

# Effects of working memory training on reading in children with special needs

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# 1. Abstract

**Purpose:** Working memory of children with special needs could be enhanced by a cognitive training program

**Hypothesis:** **High correlations** between working memory and reading comprehension skills

**Methods:** **Neuropsychological** measures and **Reading** measures

**Results:** Working memory works as a crucial factor in the reading development

## 2. Introduction

### Past

- Working memory has a limited capacity

### Present studies

- children with ADHD may benefit in their behavior from working memory training
- Increased brain activity is associated with working memory functions

# 3. Hypothesis

- Working Memory ability would **increase** through the training with **a positive effect** on children's reading comprehension skills

# 4. Methods

- Fifty-seven children with special education needs

# 4. Methods

## 4-1. Neuropsychological Measures

- A. Nonverbal reasoning ability
- B. Verbal working memory
- C. Visual-spatial working memory
- D. Response inhibition

# 4. Methods

## A. Nonverbal reasoning ability

- a. Raven's Coloured Progressive Matrices

## B. Verbal working memory

- a. Digit Span

## C. Visual-spatial working memory

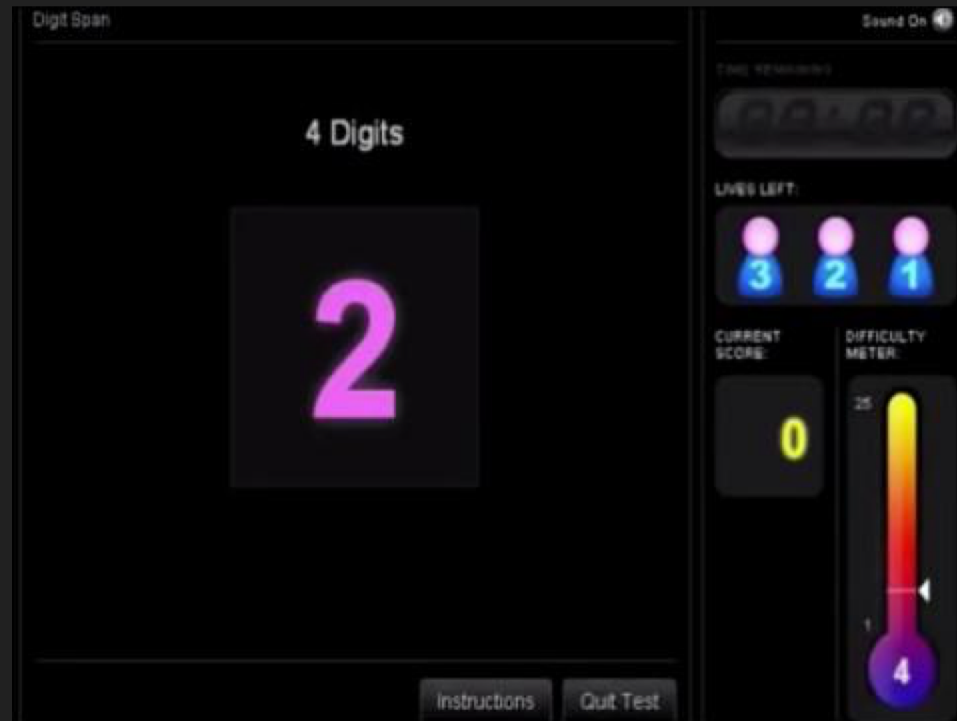
- a. Span Board

## D. Response inhibition

- a. Stroop



# Digit Span



# Spatial Span



# Stroop

RED BLUE PURPLE YELLOW  
BLACK GREEN PURPLE ORANGE  
RED GREEN BLACK BLUE  
YELLOW PURPLE PURPLE RED  
ORANGE PURPLE BLUE GREEN  
BLACK BLACK ORANGE RED

# 4. Methods

## 4-2. Reading Measures

- a. Reading comprehension
- b. Word decoding
- c. Orthographic knowledge

# 4. Methods

## A. Reading Comprehension

- a. Narrative texts from the Progress in International Reading Literacy Study

## B. Word Decoding

- a. the Phonological non-word reading test

## C. Orthographic knowledge

- a. The Orthographic verification test

# 4. Methods

## 1. Completing a set of assessments

- a. nonverbal reasoning
- b. working memory
- c. Reading

## 2. Within the same time intervals

- a. Pre-test
- b. post-test, 5–6 weeks later
- c. Post-test, 6–7 months later.

# 5. Results

- The effect of training was tested by **comparing the outcome score at post-test** in the treatment group scores **at pre-test**.
- Four measurements were improved
  - Span Board forward
  - Span Board backward
  - Digit backward
  - Nonverbal problem solving (Raven)

# 5. Results

- The treatment group enhanced its results of working memory measures
- The WM measures Span board forward and back were related to reading comprehension
- Comparison of the experimental group with an additional control group showed that the training indeed enhanced children's working memory.



# 6. Discussion

## 1. Limitation

- a. **a large difference in size** between the treatment group and the control group
  - i. including more children in the treatment group.

## 2. Practical Implication

- a. WM training may **facilitate** reading comprehension processes **directly**, and not via improvements in word-level reading processes.

# Thank you

For Your Attention