

Questions about Rosch and Coleman and Kay

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Outline

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- 2 Key linguistic evidence: Hedges
- 3 Theoretical Issues
- 4 Coleman and Kay 1981

Tversky's 1977 summary

Citing Rosch (1973); Rosch and Mervis (1975); Rosch et al. (1976)

This research demonstrated that both natural and artificial categories are commonly perceived and organized in terms of prototypes, or focal elements, and some measure of proximity from the prototypes.

Furthermore, it lent substantial support to the claim that people structure their world in terms of basic semantic categories that represent an optimal level of abstraction. Chair, for example, is a basic category; furniture is too general and kitchen chair is too specific. Similarly, car is a basic category; vehicle is too general and sedan is too specific. Rosch argued that the basic categories are selected so as to maximize family resemblance - defined in terms of cue validity.

Basic categories maximize the difference between in-category similarity and between category similarity.

Hedges

① How do **hedges** interact with prototypes?

(A(n)) X is technically a Y.

robin

penguin

parsley

asparagus

basketball

fishing

(A(n)) X is virtually a Y.

pickle

carrot

copper

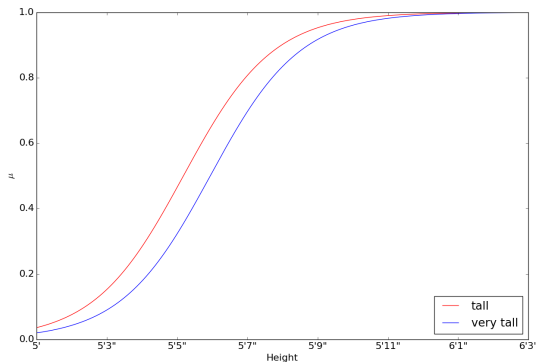
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Asymmetric Similarity Judgments (Tversky 1977)

Subject	resembles	Referent
The portrait		the person.
The son		the father.
An ellipse		a circle.
North Korea		China.

Fuzzy truth: Zadeh (1965), Lakoff (1973)

Tall and very tall [very tall = tall²]

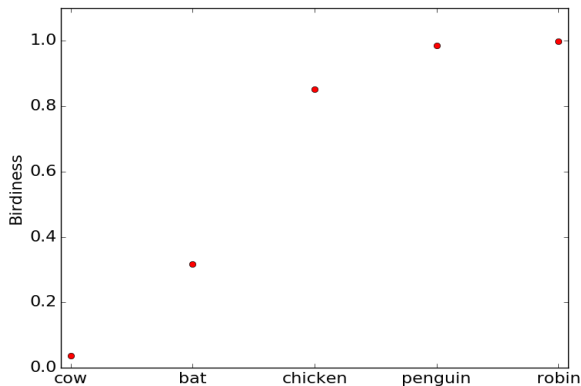


$P \Rightarrow Q$ iff $|P| \leq |Q|$
in all models.

Note that $P \Rightarrow Q$ is a categorical claim about all models.

Birdiness

From cows to robins



Entailment: *A bat is a bird* entails *A penguin is a bird* but not vice versa.

As for birds

- | | | |
|----|------------------------------|--------------------|
| a. | A robin is sort of a bird. | 0, .3, .5, .7, 1.0 |
| b. | A chicken is sort of a bird. | 0, .3, .5, .7, 1.0 |
| c. | A penguin is sort of a bird. | 0, .3, .5, .7, 1.0 |
| d. | A bat is sort of a bird. | 0, .3, .5, .7, 1.0 |
| e. | A cow is sort of a bird. | 0, .3, .5, .7, 1.0 |

Given this example, what do you think the fuzzy membership curve for *sort of tall* looks like?

Fuzzy Set Relations (Zadeh 1965)

Union	$\mu_{A \cup B}$	=	$\max(\mu_A, \mu_B)$
Complement	$\mu_{A'}$	=	$1 - \mu_A$
Intersection	$\mu_{A \cap B}$	=	$\min(\mu_A, \mu_B)$
Subset	$A \subseteq B$	iff	$\mu_A \leq \mu_B$ for all x in X

A fuzzy relation R^n is a fuzzy subset of X^n

Properties of prototypes

- 1 Prototypes are most strongly associated with basic level categories, which are acquired early.
- 2 Share maximal number of elicited features with other class members
- 3 Get highest rating on a 7-point scale for how well it fits “the idea or image of the meaning of the category” (these ratings get very high rank correlations among different subjects)
- 4 Are “focal points” or “best exemplars”. They are more **representative** of their category than other members.

Colors

What has research into colors found that lends support to the idea that categories have focal points/best exemplars?

Reaction times

Are there any results involving reaction time experiments? If roughly describe the stimulus and a result that supports the idea of prototypes?

What about priming (mentioning the category name in advance)? How does priming affect reaction times for representative and non representative category members?

