

Spring 2021

Injury Reporting Barriers Amongst Aviation Soldiers

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INJURY REPORTING BARRIERS AMONGST AVIATION SOLDIERS

by

MORGAN STANWOOD

(Under the Direction of Bridget Melton)

ABSTRACT

There is a high prevalence of musculoskeletal injuries in the U.S. military which poses a major threat to military readiness. However, recent research indicates that Soldiers do not seek medical care for nearly half of their injuries. **PURPOSE:** Identify barriers in injury reporting using the Theory of Planned Behavior within a U.S. Army special operations aviation population. **METHODS:** This descriptive study utilized a self-report survey to explore injury rates, reporting rates, and perceptions of reporting behaviors. **RESULTS:** Of the 108 Soldiers who completed this study 77.8% experienced a MSKI in the previous 12 months and 69% sought medical care (reported their injury) to a medical provider. **CONCLUSION:** The construct with the least favorable mean score was subjective norm indicating Soldiers do not feel that their leadership or fellow Soldiers support them in reporting injuries. Having embedded providers and implementing behavior change interventions may encourage Soldiers to report their injuries and increase military readiness. Future research should address Soldier and leadership behavior change interventions aimed to encourage Soldiers to seek care for their injuries.

INDEX WORDS: Military, Tactical athlete, Injury prevention

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by

MORGAN STANWOOD

B.S., West Chester University, 2019

A Thesis Submitted to the Graduate Faculty of Georgia Southern University

in Partial Fulfillment of the Requirements for the Degree

MASTER OF SCIENCE

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Electronic Version Approved:

May 2021

ACKNOWLEDGMENTS

First, I'd like to thank my thesis chair, Dr. Bridget Melton for her support and guidance through my graduate career. Additionally, I would like to thank Dr. Greg Ryan and Dr. Erin Jordan for your assistance throughout this process. I would like to extend a special thanks to Dr. Richard Westrick for giving me the opportunity to participate in efforts with USARIEM; furthering my education and career in athletic training. Thank you to my USARIEM team members: Brittany Hotaling, Dr. Bruce Cohen, Dr. Benjamin Adams, and Kristen Neitz for fostering inspiration and allowing this study to come to life. Thank you to the Soldiers and unit leadership for participation in this study; it would not be possible without you. Finally, a huge thank you to all my family and friends who have stood by my side throughout my entire academic career.

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CHAPTER 1

INTRODUCTION

Musculoskeletal injuries (MSKI) in the military population pose a major threat to military readiness. In 2018, the United States Department of Defense reported 1.6 million MSKIs, which made it the leading contributor to disability in Soldiers (Health of the Force, 2018). Recent research examining MSKIs over a 12-month time period revealed that approximately 50% of all Soldiers had experienced at least one MSKI during the observation period (Teyhen, 2015; Teyhen, 2018). Additionally, those who suffer from MSKIs, are more likely to suffer from additional subsequent injuries (Anderson, 2016; Teyhen, 2015; Teyhen, 2018). Previous research also indicates that the MSKI problem within the military is compounded by the fact that 36.8% of Soldiers reported more than one MSKI (Teyhen, 2018). MSKIs are highly prevalent in the military and have concerning implications on military readiness and health care cost.

MSKIs in the military has significantly increased the number of limited or lost duty days (Teyhen 2018). Researchers examining MSKIs and found that 68% of Soldiers who received medical care for their injury had at least one time-loss injury or an injury that resulted in the medical provider prescribing one or more days of limited duty (a physical profile) (Teyhen, 2018). A recent study revealed that close to 68,000 Servicemembers are considered non-deployable, meaning that they are unable to perform their duties due to MSKIs (Grimm, 2019). Furthermore, the financial burden associated with MSKIs is estimated to be nearly 3.7 billion dollars annually (Grimm, 2019).

In order to address the MSKI problem within the military population, evidence-informed preventative and rehabilitative strategies are critical. Focusing on evidence-based injury prevention programming and reducing injury complications through appropriate rehabilitation care are the first steps in treating the growing MSKI problem present within the military. When considering injury reporting, or healthcare seeking for MSKIs, it is essential to consider that not all injuries are reported to medical

providers, especially among the military population. Limited research has investigated the underreporting of MSKIs that take place within the military. Cohen (2019) found that 63% of Soldiers in initial training (basic training) did not report their MSKIs to medical personnel or seek medical care for their injuries. Similarly, Sauers (2016) and Smith (2016) found that 58% and 49% of MSKIs from an Army Brigade Combat Team went unreported within the military population, respectively. Sauers (2016) found that approximately 54% of respondents stated that they would not immediately seek medical care if injured. When Soldiers were asked their reasons for not reporting their MSKIs to medical personnel, the main reasons were fear of the impact on their career, avoiding negative perceptions, and avoiding a profile (Cohen, 2019; Molinar, 2015; Smith, 2016).

Soldiers' attitudes and intentions of not reporting their injuries can be described within Icek Ajzen's ideas and the "Theory of Planned Behavior" (Ajzen, 1991). The Theory of Planned Behavior (TPB), which extends from the Theory of Reasoned Action (TRA), predicts and explains human behavior in specific contexts with the addition of one's own belief that they have control over a situation; also known as perceived behavioral control (Ajzen, 1991). According to the TPB, intention to perform that behavior is the most important determinant of behavior (Ajzen, 1991). This theory highlights three independent determinants of intention: attitude towards a behavior, subjective norm, and perceived behavioral control. Together, these constructs can help examine Soldiers' reporting behaviors by identifying barriers within military populations and using behavior change techniques to address them.

TPB has been used in a variety of research to examine the reporting behaviors of athletes. Previous research has found that attitude, perceived behavioral control, and subjective norms have all played a role in reporting behaviors and intention to report symptoms in athletes (Beakey, 2016; Register-Mihalik, 2013; Kroshus, 2014). Studies have examined concussion reporting behaviors among athletes which can be compared to those of Soldiers, also known as tactical athletes. One study found that the primary reason for not reporting their concussions was not wanting to be pulled from games or practices (Kroshus, 2014). The attitudes examined among athletes may be similar to those attitudes of Soldiers. A

Soldier's avoidance of a profile due to the possible impact it could have on their career is comparable to an athlete's fear of getting pulled from practices or games.

