

## 9.65 April 12-14, 2004 HANDOUT

### Mental Codes: Pictures, Words, and Thoughts

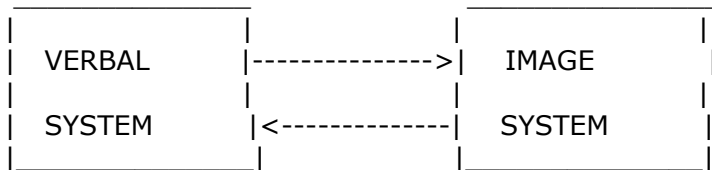
Outline:

- I. Theories about codes:
  - A. dual coding theory
  - B. conceptual coding
- II. A test: naming and categorizing pictures and words
- III. Some further issues and experiments
- IV. Conclusions

#### I. Theories about codes.

What are the roles of different mental codes in thought, and how many such codes are there? Earlier, we talked about concepts and how they are represented: images, definitions (necessary and sufficient conditions), prototypes, exemplars. Last week, I talked about mental imagery as a possible mental code, and some findings that link vision and visual imagery in the brain. Today and Wednesday, two theories about the nature and architecture of mental codes, and how experimental evidence can distinguish between them.

**A. Dual coding theory.** PAIVIO: two codes in thinking: IMAGERY (visualization), and LANGUAGE (the VERBAL CODE). (Note discussion of Paivio's ideas in Reisberg, pp. 362-365, which you've already read.)



#### Verbal code:

1. based on **associations** formed between words via reading, talking, listening. So, is especially effective for representing temporal or spatial **sequences**: serial information.

2. can represent **abstractions**

## **Imagery code:**

1. Sensory experiences
2. Concrete, IMAGEABLE objects and events

-Dual coding for concrete objects  
-associative link between image and name

How to test?

-written words and pictures of objects: hypothesized that a word enters the verbal system directly, a picture enters the imagery system directly and the verbal system only indirectly, by the name-association link.

Evidence:

(1) Takes longer to NAME a picture than to name (aloud) a written word (old finding)

(2) In long-term memory, pictures are recalled better than words. (TWO CODES). IMAGING helps recall of words--but only for concrete words that HAVE images. So, concrete words are remembered better than abstract words.

(3) Model is consistent with known hemispheric specialization: the L hemisphere is specialized for language, the R hemisphere for perceiving visual patterns such as faces.

Problems:

-simple associations don't have the power to account for our ability to use language

-is a more abstract code needed?

-something for a natural language to be mapped onto. Why do we need that?

a. Natural language is **ambiguous**, but thoughts are NOT (although they may be vague)

b. Natural language permits **synonymy**: but thoughts don't

c. Second language

d. Children and other animals

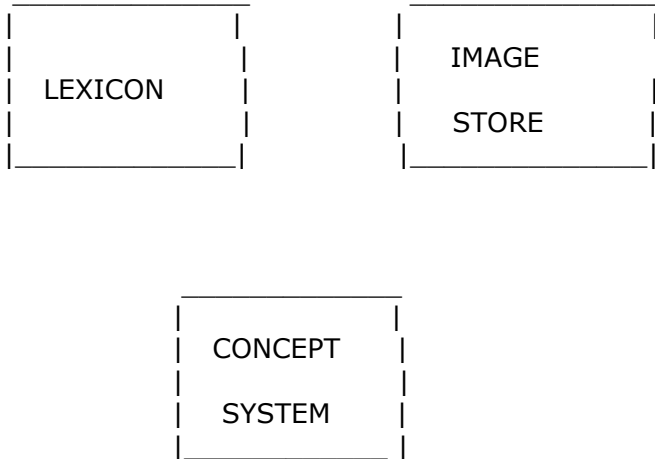
There seems to need to be an abstract representational system:

(a) natural language has to map onto something, to account for the AMBIGUITY of language but the unambiguity of thought--to account for SYNONYMY--and to allow DIFFERENT LANGUAGES to map onto one thought system--and to have a medium in which to form the thoughts which you then express (although this isn't by itself compelling, because there has to be SOME initial rep. system, or you'd have an infinite regress).

(b) CHILDREN and ANIMALS can evidently think without knowing language.

These are logical arguments, not empirical demonstrations, and many consider that there may be some clever way to get word-nodes to do the necessary mental work, as in Paivio's dual-coding theory.

**B. Conceptual coding theory** : Potter & Faulconer, 1975; Potter, 1979.



The third code represents IDEAS (CONCEPTS) without necessarily clothing them in WORDS or IMAGES: the Language of Thought (Fodor) or mentalese (Fodor, Bever, & Garrett): it represents concepts or ideas.

