	11	4		
Dislocation	8	3	1	20
Fasciitis	5	2		
Bruise/Contusion	4	1		
Cut/Laceration	3	1		
Heat Injury	0	0	1	20
Other	12	4		

Type of Injury	n (%)	TPT (%)	CT (%)	THOR3 (%)	Exercise Group Not Determined (%)
Sprain/Strain Overuse	92 (30)	4 (19)	16 (33)	39 (35)	33 (25)
Tear (muscle/ligaments)	64 (21)	5 (24)	10 (21)	28 (25)	21 (16)
Spinal Injury (e.g., bulging or slipped disk)	39 (13)	3 (14)	3 (6)	15 (13)	18 (14)

Type of Injury	n (%)	TPT (%)	CT (%)	THOR3 (%)	Exercise Group Not Determined (%)
Sprain/Strain Traumatic	36 (12)	3 (14)	6 (13)	8 (7)	19 (15)
Fracture/Break	24 (8)	4 (19)	3 (6)	8 (7)	9 (7)
Nerve Injury	13 (4)	0 (0)	1 (2)	2 (2)	10 (8)
Blunt Force Trauma	11 (4)	1 (5)	5 (10)	2 (2)	3 (2)
Dislocation	8 (3)	1 (5)	3 (6)	1 (1)	3 (2)
Fasciitis	5 (2)	0 (0)	0 (0)	2 (2)	3 (2)
Bruise/Contusion	4 (1)	0 (0)	0 (0)	2 (2)	2 (2)
Cut/Laceration	3 (1)	0 (0)	0 (0)	3 (3)	0 (0)
Heat Injury	0 (0)	0 (0)	0 (0%)	0 (0)	0 (0)
Other	12 (4)	0 (0)	1 (2)	2 (2%)	9 (7)
Total	311 (100)	21 (100)	48 (100)	112 (100)	130 (100)

TPT = Traditional Physical Training which excludes THOR3
CT = Cross-Training which excludes THOR3
THOR3 = Combination of Exercise Programs including THOR3

Table 16 displays self-reported injuries for men and women by the cause associated with the injury. A majority of the injuries were caused by overexertion, strenuous, or repetitive movements. Table 17 displays the distribution of causes associated with injury for men by fitness program. The TPT group had less overexertion injuries and more slips, trips, and falls compared to the CT and THOR3 groups.

Cause of Injury	n	Men (%)	n	Women (%)
Overexertion, strenuous or repetitive movements	170	55	3	60
Fall, jump, slip, or trip	76	24		
Struck against or by an object or person	22	7		
Bullet/Grenade/Projectile	12	4		
Direct or indirect contact by enemy	4	1		
Cut or puncture by a sharp tool, object or instrument	1	< 1		
Burn (by fire, not substance or object or steam)	1	< 1		
Other	25	8	2	40

Cause of Injury	n (%)	TPT (%)	CT (%)	THOR3 (%)	Exercise Group Not Determined (%)
Overexertion, strenuous or repetitive movements	170 (55)	10 (48)	27 (56)	62 (55)	71(55)
Fall, jump, slip, or trip	76 (24)	8 (38)	14 (29)	28 (25)	26 (20)

Cause of Injury	n (%)	TPT (%)	CT (%)	THOR3 (%)	Exercise Group Not Determined (%)
Struck against or by an object or person	22 (7)	1 (5)	0 (0)	9 (8)	12 (9)
Bullet/Grenade/Projectile	12 (4)	0 (0)	1 (2)	5 (5)	6 (5)
Direct or indirect contact by enemy	4 (1)	0 (0)	1 (2)	1 (1)	2 (2)
Cut or puncture by a sharp tool, object or instrument	1 (<1)	0 (0)	0 (0)	1 (1)	0 (0)
Burn (by fire, not substance or object or steam)	1 (<1)	0 (0)	0 (0)	0 (0)	1 (1)
Other	25 (8)	2 (10)	5 (10)	6 (5)	12 (9)
Total	311 (100)	21 (100)	48 (100)	112 (100)	130 (100)

TPT = Traditional Physical Training which excludes THOR3
CT = Cross-Training which excludes THOR3
THOR3 = Combination of Exercise Programs including THOR3

Table 18 displays self-reported injuries for men and women by the associated activity. The most common types of activities associated with injury were physical training, airborne operations, and lifting or moving heavy objects. Table 19 displays self-reported injuries for men by the associated activity. The CT group had the greatest percentage of physical training injuries compared to the TPT and THOR3 groups. The THOR3 group had the lowest percentage of airborne injuries when compared to the TPT and CT groups. The TPT group had a greater percentage of lifting or moving heavy objects injuries when compared to the CT and THOR3 groups.

Activity of Injury	n	Men (%)	n	Women (%)
Physical Training	125	40	1	20
Airborne Operations	33	11	1	20
Lifting or Moving Heavy Objects (not weight training)	33	11	1	20
Combat	28	9		
Marching with Load	20	6	1	20
Sports/Recreation	15	5	1	20
Gunshot, Missile, Blast	8	3		
Riding or Driving in a Motorized Vehicle	7	2		
Walking or Hiking	7	2		
Rough Housing or Fighting	3	1		
Stepping/Climbing	1	< 1		
Repairing or maintaining equipment	1	< 1		
Other	30	10		

Activity of Injury	n (%)	TPT (%)	CT (%)	THOR3 (%)	Exercise Group Not Determined (%)
Physical Training	125 (40)	5 (24)	24 (50)	46 (41)	50 (38)
Airborne Operations	33 (11)	3 (14)	8 (17)	8 (7)	14 (11)
Lifting or Moving Heavy Objects (not weight training)	33 (11)	5 (24)	5 (10)	12 (11)	11 (8)
Combat	28 (9)	2 (10)	3 (6)	13 (12)	10 (8)
Marching with Load	20 (6)	1 (5)	3 (6)	5 (5)	11 (8)
Sports/Recreation	15 (5%)	1 (5)	1 (2)	7 (6)	6 (5)
Gunshot, Missile, Blast	8 (3)	0 (0)	0 (0)	4 (4)	4 (3)
Riding or Driving in a Motorized Vehicle	7 (2)	0 (0)	0 (0)	4 (4)	3 (2)
Walking or Hiking	7 (2)	0 (0)	1 (2)	2 (2)	4 (3)
Rough Housing or Fighting	3 (1)	0 (0)	1 (2)	0 (0)	2 (2)
Stepping/Climbing	1 (<1)	0 (0)	0 (0)	0 (0)	1 (1)
Repairing or maintaining equipment	1 (<1)	1 (5)	0 (0)	0 (0)	0 (0)
Other	30 (10)	3 (14)	2 (4)	11 (10)	14 (11)
Total	311 (100)	21 (100)	48 (100)	112 (100)	130 (100)

TPT = Traditional Physical Training which excludes THOR3
CT = Cross-Training which excludes THOR3
THOR3 = Combination of Exercise Programs including THOR3

6.9 Self-Reported and Medical Record Injury Rates for Men and Women

Table 20 displays self-reported and medical record injury rates for both men and women who completed the survey and for whom medical record data could be obtained. No differences between men and women in injury rates for self-reported and medical record data were shown. However, injury data captured by medical records for overall injuries showed a higher rate of injury when compared to injury data captured by self-reported injuries for men and women.

Injury Type	Men (%) Injured (n) n=562	Women (%) Injured (n) n=17	p-value
Self-Reported Injury from the Survey	50 (282)	29 (5)	0.09
Comprehensive or Overall Injury from Medical Records	59 (329)	65 (11)	0.61
Overuse injury from Medical Records	46 (257)	53 (9)	0.56
Traumatic Injury from Medical Records	32 (178)	35 (6)	0.75

Table 21 displays injury rates and injury risk ratios for self-reported and medical record data for both men and women who completed the survey and for whom medical record data could be

obtained. There were no differences in injury risk between men and women for any of the injury indices.

Injury Type	Sex	n	% Injured	Risk Ratio 95% CI	p-value
Self-Reported Injury from the Survey	M	562	50	1.00	
	F	17	29	0.59 (0.28-1.23)	0.09
Comprehensive or Overall Injury from Medical Records	M	562	59	1.00	
	F	17	65	1.11 (0.78-1.58)	0.61
Overuse injury from Medical Records	M	562	46	1.00	
	F	17	53	1.16 (0.73-1.83)	0.56
Traumatic Injury from Medical Records	M	562	32	1.00	
	F	17	35	1.11 (0.58-2.15)	0.75

Table 22 displays injury risk and injury risk ratio's for self-reported and medical record injuries by those participating in TPT, CT and THOR3. The TPT group had higher injury rates compared to the THOR3 group for self-reported injuries. However, in a multivariate model (not shown) controlling for personal characteristics, unit training, and fitness, the TPT group had a marginally higher risk of being injured when compared to the THOR3 group (OR = 2.72 (0.86-8.59, p=0.09).

Variable	Unit Fitness Program	N	% Injured	Risk Ratio 95% CI	p-value
Self-Reported Injuries	TPT	27	70	1.46 (1.10-1.93)	0.03
	CT	86	52	1.08 (0.85-1.38)	0.54
	THOR3	215	48	1.00	
Self-Reported Physical Training Injuries	TPT	27	26	1.21 (0.61-2.41)	0.59
	CT	86	27	1.25 (0.81-1.93)	0.32
	THOR3	215	21	1.00	
Medical Record Injuries	TPT	27	63	1.23 (0.86-1.76)	0.28
	CT	86	51	1.00	
	THOR3	215	58	1.13 (0.89-1.43)	0.31
Medical Record Overuse Injuries	TPT	27	48	1.22 (0.76-1.95)	0.43
	CT	86	40	1.00	
	THOR3	215	47	1.18 (0.87-1.59)	0.27
Medical Record Traumatic injuries	TPT	27	44	1.54 (0.96-2.47)	0.10
	CT	86	31	1.09 (0.75-1.59)	0.66
	THOR3	215	29	1.00	

TPT = Traditional Physical Training which excludes THOR3
CT = Cross-Training which excludes THOR3
THOR3 = Combination of Exercise Programs including THOR3

Additionally, we calculated and compared self-reported physical training related injury rates by exposure time to unit physical training for each of the three groups. No significant differences were found between the three groups (Table 23).

Table 23. Injury Rates by Hours of Participation and Physical Training Program (Men)			
Variables	Unit Physical Training Programs (Men)		
	TPT	CT	THOR3
n	27	86	215
Unit Physical Training in Total Hours per Year (Hours per Week per person)	5,506 hours per year (3.9 hours per week/person)	36,368 hours per year (8.1 hours per week/person)	79,152 hours per year (7.1 hours per week/person)
Self-Reported Physical Training Related Injuries (n)	7	27	55
Injury Rates per 1,000 hours of physical training	1.27	0.74	0.69
TPT = Traditional Physical Training which excludes THOR3 CT = Cross-Training which excludes THOR3 THOR3 = Combination of Exercise Programs including THOR3 No significant differences in injury rates between the three groups			

6.10 Descriptive, Physical Training, and Human Performance Associated with Injury Risk

Table 24 displays descriptive risk factors associated with injury risk (from medical record data) for men. Men who were older, had higher BMIs, and in the 5th and 7th SF Group had a higher risk of injury. Men who were deployed for more than 60 days had a lower risk of injury. Since deployment injuries may not be captured in the medical record system, we also looked at self-reported injury risk and the number of deployment days. No difference in injury risk was shown for amount of time deployed using self-reported injuries (p=0.35).

