

Descriptive Epidemiology of Musculoskeletal Injuries in the Army 101st Airborne (Air Assault) Division

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ABSTRACT The purpose of this study was to describe the epidemiology of musculoskeletal injuries among Soldiers of the 101st Airborne (Air Assault) Division. A total of 451 subjects (age: 27.6 ± 6.2 years, gender: males 395/451 = 87.6%) volunteered. Musculoskeletal injury data were extracted from subjects' medical charts and injuries that occurred during 1 year were described. Injury frequency, injury anatomic location and sublocation, injury cause, activity when injury occurred, and injury type were described. Injury frequency was 29.5 injuries per 100 subjects per year. Most injuries affected the lower extremity (60.2% of injuries) and common anatomic sublocations for injuries were the ankle (17.3%) and knee (15.0%). Frequent causes of injuries were running (13.5%) and direct trauma (9.0%). Physical training was associated with 29.3% of the injuries. A majority of injuries were classified as pain/spasm/ache (29.3%), without further elucidation of pathology. Other frequent injury types were sprain (21.8%) and strain (14.3%). The descriptive epidemiology of musculoskeletal injuries in this population underscores the need to explore the modifiable risk factors of potentially preventable lower extremity injuries associated with physical training and running. There is scope for the development of an optimized and targeted physical training program for injury prevention in this population.

INTRODUCTION

Injuries and injury-related musculoskeletal conditions are common in Army populations both in garrison¹ and during deployment.² Many of these injuries occur during physical training and sports.³ Previous studies and publications have addressed the descriptive epidemiology of musculoskeletal injuries in military personnel,^{4–8} including among Army trainees^{9,10} and active duty soldiers.^{11–13} A report by the Armed Forces Health Surveillance Center described ambulatory visits among active duty personnel in the Armed Forces.⁵ During 2009, there were 9,478,603 documented ambulatory visits for illnesses and injuries. Of these, 2,249,371 ambulatory visits (23.7%) were because of diseases of the musculoskeletal system and connective tissue (International Classification of Diseases, 9th Revision, Clinical Modification [ICD-9-CM] codes 710–739). Hauret et al¹ described injury-related musculoskeletal diagnoses among nondeployed active duty military

personnel during the year 2006, using military medical surveillance data. The authors identified that the number of injury-related musculoskeletal conditions during a 1-year period were 743,547. Nondeployed person-time (1,183,780 person-years) was calculated using data from the Armed Forces Health Surveillance Center. The injury rate was 628 injuries per 1,000 person-years. Jones et al¹⁴ identified injuries as the leading cause of medical encounters among military personnel. The rate of injuries treated in outpatient clinics was 999 per 1,000 person-years.

A recent study by Anderson et al¹⁵ investigated the association between injury risk, Military Occupational Specialties and physical demand, among U.S. Army Soldiers, and identified a very high injury incidence of 43% during a 1-year period. The leading causes of injuries were falls, trips and slips, and overexertion, repetitive movements. Most injuries occurred during physical activity. The most commonly injured body regions were the back/shoulder and the leg/foot.¹⁵ Recent studies among U.S. Army Soldiers have identified common injury anatomic locations and injury types. A study among U.S. Army Soldiers by Bulathsinhala et al¹⁶ identified a high incidence (45.14 per 1,000 person-years) of ankle sprains in the active duty U.S. Army population. Wallace et al¹⁷ utilized the Total Army Injury and Health Outcomes Database (TAIHOD) to assess the rate of ankle and foot injury among active duty Army Soldiers. During the years 2000 to 2006, 16% of the Soldiers were seen at least once for an ankle and foot injury, and yearly 60% to 70% of Soldiers with ankle and foot injury had an ankle sprain/strain recoded in the TAIHOD.¹⁷ Hill et al¹⁸ utilized data in the TAIHOD to calculate the rate of knee injuries among active duty Army Soldiers. The rate of knee injuries between the years 2000 and 2005 were observed to be between 21 and 25 per 1,000 Soldiers per year.

