Semantic influences on episodic memory distortions

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Introduction

Existing semantic knowledge changes how we learn new information by facilitating encoding of related items and accelerating their cortical representation. However, prior knowledge can also distort new encoding, resulting in false memories or confabulation. Leveraging the organization of semantic memory may help us understand when new memories are facilitated or distorted. For instance, typical category members are thought to be more strongly associated with members of the same category, resulting in faster categorization, more efficient recognition, etc.

How does category typicality influence the precision and distortion of new episodic memories?

Design

Encoding

Drag this item to the red dot

3 per item: 15-20 min

Squirrel

3 min break

Scissors

5-7 min

Crab

Retrieval

Location of items determined by judgments from a separate cohort of participants.

All experiments completed through mTurk.

Analysis

Example retrieval trial

- Location of items
- Consistent (60%)
- Inconsistent (40%)
- Consistent
- Inconsistent

Error: Retrieved - Encoded

Positive values: Less precise memory

Bias: (Encoded - Center) - (Retrieved - Center)

Positive value: More bias

Predictions

Every item is more precise

More precise memory for items near the cluster center

More biased memory towards cluster center for typical items

Experiment 1

Is memory more precise when the locations of items relate to category membership? Are typical items more biased towards category neighbors than atypical items?

Semantic judgments

Which does not belong?

3 animal categories: birds, mammals, sea (35 images)
3 objects categories: kitchen, office, tools (25 images)

Item locations (Expts. 1 and 4)

Colors indicate category membership. Images indicate order of within-category cluster. Controls shown after verification and categorization, within same-scale cluster.

Item memory

Memory is more precise for items located near category neighbors.

More accurate memory for typical items.

Memory for typical category members is more biased towards category neighbors, relative to atypical members.

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Conclusions

Across three experiments, memory was more precise for items located near category neighbors — when location memory benefited from semantic knowledge (Expts. 1, 2, 4).

For items far from category neighbors, retrieval of typical category members was more biased towards category neighbors relative to atypical members (Expts. 1, 2, 4).

These effects are not limited to semantic categories but also extend to color (Expt. 3), suggesting that the similarity of features between items dictates how they are remembered, regardless of whether the features are semantic or visual.

Category typicality also influences how unique, task-irrelevant details are remembered (Expt. 4). Typical items may be encoded more efficiently, due to their stronger association with category neighbors, but at the cost of memory for their unique features.

References

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10. Sweeney et al. 2015 Frontiers Hum Neuro. 

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