Residual Impact of Previous Injury on Musculoskeletal Characteristics in Special Forces Soldiers


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ABSTRACT

Musculoskeletal injuries are a significant burden to US Army Special Operations Command (USASOC). The advanced tactical skill level and physical training required of USASOC Special Forces Soldiers highlight the need to improve suboptimal musculoskeletal characteristics, particularly following injury to reduce the likelihood of suffering a recurrent preventable injury. PURPOSE: To identify the residual impact of previous injury on musculoskeletal characteristics. METHODS: A total of 106 Special Forces Soldiers were enrolled in this study. Isokinetic strength of the knee, shoulder, and back and flexibility of the shoulders and hamstrings were assessed as part of a comprehensive human performance protocol. A self-reported musculoskeletal injury history was obtained from the time of enlistment to that of laboratory testing. Subjects were stratified based on knee, shoulder, or back injury and analyzed separately. RESULTS: For the knee injury analysis, no significant strength or flexibility differences existed (p > 0.05). For the shoulder injury analysis, internal rotation strength of the healthy subjects was significantly higher (60.8 ± 11.5 %BW) compared to the injured (54.5 ± 10.5 %BW, p = 0.05) and uninjured limbs (55.5 ± 11.3 %BW, p = 0.014) of the injured group. The external rotation/internal rotation strength ratio was significantly lower in the healthy subjects (0.653 ± 0.122) compared to the injured (0.724 ± 0.124, p = 0.018) limbs of the injured group. Posterior shoulder tightness was significantly different between the injured and uninjured limb of the injured group (Injured: 111.6 ± 9.4°, Uninjured: 114.4 ± 9.3°, p = 0.008). For the back injury analysis, no significant strength differences were demonstrated between the healthy and injured groups (p > 0.05). CONCLUSION: Few physical differences existed between Soldiers with prior knee or back injury suggesting restoration of strength and flexibility. For differences that existed in the shoulder, rehabilitation/human performance training should target specific suboptimal musculoskeletal characteristics to prevent the recurrence of injury and allow return to unrestricted training and operations.

INTRODUCTION

Musculoskeletal injuries are a significant issue for the USASOC community and USSOC Operators are highly physically trained and possess an advanced tactical skillset. Improving suboptimal musculoskeletal characteristics in this community is necessary to reduce likelihood of suffering a recurrent preventable injury. The purpose of the current study was to identify the residual impact of previous injury on musculoskeletal injuries in a cohort of Special Forces Soldiers.

METHODS

A total of 106 Special Forces Soldiers were enrolled in this study. Isokinetic strength of the knee, shoulder, and back and flexibility of the shoulder and hamstrings were assessed as part of a comprehensive human performance protocol. A self-reported musculoskeletal injury history was obtained from the time of enlistment to that of laboratory testing. Subjects were stratified based on knee, shoulder, or back injury and analyzed separately. RESULTS: For the knee injury analysis, no significant strength or flexibility differences existed (p > 0.05). For the shoulder injury analysis, internal rotation strength of the healthy subjects was significantly higher (60.8 ± 11.5 %BW) compared to the injured (54.5 ± 10.5 %BW, p = 0.05) and uninjured limbs (55.5 ± 11.3 %BW, p = 0.014) of the injured group. The external rotation/internal rotation strength ratio was significantly lower in the healthy subjects (0.653 ± 0.122) compared to the injured (0.724 ± 0.124, p = 0.018) limbs of the injured group. Posterior shoulder tightness was significantly different between the injured and uninjured limb of the injured group (Injured: 111.6 ± 9.4°, Uninjured: 114.4 ± 9.3°, p = 0.008). For the back injury analysis, no significant strength differences were demonstrated between the healthy and injured groups (p > 0.05). CONCLUSION: Few physical differences existed between Soldiers with prior knee or back injury suggesting restoration of strength and flexibility. For differences that existed in the shoulder, rehabilitation/human performance training should target specific suboptimal musculoskeletal characteristics to prevent the recurrence of injury and allow return to unrestricted training and operations.

RESULTS

For the knee injury analysis, no significant strength or flexibility differences existed (p > 0.05).

For the back injury analysis, no significant strength differences were demonstrated between the healthy and injured groups (p > 0.05).

Shoulder performance results for injured/uninjured limb versus the healthy cohort:

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Injured Limb</th>
<th>Uninjured Limb</th>
<th>Healthy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Rotation Strength (% BW)</td>
<td>54.5 ± 10.5</td>
<td>55.5 ± 11.3</td>
<td>60.8 ± 11.5</td>
</tr>
<tr>
<td>External Rotation/Internal Rotation Strength Ratio</td>
<td>0.724 ± 0.139</td>
<td>0.724 ± 0.136</td>
<td>0.653 ± 0.122</td>
</tr>
<tr>
<td>Posterior Shoulder Tightness (°)</td>
<td>111.6 ± 9.4</td>
<td>114.4 ± 9.3</td>
<td>112.6 ± 7.0</td>
</tr>
</tbody>
</table>

SUMMARY AND CONCLUSIONS

The results demonstrate few physical differences between Soldiers with prior knee or back injury. Several musculoskeletal differences were noted in this study in regards to those who suffered previous shoulder injuries. These findings suggest SF may benefit from targeting specific suboptimal musculoskeletal characteristics in rehabilitation and human performance training.

Experience (years) 11.0
Height (cm) 179.0
Age (years) 31.7
Mass (kg) 85.9

SOF may benefit from targeting specific suboptimal musculoskeletal characteristics in rehabilitation and human performance training.

Calculating Unilateral Strength Ratios

- **Knee**
  - Divide flexion strength by extension strength for each limb
  - Optimal ratio: 0.63-0.77

STATISTICAL ANALYSIS

- One-way Analysis of Variance (ANOVA) was used to evaluate significant between group differences (p<0.05)

DATA PROCESSING AND STATISTICAL ANALYSIS

PROCEDURES

Strength

- **Knee**
  - Flexion/extension, shoulder internal/external rotation, torso flexion/extension, and torso rotation were measured with an isokinetic dynamometer (Biodex Medical Systems, Inc, Shirley, NY) at 60°/sec

Flexibility

- **Hammstrings**
  - Flexibility of the hamstrings, and shoulders were measured using a digital inclinometer

DEMOGRAPHICS

Mean

<table>
<thead>
<tr>
<th>Subject</th>
<th>Age (years)</th>
<th>Height (cm)</th>
<th>Mass (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soldiers</td>
<td>31.7 ± 5.3</td>
<td>179.0 ± 5.5</td>
<td>85.9 ± 5.3</td>
</tr>
</tbody>
</table>

Opinions, interpretations, conclusions, and recommendations are those of the author and not necessarily endorsed by the Department of Defense, US Army, or US Army Special Operations Command. Supported by USAMRMC #W81XWH-11-2-0020

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