

# An Evaluation of the effectiveness of Functional Electrical Stimulation paired with intensive therapy to improve hand function in children with hemiplegic cerebral palsy

Project Summary

Centre for Leadership in Child Development

*Darcy Fehlings, Yvonne Ng, Betty Chan, Lauren Switzer, Luisa Garzon*

## Holland Bloorview

Kids Rehabilitation Hospital

**Bloorview**  
RESEARCH INSTITUTE

### SHARING OUR WORK

1. Poster presentation of preliminary results at the Bloorview Research Institute 11<sup>th</sup> annual symposium
2. Poster presentation of preliminary results at the 12<sup>th</sup> World Congress on Brain Injury
3. Abstract submitted for oral conference presentation.
4. A paper is being prepared and will be submitted for publication to a peer-reviewed journal.
5. We also plan on sharing the report on our findings with physicians, multidisciplinary practitioners, researchers, families, and many others.

### WHAT WAS THIS STUDY ABOUT?

Children with hemiplegic cerebral palsy (HCP) have motor impairments that particularly affect one upper extremity. The reduced upper limb function often limits their performance in functional activities and participation at home, school, and later vocational roles.

Functional electrical stimulation (FES) involves the administration of electrical impulses using skin electrodes that can activate muscles and generate functionally useful movements. FES has been used to improve upper limb motor function in both adult and pediatric stroke populations, and studies have shown very positive results.

Given that a stroke is often the underlying mechanism of injury in children HCP, we wanted to evaluate the effectiveness and feasibility of a multichannel FES system to improve hand function in children with HCP, and determine whether the results of the proposed treatment were sufficiently robust to justify conducting a subsequent larger clinical trial.

### WHAT DID WE DO?

Three children with HCP (1 male–2 females,  $9 \pm 3.6$  years old, age range: 6 years–13 years) enrolled in our study and completed up to 48 FES therapy sessions. Each child underwent a battery of assessments before starting treatment (baseline), immediately upon completion of treatment (post-FES), and 6 months after completion of treatment (6 months post-FES).

### IMPACT FOR CLIENTS, FAMILIES AND CLINICAL PRACTICE

To date, only a handful of studies have evaluated the impact of FES therapy in the upper limb for children with HCP. The results of our exploratory study will further help guide the use of possible alternative treatment strategies that can minimize or eliminate the potential for continued impairment by progressing the rehabilitation process with the end goal of increasing children's hand functional ability.

## WHAT DID WE LEARN?

Short-term improvements on grasping ability were observed in 2/3 children (a primary outcome), whereas one child's ability deteriorated. Results from the assessment immediately post-FES showed that only one child had consistent improvements across most outcomes, suggesting a positive treatment effect. However, the remaining two cases had inconclusive clinical responses. All children did show improvements in some of our sensory measures, but any possible therapeutic effects of FES on these measures are of limited value unless accompanied by meaningful improvements in functional ability.

Additionally, most of the positive benefits observed immediately post-treatment were not maintained at the 6 months follow-up assessment.

Our results also showed that FES was well tolerated with minimal discomfort. But, willingness to participate in the study was low and limited by the burden of high time commitment to attend sessions.

## NEXT STEPS?

Our preliminary findings suggest that FES is a safe and tolerable clinical intervention for the upper limb in children with HCP, but stronger evidence of the degree of the added benefit(s) for functional use is required. We are currently finalizing the analysis of the data collected during the 6-months follow-up assessments to guide the significance of the short-term improvements observed immediately after treatment ended.

We propose that future research on FES would need to consider multi-site participant-recruitment, modifying eligibility criteria (i.e., age, presence of additional clinical features), intensiveness of FES training, and outcome measurement to confirm any treatment effect and suitability.

## TO LEARN MORE ABOUT THIS STUDY, PLEASE CONTACT:

Lauren Switzer

(416) 425-6220 (ext. 3613)

lswitzer@Hollandbloorview  
.ca

## WHO ARE WE?

**Darcy Fehlings**, MD, MSc, FRCPC

**Yvonne Ng**, OT Reg. (Ont.)

**Betty Chan**, OT Reg. (Ont.)

**Lauren Switzer**, HBSc, MSc

**Luisa Garzon**, HBSc, MSc Candidate

## THANK YOU!

Thanks are extended to the children and families who participated in the study, MyndTec for the equipment support, and the rest of the CP Discovery Lab!

## THIS PROJECT WAS FUNDED BY:

This research was supported by the Centres for Leadership funding and a scholarship award (to LG.) from Holland Bloorview Kids Rehabilitation Hospital.

**Holland Bloorview Kids Rehabilitation Hospital**

150 Kilgour Road, Toronto ON Canada M4G 1R8

T 416 425 6220 T 800 363 2440 F 416 425 6591 [www.hollandbloorview.ca](http://www.hollandbloorview.ca)

A teaching hospital fully affiliated with the University of Toronto

**Holland Bloorview**  
Kids Rehabilitation Hospital