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This article was previously presented in poster format "Frequency of musculoskeletal injuries and their impact on healthcare utilization and tactical readiness in an Army Airborne Division" at the 138th Annual Meeting and Exposition of the American Public Health Association, Denver, Colorado, November 6–10, 2010.

Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the Department of Defense, or U.S. Army Medical Research and Materiel Command.

doi: 10.7205/MILMED-D-15-00262

Knapik et al¹⁹ assessed the risk factors for inpatient or outpatient stress fractures among male and female new Army recruits in basic combat training. A high incidence of stress fractures was identified in this study (19.3/1,000 among men and 79.9/1,000 among women recruits). A recent analysis of patient encounters by an Infantry Brigade Combat Team physical therapy team in a deployed environment during a 15-month period identified mechanical low back pain as the most common diagnosis (19%) and overuse as the most frequent mechanism of injury.²⁰ A study of the incidence of low back pain among 805 Soldiers from a U.S. Army Brigade Combat Team during a 1-year deployment period, by Roy et al, showed that low back pain occurred frequently. Of the 805 Soldiers surveyed, 175 Soldiers (175/805, 22%) reported moderate or worse low back pain (rating of -4 or less on the Global Rating of Change).²¹

The Fort Campbell installation, located at the Tennessee/Kentucky state line, is home to the 101st Airborne Division (Air Assault).²² Depending on their deployment status, the 101st Airborne Division (Air Assault) has about 20,000 Soldiers. Being an Air Assault Division, the tactical demands placed on Soldiers in this Division are different from other Divisions in the Army. For example, Soldiers at Fort Campbell are light infantry (Air Assault) Soldiers who, unlike Airborne Soldiers, do not regularly perform static line, high altitude low opening (HALO), or high altitude high opening (HAHO) jumps. Static line, HALO and HAHO jumps are associated with a high risk of injuries to the ankle^{23,24}. Use of parachute ankle braces has been shown to be highly effective in reducing the risk of ankle injuries²⁵⁻³⁰, without increasing the risk of other injuries.²⁶⁻²⁸ The 101st Division at Fort Campbell has been redesignated as an Air Assault Division, and Soldiers from this division do not regularly jump airborne with static or HALO/HAHO jumps, but are instead rappelled from helicopters. These specific tactical demands could result in injury frequencies and patterns that are specific to the Army population from the 101st Airborne Division (Air Assault). Also, these injury patterns are likely to change because of the additional demands of recent frequent deployments. The Neuromuscular Research Laboratory at the University of Pittsburgh has conducted the Injury Prevention and Performance Optimization Research Initiative at Fort Campbell.³¹⁻³³ Self-reported injuries among Soldiers of the 101st Airborne Division have been described previously by our group.³¹ The frequency of self-reported musculoskeletal injuries in this study was 41.1 injuries per 100 subjects per year. To the best of our knowledge, no recent publication has described the epidemiology of medical chart reviewed musculoskeletal injuries among Soldiers of the 101st Airborne (Air Assault) Division. A high rate of injuries (1.2 injuries per Soldier per year) was reported in a study conducted in 1996-1997 among active duty Soldiers of the 82nd Airborne Division at Fort Bragg utilizing medical chart review to quantify musculoskeletal injuries during a 1-year period.¹²

The purpose of this study was to describe the unique injury epidemiology of the Soldiers of the 101st Airborne (Air Assault) Division through medical chart reviews of musculoskeletal injury data among subjects who participated in the Neuromuscular Research Laboratory Injury Prevention and Performance Optimization Research Initiative at Fort Campbell. It was hypothesized that there would be a significant burden of musculoskeletal injuries in this population, especially injuries affecting the lower extremity. An assessment of the injury burden is the first step of the public health model^{31,34-37} applied to injury prevention and can guide clinicians and injury prevention researchers in the process of identification of risk factors for injuries, as well as the development of targeted interventions to reduce injuries. The descriptive epidemiology of musculoskeletal injuries in this article includes a description of injury frequency, anatomic location, injury type, injury cause, and activity when injury occurred.

