Vocabulary Learning in Primary School Children: Working Memory and Long-Term Memory Components

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The aim of this study was to investigate which working memory and long-term memory components predict vocabulary learning. Short, phonologically native nonwords were learned best. Phonological sensitivity predicted learning of all nonword types (except short native nonwords), vocabulary predicted learning of only short native nonwords, and central attentional resources predicted learning of short nonwords (but not long nonwords).

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The aim of this study was to investigate which working memory and long-term memory components predict vocabulary learning. A nonword learning paradigm was used in which children aged 8–10 years learned picture—nonword pairs. The nonwords varied in length and phonology. Short phonologically native nonwords were learned most effectively. Linear structural equation analyses demonstrated the influence of three constructs: phonological sensitivity, vocabulary knowledge, and central attentional resources on nonword learning. Phonological sensitivity predicted learning of all nonword types (except short native nonwords), vocabulary predicted learning of only short native nonwords, and central attentional resources predicted learning of short nonwords (but not long nonwords).

- It is universally recognised that vocabulary learning is a fundamental component of both the acquisition of native language and learning a foreign language.
- Baddeley and colleagues (1993; 1998) proposed that phonological short-term memory has an important role in constructing representations of the phonological form of new words in both native and foreign languages.
- They used terms such as 'phonological memory skills', 'phonological loop abilities', 'phonological loop capacity', and 'phonological storage' in an interchangeable way.
- Phonological memory is most commonly measured using forward digit span and nonword repetition.
- Baddeley and colleagues suggested that nonword repetition could be a relatively pure measure of phonological loop capacity.
- However, it has been suggested that nonword repetition involves various abilities, such as speech perception, phonological encoding, segmentation of speech sounds, and programming and executing articulatory instructions.
- Nonword repetition could depend on 'phonological awareness' ('phonological sensitivity').

M capacity

 A neo-Piagetian theory of cognitive development (Pascual-Leone, 1987) posited the existence of a resource referred to as 'M capacity', which is conceived as a central attentional component of the working memory system that can be used to keep a limited number of



Study

In this study, it is hypothesised that the construct of phonological memory could be deconstructed into three components: phonological sensitivity, attentional resources (M capacity), and rehearsal. The role of the predictors is likely to vary according to the different materials to be learned.

Participants were 161 elementary school children in Italy with a mean age of 9 years 8 months.



Findings

- Learning was more effective for short nonwords and phonologically legal words.
- Learning scores increased significantly from each cycle to the next.
- The effects of length and phonology were over-additive. Learning was most effective in native short conditions, then in non-native short and then native long conditions. Non-native long words were most difficult to learn.
- Nonword repetition correlated better with phonological sensitivity measures than with the forward digit span or other variables.

- Following exploratory factor analysis, three factors accounted for 56% of the total variance. The first factor loaded most highly the four tests of M capacity, the second factor loaded the articulation rate measures that tap rehearsal efficiency, and the third factor loaded all of the measures that we hypothesised to tap phonological sensitivity. Nonword repetition loaded .80 on the third factor.
- These results support the hypothesis that phonological memory can be decomposed into three constituents that we refer to as phonological sensitivity, rehearsal efficiency, and M capacity.
- Phonological sensitivity was the most important predictor of learning all nonword types (except the short native nonwords).
- Vocabulary only predicted learning short native nonwords.
- M capacity was a significant predictor for short nonwords (but not long nonwords).



Conclusions and implications

The results of this study support the view that vocabulary learning cannot be accounted for by a single mechanism; instead, a cognitive system with several components is involved. The relative importance of these different components may vary depending on the characteristics of the words being learned. Consistent with the hypotheses, the predictor latent variables that represent the cognitive system involved in learning include both long-term memory and working memory components. Phonological memory can be decomposed into phonological sensitivity, rehearsal efficiency, and M capacity.