The Prevalence and Impact of Musculoskeletal Injuries During a Pre-deployment Workup Cycle: Survey of a Marine Corps Special Operations Company

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ABSTRACT

Musculoskeletal injuries are a primary cause of morbidity and missed training throughout the military. Only a handful of studies have been performed which focus on the Special Operations community. This study was performed to determine a baseline understanding of the prevalence of musculoskeletal injuries within an operational element of the newly formed Marine Corps Special Operations Command. The results of this survey reveal that nearly one-third of all members of 1st Marine Special Operations Battalion, Delta Company, experienced pain or physical limitation due to a musculoskeletal injury. Of those who were injured, nearly 30% reported that their injury impacted their ability to train during their pre-deployment training cycle. These results confirm that musculoskeletal injuries are a significant problem within the Marine Corps Special Operations Command. Further investigation is warranted to examine etiological factors resulting in these injuries and changes to training regimens that may result in decreased injuries.

INTRODUCTION

It is well documented that musculoskeletal injuries are responsible for a significant percentage of missed training days throughout the military. Studies show that up to 60% of all active duty outpatient visits are due to exercise-related injuries.[1] Additionally, Bohnker et al. found that more than 40% of Navy Physical Evaluation Board cases were due to musculoskeletal conditions.[2]

Strenuous physical activity is synonymous with military duty. Across all branches of service, physical fitness requirements are strictly enforced and the physical capacity of their members is tested on an annual or semiannual basis. Within this population there exists a group of servicemembers who are held to a much higher standard in terms of fitness and physical capacity. Members of the elite units within Special Operations Command (SOCOM) train and operate at levels of physical demand that far outweigh those of their non-SOCOM colleagues.

A review conducted by Jones and colleagues in 1994 revealed that the primary risk factor most closely associated with higher risk of injury was frequency and duration of exercise.[3] As the frequency and duration of exercise increases, so does the risk of musculoskeletal injury. Given the extreme levels of physical activity that Special Operations units engage in, it is natural to assume that they would experience increased incidence of musculoskeletal injuries.

Very few studies have been conducted within the Special Operations community. The studies that have been conducted reveal injury rates similar to non-SOCOM units. Lynch and Pallis examined injury rates within 5th Special Forces Group (Airborne). They reviewed all recorded patient encounters during fiscal year 2007 and found that musculoskeletal complaints comprised 40% of all clinical diagnoses.[4] In their discussion, Lynch and Pallis predicted that the actual number of injuries may be higher than 40%, as many Special Forces members will avoid reporting to the Troop Medical Clinic unless their injuries mandate it. Also, the authors did not include those who were initially evaluated and treated by the Group physical therapist whose primary duty is evaluating and independently managing musculoskeletal injuries .

The aim of this study was to examine musculoskeletal injury rates specifically within the operational component of a Marine Corps Special

Operations Battalion. To the author's knowledge, this is the first study conducted on this specific population.

Methods

The subjects of this study included all members of 1st Marine Special Operations Battalion, Delta Company. This company had just completed an arduous pre-deployment training cycle of approximately 12 months and was in final preparations for deployment in support of Operation Enduring Freedom. All members of this Marine Special Operations Company (MSOC) were male and ranged in age from 19-38. (Table 1)

Research Instrument

Each subject completed a Musculoskeletal Injury Survey (Appendix A). The survey obtained basic demographic information from each subject to include age, rank, Military Occupational Specialty (MOS), years of active duty service, and years in the Special Operations and reconnaissance community. The subjects were asked if, during this pre-deployment workup cycle, they had experienced any pain or physical limitation due to musculoskeletal injury. For those who answered yes, they were asked to elaborate on affected body part, mechanism of injury, date of injury, level of medical care sought, number of lost training days, and finally they were asked to rate the impact of the injury on their ability to train using a 5-point Likert scale. The survey did not ask for any personally identifiable information. The author felt that the subjects may have been hesitant to answer the survey truthfully if they thought there might be some potential for recourse for unreported injuries. Members of this community are known for being highly motivated and eager to deploy; any potential roadblock to deployment is not welcomed by anyone.

