Modal Representations of Word Meanings: Schematic or Instance-Based?

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A large body of research has demonstrated that perceptual information is routinely activated during language comprehension (Zwaan, 2004). Little is known, however, in which way different perceptual dimensions such as color and shape are combined during word access. We tested implications of two opposing theoretical accounts on this issue. According to the theory of perceptual symbols (Barsalou, 1999), modal representations are schematic and componential. The representation underlying the comprehension of the word *tomato*, for instance, is based on a schematic representation of *red* that is combined with a schematic representation of *round*. This view predicts that priming of color and shape information facilitates lexical access in an additive manner. Instance or exemplar models of categorization (e.g., Medin & Schaffer, 1978) provide a theoretical alternative. According to these models, the meaning of concepts is based on experiences with specific exemplars. Activation of word meanings depends on the similarity of a stimulus to these exemplars (e.g., experiences with actual tomatoes). This view predicts that priming of both color and shape information is necessary to facilitate lexical access and therefore predicts a multiplicative effect.

Method

Twenty-three psychology undergraduates performed a lexical decision task. The experimental stimuli were 20 names of fruits and vegetables with typical colors and shapes (e.g. tomato). In addition, 20 filler items (names of cereals and herbs) and 40 nonwords were included. In each trial, one word/nonword appeared in the center of a background picture that varied in color (green, red, yellow, orange, purple) and shape (round, elongated/oval). The onset of the background picture presentation preceded that of the word/nonword by 200 ms. Color and shape of the background picture either matched or mismatched the actual color or shape of the fruit or vegetable denoted by the stimulus words (*color match* vs. *mismatch* and *shape match* vs. *mismatch*). In addition, there was a neutral condition where the stimulus word was presented in a grey rectangle.

Results and Discussion

An ANOVA (by subjects) of the response latencies in the lexical decision task revealed no main effects for color match/mismatch or shape match/mismatch (for both effects: $F < 1$) but a strong interaction of the two variables, $F(1,22) = 4.4$, $p < .05$, $\eta^2 = .17$ (Figure 1). Compared to the neutral condition, lexical decisions were facilitated only when both color and shape matched the fruit or vegetable denoted by the stimulus word ($t(22) = 2.3$, $p < .05$, $d = 0.47$). Matching color or matching shape alone, in contrast, was not sufficient to yield a significant facilitation effect (for both comparisons: $t(22) < 0.6$, $p > 0.5$, $d < 0.12$).

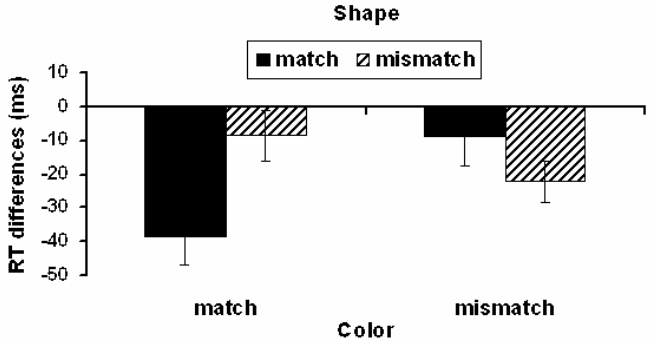

Figure 1: Lexical decision latencies (differences to neutral condition) for names of fruits and vegetables.

These results suggest that different kinds of perceptual information are integrated in a multiplicative rather than an additive manner when word meanings are accessed. This conclusion is difficult to reconcile with the assumption of schematic perceptual representations, but it is consistent with the notion that the representation of word meanings is based on instances of experiences with the word's referent.

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References

Barsalou, L. W. (1999). Perceptual symbol systems. *Behavioral and Brain Sciences, 22*, 577-609.

Medin, D. L., & Schaffer, M. M. (1978). Context theory of classification learning. *Psychological Review, 85*, 207-238.

Zwaan, R. A. (2004). The immersed experiencer: Toward an embodied theory of language comprehension. In B. H. Ross (Ed.), *The psychology of learning and motivation: Advances in research and theory*. Amsterdam: Elsevier.