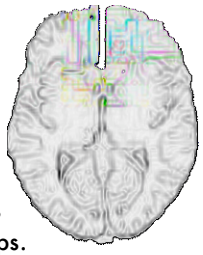
Newsletter
Fall/Winter 2007
Issue 5

Neuropsychological Studies of Brain Injury

University of Pennsylvania
Center for Cognitive Neuroscience (CCN)



Center for Cognitive Neuroscience Patient Database

The Center for Cognitive Neuroscience Patient Database program was begun to help researchers identify patients with focal brain injury in order to investigate brain-cognitive behavior relationships. The database is in its seventh year of operation and now includes 172 patients and 84 non-brain injured control subjects who have participated in more than 1500 research sessions. The success of the program in terms of identifying and recruiting patients will be part of a presentation by Dr. Lesley Fellows (authors include Lesley Fellows, Marianna Stark, Arlene Berg and Anjan Chatterjee) at the Cognitive Neuroscience Society 2007 Annual Meeting in New York City. Dr. Fellows is a neurologist in the Department of Neurology and Neurosurgery at McGill University in Montreal, Canada. She is a former postdoctoral fellow in Penn's Center for Cognitive Neuroscience.

New Researchers Join Patient Program

Roy Hamilton, M.D., M.S.
Cognitive Neurology Fellow

Can brain function be modified after injury in order to enhance recovery of language and motor abilities? This question is the focus of my research, which involves using a technology called Transcranial Magnetic Stimulation (TMS) to alter and enhance brain activity. I finished residency training in adult neurology at the University of Pennsylvania in 2005 and I am now entering my second year of fellowship in Cognitive Neurology, working with Dr. Branch Coslett. Prior to coming to Penn, I received my M.D. from Harvard, where I worked with blind patients in order to test theories about how the brain reorganizes its function in the setting of profound sensory loss. Here at Penn I hope to expand my investigations by exploring ways in which the brain reorganizes in response to other kinds of injury, and to examine how the brain's ability to respond to an insult like a stroke can be maximized using magnetic brain stimulation. My research is funded by a generous grant from the American Academy of Neurology Clinical Research Training Fellowship.

Patients who volunteer in research are a resource of immeasurable value to investigators working in our field. Your time, effort, and patience in the laboratory form the foundation upon which new hypotheses and insights about the brain and cognition can be built. In upcoming months I hope to meet a number of you and I want to thank you in advance for your generous assistance.

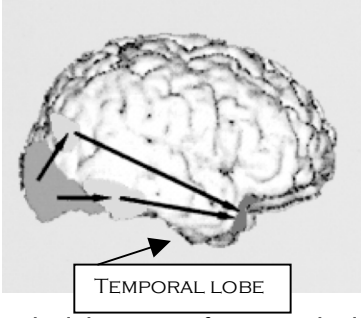
Jared Medina, Ph.D.

My name is Jared Medina, and I am a new post-doctoral fellow working with Dr. Branch Coslett. I spent the last six years in Baltimore at Johns Hopkins University completing my Ph.D. in Cognitive Science. In some of my past research at Johns Hopkins, I examined the ability to localize tactile stimuli after strokes to specific regions of the brain. For example, we tested some individuals that would accurately report that they were touched on one hand or the other. However, they were consistently inaccurate in reporting the specific location of the touch, often shifting their responses towards the forearm. For example, one individual that we would touch on the tip of the middle finger would consistently report being touched at the base of the middle finger (Rapp, Hendel, & Medina, 2002). Tests from these individuals provided insight as to how the brain reorganizes to represent tactile stimulation after stroke.

Another individual that I have tested demonstrated an uncommon disorder known as *synchiria*. When this individual was touched on, for example, the index finger of his left hand, he would report being touched on the index finger of both his left hand *and right hand*. Interestingly, this subject was more accurate at localizing the *phantom sensation* on his right hand than he was at localizing *actual stimuli* presented to his right hand (Medina & Rapp, 2004). Tests with this individual have helped us understand how both hemispheres of the brain are linked with regards to touch.

