

# The “Verbal Stroop Task”: A New Paradigm for Assessing Executive Control in Word Retrieval

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## BACKGROUND

Executive control mechanisms commonly studied in the context of word retrieval:

1. Inhibition of a dominant, prepotent response to comply with task goals (e.g., Stroop Task)
2. Biasing intrinsic competition among candidates for selection (e.g., blocked cyclic naming)

## CURRENT STUDY

Single word retrieval paradigm permitting study of management of both types of control mechanisms in people with aphasia (PWA) and controls

- Evaluate role of type of relatedness (semantic versus phonological) in inducing intrinsic competition
- Permit detection of potential interdependency between the two control mechanisms
- Permit detection of PWA with a selective deficit in either type of control mechanism

## METHODS

### PARTICIPANTS

- N=18 PWA with mild to moderate naming impairment
- N=21 neurotypical controls matched for age, gender and ethnicity

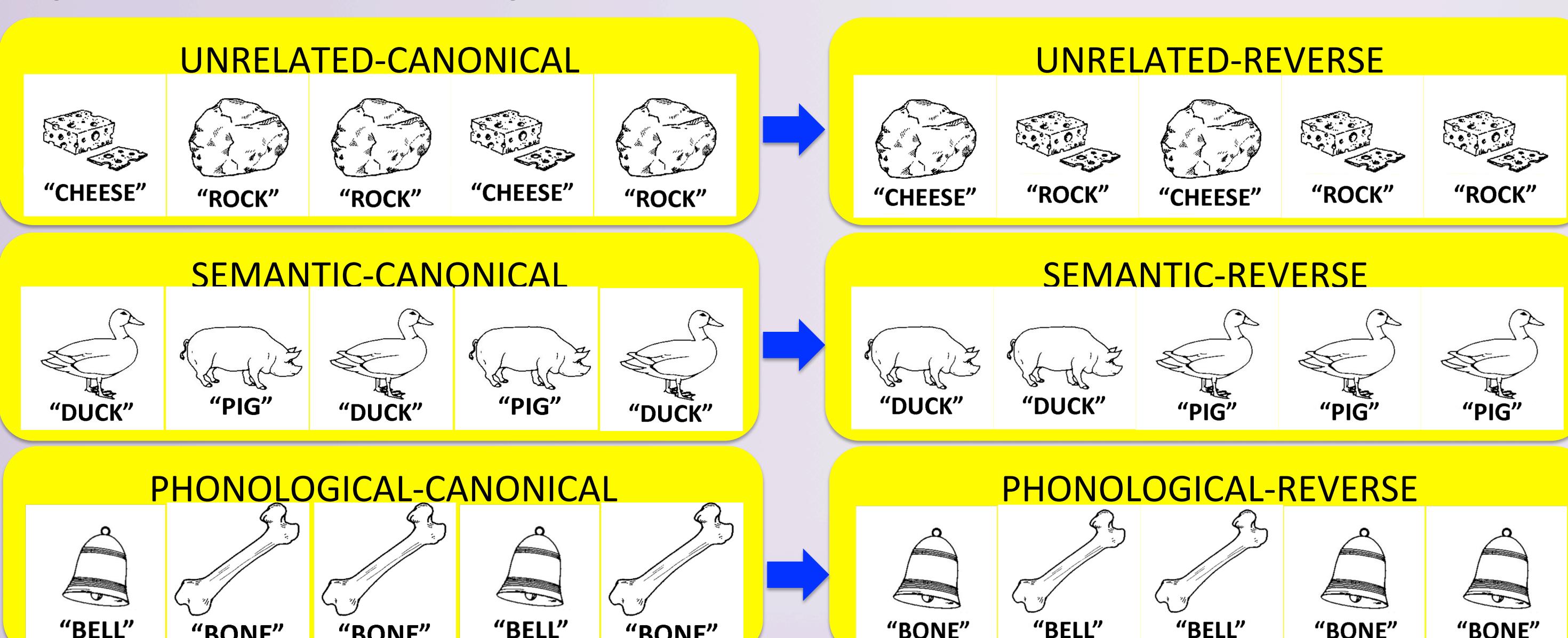
### PROCEDURE (Fig. 1)

- Repeated naming of two objects, presented successively (12 trials of each) in random order
- 6 conditions manipulating *relatedness* and *canonicity* (canonical vs. reverse naming)

### DEPENDENT VARIABLES

- Naming latency (correct trials only); no phonological distortions accepted

Figure 1. Current study design



## PREDICTIONS

- Decrement from semantic relatedness (Analysis 1)
- Facilitation or no effect of phonological relatedness (Analysis 2)<sup>[1]</sup>
- Decrement from non-canonical (reverse) naming (Analyses 1 & 2)
- Potential interactions between relatedness and canonicity