The TPB has been examined within the military setting involving concussion reporting. Register-Mihalik found that all constructs within the theory were associated with high intention to disclose concussions (Register-Mihalik, 2018). However, no previous research examines Soldiers in aviation units MKSI reporting behaviors using the TPB framework. It's critical to investigate behaviors amongst the wide range of Soldiers, specifically those in aviation whose flight status can be impacted due to injuries. The military is a diverse organization and results from one group may not be generalizable to all other groups.

Although under-reporting research is emerging, limited data exists. Existing research does not address the common barriers among Soldiers and calls for more research grounded in theoretical approaches. This study aims to improve the care of MSKIs among Soldiers. The purpose of this study is to identify barriers in injury reporting using TPB within a U.S. Army special operations aviation population.

CHAPTER 2

METHODS

Design and Participants

This descriptive study examined a special operations aviation unit's reporting behaviors with embedded onsite prevention and rehabilitative care personnel onsite with the unit. Unlike traditional Army health care, this onsite prevention and rehabilitation care offers direct access to physical therapists and strength and conditioning coaches. It was predicted that Soldiers in the special operations aviation unit would have more barriers to reporting injuries due to concerns related to flight status being taken away from them. A total of 108 Soldiers were recruited to participate in this study. The inclusion criteria for this study included: (1) being at least 18 years of age, (2) currently on active-duty Army status, and (3) assigned to the special operation aviation unit examined. Exclusion criteria: (1) ages 17 or younger, (2) not currently active-duty status, (3) not assigned to the unit examined. This study was approved by Georgia Southern University Institutional Review Board (IRB) for Authorization agreement to rely on IRB approval by the U.S. Army Research Institute of Environmental Medicine (USARIEM).

Procedures

Investigators established and obtained a letter of support from the special operations aviation unit to conduct research with their unit. The unit leadership distributed the initial introductory email to all Soldiers describing the study's purpose with a link to the electronic self-report survey. An introductory survey screen was included at the beginning of the survey describing the purpose of the study and articulated that a participant implied their consent by completing the self-report survey. Subjects were able to decline participation or withdraw at any point by not completing the self-report survey. No incentives were offered for participating, only the commanding officer's encouragement via initial and follow-up emails.

Measures

Injury reporting was assessed using an online questionnaire adapted from previous research used with the military population (Cohen, 2019; Smith, 2016) and previous TPB surveys (Register-Mihalik, 2013). This self-report survey explored the incidence of MSKI, attitude towards reporting, subjective norms of reporting, and perceived behavioral control of reporting injuries.

Injury reporting

In order to explore MSKI reporting prevalence, 39-items were included on the questionnaire. Definitions for MSKI and medical providers were adapted from previous research (Smith, 2016). MSKIs were defined as “any ache, pain, or discomfort in the bones, muscles, ligaments, and tendons that lasted more than 7 days”. For the purpose of this study, the definition of medical provider was a “physician, physician assistant, nurse practitioner, or physical therapist; not medics and strength & conditioning professionals.”

Theory of Planned Behavior

The assumption behind the TPB is that intention is a contributing factor in behavior. Behavioral intention is the “perceived likelihood of performing behavior” which can be measured by asking how likely or unlikely a Soldier is to report an MSKI (Ajzen, 1991). There are three independent determinants of intention: attitude towards behavior, subjective norm, and perceived behavioral control. Attitude is defined as the personal evaluation of a specific behavior (i.e., “Reporting a musculoskeletal injury to a medical provider is important”). Subjective norm is a person’s beliefs about whether key people approve or disapprove of a specific behavior (i.e., “My leadership thinks I should report my musculoskeletal injuries to medical providers”). Lastly, perceived behavioral control is the belief that one has and can exercise control over performing a specific behavior (i.e., “Reporting my musculoskeletal injuries mean my injury gets managed efficiently”). Five questions for each of the four constructs were included on the self-report survey using a 7-point Likert scale [Strongly agree (1), Agree (2), Somewhat agree (3), Neither agree nor disagree (4), Somewhat disagree (5), Disagree (6), Strongly disagree (7)]. In order to address

the construct validity of the questionnaire, five content experts reviewed and modified the self-report survey for the target population including experts from public health, injury prevention, and military science. Additionally, a small group of four Soldiers piloted the self-report survey for readability. Language and terms used in the final survey tool were refined based on feedback from this pilot group.

Data Analysis

Data was collected using an online self-report survey using Qualtrics software, Version (2020/2021), (Qualtrics, Provo, UT). Descriptive statistics explored demographic information for the unit. Frequency analysis highlighted injury rates, reporting rates, and most common reasons for reporting/not reporting. One-way ANOVAs investigated difference in injury rates and reporting rates amongst sex, ranks and years in service. Additionally, post-hoc analyses were utilized to determine where the difference was between years of service groups. Linear regressions were used to examine construct scores amongst those with a previous injury and history of reporting.

CHAPTER 3

RESULTS

Sample Characteristics

A total of 108 Soldiers from a special operations aviation unit were included in this study. Soldiers are from a special operations aviation unit. Demographic information is further presented in table one. More males (n=101) completed the self-report survey than females (n=6); one Soldier preferred not to answer. The average age of the Soldiers was 33.8 (S.D. = ± 6.7) ranging from 21 to 55 years old. Commissioned Soldiers (Officer ranks) consisted of 51.9% (n=56) of participants. Approximately 50% (n=55) of the Soldiers had served between 11-25 years in the Army. One hundred Soldiers (92.6%) reported not currently being on a profile. More than half, 51.9% (n=56), reported currently being on flight status.

Injury Reporting Prevalence

Of the Soldiers who completed the self-report survey, 77.8% (n=84) had experienced an MSKI in the previous 12 months. Of those who had experienced an MSKI, 69% (n=58) sought medical care (reported their injury) from a medical provider. All females who experienced a MSKI reported their injuries while only 76% of males reported their injuries. When Soldiers were asked their main reasons for reporting their injuries, the most common responses were injury affected job performance (28.4%), documentation in medical record (27.5%), and concern about symptoms (26.6%). Of injured Soldiers, 31% did not report their injuries to medical providers. The most common reasons for not reporting their injuries included: did not feel the injury was severe enough to be reported (15.6%), avoiding a profile (11%), and inconvenient for me to see a medical provider (6.4%).

