



FURTHER EVIDENCE FOR A POST-SELECTION INHIBITORY MECHANISM IN LEXICAL RETRIEVAL

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INTRODUCTION

Several studies have reported aphasic patients with preserved processing of individual items, but who have difficulty when items are presented in semantically related contexts (e.g., blocked cyclic naming). Some researchers have attributed this to disruptions in semantic retrieval (e.g., Warrington & McCarthy, 1983), whereas others have argued for a deficit in selecting from active lexical competitors (Schnur et al., 2006). One patient, ML, shows evidence of a deficit in inhibiting irrelevant verbal information (Hamilton & Martin, 2005), which we have hypothesized to be the source of his exaggerated semantic blocking effect in picture naming.

In the present study, we aimed to provide further evidence that ML does not have a semantic disruption that could underlie his semantic blocking effect and investigated whether he has difficulty when several lexical representations are concurrently activated but not repeatedly retrieved. We compared his performance to BQ, another patient with an exaggerated semantic blocking effect, and to KV, who shows a normal semantic blocking effect.

EXPERIMENT 1

Category Fluency

The category fluency task presumably taps similar retrieval and selection processes as semantically blocked naming. Mayr and Kliegl (2000) argued that by calculating a regression equation predicting inter-item response interval from response number, the intercept measures abilities involved in semantic search (i.e., locating the appropriate category) and the slope measures the retrieval process:

$$\text{Inter-item response} = \text{slope} * \text{response number} + \text{constant}$$

If ML has no semantic disruption, then we expected an intercept within the normal range, but an above-normal slope and a reduced number of items retrieved, due to difficulty inhibiting previous responses.

Methods

Subjects were given a category name (13 categories in total) and asked to generate as many category members as possible within one minute.

Results

ML had an intercept value below the mean for controls, indicating fast access to the category, but a slope more than three times the mean for controls, indicating long inter-item retrieval times. BQ had substantially higher intercept and slope values than controls, indicating difficulty in both semantic search and retrieval. KV showed intercept and slope values similar to the controls.

	ML	BQ	KV	Controls (medians)	(range)
Items Retrieved	8.92	4.92	9.00	15	(9.67 to 20.33)
Slope	1.14	1.98	0.36	0.21	(-0.09 to 0.46)
Intercept	0.62	5.05	1.64	1.48	(0.44 to 2.15)

EXPERIMENT 2

Sentence Completion

Robinson et al. (2005) reported a left frontal patient CH, who had great difficulty providing completions for low-constraint sentences compared to high-constraint sentences. They argued that his difficulty arose from having to select from several simultaneously activated lexical responses. We expected ML would have little difficulty on this task, since it does not require repeated retrieval from a single category.

Methods

Three kinds of sentences were created, varied on lexical and semantic constraint:

lexical high/semantic high ("The pilot landed the ____")
lexical low/semantic high ("The repairman fixed the ____")
lexical low/semantic low ("The senator defended the ____")

Lexical constraint was determined by proportion of responses provided for the most common response, being either high (>0.70) or low (<0.70). Semantic constraint was determined by whether responses were constrained to a single semantic category (high) or not (low).

Results

Neither ML nor KV had any difficulty with this task. BQ, however, had a greater number of errors as constraint was lowered, indicating his difficulty may be in retrieving weakly activated responses, rather than selecting from many competitors.

Errors by Condition						
Lexical Constraint	Semantic Constraint	ML	BQ	KV	Controls	(range)
High	High	3.2%	6.5%	0.0%	1.7%	(0-9.7%)
Low	High	0.0%	15.4%	5.1%	2.3%	(0-12.8%)
Low	Low	13.9%	33.3%	5.6%	4.3%	(0-16.7%)

CONCLUSIONS

ML's results are consistent with a selective deficit in a post-selection inhibitory mechanism, since he shows interference from possible competitors only when they have been previously activated. BQ shows a different pattern that implies difficulty in searching for and retrieving semantic representations. One hypothesis about AR's pattern might be that all lexical-semantic links have been weakened for him, slowing semantic access. One successful retrieval, however, results in strengthening of links for that item (through learning), resulting in the learned item becoming a potent competitor for subsequent retrievals within the same category. This competition would negatively affect both category fluency and semantically blocked naming.

References

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Patient Information

	ML	BQ	KV
Age	62	70	72
Lesion	left frontal/parietal operculum	frontal/parietal/temporal	unknown
Speech	nonfluent	nonfluent	fluent
PNT score	98%	93%	96%