

Chapter 9

Concepts and Generic Knowledge

Definitions and Concepts

- Definition
 - includes superordinate category
 - Properties of the defined object that distinguish it from other members of the category
 - E.g a triangle is a polygon (or a closed, straight-sided figure) with three sides & three angles
- Concepts – often difficult to define; e.g. *game*, *virtue*
 - Always exceptions to definition
- People comfortable using concepts even if they can't define them

Family Resemblance

- *Defining features* essential for category membership
- *Characteristic* features characterize most members of the category
- Definition of concept includes properties *likely* to characterize instances
 - E.g. dogs have 4 legs, fur, a tail and they bark
- Wittgenstein: Family resemblance
 - Members of a family share traits, but not all family members have the same set of traits
 - E. g. Dad & one kid have blond hair, blue eyes; Mom and 2nd kid have brown hair and eyes. Daughter has grandfather's nose; son has grandmother's personality etc.

Family Resemblance - 2

- Family Resemblance
 - No *defining* features (features shared by all family members)
 - Matter of degree, not all-or-none
 - No *necessary* or *sufficient* properties
 - E.g. Triangle must have three sides which form a closed figure. Note: this is a definition.
 - (Properties are both necessary & sufficient.)

Prototypes & Fuzzy Boundaries

- Specify “most typical” or most “average” example, E.g robin is typical bird
 - *Prototype*
- Some birds are obviously birds; some birds are harder to classify, e.g. penguins swim & waddle but don't fly. Emus are large & don't fly.
- Different people may have different prototypes (typical bird in Nfld. vs typical bird in Brazilian jungle)
- Prototypes = benchmarks or anchors
- Usually think about prototype

Prototypes & Fuzzy Boundaries - 2

- Categorization involves comparison between prototype and exemplar
- Some categories have fuzzy boundaries (e.g. celebrity)
 - Not clear who is and who is not a celebrity
- Fuzzy boundaries → graded membership
- Graded membership: some members are more *typical* members of category
 - Items more similar to prototype = more typical members

Testing the Prototype Notion

- Sentence verification Task: A robin is a bird.
- Latency (response time) depends on *Semantic Distance* (number of connections to be traveled)
- Responses faster for true than false sentences (More connections to search for false sentences.)

Testing the Prototype Notion - 2

- Typicality effects: “A robin is a bird” is faster than “A penguin is a bird”
- Explanation: distance from prototype
 - Faster response when more features in common with prototype
- → Circular argument. Need different measures of “typicality”.
- If we can measure “typicality” in a variety of tasks and get similar effects → don’t have problem with circular argument.

Testing the Prototype Notion - 3

- Variety of tasks converge
- “Typical” category members
 - give fastest RTs in sentence verification
 - are produced first in production task
 - are given highest typicality ratings
 - are best recalled in memory task,
 - are rated as the most attractive etc.
- Eliminates problem of circular argument

Converging Evidence for Prototypes

- **Sentence Verification:** faster responses for “typical” exemplars → more similar to prototype
- **Picture identification:** Is next picture a dog? Get faster responses for “typical” exemplars of category
- **Production Task:** Ask Ss to produce exemplars from a particular category. Most “typical” exemplars are produced first.
- **Judgements of Category Membership:** Items given higher ratings (more similar) are those that give fast responses in SV & PI tasks

Converging Evidence for Prototypes - 2

- **Three-step task:** ask people to make up sentences about categories. (E.g. Businessmen wear suits.)
 - Es substituted either typical (prototype) or atypical category member,
 - “Executives wear suits” vs. “Escort service owners wear suits” vs. “Independent home building contractors wear suits.”
 - Ss rate new sentences on plausibility or silliness.
 - Ratings reflected typicality of substituted words
 - “Executives...” more acceptable than “Escort service owners...”

