NPS-HR-26-299

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Training Under Pressure: Assessing Attrition Trends at Marine Corps Officer Candidate School

March 2026

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The research presented in this report was supported by the Acquisition Research Program of the Department of Acquisition, Finance and Manpower Naval Postgraduate School.

ABSTRACT

Marine Corps Officer Candidate School (OCS) serves as a primary officer screening and commissioning source for the Marine Corps. The demanding and physical requirements produce persistent attrition throughout the training cycle. Understanding variations in attrition patterns is important to support officer accession manpower planning. Despite the significance of OCS, there has been no comprehensive study to analyze long-term patterns of attrition, injury-related attrition, and the timing of attrition during training.

I conducted a quantitative data analysis of candidate attrition at OCS using administrative records from the Total Force Data Warehouse from 2003 to 2025. I used a combination of descriptive statistics, survival analysis, logistic regressions, and multinomial logistic regressions to analyze overall attrition, injury-related attrition, injury composition, and the timing of injury-related attrition.

The results illustrate persistent attrition rates over time generally ranging between 15% and 20%. Injury-related attrition predominantly occurs within the first three weeks of training. Orthopedic injuries remain the dominant injury type over time. These results provide insight into attrition patterns and their significance for officer accession planning.

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ACKNOWLEDGMENTS

First, I would like to say how grateful I am for my advisors, Dr. Yu-Chu Shen and Dr. Marigee Bacolod, for their patience and guidance throughout this process. I especially appreciate their willingness to repeatedly explain concepts and provide immediate feedback whenever I needed it. Their support made a huge difference as I worked through the research and writing for this thesis. I am also grateful for their understanding and encouragement during the moments when I struggled to clearly articulate what I was trying to say. Their patience and mentorship were a big part of what helped me get through this process and bring this work to completion.

I am also deeply thankful for my close friends who continued to check in on me, encouraged me, and made sure I was staying on track while finishing this thesis. Their support and encouragement meant a lot throughout this process.

Finally, I would like to thank my little brother, Karwen Martinez, for his constant encouragement and motivation. During the moments when I felt discouraged or overwhelmed, he helped keep my energy up and reminded me to keep pushing forward. I am incredibly fortunate to have such supportive people in my life.

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LIST OF ACRONYMS AND ABBREVIATIONS

BMI	Body Mass Index
DOR	Drop on Request
MCRISS	Marine Corps Recruiting Information Support System
MCTFS	Marine Corps Total Force System
MSKI	Musculoskeletal Injuries
OCC	Officer Candidate Course
OCS	Officer Candidate School
PFT	Physical Fitness Test
PLC	Platoon Leaders Class
TFDW	Total Force Data Warehouse

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I. INTRODUCTION

A. BACKGROUND

Officer Candidate School (OCS) is the centralized screening institution for officers in the Marine Corps. While other Armed Forces OCS primarily focus on pre-selection evaluations, the Marine Corps uses OCS as a mechanism to apply uncertainty and pressure to test leadership under stress during training. Candidates are evaluated within a performance-based training environment designed to assess suitability as a Marine officer. This screening mechanism identifies candidates capable of meeting the basic requirements of service in the Fleet Marine Force.

Attrition is an intentional feature of this screening system. Historically, overall attrition has exhibited limited fluctuation across fiscal years and class types. Injury-related attrition, specifically, has been a persistent component of total candidate attrition. The physical demands of OCS are substantial, and overuse injuries remain a significant factor associated with attrition. Although injury is not the only factor, it accounts for a significant portion of candidate attrition across fiscal years and class types. Injury-related attrition may reflect injury-prone characteristics, training events or trends within the accession population.

Injury-related attrition affects Marine Corps manpower. Every candidate disenrollment directly affects the projected commissioning quota required to maintain a balance between retention and accession. Evaluating the patterns of injury-related attrition is essential to ensure attrition reflects the screening function of OCS rather than a structure deficiency. Although the persistence of injury-related attrition is noted, there is limited evaluation of trends over time.

B. PURPOSE OF STUDY

The purpose of this study is to conduct an analysis of attrition patterns at Marine Corps OCS across multiple years with an emphasis on injury-related attrition. Using longitudinal administrative data, this research analyzes trends in overall and injury-related attrition and evaluates candidate characteristics that are associated with that disenrollment.

The objective of this study is to provide descriptive insight into the fluctuation of overall attrition and injury-related attrition throughout fiscal years. More specifically, this research addresses the following questions:

1. Primary Research Question

- What are the longitudinal trends in overall attrition at OCS across fiscal years?

2. Secondary Research Questions

- What are the longitudinal trends in injury-related attrition at OCS across fiscal years?
- What candidate-level characteristics are associated with injury-related attrition?

C. SCOPE AND LIMITATIONS

This study focuses on Marine Corps Officer candidates who physically reported to OCS during the observational period. The analysis covers fiscal year 2003 through fiscal year 2025. The scope of analysis is limited to administrative transaction-level candidate data. The scope of this study is strictly limited to candidates who have at least one recorded training attempt.

D. METHODOLOGY

The goal of this study is to obtain a foundational understanding of the fluctuation or persistence of attrition at Officer Candidate School and to identify characteristics associated with it. To accomplish this goal, I constructed an individual-level analytic dataset and used descriptive statistics to evaluate overall attrition and injury-related attrition over time. The study uses multivariable logistic regression models to assess candidate characteristics associated with injury-related attrition. I split the dataset into a pre-2015 and a post-2015 period to analyze differences in institutional patterns and candidate characteristics associated with these patterns.

E. OVERVIEW OF CHAPTERS

Chapter II provides a background of OCS structure, commissioning sources, attrition and injury and institutional responses to attrition and injury. Chapter III provides a comprehensive literature review of OCS attrition, injury-related attrition, injury composition in entry training, and injury timing in entry training. Chapter IV describes data sources, data preparation, and methodologies used. Chapter V summarizes the findings of the analysis. Chapter VI provides a conclusion and recommendations for further research.

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II. BACKGROUND

This chapter provides an overview of OCS, including institutional structure, commissioning sources, attrition and injury at OCS, and institutional responses.

A. OCS INSTITUTIONAL STRUCTURE

OCS, located at Marine Corps Base Quantico, Virginia, serves as the primary entry-level screening institution for Marine Corps officer candidates. The mission of OCS is "to educate and train officer candidates within a controlled and challenging environment in order to evaluate and screen individuals for the leadership, moral, mental, and physical qualities required for commissioning as a Marine Corps officer" (United States Marine Corps Officer Candidate School, n.d.). Candidates who successfully complete the program are commissioned as second lieutenants. Historically, approximately 84% of Marine Corps officers are processed through OCS, while the remaining proportion are commissioned through the United States Naval Academy (Office of the Under Secretary of Defense for Personnel and Readiness [OUSD(P&R)], 2021).

Every program at OCS falls into either the ten-week Officer Candidate Course (OCC) or the six-week Platoon Leaders Class (PLC). The OCC class is tailored for college juniors or recent college graduates. College juniors have the option to accept or decline a commission after college graduation, in contrast with college graduates, who commission immediately upon completion of the program.

PLC consists of one or two six-week courses during a candidate's undergraduate education (Barrett, 1964). Candidates who are unable to complete both PLC increments may attend a single ten-week course, referred to as PLC Combined, which is structured similarly to the OCC course (McNeill, 2002).

OCS is organized into five distinct phases, each designed to progressively develop candidates. The first phase, in-processing, introduces core values, issues gear and uniforms, and assigns candidates to training platoons (United States Marine Corps, n.d.). The second phase, transition, marks the beginning of combat conditioning, introduces the fundamentals of close-order drill, and continues the indoctrination into Marine Corps culture and leadership (United States Marine Corps, n.d.).

The third phase, adaptation, increases candidate responsibility, as individuals serve in leadership billets and are held accountable for leading their peers, while teamwork is emphasized (United States Marine Corps, n.d.). The fourth phase focuses on decision-making and execution, where leadership traits and principles are reinforced, tactics are practiced, and problem-solving becomes central to training (United States Marine Corps, n.d.).

The final phase, out-processing, prepares candidates for future duties, including transition to The Basic School, and culminates in a heightened sense of esprit de corps (United States Marine Corps, n.d.).

OCS evaluates candidates across three primary categories: leadership, academics, and physical fitness (Marine Corps Recruiting Command, n.d.). Leadership is the most heavily weighted evaluation area. It assesses a candidate's ability to exercise command presence and make sound decisions under stress. Candidates must maintain a minimum cumulative leadership average of 3.0 (Headquarters, U.S. Marine Corps, 2018). Academic evaluations measure the knowledge of Marine Corps history and organization, weapons fundamentals, navigation, and orders. Candidates must achieve a minimum 70% average through written exams and practical application. Candidates must meet a minimum physical standard of a 235 Physical Fitness Test score and pass the Combat Fitness Test, obstacle course, endurance course and required hikes (Headquarters, U.S. Marine Corps, 2019). To succeed at OCS, candidates must pass all three categories, avoid medical disqualification and unsatisfactory performance determination.

Attrition at OCS occurs through several disenrollment mechanisms. Candidates may be disenrolled for medical reasons or unsatisfactory performance. Disenrollment can also occur due to misconduct or failure to maintain standards within the evaluation categories. A candidate may also drop by request (DOR), which allows the candidate to voluntarily withdraw from training.

B. COMMISSIONING SOURCES

Marine Corps officers are commissioned through eight different pathways. These pathways include both enlisted-to-officer programs and college-based programs. Entry requirements and service obligations vary across commissioning sources, and each program ultimately feeds into either an OCC course or a PLC course. Tables 1 and 2 present civilian and enlisted programs, eligibility, course timing, entry requirements, and service obligations.

Table 1. Civilian Officer Candidate School Programs

Program	Eligible Population	Course Length	Timing	Entry Requirements
Platoon Leaders Class Junior Session	College students	6 weeks	Summer	College enrollment, medical qualification, physical fitness standards, leadership screening
Platoon Leaders Class Senior Session	College students	6 weeks	Summer	Completion of Junior Session or eligibility for Combined Session, medical and physical qualification
Platoon Leaders Class Combined Session	College students	10 weeks	Summer	College enrollment, higher endurance and physical standards
Officer Candidates Course	College graduates	10 weeks	Year-round	Bachelor's degree, medical qualification, physical fitness standards, leadership screening

Adapted from Marine Corps Order 1040.43B: Enlisted to Officer Commissioning Programs, by Headquarters, U.S. Marine Corps, 2015, Marine Corps Publications Electronic library.

Table 2. Enlisted Commissioning Officer Programs

Program	Eligible Populations	Course Length	Timing	Entry Requirements	Service Obligation
Marine Corps Enlisted Commissioning Education Program Candidate Course	Active-duty enlisted Marines	10 weeks	Aligned with academic calendar	Command endorsement, acceptance to accredited college, medical and physical qualification	Eight years after commissioning (minimum four years active duty, remainder in reserve status)
Enlisted Commissioning Program Candidate Course	Active-duty enlisted Marines	10 weeks	Year-round	Bachelor’s degree, command endorsement, medical and physical qualification	Eight years after commissioning (minimum four years active duty, remainder in reserve status)
Meritorious Commissioning Program Candidate Course	Active-duty enlisted Marines	10 weeks	Year-round	Command nomination, competitive selection, medical and physical qualification	Eight years after commissioning (minimum four years active duty, remainder in reserve status)
Reserve Officer Candidate Course	Reserve officer applicants	10 weeks	Year-round	Medical qualification, physical fitness standards, leadership screening	Eight years in reserve status after commissioning

Adapted from Marine Corps Order 1040.43B: Enlisted to Officer Commissioning Programs, by Headquarters, U.S. Marine Corps, 2015, Marine Corps Publications Electronic library.

C. ATTRITION AND INJURY AT OCS

Attrition at OCS occurs across several categories, including administrative, injury, medical, performance, adaptation, physical performance, and voluntary. While attrition has historically ranged between 20% and 30% per class, recent attrition has shifted from disenrollment during training to medical pre-screening drops. Administrative data from fiscal years 2022–2025 demonstrated the shift with in-processing attrition rising 2% above the three-year average. This increase is primarily driven by medical disqualifications during initial screening and a smaller increase in in-processing DOR. Training attrition declined by 4% compared to the three-year average, with reductions across medical, performance, and DOR disenrollments. Medical attrition during training dropped significantly in fiscal year 2025 for male and female candidates. This drop is most likely related to the change in pre-screening efforts and protocols now effectively targeting issues before training begins, rather than during. The current graduation rate improved by 2%, which produced 170 more graduates in fiscal year 2025 compared to the three-year average (FY22–FY25 Data Analysis, 2025).

D. INSTITUTIONAL RESPONSES TO ATTRITION AND INJURY

Institutional responses to attrition and injury have generally been implemented as part of broader Marine Corps initiatives rather than programs specifically designed for OCS. In 2018, the Marine Corps introduced the Force Fitness Instructor Program to enhance the overall health, physical fitness, and combat readiness of Marines at both the individual and unit levels. This program incorporates evidence-based approaches to training, injury prevention, and nutrition (Headquarters Marine Corps, 2018).