When examining injury rates and reporting rates between sex there were no significant differences despite the 100% reporting rate for females. There was a significant difference between years in service groups for injury rates ($p=0.026$), but not with reporting rates. Further analysis revealed there was a

significant difference in injury rates between Soldiers with 1-5 years in the service and Soldiers with 6-10 years in the service ($p=0.009$) and between Soldiers with 6-10 years in the service and Soldiers with 11-25 years in the service ($p=0.035$). There was a significant difference between ranks, enlisted vs. officers, and reporting rates. Additionally, there was a significant difference between flight status and reporting rates ($p=0.012$).

Theory of Planned Behavior

The TPB constructs' average scores were within 3 points of each other out of a total 35 points. A lower construct score means a more favorable outcome for intention, a positive attitude towards reporting, a feeling of support from leadership, and strong beliefs that they have control over performing the behavior. TPB questions and constructs with mean scores can be found in table 2. The constructs with the lowest average score in ascending order were: PBC (10.1481), intention (11.3889), attitude (11.4537), and subjective norm (13.0648). Previous history of reporting an injury ($p=0.002$) and being on a profile ($p=0.035$) were significant predictors of a favorable intention score $F(1,82) = 10.600$. Previous history of reporting an injury predicted a lower attitude score $F(1,82) = 5.107$, $p=0.026$. There were no significant results for the constructs subjective norm and PBC. There was a weak, negative correlation between subjective norm and age, as well as between PBC and age, rank, and years in the service with a 1-tailed test.

TABLE 1

DEMOGRAPHICS

Demographics	n	Percentile
Sex (n=108)		
Male	101	93.5
Female	6	5.6
Prefer not to answer	1	.9
Age (n=108)		
20-30	36	33.3
31-40	57	52.8
41-50	14	13.0
51+	1	.01
Years in Service (n=108)		
1-5 Years	14	13.0
6-10 Years	35	32.4
11-25 Years	55	50.9
25+ Years	4	3.7
Rank (n=108)		
Enlisted	52	48.1
Officers	56	51.9
Profile (n=108)		
Yes	8	7.4
No	100	92.6
Flight Status (n=108)		
Yes	56	51.9
No	52	48.1
MSKI rate in previous 12 months (n=108)		
Yes		
No	84	77.8
	24	22.2
Reporting rates (n=84)		
Yes	58	69
No	26	31

TABLE 2
TPB QUESTIONS AND CONSTRUCTS

TPB questions and constructs	Mean (SD)*
Intention	
I intend to report my MSKIs.	2.3 (1.4)
I know how to report my MSKIs.	1.8 (.97)
I will make an effort to report my MSKIs.	2.2 (1.3)
I want to report my MSKIs.	2.2 (1.4)
I see no reason why I would not report my MSKIs.	2.9 (1.9)
Attitude – “Report a MSKI to a medical provider is...”	
Easy	2.1 (1.4)
Good	2.0 (1.0)
Important	1.7 (.95)
Beneficial	2.2 (1.5)
Brave	3.5 (1.7)
Subjective Norm	
My leadership thinks I should and approves of me reporting my MSKIs to medical providers.	1.9 (1.1)
Other Soldiers in my unit think I should and approve of me reporting my MSKIs to medical providers.	2.2 (1.1)
It is expected of me to report my MSKIs.	2.4 (1.3)
I care what my leadership thinks about me reporting my MSKIs to medical providers.	3.1 (1.9)
I care what my fellow Soldiers think about me reporting my MSKIs to medical providers.	3.4 (1.9)
PBC	
I have complete control over reporting my MSKIs to medical providers.	1.8 (1.1)
I have support from my leadership to report my MSKIs to medical providers.	2.0 (1.3)
I have support from my unit to report my MSKIs to medical providers.	2.0 (1.3)
Reporting my musculoskeletal injury means my injury gets managed efficiently.	2.3 (1.5)
Having a medical provider present makes it easier to report my musculoskeletal injuries.	2.0 (1.4)

*Scores on a 1-7 Likert scale (1- strongly agree, 7 – strongly disagree)

CHAPTER 4

DISCUSSION

There is a high incidence of MSKIs in the military setting with a known negative impact on military readiness. Previous research has found that there is also a high rate of underreporting injuries, indicating that many MSKIs are going undocumented and untreated. Not seeking medical care for MSKIs can affect the soldiers' performance and inaccurately portray the number of MSKIs in the military. In addition, reporting injuries when they occur would ideally mitigate the likelihood of that injury worsening over time. Identifying the injury reporting barriers that exist within special operations aviation units will provide leadership with a better understanding of their Soldiers and hopefully limit the amount of unreported MSKIs, which in term can help with military readiness.

This special operations unit is unique and has additional access to care, such as physical therapists and strength & conditioning coaches, unlike typical medical care in many conventional Army units. Having these resources readily available may encourage Soldiers to seek medical care for their injuries since it is easier to access. Another component to this population is that aviators have the risk of getting flight status taken away due to injury or illness. This might discourage Soldiers from reporting injuries due to fear that they will lose the ability to operate aircraft.

Just over half of the sample special operations aviation unit had experienced an MSKI in the previous 12 months. This shows that Soldiers are at risk of MSKIs despite the resources accessible to them. Of those who have experienced an injury, 70% of injuries were reported, while 30% were not reported to a medical provider. The reporting rate for this special operations unit was higher than traditional Army medical care who did not report over 45% of their injuries (Sauers, 2016; Smith, 2016). The higher level of injury reporting could be due to access to providers embedded in the units. In most conventional Army units, Soldiers may not have direct access to providers such as physical therapists or may have a long wait to see these providers due to a larger ratio of Soldiers to healthcare providers. In units like the one examined in the current study, the ratio of Soldiers to healthcare providers is smaller.

Having additional access to medical care makes it easier for Soldiers to seek medical care and could positively influence their decisions to report. This advocates for the military to acquire more medical providers such as physical therapists and athletic trainers to examine injuries, as well as advocate for strength & conditioning coaches to properly train Soldiers.