Basic Level Categories

- “Natural” level of categorization → Basic level
 - Not too general & not too specific
- Answer question, “What is that?”
- Basic level categories – named by single words; e.g. What kind of pet do you have? What furniture do you have in your apartment?
- Basic level categories used most often, learned first.
- Memory errors: recall basic-level word rather than more specific word which was presented & vice versa

Analogies from Remembered Exemplars

- Prototype theory: always use the same prototype for comparison
- Categorization may depend on specific exemplars rather than prototype
 - *Exemplar-based reasoning*
 - Use of prototype or exemplar may depend on similarity of test item to exemplar, retrievability (frequency, recency etc.) of exemplar
 - E.g. doctor diagnosing might think of recent similar case

Typicality Effects and Exemplars

- Exemplar theory: may use different exemplars depending on context & retrieval cues present
- If item is similar to typical exemplars, many items retrieved quickly → rapid decision in sentence verification or classification task
- E.g. show robin-like (or starling-like) creature and ask if it is a bird. S recalls robin or sparrow or other typical bird & decides 'yes'.
- For penguin, emu, or ostrich, similar exemplar harder to retrieve.
- Fewer similar exemplars retrieved than if test exemplar is 'typical'.

Typicality Effects and Exemplars - 2

- → get faster response times for typical exemplars
- Less typical exemplars more difficult to retrieve in production task
 - Not primed, less interconnected
- Exemplar-based reasoning consistent with observed typicality effects
- Both exemplar theory & prototype theory can explain typicality effects

Typicality Effects and Exemplars - 3

- Prototypes do not preserve information about variability of category exemplars, but people do take variability into account.
- Exemplar-based reasoning can account for variability.
 - Retrieval of several exemplars, exemplar similar to test item.

Analogies from Remembered Exemplars: Demo

- MAUGH
- LOUGH
- BEDICE
- SONE
- BOUR
- ROUCH

Analogies from Remembered Exemplars: Demo - 2

- MAUGH: LAUGH vs. DAUGHTER
- LOUGH: TOUGH vs. COUGH vs. DOUGH vs. BOUGH vs. THROUGH etc.
- BEDICE: POLICE vs. DEVICE vs ALICE
- SONE: DONE vs. GONE vs. TONE
- BOUR: HOUR vs. FOUR
- ROUCH: TOUCH vs. COUCH vs. POUCH COVE

Exemplars & Variability

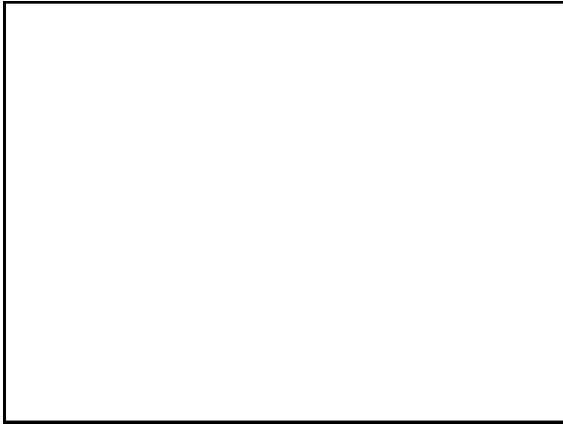
- Retrieving a number of category exemplars → info about variability of category members
 - Info about variability → category boundaries
 - Anthropologist finds skeleton that is somewhat similar to known dinosaurs, but has some differences.
- Prototype does not give information about variability

Pliability of Mental Categories

- Mental categories not fixed like subject categories in MUN library catalogue.
- People can change perspective
 - Rate typicality of tropical birds, Chinese birds etc. Will get different typicality ratings than without special instructions.
- *Goal-derived categories* (categories established to meet specific criteria)
 - Things to take on a moose-hunting trip
- *Ad Hoc categories* (categories created in response to specific question)
 - Tourist attractions in Paris

Pliability of Mental Categories - 2

- Humans are very flexible &
- Use knowledge about both prototypes & exemplars



Odd & Even Numbers

- Situation in which typicality and category membership ratings not correlated
- Categories “Odd Numbers” & “Even numbers” are well defined.
- Have Ss rate typicality of odd & even numbers
- Get consistent ratings with different numbers in each category rated differently
 - Higher numbers rated ‘less typical’ in each category than lower numbers
 - See Table page 289 of text
- Presence of clear category boundaries does not rule out use of other information in category membership judgements.

Lemons & Counterfeit Money

- Situations in which typicality judgements do not correlate with category membership judgements
 - Whales more typical fish than sea lampreys, but whales are not fish & sea lampreys are.
- Category membership not necessarily judged by typicality.
- Take lemon, remove resemblance to lemons. (eg. Paint it, spray perfume on it, add sugar & flavouring, flatten it. Etc. Lemon no longer looks, smells or tastes like a lemon.

