FUTURE SOLDIER ACCESSIONS AND THE CHALLENGE OF RISING OBESITY RATES

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by

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14. ABSTRACT

Every year the Army recruits thousands of new members, and each year a significant portion of those recruits either renegotiate their ship date to basic training or exit the process all together due to not meeting the Height and Weight requirements. These renegotiated contracts, and losses come at a financial cost to the Army.

This exploratory study used quantitative research methods to explore the impact of exercise frequency and intensity on accessions into the Army, related to body composition standards adherence. Using a single Recruiting Battalion and Military Entrance Processing Station recruits participating in Future Soldier Training, tracked their physical activity frequency and intensity for six weeks. Key findings from this study suggest that the majority of the data needed for this study is readily available, and some recommendations for future implementation of this study focus on removing the administrative burden for recruiters.

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The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

ABSTRACT

FUTURE SOLDER ACCESSIONS AND THE CHALLENGE OF RISING OBESITY RATES, By Maj Justin A. Winn, 80 pages.

Every year the Army recruits thousands of new members, and each year a significant portion of those recruits either renegotiate their ship date to basic training or exit the process all together due to not meeting the Height and Weight requirements. These renegotiated contracts, and losses come at a financial cost to the Army.

This exploratory study used quantitative research methods to explore the impact of exercise frequency and intensity on accessions into the Army, related to body composition standards adherence. Using a single Recruiting Battalion and Military Entrance Processing Station recruits participating in Future Soldier Training, tracked their physical activity frequency and intensity for six weeks. Key findings from this study suggest that the majority of the data needed for this study is readily available, and some recommendations for future implementation of this study focus on removing the administrative burden for recruiters.

ACKNOWLEDGMENTS

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To the Southern California Recruiting Battalion, LTC Mullhern, LTC (Ret) Bleigh, CSM Manan. Thank you for supporting this research and allowing me to run with this project. CPT Kim, MSG Denny, and MSG Wroblewski and the recruiters of SoCal RB, your efforts made this possible.

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TABLE OF CONTENTS

Page

ACRONYMS

ACFT	Army Combat Fitness Test
AIT	Advanced Individual Training
ARMS	Assessment of Recruit Motivation and Strength
ASI	Additional Skill Identifier
BCT	Basic Combat Training
BF	Body Fat
BMI	Body Mass Index
CDC	Centers for Disease Control and Prevention
DLIELC-ESL	Defense Language Institute, English Language Center – English as a Second Language
DLIFLC	Defense Language Institute, Foreign Language Center
DoD	Department of Defense
FFM	Fat Free Mass
FS	Future Soldier
FSAI	Future Soldier Asset Inventory
FTU	Fitness Training Unit
H2F	Holistic Health and Fitness
HPT	Human Performance Teams
HT/WT	Height/Weight
IET	Initial Entry Training
MEPS	Military Entrance Processing Station
MOS	Military Occupational Specialty
mRFEI	modified Retail Food Environment Index

MSKI	Musculoskeletal Injuries
NCO	Non-commissioned Officer
OPAT	Occupational Physical Assessment Test
OSUT	One Station Unit Training
PII	Personally Identifiable Information
PRID	Primary Identification
RENO	Renegotiated Contracts
RMR	Resting Metabolic Rate
RPE	Rate of Perceived Exertion
SNAP	Supplemental Nutrition Assistance Program
SoCal RB	Southern California Recruiting Battalion
SOP	Standard Operating Procedure
TEF	Thermic Effect of Food
TEPA	Thermic Effect of Physical Activity
USAREC	U.S. Army Recruiting Command
UTC	USAREC Training Circular
WHO	World Health Organization

ILLUSTRATIONS

Page

TABLES

Page

CHAPTER 1

INTRODUCTION

> In three decades, obesity tripled in the United States. As a result, the U.S. military is having trouble finding healthy recruits.
>
> —Council For a Strong America

Background

As highlighted by the Council for a Strong America (a non-profit with over 750 retired flag officers serving in the Mission: Readiness sub-organization), military leaders have recognized the challenges that obesity, specifically childhood obesity, and national education policies have posed to the state of readiness for the nation's military. For years the nation's education system has shifted from most districts requiring Physical Education classes, to lower standards such as participation in an after school sport, or even worse no requirement at all. This is largely due to some educators and policymakers concerns about physical education mandates for public schools and their impact on academic instruction.[1] While there are several states that require physical activity in grade school few require any formal education in secondary school. The lack of physical activity access in public schools is reducing exposure to multiple sports, or sport sampling and appears to be having an impact on local youth sports participation. The percentage of youth participating in team or individual sports even one day out of the

[1] Matt Shafer, and Elizabeth Whitehouse, "State Policies on Physical Activity in Schools," (The Counsel of State Governments, Capitol Research, Washington, DC, March 2017), 1, https://knowledgecenter.csg.org/kc/system/files/CR_activity_school.pdf.

year has declined from 73% in 2011 to 69.1% in 2017, among children age 6 to 12.[2] This still does not address the education component of physical education, which is a potential contributing factor to many of the poor lifestyle choices that are leading to the increased rates of obesity among children and adults within the United States.

The Army has implemented a training program called Future Soldier (FS) training for individuals that have contracted to join the Army, as far back as 2011. Future Soldier training aims to prepare FS populations physically, mentally, and intellectually for Basic Combat Training. However, there is no formal training given to the recruiters who will eventually lead the physical training aspect of this program. This could lead to inappropriate training programs and dietary recommendations by the recruiters. In addition to that the Military Entrance Processing Station (MEPS) uses general guidelines from the Centers for Disease Control and Prevention (CDC) for weight loss and does not address weight gain in their projections for when a FS would "ship" or depart for basic training.

To reduce costs to the Army, this study will look at recruiting, and MEPS processes that can be implemented to reduce delayed ship dates. An estimated 60% of at risk (FS within two pounds of being over, or underweight) FS populations or 5,426 FS across U.S. Army Recruiting Command (USAREC) renegotiate their contracts annually; and FS Losses are estimated at 10% or 906 at risk FS across USAREC annually. These numbers are further explained during the significance of the study section in this chapter.

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[2] Jon Solomon and Tom Farrey, "10 Charts that Show Progress, Challenges to Fix Youth Sports," *Project Play* (blog), *The Aspen Institute*, October 2018, https://www.aspeninstitute.org/blog-posts/10-charts-that-show-progress-challenges-to-fix-youth-sports/.

Some insights for how USAREC can leverage what the Army is already incorporating for physical fitness may be gleaned from the Holistic Health and Fitness (H2F) operating concepts released by the Army on October 1, 2020. This study will focus on what impact physical activity has on FS delays and losses.

Problem Statement

There are several factors that are coming together to create this recruiting/national security challenge; to include a growing percentage of the American population that is considered obese. One tool that the Army has introduced in recent years to address this challenge is the Occupational Physical Assessment Test (OPAT). While the OPAT has made significant improvements in addressing the conditioning of FS and reducing the number of injuries in basic combat training, it does little to address the body composition challenges that face FS. The Army height and weight standards are aligned with Body Mass Index (BMI) standards, the Army's body composition requirements are primarily capped in the range of Body Fat (BF) percentage that the World Health Organization (WHO) classifies as "overfat." For service aged males overfat is a BF between 19-25 percent, and 33-39 percent for service aged females. It is important to note here that the BMI standards used by the Army are not a body fat indicator, it is a health risk indicator for general populations. The overfat definition for body fat, defined by the WHO, is a discriminating factor once an individual is identified to be at a BMI of 25 or higher, they will be taped to determine their exact body fat. This use of BMI to quickly screen individuals, and the tape test to determine their body fat are the foundation of the Army's body composition program verification process.

There is a disconnect however between physical capabilities needed and the body composition standards to enter the military. This is addressed by USAREC through the Assessment of Recruit Motivation and Strength (ARMS) program that allows overweight individuals who qualify for combat arms on the OPAT to ship without meeting height and weight standards. Other examples of this disconnect would be when a FS has a high BF percentage they will likely be asked to run more by their recruiter, which may not be ideal for most overweight individuals. On the opposite side of this conversation, the underweight FS is not being exposed to exercise protocol that promotes muscle growth, also known as hypertrophy, addressing the physical demands for basic combat training among the critically weak. While there are multiple issues coming together at the point of enlistment, that USAREC is striving to address, there are some additional opportunities that could be addressed by training recruiters, leveraging Master Fitness Trainers, and modeling the principles found in the H2F operating concept.

While obesity does not necessarily mean that the FS is not physically prepared for the rigors of Basic Training, it is a discriminating factor for applicants looking to join the Army. The prevalence of obesity across the United States has generally increased since 1999, making recruiting qualified candidates a challenge for all military branches. Making the challenge worse is that the states from which the military recruits the most members across the Central and South Eastern regions, are among those most severely impacted by the spread of obesity (see figure 1). The increase of obesity from 2011-2019 is highlighted in figure 2, and shows this challenge is quickly becoming more than just a regional problem. This is undoubtedly beyond the scope of the Army alone to solve. However, it must be aware of the problem if it aims to manage the aspects that it can

control. Finally, figure 3 shows the aggregated national rate of obesity and severe obesity, further demonstrating that this is not merely a regional challenge, rather a national one.

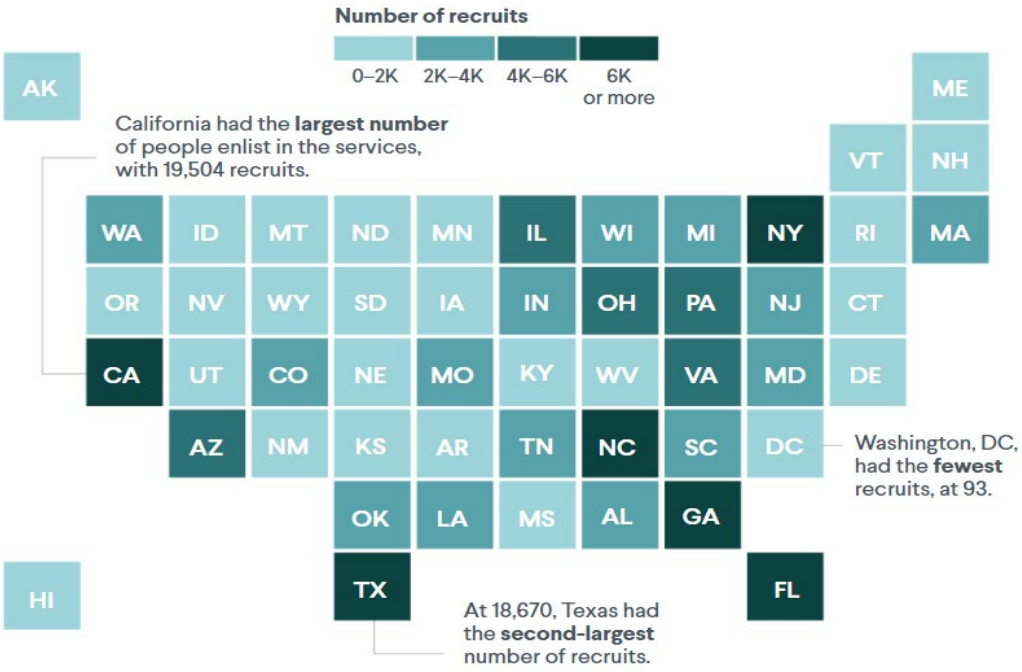

Figure 1. Number of Enlisted Recruits, 2018

Source: CFR.org Editors, "Demographics of the U.S. Military," Council on Foreign Relations, last updated July 13, 2020, https://www.cfr.org/backgrounder/demographics-us-military.

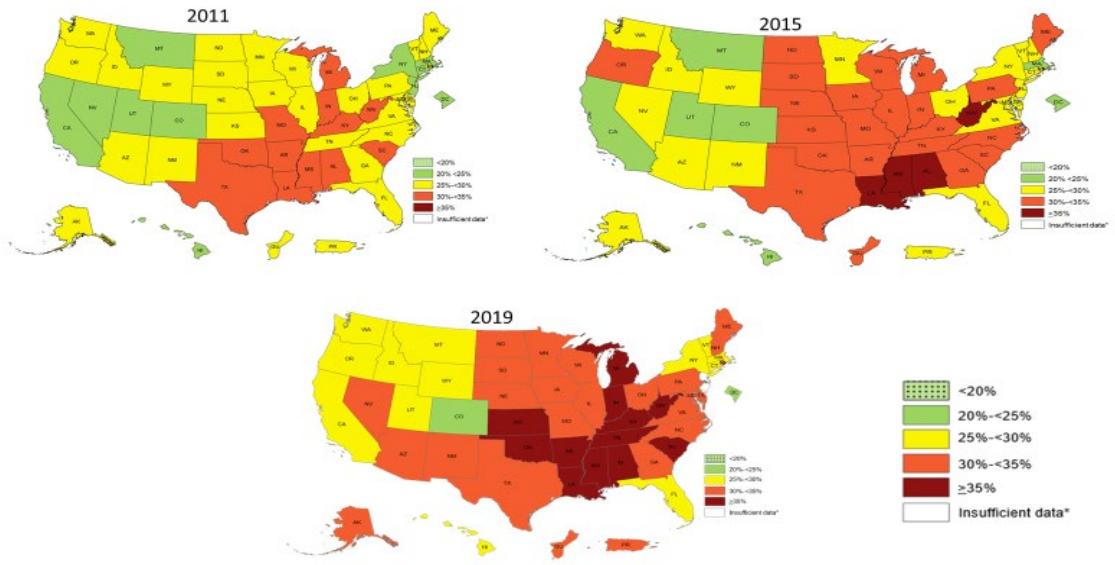

Figure 2. Prevalence of Self-Reported Obesity

Source: Centers for Disease Control and Prevention, "Adult Obesity Prevalence Maps," 2019, https://www.cdc.gov/obesity/data/prevalence-maps.html.