In this study, nearly one-third of Soldiers did not report their MSKI to medical personnel. The most common reasons for not reporting their injuries were (1) they did not feel the injury was severe enough to be reported, (2) avoiding a profile, and (3) it was inconvenient for them to see a medical provider. Previous research from Cohen (2019) supports these findings as it was reported the main reasons for not reporting their injuries was: impact on their career, avoiding negative perceptions, and avoiding a profile.

There was a total of 6 females in this study, each experienced an MSKI in the previous 12 month and reported their injury, unlike their male counterparts who only had a 76% reporting rate. However, due to the disparity between sexes in this study, being underpowered to determine significance, we cannot say the difference is meaningful. Future research should examine the reporting behaviors within the TPB amongst females Soldiers in special operations units.

Analysis showed that the more years you have served, the more injuries you will experience. Knowing this can allow the military to employ injury prevention programs for those of all ages. When examining reporting rates amongst rank and flight status, we found significant differences. Enlisted Soldiers were less likely to report their injuries compared to Officers. This could be due to the fact that Enlisted Soldiers have not climbed the ranks yet and do not want to be determined weak, avoiding negative perceptions. Additionally, those who had flight status at the time were more likely to report their injuries compared to those who did not have flight status. A positive previous experience with seeking medical care for their MSKI might be one reason for reporting their injury.

The construct with the lowest mean score was PBC (10.1481) which is the belief that one can exercise control over performing a specific behavior. Soldiers have reported in previous research that it is

complicated to get appointments and there are long waits to see providers. Intention had the second-lowest score (11.3889). Soldiers' have favorable intentions to report their injuries, but intention is predicted by attitudes, subjective norms, and perceived behavioral control. Attitude was the third favorable outcome (11.4537), meaning Soldiers had poorer attitudes than they believe they have control and can exercise control over reporting their injuries. Subjective norm was the least favorable outcome (13.0648) which we expected in this population. Soldiers' leadership and units have a great impact on whether or not they report their injuries. If their leadership or units do not support them reporting their injuries, then we can expect them to not report their injuries. This is a barrier to injury reporting. Getting leadership and fellow Soldiers to support and encourage one another to report their injuries can potentially influence Soldiers to seek medical care for their injuries. Ideally, when Soldiers report their injuries, it will allow them to receive the appropriate medical care to recover from their injuries, decreasing the number of Soldiers on profile and increasing military readiness.

Previous history of reporting an injury can predict favorable intention and positive attitude towards reporting, meaning that Soldiers plan to report their MSKIs and believe that reporting MSKIs is easy, good, important, beneficial, and brave. These positive attitudes towards reporting MSKIs are important to encourage in the military population where the incidence of MSKIs is high, and reporting is low. In addition, being on a profile was another factor that can predict favorable intention scores. To be placed on a profile, a Soldier would have to report their injury and have seen a medical provider. These Soldiers on profile had previously reported their injury and intend to report additional injuries in the future, indicating they had a positive reporting experience. While there were no significant results for subjective norm and PBC, that does not mean they do not play a role in intention. All three constructs work together to determine a Soldier's intention to report.

These findings can be used to address the psychological barriers Soldiers in units are facing and fear when determining whether or not they should report. Future research could address targeted

education or behavioral interventions to encourage Soldiers and their leadership that reporting their injuries is beneficial to them and the Army.

Limitations

There were several limitations of this study. This study targeted a particular special operations unit with the additional access to medical care and may not be as generalizable to the other U.S. Army Aviation Units and the greater U.S. Army. Conventional Army units either may not have providers embedded in the units, or the ratio of Soldiers to providers is large so their limited access to care may influence their injury reporting behaviors. Also, there was a small population of females in this study. Only six total females, compared to one hundred males, were included in this study, reflective of the small number of females within this unit. Additionally, with research involving self-report surveys, there is an assumption that participants will answer the survey with honesty.

Conclusion

Of Soldiers in this study, 77.8% experienced an MSKI in the previous 12 months and 69% (n=58) reported their injury to a medical provider. Previous history of reporting an injury and being on a profile were significant predictors of a favorable intention score and more favorable attitudes towards injury reporting. PBC was the TPB construct with the lowest mean score, meaning Soldiers believe they have control and can exercise control over performing this behavior. Subjective norm was the highest scoring construct showing Soldiers do not feel that their leadership or fellow Soldiers support them in reporting their injuries. The military should focus on changing the stigma around injury reporting and encourage Soldiers to seek medical care for their injuries. Having embedded providers, similar to that of this population, along with behavior change interventions, may encourage Soldiers to report their injuries and increase military readiness. Future research should be aimed to provide theory-based interventions that influence Soldiers to report their injuries to medical providers.

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APPENDIX A
ANNOTATED BIBLIOGRAPHY

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This book was written by Icek Ajzen to discuss the theory of planned behavior and the constructs that lie within it. Theory of planned behavior has three independent determinants of intention: attitude towards behavior, subjective norm, and perceived behavioral control. Intention is defined as the perceived likelihood of performing a specific behavior. Attitude is the personal evaluation of the specific behavior. Subjective more can be defined as a person's beliefs about whether key people approve or disapprove of the specific behavior. Importantly, this book helps guide the theory of planned behavior into research on reporting behaviors.

Almeida, S., Williams, K., Shaffer, R., & Brodine, S. (1999). Epidemiological patterns of musculoskeletal injuries and physical training. *Medicine & Science in Sports & Exercise*, 31(8), 1176-1182.

This prospective epidemiology study observed Marines through boot camp to examine injury patterns. Injury rates found were almost 40% with 78% of those injuries diagnosed as overuse injuries. One risk factor was previous history of injury. Importantly, this data shows that military servicemembers have high injury rates and there are many contributions to those injuries.

Beakey, M., Tiernan, S., & Collins, K. (2016). Why do adolescent rugby players under-report concussion? An examination into the variables that influence their behavioral intention to report across three samples. *European Journal of Sports Medicine*, 4(1), 65-76.

Researchers use a questionnaire based on the theory of planned behavior modelled by previous research to survey rugby players about intention to report. Rugby players were asked about

reporting behaviors and it was found that behavioral intention had a significant association with attitude and perceived behavioral control. Importantly, this study used theory to explain athlete's concussion reporting behaviors and findings show that screening knowledge and reporting intentions using the theory of reasoned action and planned behavior should be implemented in interventions.

