

# The role of working memory in strategic aspects of mental arithmetic



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## Introduction

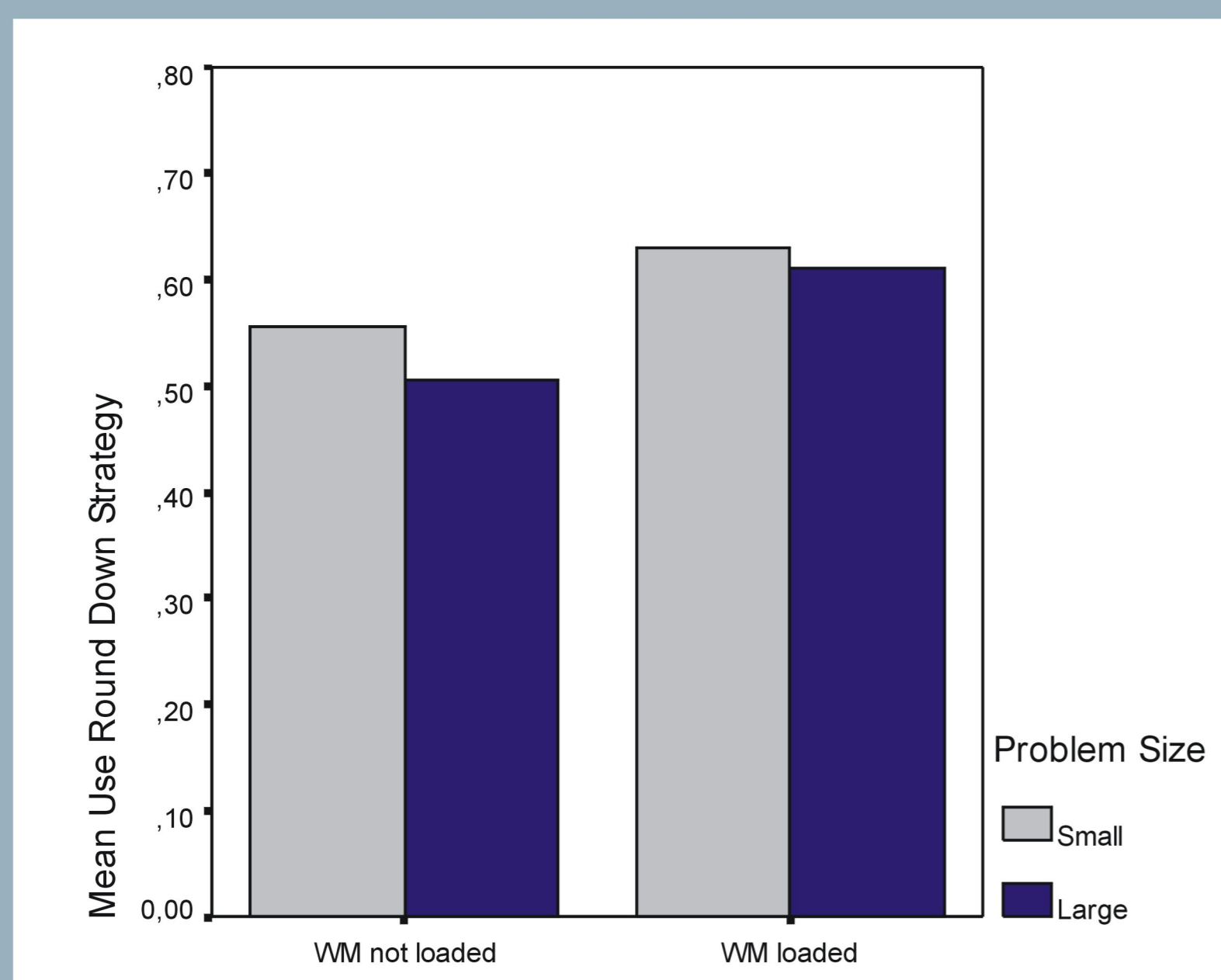
Working memory load hinders strategy execution (only when counting is used to solve problems) but not strategy distribution (Hecht, 2002). Strategy distribution depends on working memory, but only for complex problems (Duverne, Lemaire, De Rammelaere, Vandierendonck, & Deschuyteneer; in revision).

## Method

Stimuli: 80 mixed-unit products involving two-digit operands (e.g. 21x39), divided into small and large products  
Primary task: Computational estimation by rounding both operands up or down to the closest decades (e.g. 20x30 or 30x40)  
Secondary task: Two Choice Reaction Task which loads on the executive components of working memory  
Method: Choice/No-Choice method which provides unbiased measures of strategy performance  
Participants: 72 students randomly distributed into 3 groups (i.e., choice, no-choice/round-down, no-choice/round-up)  
Design: 2 (Condition: single- vs. dual-task) x 2 (Problem Size: small vs. large) [x 2 (Strategy: rounding-down vs. -up)]