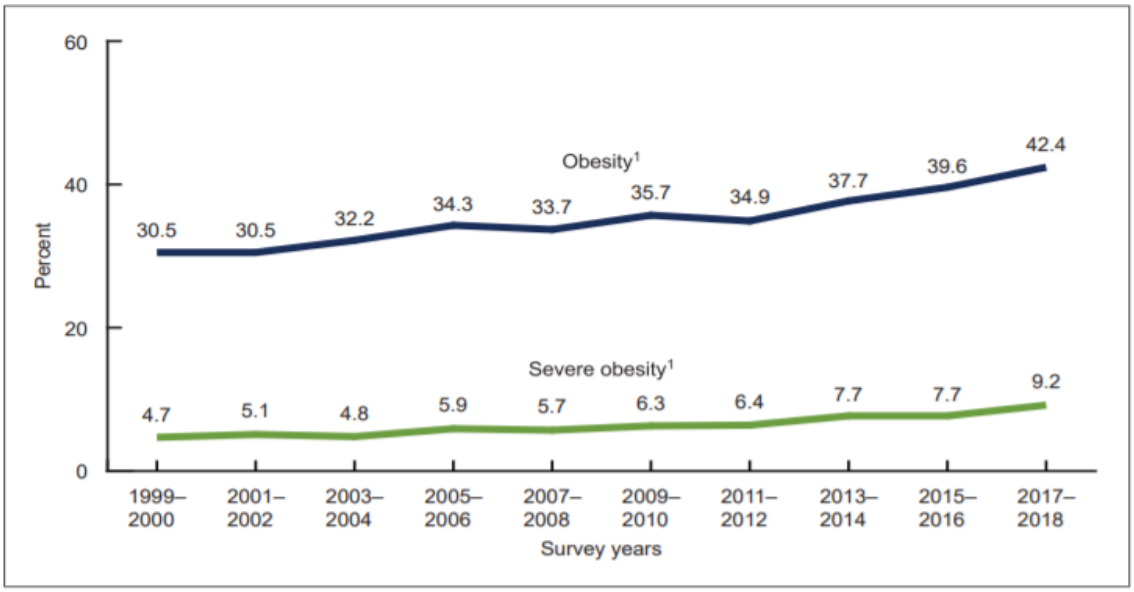

Figure 3. Prevalence of Obesity and Severe Obesity among Adults

Source: Craig M. Hales, Margaret D. Carroll, Cheryl D. Fryar, and Cynthia L Ogden, "Prevalence of Obesity and Severe Obesity among Adults: United States, 2017-2018," (NCHS Data Brief, no. 360, National Center for Health Statistics, 2020), https://www.cdc.gov/nchs/products/databriefs/db360.htm.

Understanding these challenges is only part of the problem. Another significant consideration is the Army's current fitness culture and its lust for running, as highlighted in the H2F operating concepts by GEN McConville. When most recruiters entered the Army, they were undoubtedly introduced to an environment where pushups, sit ups and the two-mile run defined the physical fitness standards. The Army is trying to change this, with the introduction of the Army Combat Fitness Test (ACFT) and the H2F operating concept.[3] While this may prove beneficial in the future, we currently have a recruiting force that is frequently offering recruits the simple advice of run more, or for the underweight FS to purchase and consume weight gainer from the local supplement shop. This advice to overweight FS populations to simply run more, can lead to overuse injuries that may also prevent FS populations from shipping, or arriving to basic training with pre-existing injuries. If a recruiter suggests resistance training, then the question becomes: have they been trained or certified to implement training to benefit the FS. The final complexity in this is how to help the FS lose weight, but also gain muscle to prepare for the rigors of basic combat training, two health outcomes that can be at odds with one another because muscle mass means more body weight, ultimately affecting BMI.

The challenge with asking FS populations to run more, or to simply do body weight (calisthenics) exercises is that you will see a short-term increase in the number of calories burnt, and subsequent fat loss. However, for overweight FS this may not be an appropriate prescription as the weight of the FS coupled with the impact of the running is

[3] U.S. Army Center for Initial Military Training (CMIT), *The U.S. Army Holistic Health and Fitness Operating Concept* (Fort Eustis, VA: CIMT, October 2020), https://www.army.mil/e2/downloads/rv7/acft/h2f_operating_concept.pdf.

likely to lead to increased injury rates, presumptively effecting Renegotiated Contracts (RENO), and FS loss rates. For the underweight FS populations, running and calisthenics are more likely to help them improve performance and maintain weight but are not likely to lead to hypertrophy and subsequent weight gain. Finding the appropriate balance of cardiovascular exercise and strength training is a skill that the Army is currently working to implement across the force through the H2F operating concept. If the Army is able to invest in a modified version of the Human Performance Teams (HPT) identified in the H2F operating concept; USAREC could benefit from having a strength coach and a dietician at each Brigade to work with these at risk populations. The USAREC version of the HPT would be necessary to reduce the time requirement for the recruiters and the on time ship rates of FS populations. An additional need for the USAREC HPT would be the H2F facilitators (a military member) who would likely be two or three per battalion, depending on how the Army decides to finalize that position as an Military Occupational Specialty (MOS) or as an Additional Skill Identifier (ASI).

With the introduction of the OPAT in 2016, the Army has observed a reduction in the number of Initial Entry Training (IET) Soldiers who are unable to complete Basic Combat Training due to Musculoskeletal Injuries (MSKI). There have been concerns raised about whether the OPAT is the main cause for this. Among those concerns are issues such as the accuracy of OPAT data provided by recruiters, as well as other external factors related to the readiness of the FS arriving at Basic Combat Training. This is difficult to know to what extent recruiters may be providing inaccurate OPAT data. The authors of *Lying to Ourselves: Dishonesty in the Army Profession* identify a challenge of too many requirements for them all to be reported accurately. "Sadly, much of the

deception that occurs in the profession of arms is encouraged and sanctioned by the military institution as subordinates are forced to prioritize which requirements will actually be done to standard and which will only be reported as done to standard."[4] Other factors could be the introduction of FS training in 2011 by USAREC via the training schedules.

1-4 in the Army Pocket Physical Training Guide.

- Training Schedule #1 – is for the FS who meets the contractual obligations as outlined in the enlistment contract. It improves the FS overall fitness level.
- Training Schedule #2 – is for the FS who may be lacking in lower body endurance. It improves the FS two-mile run time.
- Training Schedule #3 – is for the FS who lacks upper body or core strength. It increases the number of push-up and sit-up repetitions.
- Training Schedule #4 – is for the FS who lacks overall strength and endurance.[5]

Despite the existence of the Pocket Training Guide and the training schedules as far back as 2011, the USAREC Training Circular (UTC) 5-03.5 does not offer guidance on the use of these until the latest release in 2020. This makes it difficult to determine to what extent any reduction of MSKI in IET is due to the OPAT or the implementation of FS physical training across USAREC. As well, the training schedules do not address body composition and the 140-page document offers three pages of generic nutrition

[4] Leonard Wong and Stephen J Gerras, *Lying to Ourselves: Dishonesty in the Army Profession* (Carlisle Barracks, PA: US Army War College Press, 2015). https://www.jstor.org/stable/pdf/resrep11350.pdf?refreqid=excelsior%3A8c891d048ff316c1212af36993245375.

[5] U.S. Army Recruiting Command (USAREC), USAREC Training Circular 5-03.5, *Lead Future Soldiers* (Fort Knox, KY: USAREC, July 2020), https://recruiting.army.mil/Portals/15/Documents/Forms%20and%20Pubs/USAREC%20Training%20Circulars/UTC%205-03%20(5).pdf?ver=2020-08-10-061712-427.

education. In short, the current UTC and utilization of the UTC are not addressing body composition, and the size of the guide alone could be a deterrent to effective use.

One final challenge, identified by members of the San Diego MEPS, facing the in-processing of FS currently is the ability to project when they could or should be ready to ship to basic training. The MEPS staff currently use the CDC guidelines of 1-2 lbs. per week for weight loss. There are no suggestions for lbs. per week of weight gain to plan for underweight FS population ship date projections. Given that the CDC's guidelines for weight loss are primarily focused on the general population, it is possible that the 1-2 lbs. per week recommendation for weight loss is not sufficient for the typical FS whose age is between 17 and 25. For the underweight FS populations there is another challenge in that the general consensus among fitness professionals is that a person could expect to gain .25-.5 lbs. lean mass per week if they are following a hypertrophy exercise protocol, eating properly and getting enough sleep.[6] However, most recruiters are not going to be familiar with the concept of hypertrophy protocol because it has not been a part of their previous physical training, and it is not a part of the hip pocket guide provided in the UTC. Which is why running, and body weight training are most common with FS training programs, despite the presence of hex bars and bumper plates in every recruiting station since 2016. The application of running and body weight exercises, lends itself

[6] Ina Garthe, Raastad Truls, Sundgot-Borgen Jorunn. "Long-Term Effect of Nutritional Counselling on Desired Gain in Body Mass and Lean Body Mass in Elite Athletes," National Library of Medicine, August 18, 2011, https://pubmed.ncbi.nlm.nih.gov/21851204/; Debra Wein, "Calculating Your Daily Calories," *NSCA's Performance Training Journal* 4, no. 2 (2005): 7-8, https://kdhs.sesdweb.net/UserFiles/Servers/Server_143104/File/Departments/Athletics/Sports%20Performance/Nutrition/Wein_-_Calculating_Daliy_Calories.pdf.

mostly to muscular endurance training which is more likely to reduce lean mass. This lack of proper strength training skills among recruiters, coupled with no formal guidance for FS shipping based on how over or under weight an individual is, causes many unnecessary and costly delays in shipping, frustrates the FS going through the process leading to FS losses. As well, these delays create a negative lived experience that FS will undoubtedly share with their friends and family further frustrating the recruiting process.

All this information points to a growing challenge to find applicants who are qualified to serve, as populations continue to become more overweight in the regions where most of the recruiting occurs. Currently, the training for recruiters to help FS overcome specific weight challenges is not sufficient if they are expected to help FS achieve weight gain or weight loss, not to mention the time requirements for adherence to the standard are limited or non-existent. Additionally, while the OPAT has addressed MSKI and seems to have made an impact in reducing MSKI, it does not address body composition. Finally, a lack of age appropriate guidelines from MEPS personnel are only exacerbating the problem leading to increases in RENOs, and FS losses.

Primary Research Question

The primary research question will look at what guidelines should be for FS weight loss and weight gain to adhere to body composition requirements needed for military service, the research question is:

What impact does exercise have on FS processing?

Hypotheses

H1. Exercise frequency has a positive relationship to body composition standards adherence improving accessions rates.

H0. Exercise frequency has no relationship to body composition standards adherence making no impact on accessions rates.

H2. Exercise intensity has a positive relationship to body composition standards adherence improving accessions rates.

H0. Exercise intensity has no relationship to body composition standards adherence making no impact on accessions rates.

H3. Exercise volume (frequency and intensity) has a positive relationship to body composition standards adherence and a negative relationship with injury rates, an overall positive relationship with accessions

H0. Exercise volume (frequency and intensity) has no relationship to body composition or injury rates making no impact on accessions.

Definition of Terms

Army Components (Compos): Active Duty, Army Reserve, and National Guard are three separate components of the Total Force.[7]

Future Soldier: An individual who has contracted with the U.S. Army, but has not entered initial entry training.[8]

[7] Generally accepted definition within U.S. Army.

[8] Generally accepted definition within USAREC.

Future Soldier Loss: When a FS decides they no longer want to join the military and withdraw from the contract, either by direct notification to the recruiter or by becoming non-responsive to the recruiters attempts to contact them.[9]

Food Desert: a part of the country lacking in adequate supply of fresh fruit, vegetables, and other healthy whole foods, usually impoverished areas.[10]

Fad Diet: Fad diets are popular non-standard diets that often promise dramatic weight loss. However, they are usually not supported by scientific evidence, and they sometimes offer dangerous dietary advice.[11]

Health Literacy: the degree to which individuals have the ability to find, understand, and use information and services to inform health-related decisions and actions for themselves and others.[12]

Hypertrophy: Enlargement of skeletal muscle fibers in response to overcoming force from high volumes of tension.[13]

Initial Entry Training: This training is designed to produce disciplined, motivated, physically fit Soldiers ready to take their place in the Army in the field. This training includes

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[9] Generally accepted definition within USAREC.

[10] Tulane University, "Food Deserts in America (Infographic)," *Online Magazine* (blog), *School of Social Work*, May 2018, https://socialwork.tulane.edu/blog/food-deserts-in-america.

[11] Wikipedia, "Fad Diet," Wikimedia Foundation, Inc., last updated April 23, 2021, https://en.wikipedia.org/wiki/Fad_diet.

[12] Centers for Disease Control and Prevention, "What Is Health Literacy?," last reviewed January 2021, https://www.cdc.gov/healthliteracy/learn/index.html.

[13] Brian G. Sutton, "Hypertrophy," in *NASM Essentials of Personal Fitness Training* (Burlington, MA: Jones & Bartlett Learning, 2022), 672.

