Assessing the HeroWear Exosuit for use in Operating Room Environments

Luke Vathing, Sang Hyeon Kang, Gary A. Mirka PhD

Physical Ergonomics and Biomechanics Laboratory
Department of Industrial and Manufacturing Systems Engineering, Iowa State University

Introduction

• Lower back pain is a serious concern for injury and can result from long term trunk flexion postures\(^1\)
• The use of an exosuit can be a solution to low back muscle fatigue that can result from long term flexion postures such as those seen in surgical environments

Experimental Design

• 16 Participants (10 men and 6 women)
• EMG electrodes secured to the skin over the lumbar erector spinae and rectus abdominis to measure
• Inertial measurement unit (IMU) sensor attached to the back of participants neck to measure trunk flexion angle
• Each participant was asked to bend to a series of different trunk flexion angles 0, 10, 20, 30, 40, 45, 50, and 60 degrees both with and without the Exosuit
• Each angle (except 45) was repeated three times in a randomized order. The 45 degree angle was repeated 26 times.

Discussion

• Within Figure 3, the exosuit has a significant effect when analyzing the NEMG of the Erector Spinae. The exosuit is designed to decrease the activation of the Erector Spinae muscles that are used at different trunk flexion angles. The effect is present at the angles of 0, 20, 30, 40, 50, and 60 degrees.
• The gender difference has a significant effect on the NEMG produced during the trunk flexion angle of 60 degrees as shown in Figure 4.
• Figure 5 shows the NEMG of each trial on the Rectus Abdominis. The steady decrease in the NEMG relates to a learning effect within each subject that can be noticed within the NEMG slightly decreasing after each trial.

References