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Fit v. Fat: Reevaluating the USMC Body Composition Program to Increase Accuracy and Optimize Long-Term Performance

March 2022

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Department of Defense Management

Naval Postgraduate School

Prepared for the Naval Postgraduate School, Monterey, CA 93943

ACQUISITION RESEARCH PROGRAM
DEPARTMENT OF DEFENSE MANAGEMENT
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ABSTRACT

Current weight and circumference-based standards rely on an outdated study from 1984 that included few non-white servicemembers. This research analyzes the impacts of recent changes in USMC body composition standards and requirements on the performance of Marines. This research compares the distribution of weight before and after a point in time for various weight zone groups and evaluates how physical fitness scores are impacted by policy given a servicemember's previous weight. There is evidence that servicemembers actively manage their weight to stay below the weight threshold. This provides evidence that servicemembers avoid the overweight category and consequently, the scrutiny of the circumference-based method. This research does not find a strong relationship between weight and performance, but prior research highlights that restrictive weight standards are associated with adverse health behaviors such as dehydration tactics or disordered eating. Weight loss induced by weight standards may also be associated with increased injury rates. The Marine Corps should reevaluate the body composition program and consider policy changes to incentivize performance, focus on health, and use current predictors of performance to assess servicemembers, rather than appearance standards based on the circumference-based method. These changes could pay dividends toward overall combat readiness and performance.

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LIST OF ACRONYMS AND ABBREVIATIONS

ALMAR	All Marines Message
AN	Anorexia Nervosa
APFT	Army Physical Fitness Test
BMI	Body Mass Index
BN	Bulimia Nervosa
CFT	Combat Fitness Test
CNA	Center for Naval Analyses
COVID-19	Coronavirus Disease 2019
DACOWITS	Defense Advisory Committee on Women in the Services
DEXA	Dual-Energy X-Ray Absorptiometry
DOD	Department of Defense
DODI	Department of Defense Instruction
FAH	Flexed-Arm Hang
MCBMAP	Marine Corps Body Composition and Military Appearance Program
MCO	Marine Corps Order
MLIC	Metropolitan Life Insurance Company
MOS	Military Occupational Specialty
NDAA	National Defense Authorization Act
NHANES	National Institutes of Health National Health and Nutrition Examination Survey
PFT	Physical Fitness Test
RCP	Remedial Conditioning Program
TFDW	Total Force Data Warehouse
U.S. GAO	U.S. Government Accountability Office
USMC	United States Marine Corps

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EXECUTIVE SUMMARY

A. INTRODUCTION

The United States Marine Corps (USMC) is actively working to modernize manpower models to improve retention for Marines with critical skills requirements to meet the demands of Force Design 2030. Yet there is evidence to suggest that current physical fitness and appearance policies negatively affect the retention, health, and potentially the performance of Marines. The current body composition program is largely based on a study from over 30 years ago that has more recently come under scrutiny from the scientific community (Jones et al., 2017; Friedl, 2012; Peterson et al.,2014), advisory committees (Defense Advisory Committee on Women in the Services, 2019), and Marines via published articles (Sisbarro et al., 2020). At issue are the inherent limitations of body mass index (BMI) as a metric and the inaccuracy of the circumference-based method in determining overall body fat percentage for the modern, stronger, and more capable integrated force that makes up the Marine Corps today.

Anecdotally, it is not uncommon to hear of Marines, male and female alike, using dehydration, extended sauna use, laxatives, disordered eating, and other extreme measures to "make weight" on weigh-in day. Many of these behaviors appear to be normalized given the high stakes that affect promotion and retention. Culturally, Marines feel compelled to comply with the weight standards by any means necessary or risk their profession and reputation as a leader and face tangible implications such as adverse administrative action.

According to research, the circumference-based method does not accurately account for physiological differences among various body types (Babcock et al., 2006), genders (Gomes et al., 2020), and ethnicities (Wagner & Heyward, 2000), and does not discern between muscle and actual fat mass (Pandey et al., 2018). Weight loss induced by weight standards may also be associated with increased injury rates and servicemembers with higher BMIs may be less prone to injury (Jones et al., 2017). Higher weight has been associated with lower attrition and less injury (Peterson et al., 2014). A Center for Naval Analyses (CNA) study found that females who shipped to recruit training close to or above

the weigh maximum experienced lower attrition rates and decreased risk of injury (Peterson et al., 2014).

The research highlights the correlation between restrictive weight standards and adverse health behaviors such as dehydration tactics or disordered eating (Silas, 2020). Furthermore, military weight standards have been formed based on a misunderstanding of women's physiological make-up and fitness needs, and these issues are further complicated by women's integration into ground units and the requirements for more strength and physical capability (Friedl, 2012). Male and female Marines alike are forced to make trade-offs to meet weight requirements that can have long-term effects on performance and retention that have not yet been fully measured or understood in data.

The Marine Corps has the most stringent body fat percentage allowance of the four services, and thus the least margin for error (Defense Advisory Committee on Women in the Services, 2016); culturally, this can often be seen as a point of pride. Discipline within the Marine Corps extends to physical appearance. Overweight is considered a significant failure that is against regulations and a departure from the warrior culture and is the antithesis to professionalism and discipline (Johnson, 2018). Body composition standards are consequential to a Marine's career and potential for promotion and retention. The Marine Corps is seeking a balance between physical requirements and appearance standards; however, results are pending an anthropometric study and willingness to adopt policy change. There is a need to fully understand the scope of the problem to adopt changes in policy to better serve the individual Marine and consequently, the long-term strategic manpower requirements of the Marine Corps.

B. PURPOSE AND SCOPE

This research analyzes the impacts of recent changes in Marine Corps body composition standards and requirements on the performance of Marines. Significant changes to the body composition policy were introduced in 2016 with the introduction of pull-ups in the annual Physical Fitness Test (PFT) for female Marines, the increase in the maximum weight by 4–8 pounds based on height, and the decision that eliminated body composition compliance for Marines scoring 285 or above on both the PFT and Combat

Fitness Test (CFT) (Commandant of the Marine Corps, 2016b). Additionally, there was an increase in the difficulty of scoring for the PFT and CFT for all Marines. The purpose of this study is to analyze the body composition program with respect to its effects on weight and performance following policy change in 2017.

C. METHODS

This research compares the distribution of weight before and after a point in time for various weight zone groups and evaluates how physical fitness scores are impacted by policy given a servicemember's previous weight.

The following are the research questions for analysis:

1. How has the distribution of weight changed from before to after the policy changes announced by the Commandant of the Marine Corps in 2016 for various Marine weight zone groups?
2. How did the policy change and increase in scoring standards for physical fitness tests affect the weight, PFT scores, and CFT scores in subsequent years for Marines operating at various weight zone groups, given their 2016 weight?

The data used in this analysis covers the population of active-duty Marines from January 2010 to December 2020. The primary data are detailed month-by-month snapshots of each Marine's demographic data. The secondary data are detailed month-by-month snapshots of each Marine's PFT data and CFT data broken down by total score, classification, and the score of each individual event. All three datasets were acquired from the Total Force Data Warehouse (TFDW). Version 16 Basic Edition of STATA was used to convert, clean, analyze, merge, and run statistical analysis using the data sets.

This analysis used a predictor measure that identified periods before and after the policy change, baseline group weight zone variables for females and males before and after the policy change by using the relevant height for weight tables (Headquarters, United States Marine Corps, 2018; Headquarters, United States Marine Corps, 2002) and a weight-maximum group variable that corresponded to a Marine's height, weight, and moment in

time before and after the policy change. PFT and CFT scores are measured as raw points out of 300 on the twice-yearly fitness tests. Subgroup variables were used to identify the relationship between weight standards and individual Marines.

The four weight zone groups included: (1) Well Within Standards, which identifies Marines who were 6 or more pounds below the weight maximum in 2016; (2) Danger Zone, which identifies Marines who were 0–5 pounds below the weight maximum in 2016; (3) Moderately Overweight, which identifies Marines who were 1–5 pounds over the weight maximum in 2016; and (4) Overweight High, which identifies Marines who were 6 or more pounds over the weight maximum in 2016. These categories were consistent over time within an individual. In other words, Marines remained in their group regardless of their relative weight in 2017 and later.

I used regression analysis to try to create the conditions for causal analysis with the Marine data available. To leverage the timing of the policy change, I employed a two-way fixed effects event study strategy to identify the effects of the 2017 policy change on Marines' weights, PFT scores, and CFT scores. My goal was to minimize the differences between the sample populations that were and were not affected by the changes to weight standards. The regression model output provides the average weight difference from 2016 to 2017 for those in each weight zone category – Danger Zone, Moderately Overweight, and Overweight High, as measured in 2016 – relative to those who were Well Within Standards as of 2016. For PFT and CFT scores, the regression model output provides the average difference in scores from 2016 to 2017 for each weight zone subgroup relative to those who were Well Within Standards.

D. RESULTS

I find that on average, females allowed themselves to gain some weight across the weight zone categories; however, I found little association between weight and performance on the PFT and CFT. Although scores generally declined in 2017 relative to 2016, when they are placed in a broader context with the overall decline in scores, the decline in scores is not practically significant, and does not necessarily correlate to weight alone. Scores dropped for all Marines in 2017 and the effect across the weight zones was

similar. There is no obvious evidence that allowing more weight harmed physical performance scores; it is somewhat ambiguous as multiple policies changed simultaneously.

When evaluated over time from 2016 to 2019, I find that when women were allowed an additional 4–8 pounds based on their height female Marines gained weight cautiously and the amount of women in the 1–5 pound overweight category dropped by 10.5 percentage points. The results demonstrate that servicemembers actively manage their weight to stay below the weight threshold. This finding provides evidence that servicemembers avoid the overweight category, and consequently, the scrutiny of the circumference-based method. More research should be conducted to determine the extent of the negative health and performance effects that stem from Marines adhering to highly restrictive standards to meet current maximum weight standards.

E. CONCLUSIONS AND RECOMMENDATIONS

Given more reasonable weight standards, Marines will meet them without compromising performance and given less restrictive standards, Marines will gain weight cautiously. Marines respond to policy by adjusting their weight to avoid the overweight category and the scrutiny of the circumference-based methods. The implication is that it is not known how many Marines struggle to maintain their weight below the maximum and what they must do to adhere to standards, but this thesis found that there is a significant population that exists near the weight maximum danger zone.

Prior research highlights that restrictive weight standards are associated with adverse health behaviors such as dehydration tactics or disordered eating. More research should be conducted to determine the extent of the negative health and performance effects that stem from Marines adhering to highly restrictive standards to meet current maximum weight standards.

As of March 10, 2022 and upon the conclusion of this thesis, the DOD released an updated version of its Physical Fitness/Body Composition Program Instruction (DODI 1308.3). This update signals that the DOD is providing space for change in current Body Composition and Physical Fitness policies. Given this latitude for change, the Marine

Corps should lead the way and seek to build a program that emphasizes a culture of fitness and strength over a culture that values a slim and trim appearance.

Given the information presented in this thesis and the updated guidance from the DOD, there are many recommendations that the Marine Corps could pursue to increase the strength and resilience of the force and develop a more accurate and effective body composition program that balances health and mission requirements. I will present a few for consideration.

The Marine Corps could explore policy to incentivize performance to address the issues with the body composition program in the short-term by extending the body composition exemption beyond a score of 285 on the PFT and CFT. When the Marine Corps made the decision to exempt Marines who scored 285 on the PFT and CFT from height and weight limits, this was a performance-based incentive that benefitted approximately 2% of Marines in 2019. This concession could be extended to Marines who achieve a 270 and above, 260 and above, or 250 and above, depending on the desired outcome. In 2019, 7% of Marines could have been exempted from height and weight limits with a 270 and above on the PFT/CFT. If this decision had been extended to 260 and above on the PFT/CFT, 11% of Marines would have qualified. If the requirement had been extended to Marines who scored 250 and above on the PFT/CFT, 15% of Marines would have qualified for the exemption. Extending the exemption to Marines who score within 20–30 points of the current standard could incentivize more Marines to achieve a higher score than they would otherwise on the PFT and CFT. This would allow them to focus on their fitness without the limitations imposed by body composition standards.

In the long-term, the Marine Corps should take this opportunity to reevaluate the purpose, usefulness, and effectiveness of the current body composition program. If the Marine Corps will continue to use body composition measurement, it should eliminate the use of the circumference-based method and invest in a more accurate method of measuring body composition that accurately accounts for the physiological differences among gender, ethnicity, and the difference between muscle and fat.

Given the information in this study and the forthcoming recommendations from the anthropometric study that is underway, the Marine Corps should set standards that are scientifically-based, less restrictive, less appearance-based, and more focused on strength, performance, health, and capability. Marines are compelled to comply with orders and standards; there are unintended hidden consequences. Marines should receive the most accurate, effective, and updated standards to better enable them to meet mission requirements.

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I. INTRODUCTION

The United States Marine Corps (USMC) is actively working to modernize manpower models to improve retention for Marines with critical skills requirements to meet the demands of Force Design 2030. Yet there is evidence to suggest that current physical fitness and appearance policies negatively affect the retention, health, and potentially the performance of Marines. The current body composition program is largely based on a study from over 30 years ago that has more recently come under scrutiny from the scientific community (Jones et al., 2017; Friedl, 2012; Peterson et al.,2014), advisory committees (Defense Advisory Committee on Women in the Services, 2019), and Marines via published articles (Sisbarro et al., 2020). At issue are the inherent limitations of body mass index (BMI) as a metric and the inaccuracy of the circumference-based method in determining overall body fat percentage for the modern, stronger, and more capable integrated force that makes up the Marine Corps today.

The circumference-based method uses tape devices to measure circumferences at the neck, abdomen, and hips (for women). This is the basis for determining compliance with body composition standards. However, research has shown that the circumference-based method may not accurately account for physiological differences among various body types (Babcock et al., 2006), genders (Gomes et al., 2020), and ethnicities (Wagner & Heyward, 2000), and does not discern between muscle and actual fat mass (Pandey et al., 2018). Given these considerations, it is possible that servicemembers both female and male are held to unattainable standards, based on their physiological attributes, despite fitness level, and performance on physical fitness tests. Unattainable standards can lead to dehydration tactics, disordered eating, and eating disorders, which could have implications on performance, health, and retention that could be more harmful than the body fat itself (Peterson et al., 2014; Silas, 2020).

Anecdotally, it is not uncommon to hear of Marines, male and female alike, using dehydration, extended sauna use, laxatives, disordered eating, and other extreme measures to "make weight" on weigh-in day. Many of these behaviors appear to be normalized given the high stakes that affect promotion and retention. Culturally, Marines feel compelled to

comply with the weight standards by any means necessary or risk their profession and reputation as a leader and face tangible implications such as adverse administrative action.

The Marine Corps has the most stringent body composition standards and lowest body fat percentage allowance of the four services, thus Marines have the least margin for error (Defense Advisory Committee on Women in the Services, 2016). Severe standards can often be seen as a point of pride. Discipline within the Marine Corps extends to physical appearance. In her book, *The Marines, Counterinsurgency, and Strategic Culture*, Jeannie L. Johnson (2018) explores the culture of the Marine Corps through research in primary sources and interviews with Marines. Johnson found that Marines are quickly indoctrinated to regard the term "undisciplined as a deeply humiliating insult" (Johnson, 2018, Professionalism and Discipline). For Marines, the definition of discipline is "holding oneself responsible for one's own actions and others responsible for their actions," as well as a commitment to "maintaining physical, moral, and mental health, to fitness and exercise, and to lifelong learning" (Johnson, 2018, Professionalism and Discipline). However, according to Johnson, in practice "discipline" is more readily associated with appearance and fitness. Consequently, to be considered overweight is tantamount to being undisciplined. Overweight is considered a significant failure that is against regulations, overweight is departure from warrior culture, and is the antithesis to leadership, professionalism, and discipline (Johnson, 2018).

For Marines, accountability matters, and appearance is commensurate to an outward display of merit. Physical standards and body composition standards as they currently exist are a manifestation of the need to provide a baseline for accountability and a metric for promotion and retention potential that is simple and easy to interpret. However, when appearance standards penalize servicemembers based on physiological differences that do not relate to their physical performance capability, standards warrant reevaluation. Body composition standards should be attainable for a healthy servicemember through the maintenance of good physical fitness and nutrition habits, not at the expense of these components (Friedl, 2012). Meanwhile, physical performance standards continue to increase in difficulty and the importance of retaining qualified Marines with critical skills remains.

Significant changes to the body composition policy were announced in 2016 and implemented in 2017 with the introduction of pull-ups in the annual Physical Fitness Test (PFT) for female Marines, the increase in the maximum weight for females by 4–8 pounds based on height, and the decision that eliminated weight compliance for Marines scoring 285 or above on both the PFT and Combat Fitness Test (CFT) (Commandant of the Marine Corps, 2016b). In 2017, there were also significant adjustments to scoring in the PFT and CFT to increase the difficulty of obtaining a first-class score.

1. Research Questions

This research analyzes the impact of recent changes in Marine Corps body composition standards and requirements on performance and retention of Marines. This research compares the distribution of weight before and after a point in time for various weight zone groups and evaluates how physical fitness scores are impacted by policy given a servicemember's previous weight.

The following are the research questions for analysis:

1. How has the distribution of weight changed after the policy changes announced by the Commandant of the Marine Corps in 2016 for various Marine weight zone groups?
2. How did the policy change and increase in scoring standards for physical fitness tests affect the weight, PFT scores, and CFT scores in subsequent years for Marines operating at various weight zone groups, given their 2016 weight?

I find that on average women allowed themselves to gain 1–2 pounds relative to their 2016 weight, however, I found little association between weight and performance on the PFT and CFT. Although scores generally declined in 2017 relative to 2016, when they are placed in a broader context with the overall decline in scores, the decline in scores is not practically significant and does not necessarily correlate to weight alone. Scores dropped for all Marines in 2017. There is no obvious evidence that allowing more weight

harmed physical performance scores based on observing the affect among various weight categories, it is ambiguous as multiple policies changed simultaneously.

I find that when women were allowed an additional 4–8 pounds based on their height, there is a 10-percentage point drop in females in the 1–5 pounds overweight category, which is approximately 1,540 females. In 2016, 11.7% of female Marines were 1–5 pounds over the maximum weight, but in 2019 1.2% of female Marines were 1–5 pounds over the maximum weight, a change of 10.5 percentage points. Given an adjustment in weight standards, women met the requirements. From this analysis, there is evidence that notable population of servicemembers actively manage their weight to stay below the weight threshold. This provides evidence that servicemembers actively try to avoid the overweight category and consequently, the scrutiny of the circumference-based method. More research is required to determine the extent and prevalence of unsafe methods used by Marines to meet weight standards and the effect on performance and retention.

2. Significance of Research

Given updated research, evidence, and the Marine Corps' interest in manpower modernization, now appears to be an ideal time to reevaluate the purpose and effectiveness of the circumference-based method as the appropriate metric as it relates to promotion, retention, and overall health. This research does not find a causal relationship between weight and performance, but prior research highlights that restrictive weight standards are associated with adverse health behaviors such as dehydration tactics or disordered eating.

It is possible that updated research and methods could potentially better align the program with the goal of a "healthy and fit force able to better answer the call in any clime and place" (Commandant of the Marine Corps, 2016b).

3. Thesis Overview

Chapter I introduces the research topic, the questions, and the significance of this study. Chapter II is the background and literature review. Chapter II is composed of two distinct sections. Section A highlights the relevant history of the Marine Corps body

composition program and physical fitness standards. Section A also discusses the recent changes to policy. Section B examines the issues associated with the body composition program according to scientific research and studies. Chapter III describes the data and the steps taken to clean and merge the datasets to build a population sample of Marines, as well as how the measures were created for analysis. Chapter III also provides an explanation of methodology used to complete this study. Chapter IV describes the results of statistical analysis by focusing on the policy effect on the distribution of weight, the policy effect on the weight zones, and the policy effect on performance by weight zone category. This chapter also describes the regressions and the results of the regressions to estimate the effect on weight and performance. Chapter V summarizes the findings and provides recommendations for further study and policy implementation.

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II. BACKGROUND AND LITERATURE REVIEW

This chapter is composed of two distinct sections. Section A highlights the relevant history of the body composition program and physical fitness standards while surveying applicable literature and studies. Section A also discusses the recent changes to policy within this context. Section B examines the issues associated with the body composition program according to scientific research and studies.

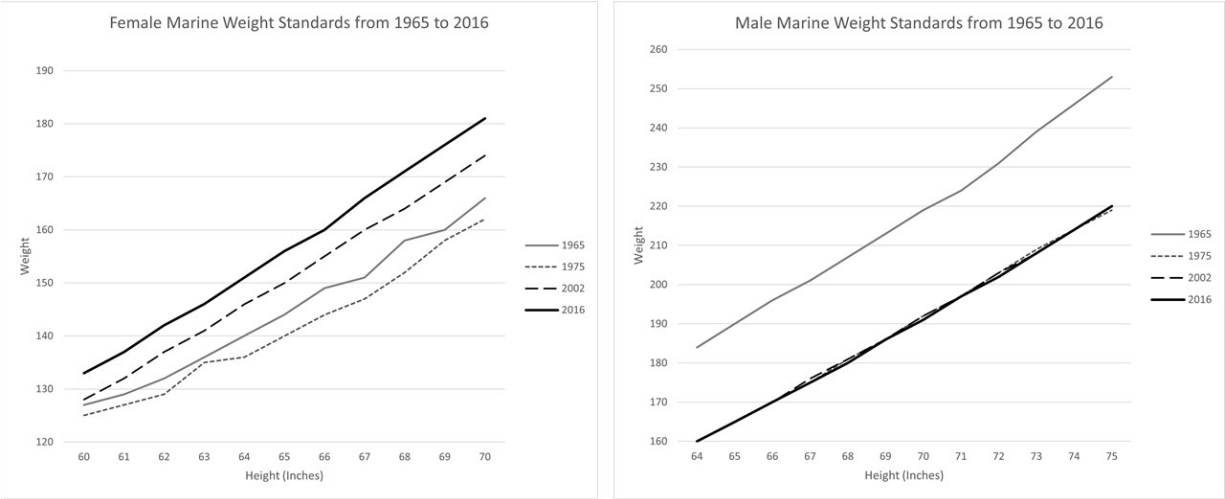
A. A BRIEF HISTORY OF MARINE CORPS PHYSICAL STANDARDS: FROM "SLIM AND TRIM" TO "A HEALTHY AND FIT FORCE"

In this section, I provide a broad overview of the development of the Marine Corps' physical fitness and body composition standards. I review relevant studies and source documents to provide a framework to understand the current policy and implications. To understand where we are in current policy, it is important to review the history and narrative framework that was used to build policy.