Basic Combat Training (BCT), OSUT, AIT, DLIFLC, and pre basic training courses (FTU, DLIELC-ESL). Individuals are considered IET status until they graduate and are awarded a military occupational specialty (MOS).[14]

Musculoskeletal system: The bones, muscles, tendons, ligaments and soft tissues. They work together to support your body's weight and help you move.[15]

Obesity: The condition of being considerably overweight, and refers to a person with a BMI of 30 or greater, or who is at least 30 pounds over the recommended weight for their height.[16]

Personally Identifiable Information (PII): Information that can be used to distinguish or trace an individual's identity, either alone or when combined with other personal or identifying information that is linked or linkable to a specific individual.[17]

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[14] U.S. Army Training and Doctrine Command (TRADOC), TRADOC Regulation 350-6, *Enlisted Initial Entry Training Policies and Administration* (Fort Eustis, VA: TRADOC: August 2019), 170, https://adminpubs.tradoc.army.mil/regulations.html.

[15] Cleveland Clinic, "Musculoskeletal System," last reviewed December 2020, https://my.clevelandclinic.org/health/articles/12254-musculoskeletal-system-normal-structure--function.

[16] Brian G. Sutton, "Obesity," in *NASM Essentials of Personal Fitness Training* (Burlington, MA: Jones & Bartlett Learning, 2022), 677.

[17] U.S. General Services Administration, "Rules and Policies - Protecting PII - Privacy Act," last reviewed December 1, 2020, https://www.gsa.gov/reference/gsa-privacy-program/rules-and-policies-protecting-pii-privacy-act.

Renegotiated Contract (RENO): is a renegotiated contract, often due to the need to delay for extenuating life circumstances, body composition failure, and other issues prior to or upon ship date re-evaluations.[18]

Social Network: a network of individuals (such as friends, acquaintances, and coworkers) connected by interpersonal relationships.[19]

Scope

This study is primarily focused on the body composition adherence among FS who participate in regular physical activity. Participants will be FS from the Southern California Recruiting Battalion's (SoCal RB) FS population and is anticipated to be approximately 120 FS over a three-month period (January-March). Some key components of the study are:

1. Data will be collected on participants for six weeks.
2. FS will be given a minimally viable work out plan based on their FS enrollment status for OPAT and body composition.

Limitations

While this study aims to identify some organizational policies that can reduce the cost of RENOs and FS losses due to body composition related issues, there are still several factors that are outside of the control of this study. Some of these factors may

[18] Generally accepted definition within USAREC.

[19] Merriam-Webster, "Social Network," last updated April 22, 2021, https://www.merriam-webster.com/dictionary/social network.

require additional studies to determine the effectiveness of their implementation with the organizational behaviors.

1. Nutrition: This study will not provide any specific nutrition advice, or recommendations. With nutrition being a significant contributor to the outcomes of body composition this will likely require further exploration of how and what types of processes could be implemented for best results.
2. Accuracy: There are often very contentious debates within the Army about the tape test and the accuracy of this method for determining body composition. While there may be consistency challenges and concerns with this method for calculating BF, it is the current Army standard for assessing body composition and will be the standard for this study.
3. Knowledge: the exercise science knowledge base of recruiters could impact the results of some subsets of FS populations. For instance, if a recruiter has a degree or other formal training with strength and conditioning, that recruiter's home station may see lower rates for RENO and FS losses compared to other stations.

Delimitations

There were several decisions made to look at specific challenges for entrance into the military. The first such decision was to look at the FS populations, and not to look at all services. This decision was partially influenced by the fact that the Army is the largest branch within the Department of Defense (DoD) and that looking at only one branch would make the data collection process more efficient. A second decision to use YouTube to host videos to standardize the prescribed exercises for FS populations, this

may also help highlight the desire for web-based programs. This does not necessarily translate directly to the desire to use an app like those used by personal trainers but may suggest interest. Finally, the last decision was focused on eliminating friction for the daily responsibilities of the recruiters, by using the data tracking systems already in place rather than leveraging the recruiters as part of the research team. While this study looks at the Army there is potential that suggestions and policies identified through this study could benefit the DoD since all branches have similar body composition requirements.

Significance of the Study

Every year USAREC has a mission of approximately 68,000 recruits.[20] A random sampling of BiZone data from the largest battalion in USAREC showed that 13.3% of FS were at risk of not shipping due to being overweight, underweight, or not passing the OPAT. Using the following assumptions to calculate the potential cost to USAREC from FS RENOs and Losses will allow for an estimated dollar impact to the Army.

1. There will be 30% of the at-risk population that ships with no issues.
2. RENOs are 60% of the at-risk population at a cost of $1,200 each.
3. Future Soldier losses are 10% of the at-risk population at a cost of $15,000 each.[21]

[20] Kyle Rempfer, "Here's how the 68,000-soldier recruiting goal broke down by MOS," *Army Times,* September 27, 2019, https://www.armytimes.com/news/your-army/2019/09/27/heres-how-the-68000-soldier-recruiting-goal-broke-down-by-mos/.

[21] Richard Buddin, *Success of First-Term Soldiers, The Effects of Recruiting Practices and Recruit Characteristics* (Santa Monica, CA: Rand Arroyo Center, 2005), https://www.rand.org/content/dam/rand/pubs/monographs/2005/RAND_MG262.sum.pdf.

4. Transposing the SoCal RB at risk population of 13.3% USAREC produces 9044 at risk FS per year.

Table 1. Estimated Cost to Army

	% of at Risk	At Risk #	Cost to Army
No Delay	30%	2713	$ -
RENO	60%	5426	$ 6,511,680.00
FS Loss	10%	904	$ 13,566,000.00
	Total	**9044**	**$ 20,077,680.00**

Source: Created by author.

This chart shows the estimated annual cost to the Army from FS delays and losses as it pertains to body composition alone. If the implementation of policies that allow for accurate projections of FS and improve the FS experience shifted the RENO percentage by 15% and the FS loss by 3% of the USAREC total, back to the no delay status. The Army could save approximately $5.7 million per year. Any additional efficiencies in this policy change, or increased number of at risk FS due to other regions facing higher obesity rates, only increase the potential savings.

Table 2. Potential Savings

	% of at Risk	At Risk #	Cost to Army
No Delay	48%	4341	$ -
RENO	45%	4070	$ 4,883,760.00
FS Loss	7%	633	$ 9,496,200.00
	Total	**9044**	**$ 14,379,960.00**
	Difference		**$ 5,697,720.00**

Source: Created by author.

Another significant outcome of improving the FS experience is that of a customer service or employee onboarding experience. Improving the FS training process and MEPS projections that supports the FS and enhances the recruiter's capabilities would reduce friction for the FS process, and for recruiters. While this is not the focus of this study, there are multiple marketing studies that show the benefit of "catering" to the Gen Z population that is currently being recruited. The Army is also using some similar approaches to appeal to Gen Z through hosting virtual events to introduce Soldiers who have recently completed IET to FS with questions, because the lived experience is very important to the Gen Z population. Anytime an organization can improve the onboarding process it is more likely to attain candidates from the same population if the individuals are sharing positive stories of their lived experience.

Summary

There are several factors that are facing USAREC which will make meeting its mission even more difficult in the future. First, is the growing rate of obesity in the United States especially as seems to be growing at a fast pace in regions where the largest numbers of recruits are coming from. Second, the lack of exercise science knowledge among recruiters, and ship date guidelines among MEPS are creating additional challenges for the FS process. Finally, while the OPAT has been an effective tool with reducing the number of MSKI in IET the OPAT does not provide guidance for body composition.

CHAPTER 2

LITERATURE REVIEW

> There is an emerging threat that we are seeing that I think will have an effect on our future, our economy, and our youth . . . {obesity} will become a National Strategic Issue over the next 20-30 years.
>
> —LTG Hertling, TedMidatlantic 2012

Introduction

This literature review will expand the readers understanding of the problem, solutions, and who is working on those solutions. For any organization to fix a problem, that problem must be defined and understood. There are many factors contributing to the growing rates of obesity in the United States. Sedentary lifestyles, high calorie/low nutrient foods, and community access are among the leading factors for childhood obesity.[22] Per the CDC, poor diet and lack of exercise are two of the leading behaviors increasing childhood obesity. Which of these factors can the Army readily influence, and which one is likely to make the most impact? Using these questions to help frame the problem will help Army and community leaders better align resources to combat obesity among its target recruitment population. Additionally, understanding what organizations are working to achieve similar goals will help the Army align itself with industry and community leaders across the nation to reverse the spread of obesity.

[22] Centers for Disease Control and Prevention, "Childhood Obesity Causes & Consequences," accessed November 21, 2020, https://www.cdc.gov/obesity/childhood/causes.html.

Why are obesity rates rising?

There are millions of professionals working every day to solve the growing obesity epidemic in the United States. Dieticians, Medical Doctors, Psychologists, and many others, to include Anthropologists, have been working to understand this challenge and create local, state, and national policies that will reverse the growing obesity rates. Despite the efforts of so many professionals working on this problem, rates keep rising. Partially because the regional challenges are very different, and the science has been interpreted in some extremely different context by some of these professionals and the organizations they are affiliated with. Despite all this complexity there are still some broad categories that all these professionals can agree on as leading factors for the rising rates of obesity, Sedentary Lifestyle and Access to Nutritious foods.

Sedentary Lifestyle Factors

When addressing the challenges of an increasingly sedentary lifestyle among most U.S. youth and young adults' researchers have identified several leading factors. The three most agreed upon reasons for an increase in sedentary lifestyles are school commutes, increased screen time and a lack of participation in sports. Screen time and participation in youth sports are both behaviors that can be influenced by schools, community access, and peer influence. Not yet addressed is the role that parents play in understanding and shaping the decisions of their children and their child's sedentary behaviors. A study out of the Netherlands found that parent's and children's perspectives differed with regard to both type and importance of sedentary behaviors.[23] Meaning that

[23] Lisa M. Hidding, Teatske M. Attenburg, Evi V. Ekris, and Mai J. M. Chinapaw, "Why Do Children Engage in Sedentary Behavior? Child- and Parent-Perceived

parents think their child does not want to be active for reasons other than what the child has stated is their reason for inactivity. Children in the study often chose not to be active due to a lack of friends to play with or the activities available required sitting. These three threads can be tied together by understanding that youth will choose to participate in sports, or increase screen time based on their social networks, as well as access to sports through public school systems and community leagues.

The issue of transportation to and from school is less of a behavioral factor and often more of an economic or environmental factor. Two studies were looked at to identify commute times in urban and rural communities, urban commute times using school buses in New Orleans averaged 35 minutes one way for nearly six total hours of commute time per week.[24] Among rural schools, 77% of the population is bussed with 59.9% of that population having a commute between 30-59 minutes, and 24.1% of the bussed population experiencing commute times of 60-90 minutes.[25] Both of these studies look at the difference in commute for students who commute by car and by school bus, the urban research also looks at students who commute by public transportation. Of the three, commute by car consistently has the lowest commute time, school busing is on

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Determinants," *International Journal of Environmental Research and Public Health* 14, no. 7 (2017), https://doi.org/https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5551109/#B7-ijerph-14-00671.

[24] Jane Lincove, Jon Valant, *New Orleans Students' Commute Times by Car, Public Transit, and School Bus* (Washington, DC: The Urban Institute, 2018), 7, https://educationresearchalliancenola.org/files/publications/new_orleans_students_commute_times_by_car_public_transit_and_school_bus.pdf.

[25] Craig Howley, "The Rural School Bus Ride in Five States: A Report to the Rural School and Community Trust," The Rural School and Community Trust, 2001, 1-76, https://www.ruraledu.org/user_uploads/file/Rural_School_Bus_Ride.pdf.

average 14 minutes slower than by car, with public transportation taking the longest time with an average of 45 minutes one way. All this commute time leads to increased sedentary time for students, and reduced opportunity to participate in sports or other physical activity. A third resource offers some solutions that may increase physical activity among urban and select rural students through walking or cycling to schools. "Walking one mile to and from school each day generates two-thirds of the recommended sixty minutes of physical activity a day. Infrastructure improvements through the Safe Routes to School program yielded walking and bicycling increases that were often in the range of 20 percent to 200 percent."[26] This is significant to the recruiting command team who is likely to have a group of community partners comprised of local politicians, school leaders, and other influential members of the community they can work with to create local policies, host events, etc. that will help drive down the rate of obesity in their respective areas.

Access to, and Understanding Nutritious Foods

There are many challenges when discussing the nature of food in the United States, fad diets, health literacy and access to nutrient dense foods are issues complicating the challenge of reducing obesity among youth and young adults. Much like with sedentary choices, some dietary choices are behavioral. Specifically, the choice to participate in a fad diet, or whether to order a burger instead of a salad whenever both are available. A study conducted at Ball State University in 2001 showed that 40% of college

[26] Safe Routes Partnership, "National Statistics on School Transportation," 2009, 2, https://www.saferoutespartnership.org/sites/default/files/pdf/school_bus_cuts_national_stats_FINAL.pdf.

age participants had tried a fad diet, with 92.5% staying on the diet for three months or less. Out of the total population of dieters, only 20.7% lost weight and were able to keep it off. This study looks at some of the motivational factors for why people tried fad diets, the number one reason for college students was to improve appearance, with 86.5% saying that was their main reason. [27] This rate should be looked at for FS populations because they are a similar age demographic, their reason for participating in a fad diet may be more accessions adherence driven than aesthetic. The fact that most of these students either did not lose weight or were unable to keep the weight off suggests the diets did not affect behavior change or improve health literacy.

