Extracting abstract knowledge from specific experiences: spontaneous category-learning from paired-associates training
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Abstract
The ability to find similarities across multiple experiences allows us to link related information and form category representations. While category learning in the laboratory typically involves explicit labeling as to which items belong in which category, naturalistic category learning is often much less direct. In this study we tested whether individuals formed categories spontaneously, even when instructed to remember specific items with their specific context. Further, we sought to understand whether the formed category representations were abstract in nature or instead driven by memory for specific exemplars.

Participants were first shown cartoon stimuli paired with distinct habitats and asked to remember the specific cartoon-habitat association. Unbeknownst to participants, cartoons that lived in similar environments also shared features in a systematic way. Following training, we tested participants’ memory for cartoon-habitat associations as well as their ability to judge the habitat for cartoons they had not seen.

In addition to successfully remembering specific animal-habitat associations, participants were able to successfully place never-seen animals into the correct habitat type at above-chance rates, indicating that they had detected the pattern in the features without being told to do so. Further, about half of participants relied on abstract category representations while the other half extracted the category directly from individual category exemplars. The participants ability to spontaneously form abstract category representations without explicit demand is analogous to how we may form categories in the real world.

Background
- Categories are formed by extracting characteristic features of a concept and finding commonalities across multiple episodes, allowing us to respond differently to information that belongs to separate classes.1
- Category learning in laboratory setting usually involves explicit labeling and receiving corrective feedback, whereas naturalistic learning is not as direct4.

- Generalization, concept learning, is often studied separately from specificity, the ability to remember specific details.5

Are individuals able to form categories without explicit demand, and if so do they rely on specific examples or abstractions?

Methods

Experimental Design
- Stimuli with 8 binary features
- One stimulus = category A prototype
- All other stimuli = 1-8 features different from the A prototype
- Stimulus with all 8 features different = B prototype

Training
- 4 exemplars per category, differing from their prototypes by 2 features
- 12 repetitions of each item
- Rate likelihood of remembering paired stimuli

Paired Associates Task
- Each exemplar presented, total 8
- Paired item with scene presented at training

Generalization
- 8 old and 30 new items from varying distances
- Participants choose between mountain and forest

Tasks Performance

- Associations between specific habitat-animal formed and subjects were successful in identifying precise habitat for each animal
- Categorization accuracy decreased with increased distance from prototype
- Subjects were able to accurately place old and never before seen exemplars into the correct habitat type

Category Representation

- Prototype models: categories represented as central tendencies (prototypes).
- Exemplar models: categories represented as individual instances (exemplars).

Conclusions
- Individuals are able to generalize across events when asked to remember specific items with their specific context
- About half of subjects rely on specific examples to form representations, while the other half rely on abstractions
- Depending on the category representation, memory for specific events and generalization can work independently from each other

References