At the OCS level, modifications to the physical training program were implemented in 2025, which contributed to reductions in performance-related attrition and improvements in both physical and mental recovery throughout the training cycle (FY22–FY25 Data Analysis, 2025). Despite these efforts, there remains limited publicly available evidence of additional programs specifically developed to target attrition or injury prevention within OCS.

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III. LITERATURE REVIEW

This literature review analyzes prior research on attrition and musculoskeletal injuries (MSKI) within military training environments. The review begins by summarizing historical attrition at OCS through the use of descriptive statistics, survival analysis, and logistic regression models. It then examines injury-related attrition by evaluating the epidemiology of MSKI at OCS using descriptive statistics, logistic regression, linear models, and machine learning techniques. Next, it focuses on injury composition in entry training by reviewing injury frequency, training-event exposure, and surveillance accuracy through descriptive statistics, and capture-recapture technique. Finally, the literature review examines injury timing during entry training using logistic models.

A. OFFICER CANDIDATE SCHOOL ATTRITION

Barrett (1964) provides one of the earliest documented examinations of OCS attrition. The study establishes a historical baseline, identifying attrition rates ranging from approximately 20% to 30%. Although the primary focus was on personality testing, the research confirms that attrition at Officer Candidate School was structurally present as early as the 1960s.

Hogin (2004) examined attrition patterns within Marine Corps initial training to identify the primary causes of separation among prior and non-prior enlisted officers. Using survival analysis, the study evaluated how officer characteristics influenced the likelihood of remaining in service as a commissioned officer. Attrition outcomes were categorized using training records and official separation codes, including medical, performance-based, administrative, and voluntary separations.

The study analyzed a sample of 18,464 individuals from 1986 to 2000, including prior enlisted, non-prior enlisted, separated, and actively serving personnel. The dataset was derived from the Marine Corps Commissioned Officer Accession Career database maintained by the Center for Naval Analysis.

The results of Hogin's study indicate that prior enlisted officers experienced a lower hazard of separation than non-prior enlisted officers, with a hazard ratio of 0.938, which improved to 0.912 in the reduced model (Hogin, 2024). The commission source was among the strongest predictors of survival, as MECEP officers had lower hazards than United States Naval Academy graduates with a hazard ratio of 0.720. Marital status demonstrated the largest effect size in the model with a hazard ratio of 0.412, indicating a 58% reduction in the risk of separation compared to unmarried officers. According to Hogin's study, commissioning age was significant with a 3.4% decrease in hazard corresponding to a hazard ratio of 0.966 (Hogin, 2024). The survival outcomes identified officers in the top third at The Basic School had reduced hazards with a ratio of 0.860. The officers in the bottom third had elevated hazards with a hazard ratio of 1.244. Gender and race were not statistically significant predictors of separation in the survival model. The study focuses on separation from commissioned service but does not distinguish between entry-level attrition, voluntary resignation, medical discharge or performance-based attrition.

Captain Cheryl Fitzgerald (1996) studied female attrition rates at Officer Candidate School. The study used a multivariate approach to estimate the differential effect of demographic variables such as commissioning source, age, physical fitness, and education on the completion of Officer Candidate School. Fitzgerald used logistic regression, and the results showed that females who entered Officer Candidate School through Marine Enlisted Commissioning Education Program, Enlisted Commissioning Program, Meritorious Commissioning Program, and Naval Reserve Officer Training Corps had a 15% higher probability of completion relative to other commissioning programs. Age demonstrated a positive association with attrition, with each additional year increasing attrition by 1%. Physical fitness test scores were not statistically significant predictors of completion after controlling for the commissioning source (Fitzgerald, 1996). The study was limited by the sample of only females, preventing attrition comparison with males. Additionally, survey responses were anonymous, preventing causal inference of attrition. The logistic regression model explained only approximately 5% of the variation in Officer Candidate School completion rates (Fitzgerald, 1996).

B. INJURY-RELATED ATTRITION

The first Marine Corps Officer injury study was conducted in 2000. O'Connor's (2000) study examined cumulative injury incidence, rates, types, and distribution at Officer Candidate School during a six-week summer training cycle. O'Connor classified injuries as acute traumatic if they were associated with a sudden precipitating event (O'Connor, 2000). All other types were classified as overuse. The cumulative injury incidence and injury rate were calculated based on entry questionnaires, individual medical records, and daily medical logs (O'Connor, 2000).

O'Connor defined cumulative injury incidence as the percentage of candidates who sustained at least one injury during the six-week period, which was 60.8% overall (O'Connor, 2000). When stratified by sex, 60.7% of males sustained at least one injury compared to 80% of females. The significant sex difference indicated 4 out of 5 female candidates were injured during the six-week cycle. The injury rate, calculated as injuries per 1,000 candidate-hours of training, was 3.9 per 1,000 hours. Bone stress fractures represented the highest injury pattern among females with an injury rate of 1.35 per 1,000 hours compared to males with an injury rate of 0.4 per 1,000 hours. These injury rates peaked during weeks two, three, and six of training showing that injuries were not evenly distributed throughout the training cycle (O'Connor, 2000). The anatomical distribution of injuries sustained by males and females had a similar distribution with lower body MSKI predominating the distribution. Overuse injuries made up 62% of injury encounters for males and 70.3% for females (O'Connor, 2000). The study relies exclusively on descriptive statistics. Logistic regressions were not included to assess independent predictors of injury. Survival analysis was not employed to estimate a hazard function. The data was drawn from one six-week cohort mid-summer, limiting generalization across other training cycles with seasonal conditions.

Feigel et al. (2024) examined the relationship between overuse musculoskeletal injuries and physiological indicators of allostatic load among officer candidates. The study collected physiological data from 69 candidates using Garmin devices, which captured measures such as energy expenditure, heart rate patterns during both daytime and sleep, and sleep architecture.

These data were then analyzed using statistical models, including logistic regression to estimate the likelihood of overuse MSKI occurrence and linear mixed models to assess changes in physiological measures (Feigel et al., 2024).

Feigel et al.'s (2024) study identified that 30% of participants sustained at least one overuse MSKI during the training cycle, including 28% of males and 35% of females. Most overuse injuries resulted in 76% light-duty disposition while 24% resulted in full-duty dispositions. Injuries were predominantly located in lower extremities at 57%, with strains accounting for 48%, and tendinitis for 29%. Candidates who sustained an overuse injury had fewer days of recorded wearable data and fewer nights of sleep.

Using linear mixed models, Feigel et al. (2024) found that physiological workload, elevated heart rate, and disrupted sleep architecture were associated with overuse injury. Overuse injuries in females were positively associated with deep sleep time, percentage of deep sleep, and relative energy expenditure but negatively associated with percentage of light sleep, rapid eye movement, sleep time, and heart rate. This demonstrates that females exhibit a different allostatic load than males. Baseline physiological differences were observed between males and females; however, only males showed significant changes upon injury (Feigel et al., 2024).

The Feigel et al. (2024) study is limited by a substantial number of candidates being excluded due to dropping out, incomplete device wear time or lost devices (Feigel et al., 2024). There is a potential imbalance bias because candidates who sustained an overuse injury had fewer recorded days and nights of physiological data than non-injured candidates. The study did not have access to raw data or algorithmic processing details from Garmin, limiting transparency.

In 2022, Bird et al. (2022) conducted a study to evaluating vertical jump patterns to determine whether they were associated with MSKI risk in 728 Marine officer candidates, 599 males and 129 females. Cameras and force plates were used to measure how candidates' bodies moved during the jump. A machine learning algorithm grouped the candidates based on movement patterns into three clusters: low-risk, medium-risk, and high-risk. Injury outcomes were not used in cluster formation. The cumulative incidence was compared to identify statistically significant differences across clusters. After examining whether sex distribution differed across clusters, researchers looked at what biomechanical variables distinguished the clusters. Injury type and severity were compared descriptively across clusters (Bird et al., 2022).

The Bird et al. (2022) study reported that differences in cumulative incidence within the clusters were statistically significant. In the low-risk cluster, 13% of candidates sustained at least one injury. The medium-risk cluster had 22.5 %, and the high-risk cluster had 30.5% (Bird et al., 2022). Sex distribution differed across clusters. Forty-one percent of females were assigned to the high-risk cluster, whereas males were evenly distributed across all three clusters. Biomechanical characteristics such as force development, joint range of motion, and temporal movement variables distinguished the clusters rather than jump height. Injury type varied across clusters while injury severity did not.

The Bird et al. (2022) study relies on care-seeking behavior, classifying candidates who experienced minor pain or MSKI without medical evaluation as non-injured. The study does not account for the candidates who attrited early due to a MSKI, causing the potential for the injury incidence to be right censored. The study only analyzed the countermovement jump at a single time point early in the training. Without repeated measures, the study cannot account for individual changes overtime, such as fatigue and adaptation to training load. Multivariable modeling was not used to control for candidate characteristics (Bird et al., 2022).

Lovalekar et al. (2023) conducted a study comparing the MSKI distribution between sexes during a ten-week Officer Candidate School class. The data for the study was collected during four Officer Candidate School classes from September 2020 to November 2021, with a sample size of 736 candidates: 131 females and 605 males. The data was derived from injury records collected by athletic trainers and physical therapists (Lovalekar et al., 2023). The data included descriptive statistics such as the MSKI incidence, the event at the time of occurrence, anatomical region, and the body part affected along with the disposition and attrition. The study used Fisher’s exact tests to compare proportions between sexes and independent t-tests for continuous variables such as height, weight, and BMI (Lovalekar et al., 2023).

The Lovalekar et al. (2023) study found that 39.7% of female candidates sustained at least one musculoskeletal injury compared to 23.1% of males. Females sustained 65.5 MSKI per 100 candidates compared to 33.4 among males, indicating females experienced both a higher proportion of injured individuals and a greater injury burden per candidate. These differences were statistically significant. The obstacle course was the most frequent event associated with injuries for both sexes, accounting for 20.9% of injuries among females and 12.9% among males (Lovalekar et al., 2023). The study reported lower body injuries accounted for 67.4% of MSKI for females and 70.8% in males. The lower leg was the most frequent injury body part for females, while the knee was the most frequent among males. The most common injury type for males and females was strains, making up 39.59% of injuries for females, and 24.3% for males. Injury modification was more frequent among females than males with 92.3% of females being placed on light duty compared to 69.3% of males (Lovalekar et al., 2023).

In Lovalekar et al.'s (2023) study, injury identification relied on the records of the physical therapist, which only included candidates who reported their injuries, potentially resulting in the underestimation of true injury incidence (Lovalekar et al., 2023). Injury rates were not adjusted for training time across candidates. Not every candidate experienced the same amount of physical training due to the reported injury modifications.

C. INJURY COMPOSITION IN ENTRY TRAINING

Jensen et al. (2019) conducted a study examining musculoskeletal injury (MSKI) patterns among Marine Corps recruits, focusing on injury prevalence, the training events during which injuries most frequently occur, and the relationship between physical fitness performance and injury. The study population consisted of male recruits at Marine Corps Recruit Depot San Diego, with data covering a six-year period from 2011 to 2016. The dataset included 43,004 injury observations from a sample of 28,829 recruits.

Injuries were identified using International Classification of Diseases diagnostic codes and classified by injury type, broad injury category, anatomical location, and diagnostic classification (Jensen et al., 2019). Descriptive statistics were used to report injury prevalence and distribution. Cumulative incidence was calculated as the percentage of recruits who sustained at least one musculoskeletal injury, and injury rates were measured as injuries per 1,000 recruit-training days.

Jensen et al. (2019) also examined injuries occurring during key fitness assessments, including the Initial Strength Test, Physical Fitness Test, and Combat Fitness Test, to determine whether injuries were associated with the testing events themselves or with other training conducted during that period.

The frequency distribution of injury types identified overuse as the highest injury classification, making up 70%-80% of all recorded MSKI, with the remaining 20%-30% classified as acute traumatic injuries (Jensen et al., 2019). The injuries were grouped by activity such as running, physical conditioning, and conditioning hikes. The majority of the overuse injuries were due to the repetitive load of these activities. Among the injuries that were documented around the time of the Physical Fitness Test, approximately 31% occurred during the conditioning hike. Among the injuries that occurred around the Combat Fitness Test, approximately 26% occurred during the conditioning hike (Jensen et al., 2019).

Jensen et al. (2019) reported that 14.1% of musculoskeletal injuries (MSKI) occurred among recruits after completing the Initial Strength Test, meaning 14 out of every 100 recruits sustained at least one injury following the test. The most common injury types associated with the Initial Strength Test were strains, sprains, and tibial band syndrome, accounting for 47% of all injuries.

Injuries associated with the Physical Fitness Test had a prevalence of 3.5%, with the most common types being strains, sprains, and tendonitis, which accounted for 43% of all injuries. For the Combat Fitness Test, the injury prevalence rate was 3.0%, and strains, sprains, and stress fractures accounted for 44% of all injuries (Jensen et al., 2019).

Jensen et al.'s (2019) study found that injury prevalence tends to decrease as training progresses and fitness levels increase. The study limited the ability to assess injury occurrence associated with the Initial Strength Test, the Physical Fitness Test, and the Combat Fitness Test, due to the inconsistent denominators. A different number of recruits participated throughout the different events. Regressions or multivariable modeling was not employed, limiting the study to descriptive statistics. The medical records included time of injury, but the study did use survival analysis to estimate risk or account for censoring. This limited the ability to determine whether risk changes systematically over time after accounting for other variables that can influence injury risk.

