ABSTRACT
Robotic therapy refers now to a diverse set of technologies and algorithms that can match or improve on the therapeutic results achievable with conventional rehabilitation therapies. However, the principles by which robotic therapy devices can be optimized are still not well understood. What is needed is a computational framework that integrates the science of motor learning, neural plasticity, and human-robot interaction, which can then be used to predict optimal device designs. In this talk I will review several results from clinical testing of robotic therapy devices, robot-assisted motor learning studies, and the emerging field of computational neurorehabilitation that suggest the beginnings of such a framework. I will also discuss several new mechanical devices and wearable sensors for rehabilitation that my research group and collaborators are developing within this framework.

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David Reinkensmeyer is Professor in the Departments of Mechanical and Aerospace Engineering, Anatomy and Neurobiology, Biomedical Engineering, and Physical Medicine and Rehabilitation at the University of California at Irvine. He is a co-inventor of the T-WREX arm training exoskeleton, commercialized by Hocoma A.G. as ArmeoSpring and now in use in over 700 clinics worldwide for people with stroke, spinal cord injury, multiple sclerosis, cerebral palsy and orthopedic injuries. He is also co-inventor of the MusicGlove hand training device, now being commercialized by Flint Rehabilitation Devices. He is co-director of the NIDILRR MARS3 Robotic Rehabilitation Engineering Center, co-director of the NIH K12 Engineering Career Development Center in Movement and Rehabilitation Sciences, and Editor-in-Chief of the Journal of Neuroengineering and Rehabilitation.