Lemons & Counterfeit Money - 2

- Counterfeit money or well made plastic lemon – looks like real thing, but isn't.
 - People understand difference between real thing & realistic imitation
- Perceptual similarity is not defining characteristic of many concepts.
- Can have category membership without similarity (abused lemon) & recognition of nonmembership in spite of similarity (counterfeit money)
- Keil: asked children what makes something a coffee pot or a raccoon, could a toaster be turned into a coffee pot?

Lemons & Counterfeit Money - 3

- Children understood that with certain modifications a toaster could be changed into a coffee pot, but a skunk could not be changed into a raccoon.
- We reason differently about living things & manufactured objects
- “Deep” features:
 - Counterfeit money not made by the mint.
 - Lemons grow on trees, are used to season food etc.
 - Raccoons are living things, don't have skunk parents.
 - Adults would understand about skunks & raccoons having different genes

Lemons & Counterfeit Money - 4

- Essential properties: depend on a network of other beliefs about how things come to be (animals are born or hatched from eggs; real money produced by government)
- Concepts are part of a network of information about how objects in world relate to one another
 - Concepts about money depend on knowledge of government, banking, currency etc.
- Typicality not necessary nor sufficient for category membership.

Complexity of Similarity

- Resemblance – depends on context.
 - Identical twins: “not alike at all” (Speaker focuses on differences.)
 - Any two unrelated human beings are highly similar.
- Which features are important to consider depend on background knowledge & on category & situation.
 - Colour relevant to determining if fruit is lime or lemon, if blueberries are ready to pick or not.

Complexity of Similarity - 2

- Background knowledge & situation - cont' d.
 - Weight important for checked baggage, if one is traveling by air, but size important for carry-on bags or for travel by car or bus.
 - Appearance important in detecting counterfeit money, but newly designed bills or coins, which look different from the old money, are readily accepted.
- In order to use category knowledge, must know essential or “deep” properties of category
- Human thinking highly flexible and adaptable

Complexity of Similarity - 3

- When comparing objects, which features to compare depends on beliefs about concepts in question.
 - Importance of attribute depends on concept
 - Origin important for money, living things but not for manufactured items.
 - Exact colour relevant for artists paints or for decor, but not for buying radios or books

Concepts as Theories about the World

- Concepts = theories about objects
 - Include exemplars, prototypes, beliefs & expectations
- To classify a new object...
 - Attend to features on basis of knowledge & beliefs
 - Encounter wild animal
 - See interesting plant
 - Meet new person
 - Responses based on how we categorize object or person or situation.

Concepts as Theories about the World - 2

- Responses to new person, situation or object based on prior experience, knowledge & beliefs about similar people, objects, situations.
- Concept = interconnected network of knowledge & beliefs about the world. Knowledge of any concept (emus, prototypes) involves knowledge about related concepts (penguins, robins & eagles or exemplars, similarity etc)
 - Concept = 'theory' about objects

Category Coherence

- Properties of objects in a category linked in 'meaningful' manner
 - Birds fly, build nests in trees, lay eggs, migrate south in winter
- Easier to learn concepts if features are *coherent*
- ADD & ADHD – defined by group of symptoms
 - Hyperactivity, inability to pay attention (to schoolwork), distractability (in school), impulsiveness, difficulty planning ahead & organizing oneself, etc.
 - no theoretical mechanism → diagnosis is hit-or-miss
 - Features are not coherent → controversy over diagnosis

Category Coherence - 2

- Dyslexia – usually defined in terms of discrepancy between IQ & reading achievement.
 - Difficulty learning to read and spell in presence of normal IQ
 - There are dyslexic kids with high IQ and with low IQ
 - There are children with low IQ who learn to read
 - Children with Autism Spectrum Disorder often good spellers & decoders but don't understand what they read

Concepts as Theories of the World

- Determine how easily we learn new concepts (hammer example in text)
- Influence category judgements
 - E.g. diagnosis of dyslexia and ADHD
- Shape reasoning about a concept.
 - School policies regarding special needs, importance of diagnosis
 - Assumption that children with dyslexia or ADHD need special teaching methods or behaviour management

Categorization and Reasoning

- Categorization → generalization
- Generalize from the category to specific exemplars, & vice versa
 - Unfamiliar bird → assume it flies, builds nests in trees, lays eggs, has feathers rather than fur, etc.
 - Unfamiliar animal, resembles cat → infer it is predator, has claws & teeth, can climb trees, gives birth to live young