The Department of Education tracks health literacy. Adults age 16-24 on average have an intermediate score for health literacy, which suggests they have moderate capability for researching, understanding and receiving health information. However, individuals who have no college education, are between a basic and intermediate score for health literacy. A basic health literacy score indicates a simple and everyday understanding of health information. Also, important to note is that Hispanic and Black Americans score below basic with 41% and 24% of their adult populations, respectively.[28] This is important because in 2017, 43% of the active duty force was a

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[27] Andrea Pedtke, "Prevalence of Fad Diets on a College Campus," (Honors Thesis, Ball State University, 2001), 28-36, https://cardinalscholar.bsu.edu/bitstream/handle/handle/192001/P43_2001PedtkeAndrea.pdf?sequence=1.

[28] Mark Kutner, Elizabeth Greenberg, Ying Jin, and Christine Paulsen, *The Health Literacy of America's Adults: Results from the 2003 National Assessment of Adult Literacy* (Washington, DC: National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education, 2006), https://nces.ed.gov/pubs2006/2006483_1.pdf.

minority. Of that minority population 39% were black, and 36% were Hispanic. The prior assessment of this data was in 2004, since then there was a 12% decrease in black, and an 11% increase among Hispanic active duty members.[29] Highlighting how these minority populations with lower health literacy rates continue to be a significant portion of the recruitment pool could shape how recruiters and the Army improves health literacy. Targeted assistance for recruiters and communities comprised of high-risk populations would likely have the most significant impact on FS populations' accessions rates.

As it pertains to accessing healthy food options, most people may be familiar with the term food desert. Food deserts are determined by assessing a population's access to transportation and the distance to a supermarket, essentially determining how challenging it is for consumers to access a grocery store. In 2009, 23.5 million Americans lived in a food desert; mostly across the south eastern region and much of the Appalachia's. There are even some urban centers, Chicago and New York City, which are considered food deserts.[30] This is a problem because of the large recruiting population that comes from the south east.

One additional measure of access to healthy foods is the modified Retail Food Environment Index (mRFEI). This index generates a number that represents the prevalence of unhealthy vs. healthy food retailers in a census tract "healthy food retailers include supermarkets, larger grocery stores, supercenters, and produce stores. Less

[29] Amanda Barroso, "The Changing Profile of the U.S. Military: Smaller in Size, More Diverse, More Women in Leadership," Pew Research Center, September 10, 2019, https://www.pewresearch.org/fact-tank/2019/09/10/the-changing-profile-of-the-u-s-military/.

[30] Tulane University, "Food Deserts in America (Infographic)."

healthy food retailers include convenience stores, fast food restaurants, and small grocery stores with three or fewer employees."[31]This is helpful when studying where populations may have access to food but have few healthy food options. Similarly to food deserts, rural areas are most likely to struggle with mRFEI. One failed point of the mRFEI is that it does not track food purchases, and many fast food restaurants are starting to include salads and other healthy options to their menus. Finally, this understanding of the food desert, and mRFEI would be beneficial to recruiting commanders striving to support local initiatives and regional initiatives to combat food insecurity.

There are a few locations in the United States that have maintained lower than national average obesity rates, Colorado, and Washington, DC. If we consider lifestyle factors and access for these populations, we can see that the challenge is not easily identified. Much of the District of Columbia has a low mRFEI. Despite that, they come in as the second lowest "state" for obesity. Some reasons for this may be the high percentage of the population who are college graduates, since the more education a person attains there is a correlation to decreased obesity rates among adults. However, the real reason is likely to be in the local leadership. The district also saw a reduction of obesity in black communities, associated with investments in bike sharing, community parks, and education.[32] For Colorado, the least overweight state in the United States, the

[31] National Center for Chronic Disease Prevention and Health Promotion (CDC), Division of Nutrition, Physical Activity, and Obesity, "Census Tract Level State Maps of the Modified Retail Food Environment Index (mRFEI)," Centers for Disease Control and Prevention, 2011, https://www.cdc.gov/obesity/downloads/census-tract-level-state-maps-mrfei_TAG508.pdf.

[32] Tracy Garner, and Tasha Lewis *Obesity in the District of Columbia, 2014 Striving to Reduce and Prevent Overweight and Obesity Among D.C. Residents* (Washington, DC: Government of the District of Columbia, Department of Health, 2014),

obesity rate doubled from 1995-2014.[33] Despite this, growth in Colorado's obesity rate, there are still some lessons to be learned from the Centennial State. Community Design and Land Use as well as Nutrition courses for Supplemental Nutrition Assistance Program (SNAP) recipients are the two initiatives Colorado is highlighted for in the 2020 State of Obesity report.[34] The success of these initiatives gives credibility to many of the ideas suggested in related studies, that education and access will improve behavior, ultimately leading to a reduction in obesity rates.

The nation is struggling with this rise in obesity. Even the two leading populations, have had a growth in obesity rates over the years. Communities that have had the greatest success in curbing the rise of obesity are implementing effective education programs and removing barriers for physical activity. All these initiatives drive the necessary behavior change required for individuals and communities to reduce the obesity challenge in America. Recruiting Commanders at all levels are considered community leaders and should be educated on this challenge to ensure they are able to contribute to solving this problem in their respective areas, since it directly impacts their mission.

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https://doh.dc.gov/sites/default/files/dc/sites/doh/publication/attachments/Obesity%20Report%202014.pdf.

[33] Colorado Department of Public Health & Environment, "Overweight and Obesity in Colorado - Colorado adults, teens and children," Data Infographic, 2017, https://drive.google.com/file/d/1YXV9J96v0l_2r8Qqi5oV6NtamP43OOfQ/view.

[34] Molly Warren, Stacy Beck, and Daphne Delgado, *The State of Obesity 2020; Better Policies for a Healthier America* (Washington, DC: Trust for America's Health, 2020), 20-45, https://www.tfah.org/wp-content/uploads/2020/09/TFAHObesityReport_20.pdf.

What is the impact of diet and exercise on body composition?

There are a couple of different factors effecting body composition when discussing exercise. The impact of resting metabolic rate, and Thermic Effect of Physical Activity (TEPA) on body composition are really the focal point of this research. There are also genetic factors at play, but they will not be the focus of this study. How all of these factors are affected by exercise and their impact on body composition must be understood by anyone implementing physical training for FS populations.

It is not uncommon for someone to reference their metabolism when discussing their body composition. However, Resting Metabolic Rate (RMR) accounts for 60% to 75% of calories burned, 15% to 30% comes from TEPA, and the remaining ~10% is the Thermic Effect of Food (TEF).[35] The ability to influence RMR through exercise is a still being studied for the most efficient method to increase overall energy expenditure. The conventional thinking in the field of exercise science currently is that resistance training will increase muscle mass, and subsequently increase overall energy expenditure, and that aerobic training will increase TEPA, but that aerobic training does not have a long term impact on RMR. This is supported by many studies, a qualitative study by Stiegler and Cunliffe highlights this through 15-week study by Cullenin and Caldwell, where participants conducted supervised resistance training twice a week, 45 minutes per session. Out of the ten non-dietary intervention studies Stiegler and Cunliffe included in their research, Cullenin and Caldwell's resistance training research yielded the greatest

[35] Fabio Comana, "Resting Metabolic Rate: How to Calculate and Improve Yours," *Nutrition* (blog), *National Academy of Sports Medicine*, August 2019, https://blog.nasm.org/nutrition/resting-metabolic-rate-how-to-calculate-and-improve-yours.

reduction in body fat/week. Of all the non-dietary intervention studies examined by Stiegler and Cunliffe, the resistance training studies yielded the greatest loss of body fat, and the greatest increase in Fat Free Mass (FFM). Those same study participants were able to maintain those body composition changes over the ensuing six month period with an unsupervised program.[36] The ability to maintain the body composition after the supervised period suggests that behavior change had occurred, though there are too many variables to say that with certainty. Two significant consideration for the Army is the length of time required for the change in body composition, and understanding that as FFM increases and BF decreases there isn't likely to be a drastic shift in weight, leaving a FS at risk of not passing the height and weight, necessitating a tape test used to determine body fat percentage.

The genetic component of weight loss has been leveraged by the fitness industry mostly to promote their products as the most efficient way to address weight loss. However, there is little evidence to suggest that an individual's genetics would be the sole cause of their obesity, unless they have an actual genetic disorder, Bardet-Biedl syndrome and Prader-Willi Syndrome are examples of extremely rare genetic diseases. The CDC suggests that both genes and behavior may be needed for a person to become

[36] Petra Stiegler, and Adam Cunliffe, "The Role of Diet and Exercise for the Maintenance of Fat-Free Mass and Resting Metabolic Rate during Weight Loss," Review Article, Department of Human and Health Sciences, University of Westminster, London, UK, 2006), 248-249, http://www.healthprofessionalsolutions.com.au/v/vspfiles/assets/images/the%20role%20of%20diet%20and%20exercise%20for%20the%20maintenance%20of%20ffm%20an%20rmr%20during%20weight%20loss.pdf.

overweight.[37] This means that the vast majority of Americans are not becoming overweight or obese due to genetic factors, rather behaviors related to poor diet and exercise choices.

It is important to note that, among the factors discussed in this section there are still many aspects that need to be explored further. For instance, resistance training can have different protocol (Endurance, Hypertrophy, Power) and these different protocols have different impacts on the body, for performance, body composition, etc. The same can be said for aerobic training, the different forms of aerobic and resistance training should eventually become part of this conversation. Understanding the short term, and long-term effects of exercise, how to improve access and impact behavior change is the key take away for this segment.

What actions are the Army and outside organizations taking?

The Army is not the only organization looking at the rising obesity rates and raising alarm. Whether it is a national organization like Mission: Readiness, a state organization like Colorado's Department of Health & Environment, or a local organization like Thrive Allen County (Rural Kansas); it is important for Army leaders at all echelons of command to understand where and how these organizations are working to improve health outcomes in their respective areas. Additionally, understanding where those organizations initiatives align with the Army's initiatives will help ensure success for everyone working to reverse the obesity trend.

[37] Centers for Disease Control and Prevention, "Other Factors in Weight Gain," last reviewed August 17, 2020, https://www.cdc.gov/healthyweight/calories/other_factors.html.

The Army as a larger organization has various health focused programs like the Performance Triad which aims to educate the force on the benefits of Sleep, Activity, and Nutrition. As well the Army has recently released the plan for Holistic Health and Fitness as an operating concept for commanders to shape how the force is focusing on exercise, sleep, and other health factors to improve readiness. Outside organizations with national impact like Mission: Readiness, have been instrumental in developing national level policies such as the 2010 Healthy, Hunger-Free Kids Act. Allowing organizations like this to leverage some of the intellectual capabilities within the Army in some form of an annual working group may help enhance the products being generated among all involved, to increase efficiency, identify the greatest challenges, and create a unified strategy to combat obesity in children and young adults.

Most states have programs similar to the Colorado Department of Health & Environment who are already working on statewide policies for access to nutritious foods, and recreation. Many of these policies and programs are focused on improving access to healthy foods and access for physical activity. Some of the Colorado specific initiatives include: The Built Environment (physical activity infrastructure), Healthy Schools (Teaching healthy eating and activity behaviors in public schools), and Healthy Food Environments (assists non-profits get healthy options into low-income areas).[38] While there are still several other state programs to reduce obesity across Colorado, these

[38] Colorado Department of Public Health & Environment, "Obesity: Healthy food environments," accessed January 10, 2021, https://cdphe.colorado.gov/obesity-prevention/obesity-healthy-food-environments.

three highlight how states can direct funds or employ workers to reduce the prevalence of obesity.

At the local level there are often organizations like Thrive Allen County (Kansas) in rural areas, and Safe Routes Partnership in urban areas. These organizations often depend on funding from their states, to bring about the change necessary for their respective communities. The most common initiatives among urban and rural organizations are access to safe walking routes, parks, etc., along with access to healthy food options through assisting community members with SNAP assistance, and partnering with local CO-Ops for "farm to table" initiatives. While state and federal funding may be a large portion of the income for these organizations, they still receive funding from businesses like Blue Cross Blue Shield, and private party donors. With this, they still have to have a robust volunteer population, to carry out the education and activity opportunities that they are coordinating for their respective communities.

It is important for senior leaders in the Army to collaborate with national organizations to identify the strategy for reducing obesity. Additionally, those leaders must educate and empower subordinate leaders to engage with policy makers and influencers in their respective spheres of influence, carrying that larger strategy into the communities where they reside. The Army is doing some great work for those individuals who are on active duty. If the obesity trends are not addressed, all three components of the Army may be faced with an even bigger recruiting problem. Ideally, regional partnerships will be created that can benefit those serving, in any status, as well as the recruiting populations.

Summary

There are no shortage of challenges relating to the rise of obesity in the United States. This is highlighted by the fact that even in the states with the lowest rates of obesity, obesity rates are on the rise. If the Army plans to address obesities impact to recruiting, it may be faced with some tough choices in the future. Those choices broadly defined are to either ease body composition requirements or get more involved with the organizations that are already working to reduce obesity rates across the country. The Army already has some great policies and programs in place demonstrating the ability to positively impact organizational change. Further extension of those policies into the communities where Soldiers live may enhance the ability for organizations at all levels of governance to improve access to education, nutritious foods, and exercise, lowering the rate of obesity through behavioral change. This will only happen when communities and cultural norms change.