1. Developing Standards: Changes over Time

In her 2015 thesis, Hogan takes us from the beginning of inclusion of women in the military and the absence of physical fitness standards for women, to the guidance of the 1960s when the message to women was that they should be "Slim and Trim" (Headquarters, United States Marine Corps, 1963), to the current messaging for women that they should be a "healthy and fit force able to better answer the call in any clime and place" (Commandant of the Marine Corps, 2016b, p. 16). From this historical overview section of Hogan's thesis, we can draw the conclusion that body composition and physical fitness policy evolved along with the role of women and their increased inclusion both in enrollment numbers and in the Marine Corps' increasing reliance on them as combat professionals within the armed forces. Major turning points in the adjustments of physical standards occurred during the 1960s, with the increased enrollment of female recruits; in 1975, when the modern physical fitness test was established and body composition standards were re-evaluated; in 1996, when the physical fitness test was reevaluated to increase standards; and in 2002, when the Department of Defense (DOD) standardized

body fat measurement (Hogan, 2015). Finally, the culmination of changes occurred following the integration of women into ground combat units, as mandated by Congress in 2012. The Marine Corps responded by implementing pull-ups for women, and then adjusting body composition policy in 2016. Throughout this history, the implementation of policy for women was coupled with changes of policy for men as well, almost always an increase in the difficulty of standards along with the formation of formal standards for physical performance, weight, and appearance (Hogan, 2015). Figure 1 depicts the changes in weight standards over time by gender.



Adapted from U.S. Department of the Navy (1965), Headquarters, United States Marine Corps (1975), Headquarters, United States Marine Corps (2002), and Headquarters, United States Marine Corps (2016)

Figure 1. Marine Weight Standards from 1965 to 2016 by Gender.

Weight standards for female Marines were adjusted more frequently and to a greater degree. The standards were restrictive in 1965 and were made more restrictive in 1975. In 2002, the weight standards were adjusted to allow for more weight, and adjusted again in 2016, again to allow for more weight. The trend has been towards adjusting highly restrictive standards while attempting to balance the physical requirements of females in the Marine Corps. For male Marines, the weight requirements were made more restrictive in 1975 and have remained consistent to the present day.

2. Defining Fat: The Introduction of the Body Fat Program

The first weight standards published for women specified a minimum weight standard and an ideal weight standard (Headquarters, United States Marine Corps, 1963). In 1964, a maximum weight standard was published for both men and women (Hogan, 2015). The current PFT was introduced in 1975 (Headquarters, United States Marine Corps, 1975). The events were performed in green-on-green physical fitness gear for all Marines. Males performed pull-ups, sit-ups, and a 3-mile run, while females performed the flexed-arm hang, sit-ups, and a 1.5-mile run (Headquarters, United States Marine Corps, 1975).

Prior to the 1980s, weight alone was used as a metric for health, until the Study of Military Services Physical Fitness introduced the concept that physical fitness was correlated to fat (Hogan, 2015). Following this recommendation, the DOD required all Services to adopt a body composition standard. In 1984, researchers Hodgdon and Beckett conducted a study on male and female sailors with a sample population of 1,026 males and 341 females (Hodgdon & Beckett, Marcie B., 1984). This study serves as the basis for the current body fat regulations, *DOD Physical Fitness and Body Fat Programs Procedures* (DODI 1308.3).

In 1996, physical standards for female Marines were increased; the PFT for women would now require women to perform 80 crunches vice 50 and run 3 miles vice 1.5 miles (Gebicke, 1998). Female Marines were still required to perform the flexed-arm hang and the scoring for the run was different from the male Marines, based on the normative assumption that women ran 3 minutes slower than men (Gebicke, 1998). Meanwhile, the PFT for men was revised to eliminate kipping during their pull-ups, which meant that they must perform strict pull-ups without engaging in a vigorous swinging motion in coordination with their legs (Fuentes, 1997).

In 2002, the DOD Physical Fitness and Body Fat Procedures guidance was updated with the requirement for a circumference- based method to estimate body fat (Department of Defense, 2002). The policy set maximum BMI within the limits of 25–27.5 with an acceptable body fat measurement of 18–26% for males and 26–36% for females

(Department of Defense, 2002). Each service was permitted to work within the bounds set by the DOD. The USMC set the BMI to 27.5 for males, which was the maximum limit, and the BMI to 25 for females, which was the DOD minimum (Hogan, 2015). The implication from this policy was that women were restricted to more stringent standards.

3. Emphasizing Readiness: The Introduction of the Combat Fitness Test and the Military Appearance Program

On August 9, 2009, All Marines Message (ALMAR) 032/08 informed Marines of the revisions to the Marine Corps Physical Fitness program and the development of the Marine Corps Body Composition and Military Appearance Program (MCBMAP). The purpose of this ALMAR was to announce the tightening of the body composition standards and to introduce the CFT (Commandant of the Marine Corps, 2008). The PFT would remain as a scored calendar year requirement to be conducted between 1 January and 30 June of each year while the CFT would become a scored calendar year requirement to be conducted between 1 July and 31 December.

The CFT was introduced to improve combat readiness and to align physical fitness with current operational demands (Commandant of the Marine Corps, 2008). The CFT was designed as a test in three events performed in boots and utilities that included the following: 880-yard movement to contact, ammunition lift with a 30-pound ammo can for 2 minutes, and a 300-yard maneuver under fire, which was designed as a series of combat-related tasks for time including the combat crawl, ammunition resupply, body drag, casualty carry, and grenade throw (Commandant of the Marine Corps, 2008).

Marine Corps Order (MCO) 6100.13 emphasized the importance of physical fitness for all Marines as leaders and "professional warrior athletes" (Headquarters, United States Marine Corps, 2008, p. 1-1) . The CFT was designed to be in line with recommendations from the advancements in sports training and findings from the Centers for Disease Control and the American College of Sports Medicine to promote aerobic and muscle-strengthening activities under high intensity and short duration (Headquarters, United States Marine Corps, 2008). The end-state would be greater health benefits and higher

overall fitness that would improve the combat readiness of the individual unit (Headquarters, United States Marine Corps, 2008).

The maximum scores were based on age categories as with the PFT. The following is an example of a maximum 100-point score for ages 17–26 (full scoring table included in the appendix): male 2 minutes and 45 seconds on movement to contact, female 3 minutes 23 seconds on movement to contact; male 91 repetitions on ammo lift, female 60 repetitions on ammo lift; male 2 minutes and 14 seconds on maneuver under fire, female 3 minutes and 1 second on maneuver under fire (Headquarters, United States Marine Corps, 2008).

Additionally, the Remedial Conditioning Program (RCP) was designed to provide structure and supervision to "adjust the attitudes and improve fitness and appearance levels of Marines that have been degraded due to apathy, injury, disease, pregnancy or prolonged period of inactivity" (Headquarters, United States Marine Corps, 2008, p. 4-1). The RCP was designed without a formal administrative process and was not intended to be punitive in nature; rather, it was designed as a supplement to the body composition and military appearance program that was implemented by this order (Headquarters, United States Marine Corps, 2008).

4. Redefining Female Fitness: The Pull-Up Requirement

On April 23, 2012, the Commandant of the Marine Corps released an ALMAR message regarding the "Assignment of Women to Ground Combat Units" (Commandant of the Marine Corps, 2012a) in response to the congressional direction in the 2012 National Defense Authorization Act (NDAA). The ALMAR restated congressional direction in the NDAA and related requirements from the Secretary of Defense to "assess the impact of newly opened positions that may be opened to female Marines across the Marine Corps" (Commandant of the Marine Corps, 2012a).

Seven months after the message regarding the assignment of Women to the Ground Combat units, on 27 November 2012, the Commandant released an ALMAR message directing the change to the PFT, which began the transition from the Flexed-Arm Hang (FAH) to pull-ups as the standard for female Marines (Commandant of the Marine Corps,

2012b). The change would become effective in January 2014 (Commandant of the Marine Corps, 2012b).

Ryan (2014) examined the policy change and its cultural implications and discussed the potential for unintended consequences. Ryan found that the implementation of the policy change lacked considerable planning, research, and coordination such that it amounted to an organizational failure. Ryan juxtaposed the planning, coordination, testing, and research that was utilized to implement the CFT in 2008 against the process that had been used to implement the pull-ups for female Marines in 2014 and found the efforts in 2014 to be lacking. The pull-up policy change was pursued with comparatively limited information, was based on a flawed study, and was hampered by insufficient messaging, which resulted in a poor effort to mitigate challenges upon implementation (Ryan, 2014).

The speed with which the policy was implemented could be tied to the Congressional direction and the exception to policy sought by the Commandant to allow women in the infantry, which was denied. However, the implementation of the pull-up policy would be suspended for a year, after it was found that 55% of female Marine recruits were unable to perform the minimum standard of pull-ups required, which was 3 pull-ups (Center for Military Readiness, 2015). Following this delay, it would be delayed one more year until 2017 (Commandant of the Marine Corps, 2016b). Due to the aforementioned shortsightedness in implementing pull-ups for females, it would take a total of four years from the date of the ALMAR publication in 2012 to take effect.

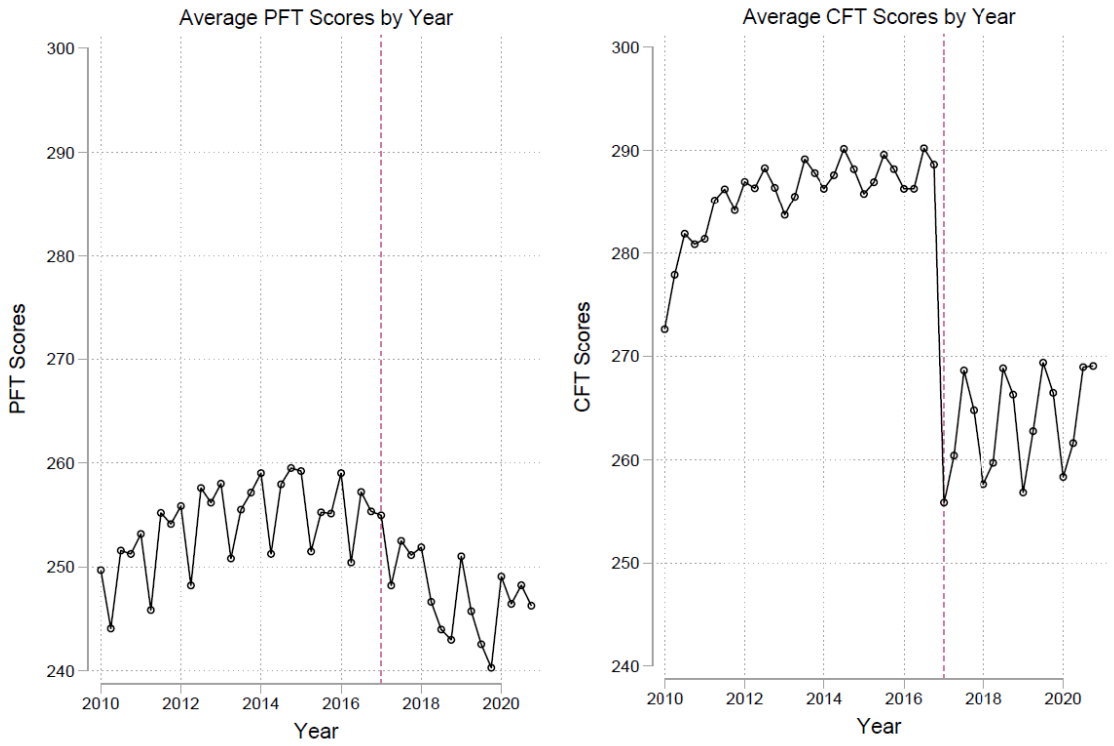
5. The Marine Corps Today: Stronger and Heavier

On 1 July 2016, ALMAR 022/16 announced changes to policy that were the result of a comprehensive review of physical fitness and body composition standards (Commandant of the Marine Corps, 2016b). The changes included adjustments to scoring to increase the difficulty of the PFT and CFT along with concessions to the body composition program and the pending pull-up requirement. The FAH would be eliminated for females, while a push-up/pull-up hybrid event was incorporated for all Marines, recruits, and officer candidates (Commandant of the Marine Corps, 2016b). Marines were incentivized to conduct pull-ups as opposed to push-ups, which were capped at 70 points

total towards the PFT score, rather than 100 possible points. Additionally, PFT and CFT performance would be taken into consideration in body composition program decisions for all Marines with concessions for Marines scoring 285 or above on both the PFT and CFT (Commandant of the Marine Corps, 2016b). These Marines would be exempt from the current body fat limits and the corresponding circumference-based method of measurement. If Marines scored 250 or higher on both the PFT and CFT, they would be allowed one additional percent of body fat once their body composition was measured using the circumference-based method (Commandant of the Marine Corps, 2016b). Furthermore, the maximum allowable weight for women was increased by four to eight pounds depending on height, while BMI was increased from 25 to 26. Marines were also encouraged to use more precise circumference-measuring tape devices. The Body Composition Program waiver authority was decentralized from Manpower and Reserve Affairs to the first General Officer in a Marine's Chain of Command (Commandant of the Marine Corps, 2016b). The changes to the PFT went into effect on 1 January 2017.

Along with these changes the scoring table was adjusted to account for a Marine's age and more points would need to be acquired per event to achieve a first or second class PFT and CFT score (Harkins & Bacon, 2016). The Marine Corps classifies PFT and CFT scores into first, second, and third class. After 2017, a first-class score comprised of a score from 235 to 300 (an increase of 10 points), a second-class score comprised of a score from 200 to 234, and a third-class score comprised of a score from 150 to 199 for both the PFT and CFT. For males, this meant 23 pull-ups vice 20 were required for a maximum 100 points on that event if their age was between 21–35 (Headquarters, United States Marine Corps, 2018). For women, this meant 11 pull-ups were required for a maximum 100 points if their age was between 21–25 or 12 pull-ups if their age was between 26–30 (Headquarters, United States Marine Corps, 2018). According to Major General James Lukeman, commanding general of Training and Education Command, "Marines today are stronger, faster, and fitter than ever, and these changes reflect that. Bigger and stronger often means heavier, so tying performance on the PFT and CFT to changes to the Body Composition Program are improvements that we think Marines will appreciate" (Harkins & Bacon, 2016).

There were several updates to MCO 6100.13 from 2018 to 2021 to adjust the scoring, provide clarification, and adjust language. The minimum requirements for the CFT were notably raised from the initial implementation along with the adjustment of the age categories. The scores required to achieve a maximum score were also noticeably raised. The following is an example of a maximum 100-point score for ages 21–25 (full scoring table included in the appendix): male 2 minutes and 38 seconds on movement to contact, female 3 minutes and 13 seconds on movement to contact; male 115 repetitions on ammo lift, female 74 repetitions on ammo lift; male 2 minutes and 4 seconds on maneuver under fire, female 2 minutes and 45 seconds on maneuver under fire. Figure 2 depicts the average PFT and CFT scores by year for all Marines.



See Chapter III for discussion of data sources and methods.

Figure 2. Average PFT and CFT Scores by Quarter from 2010 to 2021.

Prior to 2017, the average PFT score for Marines was 259. In 2017, the average PFT score dropped by 4 points to 255. In 2018, the average PFT score dropped by 7 points

relative to the 2016 score and then in 2019 the average PFT score dropped by 8 points relative to the 2016 score to 252 and 251, respectively.

In 2017 CFT scores were adjusted to increase the points required to achieve a maximum score. The following is an example of a maximum 100-point score for ages 21–25: Male 2 minutes and 38 seconds on movement to contact, female 3 minutes and 13 seconds on movement to contact, male 115 repetitions on ammo lift, female 74 repetitions on ammo lift, male 2 minutes and 4 seconds on maneuver under fire, female 2 minutes and 45 seconds on maneuver under fire (Headquarters, United States Marine Corps, 2018). Prior to 2017, the average CFT score for Marines was 290. In 2017, the average CFT score dropped by 21 points to 269. This drop in scores remained consistent from 2017 to 2019.

Currently, the Marine Corps requires all Marines to conduct a weigh-in twice a year for active-duty Marines and once a year for reserve component Marines. When a Marine exceeds their allowable body weight based on their height, they must submit to the circumference-based method of testing to determine if their body fat exceeds the limits allowed based on their height (Department of the Navy, Headquarters United States Marine Corps, 2021b). For example, a 65-inch-tall male has a maximum weight allowance of 165 pounds, and a 65-inch-tall female has a maximum weight allowance of 156 pounds. If a Marine is over the allowable weight for their height, they also must exceed their acceptable body fat by age group to be considered noncompliant. For instance, a 29-year-old male can have up to 19% body fat, whereas a 29-year-old female can have up to 27% body fat.

If a Marine is overweight, but within their body fat allowance, the Marine Corps considers them within the standard. Additionally, a Marine is exempt from weight and body fat limits if they score 285, considered a high first-class score, on both the PFT and CFT (Headquarters, United States Marine Corps, 2021b). They are also allowed an additional 1 percent body fat upon measurement using the circumference-based method (Headquarters, United States Marine Corps, 2021b). Marines who fail to meet the standards may face adverse action such as “limitations on promotion, retention, assignment or administrative separation” (Headquarters, United States Marine Corps, 2019).

6. The Way Forward: An Anthropometric Study

Currently, the Marine Corps is taking part in an anthropometric study to obtain a better picture of the physical reality of Marines today. The Human Performance Office, in collaboration with the Army Research Institute of Environmental Medicine, is conducting a body composition study to "ensure that Marine Corps policies and standards strike the right balance between health, performance, fitness, and military appearance" (Human Performance Branch, 2021). The study is led by the Army Research Institute of Environmental Medicine's senior research scientist for physiology, Karl Friedl. According to Friedl, "it has been a long time since those [tape-test standards] were first established and it was a 1980s population. We're training differently, and physique may be changing, especially with more strength training by men and women. We want to see how reliable those [measurements] are for … a current population" (Seck, 2021). The volunteer assessment includes a 3D body surface scan that can determine body type and composition, followed by a dual-energy X-ray absorptiometry, or DXA, scan that will measure bone density and soft-tissue fat (Seck, 2021). The volunteers then undergo a bioelectrical impedance analysis, which uses electricity to determine an accurate calculation of body fat (Seck, 2021). Finally, the volunteers conduct a counter-movement jump to measure explosive lower-body power and provide insight into their overall speed and strength (Seck, 2021).

7. Summary

Body composition and physical fitness policy evolved along with the role of women and their increased inclusion and reliance on them as combat professionals. The evolution of physical standards for women almost always results in a change for men, usually an increase. The introduction of women into ground combat units propelled change in physical standards, and consequently in weight standards as well. Although weight requirements for women have adjusted, the weight requirements for men have remained consistent. Yet physical standards have continued to increase for both men and women with the introduction of pull-ups for women and increased requirements for a high first-class PFT and CFT for all Marines. Body composition standards are consequential and influence

Marine Corps culture and have practical implications on a Marine's career and potential for promotion and retention. The Marine Corps appears to be seeking a balance between physical requirements and appearance standards; however, results are pending an anthropometric study and organizational willingness to adopt policy change.

B. THE CASE AGAINST THE STATUS QUO

Despite the policy changes that were implemented in 2016, issues related to the body composition program persist and have not yet been addressed. This section examines the issues associated with the body composition program according to scientific research and studies. Specifically, I explore the research related to BMI and the Hodgdon and Beckett study used to establish the current body composition program. Additionally, I examine the issues associated with the body composition program relative to women, people of color, performance measures, and disordered eating and eating disorders.

1. BMI: A Simple Metric with Complex Issues

According to recent research, there are significant limitations with the circumference-based method and BMI as a metric for assessing body fat. Department of Defense Instruction (DODI) 1308.3 dictated that each service should design a body composition program that is "consistent with established scientific principles of nutrition, body fat composition, and body fat measurement" (Department of Defense, 2002, p. 7). Many recent studies and research papers raise concerns about the validity and usefulness of BMI and the circumference-based method to determine body composition.

BMI is the basis for the body composition program tables set forth in DODI 1308.3 (Department of Defense, 2002). If a Marine exceeds the weight maximum for their height, they are subject to the circumference-based method to determine body fat. According to the DOD instruction, this method has been "carefully evaluated for applicability to Service members with minimal error (plus or minus 1 percent)" (Department of Defense, 2002, p. 15) . However, current research and studies have found that the data does not support this claim and that the circumference-based method used to measure body fat by the DOD warrants reevaluation.

BMI is a simple, convenient, quick, non-invasive and inexpensive measure to assess body composition (Stanford et al., 2019). BMI is calculated as the weight in kilograms divided by the height in meters squared. However, the measurement is controversial and has racially problematic origins given that it was developed during a period in which the pseudoscience of eugenics was used by several scientists (Stern, 2021). It was originally intended to be used as a measure of the height and weight of the "average" man using a base sample of the ideal White European man (Stern, 2021).

Historical Metropolitan Life Insurance Company (MLIC) actuarial data forms the basis for the BMI cutoffs used today (Stanford et al., 2019). In 1942, MLIC developed standard tables to determine "ideal" weight, and in 1959 to determine "desirable" weight (Stanford et al., 2019, p. 362). "Height to weight" tables became the standard in 1983 (Stanford et al., 2019). In 1942, data from 4,000,000 MLIC policyholders was used to create the first tables using sample populations from 1911 to 1935 to assess "ideal" weight on the basis of longevity according to sex, height, and weight (Stanford et al., 2019, p. 362). To create the normal distribution curve, MLIC "characterized policyholders into small, medium, and large body frames, with obesity defined as a weight over 20% to 25%, and severe obesity 70% to 100% over 'ideal'" (Stanford et al., 2019, p. 362). In 1959, an association between body weight and mortality was found to define "desirable" weight (Stanford et al., 2019, p. 362). The current BMI tables were developed with information from the Fogarty International Center Conference on Obesity in 1973 and the National Institutes of Health National Health and Nutrition Examination Survey (NHANES) (Stanford et al., 2019).

In 1984, Hodgdon and Beckett used BMI to develop the equations that are the basis for body fat estimate used by the DOD today. They conducted a study on U.S. Navy personnel to develop a method to measure body fat within this population of servicemembers (Hodgdon & Beckett, 1984a, 1984b). An initial study was conducted on male servicemembers followed by a study on female servicemembers (Hodgdon & Beckett, 1984a, 1984b).

Hodgdon and Beckett (1984a, 1984b) used eight skinfold sites (biceps, triceps, subscapular, chest, midaxillary, anterior suprailiac, abdominal, and front thigh) and 12

circumference sites (neck, shoulders, chest I and II, abdomen I and II, hip, thigh, calf, arm extended, arm relaxed, forearm, and wrist). During the factor analysis for male subjects, the researchers combined sites into "trunk skinfolds and dropped the hip circumference because of the high correlation to the abdomen and thigh measurements, while retaining the abdomen circumference" (1984a, p. 9). Meanwhile for females, variables were similarly combined into "trunk skinfolds," but "thigh and chest were deleted from this analysis because of their high correlations to hip and shoulder circumferences," but "hip circumference" remained (1984b, p. 9). Given these combinations, the researchers were able to conduct the factor analysis and began the regressions using body density as the dependent variable.

Hodgdon and Beckett used a flawed empirical strategy known as "p-hacking" to develop their original equation for measuring body fat, meaning they added or subtracted variables until they achieved a result of statistical significance (Whittenberg, 2019). Furthermore, once the researchers arrived at the best possible regression that included the circumferences, height, body weight, and age variables, they ultimately dropped body weight and age from the final equations, since they were "most reliably made in the field by personnel with minimal training" (Hodgdon & Beckett, 1984a, 1984b, p. 12). The practical implications of changing the equation to make it more user-friendly are that it would presumably have a greater rate of error and miscalculation of body fat.

Hogan (2015) fit multiple regression models to the data from Hodgdon and Beckett's study using the 1984 sample population and found that the models tended to be biased towards under- and overpredicting body fat in the original sample population. Hogan found that the male and female servicemembers were at the higher weight spectrum for their height. The equations developed by Hodgdon and Beckett that serve as the basis for the DOD body composition program overestimate the body fat of servicemembers, male and female.

