Neural, Muscular, and Perceptual responses with Shoulder Exoskeleton use over days

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BACKGROUND

A majority of the cases of Musculoskeletal Disorders in the United States involve workers employed in manufacturing, and social assistance workforce. Repetitive overhead work, that is work done over the acromion level, is one of the leading causes of work-related MSDs. This causes increased absenteeism but also affects the worker’s wellbeing and health. Passive shoulder exoskeletons have been widely introduced in the industry to aid upper extremity movements during repetitive overhead work. As an ergonomic intervention it is important to understand how users adapt to these devices over time and if these induce external stress while working.

OBJECTIVES

- Motor & Neural Adaptation over time
- Gauge benefits based on task
- Evaluate gender equity
- Does adaptation to exoskeleton happen over days?
- Can we capture it?
- Studied over 3 days
- Exoskeletons account for sex differences?
- Sex balanced population
- 24 participants

Why is this important?

- To assess if exoskeletons can help in domains requiring not just physical strength but also cognitive situation awareness
- Sex differences identified can be used as a fundamental basis to develop design metrics to built exoskeletons to aid both sexes based on physiological differences
- Based on perception, trust in technology can be improved helping masses adopt to better ways of working to safeguard themselves

Future Work

- Passive shoulder exoskeletons need to be evaluated for longer range of motion
- Based on brain activity behavior, neural metrics need to be developed to assess impact of exoskeletons
- Evaluation of motor adaptation for more cognitively challenging tasks over longer trials

Studied over 3 days

Does adaptation to exoskeleton happen over days?

Can we capture it?

(days?)

Exoskeletons happen over days?

Does adaptation to exoskeleton happen over days?

Can we capture it?

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