Table 24. Descriptive Data and Injury Risk for Men using Medical Record Data (Overall Injury Index)					
Variable	Variable Level	n	% Injured	Risk Ratio 95% CI	p-value
Age*	< 27	61	51	1.00	
	27-31	179	51	1.01 (0.76-1.35)	0.94
	32-36	157	62	1.22 (0.92-1.60)	0.14
	37-41	91	64	1.25 (0.94-1.68)	0.11
	> 41	74	69	1.36 (1.01-1.81)	0.03
BMI*	< 25	85	47	1.00	
	25-29.9	393	59	1.26 (0.99-1.60)	0.04
	> 29.9	82	66	1.40 (1.06-1.84)	0.01

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Variable	Variable Level	n	% Injured	Risk Ratio 95% CI	p-value
Operational Status	Tactical	375	57	1.00	
	Support	187	63	1.11 (0.96-1.28)	0.17
SF Group	1 st SFG	105	45	1.00	
	3 rd SFG	103	51	1.13 (0.85-1.50)	0.41
	5 th SFG	136	63	1.41 (1.10-1.81)	<0.01
	7 th SFG	146	71	1.58 (1.24-2.00)	<0.01
	10 th SFG	69	58	1.30 (0.97-1.74)	0.09
	Other	3	33	0.74 (0.15-3.74)	0.99 [^]
Number of Days Deployed in the last 12 months*	None	190	72	1.00	
	1-60 days	72	61	0.85 (0.70-1.05)	0.10
	61-150 days	145	52	0.72 (0.60-0.87)	<0.01
	> 150 days	122	47	0.65 (0.53-0.80)	<0.01
Reported Participating in a Supervised THOR3 Fitness Performance Program	No	181	59	1.00	
	Yes	381	58	0.99 (0.85-1.14)	0.85

Notes:

*Linear Trend – Age p<0.01/BMI p=0.01/Days Deployed <0.01

[^] Fisher Exact Test

There were no differences in injury risk for male Soldiers based on muscular endurance performance (push-ups and sit-ups). However, Soldiers with the highest performance on the 2-mile run test had a lower risk of injury when compared to those with the poorest performance (Table 25).

Variable	Variable Level	n	% Injured	Risk Ratio 95% CI	p-value
Push-Ups	≤72	148	60	1.00	
	73-78	125	61	1.02 (0.84-1.24)	0.82
	79-84	132	55	0.92 (0.75-1.13)	0.41
	≥ 85	131	57	0.95 (0.78-1.16)	0.62
Sit-Ups	≤ 75	151	59	0.95 (0.79-1.15)	0.62
	76-80	126	62	1.00	
	81-85	140	56	0.90 (0.74-1.10)	0.31
	≥86	119	54	0.87 (0.70-1.08)	0.20
Two Mile Run in Minutes and Fraction of Minutes	≤13.00	137	52	0.81 (0.66-1.00)	0.05
	13.01-13.68	123	57	0.89 (0.73-1.09)	0.27
	13.69-14.50	145	57	0.89 (0.73-1.08)	0.23
	≥ 14.51	119	64	1.00	

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Table 26 displays injury risk associated with unit physical fitness training. Soldiers who performed a moderate amount of unit resistance training and low amount of CT were at a lower risk of injury. Those who did not perform any road marching were at a higher risk of injury.

Table 26. Unit Physical Fitness Training and Injury Risk using Medical Record Data (Overall Injury Index)						
Variable	Variable Level	Average	n	% Injured	Risk Ratio 95% CI	p-value
Unit Running Distance per week	None		20	75	1.14 (0.84-1.56)	0.43
	2-4 miles	3.4±0.6	83	58	0.88 (0.68-1.14)	0.34
	5-7 miles	5.7±0.5	121	60	0.91 (0.72-1.15)	0.43
	8-10 miles	8.8±0.9	117	51	0.78 (0.61-1.01)	0.07
	>10 miles	14.1±3.2	61	66	1.00	
Unit Resistance Training (minutes per week)	None		95	57	0.83 (0.67-1.03)	0.08
	< 90 minutes	46.2±21.2	108	57	0.84 (0.68-1.03)	0.09
	90-160 minutes	119.3±22.8	107	49	0.71 (0.56-0.90)	<0.01
	> 160 minutes	257.7±109.5	80	68	1.00	
Unit Sprinting per week (minutes per week)	None		107	60	0.94 (0.76-1.16)	0.56
	< 21 minutes	12.8±6.3	118	58	0.90 (0.73-1.12)	0.36
	21-40 minutes	31.7±4.4	99	52	0.81 (0.64-1.03)	0.08
	> 40 minutes	68.7±29.6	102	64	1.00	
Unit Agility Training (minutes per week)	None		162	58	0.96 (0.78-1.18)	0.68
	< 20 minutes	10.3±4.1	72	60	0.98 (0.77-1.27)	0.90
	20-39 minutes	25.8±4.8	95	58	0.95 (0.75-1.21)	0.70
	>39 minutes	58.1±24.1	94	61	1.00	
Unit Aerobic Training not excluding running (minutes per week)	None		112	61	1.12 (0.89-1.41)	0.34
	<31 minutes	21.8±8.6	105	54	1.00	
	31-60 minutes	50.3±9.5	91	59	1.09 (0.86-1.40)	0.48
	>60 minutes	122.1±69.9	74	60	1.10 (0.85-1.42)	0.49
Unit CT per week	None		56	57	0.88 (0.67-1.14)	0.31
	< 41 minutes	26.1±11.1	114	53	0.81 (0.65-1.01)	0.05
	41-109 minutes	67.0±15.5	115	65	1.00	
	> 109 minutes	169.0±63.0	102	56	0.86 (0.69-1.07)	0.16
Unit Road Marching distance per month	None		51	67	1.35 (1.00-1.83)	0.05
	< 7 miles	5.3±0.7	91	57	1.16 (0.87-1.55)	0.32
	7-12 miles	10.2±1.7	120	58	1.17 (0.88-1.54)	0.27
	13-20 miles	17.8±2.0	72	61	1.24 (0.92-1.66)	0.15
	> 20 miles	30.7±9.3	75	49	1.00	
Total Unit Fitness Training Minutes per Week	None		131	59	1.00	
	15-260 minutes	141.5±70.9	145	59	1.00 (0.82-1.22)	0.98
	261-434 minutes	343.3±47.9	137	57	0.97 (0.79-1.19)	0.76
	> 434 minutes	609.4±145.2	141	61	1.04 (0.85-1.26)	0.71

Table 27 displays injury risk associated with personal physical fitness training. Soldiers who performed the highest amount of resistance training, sprint training, CT, and time spent per week performing personal fitness training were at a higher risk of injury. Those who included any running as part of their personal physical training were at a lower risk of injury.

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Table 27. Personal Fitness Training and Injury Risk Medical Record Data (Overall Injury Index)						
Variable	Variable Level	Average	N	% Injured	Risk Ratio 95% CI	p-value
Total Personal PT Running Distance per Week	No distance running		47	79	1.00	
	2-4 miles	3.2±0.7	110	64	0.81 (0.66-0.99)	0.06
	5-7 miles	5.8±0.4	111	55	0.70 (0.56-0.87)	<0.01
	8-10 miles	8.9±0.8	127	50	0.63 (0.50-0.79)	<0.01
	> 10 miles	16.7±7.0	129	58	0.74 (0.60-0.91)	0.01
Total personal resistance training performed per week	None		69	57	1.06 (0.82-1.38)	0.67
	< 90 minutes	46.7±21.1	129	54	1.00 (0.80-1.26)	0.98
	90-160 minutes	120.9±22.4	135	53	1.00	
	> 160 minutes	290.9±130.7	202	65	1.22 (1.01-1.47)	0.03
Average Number of Minutes Spent Sprinting per Week	No sprinting or interval training		153	58	1.11 (0.89-1.38)	0.35
	< 20 minutes	13.6±6.0	148	57	1.08 (0.87-1.35)	0.49
	21-40 minutes	33.3±5.3	120	53	1.00	
	>40 minutes	78.6±49.4	114	66	1.25 (1.01-1.56)	0.04
Average number of minutes of Agility training per week	No agility training		280	59	0.95 (0.79-1.15)	0.61
	< 30 minutes	18.1±8.6	86	54	0.88 (0.71-1.09)	0.25
	> 30 minutes	75.2±54.9	60	62	1.00	
Aerobic Training excluding running (minutes per week)	None		145	57	0.90 (0.74-1.08)	0.26
	< 39 minutes	22.4±8.7	119	53	0.84 (0.68-1.04)	0.10
	40-75 minutes	51.9±10.5	130	59	0.94 (0.78-1.14)	0.51
	>75 minutes	150.4±113.0	141	63	1.00	
Average number of minutes of CT per week	No CT		143	60	1.18 (0.95-1.45)	0.13
	< 45 minutes	28.2±11.5	139	51	1.00	
	46-90 minutes	71.7±14.9	125	58	1.14 (0.92-1.43)	0.23
	> 90 minutes	201.7±109.7	128	63	1.24 (1.01-1.53)	0.04
When do you Perform Stretching for Personal PT	None		41	46	1.00	
	Before Workout		38	63	1.36 (0.91-2.05)	0.13
	After Workout		86	58	1.26 (0.86-1.83)	0.21
	Before and After Workout		370	59	1.27 (0.90-1.79)	0.12
Total Personal Fitness Training Minutes per Week	None		27	67	1.29 (0.94-1.77)	0.16
	15-195	113.6±50.8	118	52	1.00	
	196-340	267.7±40.2	132	55	1.06 (0.84-1.33)	0.65
	341-480	405.2±39.9	141	59	1.14 (0.91-1.42)	0.25
	>480	729.4±255.5	139	66+	1.28 (1.04-1.58)	0.02

Two backwards stepping multivariable models were performed. One model includes descriptive statistics, unit physical training variables, and human performance, while the other model includes descriptive statistics, personal training variables, and human performance. Table 28 includes unit physical training variables. Soldiers who were older, in the 5th or 7th SF Group, and performed no resistance training or the greatest amount of resistance training were at a higher risk of injury. Table 29 includes personal training variables. Soldiers who were older, in the 5th or 7th SF Group and performed the most resistance training per week were at a higher risk of

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injury. Soldiers who ran 8–10 miles a week were at a lower risk of injury compared to those running 2–4 miles per week.