2. BMI v. Women

The research demonstrates that the circumference-based method disproportionately affects women. In 2012, Karl Friedl published an article in the *Journal of Strength and*

Conditioning that explored the challenges the Army faces in setting appropriate body fat standards to support the full range of requirements (2012). Friedl found the height and weight standards for the military were adjusted based on the fallacy that women's bodies are essentially "men with too much body fat" and, therefore, they would perform better if they were held to leaner than necessary standards (p. S89, 2012). Although some of the most restrictive standards, have been adjusted, this paradigm was used to create standards and more restrictive standards still exist. The inclusion of women in the military further complicates the issue of body fat limits because a woman's body is different than a man's and the most stringent standards can compromise the health and performance of women to a greater degree than men (Friedl, 2012). Women have historically been intentionally held to a stricter standard to presumably incentivize performance.

Issues with the Body Composition Program have been raised citing the disproportionate negative effect on women and minorities (Committee on Body Composition, Nutrition, and Health of Military Women & Committee on Military Nutrition Research, Food and Nutrition Board, 1992). In 1992, the Department of Defense Committee on Body Composition, Nutrition, and Health of Military Women and the Committee on Military Nutrition Research, Food and Nutrition Board, found that the existing body composition program may hinder female job performance and readiness due to its promotion of unhealthy eating habits (Committee on Body Composition, Nutrition, and Health of Military Women & Committee on Military Nutrition Research, Food and Nutrition Board, 1992). The committee issued recommendations to improve fitness testing, promote healthy lifestyle changes and reduce the proclivity to "crash diet" to meet requirements. Additionally, it addressed the issue of equality in that the program negatively affected different ethnicities and body types.

In 2016 and 2019, the body composition program was highlighted as a primary issue affecting servicewomen by the Defense Advisory Committee on Women in the Services (DACOWITS) in its annual report. The report stated that the body composition program was overly focused on appearance and unrealistic expectations vice performance (Defense Advisory Committee on Women in the Services, 2019). DACOWITS offered a synopsis in its report, supported by research and data that concluded that "current body fat

guidelines are based on outdated science and ultimately result in some female service members being unfairly evaluated" (p. 32). These standards could have a range of implications. According to DACOWITS, the standards may "contribute to bias, promote unattainable measures for women, especially women of color, and perpetuate beliefs that women are held to stricter standards than men" (p. 32). The committee recommended that the DOD "revisit and reevaluate its current height and weight standards and body fat measures to align them with the current state of the science" (p. 38).

Hogan (2015) compared the estimates from the Hodgdon and Beckett equation and found that the tape method overpredicted body fat percentage for 72% of the female sample and for 28% of the male sample (p. 94). These numbers are significant, especially considering that the population sample used was comprised of Marines performing ground combat MOSs, a combat-fit population. Furthermore, Hogan found that the tape method overpredicted body fat for 83% of the female Marines, which was over the maximum allowed BMI (Hogan, 2015). This finding means that if these Marines were conducting an official weigh-in, they would have been subject to adverse administrative action.

Gomes et al. (2020) conducted a study that compared the measures of the body fat of 56 athletes from a cross-sectional study using ultrasound and skinfolds relative to dual-energy X-ray absorptiometry (DEXA). They found that the circumference-based method is an inaccurate method for measuring body fat in men and women, but that it is less accurate for women (Gomes et al., 2020).

3. BMI v. People of Color

Wagner and Heyward (2000) observed that the circumference-based method disproportionately affects people of color. The researchers reviewed literature on the differences and similarities between white and black sample populations and found there was practical significance among the body composition indexes since most equations that predicted relative body fat were derived predominantly from white samples (Wagner & Heyward, 2000). They found that if differences are not accounted for, systematic error and inaccurate estimation of body fat can result (Wagner & Heyward, 2000). For servicemembers this means that they are at risk of being misclassified as noncompliant

with body composition standards and could face negative administrative action with promotion and retention impacts.

Stanford et al.(2019) analyzed BMI to redefine BMI's threshold by sex and race/ ethnicity relative to metabolic disease and developed a more biologically-based approach that allowed for a more individualized results. They found that a single BMI threshold that is based on data from over 60 years ago is insufficient to define obesity for various race/ ethnicity groups and genders and that accurate BMI measures require a more nuanced and individualized approach (Stanford et al., 2019) that is not simple and easy to replicate.

Ehrhardt (2021), a student at Expeditionary Warfare School, wrote a thesis focused on the disparity created by the current circumference-based method and the negative effects of the body composition program for "ethnically underrepresented women Marines" (Ehrhardt, 2021 p. 1). Ehrhardt found that the program is flawed and, as a result, it "inaccurately identifies Marines who should be assigned to the program" for assessment and follow-on administrative action since different body fat distribution among ethnic groups leads to non-White ethnicities being more likely to be inaccurately measured (Ehrhardt, 2021 p. 1).

Gallagher et al. (1996) conducted a study to test the hypothesis that BMI is representative of body fatness independent of age, sex, and ethnicity. They found that at similar total body fat, black subjects have greater waist to hip ratio than white subjects (Gallagher et al., 1996). This distinction is consequential when using the circumference-based method since the Hodgdon and Beckett equation for BMI dropped the hip measurement for male servicemembers but not for female servicemembers. The MCO states that the measurement for the hip circumference is to be taken "around the hips so that it passes over the greatest protrusion of the buttocks as viewed from the side" (Headquarters United States Marine Corps, 2021b p. 1-9). The implication is that women of color are at greater risk of being misclassified as noncompliant with the body composition program.

A study by Combest et al. (2017) found that the levels of fat measured differed among ethnicities while using the circumference-based method and DEXA in a military

population sample. The significant possibility of systematic error should be kept in mind when analyzing the percentages of overweight Marines relative to their ethnicity. In 2020, the Human Performance Branch, found that Hawaiian/Pacific Islander women and Black women were overweight at the highest rate at 8.3% and 7.2% respectively, and White and Asian women were overweight at the lowest rate, at 3.9% and 3.4%, respectively (McGuire & Slyman, 2020). This analysis found that Black and Hispanic female Marines were measured as over-fat at the highest rate at 2.7% and 2.5%, compared to an overall female Marine average of 2.2% (McGuire & Slyman, 2020). Given the updated research and implications on promotion and retention, the body composition program is consequential, especially for ethnically underrepresented Marines and females because they are at greater risk of misclassification and assignment to the body composition program.

4. BMI v. Performance

BMI measurements do not accurately discern between muscle and fat, which means that larger, stronger, and more muscular servicemembers, both male and female, can be subject to misclassification under the current body composition program. Pandey et al. (2018) studied the role of cardiometabolic factors, central adiposity, and cardiorespiratory fitness, in the obesity paradox (in which higher BMI is associated with lower risk of mortality) and found that "BMI is a poor estimate of overall adiposity because it fails to distinguish between lean and fat mass and between the types of adipose tissue depots such as visceral and subcutaneous stores" (Pandey et al., 2018 p. 676). Adiposity is defined as the degree of fattiness or amount of fat, especially in a particular region of the body.

Babcock et al. (2006) conducted a study that compared the circumference-based military equation with the skinfold-based equation to estimate body fat and found that the circumference-based method overestimated body fat on firefighters, who were used as the sample most comparable to military members. This study found that when the DOD circumference-based method was used to determine body fat percentages, more subjects were found non-compliant than if the skinfold-based equation was used (Babcock et al., 2006). As a result, they recommended reevaluation of the current body composition

program, as the circumference-based method used by the military may be unsuitable for assessing individual body composition (Babcock et al., 2006).

According to a 2020 U.S. Government Accountability Office (U.S. GAO) study, the implications for the optimal physical health and performance of Marines extend beyond the scope of what was previously thought and there is a significant discrepancy between what the current standards are and what constitutes a healthy performance weight (Silas, 2020). This means that although many Marines, both men and women, can meet standards, they are still affected to varying degrees by the current body composition and physical standards.

Currently, Marines are forced to make trade-offs imposed by the body composition standards to meet the weight requirements that can have short- or long-term effects on performance. Jones et al. (2017) evaluated the correlation between training-related musculoskeletal injuries, physical fitness, and body composition in a population of Army trainees. They identified that military members with higher BMI were less likely to incur musculoskeletal injuries and "current military policies may place too much emphasis on and encourage lower BMIs" (Jones et al., 2017 p. S18). The study found that higher BMI has the probability to protect against injury due to the greater muscle mass among soldiers with higher BMI (Jones et al., 2017). Jones et al. recommended the use of strength training programs to reduce injuries in soldiers with low BMI.

A 2014 Center for Naval Analyses study found that females who exceeded the maximum weight for their height at accession were less likely to attrite, were potentially better able to sustain the rigors of recruit training and were less susceptible to injury than females that were under the minimum weight (2014). This finding was consistent for male Marines, as well (Peterson et al., 2014). The CNA study recommended a reevaluation of the height and weight standards for female Marines (Peterson et al., 2014).

Pierce et al. (2017) assessed soldier physical performance and military specific task/ fitness performance stratified by BMI. They compared performance, based on the Army Physical Fitness Test (APFT) and military relevant tasks, against BMI and found that differences in BMI did not affect individual performance (Pierce et al., 2017). The tests were

conducted for muscular strength, power, endurance, and speed/agility. In the study, higher BMI soldiers, male and female, performed better on events of lower- and upper-body muscular strength and lower-body muscular power. For soldiers with higher BMI, although speed and agility scores were lower, and identified as statistically significant, they were not considered practically significant. Pierce et al. found that "allowances should be considered when tradeoffs exist between body composition classifications and performance on physical tasks with high military relevance" (Pierce et al., 2017, p. S79).

The general trend for physical fitness standards is building greater strength in Marines—specifically women, since their physical fitness standards may be at odds with the current body composition standards. Neil Baumgartner, chief of the Air Force's exercise unit, stated that "there is significant evidence to suggest that as women train to meet the demands of service, they require more muscle bulk and endurance and their body composition adjusts to allow for carrying heavier objects and loads" (U.S. Air Force, Exercise Science Unit, 2017). The women that Baumgartner is describing are those who perform physically intensive jobs, such as those in the ground combat military occupational specialties (MOS). Like the women in Hogan's thesis, they are women who performed ground combat roles and were subject to overpredicted body fat composition. However, the scope of the problem is not limited to women, although they are at a greater disadvantage given the nature of the original Hodgdon and Beckett equation and BMI as a metric of measurement.

5. "Suffering in Silence": The Hidden Costs of Current Policy

Normalized disordered eating and eating disorders are an unintended consequence of the current body composition program policy. Haley Britzky (2021), a reporter for *Task and Purpose*, wrote an article based on interviews with thirteen servicemembers across the military that revealed personal accounts of disordered eating and eating disorders. Disordered eating means "engaging in unhealthy and destructive eating behaviors such as restrictive or compulsive eating, skipping meals, vomiting, or taking laxatives or diet pills" (Britzky, 2021). Disordered eating is not the same as an eating disorder, but it can lead to the development of an eating disorder (Britzky, 2021). The service members Britzky talked to, both men and

women, revealed the cultural framework and stressors that many endure to meet weight standards.

Carlton et al. (2005) conducted a study on abnormal eating behaviors in 2005 at a major military medical center and found high rates of body dissatisfaction as well as abnormal eating behaviors within service men and women. For these service members, abnormal eating behaviors were linked to their concerns about the body mass index measurement and their fitness assessments (Carlton et al., 2005). This study found that female Marines were at greater risk for all types of disordered eating (anorexia nervosa [AN] 4.9%, bulimia nervosa [BN]15.9%, or "other/unspecified eating disorder" 76.7%) (Carlton et al., 2005). Meanwhile, active-duty male Marines were at risk at the rate of 2.5% for AN, 6.8% for BN, and 40.8% for "other/unspecified eating disorder" (Carlton et al., 2005). Disordered eating behaviors were found to increase around the physical fitness assessment cycle, although they existed year-round. This increase was made evident by data that showed that of the males surveyed, 3.7% reported vomiting year-round to meet weight requirements with an increase to 15% when they conducted weigh-in (Carlton et al., 2005). Active-duty males increased the use of diet pills and laxatives around the weigh-in period from around 3.5% to around 15%, which coincided with one month prior to an anticipated weigh-in, 31.5% of active-duty male Marines reported some degree of fasting to lose weight (Carlton et al., 2005). This study recommended "changes to the current system to incorporate treatment programs aimed at recognizing and treating eating disorders with a goal of producing more fit and healthy service members" (Carlton et al., 2005 p. 663).

In the 2016 DACOWITS annual report, a study that found that "the use of laxatives, diuretics, vomiting, and fasting for standards increased during the body measurement and fitness periods for all Services, but year-round use of many of these behaviors occurred at a significantly higher rate among Marines" (Defense Advisory Committee on Women in the Services, 2016 p. 38). In their 2019 annual report DACOWITS cited a report that found a correlation between the pressures to meet body composition standards and a 30% higher rate of eating disorders among servicewomen in their twenties than their male counterparts (Defense Advisory Committee on Women in the Services, 2019).

In 2018, a DOD study cited by the U.S. GAO found that from 2013 through 2017, a total of 1,788 active-duty service members received a diagnosis of anorexia nervosa, bulimia nervosa, or "other/unspecified eating disorder" (Silas, 2020). Many dismiss the issue, since these rates have been observed in the general population; however, this study found that the rates of eating disorders are potentially rising above the rate of the general population (Silas, 2020). The U.S. GAO report also found that eating disorders are potentially underdiagnosed and a third or more of the military population sample exhibited behavior consistent with an eating disorder but only 2 percent of the population was clinically diagnosed, indicating that the number of service members diagnosed with an eating disorder is potentially much higher (Silas, 2020).

According to a 2020 U.S. GAO report, there is a correlation between unhealthy behaviors and the stringent standards of the Department of Defense. The U.S. GAO report found that when the focus is overly involved on weight over performance, people can turn to dangerous eating behaviors. According to the U.S. GAO report, eating disorders can have an impact on health and combat readiness of servicemembers as these eating disorders are associated with serious physical and mental health problems and raise the risk of mortality (Silas, 2020). Furthermore, eating disorders can have a severe effect on heart, stomach, and brain functionality and can include dangerous behaviors such as restriction of food intake or binge eating, along with other conditions such as anxiety, depression, substance abuse, or post-traumatic stress disorder (Silas, 2020). Table 1 shows the rates of eating disorders among, civilian women, all servicewomen, and female Marines.

Table 1. Rates of Eating Disorder Diagnosis Among Female Civilians, All Servicewomen, and Female Marines.

Diagnosis	Civilian Women	All Servicewomen	Female Marines
Anorexia	1-2%	1.10%	4.90%
Bulimia	2%	8.10%	15.90%
Other	3-35%	62.80%	76.70%

Adapted from Defense Advisory Committee on Women in the Services (2016).

6. Summary

Current body composition standards are based on an outdated study from 1984 that included few non-white servicemembers. BMI and the circumference-based method is biased towards overprediction of body fat in women and ethnically underrepresented minorities based on physiological differences that are not accurately accounted for in the original equations. Military weight standards have been formed based on a misunderstanding of women's physiological make-up and fitness needs (Friedl, 2012). These issues are further complicated by women's integration into ground units and the requirements for more strength and physical capability, given that the circumference-based method may misclassify larger and stronger individuals as out of standards. Male and female Marines alike are forced to make trade-offs to meet weight requirements that can have long-term effects on performance. Weight loss induced by weight standards may also be associated with increased injury rates, while servicemembers with higher BMI may be less prone to injury and attrition (Jones et al., 2017; Peterson et al., 2014). The research highlights that restrictive weight standards are associated with adverse health behaviors such as dehydration tactics or disordered eating and there are performance and retention implications for the Marine Corps that are not yet fully defined and accounted for.

III. DATA AND METHODOLOGY

This chapter describes the data and the steps taken to clean and merge the datasets to build a population sample of Marines, as well as how measures were created for analysis. This chapter also provides an explanation of methodology used to complete this study.

A. DATA

The data covers the population of active-duty Marines from January 2010 to December 2020. The primary data comprise detailed month-by-month snapshots of each Marine's demographic data to include grade, MOS, age, gender, marital status, grade upon entry, race, ethnicity, height, weight, civilian education, armed forces active-duty base date, geographic location code, end of active service date and separation code. The secondary data comprise detailed month-by-month snapshots of each Marine's PFT data and CFT data broken down by total score, classification, and the score of each individual event. All three datasets were acquired from the Total Force Data Warehouse (TFDW). The TFDW data include nearly 13 million months and individual Marine observations covering month-specific information. Some variables change over time (e.g., weight, PFT scores, CFT scores, etc.) while others do not (e.g., race/ethnicity). Version 16 Basic Edition of STATA was used to convert, clean, analyze, merge, and run statistical analysis using the data sets.

B. DATA MANAGEMENT

1. Cleaning and Merging Data

I used the Marine demographic data as the primary dataset. The Marine demographic data consisted of 25,103,232 person-by-month observations and 545,200 unique observations of individual Marines. The PFT dataset consisted of 1,890,232 observations and the CFT dataset consisted of 2,036,232 observations.

I eliminated additional variables that were not relevant to the study given that they were not reflective of a Marine's current physical fitness state and reduced the

incidence of duplicates. I dropped the following observations for the PFT and CFT: a score of zero, class 5 (medical waiver), class 7 (failed partial), class 8 (medical waiver for partial), and class 9 (often used for deployment waivers). I then eliminated duplicate PFT and CFT scores, keeping the highest scores in a given month since Marines can retake the test until they achieve the maximum score, they are capable of.

Upon completion of initial analysis, I merged the Marine demographic, PFT score, and CFT score datasets. I analyzed the data once more to ensure that they were consistent with expectations and demographic information. Once merged there were 25,103,232 observations. The grade, MOS, age, weight, and gender distributions were comparable to the analysis prior to the merge.

Table 2 depicts the descriptive statistics by gender.

Table 2. Descriptive Statistics by Gender

Sample Demographics	Females	Males
Height	64.08	69.44
Weight	136.95	175
Age	24.63	25.79
PFT Score	258.67	255.34
CFT Score	286.06	287.78
White	0.52	0.65
Hispanic	0.24	0.17
Black	0.14	0.1
Asian	0.03	0.03
Other Ethnicity	0.03	0.03
Observations	14932	168608

See Chapter III for discussion of data sources and methods.

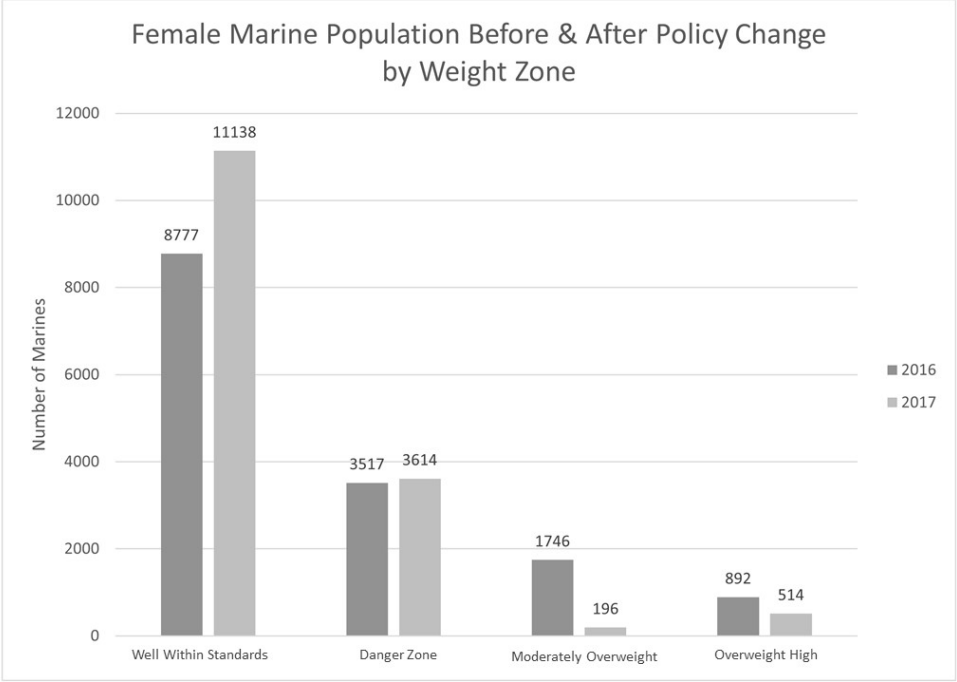
2. Creating Measures

My main predictor measure identified periods before and after the policy change. This variable, called "post," flags observations that occurred after the policy change

announced by ALMAR 022/16 that was implemented in 2017. I applied the pre/post time periods to both male and female Marines.

I created the baseline group weight zone variables for females and males before and after the policy change by using the relevant height for weight tables (Headquarters, United States Marine Corps, 2018; Headquarters, United States Marine Corps, 2002) and generated a weight maximum group variable that corresponded to a Marine's height, weight, and moment in time before and after the policy change. I measured PFT/CFT scores as raw points out of 300 on the twice-yearly fitness tests.

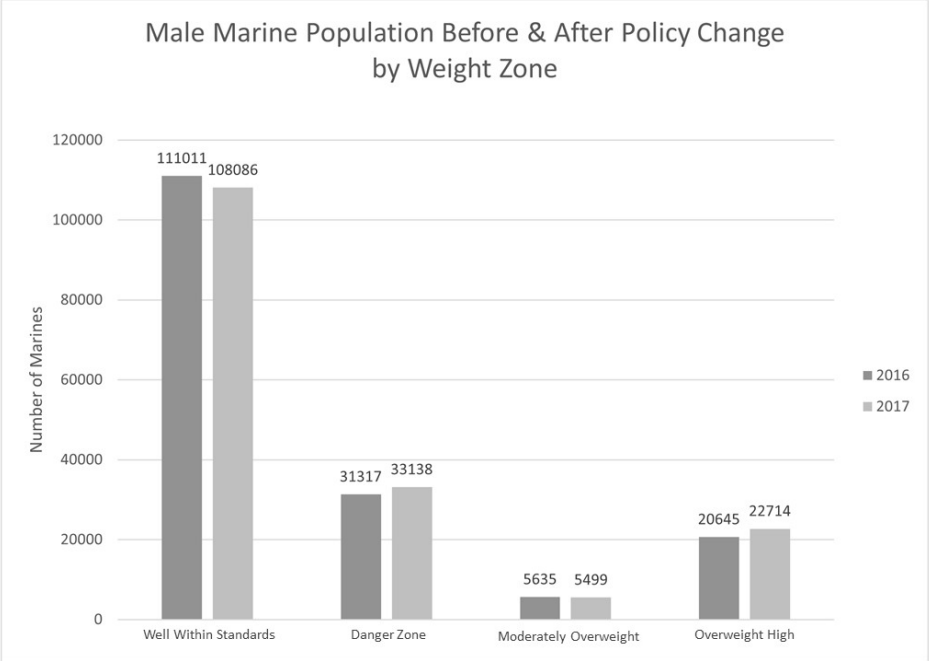
Next, I generated subgroup variables to identify the relationship between weight standards and individual Marines. First, I generated a variable to calculate "relative weight," which was calculated as weight minus female/male weight maximum allowed per standards. For example, if in 2016 a woman 65 inches tall weighed 156 pounds, she would be above the 151-weight maximum allowed for women of her height; the value for relative weight for this individual would be 5. I used the relative weight variable to categorize Marines into four categories. The four weight zone groups include: (1) Well Within Standards, which identifies Marines who were 6 or more pounds below the weight maximum in 2016; (2) Danger Zone, which identifies Marines who were 0–5 pounds below the weight maximum in 2016; (3) Moderately Overweight, which identifies Marines who were 1–5 pounds over the weight maximum in 2016; and (4) Overweight High, which identifies Marines who were 6 or more pounds over the weight maximum in 2016. For my main analysis, I create these categories to be consistent over time within an individual. In other words, Marines remain in their group regardless of their relative weight in 2017 and later, and I can observe how those same Marines change from 2016 to 2017. Figures 3 and 4 depict the female and male Marine population before and after policy change by the four weight zone variables.



