INTRODUCTION AND STATEMENT OF CLINICAL PROBLEM: Preparation for and deployment to the most arduous frontline theatres exposes the U.S. Navy Sea, Air, Land (SEAL) Operator to a high risk of injury. Therefore, acute and overuse unintentional musculoskeletal injuries are common during Naval Special Warfare (NSW) training and operations. A past history of musculoskeletal injury can result in severe long-term impairment of muscle performance defined by isolated muscle group weakness. Persistent post-injury muscle weakness is thought to be a risk factor for future re-injury and the premature onset of osteoarthrosis (OA). It is also known that single-leg balance performance can be impaired after knee injury. Impaired balance performance is a risk factor for knee re-injury and is thought to be a predisposing factor for recurrent low back pain (LBP). Therefore, impaired muscle strength and balance performance as a result of past injury may seriously threaten the short-term physical readiness of the SEAL and his overall career longevity.

PURPOSE: To obtain a shoulder, lower back, and knee medical chart documented history (MCDH) of injury from a group of fully operational U.S. Navy SEALs, and then perform a battery of reliable and valid tests to determine their current status with regard to post-injury muscle performance and balance.

METHODS: From the larger study population (n=305) sub-populations of SEALs were identified: those with a MCDH of unilateral knee injury (UKI; n=46), unilateral shoulder injury (USI; n=55), and LBP (n=40). To be designated UKI or USI, there was no MCDH of injury to the contralateral limb. An isokinetic dynamometer measured concentric quadriceps (QUAD), hamstring (HAM), shoulder external rotator (ER), and shoulder internal rotator (IR) mean peak torque (% bodyweight (BW), 5 reciprocal repetitions, 60°/sec). Single-leg, barefoot, hands-on-hips, eyes open (EO), and eyes closed (EC) static balance was measured using a force plate. Ground reaction forces (GRFs) were sampled at 100Hz. Variability in the GRFs was averaged across three trials for each leg for both conditions. Greater variability of GRFs represents greater postural sway. Comparisons were made between the sub-populations of SEALs with a MCDH of injury and those without a MCDH of injury to the same anatomical site (knee n=77; shoulder n=120; LBP n=176) (a=0.05). For the UKI and USI SEALs, within-subject side-to-side (S-S) comparisons were also made using the limb symmetry index (LSI (%)=injured ÷ uninjured*100), where an LSI <90% or >110% indicates a clinically important S-S difference >10%. After this, counts were made of SEALs with S-S differences >10% and proportions calculated (# SEALS with S-S difference >10% ÷ total # SEALs with MCDH of same injury).

RESULTS: For the between-group UKI and USI analyses, there were no significant differences (P>0.05) between the injured limbs of injured SEALs and the strongest limbs of the uninjured SEALs. For QUAD strength, 33% had S-S differences >10% (range of differences 11-57%). For HAM strength, 39% had SS differences >10% (range of differences 11-63%). For ER strength, 49% had SS differences >10% (range of differences 11-44%). For IR strength, 42% had SS differences >10% (range of differences 11-39%). CONCLUSION AND CLINICAL UTILITY: Fully operational SEALs with a MCDH of LBP demonstrate significantly worse balance on both lower limbs than those SEALs without a MCDH of LBP. Clinically important S-S differences in knee and shoulder strength persist in fully operational SEALs with MCDH of UKI and USI, respectively. Based on these data, consideration should be given to routine serial strength and balance testing in SEALs with a MCDH of UKI, USI, or LBP. This data can be used to administer a targeted intervention that reverses potentially dangerous balance dysfunctions and S-S muscle imbalances, enhancing the safety of the previously injured SEAL and increasing the probability for mission success, as well as extending overall SEAL career longevity.

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