MSKI are not unique to Officer Candidate School; they are commonly found throughout other types of Marine Corps and Navy training. Shaffer et al.'s (1999) study examined the patterns of illness and injury in military women throughout three different military schools: Marine Corps Recruit Training, Navy Recruit Training, and Marine Corps Officer Candidates School. The study used a computer-based outpatient tracking system to obtain detailed medical records. The computer system captured medical encounters, diagnostic codes, training, disposition, and duty status. Through their analysis, Shaffer et al. (1999) concluded that the frequency of the musculoskeletal injury in the three populations correlated directly with training intensity. The incidence ratios were calculated as the number of women with at least one injury divided by the total number of women for that site and reported as a percentage per 100 women.

Shaffer et al.'s (1999) study identified that injury frequency increased during the early weeks of training when physical load increased, and that stress fractures may serve as a proxy for training intensity. At Officer Candidate School, 85.8% of women sustained at least one medical encounter during training. Musculoskeletal injuries were the most common, affecting 61.7% of all candidates. Officer Candidates School also yielded the highest stress fracture incidence, with 9.5% of female candidates sustaining stress fractures and 14.5% sustaining ankle sprains (Shaffer et al., 1999). In comparison, the injury rate at Marine Corps Recruit Depot was 44.3% with 5.7% sustaining stress fractures, and with the lowest rate occurring at Navy Recruit Training Command with 37.2% overall musculoskeletal injury incidence and 3.9% stress fractures. Respiratory and dermatologic medical conditions also occurred, but at a lower injury incidence across all three training sites. (Shaffer et al., 1999).

The data for this study is limited to recorded medical encounters (Shaffer et al., 1999). Conditions not resulting in a medical visit are not included in the data, thereby potentially underestimating the true injury incidence. The study does not quantify physical training load, mileage, intensity, duration, or recovery periods, limiting assessment of exposure response relationships. The sample includes only female Navy and Marine Corps recruits, which limits the generalizability to male or mixed sex training population. The study does not control individual factors such as prior fitness, injury history, age, or body composition (Shaffer et al., 1999). The injury and illness rates are aggregated by training site, as a result the analysis reflects average injury and illness rates for each training population. The study does not distinguish initial injury events from repeated medical encounters when reporting encounter-level data or if injury predicted attrition (Shaffer et al., 1999).

MSKI during Marine Corps initial training schools are substantially underreported, with commonly used surveillance sources capturing less than half of all injuries when used independently. To address this, Lovalekar et al. (2024) utilized a capture–recapture technique to account for underreported musculoskeletal injuries during Marine Corps recruit training. The sample included 464 Marine recruits, consisting of 325 males and 139 females from Marine Corps Recruit Depot Parris Island and Marine Corps Recruit Depot San Diego. Data was collected through medical chart reviews and injury self-reports via a tablet-based survey, with only recruits who had both data sources included in the analysis. A two-source capture–recapture design estimated unreported injuries and the extent of undercounting while assuming independence between the data sources (Lovalekar et al., 2024).

The capture-recapture method is a statistical estimation technique used to adjust for under-ascertainment in injury data when multiple incomplete data sources are available (Lovalekar et al., 2024). It was used to calculate the estimated total number of injuries among recruits, cumulative incidence, and percent ascertainment for each data source. The cumulative incidence, was calculated based on the proportion of recruits who sustained at least one musculoskeletal injury during the recruit training cycle (Lovalekar et al., 2024).

Lovalekar et al. (2024) reported using single data sources, musculoskeletal injury incidence was substantially underestimated. The medical chart review reported 21.8% of recruits sustaining an injury, while injury self-report identified 28.4%. Of the 187 recruits observed as injured, only 47 were identified in both sources, indicating overlap between surveillance methods (Lovalekar et al., 2024). After applying the capture-recapture technique, the estimated true cumulative incidence of MSKI increased to 62.0%, indicating nearly two thirds of recruits sustained at least one musculoskeletal injury during the 13-week training cycle. The study quantified how incomplete each surveillance source was. Medical chart review was 35.1% incomplete, injury self-report was 45.9%, while the combined ascertainment was 65.0%. Even with the combination of both sources, 35% of injuries were still missed according to the capture-recapture estimates. The ascertainment also varied by injury classification. Strains and sprains were captured more consistently while pain, ache, or spasm-type injuries were frequently underreported, particularly in medical records (Lovalekar et al., 2024).

Lovalekar et al. (2024) acknowledge that recruits who seek medical care may also be more likely to recall and report injuries. Injuries self-report data was collected at the end of the 13-week training cycle, requiring recruits to recall injuries sustained throughout that period. This introduces a recall bias, particularly for minor injuries, short duration pain episodes, and injuries that occurred early in training. Medical chart reviews are limited to recruits who sought medical evaluation. Lovalekar et al. (2024) noted that many recruits intentionally avoid seeking care during training, leading to systematic under-ascertainment in medical chart review data. Both data sources relied on broad injury definitions rather than detailed diagnostic confirmation. The analysis reflected injuries sustained during a single recruit training cycle, rather than multiple cycles or longitudinal follow-up. As a result, findings cannot capture seasonal variation, year-to-year training changes, and long-term injury outcomes. Lovalekar et al. (2024) emphasizes that the capture-recapture technique provides an estimate, not a definitive count of true injury incidence. It does not eliminate uncertainty and should be interpreted as an upper-bound approximation of injury burden.

D. INJURY TIMING IN ENTRY TRAINING

In 2024, a study was conducted to identify the causes of attrition and whether physical traits could predict who is at higher risk for attrition at Marine Corps Recruit Depot Parris Island and Marine Corps Recruit Depot San Diego Lovalekar et al., (2024).

The study examined whether neuromuscular strength, power, body composition, smoking or prior injuries predict MSKI and attrition. The study sought to identify modifiable risk factors that could be targeted at the beginning of training to reduce injuries and attrition. The sample size of this study comprised 694 recruits, 183 females and 401 males (Lovalekar et al., 2024). The data consisted of baseline performance tests, such as the countermovement jump and the isometric mid-thigh pull, along with survey and training performance measures. Outcome data was collected throughout the training cycle and included documentation of MSKI and attrition. Logistic regression models were used to determine which baseline factors predicted injury and attrition. Any injuries that occurred before baseline testing were excluded (Lovalekar et al., 2024).

Lovalekar et al. (2024) reported that a total of 193 MSKI were observed among 135 recruits, with 80.31% affecting the lower extremity. Two neuromuscular variables emerged as significant predictors of injury, lower relative peak power and shorter eccentric deceleration duration. Recruits who generated less power relative to body mass and who spent less time braking during the countermovement jump were more likely to sustain an injury during training. A previous lower extremity injury more than doubled the odds of sustaining another during training (Lovalekar et al., 2024). Attrition was predicted by a different set of variables, showing that injury and attrition are linked but distinct outcomes. Attrition was more likely among recruits with reduced eccentric deceleration impulse and longer time to peak force. Each unit increase in eccentric deceleration impulse was associated with a 2% reduction in the odds of attrition. Cigarette users were 112% more likely to fail to complete recruit training compared to non-smokers. Descriptive results showed 42.6% of female recruits sustained an injury compared to 14.2% of males. The injury rate among females was roughly three times that of males (Lovalekar et al., 2024). The study did not account for when injuries occurred and treated them as an outcome, unable to estimate hazard. Modeling attrition as a binary outcome limits the ability to distinguish the different types of attrition. The study did not assess if neuromuscular predictors operate differently by sex.

E. CONCLUSION

In conclusion, prior literature establishes attrition has been present since at least the 1960s at Marine Corps Officer Candidate School, ranging from 20%–30%. Across both the officer and enlisted entry level training schools, overuse MSKI are consistently the most common injury type. Multiple studies documented substantial differences in injury incidence between males and females. Research also shows that injury rates are higher during physically demanding training events and early phases of training. Surveillance research demonstrated that relying solely on medical record systems underestimates the cumulative incidence of injuries.

Despite decades of research, many studies relied on descriptive statistics without multivariable regression models. When using logistic regression models, attrition and injury were frequently treated as binary outcomes. Researchers frequently treated injury and attrition as binary outcomes and did not use survival analysis to account for injury timing or hazard. The existing studies do not integrate structural attrition rates, injury incidence, sex differences, and physiological predictors with a unified analysis specific to Officer Candidate School. Injury incidence and composition are frequently described without linking patterns to attrition outcomes. Although attrition predictors were identified, they were not evaluated for persistence or change over time. The relationship between attrition, injury composition, and timing patterns at Officer Candidate School remain insufficiently examined.

This thesis addresses three gaps by examining attrition and injury timing across multiple years. Using logistic regression models and survival analysis, this research evaluates how the attrition patterns have shifted and identifies the characteristics associated with the patterns. This study provides a comprehensive assessment of injury-related attrition integrated injury epidemiology and attrition predictors that have not previously been conducted.

IV. DATA AND METHODOLOGY

This quantitative study integrates multiple data sources at the candidate level. The purpose of this chapter is to describe each data source, the construction of the sample population of candidates, and the procedures used to clean and merge the dataset for statistical analysis. This chapter outlines the descriptive statistics and the quantitative methods used in RStudio.

A. DATA SOURCES

The primary data source for this study is the Marine Corps Total Force Data Warehouse (TFDW). TFDW serves as a centralized repository that collects and stores personnel data across the Marine Corps from accession through separation. The database aggregates information from 24 underlying data sources, which capture personnel, accession, and training data throughout the full life cycle of a Marine. TFDW integrates multiple systems, including the Marine Corps Total Force System (MCTFS) and the Marine Corps Recruiting Information Support System (MCRISS). Data within TFDW is structured as monthly snapshots, with each record reflecting the status of every Marine as of the final day of the month (Noll and Florence, 2020).

For this research, the MCRISS officer applicant table housed within TFDW served as the primary extraction source. This dataset includes OCS result codes, OCS class begin dates, prior service status, and other candidate demographics used in the regression analysis. Individual candidate records were identified using Social Security numbers and structured at the person level for statistical analysis. The observation window spans from 2003–2025.

The waiver data was extracted from the MCRISS waiver table housed within TFDW. This dataset consists of administrative transaction records documenting waiver activity throughout the intake process. Waiver records were consolidated per candidate, reflecting waiver events per individual.

B. DATA CLEANING AND VARIABLE CONSTRUCTION

In this section, I discuss the procedures used to clean the administrative dataset, define the analytic sample, and construct the variables used in the regression analysis. Due to the transactional-level nature of the datasets, substantial reconstruction was required to produce an individual candidate-level analytic dataset.

1. Construction of the Sample

The initial extraction of the officer applicant table within MCRISS consisted of 5,192,983 administrative records reflecting monthly transaction snapshot. At this stage, the dataset contained multiple rows per Social Security Numbers and multiple rows per OCS attempt.

To construct the dataset, records without both OCS class begin date and an OCS class result were excluded. A person-level attempt variable was created for candidates attempting OCS multiple times. The variable was created by counting the class begin date or the outcome code if the class date was null. The dataset was aggregated to reflect an individual OCS attempt structure versus a person-month administrative record. The final dataset consisted of 44,406 candidate records, each represented once, with variables capturing one or more OCS attempts.

Although the dataset includes 2003, data for that year was inconsistent, which limited its consistency in every analysis due to incomplete reporting and small sample size. In analyses where the dataset was consistent, the observations were retained.

Date variables were converted to allow the computation of class duration and time-to-event measures. Class length was calculated as the difference between OCS class begin and end dates after conversion into date objects. Negative class lengths were treated as administrative errors and coded as null.

2. Dependent Variable

Multiple dependent variables were created to address the study's research question. The primary outcome variable, the ultimate attrition variable, was constructed using OCS class result codes. Candidates who ultimately failed OCS were coded as 1, while candidates who completed training were coded as 0.

Among candidates who ultimately failed, a binary variable was created to identify whether the failure was injury related. Drop reason descriptions were used to determine injury classification, including categories for medical, injury, orthopedic, heat, respiratory, cardiovascular and other medical conditions.

For the multinomial regression models, injury reasons were grouped into four mutually exclusive categories: Respiratory, Orthopedic, Heat, and Other. Orthopedic injuries served as the reference category in the regression models.

An early injury indicator was created to identify injury-related attrition occurring within the first 21 days of training. Injuries occurring on or before day 21 were coded as 1, while all others were coded as 0.

For survival analysis, an event indicator was created in which candidates who attrited due to an injury were coded as 1. Candidates who completed training or attrited for non-injury-related reasons were coded as 0 and treated as censored observations.

3. Independent Variables

Sex was coded as a binary categorical variable using the administrative female indicator. Age at entry was converted to a numeric format and treated as a continuous variable. Observations with zero recorded as their age were removed. These observations were determined to be administrative errors.

The prior service variable was constructed using discharge code results. Candidates with a valid prior discharge record were designated as prior service, while all others were coded as non-prior service.

A binary medical waiver variable was created for candidates who had one or more approved medical waivers, while those without were coded as having no medical waiver.

The class description was retained in its original format to capture structural differences across training pipelines.

C. MERGING OF DATA

The MCRISS waiver table contained 165,920,585 administrative waiver records, each representing a transactional entry rather than a unique individual. Identification of unique Social Security Numbers revealed 667,950 individuals with at least one documented waiver.