See Chapter III for discussion of data sources and methods

Note: Well Within Standards indicates Marines 6+ pounds below the maximum weight in 2016; Danger Zone indicates Marines who were 0–5 pounds below the maximum weight in 2016; Moderately Overweight indicates Marines who were 1–5 pounds over the maximum weight in 2016; Overweight High indicates Marines who were 6+ pounds over the maximum weight in 2016.

Figure 3. Female Marine Population Before and After Policy Change by Weight Zone



See Chapter III for discussion of data sources and methods

Note: Well Within Standards indicates Marines 6+ pounds below the maximum weight in 2016; Danger Zone indicates Marines who were 0–5 pounds below the maximum weight in 2016; Moderately Overweight indicates Marines who were 1–5 pounds over the maximum weight in 2016; Overweight High indicates Marines who were 6+ pounds over the maximum weight in 2016.

Figure 4. Male Marine Population Before and After Policy Change by Weight Zone

C. SCOPE AND LIMITATIONS

1. Scope

This research focuses on changes in an individual Marine's weight and PFT/CFT performance outcomes between 31 December 2016 and 31 December 2019 in response to policy change around standards. The policy change to require females to conduct pull-ups was initially announced on 27 November 2012 for implementation in January 2014; however, this implementation was delayed until 1 July 2016. I focus on analyzing weight and PFT/CFT scores as of December 2016 because this date captures the current year PFT/CFT and most current weight of the individual Marine. I chose to analyze changes in these outcomes as of December 2019 because it would provide an adequate amount of time for Marines to normalize and adjust to policy. Although data for 2020 was available, weight

and performance outcomes may be affected to a greater extent by the coronavirus disease 2019 (COVID-19) pandemic and would require evaluation outside of the scope of this study.

2. Limitations

An individual Marine's weight may vary throughout the year and in relation to physical fitness requirements. Because I look at measurements from a single point in time in each year pre/post policy, I do not capture this variation in my analysis. Additionally, Marines that were in the Marine Corps well ahead of the policy change announcement and implementation may have been accustomed to the previous culture and behavior around weight maintenance and fitness. They may react differently to the policy change than a new Marine who enters after the policy change. As a result, behavior and reaction to the policy may change over time, even three to five years from implementation. In this study, I am bound by time constraints one to two years from the policy change to ensure that there is significant observable data available of the same subjects over time. To maintain comparison of similar Marines, it was prudent to start at 2016 and to observe as far out as 2019 at most.

A retention study to capture a sample population of Marines three years before and after the policy change would provide more robust measures on the effects of this policy change. I was unable to conduct this study given limited weight and PFT/CFT data prior to 2014.

D. METHODOLOGY

The ideal experiment to isolate the causal effect of the policy change on the weight of Marines would be to randomly apply the policy change to some Marines and not others, and then to observe how outcomes change between the two groups. If such an experiment is not possible, a second option would be to conduct a no-notice and non-retribution weigh-in of a sample population of Marines representative of officers and enlisted personnel of all grades and military occupational specialties before and after the policy change. This sample population would also undergo a PFT and CFT assessment before and after the policy change. The outcomes before and after the policy change on a sample population

representative of the current force would ensure that, on average, the differences in outcomes would not be driven by underlying characteristics of the individual Marines but rather by the policy itself.

Neither the ideal experiment nor the second option were possible in my study setting, thus this analysis uses regression analysis with fixed effects to try to create the conditions for causal analysis with the Marine data available. To leverage the timing of the policy change, I employ a two-way fixed effects event study strategy. My goal was to minimize the differences between the sample populations.

I began with the assumption that Marines pay attention to their weight to remain within standards; therefore, if the standards change, they may adjust how they regulate their weight. I compare Marines' weight zone categories before and after the policy change. By creating these groups based on the point in time before and after the policy change, I could hypothetically find a causal relationship to the policy change.

I estimate a regression model to identify the effects of the 2017 policy change on Marines' weight, PFT scores, and CFT scores. I start with a two-way fixed-effects model, to hold constant any steady traits of individual Marines and control for time trends. With fixed effects, any variable that does not vary within person is dropped due to collinearity. I modeled the outcome (Y) Marine weight or fitness performance, for Marine (i) at time (t) as follows:

$$Y_{it} = \beta_1 DangerZone2016Post_{it} + \beta_2 OverweightMod2016Post_{it} + \beta_3 OverweightHigh2016Post_{it} + a_i + \delta_t + e_{it}$$

In the case of weight, the regression model output provides the average weight difference from 2016 to 2017 for those in each weight zone category—Danger Zone, Moderately Overweight, and Overweight High, as measured in 2016—relative to those who were Well Within Standards as of 2016. For PFT and CFT scores, the regression model output provides the average difference in scores from 2016 to 2017 for each weight zone subgroup relative to those who were Well Within Standards.

The dependent variable, Y, is weight or performance on either the CFT or PFT, a_i contains Marine fixed effects, and δ_i represents an indicator column for each unique year and controls for any annual changes in weight that were common to all Marines. Post designates a time before and after the policy with individual fixed effects. In all specifications, standard errors are clustered by individual Marine.

E. SUMMARY

The data used in this analysis covers the population of active-duty Marines from January 2010 to December 2020. The primary data comprise detailed month-by-month snapshots of each Marine's demographic data. The secondary data comprise detailed month-by-month snapshots of each Marine's PFT data and CFT data broken down by total score, classification, and the score of each individual event. All three datasets were acquired from the TFDW. Version 16 Basic Edition of STATA was used to convert, clean, analyze, merge, and run statistical analysis using the data sets.

This analysis used a predictor measure to identify periods before and after the policy change, baseline group weight zone variables for females and males before and after the policy change by using the relevant height for weight tables (Headquarters, United States Marine Corps, 2018; Headquarters, United States Marine Corps, 2002), and a weight maximum group variable that corresponded to a Marine's height, weight. PFT/CFT scores are measured as raw points out of 300 on the twice-yearly fitness tests. Subgroup variables were used to identify the relationship between weight standards and individual Marines. The four weight zone groups included: (1) Well Within Standards, which identifies Marines who were 6 or more pounds below the weight maximum in 2016; (2) Danger Zone, which identifies Marines who were 0–5 pounds below the weight maximum in 2016; (3) Moderately Overweight, which identifies Marines who were 1–5 pounds over the weight maximum in 2016; and (4) Overweight High, which identifies Marines who were 6 or more pounds over the weight maximum in 2016. These categories were consistent over time within an individual. In other words, Marines remained in their group regardless of their relative weight in 2017 and later.

I used regression analysis with fixed effects to try to create the conditions for causal analysis with the Marine data available. To leverage the timing of the policy change, I employed a two-way fixed effects event study strategy. My goal was to minimize the differences between the sample populations. I estimate a two-way fixed-effects regression model to identify the effects of the policy change on Marines' weight, PFT scores, and CFT scores. The regression model output provides the average weight difference from 2016 to 2017 for those in each weight zone category—Danger Zone, Moderately Overweight, and Overweight High, as measured in 2016—relative to those who were Well Within Standards as of 2016. For PFT and CFT scores, the regression model output provides the average difference in scores from 2016 to 2017 for each weight zone subgroup relative to those who were Well Within Standards.

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IV. RESULTS

This chapter describes the policy effect on the distribution of weight and the policy effect on performance by weight zone category based on regression analysis and interpretation of the results.

A. REGRESSION ANALYSIS

Using the regression from Chapter III, I evaluated the effects on weight, PFT score, and CFT score from 2016 to 2017 by weight zone category. Marines were assigned to a weight zone category based on their 2016 weight and I observed how those same Marines changed from 2016 to 2017. In simple terms, the regression considers the change in those Well Within Standards (6 or more pounds below the weight maximum) as the baseline and then assesses whether the other groups Danger Zone (0-5 pounds below the weight maximum), Moderately Overweight (1-5 pounds over the weight maximum), and Overweight High (6 or more pounds over the weight maximum) change more or less than the baseline. Based on the results, I analyze the difference of the various weight groups relative to those Well Within Standards. In other words, the regression tests whether the groups are near or above the weight maximum change more or less than the baseline. Given the results of the regression, I evaluated the averages to test how much each group changed after the policy was implemented.

1. Effect of Weight and Performance for Female Marines from 2016 to 2017

The model was applied to males and females separately. Table 3 depicts the results of the regressions for females. Overall, there is no evidence that weight alone caused differences in performance. Evaluated in context with the increase in physical performance standards to achieve a first-class PFT and CFT, along with the changes to the individual events, and the overall percentage of females that remained within the first-class score category, the results do not indicate causality with weight alone.

Table 3. Effects on Weight and Performance for Female Marines from Various Weight Categories

	(1) Weight	(2) PFT Score	(3) First Class PFT	(4) CFT Score	(5) First Class CFT
Female w/in 5 lbs of weight limit before policy change	0.693***	-0.329	-0.014	-2.597****	-0.002
	(0.244)	(0.557)	(0.010)	(0.453)	(0.008)
Female 1-5 lbs over before policy change	1.331****	-0.867	-0.033*	-5.545****	-0.021
	(0.285)	(0.764)	(0.014)	(0.623)	(0.011)
Female 6 lbs and over weight limit before policy change	4.805****	-3.008**	-0.042	-7.921****	-0.058***
	(0.568)	(1.233)	(0.022)	(1.047)	(0.019)
Outcome mean	134.91	259.91	0.82	288.08	1.00
R-squared	0.770	0.652	0.528	0.665	0.400
N	810666	79967	60069	81490	63533

Data from Total Force Data Warehouse (TFDW)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

See Chapter III for discussion on data source and methods.

The regression results for weight were statistically significant, which means that there is a difference in weight relative to females Well Within Standards in 2016. The increase in weight relative to those females Well Within Standards for the weight zone categories overall indicates that when women were given more lenient standards, they gained weight. However, those within the Danger Zone category in 2016 and those in the Moderately Overweight category in 2016 gained weight cautiously, presumably to avoid exceeding weight standards. Those in the Overweight High category gained 4.8 pounds on average, relative to females Well Within Standards.

The regression results for the PFT scores were not statistically significant relative to females Well Within Standards in 2016, which means that I could not differentiate the changes based on standard error relative to the scores of females Well Within Standards in 2016. The exception was the Overweight High category. Females in the Overweight High category lost 3 points on average relative to females Well Within Standards in 2016. This was statistically significant, but not necessarily practically significant. Given an outcome mean of 256, a loss of 3-points still equates to a first-class score. The regression results for the First-Class PFT scores showed very little movement downward, and only the females in the Moderately Overweight category showed statistically significant results. For those in the Moderately Overweight category, 3.3 percentage points of females did not achieve a first-class PFT score relative to those Well Within Standards in 2016.

The regression results for the CFT scores were statistically significant, which means that statistically we can differentiate the changes based on standard error relative to the scores of females Well Within Standards. The results indicate a negative correlation for the weight zone categories, relative to females Well Within Standards in 2016. Females within the Danger Zone category lost 2.60 points on the CFT, females within the Moderately Overweight category lost 5.50 points on the CFT, and females who were in the Overweight High category lost 8 points on average relative to females Well Within Standards in 2016. Although these results are statistically significant, given an outcome mean of 288, a loss of 2.6-8 points is well within the first-class score classification. The regression results to determine the effect on a First-Class CFT are not statistically significant, except for the results for females in the Overweight High category. For those in the Overweight High category 6 percentage points of females did not achieve a first-class CFT relative to those Well Within Standards in 2016; however, this is not considered practically significant given an outcome mean of 1.00.

2. Effect of Weight and Performance for Male Marines from 2016 to 2017

Table 4 depicts the results of the regressions for males as a point of comparison against the females. Evaluated in context with the increase in physical performance standards to achieve a first-class PFT and CFT, along with the changes to the individual events, and the overall percentage of males who remained in the first-class score category, the results are ambiguous and do not indicate a causality with weight alone.

Table 4. Effects on Weight and Performance for Male Marines from Various Weight Categories

	(1) Weight	(2) PFT Score	(3) First Class PFT	(4) CFT Score	(5) First Class CFT
Male w/in 5 lbs of weight limit before policy change	-2.755***	0.264	-0.007*	-2.546***	-0.026***
	(0.081)	(0.144)	(0.003)	(0.147)	(0.003)
Male 1-5 lbs over before policy change	-0.586**	-1.254***	-0.022***	-1.966***	-0.016**
	(0.193)	(0.307)	(0.006)	(0.318)	(0.005)
Male 6 lbs and over weight limit before policy change	0.854***	-2.493***	-0.050***	-4.934***	-0.050***
	(0.116)	(0.187)	(0.004)	(0.191)	(0.003)
Outcome mean	173.40	256.14	0.78	289.11	1.00
R-squared	0.840	0.689	0.571	0.628	0.352
N	9288389	1017349	766468	1019202	795921

Data from Total Force Data Warehouse (TFDW)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

See Chapter III for discussion on data source and methods.

The regression results for weight were statistically significant, which means that there is a difference in weight relative to males Well Within Standards in 2016. Males within the Danger Zone category lost 3 pounds relative to males Well Within Standards. While males within the Moderately Overweight category lost .6 pounds on average relative to males Well Within Standards. Males in the Overweight High category gained .8 pounds on average relative to males Well Within Standards. The males in the Danger Zone and Moderately Overweight category lost weight with no policy change related to weight. From this result I can infer that if all else is held equal, Marines will generally lose weight to remain within weight requirements.

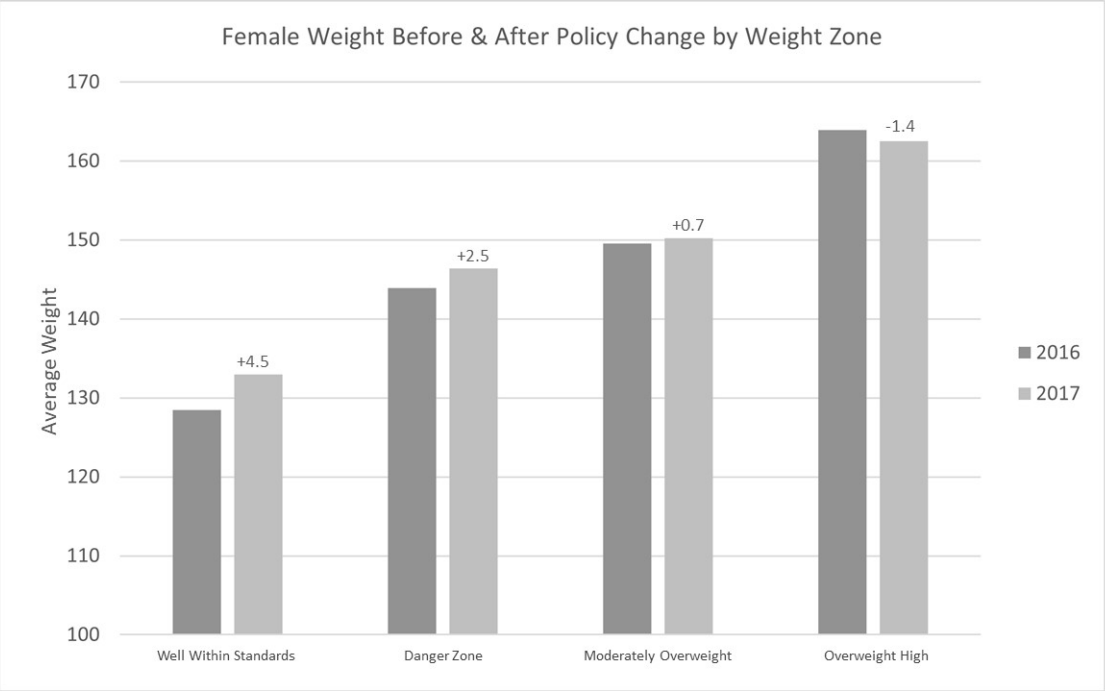
The regression results for the PFT were statistically significant for the Moderately Overweight and Overweight High categories. For the Moderately Overweight category, they lost 1.3 points on the PFT relative to males Well Within Standards in 2016. However, given an outcome mean of 256, a loss of 1.3 points still equates to a first-class score. The regression results for the First-Class PFT scores showed very little movement downward. Given a range from .07 to 5.0 percentage points, relative to those Well Within Standards in 2016, these results are not considered practically significant given an outcome mean of .78.

The regression results for the CFT scores were statistically significant, but much like the PFT scores, they are not practically significant when placed in context with the outcome mean of 289. A 2–5 point decrease in score still equates to a first-class score for the weight categories relative to males within standards in 2016.

3. Average Effect of Policy Change on Weight from 2016 to 2017

To gain a more complete picture of the effects of the regression analysis, I evaluated the averages to test how much each group changed after the policy was implemented. Overall, when women were allowed to gain 4–8 pounds on average, they gained weight and remained within standards. When men were not affected by policy change, they gained weight within the standards, except for those in the Moderately Overweight category. This indicates that when women were afforded more leniency in the weight policy, they remained within standards while gaining some weight on average. Figure 5 depicts the average weight of

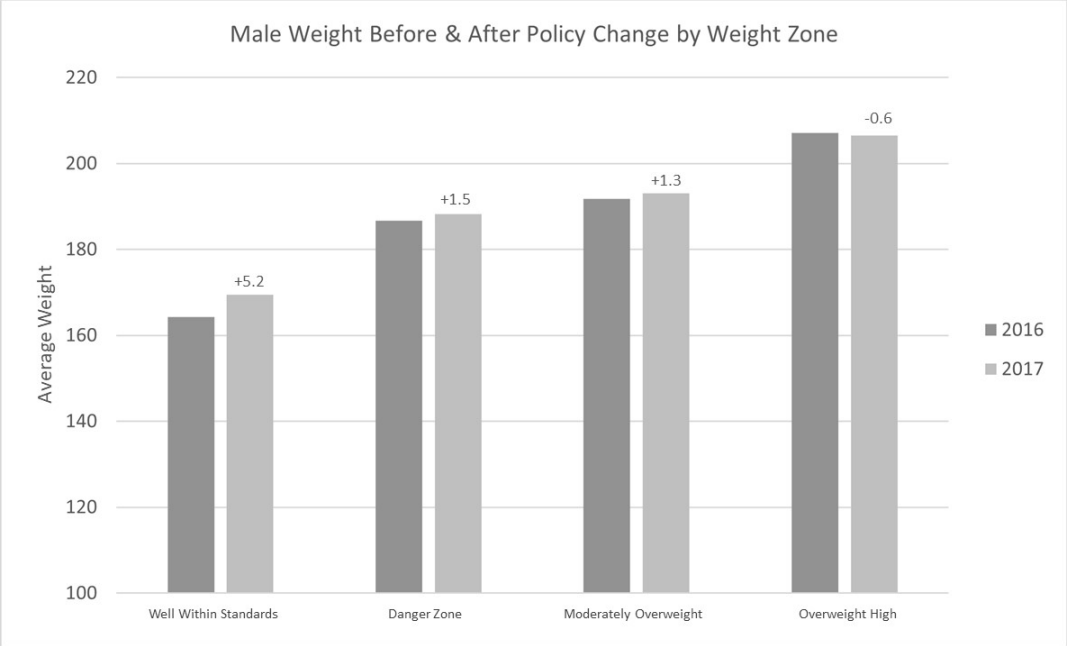
females before and after policy change by weight zone, and Figure 6 depicts the average weight of males before and after policy change by weight zone.



See Chapter III for discussion on data source and methods.

Note: Well Within Standards indicates Marines 6+ pounds below the maximum weight in 2016; Danger Zone indicates Marines who were 0–5 pounds below the maximum weight in 2016; Moderately Overweight indicates Marines who were 1–5 pounds over the maximum weight in 2016; Overweight High indicates Marines who were 6+ pounds over the maximum weight in 2016.

Figure 5. Female Average Weight Before and After Policy Change by Weight Zone



See Chapter III for discussion on data source and methods.

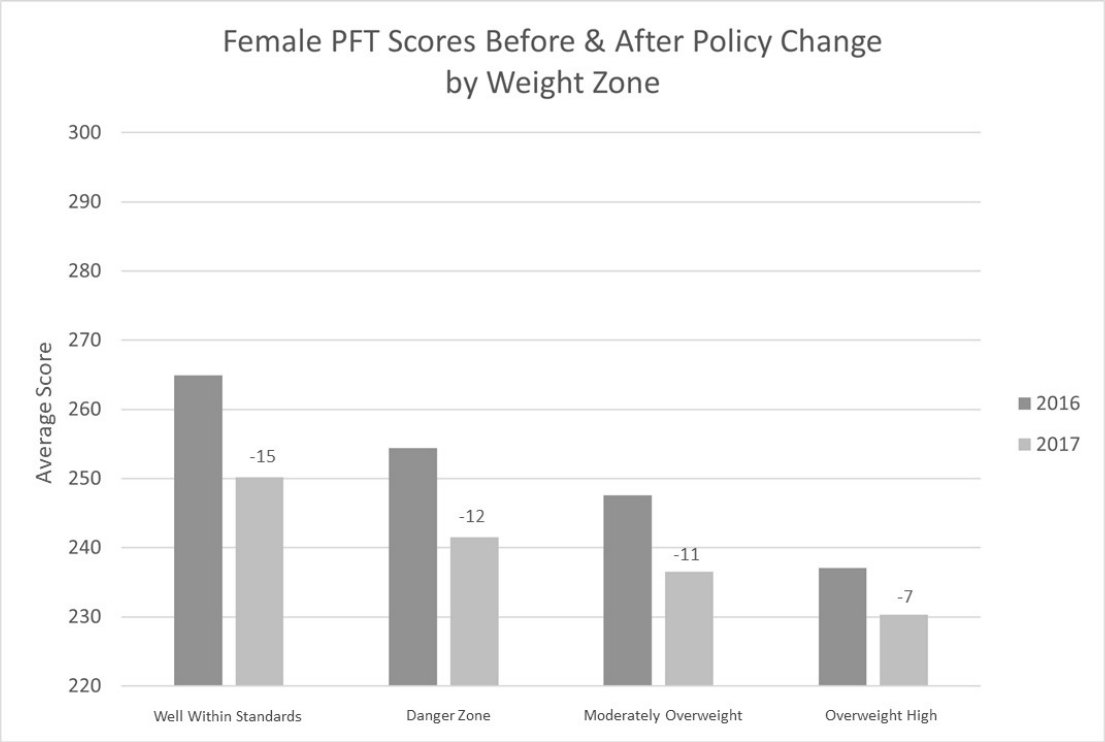
Note: Well Within Standards indicates Marines 6+ pounds below the maximum weight in 2016; Danger Zone indicates Marines who were 0–5 pounds below the maximum weight in 2016; Moderately Overweight indicates Marines who were 1–5 pounds over the maximum weight in 2016; Overweight High indicates Marines who were 6+ pounds over the maximum weight in 2016.

