# THE HARTWELL FOUNDATION

## 2011 Individual Biomedical Research Award

### Review of Proposed Research

**Investigator:** **Jennell C. Vick, Ph.D.**
**Assistant Professor**
**Departments of Psychological Sciences,**
**Biomedical Engineering and Pediatrics**

**Institution:** **Case Western Reserve University**

**Proposal:** **Treatment for Severe Speech Disorders in Children: Identifying Target Consonant Movements for Use with Animated 3D Visual Feedback Software**

Imagine if, despite years of speech therapy, less than half of what you say was understood by others. Imagine the impact on your personal and vocational life. Consider the impact this disorder has on a child approaching adolescence, when peer groups and "fitting in" are so important. Speech is a complex motor skill that requires the coordination of gestures from close to 100 muscles. Neurological damage resulting from disorders like cerebral palsy and traumatic brain injury can impair the movements of the tongue and lips that result in a motor-speech disorder called dysarthria, producing speech that is slow, imprecise, uncoordinated and frequently unintelligible. Dysarthria results from neurological injury and does not include speech disorders from structural abnormalities, such as cleft palate, another source of speech impairment even post surgical "correction". Surprisingly, the incidence and prevalence of dysarthria are unknown. Not only are these rates not reported for children, they are also unknown for the general population. The most common congenital cause of dysarthria is cerebral palsy (CP), which has an incidence of two per 1000 live births. Approximately 10,000 infants and babies are diagnosed with CP each year, with another 1200–1500 diagnosed at preschool age; and it is estimated that close to one-half of all individuals with CP have dysarthria. Traumatic brain injury (TBI) in childhood can also cause dysarthria. The incidence of TBI in children is nearly 3 per 1000, with approximately 475,000 affected children ages less than 14 years. While the incidence of dysarthria in children with TBI is also unknown, about one-third of adults who have endured a TBI at some point in their life suffer from dysarthria. Unfortunately, current methods for treating severe dysarthria are not effective, particularly because neither the clinician nor the patient can see the movements of the tongue that underlie sound formation due to the cover of the lips and cheeks. By contrast, in learning a complex motor task (e.g., golf swing) the speed of learning has been shown greatly improved when a person sees their own movements relative to an ideal target movement. Jennell proposes to bring these benefits to children with severe dysarthria by creating state-of-the-art animated 3D visual feedback software which will enable both the child and clinician to visualize the real-time movements of the child's tongue relative to an idealized target for a particular speech sound. If she is successful, her approach will change the lives of those children affected with severe dysarthria so that they may finally speak for themselves to any and all listeners.

12-11-11-R-03-22-12