Impaired Access to Manipulation Features in Apraxia: Evidence from Eyetracking and Semantic Judgment Tasks

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Introduction

A prominent theory of distributed semantic representation claims (Allport, 1985): The semantic representation of concrete objects reflects the extent to which the sensorimotor systems are involved during their acquisition and further elaboration. Studies on apraxia, a specific deficit of object-related movements, showed that apraxic patients are impaired at making an explicit judgment on object manipulation features, suggesting a relationship between physical object-related movements and knowledge about them (e.g., Buxbaum et al., 2000).

However, in this task patients were asked to explicitly access manipulation knowledge. Their impairment might reflect a failure to appropriately use heuristic information. Using an eye tracking method with normal subjects in which the aspect of manipulation of objects is not task-relevant, Myung et al. (2006) found a competitor effect based on manipulation features during lexical-semantic processing: More looks to manipulation-related items (e.g., typesaw) than the unrelated distractors (e.g., bucket) when asked to identify an auditory target and touch it on it (e.g., piano).

The current study examines the manipulation knowledge of apraxic patients in an implicit task to assess whether they have a deficit in conceptually processing manipulation features regardless of the type of a task.

Experiment 1a

Method

- 5 apraxic aphasics patients, and 5 non-apraxic aphasics controls, both groups with left frontoparietal lesions.
- Neuropsychological and language tests:
  - Apraxia: Boston Diagnostic Apraxia Examination (BDAE), Western Aphasia Battery (WAB)
  - Aphasia: Florida Apraxia Battery (FAB), Naturalistic Action Test (NAT)

Two conditions:

- Experimental Condition (Fig. 1a):
  - Target, manipulation-related competitor and distractors
  - Visual Control Condition (Fig. 1b):
  - In order to assure that the results are not due to the visual similarity between manipulation-similar objects.

Results

- Apraxics showed a deficit in accessing manipulation features, perhaps due to reduced activation of manipulation features.

Figure 1. Example display of each condition

- 10 trials in each condition for controls; 14 trials for the apraxics; 40 fillers
- Eye movements and screen touches recorded using EyleLink III and an Elo Entuitive touch screen monitor

Effect of visual similarity in both groups (Fig. 4).

Figure 3. Proportion of fixations on each picture type in Experimental Condition

Dissociation between Exp. 1a and Exp. 2

- We looked at patterns of eye movements from Exp. 1a for those stimuli which apraxics made errors on in the explicit judgment task (Exp. 2).

Questions

1) Would apraxic patients show a deficit in the lexical-semantic processing of manipulation features in an implicit task?
2) Would there be a difference between the apraxics’ performances for the same stimuli in implicit and explicit tasks on manipulation features?

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References