## GROUP EFFECTS ANALYSES

STATISTICAL APPROACH: Mixed model regression

### Analysis 1: Semantic and Unrelated Conditions (Fig. 2A)

Fixed effects:

- Relatedness (collapsing across canonicity)
- Canonicity (collapsing across relatedness)
- Interaction of relatedness and canonicity

### Analysis 2: Phonological and Unrelated Conditions (Fig. 2B)

Fixed effects: Same as above

Figure 2A. Analysis 1: Semantic and Unrelated

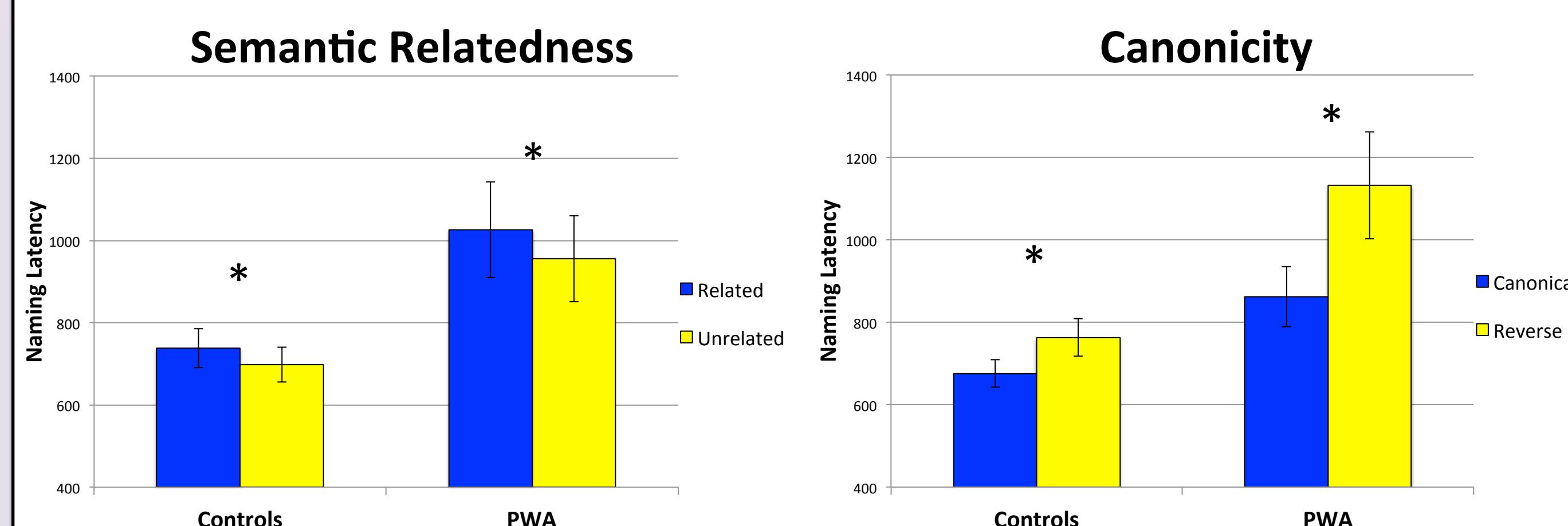
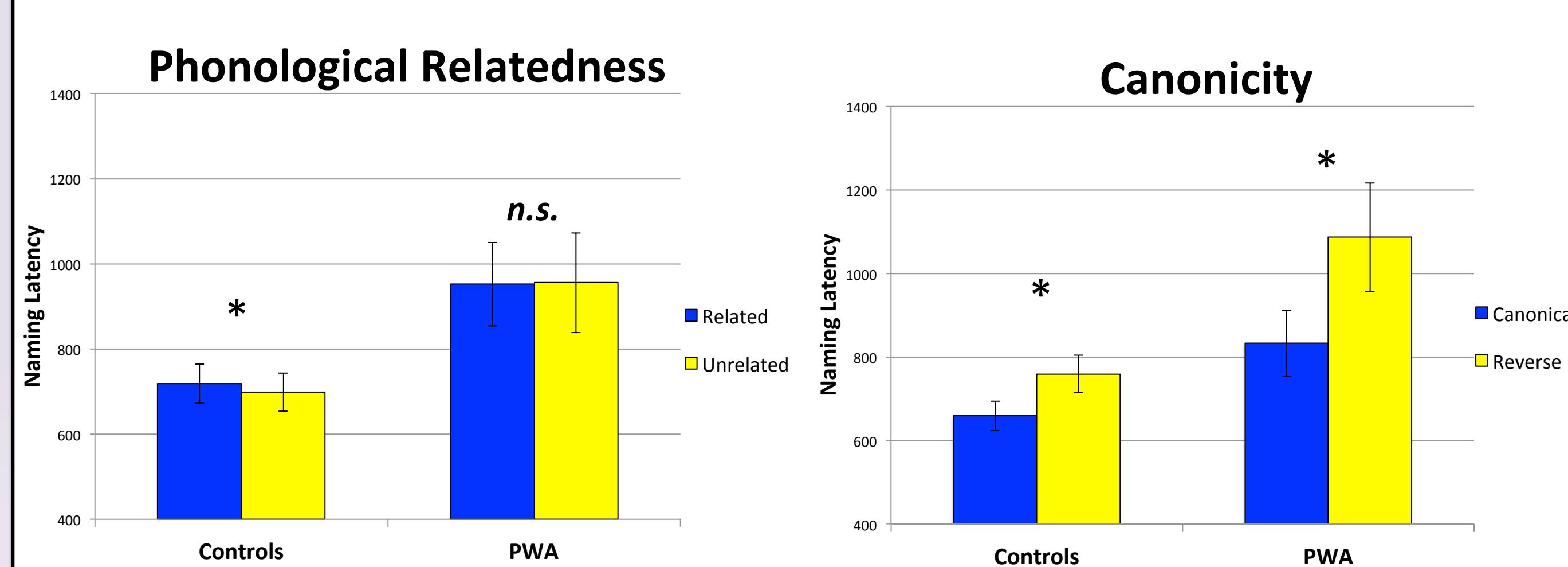


