

The importance of short-term memory for order in dissociating short-term memory and language deficits

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Introduction

Recent models of STM distinguish processes involved in the retention of item information (i.e., the identity of words) and order information (the order of presentation of words) (e.g., Burgess & Hitch, 2006). In these models, STM for item information is thought to depend upon activation of the language system. By contrast, STM for order information is considered to recruit a specific system, distinct from the language system. Here we show that verbal STM deficits in brain injured patients are not unitary, but reflect the distinction between item STM and order STM.

Aim

- To demonstrate a double dissociation between item STM and order STM deficits in two brain injured patients presenting initially with aphasia.
- To assess the impact of item and order STM deficits on the learning of new verbal sequences.

Results

Experiment 1: Item and order probe recognition

- Patient MB: Impaired item recognition
- Patient CG: Slowed order recognition

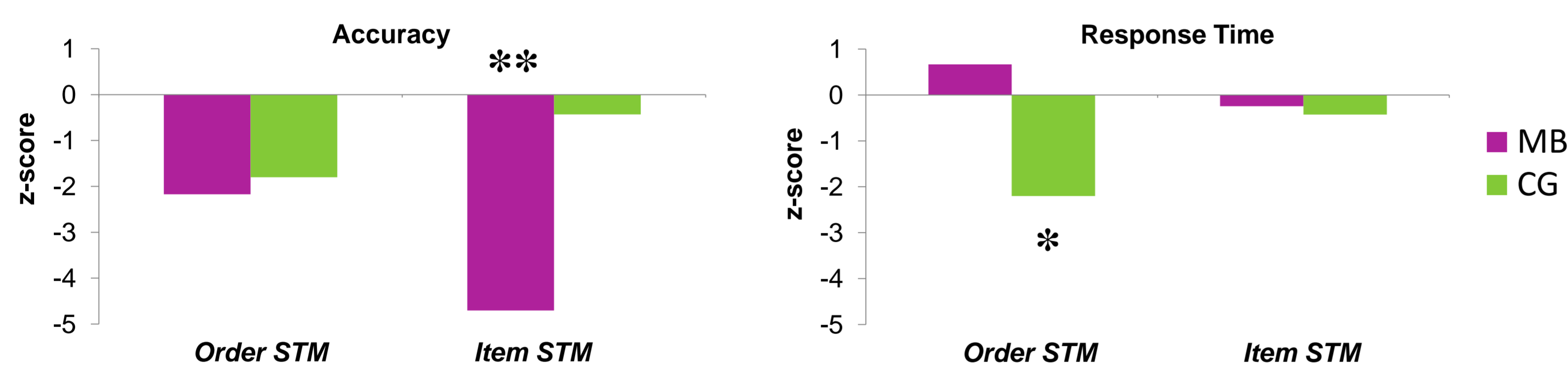


Figure 1. Patient Z-scores for recognition accuracy and response times in the item and order probe recognition task.

Experiment 2: Item and order errors

- Patient MB: Significantly increased rate of item errors especially for low imageability word lists; preserved order recall
- Patient CG: Significantly increased rate of order errors; preserved item recall