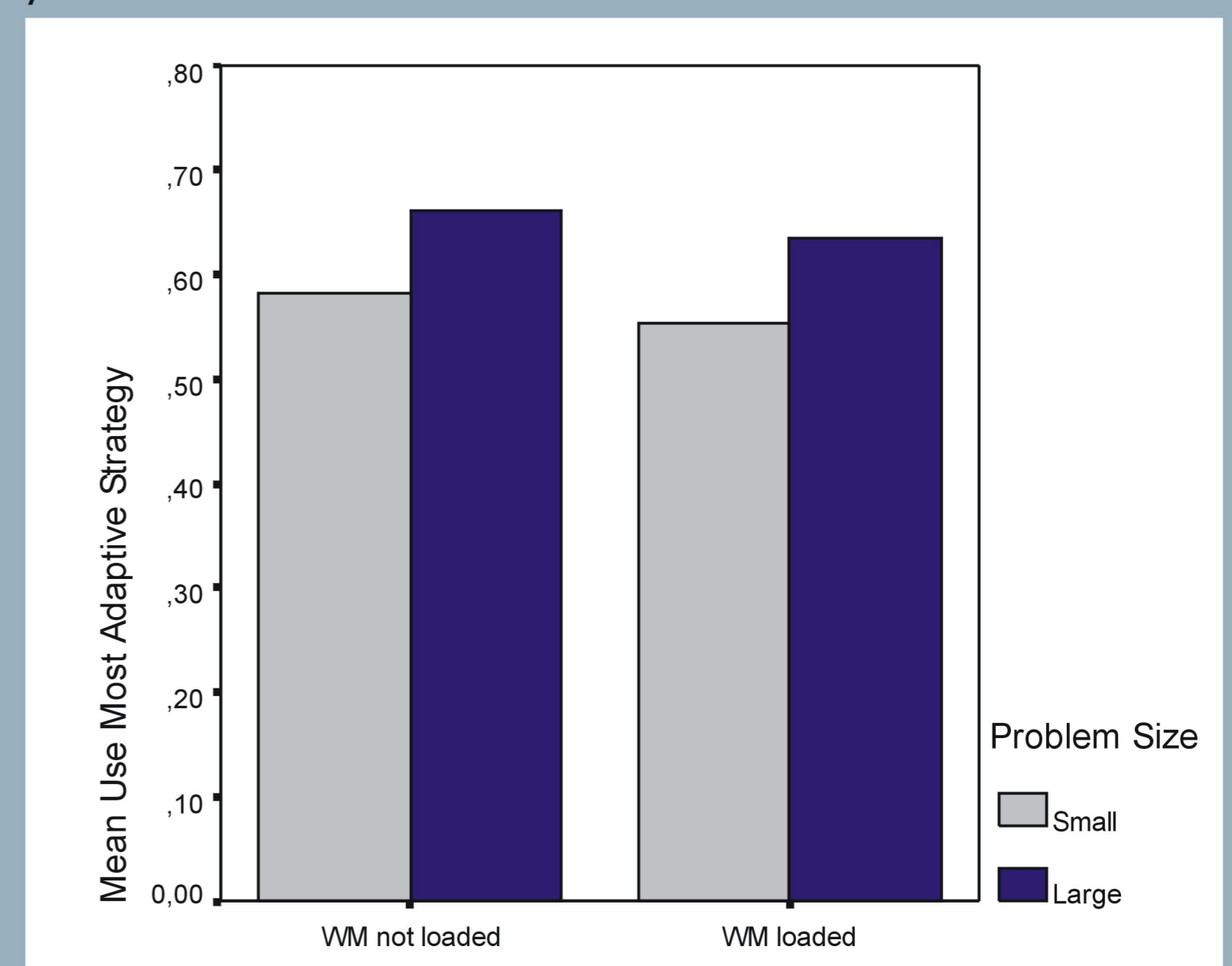
### Strategy Distribution

Percentages of using the rounding-down strategy were larger when working memory was loaded than when



