Session 228 - Motor Control in Primates and Humans

228.10 / N3 - High-dimensional posture-space analysis for upper extremity in a proctored virtual reality game

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Abstract
Injuries of the upper extremity, such as a rotator cuff tears or clavicle fractures, are highly prevalent and often require months of intensive rehabilitation. Considering the long recovery period and the need for multiple extended therapeutic sessions, we propose a virtual reality (VR) intervention for acute upper extremity assessment and rehabilitation. The participant is asked to wear a lightweight VR headset and complete a series of drawing tasks by moving her hand in a 3D VR environment. As the user completes the tasks, she is gradually encouraged to extend the range of motion of her upper-extremity relative to the shoulder in a gamified, interactive environment that can be easily adjusted to create an appropriate challenge, by either the participant or clinician. While previous approaches to VR-based rehabilitation focus on movement speed or range of motion, this is a self-proctored approach that automatically quantifies the kinematic quality and dimensionality of the movements the user is capable of producing, displayed in a way that is easy for clinicians to visualize and interpret. We present our findings from a pilot study in designing virtual reality interfaces for use in physical and occupational therapy clinics, discussing the ethical, practical, and experiential considerations of at-home and in-clinic motor rehabilitation with VR. Furthermore, we compare the user experience between the current practice of manual goniometric assessments to that of our VR system for both the clinician and the participant. Our results suggest that the ease-of-use and kinematic data from this VR system creates enables personalized treatment towards optimizing rehabilitation.

Abstract Citation