METHODS

Participants

A total of 451 subjects (age: 27.6 ± 6.2 years, gender: males 395/451 = 87.6%, height: 1.8 ± 0.1 m, weight: 81.9 ± 13.8 kg) from the U.S. Army 101st Airborne (Air Assault) Division volunteered. The subjects were enrolled in the larger study for a comprehensive injury prevention and performance optimization research program.³¹ Active duty Soldiers, with no current medical or musculoskeletal conditions that precluded them from full active duty were invited to participate in the study. Approval was obtained from the appropriate civilian and military institutional review boards and subjects signed informed consent forms.

Medical Chart Review

A musculoskeletal injury was defined as an injury to the musculoskeletal system (bones, ligaments, muscles, tendons, etc.) recorded in the subjects' medical records in the Armed Forces Health Longitudinal Technology Application. Preventable injuries were defined as those musculoskeletal injuries that can be reduced through injury prevention programs that are developed to improve neuromuscular and physiological characteristics related to risk of musculoskeletal injury. This definition was similar to the definition of preventable injuries used by our group in a previous analysis.³³ Injuries were classified by an allied health professional with clinical and research experience. Data about musculoskeletal injuries and related musculoskeletal conditions (henceforth referred to as injury in this article) were extracted from the medical charts and entered into a customized relational database (University of Pittsburgh Military Epidemiology Database-UPitt-MED).

This article describes the medical chart-reviewed injuries during the year before each subject's year of survey. Injury anatomic locations were classified as lower extremity, upper extremity, spine, or torso. Lower extremity injuries were

classified further into injuries affecting one of six anatomic sublocations: hip, knee, ankle, thigh, lower leg, or foot, and toes. Upper extremity injuries were classified further as injuries affecting one of six anatomic sublocations: shoulder, elbow, wrist, upper arm, forearm, or hand, and fingers. Injuries affecting the spine were classified into one of four anatomic sublocations: cervical, thoracic, lumbopelvic, or other. Torso injuries were classified as chest or abdomen injuries.

Statistical Analyses

Description of injuries included calculation of injury percent in each category of anatomic location and sublocation, injury cause, activity, and injury type. Descriptive statistics were calculated using IBM SPSS Statistics (Version 21; IBM Corporation, Armonk, New York). Pie charts were created using Microsoft Excel 2010 (Microsoft, Seattle, Washington).

RESULTS

Medical charts were reviewed for 451 subjects. A total of 133 medical chart-reviewed injuries were recorded, during a 1-year period. The injury frequency was 29.5 injuries per 100 subjects per year. The number of injured subjects was 20.0 injured subjects per 100 subjects/year. Fifty nine subjects (59/451, 13.1%) had one injury, 23 subjects (23/451, 5.1%) had two injuries, four subjects (4/451, 0.9%) had three injuries, and four subjects (4/451, 0.9%) had four injuries.

Of the 133 injuries, 52 (52/133, 39.1% of injuries) were classified as preventable. The frequency of preventable injuries was 11.5 injuries per 100 subjects per year. The number of subjects with preventable injuries was 9.8 injured subjects per 100 subjects per year. Thirty-six subjects (36/451, 8.0%) had one preventable injury and eight subjects (8/451, 1.8%) had two preventable injuries.

Anatomic locations and sublocations of injuries were analyzed to describe common anatomic locations for the musculoskeletal injuries. Figure 1 shows that a majority of musculoskeletal injuries affected the lower extremity (80/133, 60.2% of all injuries; 40/52, 76.9% of preventable injuries).

Table I includes a detailed description of anatomic sublocations for the musculoskeletal injuries. The most common anatomic sublocation for medical chart-reviewed injuries was the ankle (23/133, 17.3% of all injuries; 12/52, 23.1% of preventable injuries). The second most common anatomic location was the knee (20/133, 15.0% of all injuries; 11/52, 21.2% of preventable injuries).

Table II includes a description of the cause of injuries. The most frequent cause of musculoskeletal injuries was running (18/133, 13.5% of all injuries; 18/52, 34.6% of preventable injuries). Information about cause of injuries was missing in the medical charts for a large proportion of injuries (62/133, 46.6% of all injuries).

