

Agenda

I. Semantic Memory

- Nature of semantic memory
- Nature of categorization

II. Organization of semantic knowledge

- Agnosias and semantic dementia
- Category-specific deficits

III. Semantic Retrieval

Semantic Memory

...the “mental thesaurus, organized knowledge a person possesses about words and other verbal symbols, their meaning and referents, about relations among them, and about rules, formulas, and algorithms” for manipulating them.

– Tulving, 1972

Semantic Memory

Semantic memory of an item constitutes multiple features and attributes

- form
- color
- visual motion
- function
- motor movements associated with object use

Concepts/Categories: Classical Theory

Rule-based categorization

- represented as some combination of defining features
- categorization: determine if item fits category’s rules

Problems for Rule-based Categorization

Critical/defining features don’t exist for natural categories

- e.g., “able to fly” doesn’t fit all birds
- instances vary in judged “goodness of fit” to a category

Categorization: Prototype Similarity

Prototype similarity

- assess similarity between item and a category’s prototype
 - prototype: representation of the category’s central tendencies
 - prototype is separately represented within memory

Categorization: Prototype Similarity

Prototype similarity

- e.g., Posner & Keele (1968) random dot pattern task

- study exemplars (“old” items) only
- trained to classify patterns into categories

Categorization: Prototype Similarity

Random dot pattern data

Categorization: Prototype Similarity

Random dot pattern data

Categorization: Exemplar Similarity

- similarity of item to other *exemplars* associated w/ category

Perceptual Categorization & MTL

(Knowlton & Squire, 1993)

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Visual Agnosia

Failure to recognize objects by sight

- no low-level visual impairment

Visual Agnosia

Perceptual or knowledge deficit?

- unusual views test (Warrington & Taylor, 1973)

Visual Agnosia

Matching to Function Test (Warrington & Taylor, 1978)

- first, decide if two objects are same or different
 - one usual view and one in unusual view
 - RH posterior lesion group impaired

Object Priming: A Window onto Representation

Exemplar Specificity of Object Priming

Object Priming: Behavioral Effects

Neural Correlates of Object Identity Priming

Right Fusiform Cortex

Left Fusiform Cortex

Perceptual or Lexical/Semantic?

Fusiform Sensitivity to Exemplar Specificity

Semantic Dementia

- Temporal variant of Frontotemporal dementia
- Progressive atrophy of one or both temporal lobes

Semantic Dementia: Impaired Picture Naming

Semantic Dementia:
Impaired Word–Picture Naming

Semantic Dementia:
Impaired on Pyramids and Palms Test

Semantic Dementia

Category-specific Semantic Deficits
(Warrington & Shallice, 1984)

–production & comprehension deficits following left temporal damage

Category-specific Semantic Deficits

Are Living Things more difficult?

- Perhaps lower frequency items or more perceptually similar?

Category-specific Semantic Deficits

Visual/Functional hypothesis

(Warrington & Shallice. 1984; Farah & McClelland. 1991)

Category-specific Semantic Deficits

Visual/Functional hypothesis (Farah & McClelland, 1991)

Organization of Semantic Knowledge

Sensory/Motor hypothesis (Martin et al.)

Lexical Mediation btwn Semantics & Phonology

Neural Bases of Lexical Retrieval

(Damasio et al., 1996)

Specific to Lexical Knowledge

Semantic or Lexical Deficit?

Scoring criteria:

- lexical retrieval failure
- evidence of semantic knowledge intact
 - SKUNK: “Some kind of animal; I don’t know what...just an animal”
 - not included in naming score

- SKUNK: “Oh, that animal makes a terrible smell if you get too close to it; it is black and white, and gets squashed on the road by cars sometimes”
 - included in naming score

Caveat: “cannot claim that the subjects’ concept retrieval was as normal as in the premorbid state”

Neural Bases of Lexical Retrieval

(Damasio et al., 1996)

Lexical Mediation is Categorically Organized (Damasio et al., 1996)

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I. Conceptual/Categorical Representation

- Nature of categorization
- Neural bases of semantic knowledge

II. Organization of semantic knowledge

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III. Semantic Retrieval

- Automatic and controlled retrieval
- Neural substrates of semantic retrieval

Automatic Semantic Retrieval

Interpreting Semantic Priming:

Semantic Overlap

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Multiple Routes to Semantic Retrieval

Automatic and Controlled Retrieval

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Left Ventrolateral PFC & Semantic Retrieval

PFC and Mnemonic Control

Experimental Design

Semantic Retrieval: Behavioral Performance

Left PFC:

Sensitive to Semantic Retrieval Demands

Left PFC:

Sensitive to Controlled Retrieval Demands

PFC Sensitivity to Factors that Modulate Controlled Retrieval?

Effects of Prior Experience

Left Ventrolateral PFC and Semantic Retrieval