Becoming a Martian archeologist: A concurrent motor task affects conceptual judgments of learned tools
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Introduction

- Does motor experience influence object representations?
- Theories of embodied cognition propose that we recognize tools by reactivating sensorimotor representations of tool use.
- Consistent with this, performing a concurrent motor task affects conceptual judgments of tools, but not other objects. 2
- We sought to test the hypothesis that a concurrent motor task modulates conceptual processing of learned vs. non-learned objects by directly manipulating the embodied experience of participants.

Methods

Participants
- 25 manipulation group: 24 spatial group
- Stimuli
  - For the manipulation group, functional goals, arm actions and hand postures 
    were parametrically mapped onto 3-D printed tools; for the spatial group, environment, storage location, and tool placement were parametrically mapped.

Hypothesis

- A concurrent motor task should modulate conceptual judgments more for the manipulation group than the spatial group.

Reaction of sensorimotor information under the representation of tools

Reactivations of sensorimotor information underlie the representation of tools.

Results and Discussion

Procedure

- On four separate days participants completed a series of training and experimental tasks:
  - Only data from the concurrent motor task are shown here. Task details:
    - Manipulation group: 2 (hand posture: prehensile vs. poke) X 2 (arm action: sweeping vs. drilling) X 2 (function: excavation vs. digging) factorial
    - Spatial group: 2 (tool placement: flat vs. on end) X 2 (storage location: box at hip vs. box at feet) X 2 (environment: poles vs. equator) factorial
  - For the manipulation group, functional goals, arm actions and hand postures; for the spatial group, environment, storage location, and tool placement were parametrically mapped.

Models

- Reaction time data (RT) were analyzed using linear mixed effects models (LME). Variables of interest were: group (manipulation vs. spatial), interference (concurrent vs. non concurrent) and familiarity (familiar objects vs. unfamiliar objects). The model selection procedure is summarized in table 1.

Conclusions

- A concurrent motor task facilitated judgments about familiar objects for the manipulation group (i.e. a larger familiarity effect).
- A concurrent motor task impaired judgments about familiar objects for the spatial group (i.e. a smaller familiarity effect).
- The spatial group showed faster judgments for familiar objects when they were not performing a concurrent motor task.

References


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