Table III contains information about the activity in which subjects were participating, when the injury occurred. The most common activity associated with musculoskeletal injuries was physical training (39/133, 29.3% of all injuries; 34/52, 65.4% of preventable injuries). In case of seven medical chart-reviewed injuries (7/133, 5.3%), subjects were engaged in recreational activity/sports when the injury occurred. Of these seven injuries, four injuries (4/7, 57.1% of recreational activity/sports injuries) occurred while subjects were playing basketball. Information about activity when injury occurred was missing for a large proportion (57/133, 42.9%) of the injuries in the medical charts.

A description of injury types is included in Table IV. A majority of injuries were classified as pain/spasm/ache (39/133, 29.3% of injuries). Other frequent injury types were sprain (29/133, 21.8% of all injuries; 15/52, 28.8% of preventable injuries) and strain (19/133, 14.3% of all injuries; 12/52, 23.1% of preventable injuries).

DISCUSSION

The purpose of this article was to describe medical chart-reviewed injuries in an Army Airborne (Air Assault) Division during a 1-year period. The main findings from this study are that, as expected, lower extremity musculoskeletal injuries, especially those affecting the ankle and knee, are an important

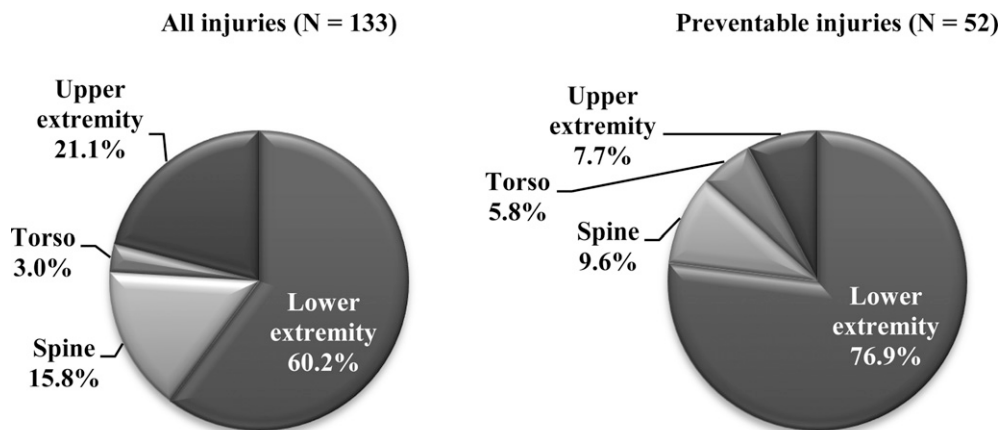


FIGURE 1. Anatomic location of injuries (relative frequency, during a 1-year period) among Soldiers from the Army 101st Airborne (Air Assault) Division.

TABLE I. Anatomic sub-location of injuries (during a 1-year period) among Soldiers from the Army 101st Airborne (Air Assault) Division

Injury Anatomic Location	Anatomic Sublocation	All Injuries		Preventable Injuries	
		No. of Injuries	Percent of Injuries	No. of Injuries	Percent of Injuries
Lower Extremity	Hip	4	3.0	0	0.0
	Knee	20	15.0	11	21.2
	Ankle	23	17.3	12	23.1
	Thigh	7	5.3	5	9.6
	Lower Leg	14	10.5	6	11.5
	Foot and Toes	12	9.0	6	11.5
Upper Extremity	Shoulder	11	8.3	2	3.8
	Elbow	2	1.5	0	0.0
	Wrist	6	4.5	1	1.9
	Upper Arm	1	0.8	1	1.9
	Hand and Fingers	8	6.0	0	0.0
Spine	Cervical	1	0.8	0	0.0
	Thoracic	5	3.8	1	1.9
	Lumbopelvic	14	10.5	4	7.7
	Other	1	0.8	0	0.0
Torso	Chest	2	1.5	1	1.9
	Abdomen	2	1.5	2	3.8
Total		133		52	

issue among the subjects studied for this analysis. When data about injury cause and activity were available, the most frequent injury cause was running and the most frequent activity that subjects were participating in when injury occurred was physical training. Common injury types were pain/spasm/ache, sprain, and strain. A large proportion of injuries are potentially preventable through an injury prevention program. There is a scope for the implementation of injury prevention programs especially those targeting lower extremity injuries that occur during physical training.

