

Long-term Effects of Post-stroke Changes in Sensorimotor Experience on Manipulation Judgments Involving Common Tools

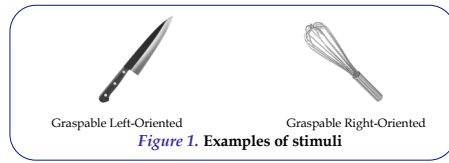
Evangelia G. Chrysikou^{1,2}, Daniel Casasanto^{3,4,5}, & Sharon L. Thompson-Schill^{1,2}

¹Department of Psychology, ²Center for Cognitive Neuroscience, University of Pennsylvania

³MPI for Psycholinguistics, ⁴Donders Center for Brain and Cognition, ⁵New School for Social Research

Background & Objectives

- Neuroimaging and neuropsychological evidence supports theories of **embodied cognition** that highlight the relations between sensorimotor and cognitive systems, particularly in tasks involving everyday objects.
- Previous research has shown that factors such as an object's **size** (e.g., Grèzes et al., 2003), the **degree of rotation** of an object from its canonical position (e.g., Graf et al., 2005), or the participant's **viewpoint** (e.g., Creem et al., 2001; Linkenauger et al., 2009) influence object recognition.
- Successful object use requires retrieval of **semantic knowledge** that incorporates information about the object's **function** and **potential for action** (Creem-Regehr & Lee, 2005; Creem & Proffitt, 2001). This knowledge is **distributed** across a semantic network based on the individual's **experiences** with the object (e.g., Thompson-Schill et al., 2006).
- This study explored possible effects of post-stroke changes in sensorimotor experience of **premorbidly right-handed stroke patients**, on conceptual knowledge about common tools. We investigated whether the **orientation of an object** (right/left) interacts with participants' sensorimotor experience as indicated by the **type** (right/left) of their paresis.



Procedure

- Participants were asked to identify aloud the type of grasp they would employ (i.e., **clench** or **pinch**) when using each object for its typical function (Figure 2).



Results

Figure 3. Manipulation Judgment Latencies by Object Orientation & Paresis Type

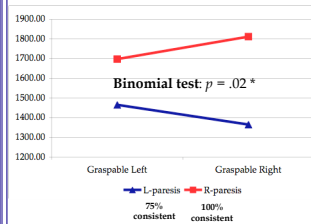


Figure 4. Manipulation Judgment Accuracy by Object Orientation & Paresis Type

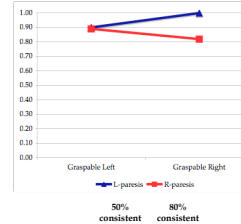
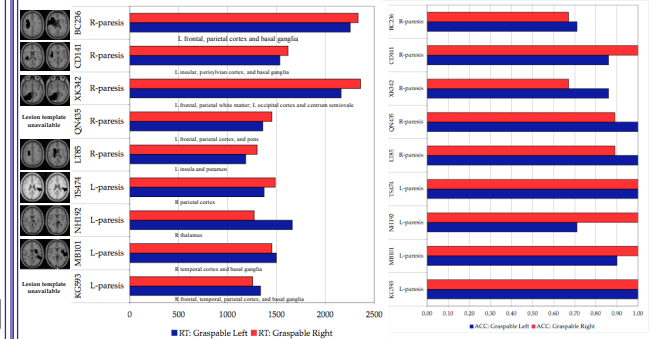


Figure 5. Reaction Times & Accuracy by Patient



Method

Participants

- Four right-hemisphere stroke (left paresis) patients (all females, mean age = 56.5 years) and 5 left-hemisphere stroke (right paresis) patients (2 males, mean age = 57.4 years) participated. Postmorbid handedness was measured via the Edinburgh handedness inventory (Oldfield, 1971) and was EHI = 90 for the left-paresis group, and EHI = -72 for the right-paresis group.

Materials

- Following morning, a set of 74 black-and-white photographs of everyday objects were used as experimental stimuli; 37 were images of graspable objects oriented to the right, 37 were images of graspable objects oriented to the left. Examples of stimuli are presented in Figure 1.

Discussion

- These results show that right-paresis (left stroke) patients are faster to make manipulation judgments when the objects are oriented to the left, whereas left-paresis (right stroke) patients show the reverse pattern. Accuracy scores reflect the same pattern. These findings are in line with evidence from right- and left-handed normal subjects on this task.
- This study offers support for the **body-specificity hypothesis** (Casasanto, 2009; Willems et al., 2010): People who interact with their physical environments in systematically different ways form correspondingly different mental representations. These results are further consistent with a **distributed model of semantic memory** according to which everyday sensorimotor experience with common objects affects our knowledge about them.

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Contact Information

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Evangelia G. Chrysikou, Ph.D.
Department of Psychology
University of Pennsylvania
3720 Walnut St., Solomon Lab B51
Philadelphia, PA 19104
Email: evangelg@psych.upenn.edu