Bernard, B. (1997). Musculoskeletal disorders and workplace factors: a critical review of epidemiologic evidence for work-related musculoskeletal disorders of the neck, upper extremity, and lower back. *U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute of Occupational Safety and Health*, (pp. 97-141).

This article provides statistical information on musculoskeletal injuries in the workplace. The annual survey of occupational injuries and illnesses conducted by the Bureau of Labor Statics found that there were approximately 705,800 cases, involving days away from work in 1994, that were result of overexertion or repetitive motion. Many of those injuries were from lifting, pushing or pulling objects, and holding or carrying. Importantly, this data shows that injury rates in the workforce are prevalent.

Bulzakhelli, M., Sulsky, S., Zhu, L., Brandt, S., & Barenberg, A. (2017). The cost of basic combat training injuries in the U.S. Army: injury-related medical care and risk factors.

The purpose of this study was to gather data from a military database to analyze medical cost and identify risk factors associated with injury in the military population. Data was gathered from 2002-2007 from basic combat training (BCT) on over 300,000 trainees. It was found that over 40% experienced at least one injury during BCT. The most common medical encounter was "pain in joint, lower leg" which accounted for 15% of injury visits and other common types of injuries were sprains, strains, joint pain and back pain. In total, the Army spent approximately \$1200 on

medical care per trainee in that time period. Importantly, researchers acknowledge the prevalence of injury-related medical encounters and determine cost associated with these injuries.

Chrisman, S. P., Quitiquit C., & Rivara, F. P. (2012). Qualitative study of barriers to concussive symptom reporting in high school athletes. *Journal of Adolescent Health, 52*(3), 330-335.
<http://dx.doi.org/10.1016/j.jadohealth.2012.10.271>

Researchers tried to identify barriers of reporting concussion symptoms in high school athletes. To determine barriers to injury reporting qualitative focus group studies were conducted. Athletes were hesitant to report symptoms to coaches if they did not result in significant pain or disability due to approachability which falls in theory. Importantly, a significant association was found between theory of planned behavior constructs and concussion reporting intention.

Cohen, B. S., Pacheco, B. M., Foulis, S. A., Canino, M. C., Redmond, J. E., Westrick, R. B., Hauret, K. G., & Sharp, M. A. (2019). Surveyed reasons for not seeking medical care regarding musculoskeletal injury symptoms in U.S. Army trainees. *Military Medicine, 184*(5/6), e431-e439. Doi: 10.1093/milmed/usy414.

Researchers conducted a study to examine injury reporting behaviors among Army trainees. Surveys were administered to participants within 5 weeks of graduation from AIT and one station unit training. It was found that 40% of trainees were injured during IET and of those who got injured, 64% did not report their injuries to leadership or a medical provider. The main reasons for not reporting were wanting to graduate on time and to avoid a profile. Also, 64% of trainees did not seek medical care for their musculoskeletal injuries during IET. Importantly, this study examines injury reporting barriers in the military population which sets the framework for future research.

Llewellyn, T., Burdette, G. T., Joyner, A. B., & Buckley, T. A. (2014). Concussion reporting rates at the conclusion of a collegiate athletic career. *Clinical Journal of Sports Medicine: Official*

Journal of the Canadian Academy of Sport Medicine, 24(1), 76-79.

<https://doi.org/10.1097/01.jsm.0000432853.77520.3d>

This cross-sectional retrospective study evaluated concussion reporting rates in collegiate athletes. Research was conducted by questionnaire to retired college athletes. It was found that the reasons for not reporting concussions were that they did not want to be pulled from games or practices as well as future games or practices. Importantly, it showed that there is a lack of reporting concussion symptoms due to fears of impact on career.

Hauret, K. G., Jones, B. H., Bullock, S. H., Canham-Chervak, M., & Canada, S. (2010). Musculoskeletal injuries – description of an under-recognized injury problem among military personnel. *American Journal of Preventative Medicine*, 38(1s), S61-S70.

Doi:10.1016/j.amepre.2009.10.021.

This study aimed to determine the incidence of musculoskeletal injuries in the military population. Researchers collected data from military medical surveillance data from non-deployed active-duty military members in 2006. A total of 745,547 musculoskeletal injuries were identified within the system. Majority of injuries were found to be from overuse to the back and lower extremities. Importantly, this study shows the prevalence of musculoskeletal injuries in the military population.

Hauschild, V. D., Schuh, A., & Jones, B. H. (2016). What Soldiers Know and want to know about preventing injuries: a needs survey regarding a key threat to readiness. *The United States Army Medical Department Journal* (pp. 10-19).

Researchers in this study aimed to help determine what additional information might contribute to reducing musculoskeletal injuries in the military population. A survey was created and sent out in 2014 to gather demographic information, job roles, personal injury history, awareness of injury effects, risk factors, interventions, leadership perspectives and I.P. interest. In total 685 Soldiers

completed the study with over half reporting that they received a musculoskeletal injury in the previous 12 months. Also, it was determined that 61% of these injuries were from overuse, mainly running. When looking at the perceptions of leadership, a small majority reported positive leadership. Importantly, this survey helped researchers recognize the prevalence of musculoskeletal injuries in the military population.

Jones B. H., Manikowski, R., Harris, J. H., Dziados, J., Nortion, S., Ewart, T., & Vogel, J. A. (1988).

Incidence of and risk factors for injury and illness among male and female Army Basic Trainees.

This prospective study examined the incidence and risk factors of injuries in military trainees. Researchers followed Soldiers through basic training and examines rates of injury occurrence. It was found that 51% of females and 27% of males were injured during BCT. Also, injuries were the leading cause of limited duty days. Importantly, this study shows the prevalence of injuries in the military.

Jones, B. H., Cowan, D. N., Tomlinson, J. P., Robinson, J. R., Polly, D. W., & Frykman, P. N. (1993).

Epidemiology of injuries associated with physical training among young men in the army. *Medicine & Science in Sports & Exercise*, 25(2), 197-203.