Table 28. Multivariate Unit Fitness Training and Injury Risk using Medical Record Data (Overall Injury Index) (n=342)

Variable	Variable Level	n	Odds Ratio 95% CI	p-value
Age	< 27	43	1.00	
	27-31	128	1.18 (0.56-5.46)	0.67
	32-36	89	2.22 (1.00-4.91)	0.05
	37-41	41	1.03 (0.42-2.58)	0.94
	> 41	41	5.15 (1.89-14.08)	<0.01
SF Group	1 st SFG	70	1.00	
	3 rd SFG	67	1.35 (0.66-2.76)	0.42
	5 th SFG	73	3.71 (1.80-7.66)	<0.01
	7 th SFG	94	3.46 (1.75-6.85)	<0.01
	10 th SFG	38	1.35 (0.58-3.12)	0.49
Total unit resistance training performed per week	None	50	2.22 (1.04-4.77)	0.04
	< 90 minutes	96	1.60 (0.86-2.99)	0.14
	90-160 minutes	92	1.00	
	> 160 minutes	104	2.74 (1.47-5.11)	<0.01

Variables run in the Backward Stepping Multivariate Model: Age, BMI, Special Forces Group, Unit Weekly Resistance Training, Unit Weekly Cross-Training, Road Marching Distance per Month, and 2-Mile Run Time

Table 29. Multivariate Personal Fitness Training and Injury Risk using Medical Record Data (Overall Injury Index) (n=482)

Variable	Variable Level	n	Odds Ratio 95% CI	p-value
Age	< 27	50	1.00	
	27-31	156	1.41 (0.71-2.81)	0.33
	32-36	142	2.25 (1.11-4.55)	0.03
	37-41	73	2.45 (1.13-5.31)	0.02
	> 41	61	3.63 (1.58-8.32)	< 0.01
SF Group	1 st SFG	91	1.00	
	3 rd SFG	89	1.28 (0.69-2.38)	0.44
	5 th SFG	119	2.08 (1.61-3.73)	0.01
	7 th SFG	125	2.93 (1.62-5.28)	< 0.01
	10 th SFG	58	1.59 (0.79-3.24)	0.20
Total Personal PT Running Distance per Week	No distance running	32	2.42 (0.93-6.32)	0.07
	2-4 miles	102	1.00	
	5-7 miles	106	0.72 (0.40-1.29)	0.27
	8-10 miles	120	0.53 (0.30-0.93)	0.03
	> 10 miles	122	0.85 (0.48-1.51)	0.58

Table 29. Multivariate Personal Fitness Training and Injury Risk using Medical Record Data (Overall Injury Index) (n=482) (continued)				
Variable	Variable Level	n	Odds Ratio 95% CI	p-value
Total personal resistance training performed per week	None	58	0.95 (0.49-1.84)	0.87
	< 90 minutes	115	0.89 (0.52-1.54)	0.68
	90-160 minutes	123	1.00	
	> 160 minutes	186	1.68 (1.03-2.75)	0.04
Variables run in the Backward Stepping Multivariate Model: Age, BMI, Special Forces Group, Personal Weekly Running Mileage, Personal Weekly Resistance Training, Personal Weekly Time Spent CT, Personal Weekly Sprinting Time, 2-Mile Run Time, and Total Personal Fitness Time				

The relationship between unit and personal running was further explored along with VO2max estimations. This same analysis was also previously run for Infantry Soldiers (9) and is shown in Table 30. For ARSOF Soldiers, there were no differences in average 2-mile run times for the amount of unit running performed per week. For personal running, ARSOF Soldiers who ran the furthest had faster (marginally significant) average run times compared to those running 2–4 miles per week. Infantry Soldiers who ran more miles per week during unit PT had similar 2-mile run times compared to those who ran equal or less than five miles per week. These results are somewhat similar to ARSOF Soldiers, where the distance run for unit physical training had little impact on aerobic fitness. However, Infantry Soldiers who ran greater than 5 miles per week for personal PT had faster 2-mile run times than those running less than or equal to 5 miles per week or performing no personal running.

Table 30. Physical Fitness Performance Measured by 2-Mile Average Run Times and Estimated VO₂ max by Unit and Personal Distance Run for ARSOF and Infantry Soldiers

Unit and Personal Distance Running For ARSOF Soldiers

Unit and Personal Distance Running	None	2-4 miles	5-7 miles	8-10 miles	> 10 miles	ANOVA	ANOVA WITH TUKEY (SPECIFIC INTERACTIONS)
Average 2-Mile Run Time by <u>Unit Distance</u> Running (min)	13:36±1:06 (n=16)	13:48±1:05 (n=82)	13:54±1:12 (n=118)	13:42±1:12 (n=108)	14:06±1:18 (n=58)	0.29	
Estimated VO₂max milligram per kilogram per minute (mL/kg/min)	54.2±3.5	53.4±3.6	53.3±4.1	53.7±3.9	52.4±4.5		
Average 2-Mile Run Time by <u>Personal Distance</u> Running (min)	14:00±1:18 (n=39)	14:00±1:00 (n=106)	13:54±1:06 (n=109)	13:48±1:12 (n=121)	13:36±1:12 (n=123)	0.07	>10 – 2-4, p=0.07
Estimated VO₂max (mL/kg/min)	52.9±4.5	52.8±3.5	53.0±3.8	53.3±3.9	54.2±4.1		
T-Test Comparing Unit and Personal 2-Mile Run Times	0.28	0.19	0.19	0.53	0.01		

Table 30. Physical Fitness Performance Measured by 2 Mile Average Run Times and Estimated VO2 max by Unit and Personal Distance Run for ARSOF and Infantry Soldiers (continued)

Unit and Personal Distance Running For Infantry Soldiers

Unit and Personal Distance Running	None	1-5 miles	5.1-10 miles	10.1-16 miles	≥16.1 miles	ANOVA	ANOVA WITH TUKEY (SPECIFIC INTERACTIONS)
Average 2-Mile Run Time by Unit Distance Running (min)	15:24±1:53 (n=129)	14:54±1:34 (n=786)	14:54±1:47 (n=1385)	15:00±1:35 (n=964)	14:54±1:39 (n=360)	0.04	None – 1-5, p=0.02 None – 5.1-10, p=0.03 None – 10.1-16, p=0.05 None – ≥ 16, p=0.03
Estimated VO2max (ml/kg/min)	48.1±5.1	49.8±6.3	49.8±5.6	49.6±5.3	49.8±5.5		
Average 2-Mile Run Time by Personal Distance Running (min)	15:12±1:43 (n=871)	15:06±1:38 (n=1277)	14:36±1:35 (n=713)	14:12±1:22 (n=184)	13:54±1:35 (n=144)	<0.01	None – 5.1-10, p <0.01 None – 10.1-16, p <0.01 None – 16+, p <0.01 1-5 – 5.1-10, p <0.01 1-5 – 10.1-16, p <0.01 1-5 – ≥ 16, p <0.01 5.1-10 – 10.1-16, p=0.04 5.1-10 – 16+, p <0.01
Estimated VO2max (mL/kg/min)	48.9±5.5	49.1±5.4	50.8±5.3	52.1±4.6	53.0±5.3		
T-Test Comparing Unit and Personal 2-Mile Run Times	0.22	<0.01	<0.01	<0.01	<0.01		

The relationship between age, CT group and the THOR3 group was further explored to determine any differences in injury risk between the two groups. The CT group’s risk of injury increased with age, whereas injury risk remained similar among the age categories in the THOR3 Group (Table 31).

Age	CT				THOR3			
	n	% Injured*	Risk Ratio (95% CI)	p-value	n	% Injured	Risk Ratio (95% CI)	p-value
<27	17	35	1.00		21	57	1.00	
27-31	30	43	1.23 (0.57-2.63)	0.59	76	51	0.90 (0.58-1.38)	0.64
32-36	19	68	1.94 (0.95-3.95)	0.05	60	65	1.14 (0.75-1.72)	0.52
37-41	10	50	1.42 (0.58-3.46)	0.45	29	55	0.97 (0.59-1.58)	0.89
>41	10	70	1.98 (0.93-4.24)	0.08	29	62	1.09 (0.68-1.73)	0.73

Notes: * Chi-Square for Trend p=0.05

7 Discussion

This analysis assessed the THOR3 rehabilitation program, training, performance, injury rates between those participating and not participating in THOR3 and injury risk factors for all ARSOF Soldiers. Majorities of the Soldiers reported a consultation or visit(s) with the physical therapist, were seen within a day, and reported full recovery from their injuries. Soldiers who included THOR3 as part of their physical training performed a greater amount of agility training compared to the TPT and the CT group as well as outperforming the TPT group on all APFT events. The TPT group had marginally higher injury rates for self-reported injuries when compared to the THOR3 group. Risk factors for injury included older age and no unit resistance training or greater amounts of personal and unit resistance training per week. However, being in the 1st SF Group and performing moderate personal distance running of 8–10 miles per week were shown to minimize injury risk.

7.1 THOR3 Physical Therapy Clinic

Unlike most physical therapy clinics that are located within the hospital, THOR3 physical therapy and rehabilitation clinics are co-located with the THOR3 fitness centers or co-located within the SF Group footprint. Soldiers do not need a referral from their primary physician; they can just walk into the physical therapy clinic and set up an appointment. This process is much more efficient and enables immediate or very rapid identification of any specific injury and rehabilitation to begin within the same day or a few days later. During or upon completion of physical therapy, Soldiers will continue rehabilitation with the certified strength and conditioning coach staff. Supervised rehabilitation has been shown to reduce the number of re-injuries and improve functional outcomes compared to home-based exercises. In a systematic review of supervised rehabilitation programs versus home exercise programs for acute ankle sprains, the evidence demonstrated that supervised programs resulted in less pain and self-reported instability at follow-up and greater gains in strength. (10) On average, an injured Soldier visited the physical therapy clinic 16 times, with over half of the Soldiers reporting complete recovery and 95 percent reporting shortened recovery times compared to treatment received at a medical clinic. This is similar to in-house athletic training programs or athletic-like training programs where they have shown a more rapid return to work (11) and a reduction in lost work days. (11, 12) It was also shown that in-house athletic training or athletic training-like programs can be cost effective compared to outsourcing medical care. (13) Therefore, THOR3 provided early identification, a supervised rapid rehabilitation program, and complete recovery for a majority of the Soldiers.

7.2 Physical Training Differences and Performance

Unit and personal physical training differed among the physical training groups (TPT, CT and THOR3). Both the CT and THOR3 groups spent more time performing a wider variety of physical training compared to the TPT group (i.e., CT, sprint training, resistance training, agility training). In addition, the THOR3 group spent more time per week performing agility training compared to the CT group. Even though there were differences in the CT and THOR3 training programs, they both outperformed the TPT group on all three APFT events. The greater

amount of time spent performing a wider variety of physical training for both the CT and THOR3 groups may have had an influence on fitness performance. Some of this additional physical training (CT and sprinting) incorporated high-intensity, intermittent training (HIIT). Previous studies investigating HIIT-type programs have found that performance improves with the addition of HIIT.(14) (15) (16) In a U.S. Air Force study, they decreased running mileage by 50 percent, and long distance runs were replaced with interval running and agility training. Investigators found that by replacing traditional training with the new functional training program, improvements were made in body composition, aerobic capacity, ventilator threshold, and upper body power. (15) In a study of triathletes, one group continued with their regular training (control group), while the other group decreased their running mileage by 70 percent and performed HIIT in place of running (experimental group). After 5 weeks of training, the experimental group improved their athletic performance on a sprint-distance triathlon; whereas, no changes occurred in control group performance. (14) When specifically looking at CT programs, adding additional exercise components to a program have shown performance to remain similar or improve with these additional training components.(17-20, 8) It would seem that implementing a wider variety of exercises, including HIIT-type programs, not only improves performance but can also be more combat-focused, meeting mission- specific requirements as compared to traditional physical training programs primarily consisting of running, push-ups and sit-ups.

Another consideration influencing performance could be the amount of time spent performing physical training. The total amount of time exercised per week between the three programs was significantly different. The CT and THOR3 programs performed an additional 6 hours and 4.5 hours, respectively, of total (unit and personal physical training) exercise per week compared to the TPT group. Therefore, the additional time spent exercising and performing various types of training may have affected physical performance.

7.3 Injury Rates

The TPT group was marginally more likely to experience a self-reported injury when compared to the THOR3 group. When comparing the CT and THOR3 groups, whose physical training programs were more alike, there were no differences in injury rates.

