

## Summer Student Research Program Project Description

**FACULTY SPONSOR'S NAME AND DEGREE:** *A.M. Barrett, MD*

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**PROJECT TITLE (200 Characters max):**

**Using optical prisms to improve visuospatial function after right brain stroke: effects on motor and executive function**

### **HYPOTHESIS:**

Spatial neglect is a failure to orient, respond to, or report stimuli in the side of space opposite a brain lesion, when this deficit is not caused by primary sensory or motor dysfunction and when it is accompanied by functional disability (Heilman et al., 1979; Barrett and Burkholder, 2006). People with post-stroke spatial neglect have longer hospital stays, poorer rehabilitation outcomes, and their caregivers incur greater personal and financial burden of acute care (Buxbaum et al., 2004; Maul et al., 2012).

Classically, rehabilitation professionals have thought of this problem as visual, but we and others (Barrett et al., 2012) demonstrated that spatial neglect may be a profound disorder of spatial motor function. "Aiming" motor-exploratory symptoms in spatial neglect may be uniquely disabling, but therapists are not taught how to assess for spatial motor deficits. We developed (Chen et al., 2012, 2015) procedures that any clinical professional can be trained to administer, which may distinguish spatial perceptual from spatial motor errors (Goedert et al., 2012, 2014), and we demonstrated that a treatment for spatial neglect, repetitive movement training while wearing optical prisms (prism adaptation therapy; Redding and Wallace, 2006), may improve Aiming function. This is interesting, because rather than a "visual" therapy, prism adaptation has been thought of in the past as a way of training movement.

If the motor system as well as Aiming spatial exploration is affected by neglect, this means that survivors with spatial neglect may be uniquely challenged in one of the fundamental areas necessary for many kinds of independent function in modern life (driving, operating a computer or mobile phone, playing sports). Motor and executive, decision-making systems are also closely interactive.

In this study, we will evaluate whether the burden of care due to motor disability is improved by prism adaptation. We are one of the only clinical environments in the world using this treatment for spatial neglect in a large number of right brain stroke survivors; students will have a rare opportunity to participate in evaluating and training these patients. We will examine: functional independence measure (FIM) assessing burden of care due to motor disability, and spatial performance testing using the Catherine Bergego Scale (Azouvi et al., 2003). We will evaluate the relationship between improvement on these variables in 10 patients receiving prism adaptation therapy, and then compare the rehabilitation outcomes in these patients to 10 right brain stroke patients who were treated who did not have spatial neglect taking into account age, and stroke severity.

**PROJECT DESCRIPTION** (Include design, methodology, data collection, techniques, data analysis to be employed and evaluation and interpretation methodology)

- The student will learn about basic neuropsychological evaluation of people with brain injury, and will read about the syndrome of spatial neglect and other cognitive deficits.

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- The student will design a datasheet and review results for stroke survivors with spatial neglect on daily life performance, and bedside functional independence assessment. The student will learn about requirements for quality outcome measurement in inpatient rehabilitation care, enforced by the Center for Medicare and Medicaid Services (CMS).
- After appropriate training in confidentiality of protected health information in research, and techniques of interview and testing, the student will collect medical history and perform a neurological examination on subjects being tested.

**SPONSOR'S MOST RECENT PUBLICATIONS RELEVANT TO THIS RESEARCH:**

Barrett AM, Buxbaum LJ, Coslett HB, Edwards E, Heilman KM, Hillis AE, Milberg WP and Robertson IH (2006). Cognitive Rehabilitation Interventions for Neglect and Related Disorders: Moving from Bench to Bedside in Stroke Patients. *J Cognitive Neuroscience*; 18(7): 1223-1236.

Barrett AM. Spatial neglect. Emedicine from Web MD.

<http://emedicine.medscape.com/article/1136474-overview>

Barrett AM, Goedert KM, Basso JC (2012). Prism adaptation for spatial neglect after stroke: translational practice gaps. *Nature Reviews Neurology* 8: 567-577.

Chen, P., Hreha, K., Fortis, P., Goedert, K.M., & Barrett, A.M. (2012, in press). Functional assessment of spatial neglect: a review of the Catherine Bergego Scale and an introduction of the Kessler Foundation Neglect Assessment Process. *Topics in Stroke Rehabilitation Sep-Oct; 19(5):423-35.*

Chen P., Chen, C.C., Hreha, K., Goedert, K.M., Barrett, A.M (2015). Kessler Foundation Neglect Assessment Process uniquely measures spatial neglect during activities of daily living. *Archives of Physical Medicine and Rehabilitation*, 96, 869-876. doi: 10.1016/j.apmr.2014.10.023. PMID: PMC4410062

Fortis, P., Chen, P. Goedert K.M., and Barrett, A.M. (2011). Effects of prism adaptation on motor-intentional spatial bias in neglect. *Neuroreport*. 22(14):700-5.

Goedert KM, Botticello A, Masmela JR, Adler US, Barrett AM (2012). Psychometric evaluation of neglect assessment reveals motor-exploratory predictor of functional disability in acute-stage spatial neglect. *Archives of Physical Medicine and Rehabilitation* 93(1): 137-142.

Goedert KM, Chen P, Boston RC, Foundas AL and Barrett AM (2013). Presence of motor-intentional aiming deficit predicts functional improvement of spatial neglect with prism adaptation. *Neurorehabil Neural Rep*. 28(5): 483-493.

**IS THIS PROJECT SUPPORTED BY EXTRAMURAL FUNDS?**

Yes  or No

*(IF YES, PLEASE SUPPLY THE GRANTING AGENCY'S NAME)*

*National Institutes of Health*

**THIS PROJECT IS:**     Clinical     Laboratory     Behavioral     Other

**THIS PROJECT IS CANCER-RELATED**

Please explain Cancer relevance

**THIS PROJECT IS HEART, LUNG & BLOOD- RELATED**

Please explain Heart, Lung, Blood relevance

**(Stroke)**

**THIS PROJECT EMPLOYS RADIOISOTOPES**

**THIS PROJECT INVOLVES THE USE OF ANIMALS**

PENDING

APPROVED

IACUC PROTOCOL #

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**THIS PROJECT INVOLVES THE USE OF HUMAN SUBJECTS**

PENDING  APPROVED  IRB PROTOCOL # M# 0120050194

However, no testing will take place at UMDNJ. All testing will take place at the Kessler Foundation, and the project is approved by the Kessler Foundation/KIR IRB.

**THIS PROJECT IS SUITABLE FOR:**

UNDERGRADUATE STUDENTS  ENTERING FRESHMAN   
SOPHOMORES  ALL STUDENTS

**THIS PROJECT IS WORK-STUDY:** Yes  or No

**THIS PROJECT WILL BE POSTED DURING ACADEMIC YEAR  
FOR INTERESTED VOLUNTEERS?:** Yes  or No

**WHAT WILL THE STUDENT LEARN FROM THIS EXPERIENCE?**

*We hope the student will*

- a) *learn about stroke-related disability. Related readings will be assigned to facilitate general learning about stroke, hemiparesis, and visual-spatial problems.*
- b) *become familiar with fundamentals of basic behavioral neuroscience test design such as randomization, consideration of confounding influences in construction of simple apparatus and design of a behavioral protocol, as well as understanding a basic data analysis plan.*
- c) *learn about the process of research, from the formulation of hypotheses and decisions about paradigm to the conclusion about a priori questions to be reached from the data. Related readings on clinical research (e.g. from Planning, Proposing and Presenting Science Effectively, by Jack Hailman) will be assigned to facilitate discussion of these issues during regular supervision meetings.*