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Effectiveness of Intensive Cognitive Training on Neuropsychological Functions of School-Age Children

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Introduction

Researchers use cognitive training platforms to study the impact of the cognitive training approach on neuropsychological functioning and brain plasticity in children. The Arrowsmith Program is a cognitive intervention that aims to improve processing weaknesses through multiple exercises[1]. The program includes a task called Symbol Relations that enhances reasoning and processing speed. The current study focuses on this task and its potential to improve neuropsychological functions in school-age children.

Effects of cognitive training on executive functioning?

EFs are a set of cognitive processes, largely supported by the prefrontal cortex, that are necessary for the cognitive control of behavior[2]. Three core interrelated EF skills are:

In the current study, we focused on examining a single component of the Arrowsmith program, the Symbol Relations task, which is designed to strengthen executive functioning.

→ training in Symbol Relations would lead to generalized increases in neuropsychological functions in school-age children.

Discussion

Neuropsychological functions changes through CIP training

In summary, this exploratory study examined the effect of intensive Arrowsmith Symbol Relations training on neuropsychological measures of cognition. Our data suggest that participation in even a short, intense regimen of this cognitive training exercise stimulates beneficial changes in neuropsychological measures.

Though preliminary, our data suggest that Symbol Relations training leads to widespread changes in cognition. Studies involving neuropsychological testing are being continued to explore this possibility.

We plan to extend this study by recruiting a larger group of students, as well as by increasing the time between assessments to consider potential practice effects on other neuropsychological assessments. This will enable us to isolate and specify the underlying behavioral and neural mechanisms for the observed improvements.

Materials & Methods

Participants

Fifty-three students, age range 9-19 years (M = 13.6, SD = 2.3) were recruited from Arrowsmith Schools in Canada and the United States.

Neuropsychological Assessments

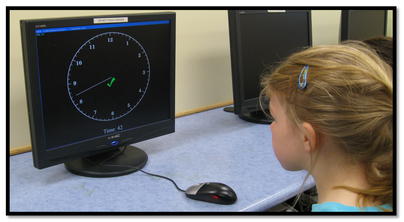
One month before and one month after the Cognitive intensive Program (CIP), executive functions were assessed using a battery of standardized neuropsychological tests.

Executive Functions

- **WJIV-Cog**
- **Creyos** (formerly Cambridge Brain Sciences)

Training

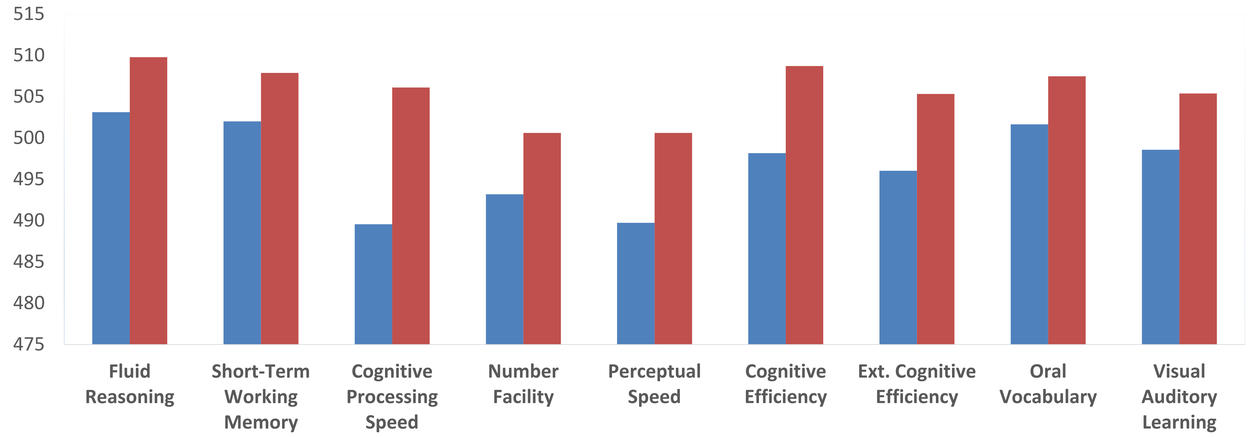
The Arrowsmith Symbol Relations Task is a visual-spatial task that gradually increases in difficulty by adding hands to an analog clock face based on accuracy. CIP students work on it for up to five hours per day, five days per week, for six weeks, to achieve proficiency.



Results

Neuropsychological functions changes

W-scores from the WJIV-Cog tests indicate significant improvements in this cohort in executive functions (pFDR < 0.05). Significant improvements were also seen in the EF-involved Spatial Planning and Double Trouble subtests of the Creyos battery ($p < 0.05$).



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References

1. Motamed Yeganeh, N., King, R., Boyd, L. A., Rose, G. M., & Weber, R. C. (2022). Symbol relations training improves cognitive functioning in students with neurodevelopmental disorders. *Applied Neuropsychology: Child*, *11*(4), 789-796.
2. Diamond, A., & Ling, D. S. (2016). Conclusions about interventions, programs, and approaches for improving executive functions that appear justified and e that, despite much hype, do not. *Developmental Cognitive Neuroscience*, 18, 34–48.

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