

Susceptibility to similarity-based interference influences judgments of long-distance dependencies

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The single resource view of working memory (WM) [1] has recently been challenged by content addressable models [2,3] that make use of similarity-based interference. This research indicates that groups of subjects that differ in susceptibility to similarity-based interference judge long-distance dependencies differently. Early sentence-processing research attempting to explain phenomena pertaining to long distance filler-gap dependencies (namely islands) adopted the single resource WM model [4]. Recently, this view of islands has been challenged by the lack of co-variation of the acceptability judgments of island effects with individual measures of WM [5]. The current research uses this methodology of co-variation of individual differences with acceptability scores to demonstrate that: 1) cognitive scores co-vary with the judgments of long-distance filler-gap dependencies but not the judgments of island-violation sentences. 2) The measure that these data co-vary with is susceptibility to phonological/orthographical similarity-based interference. And 3) High-scoring individuals do not 'perform' better than low-scoring individuals on difficult to process sentences, but rather the low-scoring individuals 'perform' worse on the easy to process sentences. This mirrors results reported in ERP studies [6,7,8].

Experiment: 81 subjects who rated 32 *wh*-questions for acceptability on a 7-point scale were scored on four cognitive tasks: Flanker attention, verbal span, N-back and recall-interference (with both phonological and semantic lures). Experimental items crossed clause type with extraction distance (see examples below). High and low scoring groups were formed for each cognitive measure by median split. An ANOVA revealed an influence *only* of phonological recall-interference scores ($p = 0.002$) on the acceptability judgment data. The high phonological recall-interference group rated the difference between extraction distance conditions greater (short extraction = 5.10, long distance extraction = 3.12) than the low group (short extraction = 4.23, long distance extraction = 3.06) regardless of whether the dependency crosses an island or not.

The results presented here indicate the importance of individual cognitive differences to the judgments of sentences containing long-distance dependencies, although those differences do not co-vary with the island phenomena as expected in [4]'s account. Additionally, the data lends credence to claims that WM is better conceived as due to attentional constraints on memory processes [2,3] rather than a capacity constraint [1,4].

Further, similarity-based interference occurs over a potentially large variety lexical features [2,3]. That it was susceptibility to the phonological/orthographic (*grass~glass*), and not semantic (*jaguar~panther*) lures in the recall interference task represent an early step in narrowing these possibilities. Finally, the pattern of results presented here fits those reported in a number of ERP experiments [6,7,8] where the high and low-scoring groups perform equally on the difficult conditions, but the low-scoring groups have more difficulty in the easier conditions. This recurring pattern, now reported in two different methodologies should shape the expectations of researchers using co-variation with individual differences, and may represent some upper-bound in the ability of the parser.

Sample Materials

(1) Short-distance dependency {non-island/island}: **Who** had _ on Tuesday {assumed that/inquired whether} the decorator annoyed the carpenter when the deadline was missed?

(2) Long-distance dependency {non-island/island}: **Who** had the carpenter {assumed that/inquired whether} the decorator annoyed _ on Tuesday when the deadline was missed?

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