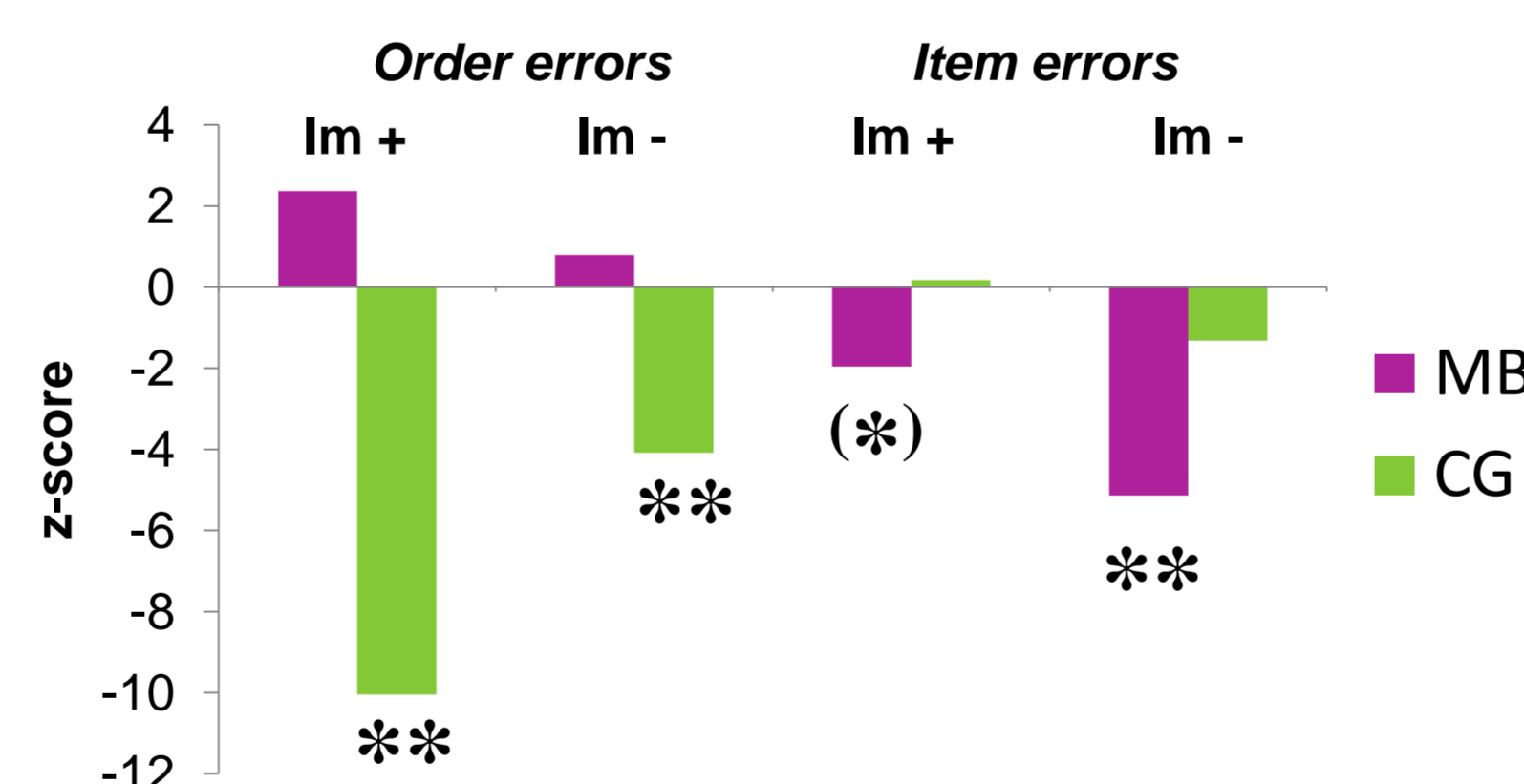


Figure 2. Patient Z-scores for error proportions in immediate serial recall for high imageability (Im+) and low imageability (Im-) word lists.

Experiment 3: New verbal sequence learning

- Patient MB: Significantly impaired new word learning performance
- Patient CG: Significantly impaired new word learning performance