The marginal differences in the self-reported injuries when comparing the TPT and THOR3 groups' programs may be attributed to differences in the amount of time spent performing different types of physical training activities and the THOR3 human-performance team. Physical training differences included more time spent per week performing sprinting, CT, agility training, and resistance training for the THOR3 group when compared to the TPT group. The TPT group spent more time running per week (marginal finding) compared to the THOR3 group. In previous military studies investigating the implementation of new exercise programs (incorporating additional CT components), injury rates remained similar or decreased with the implementation of a CT like program. (21, 15, 4)

In particular, one unit-training activity performed by the THOR3 group and minimized by the TPT group was agility training. In a systematic review of investigating prevention strategies for physical training-related injuries, strong evidence was shown that agility-like training consistently

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demonstrated a reduction in injury rates across multiple studies. (22) Some of the reasons for reduced injury rates being associated with agility-like training might include: (1) neurophysiological learning-enabling participants to move their bodies in a smoother, more coordinated fashion; (2) musculoskeletal stress of training is more evenly spread across the body; (3) strength and stabilization movements performed during agility training may represent complex combat activities; and (4) the incorporation of these activities may reduce excessive exposure to running activities.(22) The THOR3 group also consulted and trained with the strength and conditioning coaches who designed and supervised their exercise programs. As mentioned earlier, this is similar to in-house athletic training programs or athletic-like training programs where they have shown a more rapid return to work. (11) and a reduction in lost work days. (11, 12) One other consideration is that the THOR3 group and CT group mostly consisted of SF Operators (18 series MOS) where the majority of Soldiers in the TPT group were support staff. Table 32 provides a summary of the differences between the three programs for physical training time.

Table 32. Summary of Differences between TPT and THOR3 and CT and THOR3 for Physical Training Time				
		TPT	CT	THOR3
Supervised Exercise Program		No	No	Yes*
Unit PT Average Number of Minutes per Week	Run Time	70 min (↑ 27%)	62 min (NS)	55 min (Ref)
	Agility Training	4 min (↓ 86%)	20 min (↓ 31%)	29 min (Ref)
	Cross-Training	15 min (↓ 83%)	73 min (NS)	88 min (Ref)
	Sprinting	11 min (↓ 69%)	29 min (NS)	36 min (Ref)
Personal PT Average Number of Minutes per Week	Run Time	69 min (NS)	69 min (↑ 33%)	52 min (Ref)
	Aerobic Training excluding running	38 min (NS)	63 min (↑ 47%)	43 min (Ref)
	Resistance Training	120 min (NS)	188 min (↑ 54%)	122 min (Ref)
	Stretching	3.4 (NS)	3.7 (↓ 16%)	4.3 (Ref)
Exercise Time per Week	Total (Unit and Personal) Physical Training	448 min (↓ 60%)	810 min (NS)	718 min (Ref)
* A majority of the comments about THOR3 were positive (87%) NS = Not significantly different from the reference (ref) An ANOVA was used to determine any differences between the groups TPT = Traditional Physical Training which excludes THOR3 CT = Cross-Training which excludes THOR3 THOR3 = Combination of Exercise Programs including THOR3				

Overall, medical record injury rates were higher than self-reported injury rates. The differences in injury rates may be due to the inability to recall or remember previous injuries over a specific time period. Even though medical injury rates were higher, Soldiers do not always seek medical treatment, or medical injuries may not be documented in their medical records. Therefore, medical injury rates could potentially be higher than reported. Nevertheless, there were no differences in medical injury rates between the CT and THOR3 programs.

7.4 Risk Factors for Injury

Independent risk factors for injury included older age as well as no-unit resistance training or greater amounts of time spent performing both unit and personal resistance training per week. In contrast, being in the 1st SF Group, and personal distance running of between 8–10 miles per week were shown to minimize injury risk. Another interesting finding, as seen in the univariate analysis, was that as the number of deployment days increased, injury risk decreased. However, decreasing injury risk with increasing deployment days does not seem to be the case for self-reported injuries. Therefore, injuries were most likely not being captured within the medical record system during deployment, resulting in lower injury rates as the number of deployment days increased.

7.4.1 Older Age

Older age was a risk factor for injury in both the personal and unit physical training models. Other investigations have also shown older age as a risk factor for injury in both basic combat training and (23) (24) (25) (26) in operational units. (27)

Injury risk for those over 41 years of age in the unit physical training model (5.15 times greater risk of injury) was about one and a half times greater than that of the personal physical training model (3.63 times greater risk of injury). Personal physical training may have had a lower risk than unit physical training because it allows Soldiers to train at their own pace and have the ability to modify or temporarily discontinue specific exercises when pain occurs. This can be different from unit physical training where Soldiers may be expected to complete specific exercises in a certain time or at a set pace. When comparing injury risk by age group for the CT and THOR3 groups, older Soldiers (>41 years old) in the THOR3 group had similar injury risks to younger Soldiers; whereas, injury risk increased with age in the CT group. The similar injury rates between the different age categories in the THOR3 group might be attributed to the strength and conditioning coaches who have the knowledge and experience to modify and adapt exercise programs to fit the needs of different populations. Whereas, the CT group training may be the same for everyone regardless of age. Therefore, the THOR3 program compared to the CT program may offer some protective benefits through modified and adapted exercise programs in the reduction of injury risk among older Soldiers.

7.4.2 Resistance Training

Previous studies have shown that resistance training improves both physical and occupational task performance. (28) (29) (30) (31, 32) It has also been shown that endurance training

concurrent with resistance training improves load bearing performance, (33) (34) (28) (20) heavy lifting tasks and (20) increases both short- and long-term endurance capacity in sedentary and trained individuals. (35) While a few studies have shown endurance training to have a negative impact on muscle strength, (36) (37) more studies have shown no impacts on muscular strength. (38) (39) (40) (41) (32) In the current investigation, too much personal or unit-resistance training compared to a moderate amount of strength training was a risk factor for injury, while a moderate amount of personal resistance training was protective against injury when compared to no-resistance training. Previous military investigations have indicated that strength training reduces injury risk and improves human performance. (4) (15) In an investigation of infantry Soldiers, those who participated in unit-resistance training at least once a week were at a lower injury risk than Soldiers who did not perform any unit-resistance training. (4) In an Air Force study, they replaced a majority of the traditional long-distance running with interval running, agility training, and functional strength training, resulting in a 67 percent decrease in overall injury rates; trainees scored higher on nearly all of the measured fitness parameters. (15) When looking specifically at the amount of time spent resistance training and its association with injury risk, there is limited or no evidence available. The results from this investigation would suggest that a moderate amount of time (around 3–5 hours total time per week (unit + personal) be spent performing unit and personal strength training.

7.4.3 Personal Running

One of the most commonly cited training errors leading to injury is excessive mileage run per week. (42-44) It has been estimated that 60 percent of running injuries are attributed to training related errors with half of those errors being excessive running mileage. (45) In the current investigation, those who ran 8–10 miles per week (not excessive running) were at a lower risk of injury compared to those running less than 5 miles per week for personal physical training. These results are similar to an infantry study where Soldiers who ran more than 5 miles per week for personal physical training were 30% to 46% less likely to experience a running related injury. It was also shown that aerobic fitness increased with mileage run during personal physical training. (9) (Table 32). However, this was generally not the case for ARSOF Soldiers whose aerobic fitness levels were similar and independent of the mileage ran per week for personal fitness (marginal findings for those who ran for 10 or more miles). It may be that during personal physical training compared to unit based running, Soldiers can run at their own self-selected pace and maintain an amount of running that is within their comfort zone. They can also adapt their running mileage based on personal goals, pain, and potential injury.

7.4.4 Special Forces Groups

Soldiers within the 5th and 7th SF Groups were 2 to 3 times more likely to experience an injury when compared to the Soldiers within the 1st SF Group, respectively. All three groups spent a similar amount of time performing unit and personal training. There were also no differences in APFT scores between the three groups. The differences in injury rates between these groups may be due to the different areas of responsibility (1st Group Asia, 5th Group Middle East and 7th Group South Central and North America) and the specific specialized training performed to optimize performance in these environments.

7.5 Limitations

There may be differences between the three groups (THOR3, CT and TPT) when looking at the distribution of Soldiers. The majority of SF Soldiers in the CT and THOR3 groups were SF graduates; whereas, the majority of SF Soldiers in the TPT group were support Soldiers and not SF graduates. Therefore, the different roles and requirements of these jobs may have had an influence on fitness performance and the amount of time spent exercising per week. There were also no rosters obtained with demographics from SF Soldiers who did not complete a survey, so the generalizability of these results to the entire SF population cannot be determined.

8 Conclusions and Recommendations

8.1 Conclusions

About three fourths of the Soldiers reported improvements in physical fitness and being more physically fit for the mission as a result of THOR3. Having an onsite SOF physical therapy clinic allowed a majority of the Soldiers (in this evaluation) with injuries to be seen within a day or less with more than half of the Soldiers reporting complete recovery from their injuries. The physical therapy clinic was also well utilized with about 75 percent of the Soldiers having made an appointment or consulted with the THOR3 physical therapy staff. Results indicated that the THOR3 group had marginally lower self-reported injury rates when compared to the TPT group. There were no differences in injury rates for the CT and THOR3 group whose total exercise time per week, as well as the types of activities performed, were generally similar. Independent risk factors identified from this evaluation suggest that a moderate amount of unit and personal resistance training, personal distance running of 8–10 miles per week, and being in the 1st Special Forces Group will minimize injury risk. Older age was the only risk factor that was not modifiable and one of the strongest risk factors for injury. When comparing older age and injury risk, there was a significant trend showing that injury rates increased with age for the CT group; whereas, injury risk remained similar for the THOR3 age groups. The evidence from this evaluation suggests that Soldiers may benefit from participation in THOR3 compared to other human performance programs.

8.2 Recommendations

Soldiers should perform a moderate amount of unit-resistance training each week. Total resistance training for both unit and personal physical training should range between 3–5 hours per week.

A moderate amount of personal distance running was shown to have the lowest risk of injury. Soldiers should perform a moderate amount of personal distance running per week.

Soldiers over 41 years old were at a higher risk of injury. To decrease injury risk in older Soldiers, closely observe and monitor their human performance programs.

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The results of this evaluation suggest that THOR3 offers advantages over other non-THOR3 human performance programs.

The ARSOF women had much higher fitness levels when compared to the operational Army. It would be interesting to survey all of the ARSOF women to determine why they are so much more fit when compared to the rest of the operational Army. Can this be attributed to the THOR3 program or is there a greater percentage of fit women applying to work in the SOF?

9 Point of Contact

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Appendix B Example Survey Questions

Note: Survey was administered electronically; length does not represent actual page length of survey, and question numbers represent internal numbering system of Verint® software. Skip patterns are indicated.

Demographics

Background Details

What is your age?

- 17-65+

What is your gender?

- Male
 Female

Did you graduate from Special Forces Qualification Course?

- Yes (Specify Date: Month/Year) _____
 No

What is your unit?

- 1st Special Forces Group
 3rd Special Forces Group
 5th Special Forces Group
 7th Special Forces Group
 10th Special Forces Group
 Other _____

What is your military occupational specialty (MOS), AOC or Functional Area? (e.g., 11B)

Please Specify MOS _____

What is your Operational Status?

- Conducting tactical missions
 Providing mission support

Have you been deployed?

- Yes
 No

How many times have you been deployed?

- 1 time – 10 or more times

How many days were you deployed within the last 12 months? If "none" enter "0"

Days _____

Injury History (Previous 12 months)

Have you experienced an injury in the last 12 months?

- Yes
- No

Was or is this a new injury or a chronic injury?

