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Ph.D. DISSERTATION DEFENSE

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Degree:	Doctor of Philosophy
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Title:	Multimodal augmented sensory feedback during motor rehabilitative training and its influence on psychophysiological measures
Chairperson:	Dr. Raviraj Nataraj, Department of Biomedical Engineering, School of Engineering & Sciences
Committee Members:	Dr. George McConnell, Department of Biomedical Engineering, School of Engineering & Sciences Dr. Feng Liu, School of Systems and Enterprises Dr. Noam Harel, James J. Peters VA Medical Center Dr. Julien Musolino, Department of Psychology & Rutgers Center of Cognitive Science, Rutgers University

ABSTRACT

Neurological trauma to the brain or spinal cord can severely impair motor function to perform activities of daily living. Recovering movement capabilities such as reaching and grasping is typically done with rigorous and repetitive physical training, which can challenge patient engagement and willingness to participate. To address these challenges, computerized interfaces such as virtual reality (VR) are increasingly utilized in motor rehabilitation to leverage gamification and immersion to motivate participants. However, the established effectiveness of computerized rehabilitation methods compared to conventional therapies has still not been maximized. My research examines how VR-based training methods with augmented sensory cues and instrumented wearables can potentially accelerate gains in motor function. Specifically, I utilize multimodal (visual and haptic) sensory feedback, proven to enhance motor learning, during the training of rehabilitative motor tasks for upper-extremity function. Additionally, I characterize how multimodal feedback approaches for motor training impact perceptional and physiological measures that indicate user engagement and well-being with training. Findings from this dissertation should inform more optimal design of computerized methods of motor rehabilitation that can be further personalized to individual users at performance and psychophysiological levels.