Figure 6. Male Average Weight Before and After Policy Change by Weight Zone

4. Average Effect of Policy Change on Performance from 2016 to 2017

The scores for male and female Marines decreased, presumably due to the increase in physical standards requirements to achieve a first-class score and the overall increase in scoring requirements for the individual events of the PFT and CFT. For the PFT, females Well Within Standards were affected to a greater degree than those close to the maximum weight and over the maximum weight within their PFT average score. The percentage of females who did not achieve a first-class PFT score was greater than the males across the weight zone categories, with the greatest difference found in the female Well Within Standards category. The overall drop in first-class scores was 16 percentage points for females Well Within Standards. For male PFT scores, there was also a general trend of lower scores, however, to a lesser degree. Placed within context of the addition of pull-ups for females and the increase in crunches required, this was not surprising, as it would take time for females to normalize to this new

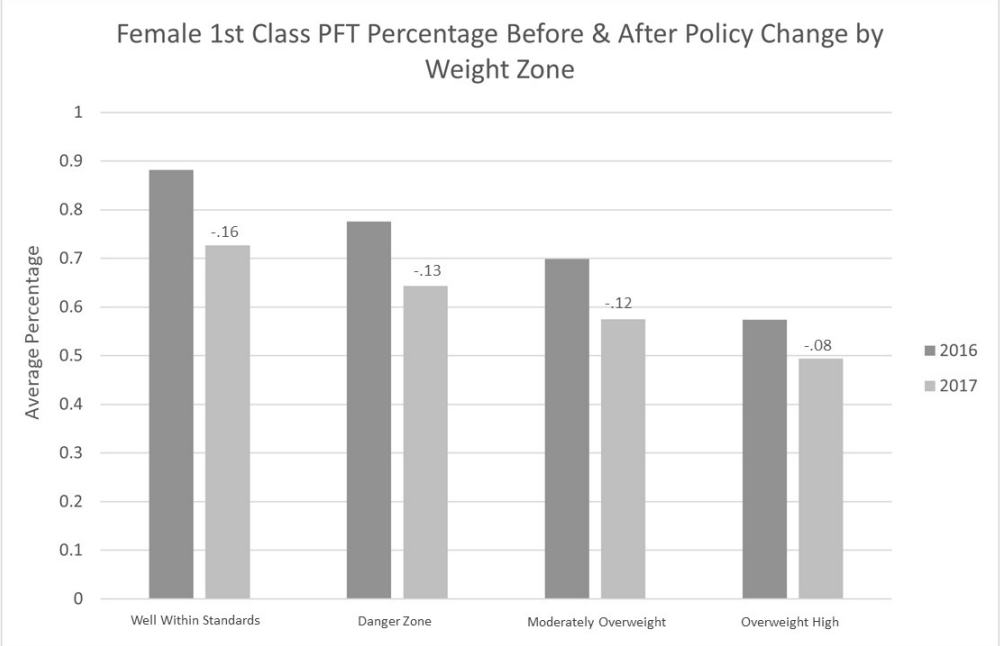
standard. Lower scores for males are likely associated with increased difficulty of achieving a maximum score and with the increase in pull-ups and crunches required. Figure 7 depicts the average PFT score of females before and after policy change by weight zone, Figure 8 depicts the female First-Class PFT Average before and after policy change by weight zone; Figure 9 depicts the average PFT score of males before and after policy change by weight zone; and Figure 10 depicts the male First-Class PFT Average before and after policy change by weight zone.



See Chapter III for discussion on data source and methods.

Note: Well Within Standards indicates Marines 6+ pounds below the maximum weight in 2016; Danger Zone indicates Marines who were 0–5 pounds below the maximum weight in 2016; Moderately Overweight indicates Marines who were 1–5 pounds over the maximum weight in 2016; Overweight High indicates Marines who were 6+ pounds over the maximum weight in 2016.

Figure 7. Female Average PFT Scores Before and After Policy Change by Weight Zone

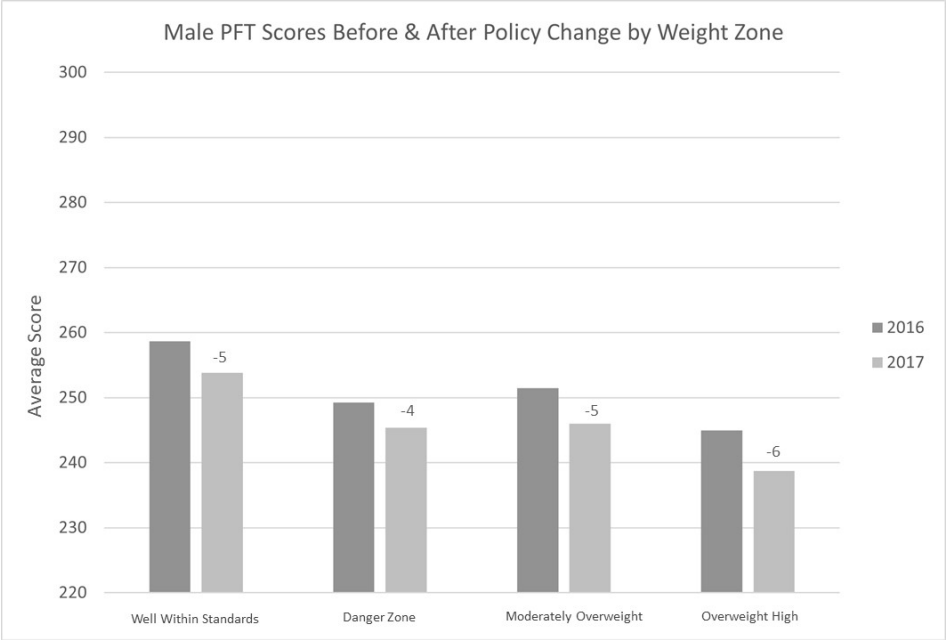


See Chapter III for discussion on data source and methods.

Note: Well Within Standards indicates Marines 6+ pounds below the maximum weight in 2016; Danger Zone indicates Marines who were 0–5 pounds below the maximum weight in 2016; Moderately Overweight indicates Marines who were 1–5 pounds over the maximum weight in 2016; Overweight High indicates Marines who were 6+ pounds over the maximum weight in 2016.

Figure 8. Female First-Class PFT Average Percentage Before and After Policy Change by Weight Zone

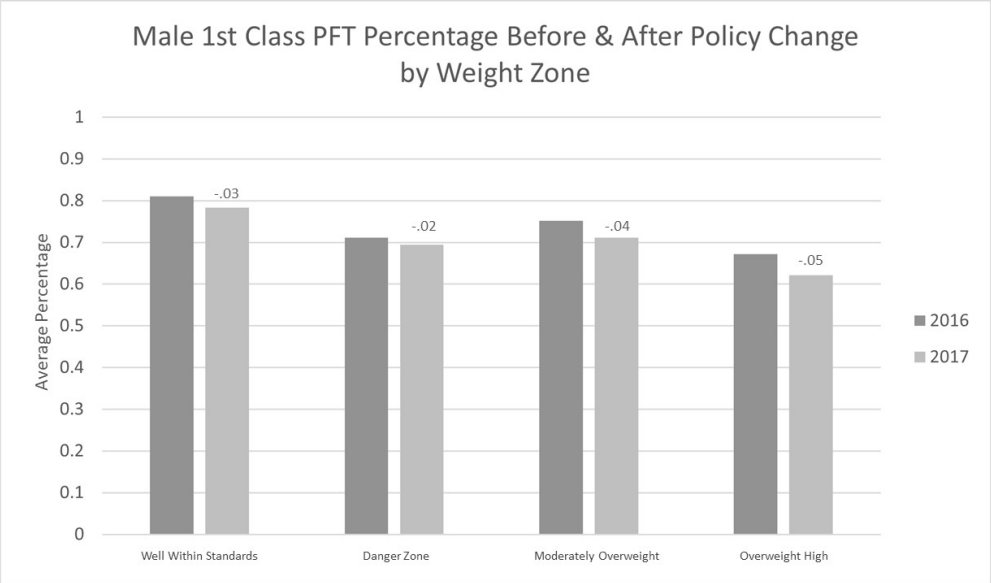
Note: Well Within Standards indicates Marines 6+ pounds below the maximum weight in 2016; Danger Zone indicates Marines who were 0–5 pounds below the maximum weight in 2016; Moderately Overweight indicates Marines who were 1–5 pounds over the maximum weight in 2016; Overweight High indicates Marines who were 6+ pounds over the maximum weight in 2016.



See Chapter III for discussion on data source and methods.

Note: Well Within Standards indicates Marines 6+ pounds below the maximum weight in 2016; Danger Zone indicates Marines who were 0–5 pounds below the maximum weight in 2016; Moderately Overweight indicates Marines who were 1–5 pounds over the maximum weight in 2016; Overweight High indicates Marines who were 6+ pounds over the maximum weight in 2016.

Figure 9. Male Average PFT Scores Before and After Policy Change by Weight Zone

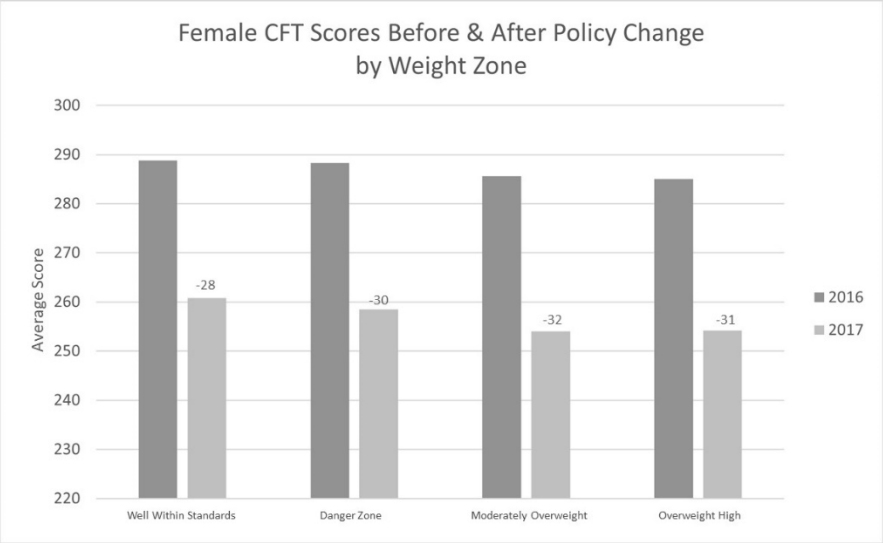


See Chapter III for discussion on data source and methods.

Note: Well Within Standards indicates Marines 6+ pounds below the maximum weight in 2016; Danger Zone indicates Marines who were 0–5 pounds below the maximum weight in 2016; Moderately Overweight indicates Marines who were 1–5 pounds over the maximum weight in 2016; Overweight High indicates Marines who were 6+ pounds over the maximum weight in 2016.

Figure 10. Male First-Class PFT Average Percentage Before and After Policy Change by Weight Zone

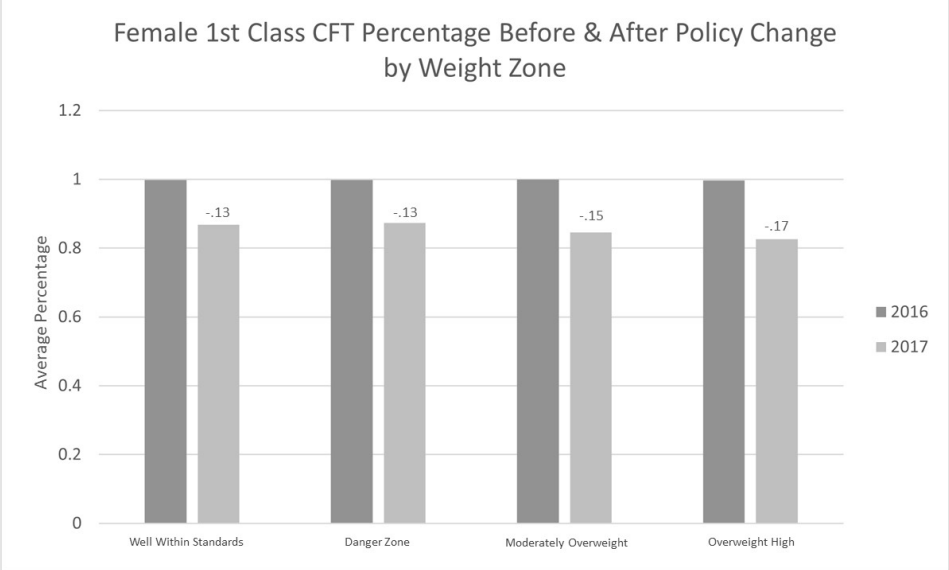
Overall, the weight zone categories were similarly characterized by a significant drop in score on the CFT. Females dropped 28–32 points across the weight zone categories, and males dropped 26–31 points across the weight zone categories. The percentage of Marines who did not achieve a first-class CFT score was relatively consistent across the weight zone categories, from 11–17 percentage points. Placed within context of the increase in scoring requirements for all the CFT individual events, this result is not surprising. Figure 11 depicts the average CFT score of females before and after policy change by weight zone; Figure 12 depicts the female first-class CFT Average before and after policy change by weight zone; Figure 13 depicts the average CFT score of males before and after policy change by weight zone; and Figure 14 depicts the male first-class CFT average before and after policy change by weight zone.



See Chapter III for discussion on data source and methods.

Note: Well Within Standards indicates Marines 6+ pounds below the maximum weight in 2016; Danger Zone indicates Marines who were 0–5 pounds below the maximum weight in 2016; Moderately Overweight indicates Marines who were 1–5 pounds over the maximum weight in 2016; Overweight High indicates Marines who were 6+ pounds over the maximum weight in 2016.

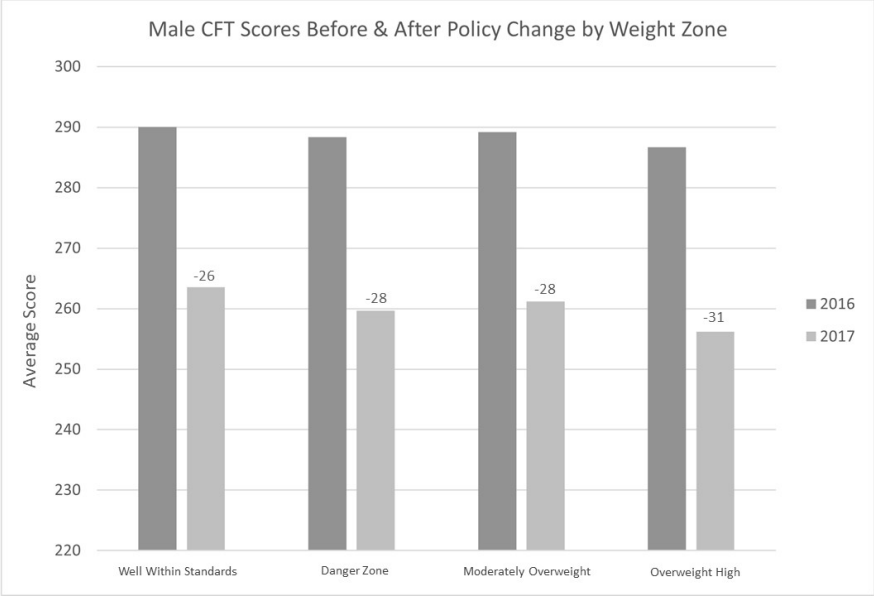
Figure 11. Female Average CFT Scores Before and After Policy Change by Weight Zone



See Chapter III for discussion on data source and methods.

Note: Well Within Standards indicates Marines 6+ pounds below the maximum weight in 2016; Danger Zone indicates Marines who were 0–5 pounds below the maximum weight in 2016; Moderately Overweight indicates Marines who were 1–5 pounds over the maximum weight in 2016; Overweight High indicates Marines who were 6+ pounds over the maximum weight in 2016.

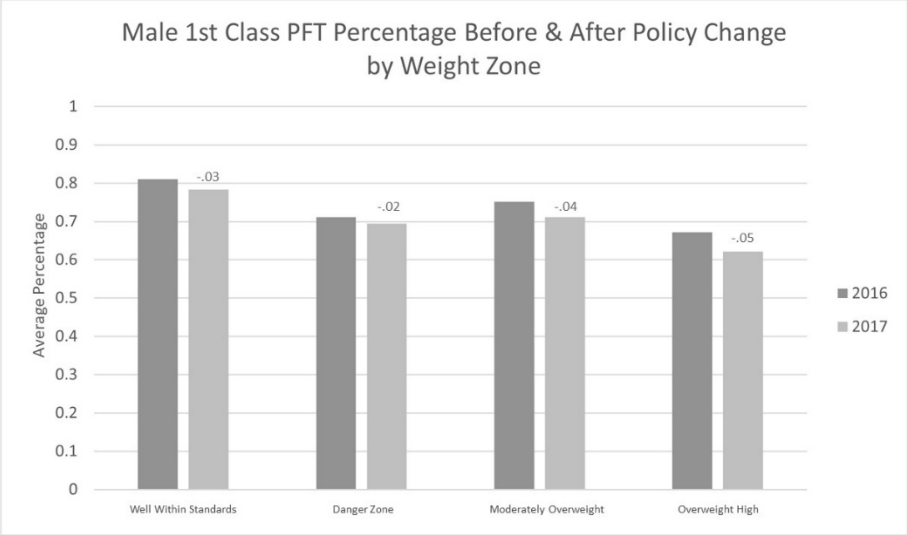
Figure 12. Female First-Class Average Percentage Before and After Policy Change by Weight Zone



See Chapter III for discussion on data source and methods.

Note: Well Within Standards indicates Marines 6+ pounds below the maximum weight in 2016; Danger Zone indicates Marines who were 0–5 pounds below the maximum weight in 2016; Moderately Overweight indicates Marines who were 1–5 pounds over the maximum weight in 2016; Overweight High indicates Marines who were 6+ pounds over the maximum weight in 2016.

Figure 13. Male Average CFT Scores Before and After Policy Change by Weight Zone



See Chapter III for discussion on data source and methods.

Note: Well Within Standards indicates Marines 6+ pounds below the maximum weight in 2016; Danger Zone indicates Marines who were 0–5 pounds below the maximum weight in 2016; Moderately Overweight indicates Marines who were 1–5 pounds over the maximum weight in 2016; Overweight High indicates Marines who were 6+ pounds over the maximum weight in 2016.

Figure 14. Male First-Class CFT Average Percentage Before and After Policy Change by Weight Zone

5. Effect on Individual Physical Fitness Events for Marines from 2016 to 2017

In an effort to avoid some of the problems associated with the PFT and CFT renorming, I build regression models where the response variable is the individual's performance on a single event. The models were applied to males and females separately. Table 5 depicts the results of the regressions for females and Table 6 depicts the results of the regressions for males.

Female performance in pull-ups across the weight zones is statistically significant and decreases by approximately 1 pull-up relative to females Well Within Standards in 2016 across the weight zones, except for those females who are in the Overweight High category for whom it decreased by approximately 2 pull-ups. Given an outcome mean of 9, a decrease of 1 pull-up equates to a loss of 5 points, which is not practically significant, and a decrease of 2 pull-ups equates to a loss of 10 points, which can be considered practically significant given the loss in total points. Female run time across the weight zones is statistically

significant and increases across the weight zones. Given an outcome mean of 25 minutes and 30 seconds and an increase of 6 seconds for females in the Danger Zone category, an increase of 13 seconds for females Moderately Overweight, and increase of 28 seconds for females in the Overweight High category, relative to females Well Within Standards in 2016, these results are not practically significant as they equate to a 1–3 point difference in score at most.

Female CFT scores relative to the weight zone categories show a negative correlation for the ammo can lifts; however, these results are not practically significant given that the greatest decrease seen is in one unit of an ammo can lift, which equates to a 1-point difference at most. The movement to contact and maneuver under fire scores do not vary significantly across the weight zone categories, with the greatest increase in score for the Overweigh High category with a result indicating an increase in 4 seconds in the movement to contact relative to females Well Within Standards in 2016. Given an outcome mean of 3 minutes 59 seconds for the movement to contact, an increase from 1–4 seconds is not practically significant as it equates to a 2-point difference at most. Given an outcome mean of 3 minutes and 25 seconds for the maneuver under fire, an increase from 1–3 seconds is not practically significant as it equates to a 2-point difference at most.

Male performance in pull-ups across the weight zones is statistically significant for males in the Danger Zone and Overweight High weight zone categories and decreases by approximately .4 pull-ups relative to males Well Within Standards in 2016. Given an outcome mean of 16.7, a decrease of 1 pull-up equates to a loss of 5 points, which is not practically significant. Male run time across the weight zones is statistically significant; males in the Danger Zone category run 10.58 seconds faster, and males in the Moderately Overweight and Overweight High categories increase their run time by 6.4 seconds relative to males Well Within Standards in 2016. Given an outcome mean of 22 minutes and 28 seconds and a decrease of 10.58 seconds or increase of 6.4 seconds, these results are not practically significant as they equate to a 1 point difference in score at most.

Male CFT scores relative to the weight zone categories show a positive correlation for the ammo can lifts; however these results are not practically significant given that the greatest increase seen is in two units of an ammo can lifts for the Overweight High category, which equates to a 2 point difference at most. The movement to contact and maneuver under fire

scores do not vary significantly across the weight zone categories, with the greatest increase in score for the Overweight High category in both events with a result indicating an increase of 2 seconds relative to males Well Within Standards in 2016. Given an outcome mean of 3 minutes 34 seconds for the movement to contact, an increase of 1–2 seconds is not practically significant as it equates to a 2 point difference at most. Given an outcome mean of 2 minutes 45 seconds for the maneuver under fire, an increase from 1–2 seconds is not practically significant as it equates to a 2 point difference at most.

Overall, there is no evidence that weight alone caused differences in performance. Although some results are statistically significant, they are not practically significant. The policy change to allow women to gain 4–8 pounds on average offers relief which is a positive outcome with barely noticeable lower performance that results from multiple changes in physical fitness requirements. Evaluated in context with the increase in physical performance standards to achieve a first-class PFT and CFT, along with the changes to the individual events, and the overall percentage of Marines that remained within the first-class score category, the results do not indicate causality with weight alone and does not vary significantly across the weight zone categories.

Table 5. Effects on Individual Physical Fitness Events for Female Marines from Various Weight Categories

	(1) PFT Pull-Ups	(2) PFT Crunches	(3) PFT Run	(4) CFT MTC	(5) CFT ACL	(6) CFT MANUF
Female w/in 5 lbs of weight limit before policy change	-0.607**	-0.771***	6.300**	1.222**	-0.981***	0.979*
	(0.190)	(0.233)	(2.260)	(0.386)	(0.267)	(0.454)
Female 1-5 lbs over before policy change	-0.881**	-0.861**	13.323***	1.958***	-0.646*	1.523*
	(0.294)	(0.313)	(3.063)	(0.524)	(0.326)	(0.620)
Female 6 lbs and over weight limit before policy change	-1.723***	-2.341***	27.696***	3.689***	-0.357	3.096**
	(0.514)	(0.539)	(4.699)	(0.869)	(1.028)	(1.020)
Outcome mean	9.29	94.98	1517.57	215.58	63.16	195.02
R-squared	0.736	0.499	0.704	0.634	0.472	0.574
N	27077	79891	79689	81477	81490	81476

Data from Total Force Data Warehouse (TFDW)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

See Chapter III for discussion on data source and methods.

