Archives Jean Piaget

**40, boulevard du Pont d'Arve**
**1205 Genève │Suisse**

**18th Advanced Course**

# Cognitive Development, Mechanisms and Constraints

**3 – 5 July 2008**

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**Friday morning, July 4, 2008**

9h00 **Lee Swanson**, University of California
***The influence of working memory growth on math and reading performance in children with math or reading disabilities***

**Abstract:**
The results of three studies will be reviewed in my presentation. Two studies will focus on the relationship between growth in WM and its influence on Math and Reading performance. The third study reviews preliminary data on strategy instruction and working memory performance.

*Study 1-math disabilities*
The influence of cognitive growth in working memory (WM) on mathematical problem solution accuracy was examined in elementary school children (N=353) at risk and not at risk for serious math problem solving difficulties. A battery of tests was administered that assessed problem solving, achievement, and cognitive processing (WM, inhibition, naming speed, phonological coding) in children in first, second and third grade across three testing waves. The results were that: (a) children identified as at risk for serious math problem solving difficulties in wave 1 showed less growth rate and lower levels of performance on cognitive measures than children not at risk; (b) fluid intelligence and two components of WM (central executive, visual-spatial sketchpad) in wave 1 (year 1) predicted wave 3 word problem solving solution accuracy; and (c) growth in the central executive and phonological storage component of WM was related to growth in solution accuracy.

[**Lee Swanson**, University of California]

*Study 2-reading disabilities*

A three-year longitudinal study determined whether (a) subgroups of children with reading disabilities (RD) (children with RD-only, children with both reading and arithmetic deficits, and low verbal IQ readers) and skilled readers varied in working memory (WM) and short-term memory (STM) growth, and (b) whether growth in an executive system and/or phonological storage system mediated growth in reading performance. A battery of memory and reading measures were administered to 84 children (ages 11 to 17) across three testing waves spaced one year apart. The results showed that skilled readers yielded higher WM growth estimates than the RD groups. No significant differentiation between subgroups of children with RD on growth measures emerged. The Hierarchical Linear Modeling showed that WM (controlled attention), rather than STM (phonological loop), was related to growth in reading comprehension and reading fluency. The results suggest that deficient growth in the executive component of WM underlies RD.

*Study 3-pilot data on intervention training*

Two experiments investigated the relationship between working memory (WM), strategy knowledge and training in children with reading disabilities (RD). Experiment 1 examined the relationship between strategy knowledge and WM performance in children (mean chronological age 10.8 yrs) as a function of initial, gain, and maintenance conditions. Three findings emerged: (1) verbal and visual-spatial WM performance in children without RD was superior to children with RD, (2) stable strategy choices, rather than specific strategy choices, predicted WM span, and (3) WM performance under cued conditions contributed significant variance to predictions of reading comprehension. Experiment 2 examined the effects of strategy instruction on WM performance. Children (Mean CA 11.2 yrs) were randomly assigned to rehearsal strategy instruction or control conditions to improve performance on an operation span task. Children with and without RD improved on the operation span task as a result of strategy training as well as showed transfer to listening span performance. However, the correlations between WM and reading before and after strategy training were statistically comparable suggesting that strategies play a minor role in predicting reading performance. Overall, these results suggest that stable strategy choices, cued performance, and strategy instruction bolster WM performance, but capacity limitations underlie RD children's performance.