I am currently working with Dr. Coslett understanding links between motor cognition (i.e. how we move our body) and the body schema (i.e. how we know where our body is, using various senses). For those that I have already worked with, we thank you for your time and efforts, as some of our experiments are already providing insights regarding how we understand our bodies in movement. And for those that I haven't worked with, I look forward to meeting you in the future. Your contributions are greatly appreciated.

Focus on Research: Dr. Ingrid Olson



Although most people believe that the eyes are all that is needed to see the rich visual world that lies before us, the eyes constitute only the front-end of visual processing. The rest takes place in the brain. Scientists have found that there are two visual processing streams, one that runs from the occipital lobe in the back of your brain along the back top of the brain; this is called the dorsal visual stream. Another visual processing stream runs from the occipital lobe along the bottom of the brain; this is called the ventral visual stream. Some scientists believe that the end-point of the ventral visual stream is in the front-most tip of the temporal lobe, however, there is little evidence for this.

The laboratory of Dr. Ingrid Olson has been assessing this idea by testing people who have suffered damage to the anterior temporal lobe. Her results show that damage to this region does not cause visual problems for most types of visual stimuli such as scenes, objects, and faces. However, very subtle deficits are evident when tested with particular types of stimuli, such as dot-configurations. Her findings suggest that this part of the brain can be considered the end-point of visual processing since high-level deficits are evident after damage.

Get to Know the Researchers!

Prin Amorapanth, B.S., *New York University*, M.D./Ph.D. Student

Neural systems underlying spatial categories

The main project I'm working on is looking at which brain areas are necessary for processing spatial concepts, ranging from the type that we use to understand terms like "above" and "below" to those that support our ability to mentally rotate things. A side research interest is how various neurological conditions affect artistic efforts.

Marian Berryhill, Ph.D., *Dartmouth College*, Postdoctoral Fellow

I am interested in understanding the process by which the brain samples and interprets the environment. Several questions are of interest: 1) How do we look where we look? Every waking moment we move our eyes towards items of interest. The manner in which we successfully focus on objects provides us with a sense of what is going on in the external world. In addition, a variety of clinical groups, such as those with autism, make eye movements in a tremendously different manner from the majority. 2) How do we retain information across short periods of time? We are constantly moving our eyes around and holding on to pieces of information as we need it. For example, it is difficult to remember locations and features for more than about 4 items at a time.

Laurel J. Buxbaum, Psy.D., *Hahnemann University*, Associate Professor of Rehabilitation Medicine, Thomas Jefferson University

Cognitive neuroscience of action

Our work focuses on representations of objects, actions, and space, using behavioral, fMRI, and virtual reality methods.

Youssef Ezzyat, B.S.E., *Princeton University*, Research Specialist

Human memory formation

My research is focused primarily on testing patients with memory problems resutling from damage to the medial temporal lobes of the human brain. I am examining the factors that affect how our experiences are encoded into memories and what abilities are spared in people with memory problems.

Cris Hamilton, Ph.D., *Rice University*, Postdoctoral Fellow
Language and memory

Broadly, I am interested in how we produce and understand language and how words and memories are stored and accessed in the brain. I am also interested in reading and writing disorders that often result from brain injury. Studies of brain-injured individuals are one of the principle sources of data in my research.

Jared Medina, Ph.D., *Johns Hopkins University*, Postdoctoral Fellow
Somatosensation, spatial representations, motor control and the body schema

I am currently studying how the brain represents the body in motor control.