Note: Pull-ups, crunches, and ammo can lift are measured by individual units. Run, Movement to Contact (MTC), and Maneuver Under Fire (MANUF) are measured in seconds.

Table 6. Effects on Individual Physical Fitness Events for Male Marines from Various Weight Categories

	(1) PFT Pull-Ups	(2) PFT Crunches	(3) PFT Run	(4) CFT MTC	(5) CFT ACL	(6) CFT MANUF
Male w/in 5 lbs of weight limit before policy change	-0.427***	-1.163***	-10.583***	0.669***	-0.631***	1.135***
	(0.021)	(0.054)	(0.666)	(0.094)	(0.070)	(0.099)
Male 1-5 lbs over before policy change	-0.030	-0.291**	6.439***	1.185***	-0.258*	0.517*
	(0.047)	(0.112)	(1.504)	(0.209)	(0.129)	(0.220)
Male 6 lbs and over weight limit before policy change	-0.455***	-1.273***	6.458***	2.024***	-0.568***	1.682***
	(0.028)	(0.068)	(0.877)	(0.125)	(0.088)	(0.130)
Outcome mean	16.75	98.59	1336.97	176.93	96.55	146.72
R-squared	0.715	0.600	0.673	0.599	0.563	0.578
N	1010506	1016560	1013579	1019158	1019202	1019146

Data from Total Force Data Warehouse (TFDW)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

See Chapter III for discussion on data source and methods.

Note: Pull-ups, crunches, and ammo can lift are measured by individual units. Run, Movement to Contact (MTC), and Maneuver Under Fire (MANUF) are measured in seconds.

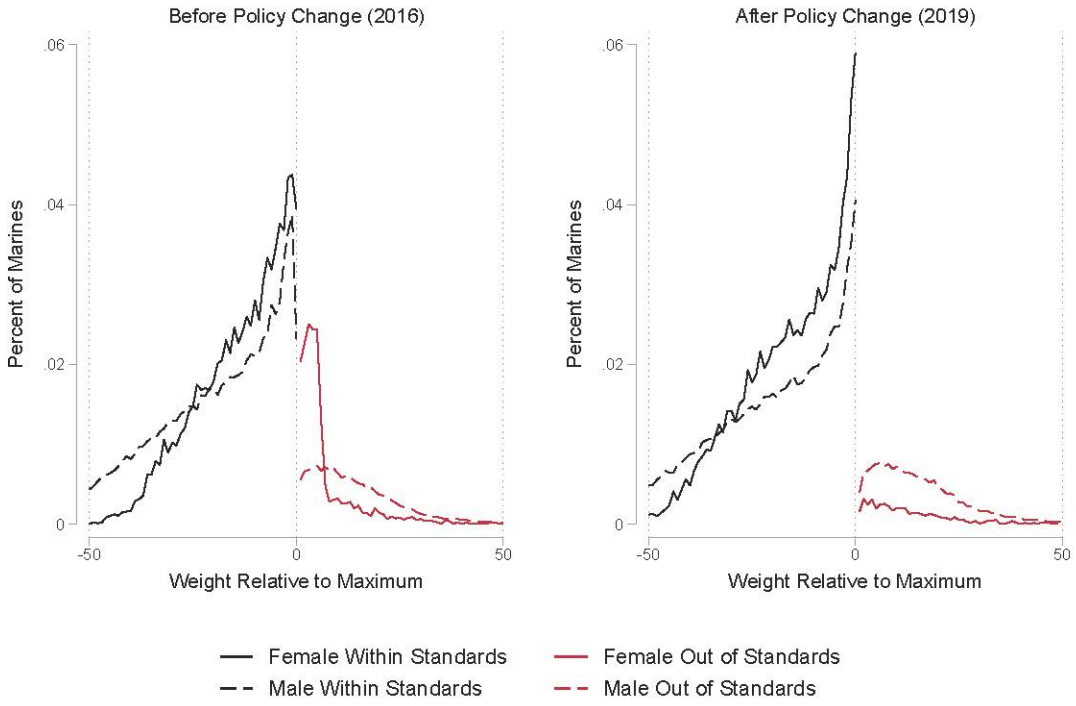
B. POLICY EFFECT ON DISTRIBUTION OF WEIGHT FROM 2016 TO 2019

To determine the policy effect over a longer time-period, while still maintaining a similar population sample, I compared the weight density against the weight maximum from 2016 to 2019. The assumption I operated under is that policy change takes time to take effect and that female Marines would begin by gaining weight cautiously. I began by creating two separate line plots to depict the Female and Male relative weight by frequency before and after the policy change. I selected 31 December 2016 as the snapshot in time before the policy change given that Marines were advised change would not take effect until 1 January 2017. I selected 31 December 2019 as the snapshot in time after the policy change, as it would provide enough time to allow Marines to normalize given the new policy. Figure 15 depicts the relationship between Marine weight and the policy change. The graph on the left depicts the relationship prior to the policy change, and the graph on the right depicts the relationship after the policy change.

Figure 15 shows a 10-percentage point drop in females in the 1–5 pounds overweight category, which is approximately 1,540 females. In 2016, 11.7% of female Marines were 1–5 pounds over the maximum weight, but in 2019 1.2% of female Marines were 1–5 pounds over the maximum weight, a change of 10.5 percentage points. There was no significant shift for males from the overweight categories; however, one was not

expected since the policy did not adjust for males. This figure visually depicts that Marines actively manage their weight to stay below the weight threshold. This provides evidence that servicemembers avoid the overweight category, and consequently, the scrutiny of the circumference-based method.

The amount of population density that is concentrated against the weight maximum is notable for both men and women, although women are affected to a greater degree in both graphs. This is a visual depiction of the tendency to adjust one's own weight through available means necessary to avoid the Overweight category and consequently the scrutiny of the circumference-based method and the adverse implications that follow. Additionally, from these graphs, we can ascertain that when women were given more reasonable weight standards, they met them.



See Chapter III for discussion on data source and methods.

Figure 15. Female v. Male Relative Weight by Frequency

C. SUMMARY

I find that on average, females allowed themselves to gain some weight across the weight zone categories; however, I found little association between weight and performance on the PFT and CFT. Although scores generally declined in 2017 relative to 2016, when they are placed in a broader context with the overall decline in scores, the decline in scores is not practically significant, and does not necessarily correlate to weight alone. Scores dropped for all Marines in 2017 and the effect across the weight zones was similar. There is no obvious evidence that allowing more weight harmed physical performance scores; it is somewhat ambiguous as multiple policies changed simultaneously.

When evaluated over time from 2016 to 2019, I find that when women were allowed an additional 4–8 pounds based on their height female Marines gained weight cautiously and the amount of women in the 1–5 pound overweight category dropped by 10.5 percentage points. The results demonstrate that servicemembers actively manage their weight to stay below the weight threshold. This finding provides evidence that servicemembers avoid the overweight category, and consequently, the scrutiny of the circumference-based method. More research should be conducted to determine the extent of the negative health and performance effects that stem from Marines adhering to highly restrictive standards to meet current maximum weight standards.

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V. CONCLUSION AND RECOMMENDATIONS

This research compared the distribution of weight before and after a point in time for various weight zone groups and evaluated how physical fitness scores are impacted by policy given a servicemember's previous weight.

A. RESEARCH QUESTIONS

The following were the research questions for analysis:

1. How has the distribution of weight changed from before to after the policy changes announced by the Commandant of the Marine Corps in 2016 for various Marine weight zone groups?
2. How did the policy change and increase in scoring standards for physical fitness tests affect the weight, PFT scores, and CFT scores in subsequent years for Marines operating at various weight zone groups, given their 2016 weight?

B. CONCLUSIONS

Given less restrictive weight standards, Marines will meet them without compromising performance and Marines will gain weight cautiously. Marines responded to policy by adjusting their weight to avoid the overweight category and the scrutiny of the circumference-based method. The implication is that it is not known how many Marines struggle to maintain their weight below the maximum and what they must do to adhere to standards, but this thesis found that there is a significant population that exists near the weight maximum danger zone.

C. RECOMMENDATIONS

As of March 10, 2022 and upon the conclusion of this thesis, the DOD released an updated version of its Physical Fitness/Body Composition Program Instruction (DODI 1308.3). This update signals that the DOD is providing space for change in current Body Composition and Physical Fitness policies. Given this latitude for change, the Marine

Corps should lead the way and seek to build a program that emphasizes a culture of fitness and strength over a culture that values a slim and trim appearance.

The update eliminated some of the more restrictive language to allow the services more flexibility in the development of their body composition and physical fitness programs in line with operational requirements and it emphasizes the need to reduce fitness-related musculoskeletal injuries (Department of Defense, 2022). Notably, the update eliminated the language that limited the services ability to measure body fat using only the circumference-based method, stating that "body composition may be evaluated using either BF calculations, waist-to-height ratio, abdominal circumference, height-weight screening, or any combination thereof (Department of Defense, 2022, p. 9)." Additionally, the update states that services may implement policies that "exempt personnel from negative consequences of exceeding body fat (BF) standards if high scores on physical fitness tests are attained (Department of Defense, 2022, p. 8)." Furthermore, the updated instruction states that the services should "promote physical training and exercise in a manner that minimizes scientifically-recognized risks of injury or other adverse health outcomes such as poor nutrition fitness or fatigue (Department of Defense, 2022, p. 8)." The update continues to mandate the use of BMI as the primary metric to measure body fat.

Given the information presented in this thesis and the updated guidance from the DOD, there are many recommendations that the Marine Corps could pursue to increase the strength and resilience of the force and develop a more accurate and effective body composition program that balances health and mission requirements. I will present a few for consideration.

The Marine Corps could explore policy to incentivize performance to address the issues with the body composition program in the short-term by extending the body composition exemption beyond a score of 285 on the PFT and CFT. When the Marine Corps made the decision to exempt Marines who scored 285 on the PFT and CFT from height and weight limits, this was a performance-based incentive that benefitted approximately 2% of Marines in 2019. This concession could be extended to Marines who achieve a 270 and above, 260 and above, or 250 and above, depending on the desired

outcome. In 2019, 7% of Marines could have been exempted from height and weight limits with a 270 and above on the PFT/CFT. If this decision had been extended to 260 and above on the PFT/CFT, 11% of Marines would have qualified. If the requirement had been extended to Marines who scored 250 and above on the PFT/CFT, 15% of Marines would have qualified for the exemption. Extending the exemption to Marines who score within 20–30 points of the current standard could incentivize more Marines to achieve a higher score than they would otherwise on the PFT and CFT. This would allow Marines to focus on their fitness without the limitations imposed by body composition standards.

In the long-term, the Marine Corps should take this opportunity to reevaluate the purpose, usefulness, and effectiveness of the current body composition program. If the Marine Corps will continue to use body composition measurement, it should eliminate the use of the circumference-based method and invest in a more accurate method of measuring body composition that accurately accounts for the physiological differences among gender, ethnicity, and the difference between muscle and fat.

Given the information in this study and the forthcoming recommendations from the anthropometric study that is underway, the Marine Corps should set standards that are scientifically-based, less restrictive, less appearance-based, and more focused on strength, performance, health, and capability. Marines are compelled to comply with orders and standards; there are unintended hidden consequences. Marines should receive the most accurate, effective, and updated standards to better enable them to meet mission requirements.

D. SUGGESTIONS FOR FURTHER RESEARCH

Future studies could run regressions using the next few years out to determine how variable the results are from year to year. In this study the re-norming of the PFT and CFT caused scores to go down, although not to levels that were overall practically significant. These regressions could also be used to examine the impacts of the COVID-19 pandemic on physical performance scores across the weight zone categories. Further research to assess the policy impacts of ALMAR 022/16 on retention would provide more granularity on policy impacts and would ideally include adequate data 3–4 years before and after the

policy impacts. Additionally, further study on the prevalence of eating disorders and disordered eating in the Marine Corps could provide much needed information on current impacts of body composition policy. More research should be conducted to determine the extent of the negative health and performance effects that stem from Marines adhering to highly restrictive standards to meet current maximum weight standards.

APPENDIX A. VARIABLES AND DESCRIPTIONS

See Chapter III for discussion on data source and methods.

STATA Variable Name	STATA Label
id	Unique Identifer for each Marine
filedate	Date of Record Entry
post	Flags post policy change years greater than 2017
year	Creates the Year Variable
month	Creates the Month Variable
officer	Marine Officer
enlisted	Enlisted Marine
warrant	Warrant Officer
amindian	American Indian/Alaskan Native
asian	Asian
black	Black
pacisl	Hawaiian/Pacific Islander
hisp	Hispanic
white	White
declined	Declined to Respond
female_weight_max	Female Weight Maximum
male_weight_max	Male Weight Maximum
max_weight	Maximum Weight
rel_weight	Weight Relative to Weight Maximum
weight2016	Marine's Weight in 30 Dec 2016, closest to policy change
withinstd	Marine is Coded as Within Standards
female_within_standard	Female 6 or More Lbs in Weight Standard
female_within_standard_2016	Female 6 or More Lbs in Weight Standard Before Policy Change
female_within_standard_2016_post	Female 6 or More Lbs in Weight Standard After Policy Change
female_danger_zone	Female 0-5 Lbs Below the Weight Standard
female_danger_zone_2016	Female 0-5 Lbs Below the Weight Standard Before Policy Change
female_danger_zone_2016_post	Female 0-5 Lbs Below the Weight Standard After Policy Change
female_overweight_mod	Female 1-5 Lbs Over the Weight Standard
female_overweight_mod_2016	Female 1-5 Lbs Over the Weight Standard Before Policy Change
female_overweight_mod_2016_post	Female 1-5 Lbs Over the Weight Standard After Policy Change
female_overweight_high	Female 6 or More Lbs Over the Weight Standard
female_overweight_high_ 2016	Female 6 or More Lbs Over the Weight Standard Before Policy Change
female_overweight_high_2016_post	Female 6 or More Lbs Over the Weight Standard After Policy Change
male_within_standard	Male 6 or More Lbs in Weight Standard
male_within_standard_2016	Male 6 or More Lbs in Weight Standard Before Policy Change
male_within_standard_2016_post	Male 6 or More Lbs in Weight Standard After Policy Change
male_danger_zone	Male 0-5 Lbs Below the Weight Standard
male_danger_zone_2016	Male 0-5 Lbs Below the Weight Standard Before Policy Change
male_danger_zone_2016_post	Male 0-5 Lbs Below the Weight Standard After Policy Change
male_overweight_mod	Male 1-5 Lbs Over the Weight Standard
male_overweight_mod_2016	Male 1-5 Lbs Over the Weight Standard Before Policy Change
male_overweight_mod_2016_post	Male 1-5 Lbs Over the Weight Standard After Policy Change
male_overweight_high	Male 6 or More Lbs Over the Weight Standard
male_overweight_high_ 2016	Male 6 or More Lbs Over the Weight Standard Before Policy Change
male_overweight_high_2016_post	Male 6 or More Lbs Over the Weight Standard After Policy Change
group	Creates 4 Groups for Each Weight Zone Category Based on 2016
both	Sample population and Weight in Dec 2016 and Dec 2017
seeboth	Sum of Sample Population and Weight in Dec 2016 and Dec 2017

PFTScore	PFT Score
PFTClass	PFT Class
PullUps	Pull-Ups
Crunches	Crunches
Run_Min	Running Score in Minutes
Run_Sec	Running Score in Seconds
CFTScore	CFT Score
CFTClass	CFT Class
ACL	Ammo Can Lift Score
MTC_min	MTC Score in Minutes
MTC_sec	MTC Score in Seconds
MANUF_min	MANUF Score in Minutes
MANUF_sec	MANUF Score in Seconds
high_pft	PFT Score of 285 and Above
high_pft_2019	PFT Score of 285 and Above in 2019
pft_270_above	PFT Score of 270-284
pft_270_above_2019	PFT Score of 270-284 in 2019
pft_260_above	PFT Score of 260-269
pft_260_above_2019	PFT Score of 260-269 in 2019
pft_250_above	PFT Score of 250-259
pft_250_above_2019	PFT Score of 250-259 in 2019
high_cft	CFT Score of 285 and Above
high_cft_2019	CFT Score of 285 and Above in 2019
cft_270_above	CFT Score of 270-284
cft_270_above_2019	CFT Score of 270-284 in 2019
cft_260_above	CFT Score of 260-269
cft_260_above_2019	CFT Score of 260-269 in 2019
cft_250_above	CFT Score of 250-259
cft_250_above_2019	CFT Score of 250-259 in 2019
n	Limits the Number of Observations for One Marine
highboth	PFT and CFT Above 285 in 2019
both270	PFT and CFT above 270 in 2019
both260	PFT and CFT Above 260 in 2019
both250	PFT and CFT Above 250 in 2019

APPENDIX B. USMC WEIGHT STANDARDS TABLES

Table 7. Manual of the Medical Department, U.S. Navy, Weight Standards for all categories of women. Source: Headquarters, United States Marine Corps (1963).

MANUAL OF THE MEDICAL DEPARTMENT, U.S. NAVY

Weight standards for all categories of women

Height (Inches)	Weight according to age and heignt													
	18-19		20-25		26-30		31-35		36-40		41-45		46-49	
	Min.	Std.	Min.	Std.	Min.	Std.	Min.	Std.	Min.	Std.	Min.	Std.	Min.	Std.
58.....	97	105	100	108	100	111	100	114	103	117	105	120	107	122
59.....	100	108	103	111	103	114	103	117	105	120	108	123	110	125
60.....	102	111	105	114	105	117	105	120	108	123	111	126	113	128
61.....	102	114	105	117	105	120	108	123	111	126	114	129	116	131
62.....	102	117	105	120	108	123	111	126	114	129	117	132	119	134
63.....	105	120	108	123	111	126	114	129	117	132	120	135	122	137
64.....	109	124	112	127	115	130	118	133	121	136	124	139	126	141
65.....	113	128	116	131	119	134	122	137	125	140	128	143	130	145
66.....	117	132	120	135	123	138	126	141	129	144	132	147	134	149
67.....	121	136	124	139	127	142	130	145	133	148	136	151	138	153
68.....	125	140	128	143	131	146	134	149	137	152	140	155	142	157
69.....	129	144	132	147	135	150	138	153	141	156	144	159	146	161
70.....	132	148	136	151	139	154	142	157	145	160	148	163	150	165
71.....	137	152	140	155	143	158	146	161	149	164	152	167	154	169
72.....	141	156	144	159	147	162	150	165	153	168	156	171	158	173

Table 8. Weight for Height Minimum and Maximum Standards, All Officers Excluding Aviators and Enlisted Men. Source: U.S. Department of the Navy (1965).

Height	Minimum	Maximum					
		16-20	21-24	25-30	31-35	36-40	41+
60	100	163	173	173	173	168	164
61	102	171	176	175	175	171	166
62	103	174	178	178	177	173	169
63	104	178	182	181	180	176	171
64	105	183	184	185	185	180	175
65	106	187	190	191	190	185	180
66	107	191	196	197	196	190	185
67	111	196	201	202	201	195	190
68	115	202	207	208	207	201	195
69	119	208	213	214	212	206	200
70	123	214	219	219	218	211	205
71	127	219	224	225	223	216	210
72	131	225	231	232	230	224	216
73	135	231	239	238	237	230	223
74	139	237	246	246	243	236	229
75	143	243	253	253	251	243	235
76	147	248	260	260	257	250	241
77	151	254	267	267	264	256	248
78	153	260	275	273	271	263	254

Table 9. Weight for Height Minimum and Maximum Standards, Aviators. Source: U.S. Department of the Navy (1965).

Height		64	65	66	67	68	69	70	71	72	73	74	75	76	77	78
Weight	Minimum	105	106	107	111	115	119	123	127	131	135	139	143	147	151	153
	Maximum	160	165	170	175	181	186	192	197	203	209	214	219	225	230	235

Table 10. Weight for Height Minimum and Maximum Standards, All Categories of Women. Source: U.S. Department of the Navy (1965).

Height	Minimum Weight	Maximum Weight					
		18-20	21-24	25-30	31-35	36-40	41+
58	90	121	123	126	124	135	135
59	92	123	125	129	126	139	138
60	94	125	127	132	128	142	141
61	96	127	129	135	131	145	141
62	98	129	132	139	132	148	147
63	100	135	136	141	136	151	150
64	102	136	140	144	140	155	154
65	104	140	144	148	145	159	158
66	106	144	149	151	150	164	163
67	109	147	151	156	154	168	167
68	112	152	158	159	159	172	171
69	115	158	160	164	162	176	175
70	118	162	166	168	167	181	180
71	122	168	171	171	171	185	184
72	125	171	176	176	175	189	188

Table 11. Weight for Height Minimum and Maximum Standards, Male Marines. Source: Headquarters, United States Marine Corps (1975).

Height		64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
Weight	Minimum	105	106	107	111	115	119	123	127	131	135	139	143	147	151	153	155	157
	Maximum	160	165	170	175	181	186	192	197	203	209	214	219	225	230	235	241	247

Table 12. Weight for Height Minimum and Maximum Standards, Female Marines. Source: Headquarters, United States Marine Corps (1975).

Height		58	59	60	61	62	63	64	65	66	67	68	69	70	71	72
Weight	Minimum	90	92	94	96	98	100	102	104	106	109	112	115	118	122	125
	Maximum	121	123	125	127	129	135	136	140	144	147	152	158	162	168	171

Table 13. USMC Height and Weight Standards as of 10 May 2002. Source: Headquarters, United States Marine Corps, 2002

MALES

HEIGHT (Inches)	Maximum Standard (Pounds)	Minimum Standard (Pounds)
58"	132	91
59"	136	94
60"	141	97
61"	146	100
62"	150	104
63"	155	107
64"	160	110
65"	165	114
66"	170	117
67"	176	121
68"	181	125
69"	186	128
70"	192	132
71"	197	136
72"	203	140
73"	208	144
74"	214	148
75"	220	152
76"	226	156
77"	232	160
78"	238	164
79"	244	168
80"	250	173

Max BF%: 18%

FEMALES

HEIGHT (Inches)	Maximum Standard (Pounds)	Minimum Standard (Pounds)
58"	120	91
59"	124	94
60"	128	97
61"	132	100
62"	137	104
63"	141	107
64"	146	110
65"	150	114
66"	155	117
67"	160	121
68"	164	125
69"	169	128
70"	174	132
71"	179	136
72"	184	140
73"	189	144
74"	195	148
75"	200	152
76"	205	156
77"	211	160
78"	216	164
79"	222	168
80"	228	173

Max BF%: 26%

Table 14. USMC Height and Weight Standards as of 1 July 2016. Source: United States Marine Corps (2016)

Height / Weight Standards (effective 1 July 2016)

Height (inches)	Minimum Weight	Maximum Weight	
	Male/Female	Male	Female
56	85	122	115
57	88	127	120
58	91	131	124
59	94	136	129
60	97	141	133
61	100	145	137
62	104	150	142
63	107	155	146
64	110	160	151
65	114	165	156
66	117	170	161
67	121	175	166
68	125	180	171
69	128	186	176
70	132	191	181
71	136	197	186
72	140	202	191
73	144	208	197
74	148	214	202
75	152	220	208
76	156	225	213
77	160	231	219
78	164	237	225
79	168	244	230
80	173	250	236
81	177	256	242
82	182	263	248

Marine Corps Body Composition Standards		
Age Group	Percent Body Fat	
	Males	Females
17-20	18	26
21-25	18	26
26-30	19	27
31-35	19	27
36-40	20	28
41-45	20	28
46-50	21	29
51+	21	29

Implementation guidance: These standards took effect on 1 July 2016. All Marines assigned to BCP, in the process of BCP assignment or administrative discharge due to BCP failure on 1 July will be re-evaluated immediately by their units. If Marines meet the new standards, they will be removed from BCP and any BCP assignment / discharge procedures will end. These standards are not retroactive. Previous BCP assignments and resulting administrative actions remain in effect even if the assignment would not have occurred with the standards that were implemented 1 July 2016.

