Summer Student Research Program
Project Description

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PROJECT TITLE (200 Characters max):
Case series to examine separate components of errors in post-stroke spatial neglect, on both laboratory and functional tasks.

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 make errors affecting performance on paper and pencil tasks, but also when acting on real-life environments. It is the latter group of problems that create disability, and demand careful assessment and treatment.

Physical and occupational therapy, as well as other treatments and interventions, require subjects to use space beyond reaching distance, but often require patients to perform complex, multi-step tasks that are hard to quantify objectively. Because therapists and other caregivers may not be educated about spatial neglect, they may not know how to alter standard techniques so that people with spatial neglect derive maximum benefit. Right/left bias on paper and pencil tasks usually improves with natural post-stroke recovery; it is not known how functional spatial bias improves, and subtle spatial impairment affecting real-life tasks may persist in chronic recovery phases (Weinberg J, Piasetsky E, Diller L and Gordon W. Treating perceptual organization deficits in non-neglecting RBD stroke patients. Journal of Clinical Neuropsychology 1982; 4: 59-75.).

Asking subjects to walk (or roll in a wheelchair) in a straight line, particularly with eyes closed, appears to be a sensitive means of assessing right-left bias on a real-life task. In a previous study (Chen and colleagues, in submission), healthy subjects made easily measured errors on this task, based on a body-centered set of spatial coordinates.

Two possible primary causes for spatial errors might be unawareness (not knowing "where"), or dysfunctional motor output ("aiming" incorrectly despite good spatial knowledge). These two types of bias might actually produce different veering patterns when ambulating. In this study, we will examine 5-8 post-stroke subjects, to determine if they veer when walking or wheelchair-ambulating forward and backward. We will also ask subjects to perform a video line bisection task. Line bisection errors can be fractionated into separate "where" and "aiming" components, and we will determine whether the primary bias affecting line bisection might be associated with the direction of ambulation bias. Initial results (Naringrekar et al., in submission) in stroke survivors with spatial neglect suggest that "aiming" bias may be related to the movement errors made in ambulation. The current proposed case series examination will seek to replicate and extend this observation.

PROJECT DESCRIPTION :

- 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 the study of normal subjects (Chen and colleagues, in submission) and initial results in post-stroke spatial neglect (Naringrekar et al., in submission), on which the current study is based.
- 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 each subject tested.
- The student will assist in obtaining copies of the post-stroke brain images for each subject, to be reviewed and examined with Dr. Barrett and the technical staff.
- The student will assist in collecting data on spatial bias with desktop and near/far apparatus for each subject. Results will be examined with one-sample t-tests to determine whether there is significant veering bias, and whether there is significant "where" or "aiming" bias for each subject tested.

SPONSOR'S MOST RECENT PUBLICATIONS RELEVANT TO THIS RESEARCH:
General review:
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. Journal of Cognitive Neuroscience; 18(7): 1223-1236.
Case series examining mechanisms of pathological spatial bias
Barrett AM and Burkholder S. (2006). Monocular patching in subjects with right hemisphere stroke affects perceptual-attentional bias. Journal of Rehabilitation Research and Development, 43(3): 337-346.

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 INVOLVES THE USE OF HUMAN SUBJECTS ☒
PENDING ☐ **APPROVED** ☒ **IRB PROTOCOL # 0120050194**
However, no testing of subjects will take place at UMDNJ. All testing will take place at KMRREC, where IRB approval by the joint KIR/KMRREC IRB is also current.

THIS PROJECT IS SUITABLE FOR:
UNDERGRADUATE STUDENTS ☐ ENTERING FRESHMAN ☐
SOPHMORES ☐ ALL STUDENTS ☒

THIS PROJECT IS WORK-STUDY: 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 An Introduction to Scientific Research, Wilson) *will be assigned to facilitate discussion of these issues during regular supervision meetings.*