The waiver data was aggregated to one row per Social Security Number. The merge was performed using Social Security Number as the identifier. For individuals without a waiver, the waiver count was set to 0 to allow proper merging without missing values. This aggregation prevented duplication and inflation of waiver counts during merging. The resulting merged dataset contained one row per unique Social Security Number.

D. DATA STATISTICS

The analytic sample consisted of 37,243 observations from 2003–2025. Each observation represents an individual candidate, with variables capturing one or more OCS attempts. The sample included candidates who completed training and those who attrited. Among attrited candidates, prior service candidates accounted for 46.1% of attrition outcomes despite representing only 14.2% of the analytic sample. Table 3 provides summary statistics of selected variables within the dataset.

Table 3. Officer Candidate School Summary Statistics

Variable	Observations	Completed	Attrited
Age at Entry (years)	23.1 (3.2)	23 (3.2)	23.4 (3.3)
Female (%)	10.2%	8.5%	18.1%
Prior Service (%)	14.2%	7.3%	46.1%
Medical Waiver (%)	25.7%	24.2%	34.3%
Overall Attrition (%)	17.8%	—	100%
Injury-Related Attrition (%)	3.6%	—	20.2%
Observations (N)	37,243	30,599	6,644

Table 4 provides demographic characteristics of the analytic sample (N = 37,243). Female candidates comprised 10.2% of the sample, while males represented 82.2%. The majority of candidates were between 21 and 24 years of age. Racial and ethnic composition was predominantly white (67.3%), followed by Hispanic, Black, and Asian candidates. The majority of the candidates were not married. Prior service candidates represented 14.2% of the sample; however, they accounted for 49.3% of candidates who failed and returned and 44.1% of candidates who failed and never returned.

Table 4. Demographic Characteristics and OCS Outcomes

Characteristic	N	Succeeded	Failed & Returned	Failed & Never Returned
Candidate Total	37,243 (100%)	30599 (100%)	2544 (100%)	4100 (100%)
Sex				
Female	3,795 (10.2%)	2592 (8.5%)	455 (17.9%)	748 (18.2%)
Male	30,597 (82.2%)	25596 (83.6%)	1984 (78%)	3017 (73.6%)
Unknown	2,851 (7.7%)	2411 (7.9%)	105 (4.1%)	335 (8.2%)
Age at Entry (years)				
<21	7,244 (19.5%)	6014 (19.7%)	430 (16.9%)	800 (19.5%)
21–24	19,437 (52.2%)	16149 (52.8%)	1225 (48.2%)	2063 (50.3%)
25–29	8,754 (23.5%)	6952 (22.7%)	754 (29.6%)	1048 (25.6%)
≥30	1,807 (4.9%)	1483 (4.8%)	135 (5.3%)	189 (4.6%)
Unknown	1 (0%)	1 (0%)	0 (0%)	0 (0%)
Race / Ethnicity				
White	25,073 (67.3%)	20870 (68.2%)	1537 (60.4%)	2666 (65%)
Black	2,070 (5.6%)	1579 (5.2%)	219 (8.6%)	272 (6.6%)
Hispanic	4,174 (11.2%)	3308 (10.8%)	351 (13.8%)	515 (12.6%)
Asian	1,684 (4.5%)	1270 (4.2%)	187 (7.4%)	227 (5.5%)
Unknown	4,242 (11.4%)	3572 (11.7%)	250 (9.8%)	420 (10.2%)
Marital Status				
Married	4,253 (11.4%)	3627 (11.9%)	217 (8.5%)	409 (10%)
Not Married	31,371 (84.2%)	25474 (83.3%)	2301 (90.4%)	3596 (87.7%)
Unknown	1,619 (4.3%)	1498 (4.9%)	26 (1%)	95 (2.3%)
Prior Service				
Non-Prior Service	31,951 (85.8%)	28371 (92.7%)	1290 (50.7%)	2290 (55.9%)
Prior Service	5,292 (14.2%)	2228 (7.3%)	1254 (49.3%)	1810 (44.1%)
Geographic Origin				
East Coast	27,071 (72.7%)	22323 (73%)	1797 (70.6%)	2951 (72%)
West Coast	8,301 (22.3%)	6750 (22.1%)	626 (24.6%)	925 (22.6%)
Unknown	1,871 (5%)	1526 (5%)	121 (4.8%)	224 (5.5%)
Waiver Type				
Law Waiver	2,207 (5.9%)	1968 (6.4%)	79 (3.1%)	160 (3.9%)
Medical Waiver	951 (2.6%)	760 (2.5%)	77 (3%)	114 (2.8%)
Other Waiver	544 (1.5%)	417 (1.4%)	50 (2%)	77 (1.9%)

Figure 1 presents attrition rates by OCS class type. Attrition varied across class types, with PLC Combined (22.4%) and OCC (22.1%) demonstrating the highest attrition rates. The PLC Junior and PLC Senior classes exhibited lower attrition rates.

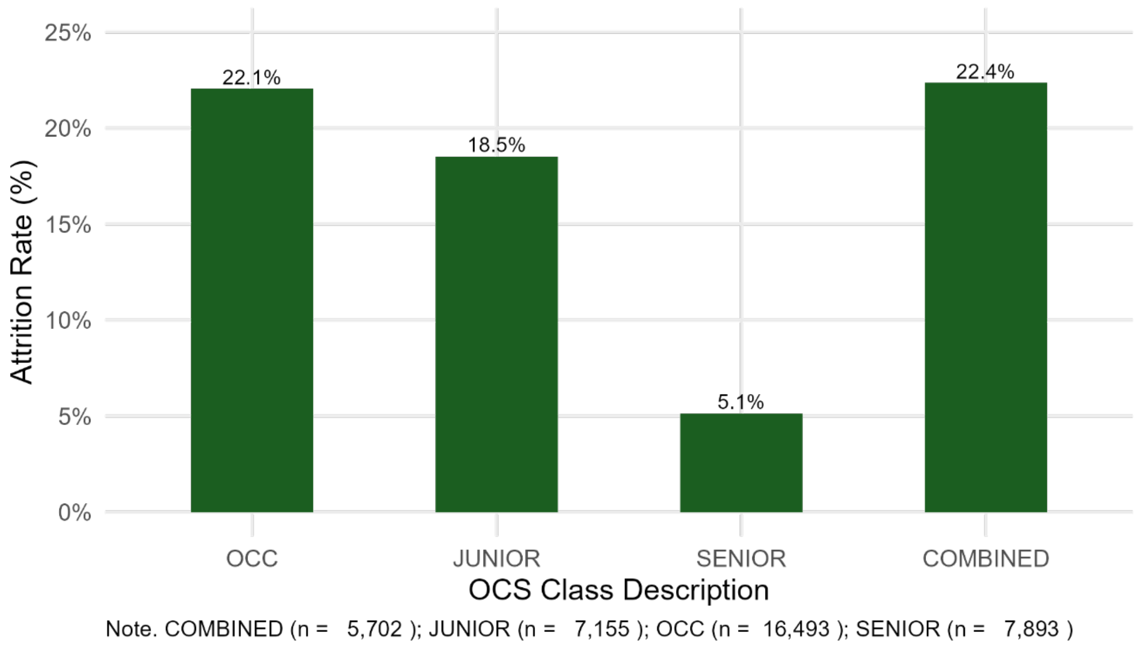

Figure 1. Attrition Rate by OCS Class Description

Figure 2 presents attrition by time in training and drop reason. The largest number of attrition events occurred within the first 21 days of training, with injury and medical-related attrition decreasing as training progressed. Voluntary attrition occurred primarily during the first half of the training cycle and declined toward the later phases. Performance and adaptation-related attrition appeared more frequently in the later training phases, while administrative and other categories were distributed more evenly across the training cycle.

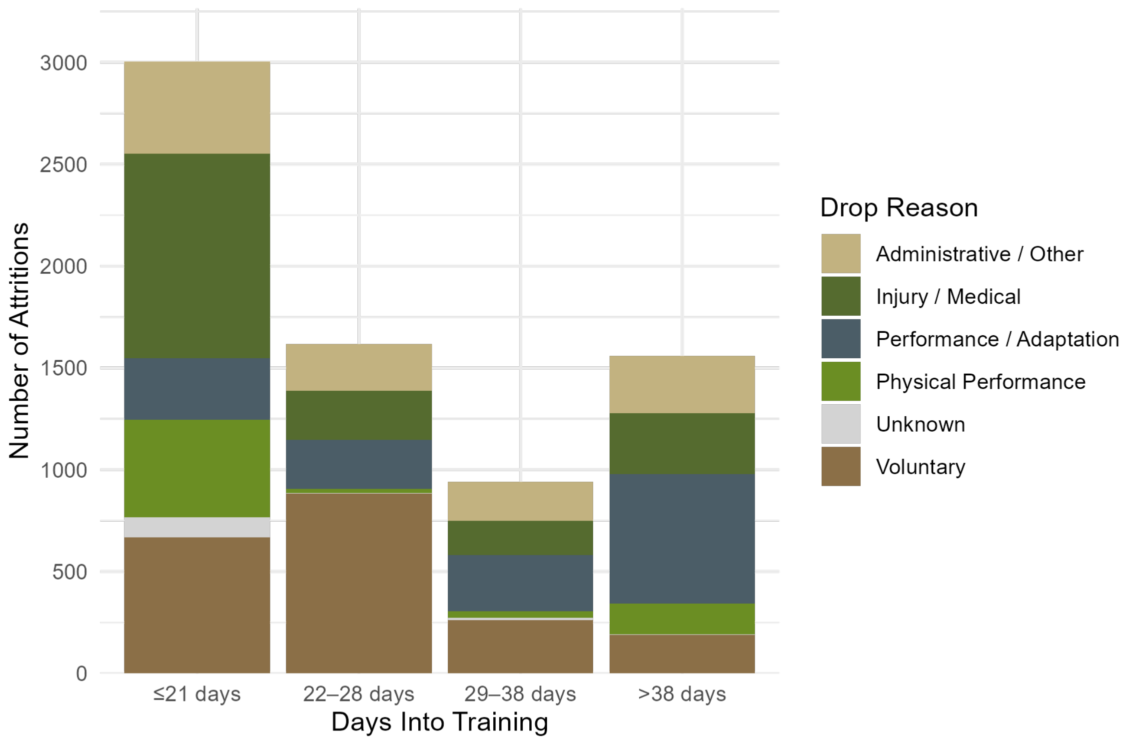

Figure 2. Drop Reason Distribution by Training Days

Figure 3 illustrates the timing of injury-related attrition by medical waiver status. For both candidates with and without an approved medical waiver, the majority of injury-related attrition occurred within the first 21 days of training. Fewer injury-related drops occur during the 29–38-day period, with a modest proportion occurring after 38 days. The overall distribution of injury timing appeared similar across waiver status, indicating comparable temporal patterns of injury-related attrition regardless of medical waiver status.

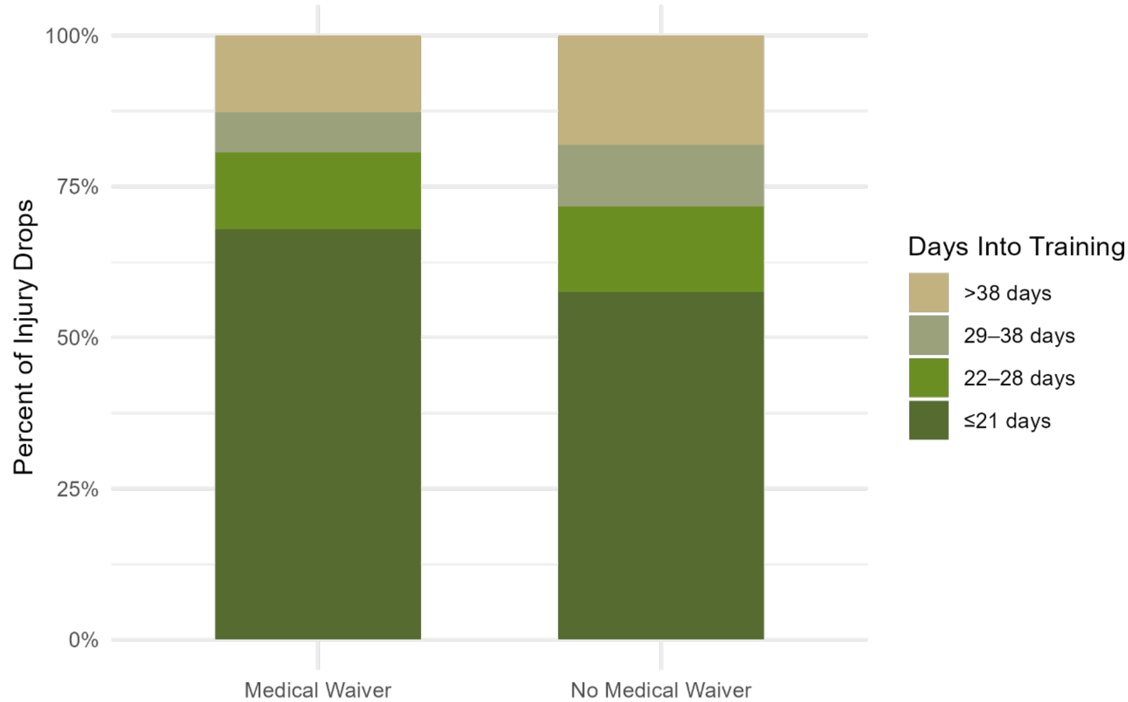

Figure 3. Medical Waiver Status

E. METHODOLOGY

I used multiple statistical models to analyze how candidate characteristics are associated with attrition at Officer Candidate School. Since attrition occurred in different forms and at different points during training, three separate modeling approaches were used.

