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Book review

S.E. Gathercole and A.D. Baddeley, *Working Memory and Language*. Erlbaum, Hillsdale, NJ, 1993.

In this monograph, Gathercole and Baddeley present a discussion of the role of working memory in the processing of language in children and adults. On first sight, this may seem to be a bit strange since no one would doubt that working memory is involved in language processing. Gathercole and Baddeley use the term 'working memory' however in a very specific sense. It refers to the model proposed by Baddeley and Hitch (1974) that decomposes short-term or working memory in three components: a central executive system and two specialized 'slave systems', the phonological or articulatory loop and the visuo-spatial sketchpad. The central executive is a general-purpose control system, whereas the other two components are dedicated to the temporary maintenance of verbal and visual-spatial information, respectively.

Although the central executive remains a somewhat vague concept, the two slave systems are tied to particular experimental techniques that make it possible to give specific interpretations to experimental data and allows specific predictions of the effects of experimental variables. For example, the model specifies that the contribution of the phonological loop can be eliminated by 'articulatory suppression', a technique where the subject has to articulate irrelevant material (e.g., repeatedly saying "da – da – da – ...") while processing other information. This framework has led to many interesting results such as a clear specification of word length and phonological similarity effects in immediate memory. This particular model for working memory is of course not without problems. There are empirical problems (e.g., patients without articulatory mechanisms function quite normally and not, as one would expect, as normal subjects under articulatory suppression) as well as theoretical questions (e.g., how strong is the evidence for the assumption that the phonological loop is indeed a completely separate system rather than a more flexible control system within short-term memory). On the whole however, the model has been quite successful and influential.

The first two chapters of this book give a review of this general framework and the development of working memory in children. The latter is especially relevant for the remainder of the monograph, since this development occurs simultaneously with the development of important language skills as reading and writing. In the following two chapters the role of phonological memory in vocabulary acquisition and speech production is considered. Convincing evidence is reported concerning this relation, in particular between nonword repetition performance (a measure of phonological skills) and vocabu-

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lary knowledge, both in normal children and in language-disordered children. This is not the case for speech production, however--the phonological loop does not seem to be used as a speech output buffer as might have been expected a priori.

A major part of the book is devoted to a discussion of the relation between working memory and various aspects of reading, including word recognition and language comprehension. The authors first present an introduction to theories of reading development and the methodological problems in such studies. This chapter is one of the least satisfactory ones. It deals almost exclusively with the familiar dual route model, ignoring recent proposals that question the existence of a direct word recognition route. The methodological discussion is weak and sometimes incorrect (e.g., the discussion on p. 113 concerning the interpretability of null results in reading group designs). One of the major difficulties in reading research is what the proper control group is to which a group of poor readers should be compared: a group of normal or good readers of the same age or a group of normal but younger children that have the same reading level. Both types of comparison have their own specific problems. For example, using a reading-level matched comparison group, the usual result is that there are no differences in e.g. phonological processing measures. This could mean that there is a direct link between such phonological capacities and reading skills. However, it could also be the case that there is in fact a difference between the groups that is masked by the obvious differences in other factors such as amount of educational experience. The authors correctly conclude that only a combination of research designs will make it possible to draw firm conclusions regarding causal factors.

What is perhaps the most intriguing result from this research program is the lack of a clear relationship between phonological memory and reading skills, in particular word recognition. Sometimes a significant relation is obtained but in other cases, using different measures, no relation seems to be present. The authors are forced to assume that most reading depends on direct visual word identification without a substantial role for phonological skills. This is rather surprising given the importance attached to such skills in recent theories of reading and reading disorders. One problem however with the framework used by Gathercole and Baddeley is that it is not a real process-oriented model but a typical example of 'boxology', the specification of system components without a detailed account of how such components interact to determine task performance. In hindsight, the concept of a phonological loop seems to be a too restricted conceptualization of phonological memory.

Notwithstanding these problems, the authors have presented a careful and balanced review of the involvement of phonological memory in reading. As such, this monograph will be of interest to researchers in the area of reading and dyslexia. In particular, it might be very useful, as pointed out by the authors, to see to what extent specific training of phonological skills is beneficial to the development of reading skills.

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