CHAPTER 3

RESEARCH METHODOLOGY

Introduction

Up to this point reader should have gained a firm grasp of the problem, conventional thinking surrounding the problem, and an introduction to organizations working to solve the challenge of rising obesity rates across the United States, with an emphasis on the impact to military recruiting operations. The next few sections will describe how this study plans to build upon the existing research, with a focus on FS populations and the impact of body composition on military accessions rates. The remaining sections in this chapter will help answer the primary research question: What impact does exercise have on FS processing?

To affectively address future policy recommendations, the following hypotheses will also be examined:

H1. Exercise frequency has a positive relationship to body composition standards adherence improving accessions rates.

H0. Exercise frequency has no relationship to body composition standards adherence making no impact on accessions rates.

H2. Exercise intensity has a positive relationship to body composition standards adherence improving accessions rates.

H0. Exercise intensity has no relationship to body composition standards adherence making no impact on accessions rates.

H3. Exercise volume (frequency and intensity) has a positive relationship to body composition standards adherence and a negative relationship with injury rates, an overall positive relationship with accessions

H0. Exercise volume (frequency and intensity) has no relationship to body composition or injury rates making no impact on accessions.

Methodology

This is a quantitative study, using data provided by the SoCal RB and the San Diego MEPS. The next few chapters will identify the data collection process and quantitative methods to be used. Figure 4 is a graphic depiction of the data collection process, the numbered steps will be described in further detail using the corresponding subsection.

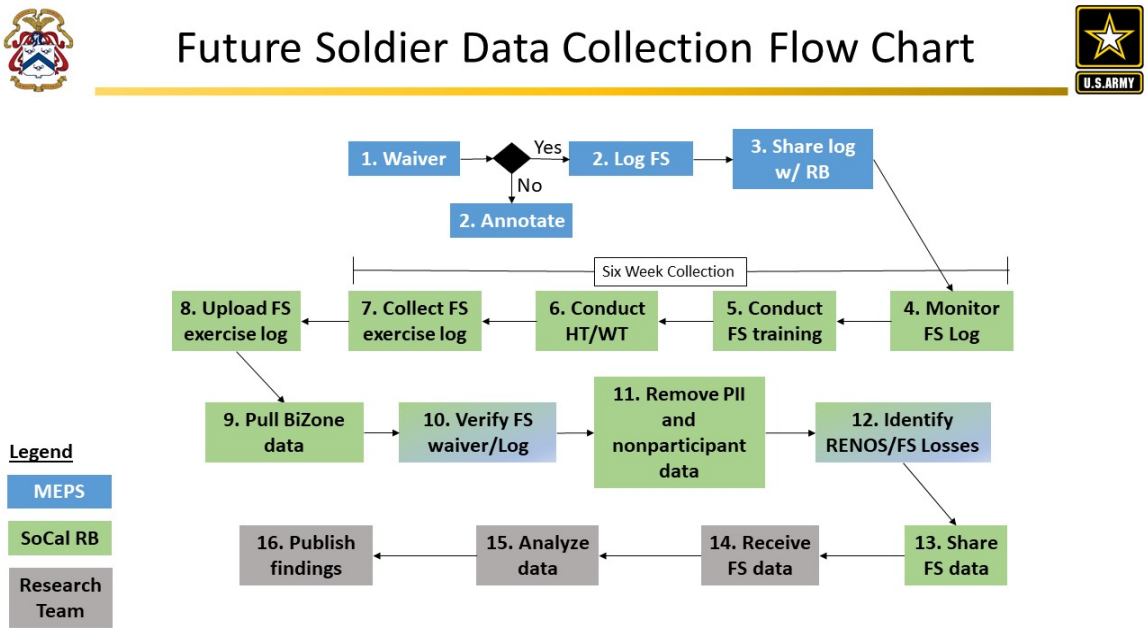

Figure 4. Future Soldier Data Collection Flow Chart

Source: Created by author.

1. Upon contracting, MEPS personnel will ask FS populations if they are willing to share their data related to body composition and FS training for secondary research purposes. MEPS personnel will remind FS that this data is already being collected, except for an exercise log, and the option to share their data is in no way going to affect their enlistment process.
2. There is a decision point here for the FS, a yes or no option:
    a. No: If a FS elects not to participate in the process, the MEPS personnel will annotate this only for the purposes of verification in a later step.
    b. Yes: If a FS elects to participate in the process by sharing their data and filling out an exercise log, then the FS will receive an at home exercise program to facilitate their FS training (Appendixes A-E), and a six-week exercise log (Appendix F). The FS will be asked to sign the waiver approving the SoCal RB and San Diego MEPS to share data pertaining to the FS within the scope of this research, minus any PII.
3. MEPS personnel will share the list FS participants with the recruiters by uploading those participants into a share drive folder that all members of the MEPS and SoCal RB will be able to access.
4. Recruiters will monitor the list of FS study participants to ensure they know when to collect the FS exercise logs.
5. Recruiters will conduct FS training as they normally would, there should be no specialized training or treatment for FS participating in the study. The only aspect that is being added for FS participants is an at home workout guide. This guide is to ensure that any FS without access to a gym has a minimally

viable at home program. This program will be supplemented with demonstrational videos that will be shared via a YouTube channel, being created specifically for this study.

6. Regular height/weight (HT/WT) is currently part of the FS program for recruiters, the only additional requirement is to annotate the HT/WT on the exercise log at the six-week mark for FS study participants.
7. Recruiters will collect FS study participant exercise logs to upload them to the SoCal RB shared drive. These exercise logs should be secured in accordance with the same standards of any sensitive enlistment documentations, until uploaded.
8. Documents will be uploaded to the FS Study share point folder in accordance with the SoCal RB policies. Once uploaded the documents should be secured until the study is complete, and verification of receipt has been received. Upon the completion of the study, all exercise logs will be securely destroyed.
9. The SoCal RB will pull the FS data from BiZone (their current method of tracking FS data) for the period from January 1-March 31, 2021. All FS who processed during this time will be represented in this data.
10. The SoCal RB will collaborate with the MEPS personnel to verify that the FS study participants have both a waiver and exercise log on file.
11. SoCal RB will take the final list of FS participants with an exercise log and waiver on file, and ensure that only the data points from those FS have been

consolidated and any PII has been removed prior to sharing with the research team.

12. SoCal RB will coordinate with the MEPS to determine if a FS shipped on time, renegotiated their contract, or became a FS loss. If the FS did not ship on time this will be annotated in the data along with the reason “body comp” or “other.” This will allow the research team to determine the rate of delay, or loss.
13. Once the data has been compiled, and verified that all PII has been removed, the SoCal RB will share the data and exercise logs with the research team via hard copy or password protected device.
14. Upon receipt of the file containing the data, the research team will finish populating the data from the exercise logs into the data base or spreadsheets for a consolidated source of all the pertinent data.
15. To answer the primary research, question the research team will conduct explore the hypotheses. The first hypothesis will be examined using a bivariate correlation to determine the relationship between exercise frequency and the three FS ship categories: No Delay, RENO, FS Loss. To address the second hypothesis, the research team will be examined using a bivariate correlation to determine the relationship between exercise intensity and the three FS ship categories: No Delay, RENO, FS Loss. The third hypothesis, will be examined using a bivariate correlation to determine the relationship between exercise volume (frequency and intensity) and the three FS ship categories: No Delay, RENO, FS Loss. If enough data points are collected, the

team will be able to use that information to propose weight loss projections to be implemented in MEPS.

16. The research team will then publish the findings in this paper, to be shared with USAREC and MEPS leaders as appropriate. Additionally, any data received will be retained for a period of three years, with a password protected device.

Ethical Assurances

De-Identification: PII will be removed by the recruiting battalion prior to sharing data with the research team. A unique code will be given to each FS participant to align BiZone data with FS exercise log data. This process will ensure that all information is de-identified.

Data management: Data security processes are already established through the U.S. Army for all FS data. The exercise log will comply with any sensitive information on FS populations that Army recruiters would have already been handling. The only challenge not addressed is the transfer of the data from the recruiting team to the research team. The Army can share this data by either handing hard copies of the sheets to the research team, or by placing the files on a password protected device to be shared with the researchers. Any data transfer will comply with the Army data security requirements for de-identified information.

Undue Influence: Although not officially Soldiers, FS populations in this study will be treated as though there is the same dynamic that a Soldier would face with their Non-Commissioned Officer (NCO) supervisors. To prevent any perception of undue influence of the recruiter to FS rank structure and relationship dynamic; MEPS personnel

will be responsible for attaining consent from FS who have already contracted to join the Army.

Sample

The target population will match that of the SoCal RB, including males and females ages 18-35. This study excludes minors due to challenges with parental consent verification. It is anticipated that there will be 120 participants, the majority of those will be 18-25 year old males.

Study Design

Participants received an exercise log with six separate weeks, see Appendix F. Each participant was asked to fill out the log as they complete each week. Information that they will provide is how frequently they worked out individually, and how many workouts were conducted with a recruiter. Each work out was logged by type; endurance is how many minutes and miles (Run, Bike, Swim, Other) with Ratings of Perceived Exertion (RPE) used as a measure of exercise intensity, and resistance training is logged by number of individual lifts, sets, reps and RPE to allow for estimation of workout intensity. At the end of the six weeks the FS will turn in their exercise log to their recruiter and the recruiter will then conduct a height and weight, in accordance with the Army standard. The recruiter will then upload the log to a SoCal RB shared point for consolidation.

Upon completion of the collection period the recruiting battalion will query BiZone and remove any PII. The research team will then receive the exercise logs and the BiZone data and will be able to cross reference the information using the FS Primary

Identification (PRID), a unique code that recruiting command uses to keep PII from being used during the recruiting process. Upon consolidating the data, the research team will explore the central tendencies and distributions of data. Correlations will be performed to explore the strength and direction of linear relationships between exercise and body composition variables. Analysis of variance will be used to determine the significance of the mean differences between accession groups. Regression will be used to explore the relationship between exercise variables and likelihood of accession in order to offer policy changes for USAREC's FS training program.

The groups will be separated by using USAREC statuses for Shipped on time, RENO, and Loss as the Dependent variable. Independent variables will be the exercise volume and OPAT scores. Additionally, a method for looking at the cumulative effect of exercise frequency and intensity (also referred to as exercise volume) will be used to study the potential for an additive or multiplicative effect of exercise frequency and intensity.

Measures

Exercise frequency will be determined using a low, moderate, high frequency standard. Low exercise frequency is defined as one to two work outs per week, moderate as three to five work outs per week, and high is six or more work outs per week. Although the specific groupings may also be made based on a review of the distribution of exercise frequency after reviewing the data.

Exercise intensity will be low, moderate and high. A low intensity is an average RPE of less than five, moderate is five to seven, and high is eight to ten. Although the

specific groupings may also be made based on a review of the distribution of exercise intensity after reviewing the data.

Exercise volume will be calculated by multiplying the number of exercises in a week by the average RPE (ex. 5 work outs x RPE 7 = volume of 35). Volume groups will be low, moderate and high; Low is defined as a volume lower than 15, moderate will be a volume of 15 to 30, and high is a volume over 31.

Summary

With obesity rates rising across the United States and military recruiters facing more challenges related to finding qualified candidates for service, the challenge of obesity has been identified as a threat to the nation's military readiness. This study looked at the impact of physical fitness frequency and intensity on body composition and accessions rates for FS populations. This study has been designed so that it is easily replicated should USAREC and MEPS command want to expand or explore the findings of this research in the future.

CHAPTER 4

ANALYSIS

Descriptive Data

The information provided in the following sections describes the population of FS that participated in this study, followed by the analysis of that data using Chi-Squared calculations, to assess the relationships between variables, related to exercise frequency, exercise intensity and volume.

Population Categories

A total of 20 participants' data was shared with the research team. By gender the participants were 18 males, one female, and one unknown. The one unknown was due to a data sheet with an illegible PRID that was not able to be matched to the BiZone data. By OPAT status the applicants were 13 heavy, two significant, two moderate, and three unknown. The three unknowns were a result of data not populating in BiZone at the time of the query. The population by ship status was one loss, 11 shipped on time, two RENO, one unknown, and five still in FS status. The one unknown status was due to the illegible PRID. Finally, participants by exercise category, six participant exercise logs were shared with the research team. Of those two were categorized as low, three moderate and one high exercise volume. Additionally, the six participants with exercise logs, one was in a FS Status at the time of data collection, and the others ship status was undetermined, due to an illegible PRID, bringing the total number of useable data sets to four.

Given that the research team received so few complete data sets, there is not enough data to show statistical significance. The data that was received was used to

model how future researchers could expect to use future data sets. The following charts represent the participant data that was received, and will be used as a model for notional statistical analysis.

Table 3. Days of Activity by Ship Status

Total (Avg Sessions per week)	Gender	0-2	3-5	6 or <	Total
	Male	1	1	2	4
	Female	0	0	0	0
	Combined	1	1	2	4

Shipped (Avg. Sessions per week)	Gender	0-2	3-5	6 or <	Total
	Male	1	1	0	2
	Female	0	0	0	0
	Combined	1	1	0	2

RENO (Avg. Sessions per week)	Gender	0-2	3-5	6 or <	Total
	Male		0	2	2
	Female	0	0	0	0
	Combined	0	0	2	2

Loss (Avg. Sessions per week)	Gender	0-2	3-5	6 or <	Total
	Male	0	0	0	0
	Female	0	0	0	0
	Combined	0	0	0	0

Source: Created by author.