Logistic regression models were used to analyze whether candidates completed OCS or attrited, and among those who left, whether attrition was injury-related or not. These models addressed questions such as whether certain candidate characteristics are associated with a higher probability of attrition.

Multinomial logistic regressions models were used to analyze injury type among candidates who attrited due to injury. Injury-related attrition occurred for different medical reasons, four mutually exclusive injury categories were constructed; orthopedic, respiratory, heat, and other. The multinomial model allowed comparisons across these categories to determine whether certain candidate characteristics are associated with a specific type of injury-related attrition.

Cox Proportional Hazards models were estimated to account for the timing of attrition. Attrition did not occur during training. Some candidates attrited early while others attrited further in the training cycle. The survival model evaluated when attrition occurred rather than simply whether it occurred. Candidates who completed training or attrited for non-injury reasons were treated as right-censored observations. All models were estimated using RStudio.

1. Logistic Regression

Logistic regression models were used to analyze the relationship between candidate characteristics and attrition outcomes at OCS. Logistic regression was selected because the dependent variables were binary. The probability of attrition was modeled as

$$P(Y_i = 1 \mid X_i) = \frac{e^{X_i\beta}}{1 + e^{X_i\beta}},$$

where

$$X_i\beta = \beta_0 + \beta_1 Sex_i + \beta_2 Age_i + \beta_3 PriorService_i + \beta_4 MedicalWaiver_i + \beta_5 Class_i$$

In this specification, Y_i represented the attrition outcome for candidate i, and X_i included the listed set of candidate characteristics. Three logistic regression models were estimated.

The first model analyzes overall attrition using the training outcome as the dependent variable. The dependent variable was coded as 1 if the candidate ultimately failed OCS and 0 if the candidate completed training. This model evaluated whether candidate characteristics were associated with the probability of attrition.

The second model analyzed injury-related attrition. The analytic sample for this second model was restricted to candidates who ultimately failed OCS. The dependent variable was coded as 1 if the failure was injury or medically related and 0 if the failure was due to a non-injury reason. This model evaluated whether candidate characteristics were associated with the probability that attrition was injury-related rather than non-injury-related.

The analytic sample was restricted to candidates who failed due to injury. The dependent variable was coded as 1 if the injury occurred within the first 21 days of training and 0 if the injury occurred later in the training cycle. This model evaluated whether candidate characteristics are associated with early injury-related attrition.

All models were estimated separately for pre–2015 and post–2015 periods to account for potential structural differences within the training environment. Marine Corps physical readiness policy emphasized the central role of fitness in training outcomes. Marine Corps Order 6100.13A states that "physical fitness is essential to the day-to-day effectiveness and combat readiness of the Marine Corps" (U.S. Marine Corps, 2008). Given the central role of physical performance in training outcomes, the models were separated to evaluate whether relationships between candidate characteristics and attrition outcomes differed across earlier and later training environments. Independent variables included sex, age at OCS entry, prior service status, medical waiver, and OCS class description. For the ultimate attrition and injury-related attrition models, standard errors were clustered at the class begin date level to control for class correlation among candidates. Results are reported as odds ratios. Odds ratios greater than 1 indicate increased odds of the outcome associated with a change in that characteristic, while values less than 1 indicate decreased odds, holding all other variables constant.

2. Multinomial Logistic Regression

Multinomial logistic regression models were estimated to determine the differences in the types of injuries associated with attrition at OCS. The analytic sample was restricted to candidates who attrited due to injury. This model focused on analyzing candidate characteristics to determine whether they were associated with differences in the probability of injury-related attrition across four injury categories.

In this study, the dependent variable represented the primary injury category associated with attrition. Injury-related failures were grouped into four mutually exclusive categories: orthopedic, heat-related, respiratory, and other injuries. Orthopedic injuries were the most frequent injuries observed throughout the training cycle and over time, which is why they were used as the reference category.

Independent variables included sex, age at OCS entry, prior service status, OCS class description, and medical waiver status. Two separate models were estimated for the pre–2015 and post–2015 eras to account for potential differences in the training environment over time.

Model coefficients were reported as relative risk ratios. Coefficients greater than 1 indicated a higher probability of attrition in a given injury category relative to the reference category associated with a change in that independent variable. Coefficients with a value less than 1 indicated a lower probability of attrition relative to the reference category while holding other variables constant.

3. Survival Analysis

Survival analysis was used to examine the timing of injury-related attrition at OCS. Survival analysis evaluated when an event occurred during the training cycle, which accounts for the fact that candidates attrite at different points during training.

The analytic sample for this model included candidates who experienced injury-related attrition during OCS. The outcome of interest was the time to injury-related attrition, measured in days from the start of training to the date the candidate was disenrolled from training due to injury. Records with a missing OCS class begin date were removed for the survival analysis. Time-to-event measures required a valid period to preserve accurate calculations.

A Cox proportional hazards model was estimated to determine whether candidate characteristics were associated with the hazard of injury-related attrition over the training cycle. The hazard rates represented the risk of attrition at a given point in the training cycle for candidates who have not yet experienced the event.

Independent variables included sex, age at OCS entry, prior service status, OCS class description, and medical waiver status. Two separate models were estimated for the pre-2015 and post-2015 eras to account for potential differences in the training environment over time.

The model coefficients were reported as hazard ratios. A coefficient greater than 1 indicated a higher risk of injury-related attrition at a given point in time, while a coefficient less than 1 indicated a lower risk, holding all other variables constant. Candidates who were disenrolled from OCS for reasons other than injury-related attrition were treated as censored observations, including candidates who graduated from OCS. The observations were considered right censored in the survival analysis.

F. CONCLUSION

In summary, this chapter described the datasets utilized in this study and the methodology chosen to analyze the data. The methods used to clean the datasets were described, along with the variable creation process and merging of the various datasets into one usable format for analysis. Summary and descriptive statistics were used to summarize the dataset and the study population. Finally, the methodology and criteria for model selection, along with the logistic regression models and survival analysis with the Cox Proportional Hazard models, were outlined.

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V. RESULTS AND ANALYSIS

In this chapter, the results of the statistical analysis are presented. The chapter is organized into four sections: overall attrition, injury-related attrition, injury type composition, and timing of injury-related attrition. The first section examines overall attrition by analyzing ultimate attrition outcomes. The second section examines injury-related attrition patterns through logistic regression models. The third section presents injury type composition results using multinomial logistic regression models. The final section examines the timing of injury-related attrition through survival analysis and descriptive timing patterns.

A. OVERALL ATTRITION

Figures 4 and 5 illustrate variations in overall attrition and the distribution of attrition across the four OCS class types. Figure 4 shows slight variations in overall attrition across the observed period. From 2004 to 2025, attrition remained within a relatively narrow range, with lows of approximately 11%–12% and highs 22%–23%. Elevated attrition occurred between 2005 and 2008, with rates ranging from approximately 21%–23%, followed by another increase between 2014 and 2015, when attrition again rises to approximately 20%–22%. A noticeable decline occurs between 2019 and 2020, when attrition drops to approximately 11%–14%, followed by a rebound after 2021, when rates return to approximately 17%–20%. Despite these periodic fluctuations, overall attrition appeared relatively stable over time.

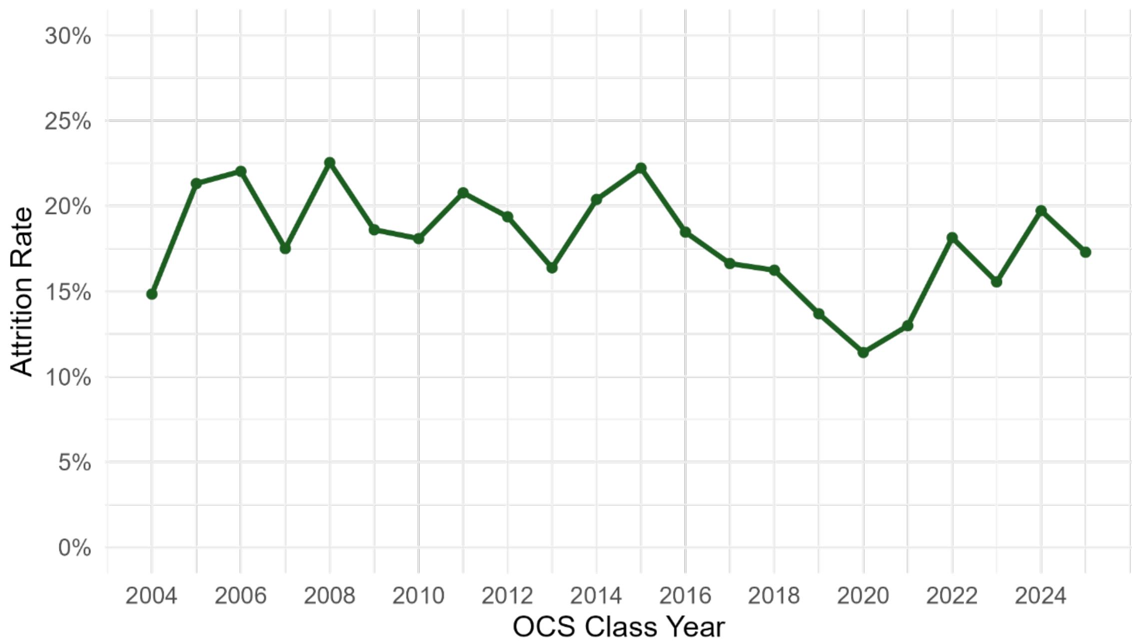

Figure 4. OCS Attrition Over Time

Figure 5 displays the structural differences across OCS class types. OCC and PLC Combined classes generally exhibited higher attrition rates, while PLC Junior fell in the middle range. PLC Senior consistently demonstrated the lowest attrition rates, indicating attrition was not evenly distributed across training pipelines. OCC and PLC Combined classes also showed greater year-to-year fluctuation, with several peaks above 20% attrition and more pronounced dips. PLC Senior remained relatively low and stable, generally below 10%. Overall, these structural differences persisted throughout the years despite fluctuations.

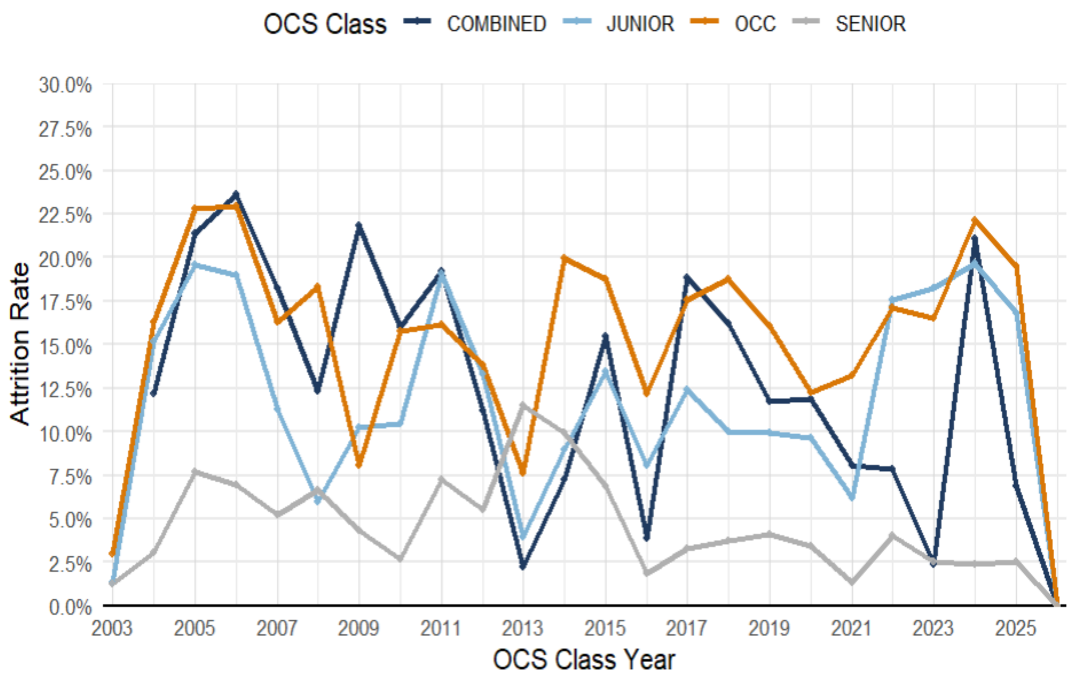

Figure 5. OCS Class Attrition Rates Over Time

Figure 6 displays the distribution of attrition timing across calendar year cohorts, divided into four different categories: less than 21 days, 22–28 days, 29–38 days and more than 38 days. Across all eras, early attrition dominated with the largest portion occurring within 21 days of training. This portion increased in the more recent era from 2020–2025. This suggested attrition was consistently front-loaded in the training cycle. Middle phase attrition has a slight variation from 2010–2014 showing relatively more attrition in the 29–38-day window. Attrition after 38 days remained relatively stable.

