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Predicting response to restorative treatment in stroke rehabilitation

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Statement of the Problem: Stroke rehabilitation is highly varied, ranging from restorative interventions to compensatory strategies to circumvent impairments and enhance function. In most medicine areas, specific information about the targeted organ is used to guide treatment. In contrast, only gross behavioral assessment and reimbursement often guides rehabilitation treatment decisions and, to date, there have been no valid algorithms predicting response to treatment to guide rehabilitation therapists in their choice of interventions.

Methodology & Theoretical Orientation: The target organ for restorative intervention in stroke rehabilitation is the brain. Such restorative interventions depend on neuroplasticity in the respective neural circuits underlying the particular body functions that are impaired. Only when sufficient neuroplasticity within the specific neural circuit is possible with our current methods of facilitating learning based on neuroplasticity, should restorative interventions be employed. This requires the ability to identify the neural elements that are important for a function and a way to identify the critical features of damage that prevent sufficient neuroplasticity. Current work in two common areas of body function impairment post-stroke, hemiparesis and unilateral spatial neglect will be discussed.

Findings: Measures of corticospinal tract integrity seem to be the best predictor for upper extremity motor recovery. The presence of frontal, but not parietal, lesions may predict the presence of Aiming neglect and may also predict response to Prism Adaptation Treatment.

Conclusion & Significance: The development of neural biomarkers that indicate likelihood of sufficient neuroplasticity in response to restorative therapies to results in meaningful functional change is critical to bring rehabilitation into the world of precision health care. Current trials are underway to validate such biomarkers for upper extremity hemiparesis and one type of unilateral spatial neglect. Such valid predictors will increase rehabilitation efficiency and allow for more targeted clinical trials.

Recent Publications

1. Small SL, Buccino G, Solodkin A. Brain repair after stroke–a novel neurological model. Nat Rev Neurol. (2013) 9:698–707.

2. Stinear, C.M., Byblow, W.D., Ackerley, S.J., Smith, M.-C., Borges, V.M. and Barber, P.A. (2017), PREP2: A biomarker-based algorithm for predicting upper limb function after stroke. Ann Clin Transl Neurol, 4: 811-820.

3. Goedert KM, Chen P, Foundas AL, Barrett AM. Frontal lesions predict response to prism adaptation treatment in spatial neglect: A randomised controlled study. Neuropsychol Rehabil. 2020 Jan;30(1):32-53.

Biography

Lorie Gage Richards is an Occupational Therapist with a PhD in Experimental Psychology. She has been involved in stroke rehabilitation trials for over 27 years, particularly in clinical trials of restorative interventions for hemiparesis and now for spatial neglect. She is currently the Chair of Occupational and Recreational Therapies at the University of Utah. She has been an occupational therapy

faculty and rehabilitation researcher previously at the University of Kansas Medical Center, the University of Florida, and the Malcom Randall VA Medical Center. She was also the Editor-in-Chief of the American Journal of Occupational Therapy and currently is co-editor of the intervention subsection of the journal Stroke. Her current research centers on testing interventions in these areas, especially interventions that increase the neuroplasticity of the brain, and in developing predictors of recovery and response to therapies for hemiparesis and spatial neglect.

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