Table 4. Average Weekly Exercise Intensity by Ship Status

Total (Avg Intensity per week)	Gender	1-4	5-7	8-10	Total
	Male	0	4	0	4
	Female	0	0	0	0
	Combined	0	4	0	4

Shipped (Avg. Intensity per week)	Gender	1-4	5-7	8-10	Total
	Male	0	2	0	2
	Female	0	0	0	0
	Combined	0	2	0	2

RENO (Avg. Intensity per week)	Gender	1-4	5-7	8-10	Total
	Male	0	2	0	2
	Female	0	0	0	0
	Combined	0	2	0	2

Loss (Avg. Intensity per week)	Gender	1-4	5-7	8-10	Total
	Male	0	0	0	0
	Female	0	0	0	0
	Combined	0	0	0	0

Source: Created by author.

Table 5. Weekly Volume by Ship Status

Total (Volume)	Gender	Light	Moderate (V)	Heavy (V)	Total
	Male	1	3	0	4
	Female	0	0	0	0
	Combined	1	3	0	4

Shipped (Volume)	Gender	Light	Moderate (V)	Heavy (V)	Total
	Male	1	1	0	2
	Female	0	0	0	0
	Combined	1	1	0	2

RENO (Volume)	Gender	Light	Moderate (V)	Heavy (V)	Total
	Male	0	2	0	2
	Female	0	0	0	0
	Combined	0	2	0	2

Loss (Volume)	Gender	Light	Moderate (V)	Heavy (V)	Total
	Male	0	0	0	0
	Female	0	0	0	0
	Combined	0	0	0	0

Source: Created by author.

Table 6. OPAT Scores by Ship Status

Total by OPAT	Gender	Moderate	Significant	Heavy	Total
	Male	1	1	13	15
	Female	0	1	0	1
	Combined	1	2	13	16

Shipped (OPAT)	Gender	Moderate	Significant	Heavy	Total
	Male	1	0	10	11
	Female	0	1	0	1
	Combined	1	1	10	12

RENO (OPAT)	Gender	Moderate	Significant	Heavy	Total
	Male	0	0	3	3
	Female	0	0	0	0
	Combined	0	0	3	3

Loss (OPAT)	Gender	Moderate	Significant	Heavy	Total
	Male	0	1	0	1
	Female	0	0	0	0
	Combined	0	1	0	1

Source: Created by author.

Tables 3 through 6 represent the data that was received. Comparing that to what was anticipated is the difference between 20 incomplete received and 120 complete data sets anticipated. The data from the exercise logs were duplicated until there were 120 entries on the data collection spreadsheet. An assumption was made that there would be some number of study participants with unqualified data profiles. Things that would disqualify a data set would be having either the BiZone data or the data sheet but not both. Continued enrollment in the FS training program was a disqualifier, because that means the individual does not have ship status criteria.

In order to test the overall strategy of this study, the unqualified data profiles totaled 21, bringing the useable population to 99. Another modification to the data received was to match the female recruit population with the number of currently serving females, 14%.[39] This was done by randomly selecting gender for 14% of the data sets and

[39] Kim Parker, Anthony Cilluffo, and Renee Stepler, "6 Facts about the U.S. Military's Changing Demographics," Pew Research Center, April 13, 2017, https://www.pewresearch.org/fact-tank/2017/04/13/6-facts-about-the-u-s-military-and-its-changing-demographics/#:~:text=The%20share%20of%20women%20in%20the%20ranks%20varies,and%20ethnically%20diverse%2C%20so%20has%20the%20U.S.%20military.

changing them from M to F. The notional data set that is shown below reflects the changes mentioned, 120 participants, 99 useable data sets, 14% female population).

Table 7. Notional Weekly Volume by Ship Status

	Gender	Light	Moderate (V)	Heavy (V)	Total
Total (Volume)	Male	35	37	15	87
	Female	4	4	4	12
	Combined	39	41	19	99

	Gender	Light	Moderate (V)	Heavy (V)	Total
Shipped (Volume)	Male	18	24	12	54
	Female	2	2	3	7
	Combined	20	26	15	61

	Gender	Light	Moderate (V)	Heavy (V)	Total
RENO (Volume)	Male	8	8	2	18
	Female	1	1	1	3
	Combined	9	9	3	21

	Gender	Light	Moderate (V)	Heavy (V)	Total
Loss (Volume)	Male	9	5	1	15
	Female	1	1	0	2
	Combined	10	6	1	17

Source: Created by author.

Table 8. Notional OPAT Scores by Ship Status

	Gender	Moderate	Significant	Heavy	Total
Total by OPAT	Male	16	18	53	87
	Female	2	6	4	12
	Combined	18	24	57	99

	Gender	Moderate	Significant	Heavy	Total
Shipped (OPAT)	Male	6	7	38	51
	Female	1	3	3	7
	Combined	7	10	41	58

	Gender	Moderate	Significant	Heavy	Total
RENO (OPAT)	Male	5	5	12	22
	Female	1	2	1	4
	Combined	6	7	13	26

	Gender	Moderate	Significant	Heavy	Total
Loss (OPAT)	Male	5	6	3	14
	Female	0	1	0	1
	Combined	5	7	3	15

Source: Created by author.

Test for Equivalent Distribution

With the notional data compiled, the research team used nominal categories to conduct multiple 3 x 3 Chi-Squared contingencies, using a calculator provided by Social Science Statistics found at socscistatistics.com. The first calculation explored the dependent variables (ship status) association with the Independent variable of exercise volume.

Table 9. Relationship between Relationship Exercise Volume and Ship Status

Exercise Volume Chi-Suared				
	Light	Moderate	Heavy	Totals
Shipped	20 (24.03) [0.68]	26 (25.26) [0.02]	15 (11.71) [0.93]	61
RENO	9 (8.27) [0.06]	9 (8.70) [0.01]	3 (4.03) [0.26]	21
Loss	10 (6.70) [1.63]	6 (7.04) [0.15]	1 (3.26) [1.57]	17
Column Totals	39	41	19	99

Source: Created by author.

The calculation for table 7 is represented as X^2 (3, N=99) = 5.31, p = .257, making the results not significant at a $p < .05$. In an effort to determine what population size would be needed to achieve significance with similar data the number of notional data sets was expanded until significance was achieved.

Statistical significance was achieved at 185 complete data sets, making the total target 222 participants with frustrated or unusable data sets included. For table 8, the calculation is represented as X^2 (3, N=185) = 9.95, p = .041, at $p < .05$. These calculations were run using aggregated data and not gender specific data. If it is assumed that recruiting numbers match active service numbers of 14% for females, then to achieve a female population of 222, the total population with frustrated data would need to be 1,586 total participants. However, different data sets may show significance at an earlier total number of participants as indicated by the another Chi-Squared calculation performed during this study, suggesting that the target population size is undeterminable with the results of this study.

In an effort to continue exploring physical preparedness for basic training and its impact on ship status, another 3 x 3 Chi-Squared calculation was performed using the dependent variables (ship status) and the OPAT performance categories.

Table 10. Relationship between Relationship OPAT Scores and Ship Status

OPAT Chi-Suared				
	Moderate	Significant	Heavy	Totals
Shipped	7 (10.55) [1.19]	10 (14.06) [1.17]	41 (33.39) [1.73]	58
RENO	6 (4.73) [0.34]	7 (6.30) [0.08]	13 (14.97) [0.26]	26
Loss	5 (2.73) [1.89]	7 (3.64) [3.11]	3 (8.64) [3.68]	15
Column Totals	18	24	57	99

Source: Created by author.

The results of the test were X^2 (3, N=99) = 13.46, p = .009, indicating significance at $p < .05$. This notional data suggests that there is a relationship between OPAT scores and a Future Soldiers ship status.

Aggregate Population Implication

The most significant finding of this study is knowing that the target population for execution of future studies would be 222 participants or more. With a total number of 222 participants, the anticipated number of complete data sets would be 185, unless there is a tool implemented that would remove any administrative burdens from the recruiters and MEPS personnel. It is believed that there would need to be approximately 185 complete data sets in order to perform a Chi-Squared calculation that has statistical significance with similar exercise input. However, this may not be enough data sets to determine significance between groups, for example understanding if the effects are the same in females as well as males. The lower number of FS in the Loss status makes it more difficult to determine statistical significance between groups.

Age and Gender Implications

In order to compile enough data sets to establish statistical significance by gender, the total population size will likely need to be near, or exceed 1,586 participants to allow for a total of 185 complete data sets for female FS. This assumes a 14% female FS population, and allows for unusable data sets to be removed as well. Age was not included in the BiZone query, and should be included in the future.

Primary Research Question Answer

Q: What impact does exercise have on FS processing?

A: At the time of this exploratory study it is undeterminable what impact exercise has on FS processing.

The hypotheses and null hypothesis were undeterminable as well.

Collection Steps

This study used a 16-step process to enroll, collect, and process data (see figure 4). Some steps in that process were identified as being useful and others need modification to ensure success for future studies.

Steps 1-3: As a result of Battalion Policy that required each FS to receive an exercise log and at home work out plan, these steps were managed by the MEPS to reduce the burden on recruiters. This was also seen as an effort to eliminate undue influence from the recruiters. The battalion leadership coordinated with MEPS personnel to issue exercise logs and enter the PRIDs into a spreadsheet that would be shared with the recruiting battalion. This step worked well for issuing the exercise logs, signing individual waivers, and PRID tracking upon entry into the FS training program. Where

this step needed improvement was in the data sharing. The additional step of disseminating the MEPS PRID log with each station created confusion about what individuals had signed the waiver allowing FS training data to be shared with secondary researchers.

Steps 4-7: These steps were dependent on the recruiters and individual participants. Each participant was to annotate their data at the end of each week. This proved to be unsustainable as individuals either filled them out with their recruiter at the time of collection, or stopped after a couple weeks of tracking. It was evident that some individuals were filling the sheets out without context because many of the sheets from one station simply had 15-minute mile pace, and another had a 30-minute mile pace. It is unlikely that an individual who qualified Heavy on the OPAT interval aerobic run, would run a mile in 15 minutes at an RPE of 6. An additional challenge with this model was collection of data sheets for FS losses, once a FS decides they no longer want to join the Army they typically sever all communications with the recruiter, making data sheet collection for that category difficult.

Recruiters were able to conduct the FS training with limited interruptions due to the pandemic, and not the study design. Recruiters did not conduct height and weight and annotate it on the exercise log at the end of the six weeks, possibly due to a lack of training, or understanding. This made it difficult to link exercise volume with changes in body composition. One additional detail that was missing was the justification for ship status, because not every FS loss or RENO is due to body composition, some are due to circumstances beyond the individuals control, there needs to be an option for recruiters to list the cause for each FS status.

Steps 8-9: Step eight, uploading data into a SharePoint folder established by the Battalion, was intended to be the duty of the recruiter. This step did not happen, and as a result the battalion operations officer was unable to verify the progress and quality of the data sheet collection. Step nine, BiZone query, was conducted by the battalion operations staff. There were no significant challenges with this process because it was already happening weekly prior to the start of this study. It is important to note that the weekly query needs to be stored somewhere during the study in order to capture as many individuals as possible since some individuals may be removed from the system upon shipping without having their data collected.

Steps 10-13: Step 10 was intended to be a collaboration between the MEPS and battalion operations section to confirm the PRID's pulled match the PRIDs for the waivers on hand. This quality assurance step should remain in some form. Step 11 starts the process of preparing the BiZone data for the research team by removing all the PII. There will be a secondary query from BiZone to verify ship status because that is a different report from the BiZone database. The merging of these two BiZone data sets should be performed by someone that has expertise with Microsoft excel, in order to maximize efficiency.

Steps 14-16: The researchers were unable to conduct all of the tests that would be needed to determine statistical significance. However, the data received may help identify the desired sample size required to produce statistically significant results and allow the process to reveal barriers to successful completion of the study.

Conclusion

As an exploratory study, this data collection process served as a pilot for determining how to collect data, and analyze the processes stress on the recruiting system. It is evident that this process works, and that with a few minor adjustments this process could produce accurate and plentiful data. Additionally, this study may help to determine what the target number of participants should be to look at either aggregate or gender-stratified results. The data tables, exercise logs, and waivers have been established through this process, and are ready for use by an eager research team.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Chapter Introduction

This exploratory study tested the process for collecting data that may answer the question: What impact does exercise have on FS processing? While enough data was not received to answer the primary research question, the process for collecting that data was validated and will be explored further in the rest of this chapter.

Interpretation of Findings

Assuming the information provided by participants is accurate, and the model used to generate the notional data is eventually shown to be valid then, there may be a different research question that needs to be explored related to exercise volume. Only one of the six participants had reported an exercise volume categorized as high. Of the other five the average exercise volume was 15.3, slightly less than half the exercise volume expected during the first three weeks of Basic Training. Suggesting these FS may be at risk for overtraining injuries during BCT.

The challenges this study faced are easily addressed and should allow for a future study to have success in determining the effect of exercise on FS accessions. Some additional implications of this study are related to the organizational challenges that the Army faces as a whole with communications obstacles and under-reporting useful data, as a result of a saturated unit reporting environment.

The most unexpected finding of this study related to the lack of support for the additional work generated by the study. Most individuals who were briefed on the study

believed it was a good thing to explore ways to adjust policy and reduce the number of RENO's and Losses due to not meeting the height and weight standards. However, there were a nearly equivalent number of individuals who expressed concerns about the additional workload placed on the recruiters. It is outside the scope of this study to state observations about organizational behaviors, however, the literature review referenced the report *Lying to Ourselves* and it could be that the Army is unable to capitalize on research that will make processes more efficient due to the abundance of unit reporting requirements.

