Neural Correlates of Indirect Semantic Priming: An ERP Study
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Introduction
- Direct semantic priming (e.g., tiger–stripes) can be explained by both automatic and controlled processes
- Indirect or mediated semantic priming (e.g., lion–tiger–stripes) is best explained by automatic spreading activation theories [3]
- Currently, evidence for an N400 effect in indirect semantic priming is mixed [1,4]

The Present Study
- We systematically varied the associative distance of word pairs and task explicitness across two experiments
- If spreading activation theory is correct, we predict:
  1) Indirect targets will elicit N400s in between those of direct and unrelated targets
  2) Indirect targets will show a significant N400 effect regardless of task explicitness

Methods

Experiment 1 – Relatedness Ratings Task
- 18 participants (9 female, mean age = 19.83 years)
  - Right-handed native speakers of English
  - Normal or corrected-to-normal vision
- Participants were instructed to rate the relatedness of word pairs on a 1-7 scale
  - 210 trials
    - 70 directly related word pairs (tiger–stripes)
    - 70 indirectly related word pairs (lion–stripes)
    - 70 unrelated word pairs (soft-stripes)

Experiment 2 – Semantic Categorization Task
- 15 participants (10 female, mean age = 20.07 years)
  - Right-handed native speakers of English
  - Normal or corrected-to-normal vision
- Participants were instructed to press a button to all food words
  - 241 trials
    - 87 directly related word pairs (tiger–stripes)
    - 87 indirectly related word pairs (lion–stripes)
    - 67 unrelated word pairs (soft-stripes)

Results

Experiment 1 – Relatedness Ratings
- Priming effects
  - A robust N400 effect was found for both direct and indirect targets (Figure 3a)
  - N400s to direct targets were significantly smaller than N400s to indirect or unrelated targets
  - N400s to indirect targets were significantly smaller than N400s to unrelated targets
- Effects of relatedness judgments
  - Higher ratings of relatedness were also associated with significantly smaller N400s (Figure 3b)
- Are priming and ratings effects dissociable?
  - No ratings X priming interaction was found for the N400 time window
  - Participants did not become aware of the three types of semantic relationships or develop strategies accordingly (Figure 3c)

Experiment 2 – Semantic Categorization
- Smaller but still significant N400 effects were found for both direct and indirect targets (Figure 4)
- Direct targets elicited significantly smaller N400s than direct and unrelated targets
- Indirect targets elicited significantly smaller N400s than unrelated targets

Discussion

- A reliable N400 effect was found for indirectly related word pairs
- As predicted, this N400 was halfway between that of direct and unrelated targets, even when participants were asked to make relatedness judgments
- Although more robust in an explicit task, this N400 effect was still significant in a task that biased toward more automatic processing
- Taken together, these results provide further evidence for automatic spreading activation theories
- However, N400 amplitude was also modulated by participants’ relatedness judgments, confirming that the N400 component is also sensitive to controlled or strategic processing, and is not a pure index of automatic processes [2]

References

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