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APPENDIX C. USMC PHYSICAL FITNESS SCORING TABLES

Table 15. PFT Scoring Table for Female Marines. Source: Headquarters, United States Marine Corps (2002).

Sec I: FEMALES

Points	Flexed-Arm Hang	Crunches	3-Mile Run
100	70 sec	100	21:00
99		99	21:10
98	69 sec	98	21:20
97		97	21:30
96	68 sec	96	21:40
95		95	21:50
94	67 sec	94	22:00
93		93	22:10
92	66 sec	92	22:20
91		91	22:30
90	65 sec	90	22:40
89		89	22:50
88	64 sec	88	23:00
87		87	23:10
86	63 sec	86	23:20
85		85	23:30
84	62 sec	84	23:40
83		83	23:50
82	61 sec	82	24:00
81		81	24:10
80	60 sec	80	24:20
79		79	24:30
78	59 sec	78	24:40
77		77	24:50
76	58 sec	76	25:00
75		75	25:10
74	57 sec	74	25:20
73		73	25:30
72	56 sec	72	25:40
71		71	25:50
70	55 sec	70	26:00
69		69	26:10
68	54 sec	68	26:20
67		67	26:30
66	53 sec	66	26:40
65		65	26:50
64	52 sec	64	27:00
63		63	27:10
62	51 sec	62	27:20
61		61	27:30
60	50 sec	60	27:40
59		59	27:50
58	49 sec	58	28:00
57		57	28:10
56	48 sec	56	28:20
55		55	28:30
54	47 sec	54	28:40
53		53	28:50
52	46 sec	52	29:00
51		51	29:10
50	45 sec	50	29:20
49		49	29:30
48	44 sec	48	29:40
47		47	29:50
46	43 sec	46	30:00
45		45	30:10
44	42 sec	44	30:20
43		43	30:30
42	41 sec	42	30:40
41		41	30:50
40	40 sec	40	31:00
39	39 sec	x	31:10
38	38 sec	x	31:20
37	37 sec	x	31:30
36	36 sec	x	31:40
35	35 sec	x	31:50
34	34 sec	x	32:00
33	33 sec	x	32:10
32	32 sec	x	32:20
31	31 sec	x	32:30
30	30 sec	x	32:40
29	29 sec	x	32:50
28	28 sec	x	33:00
27	27 sec	x	33:10
26	26 sec	x	33:20
25	25 sec	x	33:30
24	24 sec	x	33:40
23	23 sec	x	33:50
22	22 sec	x	34:00
21	21 sec	x	34:10
20	20 sec	x	34:20
19	19 sec	x	34:30
18	18 sec	x	34:40
17	17 sec	x	34:50
16	16 sec	x	35:00
15	15 sec	x	35:10
14	x	x	35:20
13	x	x	35:30
12	x	x	35:40
11	x	x	35:50
10	x	x	36:00
9	x	x	x
8	x	x	x
7	x	x	x
6	x	x	x
5	x	x	x
4	x	x	x
3	x	x	x
2	x	x	x
1	x	x	x

*Round up all values (e.g., 21:01 to 21:09 equals 99 points)

Table 16. PFT Scoring Table for Male Marines. Source: Headquarters, United States Marine Corps (2002).

Sec II:	MALES		
Points	Pull-ups	Crunches	3-Mile Run
100	20	100	18:00
99		99	18:10
98		98	18:20
97		97	18:30
96		96	18:40
95	19	95	18:50
94		94	19:00
93		93	19:10
92		92	19:20
91		91	19:30
90	18	90	19:40
89		89	19:50
88		88	20:00
87		87	20:10
86		86	20:20
85	17	85	20:30
84		84	20:40
83		83	20:50
82		82	21:00
81		81	21:10
80	16	80	21:20
79		79	21:30
78		78	21:40
77		77	21:50
76		76	22:00
75	15	75	22:10
74		74	22:20
73		73	22:30
72		72	22:40
71		71	22:50
70	14	70	23:00
69		69	23:10
68		68	23:20
67		67	23:30
66		66	23:40
65	13	65	23:50
64		64	24:00
63		63	24:10
62		62	24:20
61		61	24:30
60	12	60	24:40
59		59	24:50
58		58	25:00
57		57	25:10
56		56	25:20
55	11	55	25:30
54		54	25:40
53		53	25:50
52		52	26:00
51		51	26:10

Points	Pull-ups	Crunches	3-Mile Run
50	10	50	26:20
49		49	26:30
48		48	26:40
47		47	26:50
46		46	27:00
45	9	45	27:10
44		44	27:20
43		43	27:30
42		42	27:40
41		41	27:50
40	8	40	28:00
39		x	28:10
38		x	28:20
37		x	28:30
36		x	28:40
35	7	x	28:50
34		x	29:00
33		x	29:10
32		x	29:20
31		x	29:30
30	6	x	29:40
29		x	29:50
28		x	30:00
27		x	30:10
26		x	30:20
25	5	x	30:30
24		x	30:40
23		x	30:50
22		x	31:00
21		x	31:10
20	4	x	31:20
19		x	31:30
18		x	31:40
17		x	31:50
16		x	32:00
15	3	x	32:10
14	x	x	32:20
13	x	x	32:30
12	x	x	32:40
11	x	x	32:50
10	x	x	33:00
9	x	x	x
8	x	x	x
7	x	x	x
6	x	x	x
5	x	x	x
4	x	x	x
3	x	x	x
2	x	X	x
1	x	x	x

* Round up all values (e.g., 18:01 to 18:09 equals 99 points)

Table 17. The PFT Pull-Up Scoring Table. Source: Headquarters, United States Marine Corps (2018).

	Male Pullups							
	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
Max	20	23	23	23	21	20	19	18
Min	4	5	5	5	5	5	4	3
Max	100	100	100	100	100	100	100	100
Min Pts	40	40	40	40	40	40	40	40
	Male Pull-ups							
Reps	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
23		100	100	100				
22		97	97	97				
21		93	93	93	100			
20	100	90	90	90	96	100		
19	96	87	87	87	93	96	100	
18	93	83	83	83	89	92	96	100
17	89	80	80	80	85	88	92	96
16	85	77	77	77	81	84	88	92
15	81	73	73	73	78	80	84	88
14	78	70	70	70	74	76	80	84
13	74	67	67	67	70	72	76	80
12	70	63	63	63	66	68	72	76
11	66	60	60	60	63	64	68	72
10	63	57	57	57	59	60	64	68
9	59	53	53	53	55	56	60	64
8	55	50	50	50	51	52	56	60
7	51	47	47	47	48	48	52	56
6	48	43	43	43	44	44	48	52
5	44	40	40	40	40	40	44	48
4	40						40	44
3								40

	Female Pullups							
	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
Max	7	11	12	11	10	8	6	4
Min	1	3	4	3	3	2	2	2
Max	100	100	100	100	100	100	100	100
Min Pts	60	60	60	60	60	60	60	60
	Female Pull-ups							
Reps	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
12			100					
11		100	95	100				
10		95	90	95	100			
9		90	85	90	94			
8		85	80	85	89	100		
7	100	80	75	80	83	93		
6	93	75	70	75	77	87	100	
5	87	70	65	70	71	80	90	
4	80	65	60	65	66	73	80	100
3	73	60		60	60	67	70	80
2	67					60	60	60
1	60							

Table 18. PFT Crunches Scoring Table by Gender. Source: Headquarters, United States Marine Corps (2018).

	Male Crunches							
	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
Max	105	110	115	115	110	105	100	100
Min	70	70	70	70	70	65	50	40
Min Pts	40	40	40	40	40	40	40	40

	Male Crunches							
Reps	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
115			100	100				
114			99	99				
113			97	97				
112			96	96				
111			95	95				
110		100	93	93	100			
109		99	92	92	99			
108		97	91	91	97			
107		96	89	89	96			
106		94	88	88	94			
105	100	93	87	87	93	100		
104	98	91	85	85	91	99		
103	97	90	84	84	90	97		
102	95	88	83	83	88	96		
101	93	87	81	81	87	94		
100	91	85	80	80	85	93	100	100
99	90	84	79	79	84	91	99	99
98	88	82	77	77	82	90	98	98
97	86	81	76	76	81	88	96	97
96	85	79	75	75	79	87	95	96
95	83	78	73	73	78	85	94	95
94	81	76	72	72	76	84	93	94
93	79	75	71	71	75	82	92	93
92	78	73	69	69	73	81	90	92
91	76	72	68	68	72	79	89	91
90	74	70	67	67	70	78	88	90
89	73	69	65	65	69	76	87	89
88	71	67	64	64	67	75	86	88
87	69	66	63	63	66	73	84	87
86	67	64	61	61	64	72	83	86
85	66	63	60	60	63	70	82	85
84	64	61	59	59	61	69	81	84
83	62	60	57	57	60	67	80	83
82	61	58	56	56	58	66	78	82
81	59	57	55	55	57	64	77	81
80	57	55	53	53	55	63	76	80

	Female Crunches							
	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
Max	100	105	110	105	105	100	100	100
Min	50	55	60	60	60	55	50	40
Min Pts	40	40	40	40	40	40	40	40

	Female Crunches							
Reps	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
110			100					
109			99					
108			98					
107			96					
106			95					
105		100	94	100	100			
104		99	93	99	99			
103		98	92	97	97			
102		96	90	96	96			
101		95	89	95	95			
100	100	94	88	93	93	100	100	100
99	99	93	87	92	92	99	99	99
98	98	92	86	91	91	97	98	98
97	96	90	84	89	89	96	96	97
96	95	89	83	88	88	95	95	96
95	94	88	82	87	87	93	94	95
94	93	87	81	85	85	92	93	94
93	92	86	80	84	84	91	92	93
92	90	84	78	83	83	89	90	92
91	89	83	77	81	81	88	89	91
90	88	82	76	80	80	87	88	90
89	87	81	75	79	79	85	87	89
88	86	80	74	77	77	84	86	88
87	84	78	72	76	76	83	84	87
86	83	77	71	75	75	81	83	86
85	82	76	70	73	73	80	82	85
84	81	75	69	72	72	79	81	84
83	80	74	68	71	71	77	80	83
82	78	72	66	69	69	76	78	82
81	77	71	65	68	68	75	77	81
80	76	70	64	67	67	73	76	80
79	75	69	63	65	65	72	75	79
78	74	68	62	64	64	71	74	78
77	72	66	60	63	63	69	72	77
76	71	65	59	61	61	68	71	76
75	70	64	58	60	60	67	70	75

Table 19. PFT Run Scoring by Gender. Source: Headquarters, United States Marine Corps (2018).

	Male 3 Mile Run							
	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
Max	18:00	18:00	18:00	18:00	18:00	18:30	19:00	19:30
Min	27:40	27:40	28:00	28:20	28:40	29:20	30:00	33:00
Min Pts	40	40	40	40	40	40	40	40

	Male 3 Mile Run							
Time	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
18:00	100	100	100	100	100			
18:10	99	99	99	99	99			
18:20	98	98	98	98	98			
18:30	97	97	97	97	97	100		
18:40	96	96	96	96	96	99		
18:50	95	95	95	95	95	98		
19:00	94	94	94	94	94	97	100	
19:10	93	93	93	93	93	96	99	
19:20	92	92	92	92	93	95	98	
19:30	91	91	91	91	92	94	97	100
19:40	90	90	90	90	91	94	96	99
19:50	89	89	89	89	90	93	95	99
20:00	88	88	88	88	89	92	95	98
20:10	87	87	87	87	88	91	94	97
20:20	86	86	86	86	87	90	93	96
20:30	84	84	85	85	86	89	92	96
20:40	83	83	84	85	85	88	91	95
20:50	82	82	83	84	84	87	90	94
21:00	81	81	82	83	83	86	89	93
21:10	80	80	81	82	82	85	88	93
21:20	79	79	80	81	81	84	87	92
21:30	78	78	79	80	80	83	86	91
21:40	77	77	78	79	79	82	85	90
21:50	76	76	77	78	78	82	85	90
22:00	75	75	76	77	78	81	84	89
22:10	74	74	75	76	77	80	83	88
22:20	73	73	74	75	76	79	82	87
22:30	72	72	73	74	75	78	81	87
22:40	71	71	72	73	74	77	80	86
22:50	70	70	71	72	73	76	79	85
23:00	69	69	70	71	72	75	78	84
23:10	68	68	69	70	71	74	77	84
23:20	67	67	68	69	70	73	76	83
23:30	66	66	67	68	69	72	75	82
23:40	65	65	66	67	68	71	75	81
23:50	64	64	65	66	67	70	74	81
24:00	63	63	64	65	66	70	73	80
24:10	62	62	63	64	65	69	72	79
24:20	61	61	62	63	64	68	71	79
24:30	60	60	61	62	63	67	70	78
24:40	59	59	60	61	63	66	69	77
24:50	58	58	59	60	62	65	68	76
25:00	57	57	58	59	61	64	67	76

	Female 3 Mile Run							
	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
Max	21:00	21:00	21:00	21:00	21:00	21:30	22:00	22:30
Min	30:50	30:50	31:10	31:30	31:50	32:30	33:30	36:00
Min Pts	40	40	40	40	40	40	40	40

	Female 3 Mile Run							
Time	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
21:00	100	100	100	100	100			
21:10	99	99	99	99	99			
21:20	98	98	98	98	98			
21:30	97	97	97	97	97	100		
21:40	96	96	96	96	96	99		
21:50	95	95	95	95	95	98		
22:00	94	94	94	94	94	97	100	
22:10	93	93	93	93	94	96	99	
22:20	92	92	92	92	93	95	98	
22:30	91	91	91	91	92	95	97	100
22:40	90	90	90	90	91	94	97	99
22:50	89	89	89	90	90	93	96	99
23:00	88	88	88	89	89	92	95	98
23:10	87	87	87	88	88	91	94	97
23:20	86	86	86	87	87	90	93	96
23:30	85	85	85	86	86	89	92	96
23:40	84	84	84	85	85	88	91	95
23:50	83	83	83	84	84	87	90	94
24:00	82	82	82	83	83	86	90	93
24:10	81	81	81	82	82	85	89	93
24:20	80	80	80	81	82	85	88	92
24:30	79	79	79	80	81	84	87	91
24:40	78	78	78	79	80	83	86	90
24:50	77	77	77	78	79	82	85	90
25:00	76	76	76	77	78	81	84	89
25:10	75	75	75	76	77	80	83	88
25:20	74	74	74	75	76	79	83	87
25:30	73	73	73	74	75	78	82	87
25:40	72	72	72	73	74	77	81	86
25:50	71	71	71	72	73	76	80	85
26:00	69	69	70	71	72	75	79	84
26:10	68	68	70	70	71	75	78	84
26:20	67	67	69	70	70	74	77	83
26:30	66	66	68	69	70	73	77	82
26:40	65	65	67	68	69	72	76	81
26:50	64	64	66	67	68	71	75	81
27:00	63	63	65	66	67	70	74	80
27:10	62	62	64	65	66	69	73	79
27:20	61	61	63	64	65	68	72	79
27:30	60	60	62	63	64	67	71	78
27:40	59	59	61	62	63	66	70	77
27:50	58	58	60	61	62	65	70	76
28:00	57	57	59	60	61	65	69	76

Table 20. CFT Movement to Contact Scoring by Gender. Source: Headquarters, United States Marine Corps (2018).

	Male MTC							
Male	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
Max	2:40	2:38	2:39	2:42	2:45	2:52	3:01	3:05
Min	3:45	3:45	3:48	3:51	3:58	4:11	4:28	5:07
Min Pts	40	40	40	40	40	40	40	40
2:38		100						
2:39		99	100					
2:40	100	98	99					
2:41	99	97	98					
2:42	98	96	97	100				
2:43	97	96	97	99				
2:44	96	95	96	98				
2:45	95	94	95	97	100			
2:46	94	93	94	97	99			
2:47	94	92	93	96	98			
2:48	93	91	92	95	98			
2:49	92	90	91	94	97			
2:50	91	89	90	93	96			
2:51	90	88	90	92	95			
2:52	89	87	89	91	94	100		
2:53	88	87	88	90	93	99		
2:54	87	86	87	90	93	98		
2:55	86	85	86	89	92	98		
2:56	85	84	85	88	91	97		
2:57	84	83	84	87	90	96		
2:58	83	82	83	86	89	95		
2:59	82	81	83	85	88	95		
3:00	82	80	82	84	88	94		
3:01	81	79	81	83	87	93	100	
3:02	80	79	80	83	86	92	99	
3:03	79	78	79	82	85	92	99	
3:04	78	77	78	81	84	91	98	
3:05	77	76	77	80	84	90	97	100
3:06	76	75	77	79	83	89	97	99
3:07	75	74	76	78	82	89	96	99
3:08	74	73	75	77	81	88	95	98
3:09	73	72	74	77	80	87	94	98
3:10	72	71	73	76	79	86	94	97
3:11	71	70	72	75	79	86	93	97
3:12	70	70	71	74	78	85	92	96
3:13	70	69	70	73	77	84	92	96
3:14	69	68	70	72	76	83	91	95
3:15	68	67	69	71	75	83	90	95
3:16	67	66	68	70	75	82	90	94
3:17	66	65	67	70	74	81	89	94
3:18	65	64	66	69	73	80	88	93
3:19	64	63	65	68	72	79	88	93
3:20	63	62	64	67	71	79	87	92
3:21	62	61	63	66	70	78	86	92
3:22	61	61	63	65	70	77	86	91

	Female MTC							
Female	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
Max	3:19	3:13	3:10	3:12	3:18	3:25	3:39	3:55
Min	4:36	4:41	4:45	4:46	4:55	4:58	5:26	5:52
Min Pts	40	40	40	40	40	40	40	40
3:10			100					
3:11			99					
3:12			99	100				
3:13		100	98	99				
3:14		99	97	99				
3:15		99	97	98				
3:16		98	96	97				
3:17		97	96	97				
3:18		97	95	96	100			
3:19	100	96	94	96	99			
3:20	99	95	94	95	99			
3:21	98	95	93	94	98			
3:22	98	94	92	94	98			
3:23	97	93	92	93	97			
3:24	96	93	91	92	96			
3:25	95	92	91	92	96	100		
3:26	95	91	90	91	95	99		
3:27	94	90	89	90	94	99		
3:28	93	90	89	90	94	98		
3:29	92	89	88	89	93	97		
3:30	91	88	87	89	93	97		
3:31	91	88	87	88	92	96		
3:32	90	87	86	87	91	95		
3:33	89	86	85	87	91	95		
3:34	88	86	85	86	90	94		
3:35	88	85	84	85	89	94		
3:36	87	84	84	85	89	93		
3:37	86	84	83	84	88	92		
3:38	85	83	82	83	88	92		
3:39	84	82	82	83	87	91	100	
3:40	84	82	81	82	86	90	99	
3:41	83	81	80	81	86	90	99	
3:42	82	80	80	81	85	89	98	
3:43	81	80	79	80	85	88	98	
3:44	81	79	79	80	84	88	97	
3:45	80	78	78	79	83	87	97	
3:46	79	78	77	78	83	86	96	
3:47	78	77	77	78	82	86	96	
3:48	77	76	76	77	81	85	95	
3:49	77	75	75	76	81	85	94	
3:50	76	75	75	76	80	84	94	
3:51	75	74	74	75	80	83	93	
3:52	74	73	73	74	79	83	93	
3:53	74	73	73	74	78	82	92	
3:54	73	72	72	73	78	81	92	

	Male MTC							
Male	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
Max	2:40	2:38	2:39	2:42	2:45	2:52	3:01	3:05
Min	3:45	3:45	3:48	3:51	3:58	4:11	4:28	5:07
Min Pts	40	40	40	40	40	40	40	40
3:23	60	60	62	64	69	76	85	91
3:24	59	59	61	63	68	76	84	90
3:25	58	58	60	63	67	75	83	90
3:26	58	57	59	62	66	74	83	89
3:27	57	56	58	61	65	73	82	89
3:28	56	55	57	60	65	73	81	88
3:29	55	54	57	59	64	72	81	88
3:30	54	53	56	58	63	71	80	87
3:31	53	53	55	57	62	70	79	87
3:32	52	52	54	57	61	70	79	86
3:33	51	51	53	56	61	69	78	86
3:34	50	50	52	55	60	68	77	85
3:35	49	49	51	54	59	67	77	85
3:36	48	48	50	53	58	67	76	85
3:37	47	47	50	52	57	66	75	84
3:38	46	46	49	51	56	65	74	84
3:39	46	45	48	50	56	64	74	83
3:40	45	44	47	50	55	64	73	83
3:41	44	44	46	49	54	63	72	82
3:42	43	43	45	48	53	62	72	82
3:43	42	42	44	47	52	61	71	81
3:44	41	41	43	46	52	61	70	81
3:45	40	40	43	45	51	60	70	80
3:46			42	44	50	59	69	80
3:47			41	43	49	58	68	79
3:48			40	43	48	57	68	79
3:49				42	47	57	67	78
3:50				41	47	56	66	78
3:51				40	46	55	66	77
3:52					45	54	65	77
3:53					44	54	64	76
3:54					43	53	63	76
3:55					42	52	63	75
3:56					42	51	62	75
3:57					41	51	61	74
3:58					40	50	61	74
3:59						49	60	73
4:00						48	59	73
4:01						48	59	72
4:02						47	58	72
4:03						46	57	71
4:04						45	57	71
4:05						45	56	70
4:06						44	55	70
4:07						43	54	70
4:08						42	54	69
4:09						42	53	69
4:10						41	52	68
4:11						40	52	68
4:12							51	67