Recommendations for Future Research

Recommendations resulting from this study can be broken down into three components, Improvements, Related Studies, Technology.

Improvements

This thesis used a 16-step process to enroll, collect, and process data (see figure 4). The following are recommendations to make each step better able to produce the desired results.

Steps 1-3: Have recruiters issue the exercise logs, and attain consent for use of data in secondary research. This will ensure that the recruiters know who in their FS populations have agreed to share their data, and should lead to improved reporting.

Steps 4-7: These steps were self-reported during this study, it is recommended that a minimum of one recruiter per station be responsible for filling this out with their FS populations during FS Asset Inventory (FSAI) to ensure accuracy, timeliness, and a record in the event of a FS loss. The implication to this recommendation would be that

the recruiter performing this duty would need to attain Human Subjects Research training (approximately two hours needed to complete) as they will become part of the research data collection process rather than performing the function of a unit standard operating procedure (SOP).

Steps 8-9: No change to the process used in this study, one consideration for commanders considering this study would be that the operations individual needs to be familiar with BiZone and Microsoft Excel, and can anticipate 3-5 hours per week dedicated to pulling and packaging the data.

Steps 10-13: Per the first recommendation, the MEPS personnel are no longer needed in the PRID scrub. Having a second individual from the operations section would be recommended to verify PRID and provide some quality assurance oversight.

Related Studies

Since diet and exercise are generally accepted as both having an impact on body composition the same process using self-reported data sheets could be used to see if there are any dietary recommendations that could apply specifically to FS populations. Some factors impacting dietary patterns could be socioeconomic status, food deserts, etc. Additionally, determining the quality of food available and consumed are other considerations for younger populations.

Exercise volumes impact on success in BCT is another potential study that could help save the Army time and money with training delays, and injuries in BCT. The preliminary data from this study indicating an average volume of exercise during the FS training program of 15.3, which will be followed by a seven to ten-day period with limited training while Soldiers are received at reception battalion, and then red phase with

an estimated training volume between 35 and 40. This indicates a potentially significant increase in exercise volume from 15.3 to 40, which may lead to over-training injuries.

Technology

There are many technological tools that could be leveraged to help guide FS populations to meet body composition standards, augment the FSAI process, and assist in tracking physical activity. Currently the U.S. Air Force has a Delayed Entry app for Apple and Android devices that allows their equivalent to the FS to see a work-out of the day, fitness and nutrition information, and a fitness calculator. If the Army implemented an app similar to this that allows individuals to register with their PRID it could then track exercise volume and record real-time data by allowing FS populations to mark a work out as complete, and then rate it's difficulty (similar to many personal training apps that currently exist). Individuals would then have the ability to opt in or out of secondary research with the apps user terms of agreement.

Conclusion

There are significant challenges that any large organization has to face; today's Army is no different. Organizations that continue to thrive and attract top talent must be innovative. While the Army itself may not produce products that require product innovation, the organization as a whole must continue to make strides to improve through policy changes, leveraging technology and personnel. In the case of FS retention and accession, there are some readily-available tools that could be implemented to help further understand the challenges of obesity on FS accessions, potentially helping improve the program and save significant amounts of money.

GLOSSARY

Body Fat (BF). Triglycerides stored in fat cells (adipose tissue) that can be used for energy production through fat oxidation.[40]

Body Fat Percentage (BFP). The proportion of lean body mass to fat, also known as body composition. Using the Army tape test BFP is calculated For Women as % body fat = [163.205 x Log10 (waist + hip – neck)] – [97.684 x Log10 (height)] – 78.387. For Men as % body fat = [86.010 x Log10 (waist – neck)] – [70.041 x Log10 (height)] + 36.76.[41]

Body Mass Index (BMI). An initial screening tool to identify potential weight issues in individuals and to track population-based rates of overweight and obesity. [Weight (pounds) / Height (inches)^2] X 703.[42]

Fat Free Mass (FFM). Fat-free mass refers exclusively to the composite materials making up the human body that do not contain fat deposits, such as vital organs, bones, connective tissue, and water.[43]

Lean Body Mass (LBM). The total weight of your body minus all the weight due to your fat mass**.** LBM = Total Weight – Fat Mass.[44]

Modified Retail Food Environment Index (mRFEI). Measures the number of healthy and less healthy food retailers within census tracts across each state as defined by typical food offerings in specific types of retail stores (e.g., supermarkets,

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[40] Greg Haff and Travis Triplett, *Essentials of Strength Training and Conditioning* (Champaign, IL: Human Kinetics, 2016), 53.

[41] Headquarters, Department of the Army, Army Regulation 600-9, *The Army Body Composition Program* (Washington, DC: Army Publishing Directorate, July 16, 2019), 35, https://armypubs.army.mil/epubs/DR_pubs/DR_a/pdf/web/ARN7779_AR600-9_FINAL.pdf.

[42] Haff and Triplett, *Essentials of Strength Training and Conditioning,* 219.

[43] Janet Renee, "What Is Fat-Free Body Mass?" LiveStrong.com, accessed May 4, 2021, https://www.livestrong.com/article/128552-fat-body-mass/.

[44] InBody, "Lean Body Mass and Muscle Mass – What's the Difference?," *InBody* (blog), *InBody USA,* last updated August 24, 2018, https://inbodyusa.com/blogs/inbodyblog/lean-body-mass-and-muscle-mass-whats-the-difference/.

convenience stores, or fast food restaurants) mRFEI = 100 x (# Healthy Food Retailers / [#Healthy Food Retailers + # Less Healthy Food Retailers])[45]

Resting Metabolic Rate (RMR). The total number of calories burned when your body is completely at rest, approximately 65% to 70% of daily energy expenditure. Using the Cunningham equation RMR = 550 + 22(LBM) and is the most appropriate for Athletes.[46]

Thermic Effect of Food (TEF). The increase in energy expenditure above the RMR that can be measured for several hours following a meal, approximately 10% to 15% of daily energy expenditure .[44]

Thermic Effect of Physical Activity (TEPA). The increase in energy expenditure above the RMR that can be measured for several hours following physical activity, approximately 20% to 30% of daily energy expenditure.[44]

[45] Centers for Disease Control and Prevention (CDC). Activity, and Obesity, and CDC NPAO Division, *Census Tract Level State Maps of the Modified Retail Food Environment Index (mRFEI)*. (Washington, DC: CDC Division of Nutrition, Physical Activity, and Obesity, 2011) https://www.cdc.gov/obesity/downloads/census-tract-level-state-maps-mrfei_TAG508.pdf.

[46] Haff and Triplett, *Essentials of Strength Training and Conditioning,* 216-217.

APPENDIX A

AEROBIC TRAINING

Focus: Aerobic Training				Goal:		
Warm up						
Exercise		Set	Duration		Coaching que	
Walk			5 min		Foam roll sore muscles if possible	
Dymamic Stretch						
Exercise	Sets	Reps	Tempo	Rest	Weight	Coaching que
High knee Pull	1	10				Both sides
Dynamic Toe Touch	1	10				Both sides
Hip flexors	1	10				Both sides
Main set						
Exercise	Sets	Reps	Tempo	Rest	Weight	Coaching que
45-60 Minutes						See Note
Potential Activities						
Bike Riding						
Backpacking						
Swimming						
Skating						
Cool Down						
Exercise	Sets	Reps	Tempo	Rest	Weight	Coaching que
Hamstring Stretch Standing						30 Seconds
Kneeling Hip Flexor Stretch						30 Seconds/Side
Groin Stretch						30 Seconds/Side
Notes						
Your heart rate should be between 120-160 beats per minute for 45 minutes. If you don't have a heart rate monitor you can use your watch, or timer on your phone while checking your pulse. An easy way to check is every 15 minutes pause and count your pulse for six seconds, and add a zero to the end of that number. Example. at the end of six seconds, I counted 14 beats, this is approximately 140 beats per minute, now back to my work out. If my heart rate is less than 120, I need to make the work out harder (run faster, find a hill). If it is over 160, I need to make it easier (slow down, find flat ground).						

Source: Created by author.

APPENDIX B

UPPER BODY RESISTANCE

Focus: Upper Body Resistance				Goal:		
Warm up						
Exercise		Set	Duration		Coaching que	
Walk			5 min		Foam roll sore muscles if possible	
Dymamic Stretch						
Exercise	Sets	Reps	Tempo	Rest	Weight	Coaching que
Shoulder rotations	1	10				Forward and Backwards
Y to W exercise	1	10				Arms overhead
Standing Side Bend	1	10				Look up at your hand
Main set						
Exercise	Sets	Reps	Tempo	Rest	Weight	Coaching que
Windmill Push Ups	3	10/side		30 Sec	BW	Use good push up position
Bent over reverse fly	3	15		30 Sec	16.6 lbs	Use two gallons of water
Plank knee to elbow	3	20		30 Sec	BW	Don't move your hands
T push ups	3	15		30 Sec	BW	
Overhead Press	3	15		30 Sec	16.6 lbs	Use two gallons of water
Hanging knee raise	3	10		30 Sec	BW	See note for alt. event
Cool Down						
Exercise	Sets	Reps	Tempo	Rest	Weight	Coaching que
Chest Stretch						30 Seconds/side
Overhead Arm Pull						30 Seconds/side
Note						
If you don't have access to pull up bars, or similar park items for the hanging knee raise you can lay on a flat on your back with your arms overhead, and bring your knees up and extending them back out to complete one repetition. If you don't have access to a gym, this entire work out can be done with two plastic jugs. When performing the bent over fly, keep your back straight and focus on squeezing your shoulder blades with each repetition.						

Source: Created by author.

APPENDIX C

SPEED TRAINING

Focus: Speed				Goal:		
Warm up						
Exercise		Set	Duration		Coaching que	
Jog			5 min		Foam roll sore muscles if possible	
Dymamic Stretch						
Exercise	Sets	Reps	Tempo	Rest	Weight	Coaching que
Knee hug	1	10				Both Sides
Alt toe touch (front Kick)	1	10				Both Sides
Lunge	1	10				Both Sides
Main set						
Exercise	Sets	Reps	Tempo	Rest	Weight	Coaching que
Hill Repeats	1	10				See note
1.5 Mile Jog	1					
Cool Down						
Exercise	Sets	Reps	Tempo	Rest	Weight	Coaching que
Hamstring Stretch Standing						30 Seconds
Kneeling Hip Flexor Stretch						30 Seconds/Side
Calve Stretch						30 Seconds/Side
Note						

If you have access to a steep hill, measure out approximately 20 meters and sprint up the hill. If you don't have access to a steep hill, the measure approximately 50 meters and sprint that distance. Your rest is walking back to the starting point. For the 1.5 mile run, try and push yourself. Track your pace, and keep trying to improve on that pace each week.

Source: Created by author.

APPENDIX D

LOWER BODY RESISTANCE

Focus: Lower Body Resistance				Goal:		
Warm up						
Exercise		Set	Duration		Coaching que	
Walk			5 min		Foam roll sore muscles if possible	
Dymamic Stretch						
Exercise	Sets	Reps	Tempo	Rest	Weight	Coaching que
Knee hug	1	10				Both Sides
Alt toe touch (front Kick)	1	10				Both Sides
Lunge	1	10				Both Sides
Main set						
Exercise	Sets	Reps	Tempo	Rest	Weight	Coaching que
Standing Long Jump	4	15		30 Sec	BW	Mark your first jump
Overhead squat	4	15		30 Sec	BW	Use a broom handle
Lunge to single leg OH press	4	15		30 Sec	8.3 lbs	See Note
Tuck Jump	4	15		30 Sec	BW	
Side Lunge	4	15		30 Sec	8.3 lbs	
Forward lunge w/ Rotation	4	15		30 Sec	8.3 lbs	See Note
Cool Down						
Exercise	Sets	Reps	Tempo	Rest	Weight	Coaching que
Kneeling Hip Flexor Stretch						30 Seconds/Side
Single Leg Over						30 Seconds/Side
Deep Glute Stretch						30 Seconds/Side
Note						

You should conduct FS training with your recruiter as they have planned, if you are unable to attend then this work out is for you to do at home. For the Standing Long Jump, mark your starting point and your first jump. Try and make it back to that spot with each subsequent jump. For the overhead squat, try to make your form as good as possible (back straight, arms by your ears). With the lunge to single leg over head press, keep the weight you're pressing in the opposit hand of the leg you're balancing on. During the Forward lunge w/rotation, use a gallon of water and hold it out during the rotation.

Source: Created by author.

APPENDIX E

ACTIVE RECOVERY

Focus: Active Recovery				Goal:		
Warm up						
Exercise		Set	Duration		Coaching que	
Walk			5 min		Foam roll sore muscles if possible	
Dymamic Stretch						
Exercise	Sets	Reps	Tempo	Rest	Weight	Coaching que
Shoulder rotations	2	10				Forward and Backwards
Y to W exercise	2	10				Arms overhead
Standing Side Bend	2	10				Look up at your hand
Single Leg Over	2	10				Both sides
Dynamic Toe Touch	2	10				Both sides
Hip flexors	2	10				Both sides
Knee hug	2	10				Both Sides
Alt toe touch (front Kick)	2	10				Both Sides
Lunge	2	10				Both Sides
Cool Down						
Exercise	Sets	Reps	Tempo	Rest	Weight	Coaching que
N/A						
Note						
These are mostly stretches, so it is important to get a good warm up in, in order to get the most out of today.						