Table 1. Demographic Characteristics of Subjects

Variable	All (n = 87)	Injured (n = 28)	Uninjured (n = 59)
Age (y)	26.8 ± 4.3 (19-38)	27.9 ± 4.0 (21-36)	26.3 ± 4.3 (19-38)
Years AD Service	7.6 ± 3.9 (1-19)	8.6 ± 3.8 (3-17)	7.1 ± 3.9 (1-19)
Years in Community†	4.1 ± 3.0 (<1-15)	4.6 ± 1.6 (1-15)	3.8 ± 2.8 (<1-14)
# Previous Deployments	2.6 ± 1.8 (0-10)	2.9 ± 1.6 (0-7)	2.4 ± 1.9 (0-10)

*Data are mean ± SD (range).
†Includes years in Marine Reconnaissance community.

Results

Eighty-seven (N=87) members of 1st Marine Special Operations Battalion, Delta Company, completed the survey. According to the most recent roster, this represents 94% of the company. Several members of the company remained on pre-deployment leave or were otherwise unavailable to complete the survey prior to deployment. It is felt that the exclusion of these members did not significantly impact the results of this study.

Twenty-eight (32%) of the subjects reported experiencing musculoskeletal pain or physical limitations during the pre-deployment training cycle. A summary of the survey responses is provided in Table 2.

Nine (32%) of the 28 injured subjects, reported having issues with multiple body regions, resulting in 41 total injured body regions. Chronic injuries accounted for 46% (n=22) of all reported injuries and 54% (n=19) of the injuries were traumatic in nature.

The most commonly injured body region was the knee, followed by the lower back and ankle (Figure 1). The survey did not specifically ask the subjects to identify unilateral versus bilateral joint injuries.

The average chronicity of injury was 22.3 months with a range of 1-170 months. The average number of lost training days was 6.03 with a range of 0-60. Twenty-nine percent (n=8) of the injured subjects reported that, as a result of their injury, their ability to train was at least moderately hindered, with two subjects stating they were unable to train.

Table 2. Summary of Survey Responses: Injured Subjects

Survey Question	Number Reporting
Body region affected	
Lower extremity	19
Upper extremity	8
Spine	8
Multiple body regions	9
Mechanism of injury	
Overuse	18
Traumatic	23
Length of symptoms (months)	
<3	4
3-6	6
7-9	2
10-12	4
>12	12
Number of lost training days	
None	19
1-7	3
8-14	2
15-30	3
>30	1
Medical care sought	
None	8
Company corpsman (SARC)	7
Battalion Aid Station (BAS)	3
Physical therapy	8
Other	2
Impact on training	
None	5
Mildly hindered	15
Moderately hindered	5
Severely hindered	1
Unable to train	2

Discussion

The results of this survey indicate that musculoskeletal injuries are a significant issue within the Marine Special Operations community. Nearly one-third of all Marines and Sailors in this MSOC experienced a

musculoskeletal injury or physical limitation during their pre-deployment training cycle. These results are consistent with the findings of Kaufman and colleagues, who reported a 33% injury rate among Navy

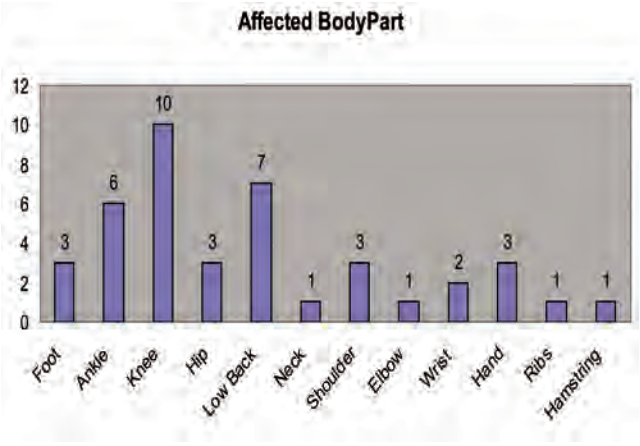

Figure 1:. *Musculoskeletal Injuries by Body Part*

Special Warfare candidates and Riddell, et al., who found a 33.5% injury rate among Royal Marine Commandos.[5,6]