	Female MTC							
Female	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
Max	3:19	3:13	3:10	3:12	3:18	3:25	3:39	3:55
Min	4:36	4:41	4:45	4:46	4:55	4:58	5:26	5:52
Min Pts	40	40	40	40	40	40	40	40
3:55	72	71	72	73	77	81	91	100
3:56	71	71	71	72	76	80	90	99
3:57	70	70	70	71	76	79	90	99
3:58	70	69	70	71	75	79	89	98
3:59	69	69	69	70	75	78	89	98
4:00	68	68	68	69	74	77	88	97
4:01	67	67	68	69	73	77	88	97
4:02	66	67	67	68	73	76	87	96
4:03	66	66	67	67	72	75	87	96
4:04	65	65	66	67	72	75	86	95
4:05	64	65	65	66	71	74	85	95
4:06	63	64	65	66	70	74	85	94
4:07	63	63	64	65	70	73	84	94
4:08	62	63	63	64	69	72	84	93
4:09	61	62	63	64	68	72	83	93
4:10	60	61	62	63	68	71	83	92
4:11	59	60	61	62	67	70	82	92
4:12	59	60	61	62	67	70	81	91
4:13	58	59	60	61	66	69	81	91
4:14	57	58	60	60	65	68	80	90
4:15	56	58	59	60	65	68	80	90
4:16	56	57	58	59	64	67	79	89
4:17	55	56	58	59	64	66	79	89
4:18	54	56	57	58	63	66	78	88
4:19	53	55	56	57	62	65	78	88
4:20	52	54	56	57	62	65	77	87
4:21	52	54	55	56	61	64	76	87
4:22	51	53	55	55	60	63	76	86
4:23	50	52	54	55	60	63	75	86
4:24	49	52	53	54	59	62	75	85
4:25	49	51	53	53	59	61	74	85
4:26	48	50	52	53	58	61	74	84
4:27	47	50	51	52	57	60	73	84
4:28	46	49	51	51	57	59	73	83
4:29	45	48	50	51	56	59	72	83
4:30	45	48	49	50	55	58	71	82
4:31	44	47	49	50	55	57	71	82
4:32	43	46	48	49	54	57	70	81
4:33	42	45	48	48	54	56	70	81
4:34	42	45	47	48	53	55	69	80
4:35	41	44	46	47	52	55	69	79
4:36	40	43	46	46	52	54	68	79
4:37		43	45	46	51	54	67	78
4:38		42	44	45	51	53	67	78
4:39		41	44	44	50	52	66	77
4:40		41	43	44	49	52	66	77
4:41		40	43	43	49	51	65	76
4:42			42	43	48	50	65	76
4:43			41	42	47	50	64	75
4:44			41	41	47	49	64	75

	Male MTC							
Male	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
Max	2:40	2:38	2:39	2:42	2:45	2:52	3:01	3:05
Min	3:45	3:45	3:48	3:51	3:58	4:11	4:28	5:07
Min Pts	40	40	40	40	40	40	40	40
4:13							50	67
4:14							50	66
4:15							49	66
4:16							48	65
4:17							48	65
4:18							47	64
4:19							46	64
4:20							46	63
4:21							45	63
4:22							44	62
4:23							43	62
4:24							43	61
4:25							42	61
4:26							41	60
4:27							41	60
4:28							40	59
4:29								59
4:30								58
4:31								58
4:32								57
4:33								57
4:34								56
4:35								56
4:36								55
4:37								55
4:38								55
4:39								54
4:40								54
4:41								53
4:42								53
4:43								52
4:44								52
4:45								51
4:46								51
4:47								50
4:48								50
4:49								49
4:50								49
4:51								48
4:52								48
4:53								47
4:54								47
4:55								46
4:56								46
4:57								45
4:58								45
4:59								44
5:00								44
5:01								43

	Female MTC							
Female	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
Max	3:19	3:13	3:10	3:12	3:18	3:25	3:39	3:55
Min	4:36	4:41	4:45	4:46	4:55	4:58	5:26	5:52
Min Pts	40	40	40	40	40	40	40	40
4:45			40	41	46	48	63	74
4:46				40	46	48	62	74
4:47					45	47	62	73
4:48					44	46	61	73
4:49					44	46	61	72
4:50					43	45	60	72
4:51					42	45	60	71
4:52					42	44	59	71
4:53					41	43	59	70
4:54					41	43	58	70
4:55					40	42	57	69
4:56						41	57	69
4:57						41	56	68
4:58						40	56	68
4:59							55	67
5:00							55	67
5:01							54	66
5:02							53	66
5:03							53	65
5:04							52	65
5:05							52	64
5:06							51	64
5:07							51	63
5:08							50	63
5:09							50	62
5:10							49	62
5:11							48	61
5:12							48	61
5:13							47	60
5:14							47	59
5:15							46	59
5:16							46	58
5:17							45	58
5:18							44	57
5:19							44	57
5:20							43	56
5:21							43	56
5:22							42	55
5:23							42	55
5:24							41	54
5:25							41	54
5:26							40	53
5:27								53
5:28								52
5:29								52
5:30								51
5:31								51
5:32								50
5:33								50

Table 21. CFT Ammo Can Lift Scoring by Gender. Source: Headquarters, United States Marine Corps (2018).

	Male ACL							
Male	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
Max	106	115	116	120	110	106	100	95
Min	62	67	67	67	67	66	65	16
Min Pts	40	40	40	40	40	40	40	40
120				100				
119				99				
118				98				
117				97				
116			100	95				
115		100	99	94				
114		99	98	93				
113		98	96	92				
112		96	95	91				
111		95	94	90				
110		94	93	89	100			
109		93	91	88	99			
108		91	90	86	97			
107		90	89	85	96			
106	100	89	88	84	94	100		
105	99	88	87	83	93	99		
104	97	86	85	82	92	97		
103	96	85	84	81	90	96		
102	95	84	83	80	89	94		
101	93	83	82	78	87	93		
100	92	81	80	77	86	91	100	
99	90	80	79	76	85	90	98	
98	89	79	78	75	83	88	97	
97	88	78	77	74	82	87	95	
96	86	76	76	73	80	85	93	
95	85	75	74	72	79	84	91	100
94	84	74	73	71	78	82	90	99
93	82	73	72	69	76	81	88	98
92	81	71	71	68	75	79	86	98
91	80	70	69	67	73	78	85	97
90	78	69	68	66	72	76	83	96
89	77	68	67	65	71	75	81	95
88	75	66	66	64	69	73	79	95
87	74	65	64	63	68	72	78	94
86	73	64	63	62	67	70	76	93
85	71	63	62	60	65	69	74	92
84	70	61	61	59	64	67	73	92
83	69	60	60	58	62	66	71	91
82	67	59	58	57	61	64	69	90
81	66	58	57	56	60	63	67	89
80	65	56	56	55	58	61	66	89
79	63	55	55	54	57	60	64	88
78	62	54	53	52	55	58	62	87
77	60	53	52	51	54	57	61	86

	Female ACL							
Female	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
Max	66	74	75	72	70	62	53	44
Min	30	30	30	30	30	28	26	6
Min Pts	40	40	40	40	40	40	40	40
75			100					
74		100	99					
73		99	97					
72		97	96	100				
71		96	95	99				
70		95	93	97	100			
69		93	92	96	99			
68		92	91	94	97			
67		90	89	93	96			
66	100	89	88	91	94			
65	98	88	87	90	93			
64	97	86	85	89	91			
63	95	85	84	87	90			
62	93	84	83	86	88	100		
61	92	82	81	84	87	98		
60	90	81	80	83	85	96		
59	88	80	79	81	84	95		
58	87	78	77	80	82	93		
57	85	77	76	79	81	91		
56	83	75	75	77	79	89		
55	82	74	73	76	78	88		
54	80	73	72	74	76	86		
53	78	71	71	73	75	84	100	
52	77	70	69	71	73	82	98	
51	75	69	68	70	72	81	96	
50	73	67	67	69	70	79	93	
49	72	66	65	67	69	77	91	
48	70	65	64	66	67	75	89	
47	68	63	63	64	66	74	87	
46	67	62	61	63	64	72	84	
45	65	60	60	61	63	70	82	
44	63	59	59	60	61	68	80	100
43	62	58	57	59	60	66	78	98
42	60	56	56	57	58	65	76	97
41	58	55	55	56	57	63	73	95
40	57	54	53	54	55	61	71	94
39	55	52	52	53	54	59	69	92
38	53	51	51	51	52	58	67	91
37	52	50	49	50	51	56	64	89
36	50	48	48	49	49	54	62	87
35	48	47	47	47	48	52	60	86
34	47	45	45	46	46	51	58	84
33	45	44	44	44	45	49	56	83
32	43	43	43	43	43	47	53	81

Male	Male ACL							
	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
Max	106	115	116	120	110	106	100	95
Min	62	67	67	67	67	66	65	16
Min Pts	40	40	40	40	40	40	40	40
76	59	51	51	50	53	55	59	86
75	58	50	50	49	51	54	57	85
74	56	49	49	48	50	52	55	84
73	55	48	47	47	48	51	54	83
72	54	46	46	46	47	49	52	83
71	52	45	45	45	46	48	50	82
70	51	44	44	43	44	46	49	81
69	50	43	42	42	43	45	47	80
68	48	41	41	41	41	43	45	79
67	47	40	40	40	40	42	43	79
66	45					40	42	78
65	44						40	77
64	43							76
63	41							76
62	40							75
61								74
60								73
59								73
58								72
57								71
56								70
55								70
54								69
53								68
52								67
51								67
50								66
49								65
48								64
47								64
46								63
45								62
44								61
43								61
42								60
41								59
40								58
39								57
38								57
37								56
36								55
35								54
34								54

Female	Female ACL							
	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
Max	66	74	75	72	70	62	53	44
Min	30	30	30	30	30	28	26	6
Min Pts	40	40	40	40	40	40	40	40
31	42	41	41	41	42	45	51	79
30	40	40	40	40	40	44	49	78
29						42	47	76
28						40	44	75
27							42	73
26							40	72
25								70
24								68
23								67
22								65
21								64
20								62
19								61
18								59
17								57
16								56
15								54
14								53
13								51
12								49
11								48
10								46
9								45
8								43
7								42
6								40

Table 22. CFT Maneuver Under Fire Scoring by Gender. Source: Headquarters, United States Marine Corps (2018).

	Male MANUF							
Male	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
Max	2:07	2:04	2:05	2:10	2:16	2:23	2:40	2:52
Min	3:17	3:18	3:22	3:30	3:42	3:59	4:14	6:09
Min Pts	40	40	40	40	40	40	40	40

	Male MANUF							
	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
2:04		100						
2:05		99	100					
2:06		98	99					
2:07	100	98	98					
2:08	99	97	98					
2:09	98	96	97					
2:10	97	95	96	100				
2:11	97	94	95	99				
2:12	96	94	95	99				
2:13	95	93	94	98				
2:14	94	92	93	97				
2:15	93	91	92	96				
2:16	92	90	91	96	100			
2:17	91	89	91	95	99			
2:18	91	89	90	94	99			
2:19	90	88	89	93	98			
2:20	89	87	88	93	97			
2:21	88	86	88	92	97			
2:22	87	85	87	91	96			
2:23	86	85	86	90	95	100		
2:24	85	84	85	90	94	99		
2:25	85	83	84	89	94	99		
2:26	84	82	84	88	93	98		
2:27	83	81	83	87	92	98		
2:28	82	81	82	87	92	97		
2:29	81	80	81	86	91	96		
2:30	80	79	81	85	90	96		
2:31	79	78	80	84	90	95		
2:32	79	77	79	84	89	94		
2:33	78	76	78	83	88	94		
2:34	77	76	77	82	87	93		
2:35	76	75	77	81	87	93		
2:36	75	74	76	81	86	92		
2:37	74	73	75	80	85	91		
2:38	73	72	74	79	85	91		
2:39	73	72	74	78	84	90		
2:40	72	71	73	78	83	89	100	
2:41	71	70	72	77	83	89	99	
2:42	70	69	71	76	82	88	99	
2:43	69	68	70	75	81	88	98	
2:44	68	68	70	75	80	87	97	
2:45	67	67	69	74	80	86	97	
2:46	67	66	68	73	79	86	96	
2:47	66	65	67	72	78	85	96	

	Female MANUF							
Female	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
Max	2:55	2:45	2:42	2:49	2:53	2:57	3:35	3:44
Min	4:53	4:34	4:40	4:44	4:56	5:01	5:06	6:33
Min Pts	40	40	40	40	40	40	40	40

	Female MANUF							
	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
2:42			100					
2:43			99					
2:44			99					
2:45		100	98					
2:46		99	98					
2:47		99	97					
2:48		98	97					
2:49		98	96	100				
2:50		97	96	99				
2:51		97	95	99				
2:52		96	95	98				
2:53		96	94	98	100			
2:54		95	94	97	100			
2:55	100	94	93	97	99			
2:56	99	94	93	96	99			
2:57	99	93	92	96	98	100		
2:58	98	93	92	95	98	100		
2:59	98	92	91	95	97	99		
3:00	97	92	91	94	97	99		
3:01	97	91	90	94	96	98		
3:02	96	91	90	93	96	98		
3:03	96	90	89	93	95	97		
3:04	95	90	89	92	95	97		
3:05	95	89	88	92	94	96		
3:06	94	88	88	91	94	96		
3:07	94	88	87	91	93	95		
3:08	93	87	87	90	93	95		
3:09	93	87	86	90	92	94		
3:10	92	86	86	89	92	94		
3:11	92	86	85	89	91	93		
3:12	91	85	85	88	91	93		
3:13	91	85	84	87	90	92		
3:14	90	84	84	87	90	92		
3:15	90	83	83	86	89	91		
3:16	89	83	83	86	89	91		
3:17	89	82	82	85	88	90		
3:18	88	82	82	85	88	90		
3:19	88	81	81	84	87	89		
3:20	87	81	81	84	87	89		
3:21	87	80	80	83	86	88		
3:22	86	80	80	83	86	88		
3:23	86	79	79	82	85	87		
3:24	85	79	79	82	85	87		
3:25	85	78	78	81	84	86		

	Male MANUF							
Male	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
Max	2:07	2:04	2:05	2:10	2:16	2:23	2:40	2:52
Min	3:17	3:18	3:22	3:30	3:42	3:59	4:14	6:09
Min Pts	40	40	40	40	40	40	40	40
2:48	65	64	66	72	78	84	95	
2:49	64	64	66	71	77	84	94	
2:50	63	63	65	70	76	83	94	
2:51	62	62	64	69	76	83	93	
2:52	61	61	63	69	75	82	92	100
2:53	61	60	63	68	74	81	92	99
2:54	60	59	62	67	73	81	91	99
2:55	59	59	61	66	73	80	90	99
2:56	58	58	60	66	72	79	90	98
2:57	57	57	59	65	71	79	89	98
2:58	56	56	59	64	71	78	89	98
2:59	55	55	58	63	70	78	88	98
3:00	55	55	57	63	69	77	87	97
3:01	54	54	56	62	69	76	87	97
3:02	53	53	56	61	68	76	86	97
3:03	52	52	55	60	67	75	85	96
3:04	51	51	54	60	67	74	85	96
3:05	50	51	53	59	66	74	84	96
3:06	49	50	52	58	65	73	83	95
3:07	49	49	52	57	64	73	83	95
3:08	48	48	51	57	64	72	82	95
3:09	47	47	50	56	63	71	81	95
3:10	46	46	49	55	62	71	81	94
3:11	45	46	49	54	62	70	80	94
3:12	44	45	48	54	61	69	80	94
3:13	43	44	47	53	60	69	79	93
3:14	43	43	46	52	60	68	78	93
3:15	42	42	45	51	59	68	78	93
3:16	41	42	45	51	58	67	77	92
3:17	40	41	44	50	57	66	76	92
3:18		40	43	49	57	66	76	92
3:19			42	48	56	65	75	92
3:20			42	48	55	64	74	91
3:21			41	47	55	64	74	91
3:22			40	46	54	63	73	91
3:23				45	53	63	73	90
3:24				45	53	62	72	90
3:25				44	52	61	71	90
3:26				43	51	61	71	89
3:27				42	50	60	70	89
3:28				42	50	59	69	89
3:29				41	49	59	69	89
3:30				40	48	58	68	88
3:31					48	58	67	88
3:32					47	57	67	88
3:33					46	56	66	87

	Female MANUF							
Female	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
Max	2:55	2:45	2:42	2:49	2:53	2:57	3:35	3:44
Min	4:53	4:34	4:40	4:44	4:56	5:01	5:06	6:33
Min Pts	40	40	40	40	40	40	40	40
3:26	84	77	78	81	84	86		
3:27	84	77	77	80	83	85		
3:28	83	76	77	80	83	85		
3:29	83	76	76	79	82	85		
3:30	82	75	76	79	82	84		
3:31	82	75	75	78	81	84		
3:32	81	74	75	78	81	83		
3:33	81	74	74	77	80	83		
3:34	80	73	74	77	80	82		
3:35	80	72	73	76	80	82	100	
3:36	79	72	73	75	79	81	99	
3:37	79	71	72	75	79	81	99	
3:38	78	71	72	74	78	80	98	
3:39	78	70	71	74	78	80	97	
3:40	77	70	71	73	77	79	97	
3:41	77	69	70	73	77	79	96	
3:42	76	69	69	72	76	78	95	
3:43	76	68	69	72	76	78	95	
3:44	75	68	68	71	75	77	94	100
3:45	75	67	68	71	75	77	93	99
3:46	74	66	67	70	74	76	93	99
3:47	74	66	67	70	74	76	92	99
3:48	73	65	66	69	73	75	91	98
3:49	73	65	66	69	73	75	91	98
3:50	72	64	65	68	72	74	90	98
3:51	72	64	65	68	72	74	89	97
3:52	71	63	64	67	71	73	89	97
3:53	71	63	64	67	71	73	88	96
3:54	70	62	63	66	70	72	87	96
3:55	69	61	63	66	70	72	87	96
3:56	69	61	62	65	69	71	86	95
3:57	68	60	62	65	69	71	85	95
3:58	68	60	61	64	68	70	85	95
3:59	67	59	61	63	68	70	84	94
4:00	67	59	60	63	67	70	84	94
4:01	66	58	60	62	67	69	83	94
4:02	66	58	59	62	66	69	82	93
4:03	65	57	59	61	66	68	82	93
4:04	65	57	58	61	65	68	81	93
4:05	64	56	58	60	65	67	80	92
4:06	64	55	57	60	64	67	80	92
4:07	63	55	57	59	64	66	79	92
4:08	63	54	56	59	63	66	78	91
4:09	62	54	56	58	63	65	78	91
4:10	62	53	55	58	62	65	77	91
4:11	61	53	55	57	62	64	76	90

	Male MANUF							
Male	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
Max	2:07	2:04	2:05	2:10	2:16	2:23	2:40	2:52
Min	3:17	3:18	3:22	3:30	3:42	3:59	4:14	6:09
Min Pts	40	40	40	40	40	40	40	40
3:34					46	56	66	87
3:35					45	55	65	87
3:36					44	54	64	86
3:37					43	54	64	86
3:38					43	53	63	86
3:39					42	53	62	86
3:40					41	52	62	85
3:41					41	51	61	85
3:42					40	51	60	85
3:43						50	60	84
3:44						49	59	84
3:45						49	59	84
3:46						48	58	83
3:47						48	57	83
3:48						47	57	83
3:49						46	56	83
3:50						46	55	82
3:51						45	55	82
3:52						44	54	82
3:53						44	53	81
3:54						43	53	81
3:55						43	52	81
3:56						42	51	80
3:57						41	51	80
3:58						41	50	80
3:59						40	50	79
4:00							49	79
4:01							48	79
4:02							48	79
4:03							47	78
4:04							46	78
4:05							46	78
4:06							45	77
4:07							44	77
4:08							44	77
4:09							43	76
4:10							43	76
4:11							42	76
4:12							41	76
4:13							41	75
4:14							40	75
4:15								75
4:16								74
4:17								74
4:18								74
4:19								73

	Female MANUF							
Female	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
Max	2:55	2:45	2:42	2:49	2:53	2:57	3:35	3:44
Min	4:53	4:34	4:40	4:44	4:56	5:01	5:06	6:33
Min Pts	40	40	40	40	40	40	40	40
4:12	61	52	54	57	61	64	76	90
4:13	60	52	54	56	61	63	75	89
4:14	60	51	53	56	60	63	74	89
4:15	59	50	53	55	60	62	74	89
4:16	59	50	52	55	60	62	73	88
4:17	58	49	52	54	59	61	72	88
4:18	58	49	51	54	59	61	72	88
4:19	57	48	51	53	58	60	71	87
4:20	57	48	50	53	58	60	70	87
4:21	56	47	50	52	57	59	70	87
4:22	56	47	49	51	57	59	69	86
4:23	55	46	49	51	56	58	68	86
4:24	55	46	48	50	56	58	68	86
4:25	54	45	48	50	55	57	67	85
4:26	54	44	47	49	55	57	66	85
4:27	53	44	47	49	54	56	66	85
4:28	53	43	46	48	54	56	65	84
4:29	52	43	46	48	53	55	64	84
4:30	52	42	45	47	53	55	64	84
4:31	51	42	45	47	52	55	63	83
4:32	51	41	44	46	52	54	62	83
4:33	50	41	44	46	51	54	62	82
4:34	50	40	43	45	51	53	61	82
4:35	49		43	45	50	53	60	82
4:36	49		42	44	50	52	60	81
4:37	48		42	44	49	52	59	81
4:38	48		41	43	49	51	58	81
4:39	47		41	43	48	51	58	80
4:40	47		40	42	48	50	57	80
4:41	46			42	47	50	56	80
4:42	46			41	47	49	56	79
4:43	45			41	46	49	55	79
4:44	45			40	46	48	55	79
4:45	44				45	48	54	78
4:46	44				45	47	53	78
4:47	43				44	47	53	78
4:48	43				44	46	52	77
4:49	42				43	46	51	77
4:50	42				43	45	51	76
4:51	41				42	45	50	76
4:52	41				42	44	49	76
4:53	40				41	44	49	75
4:54					41	43	48	75
4:55					40	43	47	75
4:56					40	42	47	74
4:57						42	46	74

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APPENDIX D. USMC PHYSICAL FITNESS CLASSIFICATION TABLES AND MINIMUM REQUIREMENTS

Table 23. PFT Classification Requirements. Source: Headquarters, United States Marine Corps (2008).

PFT Class	Age Groups 17-26	27-39	40-45	46+
1st	225	200	175	150
2d	175	150	125	100
3d	135	110	88	65

Table 24. PFT Classification Requirements. Source: Headquarters, United States Marine Corps (2018).

PFT Class	
1st	235 to 300
2nd	200 to 234
3rd	~~120~~150 to 199

Table 25. CFT Classification Requirements. Source: Headquarters, United States Marine Corps (2008).

CFT Classifications	
1st Class	270-300
2d Class	225-269
3rd Class	190-224
Fail	189 and below

Table 26. CFT Classification Requirements. Source: Headquarters, United States Marine Corps (2018).

CFT Class	
1st	235 to 300
2nd	200 to 234
3rd	~~120~~150 to 199

Table 27. CFT Minimum Requirements. Source: Headquarters, United States Marine Corps (2008).

CFT Minimum Requirements				
Male				
	17-26	27-39	40-45	46+
MTC	4:13	4:31	5:07	5:09
AL	33	28	17	16
MANUF	3:58	4:42	5:59	6:07
Female				
	17-26	27-39	40-45	46+
MTC	5:27	5:28	5:35	5:50
AL	17	13	7	6
MANUF	5:59	6:04	6:25	6:30

Table 28. CFT Minimum Requirements. Source: Headquarters, United States Marine Corps, 2019

COMBAT FITNESS TEST MINIMUM SCORE								
MALE								
	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
MTC	3:45	3:45	3:48	3:51	3:58	4:11	4:28	5:07
AL	62	67	67	67	67	66	65	16
MANUF	3:17	3:18	3:22	3:30	3:42	3:59	4:14	6:09
FEMALE								
	17-20	21-25	26-30	31-35	36-40	41-45	46-50	51+
MTC	4:36	4:41	4:45	4:46	4:55	4:58	5:26	5:52
AL	30	30	30	30	30	28	26	6
MANUF	4:53	4:34	4:40	4:44	4:56	5:01	5:06	6:33

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