Feature diagnosticity affects semantic representations of novel and common object categories

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INTRODUCTION

A central principle in feature-based theories of semantic memory is the differential weighting of some features over others [1-5]. Some of these features are diagnostic – they serve to distinguish or otherwise conspicuously differentiate one item from others [6,7]. In determining feature diagnosticity, we argue for a distinction between when a feature is available and needed, and when it is actually used.

Color is necessary in order to distinguish lemons and limes. Color is available but not needed in order to distinguish stop signs and yield signs.

Using color as the diagnostic feature, we used a training paradigm to investigate how diagnostic features interact with semantic representations.

METHODS

Subjects learned one of two novel object sets over the course of four sessions:

COLOR + SHAPE:

- Whale
- Whale
- Whale
- Whale

SHAPE:

- Whale
- Whale
- Whale
- Whale

Color is necessary, shape is not sufficient:

P(object | shape) = 0.33
P(object | color) = 0.50
P(object | shape AND color) = 1.00

Color is available, shape is sufficient:

P(object | shape) = 1.00
P(object | color) = 0.50
P(object | shape AND color) = 1.00

Following training, subjects performed a number of behavioral tasks, including adjective generation and pairwise general similarity ratings:

- Klave
- Klave
- Klave
- Klave

Color diagnosticity and object color knowledge

In order to prioritize color positively correlated with left fusiform activation.

RESULTS: GENERALIZATION

We examined the extent to which these results generalized to common object categories via fruits and vegetables (PV, color is diagnostic) and household items (HHI, color is not diagnostic) through parallel behavioral and fMRI tasks.

If you flipped a CARROT over, would it stand up straight?

Like “color+shape” subjects, those subjects describing PV objects were more likely to list color first. When combining novel and common object categories, we found that prioritizing color positively correlated with left fusiform activation.

REFERENCES


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