Injury Frequency

The injury frequency in this study was 29.5 injuries per 100 subjects per year. This injury frequency is lower than that reported among Soldiers from the 82nd Airborne Division at Fort Bragg, where the injury frequency reported was 1.2 injuries per Soldier per year.¹² One possible explanation

for the lower injury frequency in the current study is that the subjects were participants in a comprehensive injury prevention and performance optimization research program, which required that subjects meet inclusion and exclusion criteria for laboratory testing. This may have resulted in an unusually healthy sample of subjects being recruited in the current study. A previous publication by our group reported an injury frequency of 41.1 injuries per 100 subjects per year for self-reported data from the same population.³¹ The higher incidence in self-reported data could be due to subjects not seeking medical help for perceived nonserious injuries, which has been reported to be a problem in military populations.^{38,39} Also, bilateral injuries in the self-reported data were counted twice, contributing to the higher frequency in the self-reported data.

A recent publication by our group described an injury frequency of 24.5 injuries per 100 subjects per year among U. S. Army Special Operations Forces Operators.³³ This is just slightly lower than the injury frequency in the current study (29.5 injuries per 100 subjects per year). The subjects in

TABLE II. Cause of injuries (during a 1-year period) among Soldiers from the Army 101st Airborne (Air Assault) Division

Cause of Injury	All Injuries		Preventable Injuries	
	No. of Injuries	Percent of Injuries	No. of Injuries	Percent of Injuries
Running	18	13.5	18	34.6
Direct Trauma	12	9.0	0	0.0
Fall	8	6.0	0	0.0
Lifting	7	5.3	7	13.5
Landing	5	3.8	2	3.8
Marching	5	3.8	3	5.8
Twist/Turn/Slip (No Fall)	5	3.8	4	7.7
Other	11	8.3	8	15.4
Unknown	62	46.6	10	19.2
Total	133		52	

TABLE III. Activity when injury occurred (during a 1-year period) among Soldiers from the Army 101st Airborne (Air Assault) Division

Activity	All Injuries		Preventable injuries	
	No. of Injuries	Percent of Injuries	No. of Injuries	Percent of Injuries
Physical Training	39	29.3	34	65.4
Tactical Training	9	6.8	2	3.8
Motor Vehicle Accident	7	5.3	0	0.0
Recreational Activity/Sports	7	5.3	2	3.8
Other	14	10.5	5	9.6
Unknown	57	42.9	9	17.3
Total	133		52	

TABLE IV. Types of injuries (during a 1-year period) among Soldiers from the Army 101st Airborne (Air Assault) Division

Type of Injuries	All Injuries		Preventable Injuries	
	No. of Injuries	Percent of Injuries	No. of Injuries	Percent of Injuries
Pain/Spasm/Ache	39	29.3	7	13.5
Sprain	29	21.8	15	28.8
Strain	19	14.3	12	23.1
Fracture	7	5.3	1	1.9
Chondromalacia/ Patellofemoral Pain	6	4.5	3	5.8
Inflammation—IT Band	4	3.0	1	1.9
Stress Fracture	4	3.0	3	5.8
Inflammation—Plantar Fascia	3	2.3	2	3.8
Inflammation—Shin Splints	3	2.3	2	3.8
Tendonitis/Tenosynovitis/ Tendinopathy	2	1.5	2	3.8
Bursitis	1	0.8	0	0.0
Contusion	1	0.8	0	0.0
Degenerative Joint Disease	1	0.8	0	0.0
Disc Injury	1	0.8	0	0.0
Inflammation—Other	1	0.8	0	0.0
Labral Tear	1	0.8	1	1.9
Nerve	1	0.8	0	0.0
Periostitis	1	0.8	1	1.9
Other	8	6.0	1	1.9
Unknown	1	0.8	1	1.9
Total	133		52	