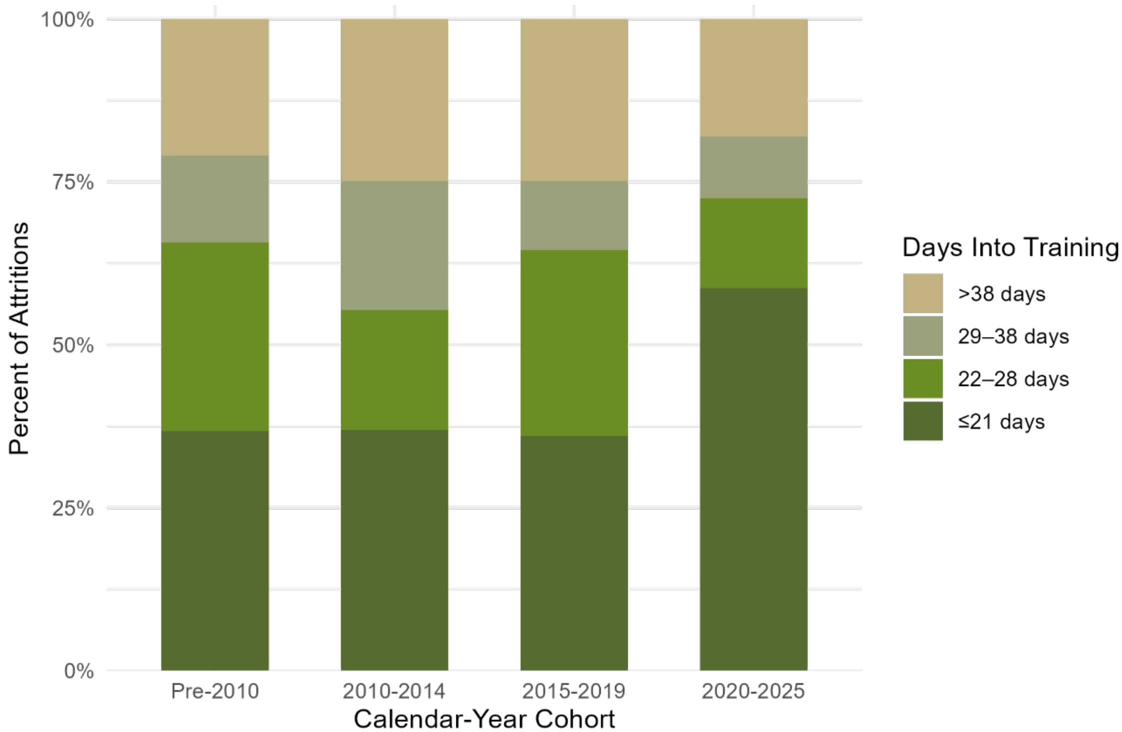

Figure 6. Timing of Attrition by Training Days

Table 5 displays the results of the logistic regression model with ultimate outcome versus success as the outcome, clustered by class and estimated separately for the pre-2015 and post-2015 eras. Results are reported as odds ratios. Prior service status demonstrated the strongest association with ultimate attrition. In the pre-2015 era, prior service candidates exhibited nearly seven times the odds of attrition relative to non-prior candidates. In the post-2015 era, this relationship increased substantially, with prior service candidates demonstrating over 24 times the odds of attrition. This made prior service the strongest predictor of ultimate attrition in both periods.

Female candidates exhibited more than twice the odds of attrition compared to male candidates in both eras. This relationship remained stable across time, indicating that sex is a strong and consistent predictor of ultimate attrition. Age showed a modest association with attrition, with older candidates demonstrating slightly higher odds of attrition in the post-2015 model.

Contradicting intuitive expectations, candidates with a medical waiver exhibited lower odds of attrition in the pre-2015 model. Medical waivers status was associated with 19% lower odds of attrition, and in the post-2015 model, 48% lower odds. PLC Junior and Senior classes consistently demonstrated lower odds of attrition relative to OCC and PLC Combined classes, indicating that structural class differences persisted even after controlling candidate demographics.

Table 5. Ultimate Attrition versus Success

	Dependent variable:	
	Ultimate Attrition	
	Pre-2015	Post-2015
Female	2.320***	2.227***
	(0.072)	(0.094)
Age	0.998***	1.025***
	(0.009)	(0.010)
Prior Service	6.917***	24.568***
	(0.200)	(0.172)
Medical Waiver	0.811***	0.522***
	(0.082)	(0.085)
PLC Junior	0.533***	0.690***
	(0.140)	(0.219)
PLC Senior	0.303*	0.231
	(0.160)	(0.207)
OCC	1.365***	1.227***
	(0.099)	(0.176)
Observations	20,401	16,773
Note:	Odds ratios reported. Standard errors clustered at the class begin date level. * p < 0.10, ** p < 0.05, *** p < 0.01.	

B. INJURY-RELATED ATTRITION

Figure 7 illustrates the variations in injury-related attrition from 2004 to 2025, remaining within a relatively narrow range of 1%–4% and short-term increases in the mid–2000s and 2007–2008. There was a decline in attrition in the early 2010s, reaching a low point in 2013 (1%), followed by an increase beginning in the late 2010s. Injury-related attrition fluctuated through the early 2020s and reached its highest level in 2024 just under 4%. This pattern suggested that injury-related attrition remained relatively stable.

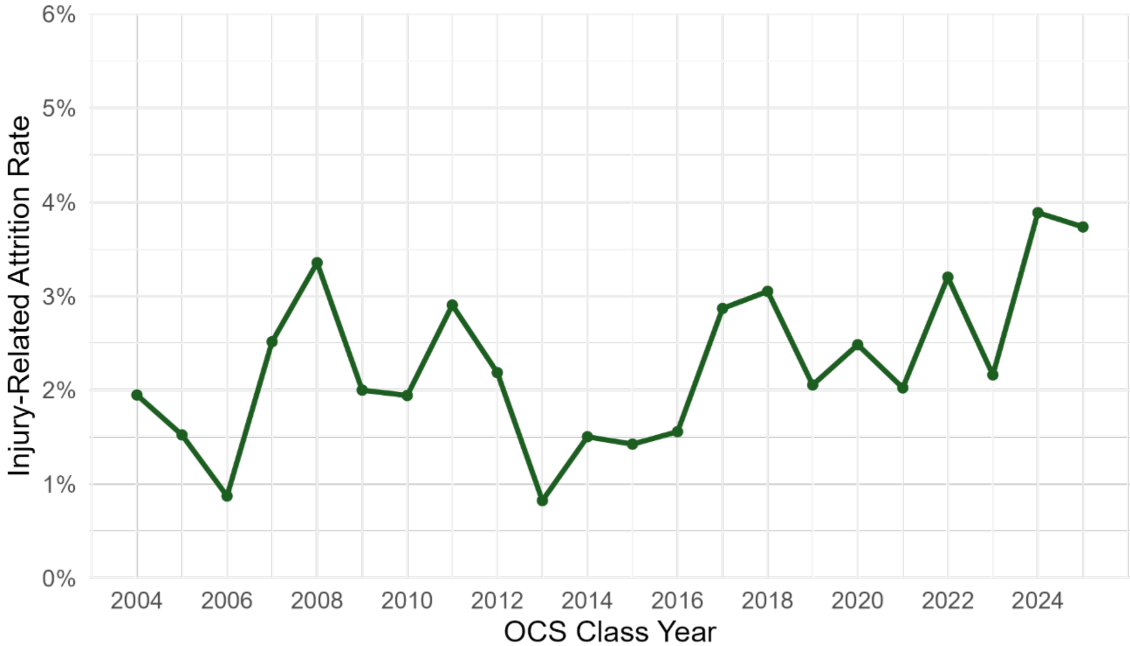

Figure 7. Injury-Related Attrition Overtime

Table 6 presents the results of the logistic regression examining injury-related ultimate attrition. The models were estimated separately for the pre-2015 and post-2015 periods. Odds ratios are reported with standard errors clustered at the class level.

- Across both eras, being a female candidate is the strongest and most consistent predictor. Female candidates have a 55%–74% higher odds of injury-related attrition compared to male candidates.
- Prior service status differed substantially between the two eras. In pre–2015 period, prior service candidates had 28% higher odds of injury-related attrition, while in the post-2015 era they had 22% lower odds.
- PLC Senior and OCC classes displayed similar patterns, with lower odds of injury-related attrition in the pre-2015 era and higher odds in the post-2015 era.

- Having a documented medical waiver made no significant difference in the pre-2015 era, while in post-2015 period it decreased the odds of injury-related attrition by 15%.
- Age shows a statistically significant, but relatively small effect. Each additional year of age increases the odds of injury-related attrition by 3%–4.5%.
- The PLC Junior class had the weakest overall effect, with 23% lower odds of injury-related attrition in pre-2015 era and no meaningful difference in the post-2015 era.

Overall, the regression results indicate that female candidates consistently have higher odds of injury-related attrition across both eras. In contrast prior service candidates shifted from higher risk to lower risk after 2015, suggesting an important pattern change within the model.

Table 6. Odds of Attrition due to Injury

	Dependent variable:	
	Injury Type	
	Pre-2015	Post-2015
Female	1.744***	1.549***
	(0.117)	(0.113)
Age	1.034***	1.045***
	(0.019)	(0.014)
Prior Service	1.276***	0.784***
	(0.116)	(0.146)
Medical Waiver	1.021***	0.846***
	(0.142)	(0.210)
PLC Junior	0.775***	0.962***
	(0.246)	(0.190)
PLC Senior	0.600*	1.208***
	(0.308)	(0.345)
OCC	0.775***	1.104***
	(0.184)	(0.162)
Observations	3,956	2,677

Note: Odds ratios reported. Standard errors clustered at the class begin date level. Denominator includes only candidates who ultimately failed OCS.
* p < 0.10, ** p < 0.05, *** p < 0.01.

C. INJURY TYPE COMPOSITION

The tables and figures in this section examine the composition of injury-related attrition at OCS. The figures focus on the distribution of injuries throughout the training cycle and across eras. The multinomial logistic regression models are estimated separately for the pre-2015 and post-2015 periods, comparing the likelihood of heat, respiratory, and injury categories to orthopedic injuries.

Figure 8 illustrates the distribution of injury-related drop reasons across training eras. From pre-2010 period through 2015, orthopedic injuries remained the predominant cause of injury-related attrition, consistently representing the largest share of injury drops across all eras. While minor fluctuations were present between periods, the overall distribution of injury types remained relatively stable over time.

Among the remaining injury categories, heat injuries and respiratory conditions account for the next largest proportions, though both remain substantially lower than orthopedic injuries. A slight increase in heat-related injuries was observed beginning around 2015, while respiratory-related injuries showed a more noticeable increase in the most recent period from 2020 to 2025. Despite these modest changes, orthopedic injuries remained the dominant contributor to injury-related attrition throughout the entire observation period.

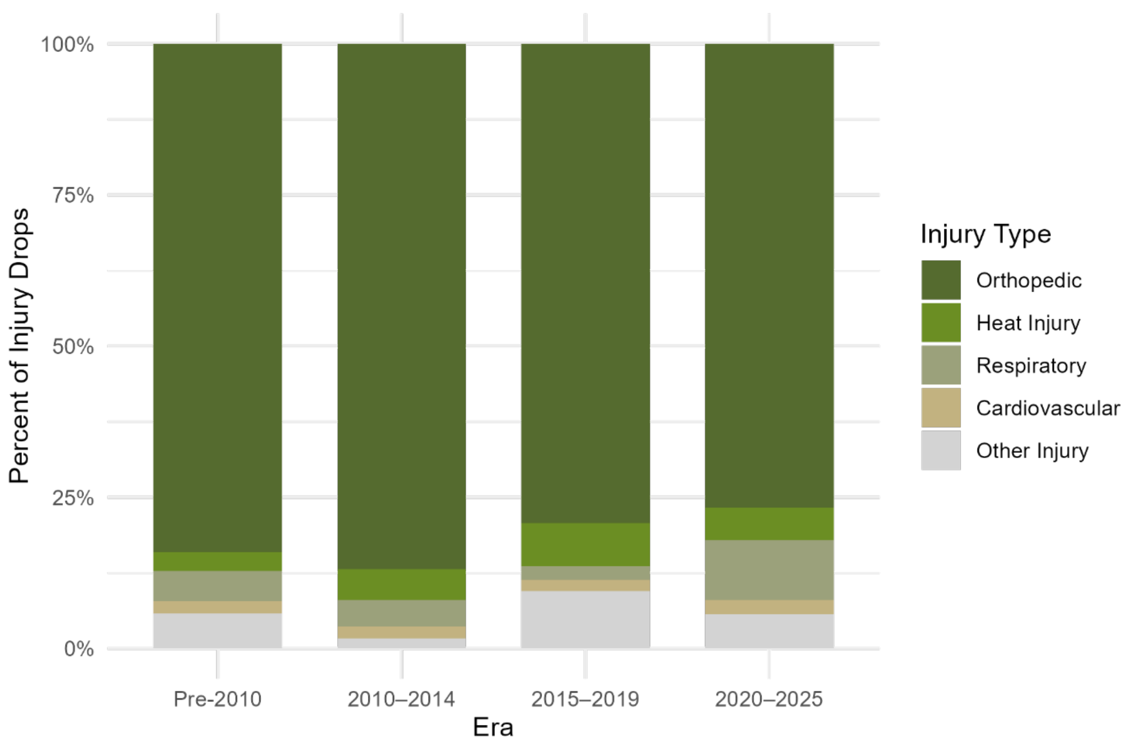

Figure 8. Distribution of Injury-Related Drop Reasons over Time

Figure 9 illustrates the distribution of injury-related attrition by day of training. Throughout all training days, orthopedic injuries remained the predominant and largest injury type. While orthopedic injuries dominated across the training cycle, there were slight fluctuations among the other injury categories during the early and later stages of training.

