Semantic Knowledge Saves Working Memory Resources

The link between the **linguistic system** and **working memory** (WM) is now firmly established. Studies have shown that semantic knowledge can be used in order to support the short-term maintenance of verbal information. This is shown for instance by the recall advantage observed for semantically related (e.g. leaf – tree – branch) over semantically unrelated (e.g. house – dog – wall) lists of items. However, the underlying mechanisms responsible for these influences of the linguistic system remain unknown.

From a psycholinguistic perspective, **interactive activation models** of language processing assume that semantically related items reactivate each other, for instance via their shared semantic features (Dell, Schwartz, Martin, Saffran, & Gagnon, 1997). Hence, semantically related items might be better recalled because they benefit from these mutual reactivations. In this study, we not only demonstrate the plausibility of this mechanism, but we also show that semantic knowledge can be used in order to save WM resources, and this using a convergent approach involving computational and behavioural methods.

In an experiment requiring participants to perform immediate serial recall of lists composed of six memoranda (e.g. leaf - tree - branch - *wall* - *sky* - *dog*), we observed that the presence of a semantic chunk (i.e. leaf - tree - branch) enhanced recall performance for items that directly followed the semantic chunk (i.e. *wall* - *sky* - *dog*), and this compared to a condition where all the items were semantically unrelated (e.g. hammer - jacket - horn - *wall* - *sky* - *dog*). These results show that the presence of a semantic chunk did save WM resources. This phenomenon is successfully captured by a **new computational model** in which an attention-based WM architecture (Oberauer & Lewandowsky, 2011) takes into account the core principles of interactive activation models (see **Figure 1**).

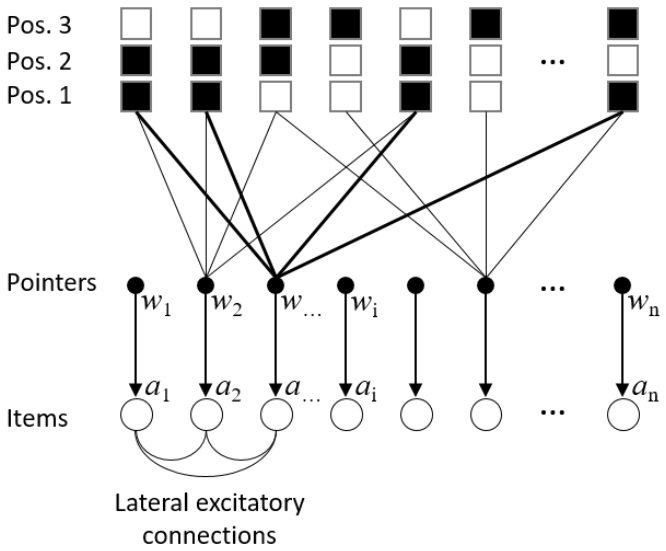

Figure 1. Schematic illustration of the working memory model.

Dell, G. S., Schwartz, M. F., Martin, N., Saffran, E. M., & Gagnon, D. A. (1997). Lexical Access in Aphasic and Nonaphasic Speakers. *Psychological Review*, *104*(4), 801–838.

Oberauer, K., & Lewandowsky, S. (2011). Modeling working memory: a computational implementation of the Time-Based Resource-Sharing theory. *Psychonomic Bulletin & Review*, *18*(1), 10–45. https://doi.org/10.3758/s13423-010-0020-6