both studies were healthy enough to participate in laboratory testing, likely resulting in an unusually healthy sample of subjects in both studies. Jones et al¹⁴ reported injury hospitalization rates of 1 per 100 person-years and 99.9 per 100 person-years for injuries treated in outpatient clinics. The injury frequency was three times higher than the injury frequency observed in the current study. The injury frequency calculated in the current study may be lower compared to the incidence rate calculated in the study by Jones et al, as the sources of injury data were different for the two studies. Injury data in the current study were retrieved through a review of medical charts and those in the study by Jones et al were retrieved utilizing ICD-9-CM coded data from a centralized database.

Injury Anatomic Location

The most common injury anatomic location in the current study was the lower extremity and the most common anatomic sublocation for injuries was the ankle. Other studies have described the anatomic locations of musculoskeletal injuries among military populations. A previous study of self-reported injuries by our group in the same population showed that the relative frequency of anatomic location³¹ was approximately similar to that of medical chart-reviewed injuries described in the current study. The relative frequencies of self-reported injuries for the three most frequent anatomic locations were: lower extremity (62.6%), upper extremity (20.2%), and spine (12.1%). This is comparable to the rela-

tive frequencies of medical chart-reviewed injuries for the three most frequent anatomic locations in the current study: lower extremity (60.2%), upper extremity (21.1%), and spine (15.8%). Similar to the current study, the two most common anatomic sublocations for self-reported injuries were the ankle (18.2%) and the knee (13.1%).³¹ In our study of musculoskeletal injuries among Army Special Operations Forces Operators,³³ the most common anatomic location of injuries was the lower extremity (50.0%), although the relative percent of lower extremity injuries was lower than that in the current study. Interestingly, the percent of upper extremity injuries among Army Special Operations Forces Operators (34.6%)³³ was higher than that in the current study (21.1%). The difference in injury anatomic distribution between Army Special Operations Forces Operators and Army 101st Soldiers is probably because of a difference in their occupational and training demands.

Hauret et al¹ described injury-related musculoskeletal diagnoses using ICD-9-CM codes among active duty nondeployed military service members during a 1-year period. The anatomic distribution of injury-related musculoskeletal conditions was different from that observed in the current study, which included traumatic injuries. Injury-related musculoskeletal conditions as described in the study by Hauret et al¹ most commonly affected the vertebral column (40.3%), followed by the lower extremity (39.0%), and upper extremity (14.1%). The knee/lower leg (22.4%) were the most common anatomic sublocation, followed by the lumbar vertebral column (19.5%) and the ankle/foot (13.0%). In a study among Naval Special Warfare Sea, Air, and Land Operators by Peterson et al,⁴⁰ clinic visits most commonly were because of injuries affecting the back/neck (26.5%), followed by the knee (20.9%), and the shoulder (18.8%). The differences in the distribution of anatomic location of injuries among various studies could be because of the difference in the nature of the injury outcome being described in various studies. More specifically, the current study utilized all musculoskeletal injuries, Hauret et al utilized injury-related musculoskeletal conditions, and Peterson et al used clinical visits. Another reason for the differences in the anatomic distribution of injuries may be because of the various unique occupational requirements of each military population.

Cause of Injury and Activity When Injury Occurred

In the current study, the most common cause of injuries was running (13.5%). In the study by Potter et al¹² in the 82nd Airborne Division, the common causes of injury were parachuting and running. Similar to the current study, a large proportion of causes were classified as others or unknown. In the current study, there were no injuries with jump as a cause of injury. The difference in injury causes between these two populations could be because of the difference in occupational tasks and demands between these two populations. Soldiers at Fort Campbell are light infantry (Air Assault) Soldiers who, unlike Airborne Soldiers, do not regularly perform static line, HALO, or HAHO jumps. Also, participants

in our study had to meet inclusion criteria, including being physically fit and cleared to be tested in the laboratory, which may have excluded subjects with severe jump-related injuries. Among Soldiers of the 101st Airborne (Air Assault) Division, the causes of self-reported injuries in our previous study³¹ were similar to the causes identified in the current study. The most frequent causes of self-reported injuries were running (34.3%), followed by fall, direct trauma, and lifting (each 8.1%).

