Does the activation of motor information affect semantic processing?

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Knowledge of objects use is one of the most important available types of knowledge for a living being. For example, humans can make use of a hammer to nail wooden planks and build a house, chimpanzees can use a twig to "fish" for insects, and birds of prey called bearded vultures, or lammergeiers, can make use of stones to break bones and feed themselves with marrow.

A basic issue in human cognition is how information concerning actions with objects is represented. Are motor representations critical components of objects concepts? Recent accounts assume so and focus on the interaction between cognition and action (e.g., Creem & Proffitt, 2001; Barsalou, 2016). Specifically, semantic content is thought to mediate action in response to the environment.

Several behavioral studies show that semantic content influences reach-to-grasp movement responses. For instance, Glenberg and Kaschak (2002) showed that judging sensibility of sentences was easier when the movement implied by the sentence was in the same direction as the movement required by the response. Furthermore, Glover, Rosenbaum, Graham, and Dixon (2004) demonstrated that reading words describing objects activated motor tendencies, which influenced the grasping of target blocks. Interestingly, Myung, Blumstein, and Sedivy (2004) showed similar effects of semantics with a lexical decision task that required keypress responses: Performance on the target word was better when semantically dissimilar prime-target pairs shared manipulation information (e.g. *typewriter* and *piano*).

However, not much is known about the influence of motor activation on semantic processing. The present study aimed at examining whether: a) motor information concerning objects can be pre-activated through the presentation of images of graspable objects as primes (e.g. *frying pan*); b) pre-activated motor information about objects facilitates a lexical decision task on target words describing objects' properties (e.g. *handle*) relevant for action. To this end, thirty-two participants were instructed to observe a prime object and then judge whether the following target was a known word in the lexicon. They were required to make a keypress response with either a key on the same side as the depicted action-relevant property of the prime object (i.e. corresponding key) or on the opposite side (i.e. non-corresponding key). Target words matching in frequency and length were of three different types: words describing properties relevant for action with the object (e.g. *handle*); words describing properties irrelevant for action with the object (i.e. its material, e.g. *ceramic*); words describing things unrelated to the object (e.g. *eyelash*).

An ANOVA with *Word type* (relevant for action vs. irrelevant for action vs. unrelated) and *Correspondence* (corresponding vs. non-corresponding key) as within-subject factors was performed on RT and PE data. Results show a main effect of *Word type* for PE ($p = .02$). Pairwise comparisons showed that participants were more accurate with words describing attributes relevant for action (M: 1.5 %) than with both words describing attributes irrelevant for action (M: 4.5 %, $p = .002$) and unrelated words (M: 4.5 %, $p = .02$). This preliminary finding suggests that the activation of motor information affects semantic processing.

References

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