- This was a NEW injury that occurred for the first time
- This was a re-injury or an injury that occurs repeatedly

Estimate the approximate date of this injury?

Injury Date _____

Primary body area injured?

- Head
- Neck
- Shoulders
- Upper Arm (bicep/tricep)
- Lower Arm (forearm)
- Elbow
- Wrist
- Hand
- Chest/ribs
- Abdomen
- Back (lower)
- Back (upper)
- Spine
- Hip
- Upper leg (Thigh/Hamstring)
- Lower leg (Shin/Calf)
- Knee
- Ankle
- Foot
- Heat/Cold Injury - Non-specific body area
- Other (Please Specify) _____

Type of injury #1?

- Abrasion
- Blister
- Bruise/contusion
- Bursitis
- Cut/laceration
- Dislocation
- Fasciitis (e.g., plantar fasciitis)
- Fracture/Break
- Heat injury
- Cold injury
- Nerve injury
- Sprain/strain overuse
- Sprain/strain traumatic

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- Tear (muscle/ligaments)
- Blunt force trauma
- Spinal injury (e.g., bulging or slipped disk)
- Other (Please Specify) _____

Activity associated with the injury #1?

- Combat
- Gunshot, missile, or blast
- Lifting or moving heavy objects (Not weight training)
- Physical training
- Repairing or maintaining equipment
- Riding or driving in a motorized vehicle
- Rough-housing or fighting
- Sports/recreation
- Stepping/climbing
- Walking or hiking
- Marching - with load
- Marching - no load
- Other (Please Specify) _____

Please specify the sport causing the injury #1:

- Football
- Basketball
- Soccer
- Volleyball
- Softball/baseball
- Running (e.g., road racing/marathons)
- Other (Please Specify) _____

If injury #1 was from Physical training, please specify.

- Weight-training
- Running
- Agility/stretching
- Extreme conditioning
- THOR3
- Swimming
- Other (Please Specify) _____

While injured in a motorized vehicle you were...

- Driving a military vehicle
- Riding in a military vehicle
- Driving a civilian vehicle
- Riding in a civilian vehicle

Cause associated with the injury #1?

- Bullet/Grenade/Projectile
- Cut or puncture by a sharp tool, object or instrument
- Direct or indirect contact by enemy
- Environmental Factors such as Heat or Cold
- Fall, jump, slip, or trip

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- Burn (by fire, hot substance or object, or steam)
- Overexertion, strenuous or repetitive movements
- Struck against or by an object or person
- Other (Please Specify) _____

If injury #1 was from a fall, jump, trip or slip, please specify.

- Motor vehicle
- Aircraft
- Raised surface or platform 6ft or higher (not from a motor vehicle or aircraft)
- Raised surface or platform less than 6 ft high (not from a motor vehicle or aircraft)
- Level surface such as floor or ground (e.g., slipped, tripped)
- Other (Please Specify) _____

Have you been seen by a medical professional for injury #1?

- Yes
- No

Where were you seen for this injury?

- Hospital
- Clinic
- THOR3 treatment room
- Other (specify) _____

Were you placed on Permanent profile for this injury?

- Yes, I am on permanent profile
- No, I am not on permanent profile

Do you know what type of alternative exercises you can do while on profile?

- Yes
- No

If you were placed on permanent profile, how long have you been on this profile? (If "none", enter "0")

Number of Years ____
Number of Months ____
Number of Days ____

Restricted Training:

Was your training/activity restricted or modified by a therapist (or other medical provider)?

- Yes, my training was restricted or modified
- No, my training was not restricted or modified

If your training was restricted or modified for this injury, how many days? (If "none" enter "0")

Number of Days ____

Do you know what type of alternative exercises you can do while on restricted activity?

- Yes
- No

What impact does this injury currently have on your physical activity or job duties?

- No impact on current physical training
- Little impact on current physical training
- Some impact on current physical training
- Significant impact on current physical training
- Unable to perform military duties as assigned

Do you have another injury that is limiting your physical activity or job duties?

- Yes
- No

Injury #2

Was or is this a new injury or a chronic injury?

- This was a NEW injury that occurred for the first time
- This was a re-injury or an injury that occurs repeatedly

Estimate the approximate date of injury#2 ?

Injury Date _____

Injury #2 Primary body area injured?

- Head
- Neck
- Shoulders
- Upper Arm (bicep/tricep)
- Lower Arm (forearm)
- Elbow
- Wrist
- Hand
- Chest/ribs
- Abdomen
- Back (lower)
- Back (upper)
- Spine
- Hip
- Upper leg (Thigh/Hamstring)
- Lower leg (Shin/Calf)
- Knee
- Ankle
- Foot
- Heat/Cold Injury - Non-specific body area
- Other (Please Specify) _____

Type of injury #2?

- Abrasion
- Blister
- Bruise/contusion
- Bursitis
- Cut/laceration
- Dislocation

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- Fasciitis (e.g., plantar fasciitis)
- Fracture/Break
- Heat injury
- Cold injury
- Nerve injury
- Sprain/strain overuse
- Sprain/strain traumatic
- Tear (muscle/ligaments)
- Blunt force trauma
- Spinal injury (e.g., bulging or slipped disk)
- Other (Please Specify) _____

Activity associated with the injury #2?

- Combat
- Gunshot, missile, or blast
- Lifting or moving heavy objects (Not weight training)
- Physical training
- Repairing or maintaining equipment
- Riding or driving in a motorized vehicle
- Rough-housing or fighting
- Sports/recreation
- Stepping/climbing
- Walking or hiking
- Marching - with load
- Marching - no load
- Other (Please Specify) _____

Please specify the sport causing the injury #2:

- Football
- Basketball
- Soccer
- Volleyball
- Softball/baseball
- Running (e.g., road racing/marathons)
- Other (Please Specify) _____

If injury #2 was from Physical training, please specify.

- Weight-training
- Running
- Agility/stretching
- Extreme conditioning
- THOR3
- Swimming
- Other (Please Specify) _____

While injured in a motorized vehicle you were...

- Driving a military vehicle
- Riding in a military vehicle
- Driving a civilian vehicle
- Riding in a civilian vehicle

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Cause associated with the injury #2?

- Bullet/Grenade/Projectile
- Cut or puncture by a sharp tool, object or instrument
- Direct or indirect contact by enemy
- Environmental Factors such as Heat or Cold
- Fall, jump, slip, or trip
- Burn (by fire, hot substance or object, or steam)
- Overexertion, strenuous or repetitive movements
- Struck against or by an object or person
- Other (Please Specify) _____

If injury #2 was from a fall, jump, trip, or slip, please specify.

- Motor vehicle
- Aircraft
- Raised surface or platform 6ft or higher (not from a motor vehicle or aircraft)
- Raised surface or platform less than 6 ft high (not from a motor vehicle or aircraft)
- Level surface such as floor or ground (e.g., slipped, tripped)
- Other (Please Specify) _____

Have you been seen by a medical professional for injury #2?

- Yes
- No

Where were you seen for this injury?

- Hospital
- Clinic
- THOR3 treatment room
- Other (specify) _____

Were you placed on Permanent profile for this injury?

- Yes, I am on permanent profile
- No, I am not on permanent profile

If you were placed on permanent profile for Injury#2, how long have you been on this profile?

Number of Years ____
Number of Months ____
Number of Days ____

Do you know what type of alternative exercises you can do while on profile for injury #2?

- Yes
- No

Restricted Training for Injury#2:

Was your training/activity restricted or modified by a therapist (or other medical provider)?

- Yes, my training was restricted or modified
- No, my training was not restricted or modified

If your training was restricted or modified for injury#2, how many days?

Number of Days ____

Do you know what type of alternative exercises you can do while on restricted activity?

- Yes
- No

What impact does this injury or previous injury currently have on your physical activity or job duties?

- No impact on current physical training
- Little impact on current physical training
- Some impact on current physical training
- Significant impact on current physical training
- Unable to perform military duties as assigned

THOR3

Do you participate in THOR3 performance training programs supervised by THOR3 staff, have you seen or consulted with the THOR3 physical therapist or THOR3 dietitian? (Select all that Apply)

- Participate in supervised THOR3 Performance Training Programs
- Had an appointment/Consulted with the THOR3 Physical Therapist
- Had an appointment/Consulted with the THOR3 Dietitian
- None of the above

Have you noticed any benefits from participating in the THOR3 performance training program? (Select all that Apply)

- Increased my aerobic capacity
- Increased my muscular strength
- Increased my core strength
- I am more physically prepared for the mission
- I have NOT noticed any changes
- I have NOT participated in the THOR3 fitness program

If you have any additional comments about the THOR3 fitness program, please write them here:

Have you received treatment for any injury from one of the THOR3 physical therapists?

- Yes
- No

How long did it take to be seen (from the time you notified THOR3 staff of your injury)?

Days _____

How many times did you see the physical therapist?

Number of visits _____

Do you feel completely recovered from your injury?

- Yes
- No

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By having access to a THOR3 physical therapist, do you believe your recovery time was more rapid than compared to seeking treatment at the hospital or clinic?

- Yes
- No

How many days do you think your recovery was shortened by seeing the THOR3 physical therapist? (If "none", enter "0")

Number of Days _____

If you have any comments about the THOR3 physical therapist please write them here:

Have you consulted or had an appointment with the THOR3 Dietitian?

- Yes
- No

What was the goal of your meeting with the THOR3 dietitian (Select All that Apply)

- Healthier eating
- Lose Weight
- Gain Muscle
- Improve performance
- Learn more about dietary supplements

If you have any comments about the THOR3 dietitian please write them here:

Dietary Supplements and Prescriptions

Do you take dietary supplements?

- Yes
- No

What dietary supplements do you take? (Select all that apply)

- Vitamins/multivitamin
- Weight loss supplements
- Performance/muscle enhancement supplements
- Nutrition enhancement supplements
- Healthy joint supplements
- Other (Please Specify) _____

What reasons do you take dietary supplements? (Select all that apply)

- Promote general health
- Give more energy
- Greater muscle strength

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- Performance enhancer
- Healthy joints
- Weight loss
- Increased endurance
- Not sure
- Other (Please Specify) _____

Leadership Support

Your unit leadership (e.g., ODA-, company-, battalion-, or Group level) encourages use of supervised THOR3 performance training?

- Strongly agree
- Agree
- Disagree
- Strongly Disagree

Your unit leadership encourages physical training in a safe way that strives to increase fitness but reduce or minimize injuries?

- Strongly agree
- Agree
- Disagree
- Strongly Disagree

Does your unit leadership, medical sergeants, or physical training leader describe common causes of training injury and provide recommendations to reduce injuries?

- Routinely
- Occasionally
- Rarely
- Never

Does your unit leadership, medical sergeants, or physical training leader provide information about status of team injuries and causes?

- Routinely
- Occasionally
- Rarely
- Never

You think your current unit has a higher than normal rate of physical training related injuries?

- Strongly agree
- Agree
- Disagree
- Strongly Disagree
- Not Sure

Army Physical Fitness Test (APFT)

What was the approximate date of your most recent APFT?

Approximate Date (mm/dd/yyyy) _____

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What were the raw scores on your most recent APFT (If not applicable, fill in the a "0").

Push-ups (repetitions) _____

Sit-ups (repetition) _____

2-Mile Run time (min:sec) _____

What is your height (feet'inches")?

4'2" - 7'2"

What is your weight (lbs)?

90 - 300

Are you currently restricted from participating in APFT events? Which event(s)?

Yes

No

If "Yes" Restricted, Which events?

