

## APPROPRIATE SENSORY FEEDBACK IMPROVES PERFORMANCE

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### BACKGROUND

Persons with upper-limb amputation have reduced sensory feedback, and it is likely that this contributes to reduced performance in daily activities [1]. Despite many attempts to improve performance by providing sensory substitution, few succeeded in the presence of vision [2]. Recent computational motor control research suggests that the most useful augmented feedback depends on 1) existing feedback (such as vision), 2) control vs. task uncertainty, and 3) whether the feedback is in a local or global reference frame [3]. This research suggests local joint-based velocity feedback improves prosthetic arm control, even with unaffected vision.

### AIM

The aim of this study was to see if local joint-based velocity feedback improves performance, even when vision is present, during control of a 2 degree of freedom (DOF) myoelectric interface.

### METHOD

Four able-bodied subjects controlled a two DOF myoelectric interface with virtual dynamics (shoulder and elbow), after giving informed consent in a study approved by our local ethics board. They were asked to perform center-out reaches to one of four targets within 1.5 seconds. Subjects were provided audio feedback, where amplitude corresponded to joint speed, with a different frequency for each joint. After the subjects became familiar with the task, the damping of the virtual prosthetic arm was unknowingly decreased. Subjects were then assessed to see how quickly they could regain performance, as well as how accurately this control generalized to targets to the right and left.

### RESULTS

We found a significant improvement in subject's ability to respond to perturbed dynamics when they were provided with audio feedback that corresponded to the speed of each joint (Figure 1).

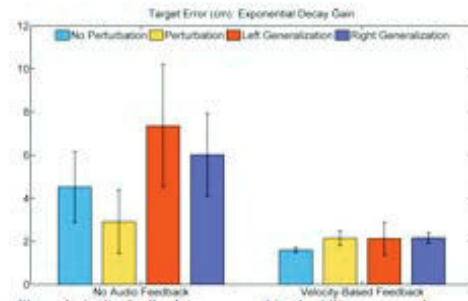


Figure 1. Audio feedback improves subject's ability to respond to disturbances in control

### DISCUSSION & CONCLUSION

This preliminary study suggests that joint-based speed feedback can play an important role in improving performance, even in the presence of vision.

### REFERENCES

1. Childress; 1980 Ann Biomed Eng.
2. Antfolk; 2013 Expert Rev. Med. Devices
3. Berniker; 2008 Nature Neuroscience

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