

Department of Health and Human Services Grant Application

PA-03-107

NIH Exploratory/Developmental Research Grant Award (R21)

(Grant was awarded 2005)

Title: Portable low-cost glove for functional hand measures

Description: The long term goal of this project is to design, build and evaluate a novel low-cost wireless device to measure hand and finger activity while individuals participate in normal home and community activities. It will be designed to study the loss of hand function that can occur following neurological disorders such as stroke and traumatic brain injury, and to evaluate the relationship between quality of hand movement and an individual's ability to function in the home and community environments following treatment.

Currently, rehabilitation researchers have few methods available to objectively evaluate hand use and function outside the clinic, especially for individuals with moderate to severe reduction in range of motion, dexterity, and fine motor control. This wearable measurement system will have innovative improvements over traditional sensor glove methods including disposable sensors that are easy to put on for individuals with reduced hand and finger range of motion. Data will be transmitted wirelessly to a receiving unit (data logger or computer) using a new wireless protocol designed for low-power remote sensor monitoring. This device will be the first for home and community evaluations.

AIM 1: To develop a low-cost, disposable, wireless sensor data “glove” that is easy to put on in nearly any hand position, and evaluate accuracy, resolution, sensitivity, and develop calibration methods.

AIM 2: To evaluate the usefulness, repeatability of donning, durability and comfort of the wireless glove in recording continuous finger flexion activity in individuals with acquired brain injury (ABI) (including stroke and traumatic brain injury) during day-to-day activities, and during extended data collection (>24 hours) in the home and community.

AIM 3: To develop output variables from finger flexion data that objectively describe hand postures and trends during specific tasks (passive and active) and during normal activities outside the clinic. We will explore the relationship between these parameters and the degree of hand disability (using standard clinical measures) and make recommendations on the usefulness of these methods.

SIGNIFICANCE: This method and device is proposed to overcome a barrier in understanding trends in hand use and disability by providing objective data for two important goals: 1) to explore the origins of motor impairment in the hand, and 2) to assist clinicians in assessing treatment efficacy in functional and useful terms by evaluating the quality and extent of participation in activities of daily living.