Explaining the data:

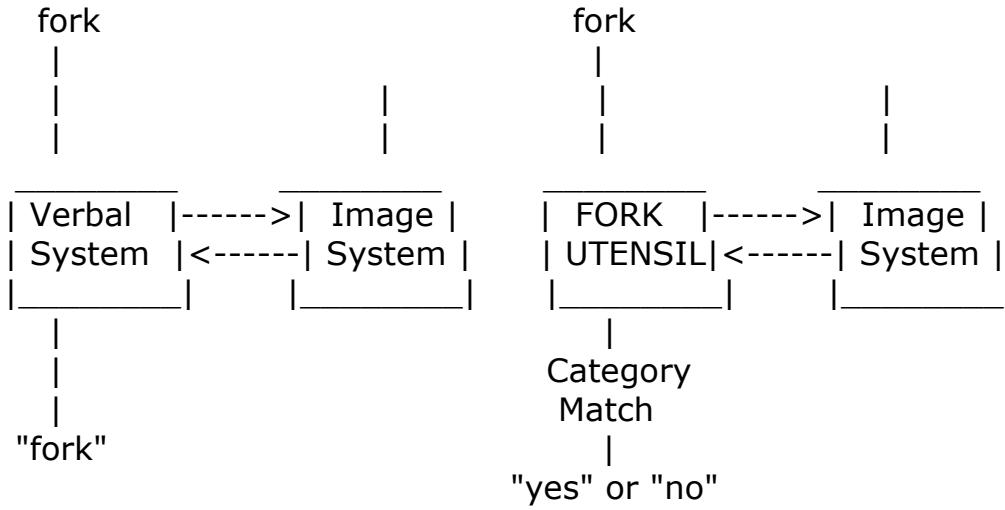
(1) NAMING pictures and words

(2) Memory advantage for pictures/imaging/concrete (not abstract) words

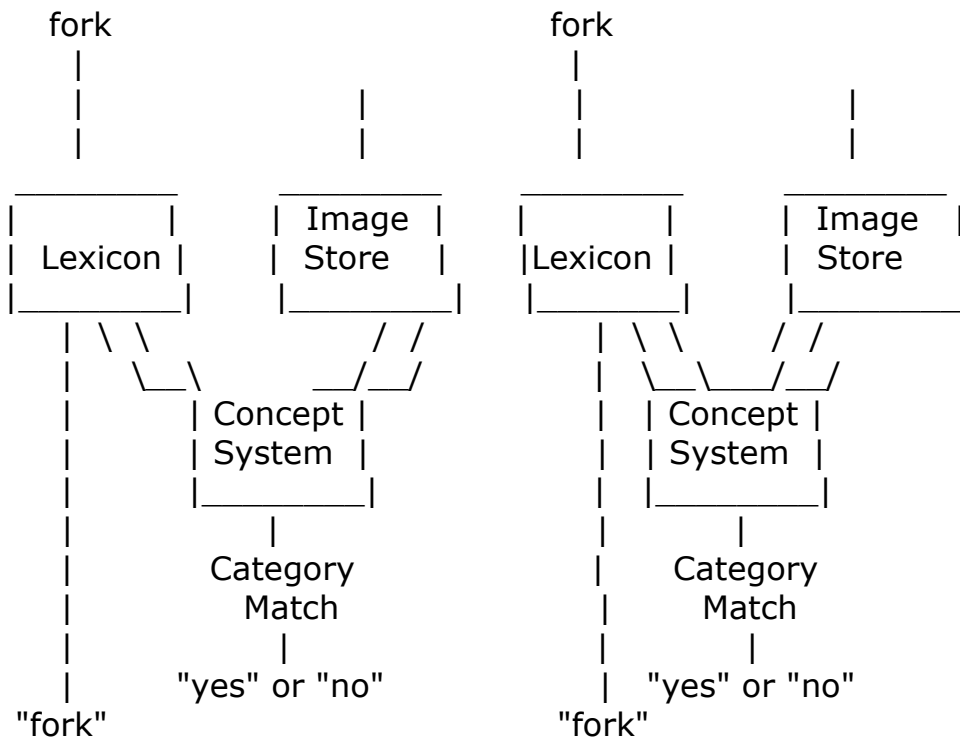
(3) Hemispheric specialization

BOTH MODELS CAN EXPLAIN THE RESULTS

DUAL CODING MODEL



CONCEPTUAL CODING MODEL



## **II. A test: Naming and categorizing pictures and words.**

Predictions from the two models:

DEMONSTRATION: Naming versus categorizing pictures and words.

RESULTS

DEMO: Name the category of a picture, word.

Possible problems with these experiments and the argument:

## **III. Further issues and experiments.**

**a.** How to get an advantage for words rather than pictures:

Sentence plus picture or word probe: Potter, Valian, & Faulconer (1987).

**b.** Probing a scene with line drawings versus words: Potter & Elliot.

**c.** Size, value judgments:

**d.** Bilinguals and the mental lexicon: Potter, So, Von Eckardt, & Feldman (1984).

**e.** Brain imaging study:

Vandenberghe, R. Price, C., Wise, R., Josephs, O., & Frackowiak, R.S. J. (1996). Functional anatomy of a common semantic system for words and pictures. *Nature*, 383, 254-256. PLUS Commentary by A. Caramazza, "Pictures, words and the brain" in the same issue, pp. 216-217. (NOTE: you don't have to read this article!)

#### **IV. Conclusions: Mental codes**

1. Most of our general knowledge is represented in an abstract (conceptual) form, not tied to a particular sense or a particular (natural) language. We use this conceptual system in looking around, thinking, conversing.

2. Special-purpose memories of surface form: E.g., imagery is like perception.

3. The **surface** representations are what we are introspectively aware of. "Blackboard" or "playback" device in thought?