Push-Ups

Sit-Ups

2 Mile run

Unit or Team Physical Fitness Training (PT)

The following questions will ask about unit or team physical fitness training. Unit or team physical fitness training is defined as: exercising (i.e., road marching, running, calisthenics, or strength training...) with a group of soldiers, such as squad, platoon, company or team.

Does your ODA participate in a THOR3 training program implemented and supervised by THOR3 training staff?

N/A (I am not on an ODA)

No

Yes, If Yes, When did you start (MM / YYYY) _____

On average, how many times per week do you, along with your team, participate in THOR3 training?

1 time per week

2 times per week

3 times per week

4 times per week

5 times per week

6 times per week

7 times per week

Other (Please specify) _____

Overall (including THOR3 and Other Unit PT activities) how often do you, along with your team, participate in Unit PT each week?

1 time per week

2 times per week

3 times per week

4 times per week

5 times per week

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- 6 times per week
- 7 times per week
- 8 times per week
- 9 times per week
- 10 times per week
- Other (Please specify) _____

On average, how often do you participate in Unit PT each week?

- None
- 1 time per week
- 2 times per week
- 3 times per week
- 4 times per week
- 5 times per week
- 6 times per week
- 7 times per week
- Other (Please specify) _____

In the past 12 months, did your team perform cross-training type exercise programs? If so, which one (select all that apply):

Cross-Training is defined as a program that involves a variety of exercises, such as strength training, agility drills, sprints, plyometrics, etc.

- No, my team focused on Traditional Army PT (distance running, push-ups, sit-ups)
- Cross-training (a variety of exercises, such as agility drills, sprints, etc)
- Crossfit
- Army Physical Readiness Training
- P90X
- THOR3
- Other (please specify) _____

Unit PT Distance Running in the last 12 months (running continuously for 1 mile or greater)

On average, each time you run with your unit, how many miles do you run?

- None
- 1 mile
- 2 miles
- 3 miles
- 4 miles
- 5 miles
- 6 miles

On average, how many times per week did your team perform distance running?

- None
- 1 time per week
- 2 times per week
- 3 times per week
- 4 times per week
- 5 times per week
- 6 times week

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At about what pace does your team usually run when performing unit distance running?

- No Distance Running
- 5 minute mile
- 6 minute mile
- 7 minute mile
- 8 minute mile
- 9 minute mile
- 10 minute mile
- Other (Please specify) _____

Unit PT Activities in the last 12 months (If "None" for an Activity, Select "None" for both columns)

Sprinting/Interval Training (Sprints are short bursts of speed that cannot be sustained for more than a few minutes. Intervals are short periods of high speed running mixed with periods of jogging or walking)

On average, how many times per week did you perform the activity with your team ?

- None
- 1 time per week
- 2 times per week
- 3 times per week
- 4 times per week
- 5 times per week
- 6 times week

On average how many minutes per event/session, did you perform this activity with your unit?

- None
- 1 minute-40 minutes (drop down)

Cross-training type of exercises (e.g., circuit training, combination of exercises to work various parts of the body)

On average, how many times per week did you perform the activity with your team ?

- None
- 1 time per week
- 2 times per week
- 3 times per week
- 4 times per week
- 5 times per week
- 6 times week

On average how many minutes per event/session, did you perform this activity with your unit?

- None
- 1 minute-40 minutes (drop down)

Agility drills(e.g., drills requiring lateral movements, typically using cones or ladders, obstacle course, etc.) approximately how many times per week Aerobic endurance activities that do NOT involve running (e.g., elliptical machines, rowing machine, cycling, stair stepper)

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On average, how many times per week did you perform the activity with your team ?

- None
- 1 time per week
- 2 times per week
- 3 times per week
- 4 times per week
- 5 times per week
- 6 times week

On average how many minutes per event/session, did you perform this activity with your unit?

- None
- 1 minute-40 minutes (drop down)

Resistance training (e.g., weight lifting using free weights, dumbbells, kettle bells, hammer strength machines, etc.)

On average, how many times per week did you perform the activity with your team ?

- None
- 1 time per week
- 2 times per week
- 3 times per week
- 4 times per week
- 5 times per week
- 6 times week

On average how many minutes per event/session, did you perform this activity with your unit?

- None
- 1 minute-40 minutes (drop down)

Aerobic endurance activities that do NOT involve running (e.g., elliptical machines, rowing machine, cycling, stair stepper)

On average, how many times per week did you perform the activity with your team ?

- None
- 1 time per week
- 2 times per week
- 3 times per week
- 4 times per week
- 5 times per week
- 6 times week

On average how many minutes per event/session, did you perform this activity with your unit?

- None
- 1 minute-40 minutes (drop down)

What type of equipment do you typically use for unit resistance training? (select all that apply)

- No Resistance Training with Team
- Free Weights
- Weight Machines

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- Kettlebells
- Tire Flipping
- Sled Dragging
- Bands and Chains
- Rope Swinging
- Other _____

During the last 12 months, on average, how often did your team perform road marches?

- Our unit does NOT perform road marches
- 1 time per month
- 2 times per month
- 3 times per month
- 4 times per month
- 5 times per month
- 6 times per month
- 7 times per month
- 8 times per month
- 9 times per month
- 10 times per month
- Other (please specify) _____

On average, how heavy is the load you carry when your team performs road marches?

weight of load (lbs) _____

How far does your team road march at a time?

- 1 mile
- 2 miles
- 3 miles
- 4 miles
- 5 miles
- 6 miles
- 7 miles
- 8 miles
- 9 miles
- 10 miles
- Other (Please Specify) _____

During the last 12 months, on average, how often does your team perform physical training in the swimming pool per MONTH?

- Our unit does NOT perform physical training in the swimming pool
- 1 time per month
- 2 times per month
- 3 times per month
- 4 times per month
- 5 times per month
- 6 times per month
- 7 times per month
- 8 times per month
- 9 times per month

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- 10 times per month
- Other (Please specify) _____

During the last 12 months, on average, what level of intensity of aerobic capacity do you usually work out at during team PT training (running, swimming, weight training, etc..)?

- 10-30% (tired/barely working)
- 31-55% (just going through the motions)
- 56-75% (Can feel yourself working)
- 76-92% (High Intensity)
- 93-100% (All out/Nothing held back)

Do you lead PT for your Team?

- Yes
- No

During the last 12 months, on average, how often does your team perform stretching per week?

- Our team, does NOT perform stretching
- 1 time per week
- 2 times per week
- 3 times per week
- 4 times per week
- 5 times per week
- 6 times per week
- 7 times per week
- 8 times per week
- 9 times per week
- 10 times per week
- Other (Please specify) _____

When does your unit typically perform stretching?

- Stretch BEFORE workout
- Stretch AFTER workout
- Stretch BEFORE and AFTER workout

Personal Physical Training (PT)

Do you perform PT on your own time?

- Yes
- No

Do you participate in THOR3 program supervised by THOR3 staff for personal PT?

- Yes, Please specify start date (Month/Year) _____
- No

How many times per week do you participate in THOR3 training for personal PT each week?

- 1 time per week
- 2 times per week
- 3 times per week
- 4 times per week
- 5 times per week

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- 6 times per week
- 7 times per week
- 8 times per week
- 9 times per week
- 10 times per week
- Other (Please specify) _____

Overall, (including THOR3 and other activities) how often do you perform personal PT each week?

- 1 time per week
- 2 times per week
- 3 times per week
- 4 times per week
- 5 times per week
- 6 times per week
- 7 times per week
- 8 times per week
- 9 times per week
- 10 times per week
- Other (Please specify) _____

On average, how often do you participate in personal PT each week?

- 1 time per week
- 2 times per week
- 3 times per week
- 4 times per week
- 5 times per week
- 6 times per week
- 7 times per week
- Other (Please specify) _____

What is your primary goal of personal PT?

- Lose weight
- Gain muscle mass
- Increase aerobic capacity
- Increase aerobic capacity and gain muscle mass
- Maintain current fitness levels
- Unit PT is not challenging so I need additional PT to maintain my fitness levels

Personal PT Distance Running in the last 12 months (running consecutively for 1 mile or further)

On average, each time you run on your own, how many miles do you run?

- None
- 1 mile
- 2 miles
- 3 miles
- 4 miles
- 5 miles
- 6 miles

On average, how many times per week did you perform distance running on your own?

- None
- 1 time per week
- 2 times per week
- 3 times per week
- 4 times per week
- 5 times per week
- 6 times week

Personal PT Activities in the last 12 months (If "None" for an activity, select "None" for both columns)

Sprinting/Interval Training (Sprints are short bursts of speed that cannot be sustained for more than a few minutes. Intervals are short periods of high speed running mixed with periods of jogging or walking)

On average, how many times per week did you perform the activity on your own?

- None
- 1 time per week
- 2 times per week
- 3 times per week
- 4 times per week
- 5 times per week
- 6 times week

On average how many minutes per event/session, did you perform this activity on your own?

- None
- 1 minute-40 minutes (drop down)

Cross-training type of exercises (e.g., circuit training, combination of exercises to work various parts of the body)

On average, how many times per week did you perform the activity on your own?

- None
- 1 time per week
- 2 times per week
- 3 times per week
- 4 times per week
- 5 times per week
- 6 times week

On average how many minutes per event/session, did you perform this activity on your own?

- None
- 1 minute-40 minutes (drop down)

Agility drills(e.g., drills requiring lateral movements, typically using cones or ladders, obstacle course, etc.) approximately how many times per week Aerobic endurance activities that do NOT involve running (e.g., elliptical machines, rowing machine, cycling, stair stepper)

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On average, how many times per week did you perform the activity on your own?

- None
- 1 time per week
- 2 times per week
- 3 times per week
- 4 times per week
- 5 times per week
- 6 times week

On average how many minutes per event/session, did you perform this activity on your own?

- None
- 1 minute-40 minutes (drop down)

Resistance training (e.g., weight lifting using free weights, dumbbells, kettle bells, hammer strength machines, etc.)

On average, how many times per week did you perform the activity on your own?

- None
- 1 time per week
- 2 times per week
- 3 times per week
- 4 times per week
- 5 times per week
- 6 times week

On average how many minutes per event/session, did you perform this activity on your own?

- None
- 1 minute-40 minutes (drop down)

Aerobic endurance activities that do NOT involve running (e.g., elliptical machines, rowing machine, cycling, stair stepper)

On average, how many times per week did you perform the activity on your own?

- None
- 1 time per week
- 2 times per week
- 3 times per week
- 4 times per week
- 5 times per week
- 6 times week

On average how many minutes per event/session, did you perform this activity on your own?

- None
- 1 minute-40 minutes (drop down)

During the last 12 months, on average, did you perform stretching during personal PT?

- Yes
- No

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When do you perform stretching for Personal PT?

- Stretch BEFORE workout
- Stretch AFTER workout
- Stretch BEFORE and AFTER workout

Why do you perform stretching?

- To prevent injury
- To improve flexibility
- To decrease muscle soreness
- Other (Please specify) _____

During the last 12 months, on average, what level of intensity of aerobic capacity do you usually work out at during personal PT training (running, swimming, weight training, etc..)?

- 10-30% (tired/barely working)
- 31-55% (just going through the motions)
- 56-75% (Can feel yourself working)
- 76-92% (High Intensity)
- 93-100% (All out/Nothing held back)

What program is your personal physical training program based upon? (Select all that apply)

- Army Physical Readiness Training Manual (FM 7-22)
- Cross-training types of exercises
- Total body resistance exercise (TRX)
- Power 90 Extreme (P90X)
- Crossfit
- THOR3
- Insanity
- Other (Please list) _____

What training program is most effective in increasing your fitness performance?

