Domain-Specific Versus Domain-General Maintenance in Working Memory: Reconciliation Within the Time-Based Resource Sharing Model

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Abstract
Working memory is the structure devoted to the maintenance and processing of information. Due to the evanescence of percepts and to forgetting of mental representations resulting from time-based decay and interference, maintenance of information at short term during concurrent processing activities is fundamental for achieving any cognitive task. In this respect, understanding the nature of the mechanisms and
systems fulfilling this maintenance function is of particular importance for human cognition, and various responses have been put forward in the past. This chapter reviews evidence in favor or against domain-specific and domain-general maintenance mechanisms. This leads to present our current thinking on how to reconcile domain-specific and domain-general approaches by assuming the existence of two independent systems of maintenance. We propose how these two systems can interplay within a time-based resource sharing framework of working memory and highlight prior research that sustains our view.

1. INTRODUCTION

Working memory is the structure devoted to the maintenance of information at short term during concurrent processing activities. Thus, it is often said that the dual function of working memory is the storage and processing of information and that working memory is the hub of human cognition (Haberlandt, 1997). However, irrelevant information issued from the environment or stored in long-term memory could interfere with the information to be processed (Oberauer, Farrell, Jarrold, & Lewandowsky, 2016). Furthermore, memory traces of the to-be-maintained information could also decay with time (Baddeley, 1986; Barrouillet, Bernardin, & Camos, 2004). Thus, some mechanisms are needed to temporarily maintain transient representations of this information in the face of interference and decay. Our ability to maintain these representations in working memory is essential for achieving any cognitive activity. As a consequence, the capacity of working memory (i.e., the measure of how many items can be maintained in working memory) is known as the best predictor of success for many cognitive tasks, such as reasoning or language comprehension (Daneman & Carpenter, 1980; Kyllonen & Christal, 1990), and for school achievement (Gathercole & Baddeley, 1993; Lépine, Barrouillet, & Camos, 2005). Working memory capacity is also strongly related to measures of general fluid intelligence (Engle, Tuholski, Laughlin, & Conway, 1999; Unsworth, 2016).

In this respect, uncovering the nature of the mechanisms and systems fulfilling the maintenance function is of particular importance. Moreover, the question of the number and nature of the mechanisms of maintenance is embedded in the larger debate about the existence of working memory per se, i.e., the existence of a separate structure, distinct from long-term memory and dedicated to the short-term maintenance. After presenting the three main conceptions of working memory, we will expose and discuss
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