Source: Created by author.

APPENDIX F

TRAINING RECORD

OMB Control # ADN

Training Record

	# of **Recruitment Office Trainings** Completed	# of **Home or individual Workouts** Completed	**During Home Workouts:** How would you describe your typical **cardio** exercise?	**During Home Workouts:** How would you describe your typical **resistance** exercise?
Week 1			_____Minutes _____ Miles Run / Bike / Swim ___RPE	_____# of Exercises ____ Sets ___ Reps ___RPE
Week 2			_____Minutes _____ Miles Run / Bike / Swim ___RPE	_____# of Exercises ____ Sets ___ Reps ___RPE
Week 3			_____Minutes _____ Miles Run / Bike / Swim ___RPE	_____# of Exercises ____ Sets ___ Reps ___RPE
Week 4			_____Minutes _____ Miles Run / Bike / Swim ___RPE	_____# of Exercises ____ Sets ___ Reps ___RPE
Week 5			_____Minutes _____ Miles Run / Bike / Swim ___RPE	_____# of Exercises ____ Sets ___ Reps ___RPE
Week 6			_____Minutes _____ Miles Run / Bike / Swim ___RPE	_____# of Exercises ____ Sets ___ Reps ___RPE

Rate of Perceived Exertion (RPE) On a scale from 1-10 how hard was your average work out by category?

1-4 you probably didn't sweat, often associated with mobility or active recovery work outs
5-6 the work out caused you to sweat but you were able to talk, and were comfortable most of the time. No issue completing all sets and reps for resistance exercise.
7-8 Heavy breathing, probably difficult to talk for Aerobic exercise. The work out felt difficult muscles were shaky but completed all sets and reps for resistance exercise.
9-10 was so hard you thought you might pass out, be sick, etc for Aerobic exercise. You were unable to complete all sets or reps due to muscle fatigue for resistance exercise.

Link to YouTube Channel for Exercises:
https://www.youtube.com/channel/UCmO6bcLI1uWjKYbBXN1I1hg

Or search YouTube for - Socal FS Training

Source: Created by author using NSCA RPE Scale, and collaboration with research team.

BIBLIOGRAPHY

Barroso, Amanda. "The Changing Profile of the U.S. Military: Smaller in Size, More Diverse, More Women in Leadership." Pew Research Center, September 10, 2019. https://www.pewresearch.org/fact-tank/2019/09/10/the-changing-profile-of-the-u-s-military/.

Buddin, Richard. *Success of First-Term Soldiers, The Effects of Recruiting Practices and Recruit Characteristics*. Santa Monica, CA: Rand Arroyo Center, 2005. https://www.rand.org/content/dam/rand/pubs/monographs/2005/RAND_MG262.sum.pdf.

Centers for Disease Control and Prevention. "Childhood Obesity Causes & Consequences." Accessed November 21, 2020. https://www.cdc.gov/obesity/childhood/causes.html.

———. "Other Factors in Weight Gain." Last reviewed August 17, 2020. https://www.cdc.gov/healthyweight/calories/other_factors.html.

———. "Adult Obesity Prevalence Maps." 2019. https://www.cdc.gov/obesity/data/prevalence-maps.html.

———. "What Is Health Literacy?," Last reviewed January 2021. https://www.cdc.gov/healthliteracy/learn/index.html.

CFR.org Editors. "Demographics of the U.S. Military." Council on Foreign Relations. Last updated July 13, 2020. https://www.cfr.org/backgrounder/demographics-us-military.

Cleveland Clinic. "Musculoskeletal System." Last reviewed December 2020. https://my.clevelandclinic.org/health/articles/12254-musculoskeletal-system-normal-structure--function.

Colorado Department of Public Health & Environment. "Overweight and Obesity in Colorado - Colorado adults, teens and children." Data Infographic, 2017. https://drive.google.com/file/d/1YXV9J96v0l_2r8Qqi5oV6NtamP43OOfQ/view.

———. "Obesity: Healthy food environments." Accessed January 10, 2021. https://cdphe.colorado.gov/obesity-prevention/obesity-healthy-food-environments.

Comana, Fabio. "Resting Metabolic Rate: How to Calculate and Improve Yours." *Nutrition* (blog). *National Academy of Sports Medicine*, August 2019. https://blog.nasm.org/nutrition/resting-metabolic-rate-how-to-calculate-and-improve-yours.

Council for a Strong America. “Childhood Obesity.” Accessed May 6, 2021. https://www.strongnation.org/topics/childhood-obesity.

Garner, Tracy, and Tasha Lewis. *Obesity in the District of Columbia, 2014 Striving to Reduce and Prevent Overweight and Obesity Among D.C. Residents*. Washington, DC: Government of the District of Columbia, Department of Health, 2014. https://doh.dc.gov/sites/default/files/dc/sites/doh/publication/attachments/Obesity%20Report%202014.pdf.

Garthe, Ina, Raastad Truls, and Sundgot-Borgen Jorunn. “Long-Term Effect of Nutritional Counselling on Desired Gain in Body Mass and Lean Body Mass in Elite Athletes.” National Library of Medicine, August 18, 2011. https://pubmed.ncbi.nlm.nih.gov/21851204/.

Haff, Greg, and N. Travis Triplett. *Essentials of Strength Training and Conditioning*, *Fourth Edition* Champaign, IL: Human Kinetics, 2016.

Hales, Craig M., Margaret D. Carroll, Cheryl D. Fryar, and Cynthia L Ogden. “Prevalence of Obesity and Severe Obesity among Adults: United States, 2017-2018.” NCHS Data Brief, no. 360. National Center for Health Statistics, 2020. https://www.cdc.gov/nchs/products/databriefs/db360.htm.

Headquarters, Department of the Army. Army Regulation 600-9, *The Army Body Composition Program*. Washington, DC: Army Publishing Directorate, July 16, 2019. https://armypubs.army.mil/epubs/DR_pubs/DR_a/pdf/web/ARN7779_AR600-9_FINAL.pdf.

Hidding, Lisan M., Teatske M. Attenburg, Evi V. Ekris, and Mai J. M. Chinapaw. “Why Do Children Engage in Sedentary Behavior? Child- and Parent-Perceived Determinants.” *International Journal of Environmental Research and Public Health* 14, no. 7 (2017). https://doi.org/https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5551109/#B7-ijerph-14-00671.

Howley, Craig. “The Rural School Bus Ride in Five States: A Report to the Rural School and Community Trust.” The Rural School and Community Trust, 2001. https://www.ruraledu.org/user_uploads/file/Rural_School_Bus_Ride.pdf.

InBody. “Lean Body Mass and Muscle Mass – What’s the Difference?” *InBody* (blog). *InBody USA.* Last updated August 24, 2018. https://inbodyusa.com/blogs/inbodyblog/lean-body-mass-and-muscle-mass-whats-the-difference/.

Kutner, Mark, Elizabeth Greenberg, Ying Jin, and Christine Paulsen. *The Health Literacy of America’s Adults: Results from the 2003 National Assessment of Adult Literacy*. Washington, DC: National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education, 2006. https://nces.ed.gov/pubs2006/2006483_1.pdf.

Lincove, Jane A., and Jon Valant. *New Orleans Students' Commute Times by Car, Public Transit, and School Bus*. Washington, DC: The Urban Institute, September 2018. https://educationresearchalliancenola.org/files/publications/new_orleans_students_commute_times_by_car_public_transit_and_school_bus.pdf.

Merriam-Webster. "Social Network." Last updated April 22, 2021. https://www.merriam-webster.com/dictionary/social network.

National Center for Chronic Disease Prevention and Health Promotion (CDC), Division of Nutrition, Physical Activity, and Obesity. "Census Tract Level State Maps of the Modified Retail Food Environment Index (mRFEI)." Centers for Disease Control and Prevention, 2011. https://www.cdc.gov/obesity/downloads/census-tract-level-state-maps-mrfei_TAG508.pdf.

Parker, Kim, Anthony Cilluffo, and Renee Stepler. "6 Facts about the U.S. Military's Changing Demographics." Pew Research Center, April 13, 2017. https://www.pewresearch.org/fact-tank/2017/04/13/6-facts-about-the-u-s-military-and-its-changing-demographics/#:~:text=The%20share%20of%20women%20in%20the%20ranks%20varies,and%20ethnically%20diverse%2C%20so%20has%20the%20U.S.%20military.

Pedtke, Andrea. "Prevalence of Fad Diets on a College Campus." Honors Thesis, Ball State University, 2001. https://cardinalscholar.bsu.edu/bitstream/handle/handle/192001/P43_2001PedtkeAndrea.pdf?sequence=1.

Rempfer, Kyle. "Here's how the 68,000-soldier recruiting goal broke down by MOS." *Army Times,* September 2019. https://www.armytimes.com/news/your-army/2019/09/27/heres-how-the-68000-soldier-recruiting-goal-broke-down-by-mos/.

Renee, Janet. "What Is Fat-Free Body Mass?" LiveStrong.com. Accessed May 4, 2021. https://www.livestrong.com/article/128552-fat-body-mass/.

Safe Routes Partnership. "National Statistics on School Transportation." 2009. https://www.saferoutespartnership.org/sites/default/files/pdf/school_bus_cuts_national_stats_FINAL.pdf.

Shafer, Matt, and Elizabeth Whitehouse. "State Policies on Physical Activity in Schools." The Counsel of State Governments, Capitol Research, Washington, DC, March 2017. https://knowledgecenter.csg.org/kc/system/files/CR_activity_school.pdf.

Solomon, Jon, and Tom Farrey. "10 Charts that Show Progress, Challenges to Fix Youth Sports." *Project Play* (blog). *The Aspen Institute*, October 2018. https://www.aspeninstitute.org/blog-posts/10-charts-that-show-progress-challenges-to-fix-youth-sports/.

Stiegler, Petra, and Adam Cunliffe. “The Role of Diet and Exercise for the Maintenance of Fat-Free Mass and Resting Metabolic Rate during Weight Loss.” Review Article, Department of Human and Health Sciences, University of Westminster, London, UK, 2006. http://www.healthprofessionalsolutions.com.au/v/vspfiles/assets/images/the%20role%20of%20diet%20and%20exercise%20for%20the%20maintenance%20of%20ffm%20an%20rmr%20during%20weight%20loss.pdf.

Sutton, Brian G. “Hypertrophy.” In *NASM Essentials of Personal Fitness Training,* 672. Burlington, MA: Jones & Bartlett Learning, 2022.

———. “Nutrition.” In *NASM Essentials of Personal Fitness Training,* 492-496. Burlington, MA: Jones & Bartlett Learning, 2022.

———. “Obesity.” In *NASM Essentials of Personal Fitness Training,* 677. Burlington, MA: Jones & Bartlett Learning, 2022.

TEDx Talks. “Obesity Is a National Security Issue: Lieutenant General Mark Hertling at TEDx MidAtlantic 2012.” YouTube, December 6, 2012. https://www.youtube.com/watch?v=sWN13pKVp9s&t=1s.

Tulane University. “Food Deserts in America (Infographic).” *Online Magazine* (blog). *School of Social Work*, May 2018. https://socialwork.tulane.edu/blog/food-deserts-in-america.

U.S. Army Center for Initial Military Training (CMIT). *The U.S. Army Holistic Health and Fitness Operating Concept.* Fort Eustis, VA: CMIT, October 2020. https://www.army.mil/e2/downloads/rv7/acft/h2f_operating_concept.pdf.

U.S. Army Recruiting Command (USAREC). USAREC Training Circular 5-03.5, *Lead Future Soldiers*. Fort Knox, KY: USAREC, July 2020. https://recruiting.army.mil/Portals/15/Documents/Forms%20and%20Pubs/USAREC%20Training%20Circulars/UTC%205-03%20(5).pdf?ver=2020-08-10-061712-427.

U.S. Army Training and Doctrine Command (TRADOC). TRADOC Regulation 350-6, *Enlisted Initial Entry Training Policies and Administration.* Fort Eustis, VA: TRADOC, August 2019. https://adminpubs.tradoc.army.mil/regulations.html.

U.S. General Services Administration. “Rules and Policies - Protecting PII - Privacy Act.” Last reviewed December 1, 2020. https://www.gsa.gov/reference/gsa-privacy-program/rules-and-policies-protecting-pii-privacy-act.

Warren, Molly, Stacy Beck, and Daphne Delgado. *The State of Obesity 2020; Better Policies for a Healthier America*. Washington, DC: Trust for America's Health, September 2020. https://www.tfah.org/wp-content/uploads/2020/09/TFAHObesityReport_20.pdf.

Wein, Debra. “Calculating Your Daily Calories.” *NSCA's Performance Training Journal* 4, no. 2 (2005): 7-8. https://kdhs.sesdweb.net/UserFiles/Servers/Server_143104/File/Departments/Athletics/Sports%20Performance/Nutrition/Wein_-_Calculating_Daliy_Calories.pdf.

Wikipedia. “Fad Diet.” Wikimedia Foundation, Inc. Last updated April 23, 2021. https://en.wikipedia.org/wiki/Fad_diet.

Wong, Leonard, and Stephen J. Gerras. *Lying to Ourselves: Dishonesty in the Army Profession*. Carlisle Barracks, PA: US Army War College Press, 2015. https://www.jstor.org/stable/pdf/resrep11350.pdf?refreqid=excelsior%3A8c891d048ff316c1212af36993245375.