- Team PT
- Personal PT
- Both Team and Personal PT

Out of 100%, what percentage of team and personal PT contribute to your overall fitness performance. (Example both team and personal PT contribute to my fitness performance, team PT 50%, and personal PT 50%)

Team PT (%) _____
Personal PT (%) _____

This is the end of the survey. Thank you.

Appendix C Physical Training Tables for Men and Women

Table 1-C. Unit or Team Distance Running			
Variable	Variable Level	Men (%)	Women (%)
Average Distance run with unit per exercise session	No distance running	24 (5)	2 (20)
	1 mile	4 (1)	
	2 miles	31 (7)	1 (10)
	3 miles	157 (34)	4 (40)
	4 miles	132 (29)	2 (20)
	5 miles	95 (21)	
	6 miles	11 (2)	1 (10)
	7 miles	2 (<1)	
	8 miles	1 (<1)	
	9 miles	0 (0)	
	10 miles	2 (<1)	
Average number of times distance running is performed per week with your Unit or Team	No distance running	24 (5)	2 (18)
	1 time per week	136 (30)	1 (9)
	2 times per week	181 (40)	5 (46)
	3 times per week	94 (21)	1 (9)
	4 times per week	14 (3)	1 (9)
	5 times per week	2 (<1)	1 (9)
	6 times per week	0 (0)	
	7 times per week	0 (0)	
	8 times per week	0 (0)	
	9 times per week	0 (0)	
	10 times per week	1 (<1)	
Approximately what pace does your team usually run	No distance running	24 (5)	2 (18)
	5 minute mile	3 (1)	
	6 minute mile	8 (2)	
	7 minute mile	133 (29)	
	8 minute mile	233 (51)	5 (46)
	9 minute mile	49 (11)	4 (36)
	10 minute mile	6 (1)	
Total Unit PT Running Distance per Week	No distance running	24 (6)	2 (20)
	2-4 miles	96 (22)	0 (0)
	5-7 miles	127 (29)	6 (60)
	8-10 miles	121 (28)	1 (10)
	> 10 miles	72 (16)	1 (10)
Total Unit PT Running Time per Week	No distance running	24 (4)	2 (20)
	< 36 minutes	101 (24)	0 (0)
	36-50 minutes	108 (25)	3 (30)
	51-79 minutes	104 (24)	4 (40)
	> 79 minutes	90 (21)	1 (10)

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Table 2-C. Unit or Team Sprint and Cross-training			
Variable	Variable Level	Men (%)	Women (%)
Unit Sprinting Sessions per Week	None	124 (27)	4 (36)
	1 time per week	182 (39)	3 (27)
	2 times per week	89 (19)	3 (27)
	3 times per week	48 (10)	1 (9)
	4 times per week	9 (2)	
	5 times per week	13 (2)	
Minutes Sprinting Performed per Unit PT Session	None	124 (27)	4 (36)
	< 15 minutes	99 (21)	2 (18)
	15-29 minutes	121 (26)	3 (27)
	> 29 minutes	121 (26)	2 (18)
Total Unit Sprinting Time per week	None	124 (27)	4 (36)
	< 21 minutes	124 (27)	3 (27)
	21-40 minutes	108 (23)	3 (27)
	> 40 minutes	109 (23)	1 (9)
Unit CT sessions per week	None	71 (16)	5 (46)
	1 time	93 (20)	3 (27)
	2 times	108 (24)	2 (18)
	3 times	119 (26)	1 (6)
	4 times	27 (6)	
	5 times	39 (9)	
	6 times	1 (<1)	
	10 times	1 (<1)	
Minutes CT per Unit PT session when performed	None	71 (16)	5 (46)
	1-40 minutes	249 (57)	5 (46)
	41-80 minutes	107 (25)	1 (9)
	81+ minutes	7 (2)	
Total Unit CT Performed per Week	None	71 (17)	5 (46)
	< 41 minutes	117 (28)	4 (36)
	41-109 minutes	120 (28)	1 (9)
	> 109 minutes	114 (27)	1 (9)
Agility Training Sessions per Week	None	187 (40)	7 (64)
	1 time	114 (25)	2 (18)
	2 times	76 (16)	1 (9)
	3 times	52 (11)	1 (9)
	4 times	15 (3)	
	5 times	17 (4)	
Minute of Agility Training Time per Session	None	187 (40)	7 (64)
	< 11 minutes	128 (28)	2 (18)
	11-20 minutes	83 (18)	0 (0)
	> 20 minutes	65 (11)	2 (18)
Total Unit Agility training Performed per week	None	187 (40)	7 (64)
	< 20 minutes	76 (16)	1 (9)
	20-39 minutes	101(22)	2 (18)
	> 39 minutes	99 (21)	1 (9)

Note: *More than one answer may have been selected

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Table 3-C. Unit or Team Resistance and Aerobic (non-running)			
Variable	Variable Level	Men (%)	Women (%)
Unit Resistance Training Sessions per week	None	110 (24)	5 (46)
	1 time	48 (10)	1 (9)
	2 times	65 (14)	2 (18)
	3 times	132 (28)	2 (18)
	4 times	36 (8)	0 (0)
	5 times	67 (14)	1 (6)
	6 times	5 (1)	
	7 times	2 (<1)	
	8 times	1 (<1)	
Minutes resistance training per Unit PT session	None	110 (24)	5 (46)
	< 31 minutes	137 (29)	3 (27)
	31-55 minutes	89 (19)	1 (9)
	> 55 minutes	130 (28)	2 (18)
Total resistance training performed per week	None	110 (24)	5 (46)
	< 90 minutes (mean±SD 46±21)	114 (25)	3 (27)
	90-160 minutes (mean±SD 119±23)	117 (25)	1 (9)
	> 160 minutes (mean±SD 260±109)	125 (27)	2 (18)
Equipment Used for Unit Resistance Training*	Free Weights	342 (56)	5 (28)
	Weight Machines	128 (21)	6 (33)
	Kettlebells	261 (43)	5 (28)
	Tire Flipping	116 (19)	1 (6)
	Sled Dragging	182 (30)	4 (22)
	Bands and Chains	166 (27)	3 (17)
	Rope Swinging	103 (17)	1 (6)
Unit Aerobic Endurance Sessions per week (No Running)	None	134 (32)	4 (44)
	1 time	96 (23)	1 (11)
	2 times	76 (18)	2 (22)
	3 times	81 (19)	1 (6)
	4 times	11 (3)	1 (6)
	5 times	18 (4)	
	6 times	1 (<1)	
	7 times	1 (<1)	
Minutes Aerobic Endurance training (No Running) per Unit PT session	None	134 (32)	4 (44)
	< 16 minutes	93 (22)	2 (22)
	16-30 minutes	116 (28)	1 (11)
	> 30 minutes	75 (18)	2 (22)
Total Aerobic Endurance training (No Running) per week	None	134 (32)	4 (44)
	< 31 minutes	109 (26)	2 (22)
	31-60 minutes	96 (23)	1 (11)
	> 60 minutes	79 (19)	2 (22)

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Table 4-C. Unit or Team Road Marching, Stretching and Physical Training Intensity			
Variable	Variable Level	Men (%)	Women (%)
How often did your team perform road marches	None	59 (13)	4 (40)
	1 time per month	136 (44)	3 (30)
	2 times per month	110 (25)	1 (10)
	3 times per month	43 (10)	1 (10)
	4 times per month	80 (18)	1 (10)
	5 times per month	15 (3)	
	6 times per month	2 (<1)	
	7 times per month	1 (<1)	
	8 times per month	1 (<1)	
	9 times per month	0 (0)	
	10 times per month	1 (<1)	
How far does your team road march at a time	None	59 (13)	4 (44)
	1 mile	0(0)	
	2 miles	1 (<1)	
	3 miles	3 (1)	
	4 miles	46 (10)	
	5 miles	101 (23)	1 (11)
	6 miles	138 (31)	2 (22)
	7 miles	12 (3)	
	8 miles	39 (9)	1 (11)
	9 miles	3 (<1)	
	10 miles	28 (6)	
	11 miles	0 (0)	
	12 miles	17 (4)	1 (11)
Average load carried when road marching	30-49 lbs	204 (53)	
	50-90 lbs	182 (47)	
How often does team perform physical training in the swimming pool	None	260 (58)	
	1 time per month	61 (14)	
	2 times per month	30 (7)	
	3 times per month	18 (4)	
	4 times per month	33 (7)	
	5 times per month	11 (3)	
	6 times per month	12 (3)	
	7 times per month	0 (0)	
	8 times per month	7 (<1)	
	9 times per month	1 (<1)	
	10 times per month	12 (3)	
> 10 times per month	3 (1)		

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Variable	Variable Level	Men (%)	Women (%)
Unit or Team Stretching Times per week	None	48 (10)	1 (9)
	1 time	25 (5)	2 (18)
	2 times	26 (6)	0 (0)
	3 times	75 (16)	2 (18)
	4 times	39 (8)	1 (9)
	5 times	211 (46)	5 (46)
	6 times	9 (2)	
	7 times	13 (3)	
	8 times	3 (1)	
	9 times	1 (<1)	
	10 times	12 (3)	
When does your unit or team typically perform stretching	None	48 (10)	1 (9)
	Stretch Before workout	35 (7)	1 (9)
	Stretch After workout	79 (17)	2 (18)
	Stretch Before and after workout	309 (66)	7 (64)
What level of intensity do you usually train during unit PT	10-30% (tired / barely working)	3 (1)	2 (18)
	31-55% (going through the motions)	7 (2)	0 (0)
	56-75% (can feel yourself working)	119 (25)	4 (36)
	76-92% (high intensity)	297 (63)	4 (36)
	93-100% (All out/ nothing held back)	45 (10)	1 (9)
Do you lead PT for your team?	No	312 (51)	8 (44)
	Yes	159 (26)	3 (17)

Variable	Variable Level	Men (%)	Women (%)	
Participate in Personal PT	No	28 (5)	1 (6)	
	Yes	586 (95)	17 (94)	
Primary goal or personal PT	Lose Weight	42 (7)	4 (24)	
	Gain Muscle Mass (GMM)	48 (8)	2 (12)	
	Increase Aerobic Capacity (IAC)	54 (9)	0 (0)	
	GMM and IAC	332 (57)	7 (41)	
	Maintain Current Fitness	102 (17)	4 (24)	
	Unit PT not Challenging need Personal PT to maintain Fitness	8 (1)	0 (0)	