The purpose of this study to examine training related injuries such as incidence, types and risk factors associated with them in military servicemembers. Subjects in this study were followed during physical training to observe injury occurrence. It was found that 37% of subjects had one or more lower extremity training-related injuries. Importantly, this study found that Soldiers who had a previous injury were more at risk for sustaining another injury.

Jones, B. H., Canaham-Chervak, M., Canada, S., Mitchener, T. A., & Moore, S. (2010). Medical

surveillance of injuries in the U.S. military. *American Journal of Preventative Medicine*, 38(1), s42-s60. Doi: 10.1016/j.amepre.2009.10.014.

This study aimed to compare the incidence of injuries and determine size and cause of the injury problem within the military population. Researchers obtained medical data from Armed Forces Health Surveillance Center to determine statistics on injuries in the military. Musculoskeletal injuries were found to be the leading cause of injury among military personnel. It was found that injuries were the leading cause of medical encounters with over 1.95 million in 2006.

Importantly, this article shows musculoskeletal injuries are debilitating among military personnel and the leading cause of injury.

Knapik, J. J., Graham, B., Cobbs, J., Thompson, D., Steelman, R., & Jones, B. H. (2013). A prospective investigation of injury incidence and injury risk factors among army recruits in military police training. *BMC Musculoskeletal Disorder*, 43(32), 1-11.
<https://doi.org/10.1186/1471-2474-14-32>

The purpose of this study was to examine injury rates and risk factors in military police training. Researchers administered a questionnaire to military police recruits to gather information and medical records were examined to obtain injury records during training. It was found that 34.2% of male recruits and 66.7% of female recruits sustained at least one injury during training. Also, male trainees who had a previous injury were at an increased risk for injury if they had a prior injury. Importantly, this reiterates the idea that there is a high number of injuries in the military population and that previous injury can have an effect on risk.

Kroshus, E., Baugh, C. M., Daneshvar, D. H., & Viswanath, K. (2014). Understanding concussion reporting using a model based on the theory of planned behavior. *Journal of Adolescent Health*, 54, 269-274.

This study aims to predict concussion symptom reporting in ice hockey players. Researchers in this study used the theory of planned behavior as a framework to help predict reporting behaviors through survey. It was found intention to report symptoms was significantly associated with

reporting behavior. Also, subjective norms were significantly associated with both intention and behavior. However, attitude about perceived outcomes of reporting was significantly associated with intention, but not behavior. Importantly, the results of this study supported the fit of the theory of planned behavior and suggest that the theory can help explain reporting behaviors.

Kucera, K. L., Marshall, S. W., Wolf, S. H., Padua, D. A., Cameron, K. L., & Beutler, A. I. (2016).

Association of injury history and incident injury in cadet basic military training. *Medicine & Science in Sports & Exercise*, 48(6), 1053-1061. Doi:10.1249/mss.0000000000000872.

This study examined the association of injury history at prior to basic training and incidence during training for military cadets. Researchers completed a defense medical surveillance system review of three large U.S. military academies from 2005-2008. Prior to training approximately 65% reported a history of injury to the lower extremity and about 45% reported a history of injury to the upper extremity. During training, there were 3,157 lower extremity injuries, most frequently to were ankle and lower leg sprains/strains. Overall, it was found that previous history of prior lower extremity injury was associated with incidence of lower extremity injury during cadet basic training. This article explains risk factors associated with military servicemembers due to previous injury.

Molinar, S. J., Yancosek, K. E., & Smith, L. (2015). Musculoskeletal injury reporting by U.S. Army medical command (MEDCOM) personnel. *Texas Orthopaedic Journal*, 1(2), 71- 80. Doi: 10.18600/toj.010208.

The purpose of this study was to evaluate musculoskeletal injury reporting in Army Medical Command personnel. Researchers administered surveys to Soldiers to gather information about musculoskeletal injuries in the past year. There was a total of 1,230 musculoskeletal injuries in the previous year and 33% of those injuries went unreported. Personnel reported that the main

reasons for not reporting their injuries were: fear of impact on career, avoid negative perceptions, and avoiding a profile. This article gives a look into reporting behaviors in the military setting.

Office of the Chairman of the Joint Chiefs of Staff, DOD Dictionary of Military and Associated Terms, (Washington DC: The Joint Staff, (pp. 161).

The Department of Defense dictionary provides definitions for military and associated terms. The definition for operational readiness is as follows: The capability of a unit/formation, ship, weapon system, or equipment to perform the missions or functions for which it is organized or designed. An abbreviation for operational readiness is “OR”.

Register-Mihalik, J. K., Linnan, L. A., Marshall, S. W., McLeod, V., Mueller, F. O., & Guskiewicz, K. M. (2013). Using theory to understand high school aged athletes’ intentions to report sport-related concussion: implications for concussion education initiatives. *Brain Injury*, 27(7-8), 878-886. DOI: 10.3109/02699052.2013.775508

This study’s purpose was to use the theory of reasoned action and planned behavior to determine intentions to report concussion in high school athletes. Concussion reporting behaviors were examined by survey that was developed by researchers through elicitation interviews producing a 48-item TRA/TPB questionnaire. It was found that direct attitude, subjective norm and direct perceived behavioral control all were associated with intention to report concussions. Attitude and subjective norm were found to have the greatest influence on symptom reporting. Importantly, this study shows that concussion reporting behaviors can be explained using the theory of planned behavior.

Register-Mihalik, J K., Cameron, K. L., Kay, M. C., Kerr, Z. Y., Peck, K. Y., Houston, M. N., Linnan, L.A., Hennik-Kaminski, H., Gildner, P., Svoboda, S. J., & Marshall, S. W. (2018). Determinants of intention to disclose concussion symptoms in a population of U.S.

military cadets. *Journal of Science and Medicine in Sport*.

<https://doi.org/10.1016/j.jsams.2018.11.003>

The aim of this study was to examine the association between intention to report concussion symptoms and concussion reporting behaviors in first-year military cadets. Researchers completed a cross-sectional study utilizing online survey. High perceived control, concussion knowledge, more favorable attitudes and social norms about concussions were associated with high intention to disclose. Importantly, this study shows that reporting behaviors can be explained within the theory of planned behavior.

