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Development of Skilled Memory for Structured Lists

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Introduction

Contemporary theories of working memory have not been very successful in accounting for basic experimental findings of skilled memory performance. Most theories of working memory are based on the rapid access and storage of information in short-term memory (STM). A growing body of research has demonstrated that experts rely extensively on long-term memory (LTM) for skilled activities. Ericsson and Kintsch's (1995) Long-term Working Memory (LT-WM) theory proposes that skilled memory performance can be accounted for by using LTM to extend working memory limits. Evidence for LT-WM has been demonstrated for specialized skills, such as chess, as well as more common skills such as reading and text comprehension. A preliminary study tested whether subjects can use preexisting schematic knowledge to synthesize a memory skill that uses a LT-WM.

Long-term Working Memory Theory

Evidence suggests that experts rely extensively on the storage capacity of LTM during skilled activities. Experts have been shown to have a much larger working memory capacity than novices for domain activities. Additionally, dual tasks or brief interruptions during a skilled activity lead to little disruptions in an expert's memory retention as compared to novices. These phenomena are difficult to account for if one assumes that experts rely on a transient store to perform skilled activities.

The LT-WM theory proposes that experts use LTM to extend working memory capacity limits with skilled activities. This extension occurs when a large base of domain-relevant knowledge has been acquired and the expert has become familiar enough with an activity that he/she can anticipate future retrieval demands. Selective storage and retrieval from LTM is accomplished by the expert associating new information to appropriate cues in LTM and using the cues to retrieve the new information. A stable set of such cues is referred to as a retrieval structure. Thus, LT-WM can be viewed as the skilled use of LTM to rapidly encode relevant information into retrieval structures and the use of retrieval cues for fast selective access to the encoded information.

Preliminary Experiment

Focused tests of the predictions of LT-WM can be made by examining constraints involved with a simple memory skill. Since most people have extensive knowledge of words and practice at generating coherent mental representations of scenarios, it should be possible to use this knowledge base to assemble LT-WM with very little additional practice.

Eighteen college freshmen were tested for memory retention of 5 lists of 12 words. Each lists was presented as 4 word triplets (5s/triplet). Following each triplet, subjects shadowed digits for 14 seconds. Following each list, subjects were required to recall all 12 words in order. The words for each list were ordered into 12 unique categories. Each list comprised of 4 groups of 3 words. The words were pre-selected to fit into one of 4 scenes. An example of a scene is, "An *Elected Official* was reading a *Type of Reading Material* while riding a *Type of Vehicle.*" Example words would be, "chairman, play, taxi." Prior to testing, half of the subjects were informed that the triplets corresponded to 4 scenes and were given practice in using the scenes for encoding. The other half received a comparable practice but were not informed of the scenes.

Subjects learning scenes recalled 9.8 words in correct order and control subjects only 3.7 ($F = 78.84$; $p < .01$). When ordering was not considered, subjects learning scenes recalled 9.9 and control subjects 5.2 ($F = 41.46$; $p < .01$).

Conclusions

Superior performance by subjects who learned the scenes gives evidence that subjects can be quickly trained to use preexisting schematic knowledge to acquire a skill for remembering organized lists of unfamiliar words. Improved performance in spite of a distraction task implicates that those subjects are using a LT-WM. This experiment also highlights the importance of subjects learning to anticipate the type of information that will be retrieved during skill development. Future experiments will explore factors critical for development of retrieval structures by comparing memory performance to other encoding and retrieval techniques, such as the method of loci and cued recall.

References

Ericsson, K. A., & Kintsch, W. (1995). Long-term working memory. *Psychological Review*, 102(2), 211-245.