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Building Mental Models of Multimedia Procedures: Implications for Memory Structure and Content

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The present experiments examined memory for procedural instructions following three presentation formats. In three experiments participants learned procedures for assembling toys either with instructions presented in text-only, picture-only, or multimedia formats. Testing examined recall, serial order knowledge, and source knowledge. In Experiment 1A, multimedia learning produced faster and more accurate serial order determinations and greater recall, but more source monitoring errors, compared to the other formats. Experiment 1B demonstrated that additional multimedia exposure following initial learning can further influence memory. Experiment 2 examined working memory processes during multimedia learning by attempting to selectively interfere with visuo-spatial and articulatory resources. Contrary to Baddeley's (1992) working memory model, verbally- and spatially-based divided attention tasks failed to selectively interfere with individual slave-system processing, suggesting central executive involvement in the sequential 2-back concurrent tasks. These results provide empirical support for the underlying nature and potential benefits of mental representations following multimedia experiences.

Experiment 1

Participants were presented with a total of 18 5-step Kinder Egg™ toy assembly sequences in picture-only (6), text-only (6), or multimedia (6) format. Half of the participants performed a verbal concurrent task. Subsequent testing included order verification (O.V.), instructions recall (I.R.), and source monitoring tasks. Order of testing for the O.V. and I.R. was reversed in Experiment 1B to test the effects of subsequent multimedia exposure on recall performance.

Results

Congruent with past research (e.g., Mayer & Anderson, 1991), multimedia produced the highest accuracy rates on both the order verification and recall tasks. Interestingly, multimedia also produced the highest source monitoring error rates, with a tendency for participants to inaccurately recall multimedia presentations as picture-only. No evidence for selective verbal interference was found. Additionally, later exposure to pictures following text-only presentations increased recall accuracy.

Experiment 2

Experiment 2 replicated Experiment 1B with the addition of a spatially-based divided attention task.

Results

In line with Experiment 1, dependent measures revealed significant multimedia effects. Verbal and spatial concurrent tasks did not selectively interfere with articulatory or visuo-spatial working memory, respectively.

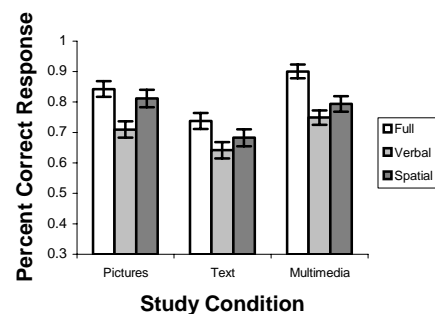


Figure 1: Percent correct response as a function of presentation condition and attention group.

Conclusions

The combination of pictures and text consistently produced higher accuracy rates on tests examining memory structure and content in comparison to pictures or text alone. However, learners are more prone to source monitoring errors after learning with multimedia in comparison to the other two presentation formats. Further research should examine selective working memory interference, with a particular emphasis on multimedia processing.

References

- Baddeley, A.D. (1992). Working memory. *Science*, 255, 556-559.
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