Figure 2B. Analysis 2: Phonological and Unrelated



## INDIVIDUAL DIFFERENCES ANALYSES

STATISTICAL APPROACH: Crawford's T-test for matched controls (based on normalized latencies)

### Analysis 3: Semantic and Unrelated Conditions (Fig. 3A)

Factors:

- Relatedness (collapsing across canonicity)
- Canonicity (collapsing across relatedness)

### Analysis 4: Phonological and Unrelated Conditions (Fig. 3B)

Figure 3A. Analysis 3: Semantic and Unrelated

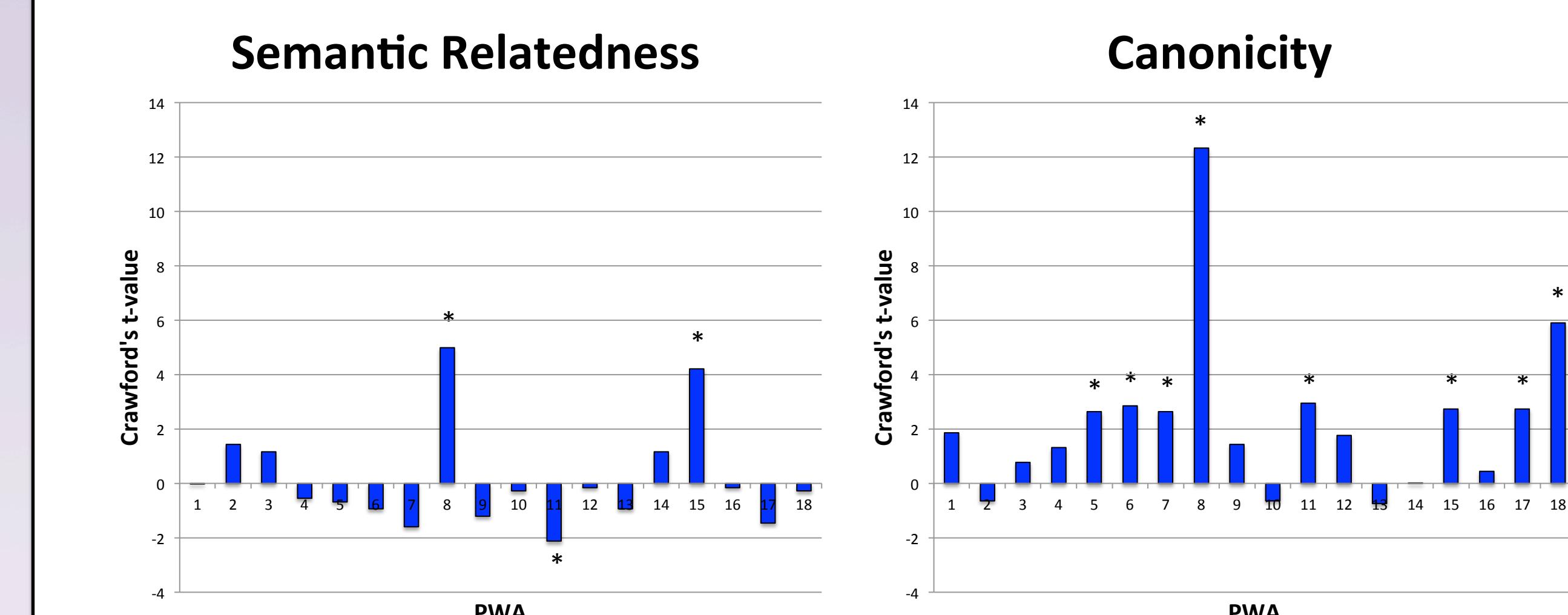
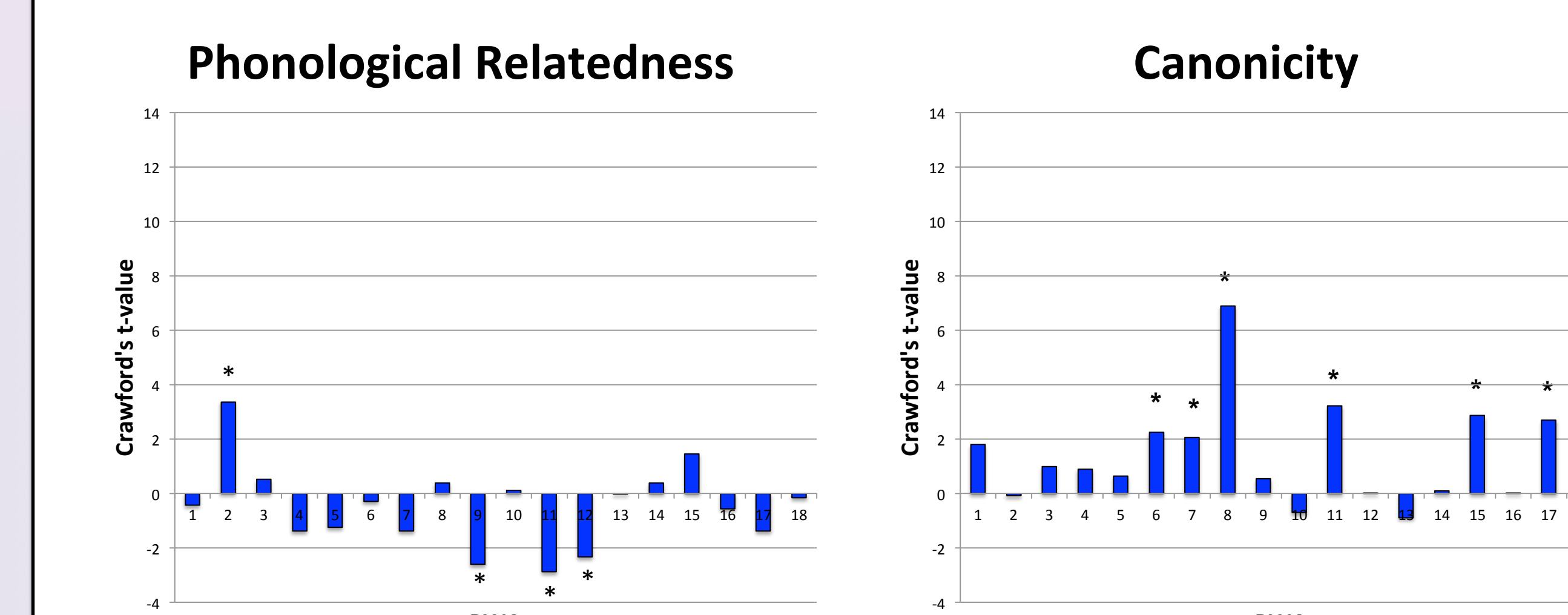


Figure 3B. Analysis 4: Phonological and Unrelated



T-scores significantly higher or lower than controls ( $p<0.05$ ) marked by (\*)

## DISCUSSION

- Controls show expected interference patterns
  - Shorter latencies for canonical (vs. reverse) naming
  - Longer latencies for semantically related (vs. unrelated) pairs and, unexpectedly, longer latencies for phonologically related (vs. unrelated) pairs.
- PWA show canonicity and relatedness effects (semantic condition only)
- No interactions – No support for inter-dependency
- Controls provide an index of interference patterns when control mechanisms are functioning normally
- PWA exhibiting exaggerated interference, relative to controls, presumed to have control deficits. Search for behavioral and anatomical correlates is ongoing.

## CONCLUSION

The Verbal Stroop task is useful for identifying exaggerated interference patterns indicative of faulty control of *intrinsic semantic competition* and/or *prepotent response competition* in the context of word retrieval.

### References

- [1] Hodgson, C., Schwartz, M. F., Schnur, T. T., & Brecher, A. (2005). Facilitation and interference in phonological blocked-cyclic naming. *Brain and Language*, 95, 46-47.

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