Ruscio, B. A., Jones, B. H., Bullock, S. H., Burnham, B. R., Canham-Chervak, M., Rennix, C. P., Wells, T. S., & Smith, J. W. (2010). A process to identify military injury prevention priorities based on injury type and limited duty days. *American Journal of Preventative Medicine*, 38(1). Doi: 10.1016/j.amepre.2009.10.004.

Researchers completed medical surveillance and safety report data for military service members in 2004. It was found that 1.6 million hospital encounters per year result in lost or limited duty days and that musculoskeletal injuries were the leading contributor for those limited duty days. Importantly, musculoskeletal injuries are hindering military readiness.

Sauers, S. E., Smith, L. B., Scofield, D. E., Cooper, A., & Warr, B. J. (2016). Self-management of unreported musculoskeletal injuries in a U.S. Army brigade. *Military Medicine*, 181(9), 10751080. Doi: 10.7205/milmed-d-15-00233.

The purpose of this study was to describe the methods that Soldiers do not report their musculoskeletal injuries are using to manage their injuries. Researchers completed a cross-sectional survey to measure reporting behaviors and treatment alternatives for unreported musculoskeletal injuries. Survey results showed that Soldiers believed it was better to work through the pain or that their unit believes in the suck it up mentality. Also, 81% of Soldiers used

over-the-counter pain relief medication to manage their injuries. Importantly, this shows that Soldiers are not reporting their issues appropriately and are using alternative methods to treat their pain rather than seeking medical care.

Smith, L., Westrick, R., Sauers, S., Cooper, A., Scofield, D., Claro, P., & Warr, B. (2016).

Underreporting of musculoskeletal injuries in the U.S. Army: findings from an infantry brigade combat team survey study. *Sports Health*, 8(6), 507-513.

Doi:10.1177/1941738116670873.

This study aims to identify injuries sustained in the military, injury onset, and whether or not injuries were reported. Researchers administered survey to Soldiers in an Army infantry brigade combat team that inquired about injury reporting. A 50-question survey was developed by experienced military health care providers and piloted and refined with a panel of military personnel. It was found that 1388 Soldiers reported 3202 injuries in the previous year and that 49% of those injuries were unreported to medical personnel. Also, the main reasons for not reporting injuries to medical personnel were fear that it might affect future career and avoidance of military profiles. Overall, this article shows that underreporting musculoskeletal injuries is an issue in the military.

Teyehn, D. S., Shaffer, S. W., Butler, R. J., Goffar, S. L., Kiesel K. B., Rhon, D. I., Williamson, J. N., &

Plisky, P. J. (2015). What risk factors are associated with musculoskeletal injury in U.S. Army rangers? A prospective prognostic study. *Clinical Orthopaedics and Related Research*, 473(9), 2948-2958. <https://doi.org/10.1007/s11999-015-4342-6>

This article is a planned secondary analysis from a large prospective cohort of 1477 Soldiers. Researchers used surveys and physical performance measures to determine baseline predictors associated with musculoskeletal injuries. It was found that 45.2% of Soldiers sustained a musculoskeletal injury. Also, recurrent prior musculoskeletal injuries and limited-duty days in the

prior year due to musculoskeletal injuries were associated with increased injury risk. Importantly, this study identified risk factors for injury which can help guide further research in injury prevention programs and help decrease the number of musculoskeletal injuries in the military population.

Teyhen, D. S., Goffar S. L., Shaffer S.W., Kiesel, K., Butler, R. J., Tedaldi, A., Prye, J. C., Rhon, D. I., & Plisky, P. J. (2018). Incidence of musculoskeletal injury in U.S. Army unit types: a prospective cohort study. *Journal of Orthopedic Sports Physiology*, 48(10), 749-757.
Doi:10.2519/jospt.2018.7979.

The purpose of this study was to examine injury rates, locations of injury, health care cost, and number of limited-work days in Soldiers. Researchers administered a monthly survey to active-duty Soldiers with no injury limitations and completed a comprehensive review of medical records and musculoskeletal injuries. After reviewing data of 1430 Soldiers, 53.4% of Soldiers sustained a musculoskeletal injury with 36.8% receiving one or more musculoskeletal injuries. Importantly, this article indicates that musculoskeletal injuries are relevant in the military population and not just once, but multiple times.

APPENDIX B

SURVEY

Injury Reporting

Start of Block: Introduction/Informed Consent

Q1

The purpose of this study is to better understand the factors that impact the reporting on musculoskeletal injuries in the U.S. Army. To be eligible for this study, you must be at least 18 years old and serving on active duty in the U.S. Army.

Study participation involves completing a 30-minute anonymous survey about your experiences reporting injuries. You will be presented with a series of questions and statements. Some of the questions may cause discomfort or embarrassment. Read all of the instructions carefully, and submit the survey upon completion.

Information in this survey will be kept private and confidential. We will not ask for any personal information such as your name, birthday or social security number that could link you to the information provided in this survey. Because we will not ask for any identifying information, no one in your chain of command will have access to your individual answers. When research results are reported, responses will be aggregated (added together) and described in summary.

Participation and withdrawal: Your participation is completely voluntary, and you may quit at any time without penalty. By completing this survey you agree to participate in this research study. Withdrawing from this study will have no impact on you or your career. Incomplete survey data will still be utilized towards this research. The information you provide in your responses will help health care providers better understand injury reporting from a Soldier's perspective.

If you have any questions or would like more information about this research study, you may contact Richard Westrick at (508) 206-2409 or Email: richard.b.westrick.civ@mail.mil.

Whom to contact about your rights in this research, for questions, concerns, suggestions, or complaints that are not being addressed by the researcher, or research-related harm: US Army Research Institute of Environmental Medicine, 10 General Greene Avenue, Bldg. 42, Natick, MA 01760. Phone: 508-206-2371. E-mail: Robert Roussel robert.r.roussel.civ@mail.mil.

By clicking on the button below, you voluntarily agree to participate in this online survey. If you do not agree, simply close your browser.

All responses are confidential. Thank you!

End of Block: Introduction/Informed Consent

Start of Block: Previous Injury

Q2 In the past 12 months have you had a musculoskeletal injury? A musculoskeletal injury is any ache, pain, or discomfort in the bones, muscles, ligaments and tendons that lasted more than 7 days.