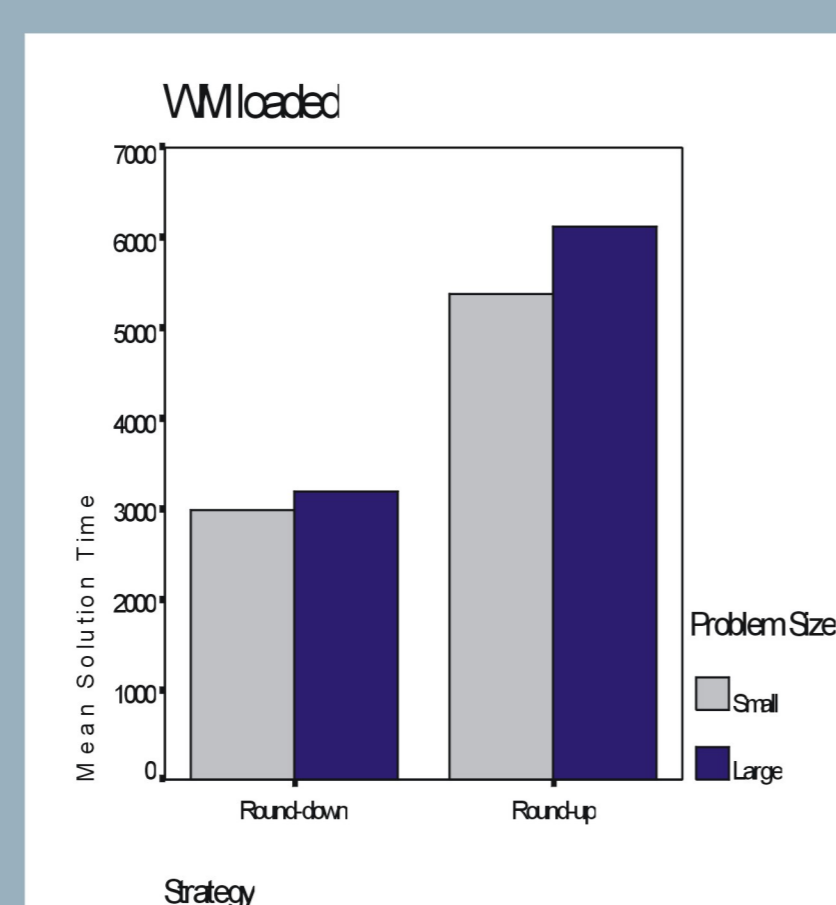
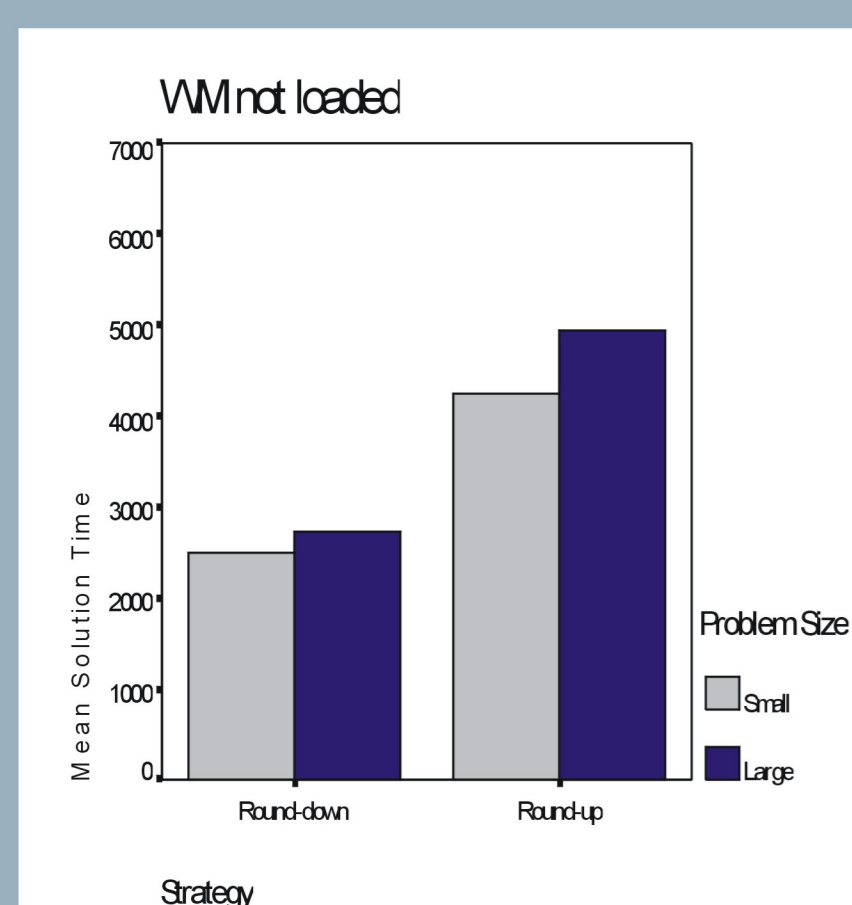
### Strategy Selection

Percentages of using the most adaptive strategy were lower when working memory was loaded than when working memory was not loaded.



### Strategy Execution

When working memory was loaded, execution of the most difficult (rounding-up) strategy was more impaired than execution of the easier (rounding-down) strategy.



### Conclusions

- Strategy Distribution is impaired under working memory load since the rounding-down strategy is used more often when executive functions of working memory are loaded. When fewer executive resources remain, people tend to more often use the easier rounding-down strategy that requires fewer cognitive resources.
- Strategy Selection depends on working memory resources. Choosing the best strategy in an adaptive way loads on executive functions of working memory.
- Strategy Execution depends on working memory resources. The execution of rounding-up strategies is more affected by working memory load since these strategies consume more cognitive resources.

## References

- Duverne, S., Lemaire, P., De Rammelaere, S., Vandierendonck, A., & Deschuyteneer, M. The role of working memory in arithmetical strategies. Article in revision.
- Hecht, S. A. (2002). Counting on working memory in simple arithmetic when counting is used for problem solving.