In their study of the members of 5th Special Forces Group, Lynch and Pallis found a significantly higher injury rate of 40%. Their finding is consistent with the findings of studies performed on non-SOCOM units.

While the injury rates found in this study are not as high as those found among non-SOCOM units or in the Lynch and Pallis study, they do indicate that musculoskeletal injuries are a primary impediment to military combat training. Eight members of MSOC Delta missed training due to their injuries, with four members missing more than 20 days. Considering the inherent danger encountered by these Marines and Sailors on a daily basis during combat operations, any loss of ability to train is a significant concern. It is interesting to note that the number of members who missed training days exactly matches the number of members who rated the impact of their injury as a three or higher on the Likert scale.

Another interesting difference between this study and the Lynch and Pallis study is the location of musculoskeletal complaints. In the Lynch and Pallis study, neck and back injuries comprised 31% of all injuries, whereas only 19.5% of those surveyed in this study reported a neck or back injury. Additionally, Lynch and Pallis found that lower extremity injuries accounted for 32% of all injuries among the members of 5th Special Forces Group. Nearly half (46%) of all reported injuries in this survey involved the lower extremities.

The high incidence of lower extremity injuries in this survey is not a surprising finding considering that members of SOCOM units spend a significant amount of time performing long-distance, high-impact activities such as running and multiple-hour ruck marches. Numerous studies have demonstrated a dose-response curve with regard to the relationship between high-impact activities and lower extremity injuries.[3,7-9] Also, these findings are consistent with those found in studies by Almeida, et al and Kaufman, et al.[5,10]

In light of the evidence indicating that as frequency and duration of impact activities increases, injury rates also increase, it seems appropriate to reconsider current training concepts within the Marine Special Operations community. A recommendation for future study would be to compare injury rates and fitness level of a group of Special Operations Marines who undergo a training program designed around decreased volume with increased intensity. Several studies have shown improvements in aerobic capacity from short duration, high intensity interval training.[10-12] It is possible that implementing this type of training program may effectively reduce injuries without a negative effect on overall fitness.

Conclusions

Musculoskeletal injuries are a significant impediment to training throughout all branches of the military. Results of this survey indicate that the newly formed Marine Corps Forces Special Operations Command is subject to injury rates similar to those that have been reported in the limited number of studies that have been performed within the Special Operations community.

Previous epidemiologic studies have identified frequency and duration as the primary etiologic factor for running and impact activity injuries. Members of SOCOM historically have engaged in training programs that consist of very high weekly running and hiking mileage. Consideration of physical conditioning programs that focus on reduced volume and increased intensity may result in decreased injury rates without sacrificing fitness and combat readiness.

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Appendix A

Musculoskeletal Injury Survey

Age:_____ Rank:_____ MOS/Title:_____

Years of service:_____ Years in community:_____

# of deployments:_____ Date of last deployment:_____

Deployed with:_____

During this workup cycle did you experience any pain or any type of physical limitation due to a musculoskeletal injury? **YES / NO**

Body part affected:_____

Mechanism of injury:_____

Date of Injury:_____ # lost training days:_____

Did you seek medical care for this injury? **YES / NO**
If yes, from whom? **SARC / BAS / PT / Other**_____

To what extent did this injury impact your training during this workup cycle? Please circle the most appropriate answer.

1 No impact
2 Mildly hindered
3 Moderately hindered
4 Severely hindered
5 Unable to train

Comments:_____

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