Artificial categories

An artificial category is taught by exemplar: random dot pattern.
Representativeness is measured by degree of distortion from the prototype

What do the reaction time experiments show?

Exemplar production

Subjects asked to list exemplars of each 56 categories (superordinate categories: basic level = genus, so exemplars can be species)

Did degree of representativeness/prototypicality affect performance on this task?

Inductive generalization

Subjects are told some property of a category instance in a context in which they are invited to generalize that property to other category members

Did degree of representativeness/prototypicality affect performance on this task?

Learning categories

Concept: degree of distortion of exemplar from the prototype pattern
[DoD]

- 1 Detecting novel exemplars: positive/negatively correlated with high DoD? What does this tell you? Where would you expect new category boundaries to be most likely to form? As close to a prototype as possible?
- 2 Order these three kinds of categories in terms of ease of learning: low DoD for all members, high DoD for all members except prototype, a mixture of high and low DoD.
- 3 Exemplify the last result with colors.
- 4 How does order of presentation of exemplars fit in? What order of presentation of a category's exemplars promotes learnability?

Dissimilarity with contrast categories

Which is true of prototypes?

- ❶ Prototypes always have close to the highest level of in category similarity of any exemplar.
- ❷ Prototypes tend to have close to the highest degree of dissimilarity (among members of their category) to contrast categories.
- ❸ With artificial categories, both high in-category similarity and high contrast category dissimilarity are required to get good representativeness effects.
- ❹ Both 1 and 2 are true.
- ❺ All of 1, 2 and 3 are true.

What does it mean that category members differ in degree of representativeness (DoR)?

- 1 Does high difference in DoR among category members predict that basic categories will have well-defined boundaries?
- 2 Can you illustrate your answer to the first question with respect to colors?
- 3 How would it work with drinking vessels (Kempton 1978)?
- 4 Does difference in DoR imply a particular kind of cognitive representation? Particular kinds of processes that act on those representations? This relates to the discussion in the section which contains the word *Representation* in the title.

Two Kinds of Models of Concept Formation

- | | |
|-------------|---|
| Abstraction | A concept is an abstraction consisting of a set of defining features and relations between them. |
| Exemplar | <p>A concept is a set of exemplars and a similarity relation. Hierarchical relations among concepts require an exemplar be associated with multiple categories (all <i>dog</i> exemplars associated with <i>dog</i> and <i>mammal</i> category)</p> <p>A lot of literature on the superiority of abstraction models. Also:</p> <ol style="list-style-type: none">1. It's easier to think about cognitive representations of novel instances belonging to multiple categories with abstraction models.2. Doesn't an explicit account of similarity relations involve abstracting features anyway? (Tversky 1977) |

Prototypes and concept formation

A prototype theory can incorporate elements of both abstraction and exemplar based models. Explain with an example.

Decomposability

Issues about decomposability of word meanings have direct analogues in the psychology literature dating back to debates between British empiricists and Gestalt theorists.

Sometimes in the psych literature, a contrast is drawn between features (qualitative, not necessarily possessed by all exemplars) and dimensions (continuous, numbers on scales, resulting in representing an object as a point in n-dimensional space).

What are the elements of the *Lie* prototype?

Coleman and Kay (1981)

- ① How many elements are there?
- ② Which is the most important?
- ③ Should reprehensibility a feature of the *lie* prototype? Recap some of the discussion on this issue.

Prototypical vs. Typical

The surgeon

A young man is involved in an automobile accident in which his father is killed. Seriously injured, the youth is rushed to the emergency room of a hospital and a surgeon is called in. Upon entering and seeing the patient, the surgeon exclaims, 'Oh, my God. I can't possibly operate on my own son!' Explain

Lakoff and *regular*

The feature *swims with agility*

Mark Spitz is a regular fish.

Is this a prototypical feature, a typical feature or something else? Explain.

Two experiments on reprehensibility

Is it a lie if you deliberately deceive people who are terminally ill, in order to spare them anguish?

Under what circumstances is it ok to lie?

No, because you are doing good for them rather than taking advantage of them.

To terminally ill people, when you're sparing them anguish.

The prototype theory

A fixed set of features

C&K argue against necessary and sufficient conditions for *lie*. Nevertheless they do argue for a fixed set of features for lying. In other words, membership in the set of lie-features is not itself fuzzy. How is this possible?

Based on C&K's discussion, complete the following analogy and discuss it:
kill:illegal::lie:??

Coleman, Linda, and Paul Kay. 1981.

Prototype semantics: The english word lie.

Language 26–44.

Lakoff, George. 1973.

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On the internal structure of natural and perceptual categories.

In T. Moore (Ed.), *Cognitive Development and the Acquisition of Language*.
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Family resemblances: studies in the internal structure of categories.

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Basic objects in natural categories.

Cognitive psychology 8(3):382–439.

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Features of similarity.

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Information and control 8(3):338–353.