We studied how working memory (WM) is related to higher order cognition. The results suggest that both elementary and complex cognitive mechanisms selectively contribute to the relationship, depending on the complexity of the WM span task and the type of higher order cognition measure.

INTRODUCTION

• Working memory is closely related to higher-order cognition, e.g. fluid intelligence and scholastic achievement. The mechanisms underlying this association are unclear.

• Previous studies have shown mixed results about
  1) whether engaging in complex attention demanding processing task captures WM-related variation in higher order cognitive task (Bunting, 2006; St.Clair-Thompson, 2007) or
  2) whether even simple processing task is sufficient in the predictive utility (Lépine, Barrouillet & Camos, 2005; Magimairaj & Montgomery, 2012).

Reasons for mixed results:
  1) studies have used either school based or fluid intelligence measures as criterion tasks and
  2) studies did not control for presentation time in working memory tasks, thus the results may reflect the effect of time rather than processing complexity.

METHODS

Subjects: 68 adolescents, mean age 16 years from three schools

Measures:

• Two WM span tasks: Reading Span task (simple) and Word Problem Span task (complex)
• Raven’s Progressive Matrices Test (Standard)
• Measures of scholastic performance: National Curriculum Test in Mathematics (Mathematics NC), Reading Comprehension, Reading Skill and Grade Point Average

A: The more complex WM span task was sufficient to predict fluid intelligence: it predicted additional variance when added to the model after the simple WM span task.

In contrast, the simpler WM span task was sufficient to predict school achievement: it predicted additional variance when added to the model after the more complex WM span task.

A: A relationship between the complex WM task and scholastic performance was mediated by fluid intelligence (b), but no clear mediating effect between the simpler WM task and scholastic performance (a) was found.

CONCLUSIONS

• WM tasks do not require complex processing in order to predict scholastic achievement, a simple computer-paced span task captures the WM related variation.
• WM task with a relatively demanding processing task is a good predictor of scholastic achievement: it seems to share common processes with fluid intelligence.
• A time-controlled presentation method allows to capture and manipulate the processing requirements of a WM span task and should be applied in forthcoming studies.

REFERENCES