What is particularly interesting is that respiratory injuries occur more frequently between 22–28 days, becoming less common as training progressed. Heat injuries appear to show the opposite pattern, with proportions increasing during the later stages of training, particularly from 29 days onward. Cardiovascular injuries remained relatively constant throughout the training period, representing only a small share of injury-related attrition across all time intervals.

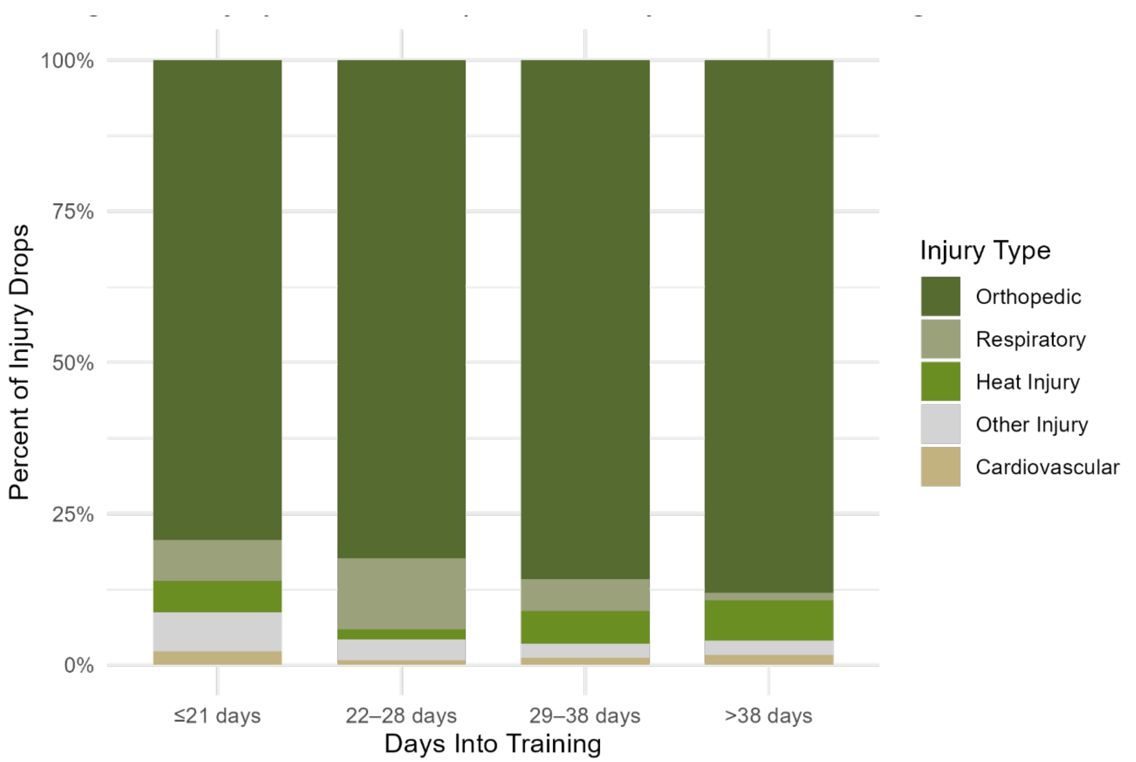

Figure 9. Injury-Related Drop Reasons by Training Days

Tables 7 and 8 present the results of the multinomial regression models examining injury composition across four injury categories, with orthopedic injuries serving as the reference category. The models compared heat, respiratory, and other injuries relative to orthopedic injuries among candidates who failed due to injury.

Starting with the pre-2015 injury composition findings, PLC Senior classes show the strongest effect. PLC Senior classes had the strongest effects, with candidates approximately five times more likely to fail due to heat injuries and four times more likely to fail due to other injuries relative to orthopedic injuries. PLC Junior classes were roughly twice as likely to experience non-orthopedic injuries relative to orthopedic injuries. OCC classes were more likely to experience respiratory injuries. Prior service candidates were less likely to fail due to heat or respiratory injuries relative to orthopedic injuries but were more likely to fail due to other injuries. When examining age, older candidates were slightly less likely to fail due to heat injuries, but more likely to fail due to respiratory or other injuries relative to orthopedic injuries. Finally, female candidates were more likely to fail due to other injury categories relative to orthopedic injuries, while male candidates were more likely to fail due to respiratory injuries relative to orthopedic.

With respect to the post-2015 injury composition findings, PLC Senior classes again showed the strongest effects. PLC Senior classes were four times more likely to fail due to respiratory injuries relative to orthopedic injuries. PLC Junior classes were more likely to experience respiratory injury-related failures relative to orthopedic injuries, and OCC classes were more likely to fail due to respiratory injuries relative to orthopedic injuries. Prior service candidates were slightly more likely to experience heat or respiratory injuries, but less likely to experience other injury categories relative to orthopedic injuries. When examining age, the effects were similar to the earlier period, where age effects remained small but statistically significant. Female candidates were less likely to experience respiratory or other injuries relative to orthopedic injuries.

The tables presented orthopedic injuries as the dominant injury type across both eras. Class description was the strongest predictor of heat and other injuries relative to orthopedic injuries. Respiratory injuries became more prominent in the post-2015 period, while the effects of age, prior service, and sex remained relatively minor.

Table 7. Pre-2015 Injury Composition Among Ultimate Failures

	Dependent variable:		
	Injury Type	Respiratory	Other
Female	0.427	0.387	1.253***
	(0.627)	(0.544)	(0.413)
Age	0.957***	1.019***	1.045***
	(0.093)	(0.075)	(0.070)
Prior Service	0.863**	0.817**	1.449***
	(0.419)	(0.359)	(0.380)
PLC Junior	2.157***	1.997***	2.371***
	(0.606)	(0.571)	(0.600)
PLC Senior	5.160***	0.825	4.148***
	(0.669)	(1.101)	(0.709)
OCC	1.035	1.739***	1.257**
	(0.632)	(0.527)	(0.570)
Observations	675		
Note:	Odds ratios reported. Reference injury type is Orthopedic. Sample includes injury-related ultimate failures only. * p < 0.10, ** p < 0.05, *** p < 0.01.		

Table 8. Post-2015 Injury Composition Among Ultimate Failures

	Dependent variable:		
	Injury Type	Respiratory	Other
Female	0.269	0.641*	0.756**
	(0.625)	(0.368)	(0.345)
Age	0.960***	1.054***	1.052***
	(0.084)	(0.047)	(0.047)
Prior Service	1.058***	1.069***	0.770***
	(0.393)	(0.298)	(0.298)
PLC Junior	0.897*	3.302***	1.356**
	(0.531)	(0.711)	(0.561)
PLC Senior	1.229	4.040***	2.220***
	(0.861)	(0.975)	(0.768)
OCC	0.181	1.865***	0.713
	(0.550)	(0.638)	(0.469)
Observations	663		
Note:	Odds ratios reported. Reference injury type is Orthopedic. Sample includes injury-related ultimate failures only. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.		

D. TIMING OF INJURY-RELATED ATTRITION

This section focuses on the timing of injury-related attrition during training. The analysis begins with descriptive figures followed by Kaplan–Meier curves of overall attrition and sex, a Cox Proportional Hazard model, and logistic regression.

Figure 10 displays the timing of injury-related attrition during training across eras. Injury-related attrition occurs primarily early in training across all areas. In pre–2010, and 2015–2019, roughly 35%- 40% of injury attrition occurs within the first 21 days. In 2020–2025, early attrition increases substantially to over half of all injury-related attrition. Injury-related attrition became increasingly concentrated in the earliest weeks of training, particularly within the first three weeks.

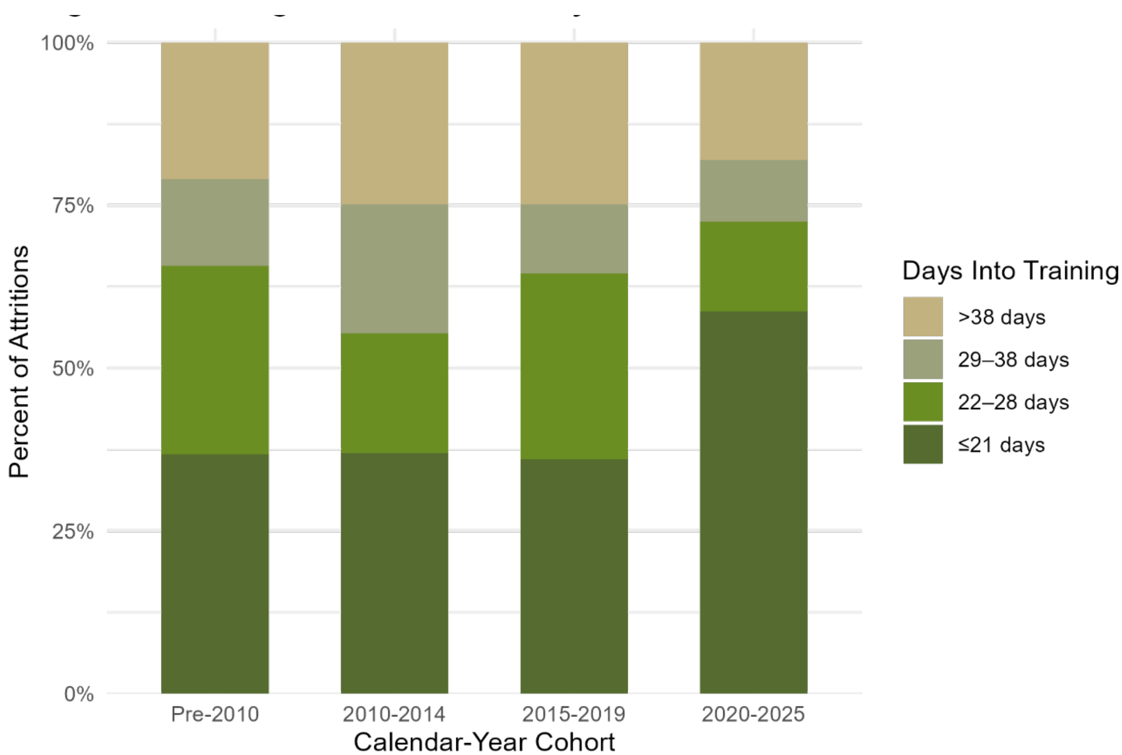

Figure 10. Attrition Within Training Days by Era

Figure 11 Kaplan-Meier curve shows the probability of remaining injury-free over the training period. Their survival curve declined gradually over time, indicating that injury-related attrition accumulates throughout training period. The largest drop occurred early, consistent with the descriptive timing figure. After approximately 40–50 days, the survival curve flattened, suggesting fewer new injury attrition events later in training. If a candidate was disenrolled from OCS for anything other than injury-related attrition, including graduation, the observation was treated as censored, making this a right-censored survival curve.

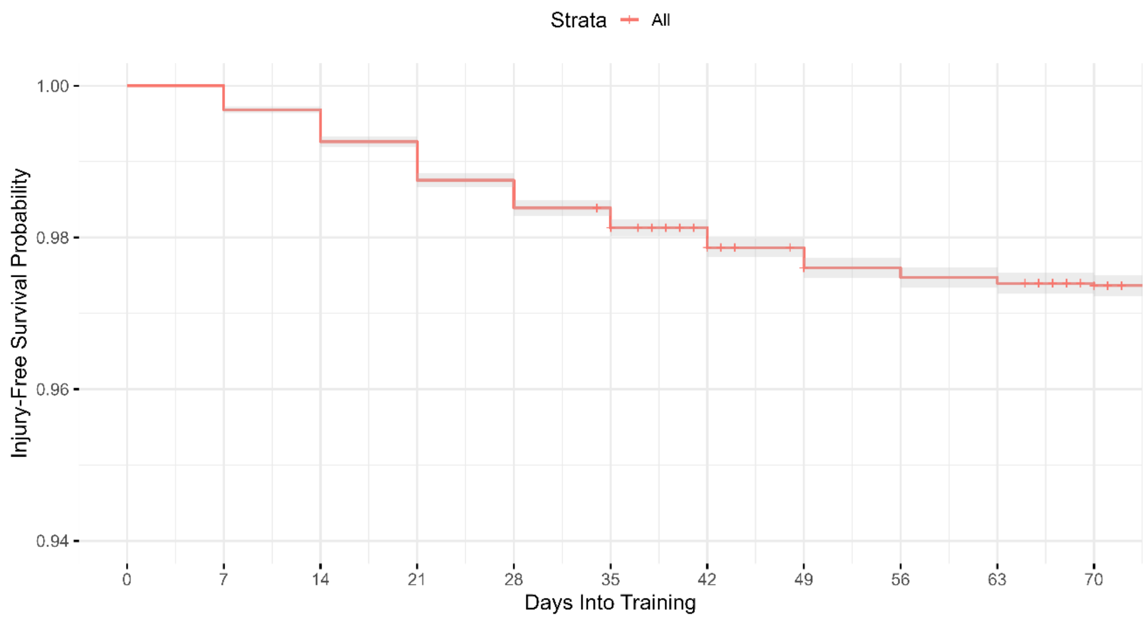

Figure 11. Kaplan–Meier Curve: Injury-Related Attrition

Figure 12 Kaplan-Meier curve compared injury-free survival between male and female candidates. Female candidates showed a steeper decline in survival probability earlier in training. Male candidates maintained a higher injury-free survival probability throughout the training period. The gap between the two groups became most visible around 20–40 days into training.