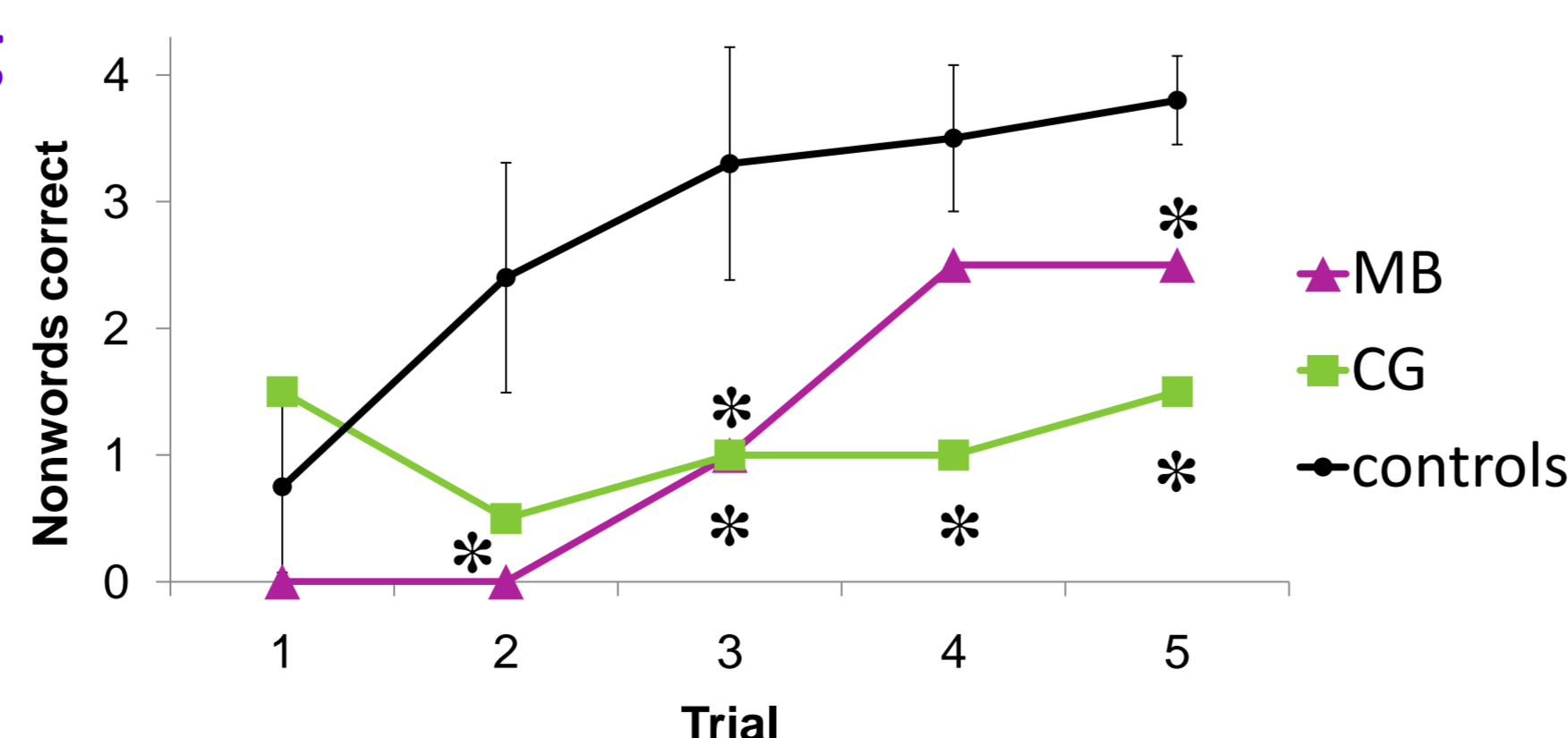


Figure 3. Learning curves for the word-nonword paired associate learning task.

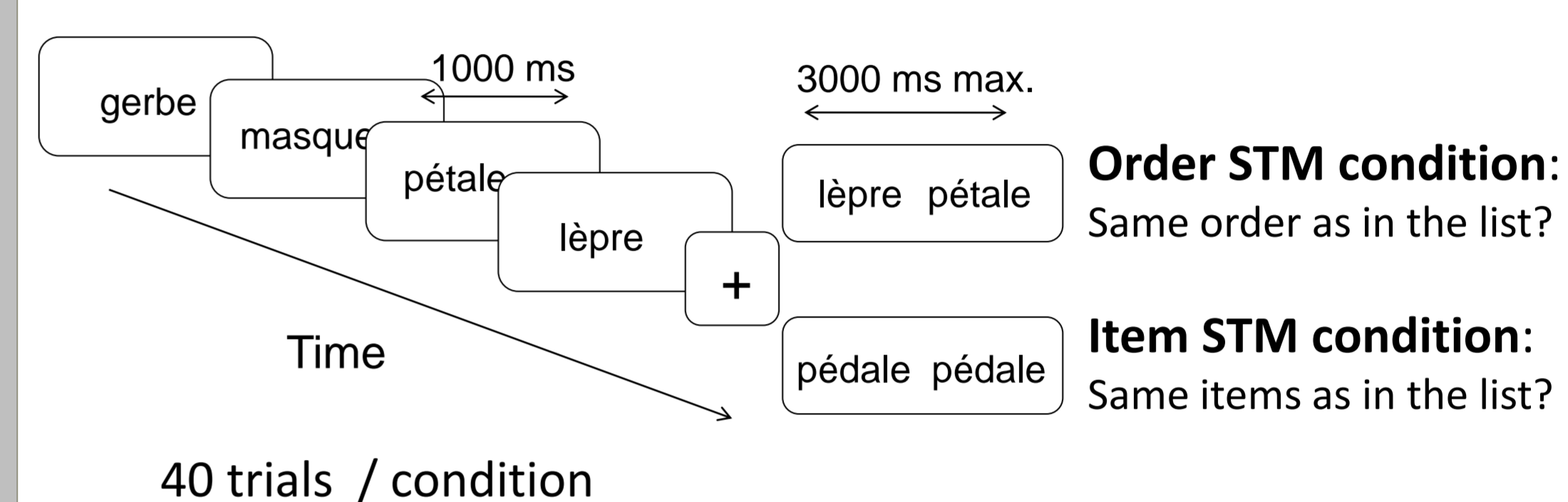
Method

Participants:

- Patient MB suffered from a CVA. He showed mild receptive phonological impairment and reduced word and digit spans.
- Patient CG suffered from TBI. He was initially anomic; at the time of this study, he showed reduced word and digit spans but no residual language impairment.
- Control group: healthy adults matched for age and profession (N=10 for each of the two groups).

Materials:

Experiment 1: Item and order probe recognition



Experiment 2: Item and order errors in immediate serial recall

- Immediate repetition of word lists of increasing length (2 to 7 words); the lists are of high or low word imageability.
- The proportion of item and order errors are determined.

Experiment 3: New verbal sequence learning

- Paired associate word-nonword learning task.
- 4 bisyllabic nonwords to be learned.
- 5 learning trials.

Discussion

- This case study demonstrates the first double dissociation between item and order retention capacities in STM.
- In MB, a specific item STM impairment is associated with an increased impact of the psycholinguistic variable of word imageability and residual language impairment. This is supporting current STM models that treat language processing as a major determining factor of item STM performance (e.g., N. Martin & Saffran, 1992; Majerus & D'Argembeau, 2011).
- CG shows selective impairment of STM for order, associated with new word learning difficulties, as supported by recent models considering that order STM capacity is a fundamental building block of new word learning (Gupta, 2003; Majerus & D'Argembeau, 2011).

→ Verbal STM is a multi-determined capacity.

References

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