

# Right Hemisphere Role in New Word Acquisition and Possible Individual Differences

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## Introduction

- It has been proposed that the two hemispheres have different styles of coding information (Beeman, 1998).
  - Right hemisphere - coarse coding style.
    - Advantage: Better activation of distant semantic relations.
    - Disadvantage: Poor performance on selection of one, precise response.
  - Left hemisphere - fine coding style.
    - Advantage: Better performance when one, precise response is selected.
    - Disadvantage: Distant semantic relations are not maintained.
- Coarse coding style of the right hemisphere may render it advantageous in processing of new words by helping the establishment of weak semantic connections in the cognitive system.
- It is possible that skilled readers acquire new words in a more effective manner than less-skilled readers. An ERP study found that skilled readers were better able to retain semantic and episodic aspects of the new words (Perfetti, Wlotko, & Hart, 2005).
- Current study utilized divided visual field semantic relatedness judgment to examine whether less-skilled and more skilled readers differed in their left-right hemisphere accuracy and latency advantage in learning new words. The amount of experience with new words was varied (i.e., 2x vs. 8x learning exposure).
- It was predicted that skilled readers would be able to better utilize the processing strengths of each hemisphere.
  - lvf/RH - The RH of skilled readers would perform better than the RH of the less-skilled readers when the amount of experience is minimal (RH coarse coding is most effective when there is minimal experience with words). This will be shown by higher accuracy in the less experience condition by skilled readers compared to less-skilled. As the amount of experience increases, the improvement of accuracy is predicted to be smaller in skilled than less-skilled since skilled readers may already be at RH peak performance even when the amount of experience is less. The RH of the less-skilled readers may benefit more from additional experience; thus, increased experience may help the less-skilled to have larger improvement in accuracy.
  - rvf/LH - Fine coding of the rvl/LH is predicted to benefit more experience words much more than the less experience words. Minimal experience with words may not provide the optimal opportunity for LH fine coding to be effective for both skilled and less-skilled readers. When word experience increases, skilled readers are better able to utilize the fine coding style of the LH, therefore they will have a much bigger accuracy improvement compared to less skilled.
- See Fig. 1 for accuracy predictions for each VF.

## Method

### EXPERIMENTAL STIMULI:

- There were 72 final experimental Lingo. Each Lingo had four definitions:
- Sample: Primary Definition: *VESDEL is a poisonous plant that tickles its victims.*  
Second Definition: *A VESDEL is a poisonous plant that likes to play with its victims.*  
Third Definition: *It is tough to find a plant poison antidote, therefore do not touch a VESDEL*  
Fourth Definition: *A poisonous tickling plant like VESDEL needs to be avoided.*

## Method

### STIMULI PREPARATION:

- Norming determined an English word that most participants found to be related to the new words and meanings.
- 44 participants (23 females).
- The subjects had to type the first word that came to their mind when they saw a primary definition of Lingo.
- Average forward associative strength = 0.256.

### EXPERIMENT PARTICIPANTS:

- 48 right-handed, native speakers of English (24 females).

### TASKS:

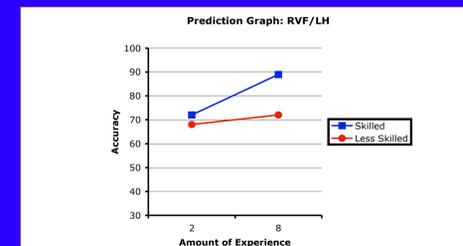
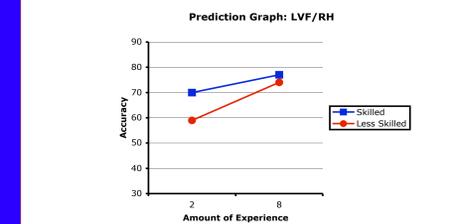
- There were 3 tasks across two days: Encoding, Acquisition, and Semantic Relatedness Judgment.
- Day 1 - Nelson-Denny Reading Test (Vocabulary & Comprehension) Form G (Brown, Fishco, & Hanna, 1993).
- Day 1 & 2 - **Encoding Task.**
  - Central presentation of Lingo and its definition.
    - Half of the Lingo items were presented twice (once per day) with only the primary definition. This constituted the less-experience condition. The other half were presented 8 times (four times/day) with all the four definitions presented. This constituted the more-experience condition.
    - A YES / NO question was presented with each Lingo definition presentation. This was done to promote deeper processing and learning.
- Day 2 - Acquisition Test (2 AFC) - **Assessment of learning.**
  - Presentation of Lingo definition in the form of a question and 2 Lingo items as possible answers.
  - Participants must choose which Lingo correctly referred to the definition.
  - Accuracy range: 68% - 100%.
- Day 2 - **Semantic relatedness judgment test.**
  - Presentation of semantically related central English word and lateralized Lingo (e.g.; IVY - VESDEL).
  - The participant must decide whether the English - Lingo pair was meaningfully related or not.

## Results

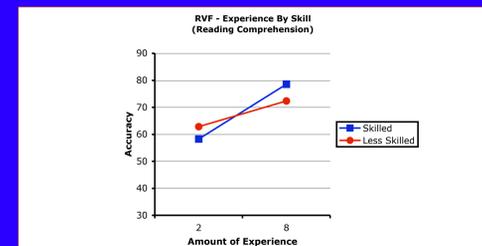
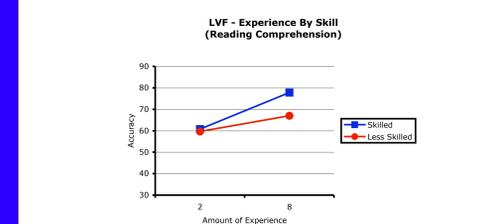
### SKILLED VS. LESS-SKILLED READERS ACCURACY (BASED ON MEDIAN SPLIT OF READING COMPREHENSION SCORES):

- More experience with words significantly improved skilled readers performance more than less-skilled readers ( $p < 0.01$ ).
- lvf/RH - There was a significant interaction between amount of experience with new words and skill ( $p < 0.05$ ). There was no difference between the two skill groups in the less-experience condition. In the more experience condition, skilled readers indeed had significantly better accuracy than less-skilled readers ( $p < 0.01$ ).
- rvf/LH - There was a significant interaction between amount of experience and skill ( $p < 0.05$ ). Less-skilled readers had better accuracy than skilled readers in less-experience condition. Skilled readers had better accuracy than less-skilled readers in more-experience condition. However, these pairwise differences were not statistically significant. See Fig 2 for results in each VF.

## Figure 1-Predictions



## Figure 2-Results



## Conclusions

- More experience with new words enabled skilled readers to improve semantic judgment accuracy to a greater extent than less-skilled readers, similar to Perfetti, Wlotko, and Hart (2005) findings.
- Skill differences were obtained only in lvf/RH with greater amount of experience.
- Skilled readers utilized resources in the right hemisphere to benefit from increased experience with new words.
- Skilled readers' right hemisphere coarse coding may be more effective in helping form necessary connections with semantic network as the new words obtained greater experience. It seemed that a sufficient amount of experience (as opposed to very minimal experience) must be present before right hemisphere coarse coding could form viable semantic connections.
- Amount of experience may have different effects on accuracy in the left hemisphere for people in different skill groups. A follow-up experiment is being conducted to examine this effect.

## References

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- Perfetti, C. A., Wlotko, E. W., & Hart, L. A. (2005). Word learning and individual differences in word learning reflected in event-related potentials. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 31, 1281-1292.

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