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Psych 355: Introduction to Cognitive Psychology  
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**Chapter 9: Knowledge**  
**Chapter 10: Visual Imagery**

**Ch 9: Knowledge**
1. What is the definitional theory of categorization? What kinds of psychological evidence are hard to explain in terms of a definitional approach to categorization?

2. According to the prototype theory, how do we categorize objects?
   * E.g., I see an animal in the woods. How do I decide that it is a deer? (As opposed to a large dog, a human, or a tree branch with a funny shape?)
   * E.g., I meet a man who I have not met before. How do I decide whether he is friendly or unfriendly? I.e., how do I decide whether to categorize this man as “friendly” or as ”unfriendly”?
   * Give some examples of typicality effects in categorization research. How does prototype theory explain typicality effects in categorization?

3. Contrast the prototype theory of categorization and the exemplar theory of categorization?
   * What is the main theoretical difference between these two approaches to categorization?
   * How do these theories explain typicality effects in semantic memory? (This issue was not emphasized in Psych 355. You will not be asked to contrast the explanations of typicality effects in prototype and exemplar theories, but you should know what is a typicality effect.)
   * As a matter of fact, it has been very difficult to discover empirical results that can be explained by prototype theory and not by exemplar theory, or vice versa. There is some evidence from correlated features that is easier to explain in terms of exemplar theory, but this evidence was not discussed in Psych 355. As far as you are concerned, you can think of the prototype and exemplar approaches to categorization as two approaches that are both consistent with the psychological evidence as of today.
   * I typically do not discuss the exemplar theory because of lack of time. From the standpoint of what you are responsible for, you will be responsible primarily for the prototype approach, what it says is happening when people categorize objects, e.g., decide that a furry animal is a “cat,” and how it explains typicality effects and priming effects. As for the exemplar approach, you only need to know that (a) it claims that we store particular exemplars of a category in memory, not a prototype, and (b) that the exemplar theory is a legitimate competitor to prototype theory. You do not need to know the pros and cons of prototype theory versus exemplar theory.

4. What are some behavioral differences between people's responses to prototypical objects and non-prototypical objects? In other words, what kinds of experimental evidence shows that people responds differently to prototypical and non-prototypical objects? Hint: Look at Table 9.1, p. 252, but only after you try to answer this question without looking at this table.

5. Category names prime prototypical objects more than non-prototypical objects. What does this mean?
   * Think of the experiment where you hear the word “green” and then you have to decide whether two colored patches are the same or different colors. If the two patches are the same, very good example of green, you will be faster to say “same” than if they are the same, mediocre example of green.

6. Eleanor Rosch hypothesized that there is a basic level in categorization. What is the basic level in categorization?

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1 The textbook calls this the "definitional approach to categorization."
* How does a basic level categorization, e.g., CHAIR, differ from a subordinate level categorization, e.g., KITCHEN CHAIR, in terms of the amount of information that is contained in the knowledge of this categorization?

* How does a basic level categorization, e.g., CHAIR, differ from a superordinate level categorization, e.g., FURNITURE, in terms of the amount of information that is contained in the knowledge of this categorization?

* Is the basic level in a given domain the same for everyone? For example, is the basic level for different types of birds the same for bird experts and the ordinary non-bird expert?

7. I do not require that you know the details of semantic network models (pp. 256 - 264) except for the material that was presented in lecture 08-3. Specifically, you should know that ....

* ... psychologists attempt to explain phenomena like sentence verification times ("a robin is a bird" or "a robin has a heart") in terms of the relationships between concepts in a semantic network;

* ... one important hypothesis is that associations between concepts are retrieved through a process of spreading activation in a semantic network (p. 258); psychologists attempt use the concept of spreading activation to explain the results of response time and priming studies.

* you should know how priming in the lexical decision task can be used to investigate semantic relationships between concepts (p. 259).

