

## Special Warfare Combatant Crewmen Demonstrate Diminished Cervical Strength and Range of Motion Compared to Crewman Qualification Training Students

Eagle, SR Keenan, KA, Lovalekar, M, Nagai, T, Morgan, PM, Beals, K

University of Pittsburgh, Pittsburgh PA

**Background:** Physical discomfort, musculoskeletal injury and occupational performance decrements have been linked to repetitive vertical shock loads and vibration exposure similar to that endured by a Special Warfare Combatant Crewmen Operator during an open-ocean mission. Cumulative effects of high-impact vertical forces could lead to substantial discomfort and injury risk over the Operator lifecycle and/or post-military life. **Purpose:** The primary purpose was to compare cervical range of motion and strength measures between Crewman Qualification Training (CQT) students and Operators, hypothesizing that students would demonstrate greater cervical range of motion and strength than Operators. The secondary purpose was to compare cervical range of motion and strength measures between Operators separated into years of service tertiles and students, hypothesizing that Operators with greater years of service would demonstrate less range of motion and strength than those with fewer years of service or students. **Methods:** CQT students (age: 22.8±3.1 years, height: 178.3±6.9 cm, weight: 82.2±8.6 kg, n=186) and Operators (age: 26.9±5.1 years, height: 178.8±6.4 cm, weight: 85.5±9.7 kg, n=167) participated in this investigation. For the secondary analysis, Operators were separated into ≤2 years of service (age: 22.9±2.8 years, height: 179.0±7.6 cm, weight: 84.5±9.6 kg, years of service: 1.5±0.6, n=49), 3-6 years of service (age: 25.4±2.8 years, height: 178.6±5.6 cm, weight: 84.6±9.3 kg, years of service: 4.1±1.0, n=55) and ≥7 years of service (age: 32.6±3.9 years, height: 179.1±6.1 cm, weight: 86.1±10.0 kg, years of service: 10.1±2.5, n=59). Cervical isometric flexion/extension, right/left rotation and right/left lateral flexion strength were measured using a handheld dynamometer. Cervical flexion/extension, right/left rotation and right/left lateral flexion range of motion was measured using a CROM-3 device. All measures were averaged across three trials. CQT and SWCC cohorts were compared with an independent samples t-test. CQT and SWCCs separated into years of service tertiles were compared by one-way Analysis of Variance. **Results:** Students demonstrated significantly higher cervical flexion strength (21.7±4.9%BW; 19.1±5.0%BW, p<0.001) than Operators. Students had significantly greater range of motion: cervical flexion (54.3±10.6°; 51.2±9.2°, p=0.009), extension (77.0±14.4°; 71.3±11.4°, p=0.001), right lateral flexion (55.4±8.3°; 43.4±7.0°, p<0.001), and left lateral flexion (57.5±8.0°; 46.3±7.0°, p<0.001) than Operators. Post-hoc analysis revealed significant differences in cervical flexion strength between students (21.7±4.9%BW) and Operators with ≤2 (19.4±5.1%BW, p=0.033), 3-6 (19.4±5.3%BW, p=0.034), and ≥7 (18.6±4.7%BW, p=0.001) years of service. Significant differences were seen in cervical flexion and extension range of motion between students and Operators with ≥7 years of service (flexion: 54.4±10.4°; 48.2±11.5°, p=0.002, extension: 76.9±14.5°; 70.3±14.1°, p=0.021). **Conclusion:** Students demonstrated greater strength and range of motion than Operators. These findings were generally reinforced by the secondary analysis, however there were very few differences in either strength or range of motion between Operator years of service tertiles. Incorporating cervical strength and range of motion exercises into physical training for this population early in the Operator lifecycle is critical to reduce potential injury risk to the cervical spine.

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