Multiple Primings of Homograph Meanings: A Transfer Analysis.

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Overview

• Research on lexical ambiguity has traditionally focused on the effect of a single occurrence of an ambiguous word on a single subsequent encounter with that word.

• Since the pioneering work of Onifer and Swinney (1981), theories have similarly focused on the role of local context and the impact of a single processing decision.
Theories Include

- Gernsbacher and St. John’s (2001) model of the role of suppression in lexical access.
- The post-selection inhibition of the non-selected meaning of ambiguous words (Simpson & Kang, 1994).
Non-suppression Theories

• Effects of global and local context, the constraint-satisfaction model of Duffy, Kambe, and Rayner (2001).

• The activation-selection model of Gorfein, quantified by Brown (Gorfein, Brown, & DeBiasi, 2007).
Activation-Selection Model
Gorfein & Bubka (1989); Gorfein (2001); Gorfein, Brown, & DeBiasi (2007)

Words are represented by a weighted set of attributes.

For modeling purposes “attributes” are just abstract features, but presumably they constitute the visual, phonological, and semantic aspects of a word’s representation.

Dominant Attributes
seal (animal)

Secondary Attributes
seal (shut)
Activation-Selection Model
Gorfein & Bubka (1989); Gorfein (2001); Gorfein, Brown, & DeBiasi (2007)

Processing a word “activates” a subset of attributes. Attributes are activated in proportion to their current weight (baseline weights for dominant-meaning attributes are higher than baseline weights for secondary-meaning attributes).

The number of attributes activated is determined by task constraints, such as the type of response required and the processing time available.
Ambiguous words are represented by attributes associated with both dominant and secondary meanings.

In a neutral context, attributes are activated in proportion to their baseline weights.

The weights of attributes that contribute to meaning selection in the current context are increased.

Reweighted Dominant Attributes
Secondary Attributes Not Reweighted
The meaning of a word is assigned based on the majority of its active attributes.

Activation of an attribute decays over time to a resting level. That is, “activation” is a relatively short-term property of an attribute.
Activation-Selection Model
Gorfein & Bubka (1989); Gorfein (2001); Gorfein, Brown, & DeBiasi (2007)

Each time a meaning is selected, the weights of active attributes associated with that meaning are increased.

Incrementing the weight of an attribute has the effect of increasing the likelihood the attribute will be activated on subsequent encounters with the word.

Thus, the weights are a long-term (but not permanent) property of an attribute.
Model: Hypotheses

• 1. Multiple primings of the same meaning will lead to larger changes than a single prime.

• 2. Effect will transfer across tasks.
Experiment

• Phase 1: Sentence Sensibility task employing 32 Balanced and 32 Unbalanced Homographs. Zero to 3 occurrences, primed in the secondary direction.

• Phase 2: Word Association to either Balanced or Unbalanced homographs.

• Phase 3: Items not tested in phase 2. Sentence Sensibility or Relatedness Decision for dominant meaning.
Details of Sentence Task

• The 32 homographs of each type were divided into four sets of 8 items each. One set of dominant and one set of secondary items were combined to form a subset.

• Three sentences related to the secondary meaning of each homograph were written taking care not to use any obvious associate of the homograph.

• Each list was conceived as having 3 parts: Part 1 contained one-quarter of the homographs and an equal number of nonsense sentences.
• Part 2 contained a second occurrence of the part 1 homograph in a different sentence, 16 first occurrences of a different subset, and 32 new nonsense sentences.
• Part 3 contained the third occurrence of the part 1 homographs, the second occurrence of the part 2 homographs, and 16 first occurrence homographs as well as 48 nonsense sentences.
• Within each part items were presented in a random order.
• Across participants the subsets for each part were counterbalanced as were the particular sentences.
Effect of Meaning Repetition on Accuracy

Effect of Meaning Repetition on Accuracy

Proportion Correct

Occur 1 Occur 2 Occur 3

Balanced

Unbalanced

Proportion Correct

Effect of Meaning Repetition on Accuracy

Proportion Correct

Occur 1 Occur 2 Occur 3

Balanced

Unbalanced
Effect of Meaning Repetition on RT

RT in msec

Balanced
Unbalanced

Occur 1
Occur 2
Occur 3
Transfer Task: Word Association

• Why word association?:
• 1. Word association is the gold standard for defining homograph balance, i.e. the relative frequency of each meaning of an ambiguous word.
• 2. Word association involves the selection of a meaning outside of a semantic context.
Word Association

For each of the words below print the first word it brings to mind on the line next to. For example, the word dog might make you think of cat and you would then print cat alongside the word dog as in the example below.

99 dog _CAT___________________________

Be sure you print your answers. Do not skip any word and don’t go on to the next word until you have printed your response. All responses must be single English words.

1 stand ______________________________
Word Association: Effect of Prime

Number of Priming Events

0.0 0.1 0.2 0.3 0.4 0.5 0.6

None | One | Two | Three

Balanced | Unbalanced

[Graph showing the effect of prime number of priming events on word association.]
Transfer

• The transfer for both related decision and sentence sensibility judgment is to items in which the homograph is presented in its’ dominant direction.

• To the extent that meaning was altered by the priming task we would expect a cost.
Transfer to Relatedness Decision and Sentence Sensibility Tasks

• For each task we computed z scores for RT.
• For each task we computed z scores for errors.
• Data represent \((Z_{rt}+Z_{errors})/2\)
• All scores are the change from the non-primed baseline condition.
Conclusions

• Multiple priming events alter meaning access despite the relatively miniscule number of exposures compared to a lifetime of language processing.

• Transfer is obtained across temporally separated events and across tasks as well.

• The data appear to be consistent with the Activation-Selection model, although we have not yet tried to fit the data.
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Questions?