The most common activity that subjects were participating in when injury occurred in the current study was physical training (29.3%), followed by tactical training (6.8%). Self-reported injury data from this population also showed that a large proportion of injuries (48.5%) occurred during training.³¹ These findings were similar to previous studies of injuries among military populations, where training has been identified as one of the leading causes of injuries.^{41,42}

In our study among Army Special Operations Forces,³³ the most common cause of injury was running (23.1%), whereas the most common activity when injury occurred was physical training (57.7%). Data from Army Special Operations Forces,³³ self-reported data from Army 101st subjects,³¹ as well as medical chart reviewed data from Army 101st subjects in the current study, all underscore the importance of altering the required and self-imposed physical training regimen, including running, to prevent lower extremity injuries.

Injury Type

A large proportion of injuries (29.3%) in the current study were classified as pain/spasm/ache, without further elucidation of injury pathology. Sprains and strains were also frequent injury types. In the study by Hauret et al,¹ 82.3% of injuries were classified as inflammation and pain (overuse). The process of classification of injury types was different between the 2 studies. Overuse injuries and pain were combined into a single category in the study by Hauret, but not in the current study. Among self-reported injuries in the same population reported previously by our group, common injury types were sprain (22.2%) and strain (16.2%).³¹ "Inflammation" related conditions, such as chondromalacia/patellofemoral pain (4.0% of injuries), iliotibial band syndrome (6.1%), and plantar fasciitis (7.1%), also were frequently self-reported.³¹ In the study by Potter et al¹² among Soldiers from the 82nd Airborne Division, traumatic fractures and stress fractures were common. In our study among Army Special Operations Forces, common injury types were sprain (23.1%), fracture (11.5%), and strain (11.5%).³³ Differing distributions of injuries among various populations may be related to differing occupational demands.

Among the musculoskeletal injuries described in this study, 52/133 (39.1% of injuries) were classified as preventable, meaning that they can be reduced by application of injury prevention programs that are developed to improve neuromuscular, biomechanical, physiological, and nutritional characteristics. In our study among Army Special Operations Forces, preventable injuries comprised 76.9% of the injuries.³³ Most previous injury epidemiology publications in the military have

not explicitly classified injuries as preventable or not, so it is difficult to directly compare the current study with other related studies in this regard. However, many studies have identified modifiable risk factors for musculoskeletal injuries in military population or recommended the need for prevention of musculoskeletal injuries.^{9,38,41-44}

Study Limitations

A limitation of medical charts is that they contain information about injuries only if medical care was sought. If medical attention is not sought, which may happen especially for self-perceived minor injuries, information about these injuries will be absent in medical charts. Medical charts are created for the purpose of medical care, but often can have missing data that are important for research. In the current study, information about injury cause and activity when injury occurred was missing for a large proportion (46.6% and 42.9%, respectively) of injuries. Running was the most frequent cause of injuries in the current analysis, but very few charts had information about the running mileage.

CONCLUSIONS

Large proportions of the injuries in this analysis were classified as being potentially amenable to prevention. For injuries with known activity when injury occurred, the majority of injuries occurred during physical training. Physical training is used by military populations as a means to improve performance and physical readiness and prevent injuries, but there is likely a threshold above which the risk of injury may outweigh the benefits of physical training. There is a need to optimize physical training to meet the unique inherent occupational demands of this population, so that physical training improves performance, but at the same time, does not predispose the participant to injury. There is a scope for potentially preventing these injuries, especially lower extremity sprains and strains as well as injuries caused by running, through a targeted injury mitigation program. Such a program has the potential to enhance the productive tactical lifespan of individual Soldiers and reduce injury-related attrition, disability, and costs.

ACKNOWLEDGMENTS

We would like to thank those Soldiers who participated in this study. This work was supported by the U.S. Army Medical Research and Materiel Command under award number W81XWH-06-2-0070/W81XWH-09-2-0095/W81XWH-11-2-0097.

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