8. Skip the discussion of connectionist models (pp. 260 - 264).

9. The semantic-category approach to neural category representation (pp. 264 - 266) proposes that there are specific combinations of neural circuits that are important for particular types of categorizations, e.g., neural circuits that are active during face recognition or neural circuits that are active during recognition of tools like hammers or screwdrivers. This idea is similar to the main idea of the multifactor approach (pp. 266 - 267) that attempts to identify the types of attributes that are highly relevant or largely irrelevant to categorizations of particular types of objects, e.g., animals or musical instruments. Is it reasonable to propose that the semantic-category approach and the multifactor approach are simply the neuropsychological and behavioral aspects of a single approach to category representations?

10. It has been suggested that some concepts, e.g., the concept of a hammer, may include multimodal representations, e.g., perceptual knowledge of what a hammer looks like, motoric knowledge of the muscle patterns that are involved in hitting nails with a hammer, and more abstract knowledge of how a hammer is used in carpentry. What kinds of evidence would support the hypothesis of multimodal representations?

11. The hub and spoke model

* What is semantic dementia? How does the hub and spoke model explain the difference between semantic dementia and more specific categorization deficits like difficulty at naming living things or difficulty at naming artifacts?

* The anterior temporal lobe (ATL) is the "hub" and the parietal cortex contains the "spokes" in the hub and spoke model. What is the difference between the effects of transcranial magnetic stimulation (TMS) on the ATL and the parietal cortex when subjects are asked to categorize living things and artifacts?

**Ch 10: Visual Imagery**

1. Zenon Pylyshyn advocated the view that mental images are epiphenomenal, i.e., mental imagery plays no functional role in human performance of cognitive activities. In lecture and in your book, we presented a lot of evidence against this view. Briefly state why the findings in each of the following experiments are hard to explain if our cognitive theory assumes that mental imagery does NOT play a functional role in performing the experimental tasks.

* Mental rotation experiments.

* Brooks' experiment where people had to mentally scan an image or a sentence and respond by pointing or by verbalizing.

* fMRI studies of people looking at or imagining places or faces.
* Kosslyn's study of image scanning ("Remember the image of an island; imagine a red dot next to the mountain; now move the red dot to the beach").
* Zooming in and zooming out ("Imagine a rabbit next to an elephant. Does the rabbit have whiskers?" or "Imagine a rabbit next to a house fly. Does the rabbit have whiskers?")
* Farah's study that suggested that imagining a letter can prime the identification of that same letter in a sequence of slides.
* Kosslyn's found that TMS disrupted both perception and imagery when people were asked to perform similar tasks with visual displays or mental images of visual displays.
* Patients with unilateral neglect (hemispatial neglect) exhibit neglect for the left side of actual perception and also for remembered mental images of scenes. (This happens usually, but not always.)

Can you describe the studies that are listed above, what they found, and how the results are interpreted?

2. The neuropsychological evidence suggests that perception and mental images of the same scene produce similar, but not identical brain activity. Describe some of the evidence to support this claim.
   * Martha Farah showed that mental images can prime perceptual processing. Describe the experiment and results that support this hypothesis. (See p. 284).
   * Do fMRI studies show activity in similar brain areas when viewing a stimulus or imagining the stimulus?

3. Although brain injuries typically have similar consequences for perception and imagery, there are cases where perception is better than imagery or vice versa. (See pp. 287(bottom) - 290(top) and lecture 8-4). How do you explain cases where a person with a brain injury has trouble perceiving objects but no difficulty creating a mental image of the object, or vice versa?

4. Transcranial magnetic stimulation (TMS) differs from fMRI insofar as TMS can be used to study whether brain activity in a particular location plays a causal role in a cognitive task (like shape discrimination). Usually, fMRI can only tell us that brain activity in some location correlates with performance on a task - such a finding may help us to guess the causal role of brain activity in this location, but it is less conclusive about the causal role of this activity.
   * Briefly explain why TMS lets us infer the causal role of brain activity in a specific location whereas fMRI only informs us as to correlations between brain activity and performance on cognitive tasks.
   * What kind of study can you do with TMS that you cannot do with fMRI?

5. Overall, would you say that empirical studies have supported or failed to support the hypothesis that perception and mental imagery are based on similar, although not perfectly identical, neural activity? Give two examples of empirical findings that are relevant to this question.