Disorders of Lexical Processing and the Lexicon

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Chapter 58
The Cognitive Neurosciences
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October 26, 2001
Overview

• Definitions
• The independent representation of meaning and form
  – Spared knowledge of meaning
  – Spared knowledge of form
• Relationship between orthographic and phonological forms
• Category-specific deficits
  – Content categories
  – Grammatical categories
• Conclusions & open issues
Definitions (or lack thereof): What is a word?

Latin *verbum*, Greek *eirein* to say, speak, Hittite *weriya-* to call, name

- a speech sound or series of speech sounds that symbolizes a meaning without being divisible into smaller units capable of independent use
- a written or printed character or combination of characters representing a spoken word. [from the Merriam-Webster Dictionary]

Note:

1) *word* is defined with respect to physical form (a series of sounds, a sequence of characters)

2) The historical root of *word* is in *speaking* and *naming*

3) Only verbalizations that can be used in a sentence are “words”. 🎤 *ah!* and *tchah!* are not “words”
Form versus content

- Sensory form of a word:
  - a sequence of sounds (a phonological form)
  - a sequence of visual marks (orthographic form)

- Grammatical form of a word:
  - Noun, verb, adjective, etc
  - Issues: nouns can become verbs (I carded him).
    verbs can become nouns (the movie was a hit!)

- Content or semantics of a word
  - The meaning or internal image invoked by a word
  - Issues: overlap between grammatical form and semantics
Lexical Items

• Difference between a “lexical item” and a “word”
  “word” ≡ physical manifestation (sensory form)
  “lexical item” ≡ cognitive correlate of a word

• “Name of a word” ≡ the abstract phonological or orthographic form of a lexical item
  – “the feeling of knowing the meaning of a word, yet not knowing its name” (p.901).
Map of lexical processing: Draft 1

Visual scene → Comprehension → Recognition

Knowledge of Orthographic form
Reading → Writing → Spelling

Knowledge of Phonological form
Speaking → Listening

Define word → Enact scene
Spared knowledge of meaning: EST

[picture of a snowman]
[picture of a stool]

“cold … frozen”
“seat… sit on the ..”
“need some on my head”

(left temporal lobe lesion)
Spared knowledge of meaning: JG

(Damaged left temporo-parietal area)
Spared knowledge of forms: JJ

(Left temporal lobe lesion)
Spared knowledge of forms: DRB

(Left temporal lobe lesion)
Map of lexical processing: Draft 2

- Comprehension
- Recognition

Knowledge of Orthographic form
Knowledge of Phonological form

- Visual scene
- Define word
- Enact scene

- Reading
- Writing
- Spelling
- Speaking
- Listening
Separation of orthographic and phonological forms: HW

[picture of a kangaroo]
[picture of a thumb]

Visual scene

Comprehension
Recognition

Knowledge of Orthographic form

Knowledge of Phonological form

Reading
Writing
Spelling
Speaking

Listening

“you go to the bank …
get more money”

Define word

Enact scene

INTEREST

THUB

K-A-G-O-O

“bank”

(left parietal and occipital damage)
Separability of orthographic and phonological forms: RGB

(left frontoparietal damage)
Separability of orthographic and phonological forms: PW, #1

(Anterior parietal and posterior frontal damage)
Separability of orthographic and phonological forms:

PW, #2
Separability of orthographic and phonological forms: 
PW, #3
Map of lexical processing: Draft 3
Category-specific defects of meaning:

- What is the internal organization of the “comprehension module” (content store)?

- Deficits shown for specific content-categories
  - Abstract words
  - Concrete words
  - Animate objects (most widely reported)
  - Fruits and vegetables
  - Nouns
  - Body parts
  - Geographic names
  - Proper names
  - Colors
Category-specific defects of meaning:
Deficit in defining animates

- **Oral definition: animate nouns**
  - Ostrich: Unusual
  - Snail: An insect animal
  - Wasp: Bird that flies
  - Holly: What you drink

- **Oral definition: inanimate nouns**
  - Tent: Temporary ... living home
  - Briefcase: Small case used ... to carry papers
  - Submarine: Ship that goes underneath the sea
Category-specific deficits of meaning:
Sub-category deficits

- “Selective islands of impairment emerge within the animate or inanimate category”
- JJ and PS exhibit inverse patterns of impairments

? Rules out complexity/familiarity as dimensions of lexical organization?
Knowledge representation in the brain is sensitive to:

1) The basic animate/inanimate distinction

2) Complexity and familiarity of the object
   (animates are more complex and less familiar than inanimates)

3) The functional or sensory prominence of the object
   (animates are defined by visual & sensory features,
    inanimates are defined by their functional properties)

Another alternative:
• Words are always embedded in the context of use (an animate reference co-occurs with other animate references). Hence animates are always clustered together?
Category-specific deficits of meaning:
Larger Issues

To what extent is conceptual knowledge separable from lexically-linked knowledge?
- Do words have a 1-1 relationship with conceptual categories?
- Can there be conceptual categories that have no lexical correlate?
Category-specific defects of meaning:
Issues (contd.)

Option 1
Relatively independent

Option 2
Inseparable
Category-specific deficits of grammatical form: SJD

Form errors only in production of written verbs

There’s a crack in the mirror

Don’t crack the nuts in here
Category-specific deficits of grammatical form: EBA

(Left temporal lobe lesion)
Category-specific deficits of grammatical form: PBS

(Left temporal lobe lesion)
Category-specific deficits of grammatical form

Summary

• Grammatical categories can be independently affected, though deficits seem to affect only one output modality

• Possible conclusion
  – Form stores are organized by grammatical category?

• Suggestion
  – Verb processing difficulty is associated with frontal lobe lesions
  – Noun processing difficulty is associated with temporoparietal lobe lesions

Issue:
  How about ambiguous verbs and nouns?
  How about other grammatical categories?
Map of lexical processing: Speculative Draft 4

- Do orthographic and phonological modules have independent and redundant grammatical organization?
- Do input and output systems with each module access the same representation?
Open Issues

• In phonetic languages, the oral form maps 1-1 onto the spelling. Is the orthographic form – meaning disassociation peculiar to English?

• Do words have a distinct mental status at all? (we don’t automatically assume that sentences and noun phrases have a separate representation).

• Should the mental lexicon be thought of as a dictionary?
  – Is each word connected to a sensory representation?
  – How about abstract words?

• How is lexical knowledge represented in bilinguals (infants learning two languages, adults learning a second language)?
  – Different form and meaning stores for each language?