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Table 7-C. Personal Physical Training Running Distance and Sprinting			
Variable	Variable Level	Men (%)	Women (%)
Average Distance run for Personal PT	No distance running	56 (10)	2 (12)
	1 mile	2 (<1)	0 (0)
	2 miles	72 (13)	1 (6)
	3 miles	193 (34)	7 (41)
	4 miles	115 (20)	3 (18)
	5 miles	97 (17)	3 (18)
	6 miles	21 (4)	0 (0)
	7 miles	8 (1)	1 (6)
	8 miles	4 (1)	0 (0)
	9 miles	0 (0)	0 (0)
	10 miles	3 (1)	0 (0)
	11 miles	0 (0)	0 (0)
	12 miles	2 (<%)	0 (0)
Average number of times distance running is performed per week for Personal PT	No distance running	56 (10)	2 (12)
	1 time per week	125 (22)	2 (12)
	2 times per week	178 (31)	5 (30)
	3 times per week	156 (27)	5 (30)
	4 times per week	30 (5)	3 (18)
	5 times per week	22 (4)	0(0)
	6 times per week	4 (1)	0(0)
	7 times per week	2 (<1)	0(0)
Total Personal PT Running Distance per Week	No distance running	56 (10)	2 (12)
	2-4 miles	121 (21)	2 (12)
	5-7 miles	117 (20)	4 (24)
	8-10 miles	135 (24)	3 (18)
	> 10 miles	144 (25)	6 (35)
Average Number of Times Performing Sprinting or Interval Training per Week	No sprinting or interval training	170 (29)	5 (29)
	1 time per week	184 (31)	4 (24)
	2 times per week	143 (24)	6 (35)
	3 times per week	46 (8)	1 (6)
	4 times per week	12 (2)	0 (0)
	5 times per week	22 (4)	0 (0)
	6 times per week	7 (1)	1 (6)
	7 times per week	1 (<1)	0 (0)
8 times per week	1 (<1)	0 (0)	
Average Number of Minutes per Session of Sprinting or Interval Training	No sprinting or interval training	170 (29)	5 (29)
	1-15 minutes	179 (31)	7 (41)
	16-20 minutes	92 (16)	2 (12)
	> 20 minutes	145 (25)	3 (18)
Average Number of Minutes Spent Sprinting per Week	No sprinting or interval training	170 (29)	5 (29)
	1-20 minutes	156 (27)	3 (18)
	21-40 minutes	130 (22)	7 (41)
	>40 minutes	130 (22)	2 (12)

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Table 8-C. Personal Physical Training, Cross-training, Agility Training, Aerobic Training			
Variable	Variable Level	Men (%)	Women (%)
Average number of times performing CT each week	No CT	157 (27)	4 (24)
	1 time per week	76 (13)	3 (18)
	2 times per week	124 (21)	3 (18)
	3 times per week	123 (21)	4 (24)
	4 times per week	40 (7)	0 (0)
	5 times per week	49 (8)	1 (6)
	6 times per week	11 (2)	2 (12)
	7 times per week	5 (1)	0 (0)
	8 times per week	1 (<1)	0 (0)
Average number of minutes per CT session	No CT	157 (27)	4 (24)
	1-20 minutes	163 (28)	3 (18)
	21-35 minutes	127 (22)	3 (18)
	>35 minutes	139 (24)	7 (41)
Average number of minutes of CT per week	No CT	157 (27)	4 (24)
	1-45 minutes	153 (26)	4 (24)
	46-90 minutes	138 (24)	5 (29)
	> 90 minutes	138 (24)	4 (24)
Average number of times performing Agility drills each week	No agility training	306 (52)	9 (53)
	1 time per week	95 (16)	2 (12)
	2 times per week	82 (14)	1 (6)
	3 times per week	55 (9)	0 (0)
	4 times per week	12 (2)	2 (12)
	5 times per week	26 (4)	2 (12)
	6 times per week	8 (1)	1 (6)
	7 times per week	2 (<1)	0 (0)
Average number of minutes per Agility drill session	No agility training	306 (52)	9 (53)
	1-11 minutes	141 (24)	3 (18)
	> 11 minutes	139 (24)	5 (29)
Average number of minutes of Agility training per week	No agility training	306 (52)	9 (53)
	1-31 minutes	174 (30)	4 (24)
	> 31 minutes	106 (18)	4 (24)

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Table 9-C. Personal Physical Training, Cross-training, Agility Training, Aerobic Training			
Variable	Variable Level	Men (%)	Women (%)
Average number of times performing CT each week	No CT	157 (27)	4 (24)
	1 time per week	76 (13)	3 (18)
	2 times per week	124 (21)	3 (18)
	3 times per week	123 (21)	4 (24)
	4 times per week	40 (7)	0 (0)
	5 times per week	49 (8)	1 (6)
	6 times per week	11 (2)	2 (12)
	7 times per week	5 (1)	0 (0)
Average number of minutes per CT session	8 times per week	1 (<1)	0 (0)
	No CT	157 (27)	4 (24)
	1-20 minutes	163 (28)	3 (18)
	21-35 minutes	127 (22)	3 (18)
Average number of minutes of CT per week	>35 minutes	139 (24)	7 (41)
	No CT	157 (27)	4 (24)
	1-45 minutes	153 (26)	4 (24)
	46-90 minutes	138 (24)	5 (29)
Average number of times performing Agility drills each week	> 90 minutes	138 (24)	4 (24)
	No agility training	306 (52)	9 (53)
	1 time per week	95 (16)	2 (12)
	2 times per week	82 (14)	1 (6)
	3 times per week	55 (9)	0 (0)
	4 times per week	12 (2)	2 (12)
	5 times per week	26 (4)	2 (12)
Average number of minutes per Agility drill session	6 times per week	8 (1)	1 (6)
	7 times per week	2 (<1)	0 (0)
	No agility training	306 (52)	9 (53)
Average number of minutes of Agility training per week	1-11 minutes	141 (24)	3 (18)
	> 11 minutes	139 (24)	5 (29)
	No agility training	306 (52)	9 (53)
Average number of minutes of Agility training per week	1-31 minutes	174 (30)	4 (24)
	> 31 minutes	106 (18)	4 (24)

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Table 10-C. Personal Resistance Training and Stretching			
Variable	Variable Level	Men (%)	Women (%)
Personal Resistance Training Sessions per week	None	77 (13)	2 (12)
	1 time	49 (8)	0 (0)
	2 times	87 (15)	4 (24)
	3 times	151 (26)	8 (47)
	4 times	74 (13)	0 (0)
	5 times	105 (18)	0 (0)
	6 times	30 (5)	3 (18)
	7 times	9 (2)	0 (0)
	8 times	3 (1)	0 (0)
	9 times	0 (0)	0 (0)
	10 times	1 (<1)	0 (0)
Minutes resistance training per Personal PT session	None	77 (13)	2 (12)
	< 31 minutes	174 (30)	5 (29)
	31-55 minutes	127 (22)	3 (18)
	> 55 minutes	208 (34)	7 (41)
Total personal resistance training performed per week	None	77 (13)	2 (12)
	< 90 minutes (mean ± SD 47±21)	141 (24)	5 (9)
	90-160 minutes (mean ± SD 120±22)	146 (25)	3 (18%)
	> 160 minutes (mean ± SD 291±130)	222 (38)	7 (41)
Stretching	No	48 (8)	0 (0)
	Yes	538 (92)	17 (100)
When do you Perform Stretching for Personal PT	Before Workout	41 (8)	2 (12)
	After Workout	96 (18)	5 (29)
	Before and After Workout	401 (75)	10 (59)
Why do you perform stretching	Prevent Injury, Improve Flexibility and Decrease Muscle Soreness	318 (59)	9 (53)
	Improve Flexibility and Decrease Muscle Soreness	15 (3)	2 (12)
	Prevent Injury and Decrease Muscle Soreness	33 (6)	1 (6)
	Prevent Injury and Improve Flexibility	61 (11)	1 (6)
	Decrease Muscle Soreness	13 (2)	0 (0)
	Improve Flexibility	26 (5)	0 (0)
	Prevent Injury	69 (13)	2 (12)

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Table 11-C. Personal Training, Intensity, Type, and Contribution Towards Fitness			
Variable	Variable Level	Men (%)	Women (%)
What Level of Intensity (aerobic capacity) do you usually work at during Personal PT	10-30% (tired/barely working)	3 (1)	2 (12)
	31-55% (just going through the motions)	5 (1)	0 (0)
	56-75% (Can feel yourself working)	193 (33)	4 (24)
	76-92% (High Intensity)	336 (57)	9 (53)
	93-100% (All out/Nothing held back)	49 (8)	2 (12)
What is your personal PT program based on?	THOR3	172 (30)	8 (47)
	CT	78 (14)	5 (29)
	Extreme Conditioning Programs (ECP)	35 (6)	1 (6)
	THOR3, ECP, CT	65 (11)	2 (12)
	THOR3, CT	46 (8)	1 (6)
	THOR3, ECP	48 (8)	0 (0)
	CT, ECP	27 (5)	0 (0)
Personal PT is based on THOR3 as one of the components	No	255 (43)	6 (35)
	Yes	331 (57)	11 (65)
What training program is most effective in increasing your fitness performance	Team PT (Unit PT)	40 (7)	1 (6)
	Personal PT	231 (38)	10 (56)
	Both Team and Personal PT	343 (56)	7 (39)
What Percent of Team PT contributes to your overall fitness performance	0-10%	178 (31)	6 (35)
	11-20%	114 (20)	7 (41)
	21-30%	0 (0)	0 (0)
	31-40%	39 (7)	0 (0)
	41-50%	129 (23)	3 (18)
	51-60%	13 (2)	0 (0)
	61-70%	29 (5)	0 (0)
	71-80%	45 (8)	1 (6)
	81-90%	22 (4)	0 (0)
91-100%	5 (1%)	0 (0)	
What Percent of Personal PT contributes to your overall fitness performance (Self-Reported)	0-10%	22 (4)	0 (0)
	11-20%	73 (13)	1 (6)
	21-30%	0 (0)	0 (0)
	31-40%	19 (3)	0(0)
	41-50%	127 (22)	3 (18)
	51-60%	31 (5)	0 (0)
	61-70%	48 (8)	2 (12)
	71-80%	65 (11)	5 (29)
	81-90%	57 (10)	2 (12)
91-100%	132 (23)	4 (24)	
Average percent contribution of team and personal PT on fitness performance (Self-Reported)	Team PT	35% ± 28	24% ± 22
	Personal PT	65% ± 28	76% ± 22

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Table 12-C. Age and Average Fitness Scores for Aerobic and Muscular Endurance (Men)						
	< 27	27-31	32-36	37-41	> 41	ANOVA
2 Mile Run Times (Minutes and Fraction of a minute)	13.4 ± 1.2 (56)	13.4 ± 0.9 (171)	13.8 ± 1.0 (151)	14.3 ± 1.3 (83)	14.8 ± 1.2 (70)	<0.01
Sit-Ups (Repetitions)	78.1 ± 9.0 (57)	83.6 ± 8.4 (174)	80.4 ± 9.4 (153)	78.6 ± 9.9 (88)	74.0 ± 9.0 (71)	<0.01
Push-Ups (Repetitions)	74.1 ± 12.0 (57)	80.0 ± 9.0 (174)	79.50 ± 10.2 (153)	77.0 ± 8.8 (88)	71.3 ± 11.4 (71)	<0.01

Glossary

AFHSB

Armed Forces Health Surveillance Branch

ANOVA

analysis of variance

APFT

Army Physical Fitness Test

APHC

U.S. Army Public Health Center

AR

Army Regulation

ARSOF

Army Special Operations Forces

BMI

body mass index

CI

confidence intervals

CT

Cross-training

DCS

Deputy Chief of Staff

DOD

Department of Defense

HIIT

high-intensity, intermittent training

ICD-9

International Classification of Disease, 9th Edition

kg/m₂

kilograms per meters squared

mL/kg/mim

milliliters per kilogram per minute

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MOS

military occupational specialty

mph

miles per hour

ODA

Operational Detachment Alpha

OR

odds ratio

PT

physical training

RR

risk ratio

SD

standard deviation

SOF

Special Operations Forces

SPSS

Statistical Package for the Social Sciences

THOR3

Tactical Human Optimization, Rapid Rehabilitation, and Reconditioning

TPT

Traditional Physical Training

USASOC

U.S. Army Special Operations Command

VO₂max

maximum volume of oxygen