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State-of-the-art clinical assessment of hand function

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Background

It is hard to overstate the importance of our hands in daily life. From writing on a piece of paper to playing the guitar, our hands are the primary means through which we manipulate the environment around us. Nowhere is the importance of the hand more visible than after an injury. Whether damage is to the part of the brain system that controls the hand (e.g. such as following a stroke or cervical myelopathy which affects the spinal cord) or to the hand itself (e.g. nerve damage or amputation), the subsequent loss of function imposes severe restrictions on a patient's daily independence and ability to work.

It is not surprising that patients report that recovery of hand function is one of the most important factors associated with improving quality of life after an injury.

The Problem

Despite the importance of the hand, we only have very basic methods to assess hand function - both to quantify the amount of impairment after an injury and to assess any improvements during rehabilitation.

A hand can be impaired in a number of ways, such as loss of strength or loss of coordination. The current assessment method for upper limb function after a stroke, which includes hand function, cannot differentiate between types of impairment. Outside of stroke, such as traumatic or non-traumatic spinal cord injury, there are no clinical measures to quantify impairment and recovery of hand function.

With only basic clinical assessment measures of hand function, we cannot sensitively evaluate and compare rehabilitation programs after stroke and degenerative arthritis of the neck (CSM), two of the most common causes of neurological impairments in North America. We strongly believe that the development of accurate, standardized clinical assessment tools for hand function will accelerate progress in the restoration of that hand function after an injury.

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The Project

We have assembled a multi-disciplinary team of engineers, surgeons, clinicians and neuroscientists from Johns Hopkins School of Medicine and Western University to develop a new device for assessing hand function. It will be capable of sensitively measuring fingertip forces across all five fingers and along all movement directions. Then we can use this device to develop and validate a clinical hand assessment for patients with brain injuries.

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