Yes (1)

No (2)

Skip To: Q3 If In the past 12 months have you had a musculoskeletal injury? A musculoskeletal injury is any ache... = Yes

Skip To: End of Block If In the past 12 months have you had a musculoskeletal injury? A musculoskeletal injury is any ache... = No

Q3 Did you report this musculoskeletal injury to a medical provider? The definition of a medical provider is a Physician, Physician Assistant, Nurse Practitioner, or Physical Therapist; NOT Medics and Strength & Conditioning coaches.

Yes (1)

No (2)

Display This Question:

If Did you report this musculoskeletal injury to a medical provider? The definition of a medical pro... = Yes

Q4 Please select the factor(s) that influenced your decision to report your injury

- Documentation in medical record (1)
- Seeking referral (2)
- Seeking medication for pain relief (3)
- Concern about symptoms (4)
- Concern that PRT may exacerbate symptoms (5)
- Injury affected job performance (6)
- Concern about ability to perform job-specific duties (7)
- Seeking a profile (8)
- Seeking medical discharge (9)
- Other (10) _____

Display This Question:

If Did you report this musculoskeletal injury to a medical provider? The definition of a medical pro... = No

Q5 Please select the factor(s) that influenced your decision not to report your injury

- Avoid a profile (1)
- Avoid negative perceptions associated with injuries (2)
- Did not feel injury was severe enough to be reported (3)
- Inconvenient for me to see a medical provider (4)
- Prior negative experiences seeking medical care in the military (5)
- Fear that injury might affect future career opportunities (6)
- Other (7) _____

End of Block: Previous Injury

Start of Block: TPB - INTENTION

Q6 Please tell us how you feel regarding the following statements for future injuries

	Strongly agree (1)	Agree (2)	Somewhat agree (3)	Neither agree nor disagree (4)	Somewhat disagree (5)	Disagree (6)	Strongly disagree (7)
I intend to report my musculoskeletal injuries. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I know how to report my musculoskeletal injuries. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I will make an effort to report my musculoskeletal injuries. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I want to report my musculoskeletal injuries. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I see no reason why I would not report my musculoskeletal injuries. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: TPB - INTENTION

Start of Block: TPB - ATTITUDES

Q7 Please tell us how you feel regarding the following statement.

"Reporting a musculoskeletal injury to a medical provider is...

	Strongly agree (1)	Agree (2)	Somewhat agree (3)	Neither agree nor disagree (4)	Somewhat disagree (5)	Disagree (6)	Strongly disagree (7)
Easy" (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Good" (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Important" (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Beneficial" (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Brave" (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: TPB - ATTITUDES

Start of Block: TPB - SUB NORM 1

End of Block: TPB - SUB NORM 1

Start of Block: TPB - PBC

End of Block: TPB - PBC

Start of Block: Additional Questions 1

Q53 There are many factors that might influence an individual's decision to report or underreport a MSKI. Are there any reasons that were not addressed in this survey that we may be missing? If so, please list those reasons here

Q54 Are there any additional comments you would like to make regarding injury reporting?

End of Block: Additional Questions 1

Start of Block: Demographics

Q10 Gender

- Male (1)
- Female (2)
- Prefer not to answer (3)



Q11
Age

18 (4)

19 (5)

20 (6)

21 (7)

22 (8)

23 (9)

24 (10)

25 (11)

26 (12)

27 (13)

28 (14)

29 (15)

30 (16)

31 (17)

32 (18)

33 (19)

34 (20)

35 (21)

36 (22)

37 (23)

38 (24)

39 (25)

40 (26)

41 (27)

42 (28)

43 (29)

44 (30)

45 (31)

46 (32)

47 (33)

48 (34)

49 (35)

50 (36)

51 (37)

52 (38)

53 (39)

54 (40)

55 (41)

56 (42)

57 (43)

58 (44)

59 (45)

60 (46)

61 (47)

62 (48)

63 (49)

64 (50)

65 (51)

66 (52)

67 (53)

68 (54)

69 (55)

70 (56)

71 (57)

72 (58)

73 (59)

74 (60)

75 (61)

76 (62)

77 (63)

78 (64)

79 (65)

80 (66)

81 (67)

Q12

Height (inches)

 60 (5 ft) (4) 61 (5) 62 (6) 63 (7) 64 (8) 65 (9) 66 (10) 67 (11) 68 (12) 69 (13) 70 (14) 71 (15) 72 (6 ft) (16) 73 (17) 74 (18) 75 (19) 76 (20) 77 (21) 78 (22) 79 (23)

- 80 (24)
 - 81 (25)
 - 82 (26)
 - 83 (27)
 - 84 (7 ft) (28)
 - 85 (29)
 - 86 (30)
 - 87 (31)
 - 88 (32)
 - 89 (33)
 - 90 (37)
-

Q13 Weight (lbs)

End of Block: Demographics

Start of Block: Military Demographics A

Q14 Aviation Unit

- 160th Special Operations Aviation Regiment (1)
- 3rd Combat Aviation Brigade (3CAB) (2)
- 224th Military Intelligence Battalion (4)

Q15 MOS

Q16 Are you currently performing duties of your MOS?

Yes (1)

No (2)

Q17 Rate/Paygrade or Rank

 E1 (38) E2 (39) E3 (40) E4 (41) E5 (42) E6 (43) E7 (44) E8 (45) E9 (46) W1 (47) W2 (48) W3 (49) W4 (50) W5 (51) O1 (52) O2 (53) O3 (54) O4 (55) O5 (56) O6 (57)

Q18 How many years have you been in the military?

- Less than 1 year (41)
 - 1-5 years (42)
 - 6-10 years (43)
 - 11-25 years (44)
 - 25+ years (45)
-

Q19 What was your last ACFT score?

- Score (1) _____
 - N/A (2)
-

Q24 What was your last APFT score?

- Less than 180 (1)
 - 180 to 200 (2)
 - 201 to 250 (3)
 - 251 to 300 (4)
 - Above 300 (5)
 - N/A (6)
-

Q20 Are you currently on a profile?

Yes (1)

No (3)

Q21 Do you currently have flight status?

Yes (1)

No (2)

End of Block: Military Demographics A
