

Serial Order Short-Term Memory Predicts Later Vocabulary Development: Evidence From A Longitudinal Study Design

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ABSTRACT

This longitudinal study adopts the dissociation between item and order information for achieving a more detailed understanding of the relation between verbal short-term memory (STM) and vocabulary development. We administered tasks maximizing retention of serial order information or retention of item information to children when they were aged 4 years and one year later. Results support a strong role for serial order STM capacities in vocabulary acquisition.

INTRODUCTION

Many studies have shown an association between verbal short-term memory (STM) and vocabulary development. However, the precise nature of this association is still not clear. Recent short-term memory (STM) models assume that the role of STM is specifically to retain serial order information (i.e., the sequential order in which the items are presented) while the retention of item information (i.e., the phonological, lexical and semantic characteristics of an item) largely depends on the activation of representations in the language system (e.g., Gupta, 2003). Hence, if there is a causal connection between STM capacity and vocabulary development, as suggested by some authors (e.g., Baddeley et al., 1998), STM measures maximizing retention of serial order information should be especially strong predictors of later vocabulary development, relative to item STM measures.

THIS STUDY

→ This study assessed the specificity of the relation between vocabulary development and STM for serial order and STM for item information using a longitudinal study design.

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METHODS

Participants

45 typically developing children (21 girls), tested at the age of 4 and 5 years

Tasks

- **Receptive vocabulary knowledge** (French adaptation of the PPVT; Dunn et al., 1993)
- **Nonverbal intelligence** (Raven's Coloured Progressive Matrices; Raven et al., 1998)
- **Serial order reconstruction task**: assessing STM for serial order (Majerus et al., 2006). Auditory presentation of sequences of increasing length containing familiar animal names; after presentation the order of presentation of the animals has to be reconstructed using cards depicting the animals.

High sensitivity to serial order information: availability of item information at recall, only order information has to be retrieved

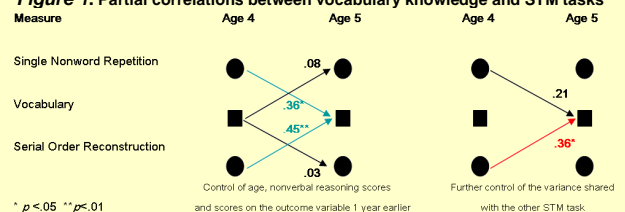
- **Single nonword delayed repetition task**: assessing STM for item information (Majerus et al., 2006).

High sensitivity to item information: A single and new monosyllabic nonword item is presented for recall after a filled delay of 3 seconds.

RESULTS

- **Predictive power of verbal STM performances at Age 4**: Both serial order STM and item STM performance at Age 4 predicted vocabulary knowledge at Age 5, after control of initial differences in age, vocabulary knowledge, and non-verbal intelligence (Figure 1).

Figure 1. Partial correlations between vocabulary knowledge and STM tasks



* $p < .05$ ** $p < .01$

- **Specific predictive power of serial order STM performance**:

1) Serial order STM performance at Age 4 still predicted vocabulary scores at Age 5 when further controlling the shared variance with nonword abilities, while the reverse was not true (Figure 1).

2) Only the age-related increase of serial order STM performance predicted the increase of vocabulary knowledge from 4 to 5 year-olds ($r = .34$, $p < .05$).

DISCUSSION

→ Our findings confirm previous transversal studies showing selective associations between serial order STM and lexical acquisition (Majerus et al., 2006, 2008). This longitudinal study provided a strong test for this position, by showing that the increase of serial order STM capacity over a one-year period predicts the increase of vocabulary size over the same time period.

→ These results support theoretical models assuming a causal role for serial order STM capacities in vocabulary acquisition.