Ingrid Olson, Ph.D., *Yale University*, Research Assistant Professor
Visual memory and perception

Elaine Wencil, M.A., *University of Pennsylvania*, Ph.D. Candidate in Psychology at the University of Pennsylvania

I study the cognitive neuroscience of interval timing (how the brain processes short durations from hundreds of milliseconds to minutes). Though terribly important to daily life, how the brain perceives and uses temporal information to guide behavior has been largely overlooked by scientists to date. I am performing fMRI studies to isolate the neural structures and functioning of a purported internal clock.

Martin Wiener, M.S., *Villanova University*, Research Assistant
Time and temporal processing

I am assisting Dr. Coslett in the investigation of the neurobiological roots of temporal awareness. Specifically, we want to know what makes the brain "tick" to allow us to perceive the passage of time.

International Connections

Alessia Folegatti, from the University of Torino, Italy, spent 6 months in Anjan Chatterjee's lab. She studied the effects of brain damage on time perception. This study will be incorporated in her Ph.D. dissertation, which she plans to defend in early 2007.

Robert Langner, from the University of Aachen, Germany, is planning to visit Anjan Chatterjee's lab to study the effects of brain damage on different components of attention. He will be funded by a training grant received by the University of Aachen in collaboration with investigators from the University of Pennsylvania.

Dr. Janice Snyder, now an Assistant Professor at the University of British Columbia, Okanagan, Canada, recently published a paper with Anjan Chatterjee in the Journal of Cognitive Neuroscience titled "The frontal cortex and exogenous attentional orienting." The data for this study was collected at the University of Pennsylvania when she was a post-doctoral fellow.

UNIVERSITY OF PENNSYLVANIA

Center for Cognitive Neuroscience (CCN)

3720 Walnut Street, B-51

Philadelphia, PA 19104-6241

Website:

www.ccn.upenn.edu

Patient Coordinator:

215-615-3649

Director:

Anjan Chatterjee, M.D.

Patient Coordinator:

Marianna Stark, Ph.D.

Faculty:

H. Branch Coslett, M.D.

Martha Farah, Ph.D.

Daniel Kimberg, Ph.D.

Ingrid Olson, Ph.D.

Sharon L. Thompson-Schill, Ph.D.

ELAINE WENCIL, M.A.

Thank you to all who have participated in the experiment in which you made judgments about the timing and size of circles – I have had the wonderful opportunity to meet with over 40 of you in the past few years. We have now finished collecting data and we presented your results last April at the Annual Meeting of the Cognitive Neuroscience Society in San Francisco. The evidence suggests that different types of magnitudes (e.g., how far away your friend is standing or how long a song lasted) are processed independently in the brain. Furthermore, regions of the parietal cortex that correlate with ability to perform size judgments are anatomically distinct from parietal cortex regions that correlate with ability to perform time judgments.

CRIS HAMILTON, PH.D.

I have spent of much the fall preparing for and presenting research at conferences in Victoria, BC and Houston, TX. There I presented studies reporting unique types of language comprehension problems observed in some forms of aphasia. These studies were the result of my work with many of you participating in the database. I would like to thank everyone who has participated in our studies and made the trip to Penn or allowed us into your homes. You and your families are a very valuable part of our research at Penn. Happy Holidays and I hope to see you in the coming year.

MARIAN BERRYHILL, PH.D.

I arrived at the Center for Cognitive Neuroscience over the summer to work with Dr. Ingrid Olson. Before coming to the University of Pennsylvania I attended Dartmouth College and studied visual perception by examining eye movements. Here at Penn, the patient database has allowed me to begin a series of studies examining short-term memory in patients. Currently, I am looking for people in their 60s-80s without neurological challenges. If you know of anyone who might be interested - please let me know! (Contact the Patient Coordinator at 215-615-3649).

WE NEED VOLUNTEERS

Non brain-injured subjects are needed for our research studies. These individuals are often the spouses and caregivers of our patients. Subjects receive the same tests as our patients, and they help to establish a baseline for how non brain-injured individuals perform on the same tasks. Payment for participation is $15 per hour plus mileage and parking.
Contact us at 215-615-3649 for more information.