Translating Hand Dexterity Recovery from Research to Clinical Care

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Stroke is one of the leading causes of disability worldwide. Stroke patients typically present with hemiparesis, which is a loss of control and coordination along one side of the body. Upper-limb hemiparesis, particularly in the fingers and hand is one of the most common impairments post-stroke. Given the importance of the hand in performing dexterous activities of daily living, it's unsurprising that patients rate recovery of dexterous hand function as one of their key goals during recovery.

In this talk, I will present the natural history of dexterous recovery in the contralesional and ipsilesional hands over the course of a year after stroke. The findings demonstrate that intrusive synergies during fine-finger movements are observed in the contralesional hand, and to a lesser extent in the ipsilesional hand. Despite the appearance and gradual reduction of these intrusive synergies in both hands, there is no signal change observed in the motor areas of the ipsi and contralesional hemispheres. Particularly in the contralesional hand, while there is a loss of both strength and dexterity, strength and dexterity do not recover similarly over the year. Specifically, while initially recovery of strength and dexterity are correlated, beyond a certain point any further recovery of strength does not result in improvement of dexterity. Together, these data suggest that recovery of dexterous hand function is more a "vertical" problem (interaction between cortical and subcortical pathways) than a "horizontal" one (interaction between ipsi and contralesional hemispheres), and likely depends on the ability of the residual corticospinal pathway to re-exert control over subcortical circuits.

I will argue that in order to train residual corticospinal pathways to promote recovery, clinicians need access to better hardware and software tools that provide dexterous training of hand function with sufficient high-dosage and intensity. Moreover, these tools need to be integrated into existing and new models of clinical care, both in the acute and in the subacute phases of recovery, but also taking into account growing trends for home-based rehab for subacute and chronic care. Here, I will briefly present the Digital Therapeutics platform MindMaze is building to help translate high-dose, high-intensity, post-stroke dexterity training interventions from research to clinical care.