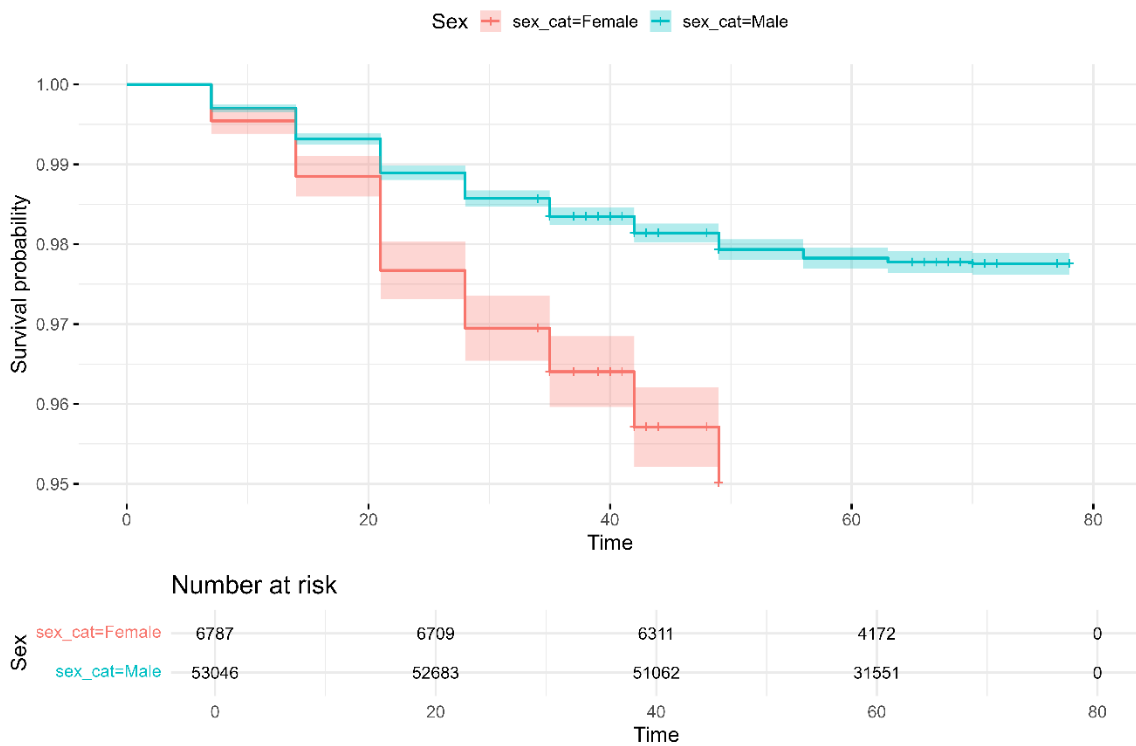

Figure 12. Kaplan-Meier Curve: Attrition by Sex

Table 9 displays the Cox Proportional Hazards models estimating how candidate characteristics affected the hazard of injury-related attrition over time. Prior service was the most significant predictor in this model. Prior service candidates experienced 19 times higher hazard of injury-related attrition compared to non-prior service candidates. As noted in the previous figures and tables, male candidates had roughly half the hazard of injury-related attrition compared to female candidate. With respect to age each additional year of age increased the hazard of injury-related attrition by 4%.

Table 9. Cox Model: Injury-Related Attrition

Variable	Hazard Ratio	95% CI	p-value
Age at Entry (per year)	1.040	(1.021, 1.06)	<0.001
Male (vs Female)	2.506	(1.267, 4.957)	0.008
Prior Service (vs Non-Prior)	13.514	(7.689, 23.75)	<0.001
Male × log (Time)	0.596	(0.483, 0.736)	<0.001
Prior Service × log (Time)	1.119	(0.937, 1.338)	0.215

Table 10 presented the results of the logistic regression models focusing on injuries occurring early in training. Two models were estimated: a model including candidate and class characteristics, and a second model that added calendar-era indicators. The strongest predictor in these models was the class type. PLC Junior classes showed the largest association with early injury, with candidates experiencing 2.8 times higher odds of injury within the first 21 days compared to the Combined class reference group. PLC Senior classes also showed substantially higher odds of injury-related attrition, with approximately twice the odds of early attrition. Candidates with medical waivers demonstrated elevated odds of early injury, with 1.62 times higher odds. The inclusion of calendar-era indicators in the second model did not substantially change the magnitude of the structural predictors. In later cohorts, there were slightly higher odds of early injury relative to the pre-2010 reference period.

Table 10. Early Injury Timing During OCS

	Dependent variable:	
	Early Injury (1 = Less than 21 Days)	
	Pre-2015	Post-2015
Female	0.607***	0.746***
	(0.179)	(0.161)
Age at Entry (years)	0.995***	1.012***
	(0.031)	(0.022)
Prior Service	1.498***	1.023***
	(0.154)	(0.137)
Medical Waiver	1.467***	1.864***
	(0.270)	(0.247)
PLC Junior	2.369***	3.527***
	(0.238)	(0.272)
PLC Senior	1.509***	3.030***
	(0.349)	(0.411)
OCC	0.900***	1.400***
	(0.202)	(0.218)
Observations	762	946
Note:	Odds ratios reported. Sample restricted to injury-related. Reference class is COMBINED. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.	

The overall analysis in this section shows injury-related attrition predominantly occurring in the early stages of training. Descriptive figures illustrate that injuries occur within the first three weeks of the training cycle, supported by the Kaplan-Meier Survival curves. The Cox Proportional Hazards models also support these patterns, while the logistic regression models highlight the role of factors, particularly class type, in explaining early injury occurrence. These findings indicate that injury-related attrition at OCS was predominately concentrated early in the training cycle.

VI. CONCULSION

In this study, I analyzed patterns associated with attrition, specifically injury-related attrition at Marine Corps OCS. The research focused on patterns over time, differences in injury composition, and the timing of injuries during the training cycle. The results provide insight into how injury-related attrition occurs within OCS training environment.

A. INTEGRATED FINDINGS

When analyzing the structural stability of OCS attrition, descriptive statistics, survival analysis, and logistic regressions illustrated attrition fluctuated while remaining structurally stable over time. Class structure was a predominant predictor of this variation. PLC Junior, PLC Senior, OCC, and Combined classes are different candidate entry points into OCS, which helped explain the persistence of structural differences across the findings. PLC Senior consistently demonstrated lower attrition rates. The duration of the OCC and Combined classes training structures created more opportunities for attrition, explaining the fluctuations within the classes. The findings of the class attrition figures aligned closely with the logistics regression results for ultimate attrition. The results illustrated higher odds of attrition among OCC and Combined classes relative to PLC classes, which support the descriptive statistics results.

The results illustrated a second pattern when examining the timing of attrition within the training cycle. The analysis within the injury timing section showed attrition became increasingly concentrated within the first three weeks of training, and in some cases occurred prior to training. Classes in the post-2015 era demonstrated a greater concentration of early attrition. The survival analysis curves reflected this pattern. The logistic regression further supported the structural predictors identified in the survival analysis, reinforcing the concentration of early injury occurrence. Several training and institutional dynamics may be consistent with the early attrition patterns observed in the data. Training intensity peaks during the early stages at OCS, when candidates are first exposed to the physical demands. Candidates adapted to the physical demands as the training progresses, limiting the risk of injury later in the cycle. This process may contribute to the higher concentration of attrition earlier in training. As discussed in the background, medical screening procedures have strengthened, involving stricter standards to identify potential medical risks earlier. These efforts improved overall graduation rates, producing more graduates in 2025 compared to previous years.

Another consistent pattern across the analysis was the persistence of orthopedic injuries. The injury composition figures, injury timing figures, and multinomial regression models all illustrated orthopedic injuries remained the most common cause of injury-related attrition across every era and across multiple analytical approaches. This pattern is consistent with the literature on MSKI in military training environments. Previous research identifies overuse MSKI as the primary mechanism of injury-related attrition during training. These injuries are associated with repetitive load-bearing activities and physical stress placed on the body during training. OCS training requires candidates to perform under heavy physical load in a demanding and repetitive training environment, supporting the findings of this study and prior research.

Prior service candidates presented one of the more significant patterns in the data. In the ultimate attrition regression, prior service candidates demonstrated substantially higher odds of attrition relative to non-prior candidates. The Cox proportional hazards model similarly indicated a higher hazard of attrition over time. However, when focusing on injury-related attrition, the results shifted in the post–2015 period, where prior service candidates demonstrated lower odds of injury-related attrition. Taken together, these findings highlighted prior service status as a significant structural factor influencing attrition patterns, even as the mechanisms driving attrition appeared to shift across eras.

Finally, when analyzing candidate characteristics, sex appeared as one of the most persistent predictors across the models. Female candidates demonstrated higher odds of attrition in the logistic regression models and higher hazard of injury-related attrition in the Cox proportional hazards model. The survival analysis supported this pattern, showing earlier declines in injury-free survival among female candidates. These findings are consistent with prior literature illustrating that female candidates experience higher rates of musculoskeletal and overuse injuries in physically demanding training environments.

While this pattern is well documented in previous research, the results of this analysis reinforce that sex differences remain a significant factor in attrition outcomes within OCS.

B. IMPLICATIONS FOR OFFICER ACCESSION AND MANPOWER

Many of the structural implications extended into the broader officer accession process. OCS has limited control over the candidates it receives, as it can only evaluate and train candidates who have already passed through the recruiting pipeline. The results of this study suggest that OCS currently performs a significant portion of the medical and administrative screening that ideally should occur earlier in the accession process. The analysis shows that attrition is increasingly concentrated early in training, with many candidates failing within the first few weeks or even prior to fully entering the training cycle. This pattern suggests that OCS is identifying medical or physical limitations that may not have been fully detected during earlier screening stages such as the Military Entrance Processing Station.

From a manpower planning perspective, this has implications for how the officer accession pipeline manages candidate screening. If candidates who clearly do not meet OCS medical or physical standards are being sent to OCS, valuable training slots, medical screening resources, and administrative time may be lost on candidates who have little probability of completing the program. Given current recruiting challenges, recruiting commands may feel pressure to send as many candidates as possible who meet the minimum qualifications in the hope that they succeed. However, the findings of this study suggest that stronger alignment between recruiting-level screening and OCS medical standards could improve the efficiency of the screening process. Ideally, the medical standards used at OCS should be more closely mirrored earlier in the recruiting pipeline, such as during Military Entrance Processing Station screening. In this way, OCS would primarily identify a smaller number of candidates who pass earlier screening but still encounter issues during training.

The findings related to attrition stability also have implications for manpower planning. Attrition at OCS has historically remained within a relatively stable range, between approximately 15% and 20%. This study confirms that this range has remained consistent over time. Manpower planners should continue to account for this expected attrition rate when forecasting officer production. Additionally, structural differences across the OCS training pipelines, such as the shorter PLC Senior class and the longer OCC and Combined classes, should be considered when estimating expected officer production across accession sources.

C. LIMITATIONS

Several limitations should be acknowledged when interpreting the results of this study. The analysis relies on administrative data, limiting the level of detail available regarding specific injury mechanisms and training events. The injury categories used in this study represent broad classifications of injuries rather than specific medical diagnoses or causal mechanisms. As a result, while the analysis can identify patterns of injury-related attrition and differences across candidate characteristics, it cannot determine causal effects.

The analysis does not allow for causal inference regarding factors that increase the probability of injury-related attrition. Although the regression models identify statistical associations between candidate characteristics and attrition outcomes, the results cannot determine whether training events, environmental conditions, or other factors directly caused the documented injuries. Finally, the study focuses exclusively on candidates who attempted OCS and therefore does not capture potential screening effects that occur earlier in the accession pipeline. As a result, the findings are limited to candidates who attended OCS rather than the entire candidate population.

D. RECOMMENDATON FOR FUTURE RESEARCH

Future research could build on the findings of this study by examining the causal relationship between injury-related attrition and the specific training environment at OCS. While this study identifies the timing of attrition during the training cycle, it does not link attrition to specific training events. Additional research that integrates attrition and medical data with the training pipeline could help identify which training events or periods are most strongly associated with injury occurrence.

By identifying where injuries occur within the training pipeline, future research could evaluate whether adjustments to the sequence of training events might reduce injury risk while preserving the demanding nature of OCS. Importantly, this type of research would not aim to reduce the difficulty of OCS training but rather would help determine whether the structure of training events could be optimized while maintaining the rigorous standards required for Marine Corps officer development.

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