

Research Initiative Update

Embodied Cognition

CCSN Research Initiatives were designed to organize faculty into groups addressing similar “big questions.” Faculty within each initiative strive to identify and employ complementary methodologies as well as intellectual opportunities for the creation of new programs of research. These initiatives, however, are necessarily overlapping, a fact that reflects the Center’s commitment to interdisciplinary inquiry as well as the fundamental interconnectedness of cognition. We interview Sian Beilock, Associate Professor of Psychology at the University of Chicago and leader of the Embodied Cognition Research Initiative.

What kinds of research interests unite the Embodied Cognition Research Initiative?

We are all interested in how one’s ability to understand, learn, and make judgments about other people, objects, or situations is driven by perceptual and motoric reexperiencing (often referred to as embodiment) in one’s self. Much of this unity is based on asking how sensory and motor experiences change cognition. We use many different measures to get at these questions, ranging from behavioral measures to neuroimaging techniques.

We are also united in asking questions about the interaction between cognition and action. One important line of work in this Research Initiative is looking at how motor experience changes the way we learn and understand. For

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SIAN BEILOCK

example, in educational settings, we want to know how having action experience might change understanding of language about actions, or understanding of math problems that have some action component. Some of us are also interested in understanding how one’s emotions and thought processes might be influenced by one’s own actions, like facial expressions or other body postures or gestures. Essentially, we want to get away from the idea that we are abstract information processors, and instead embed our cognition in bodies, in the world, and in action.

What projects are currently being explored under this Research Initiative?

Howard Nusbaum, Steve Small, Ian Lyons, Andrew Mattarella-Micke and I, in 2008, looked at how having action experience changes the neural substrates used to understand and comprehend language about actions. To get at this question, we compared professional hockey players, rabid fans, and people with no hockey experience at all. In a paper published in *Proceedings of the National Academy of Sciences*, we showed that hockey players called upon areas of the brain involved in motor planning and action selection when they were just listening to sentences about hockey actions, and they seemed to be better “comprehenders” of language about hockey action because they were able to recruit these premotor regions during language listening. We’ve used these ideas to think about how we can improve comprehension in school subjects with action components like physics or math. My lab has been looking at physics, while Susan-Goldin Meadow’s lab has been looking at gesture and chemistry.

Susan Goldin-Meadow and I have also been exploring how gesture is equivalent to action and how it is not. That is, does having experience acting on particular objects lead to

the same sorts of changes in how we understand information as gesturing about using these objects?

We have done some behavioral work looking at how people explain the way they performed the Tower of Hanoi task. In this task, there are three pegs and many disks. You have to move all the disks from one peg to the other, but you can never put a smaller disk on top of a larger disk. The smallest disk weighs the least and can be picked up with one hand. The biggest disk weighs the most and people need two hands to pick it up successfully. It is a problem-solving task. We have people solve the Tower of Hanoi task, and then explain how they solved it to someone else, either with or without gesture. When most people explain this task, they don’t actually include any information about the weight of the disks or how you pick them up (one handed versus two) in their words; but this information is sometimes conveyed in gesture. We show that the gesturing actually affects how people solve a subsequent version of the task where now – all of a sudden – the smallest disk that could be picked up previously with one hand is now heavy and requires two hands to be picked up successfully. Specifically, people who gestured about picking up the smallest disk with one hand have trouble solving the task a second time around when the actions needed to pick it up are different. This is in contrast to those people who did not gesture at all. When you convey information in gesture, you often convey different information than what you’re conveying in speech, and this is often very action-associated information. We show that gesturing and expressing action information in gesture can change how you think about solving the Tower of Hanoi problem.

What opportunities do you see for expanding this Research Initiative?

I think we could link more specifically with educators and classrooms, as well as with the Committee on Education, to consider ways to enhance learning through action.

We could also begin to ask questions about action and action experience across individuals. From a social psychological perspective there are many theories about how one’s own actions are important in terms of understanding emotions or the action of others. People are interested in these issues in terms of understanding empathy or disorders like autism where understanding of others breaks down. Some of this work is already going on here at the U of C and at other institutions.

How much individual variation do you observe in these studies on gesture and action systems?

There is probably a lot of individual variation as well as cultural variation. I know that for the Tower of Hanoi task, basically everyone gestures when they explain how they solved the problem. One finding we have is that some people gesture about particular actions and some don’t, and that affects how they think about it. This is another issue that unites this Research Initiative-- we are very interested in individual differences, both in terms of people’s past experiences and how people might call upon these previous action experiences in learning new information. ■

The Tower of Hanoi puzzle.



UPCOMING EVENTS

Upcoming Lectures

Donald W. Fiske Distinguished Lecture

23 April 2010

4:30-6:00 pm, Social Sciences

Research Building Room 122

Richard Nisbett, University of Michigan at Ann Arbor.

Research in Progress Seminars (RIPS)

The Center faculty also participate in various workshops, brown bags, and research in progress seminars. To be added to the email list for announcements of talks and events, email Anna Gomberg, agomberg@uchicago.edu.

2010 CCSN Advanced Study Workshop Speakers

The Center for Cognitive and Social Neuroscience in collaboration with other Departments, Centers, Institutes, and Programs, sponsor talks on a wide range of topics by visiting scholars. Upcoming speakers include:

3 March 2010

12:00PM, Stuart Hall Room 101

Asif Ghazanfar, Princeton University
Vocal Communication Through Coupled Oscillations: Substrates for the Evolution of Speech.

11 May 2010

Location TBD

Amir Raz, McGill University
Title Forthcoming.

25 May 2010

Location TBD

Natalie Denburg,
University of Iowa
Title Forthcoming.