



Utilizing Cognitive Training to Remediate Working Memory in School-Age Children

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Introduction

Considerable research has shown that important predictors of academic success include working memory (WM) and attention skills (Gray et al., 2012). Specifically, research has shown that WM and attention skills impact reading, writing, and mathematics (Rode, Robson, Purviance, Geary, & Mayr, 2014). Moreover, some research has found that WM and attention deficits are present in children with learning differences (e.g., ADHD) (Delavarian, Bokharaeian, Towhidkhad & Gharibzadeh, 2015; Kirk, Gray, Riby & Cornish, 2012). Thus, a focus of recent research is on the remediation of attention and WM deficits through the use of game-based computerized cognitive training programs (Gray et al, 2012; Kirk et al., 2015). The results have indicated that adaptive WM training can ameliorate low working memory, attention deficits, and other symptoms related to poor learning abilities in children (Holmes, Gathercole, & Dunning, 2009; Kirk et al., 2015). The purpose of this study is to add to the emerging body of work and examine the efficacy of a school-based computerized cognitive training intervention program.

Methods

Participants

- N=17
- Age of participants ranged between seven and thirteen years.
- All participants were students from a private Southern California school serving individuals with learning differences.

Measures

Wide Range Assessment of Memory and Learning-2 (WRAML-2)

Used to assess encoding and working memory skills; the Finger Windows, Number Letter, Symbolic Working Memory, and Verbal Working Memory subtests were used.

Captain's Log

Captain's Log is a computer-based training program that utilizes adaptive game-like exercises designed to enhance a variety of cognitive skills. The adaptive nature of the program provides optimally challenging experiences so that specific abilities (e.g., working memory) may be built in a structured sequence.

Procedure

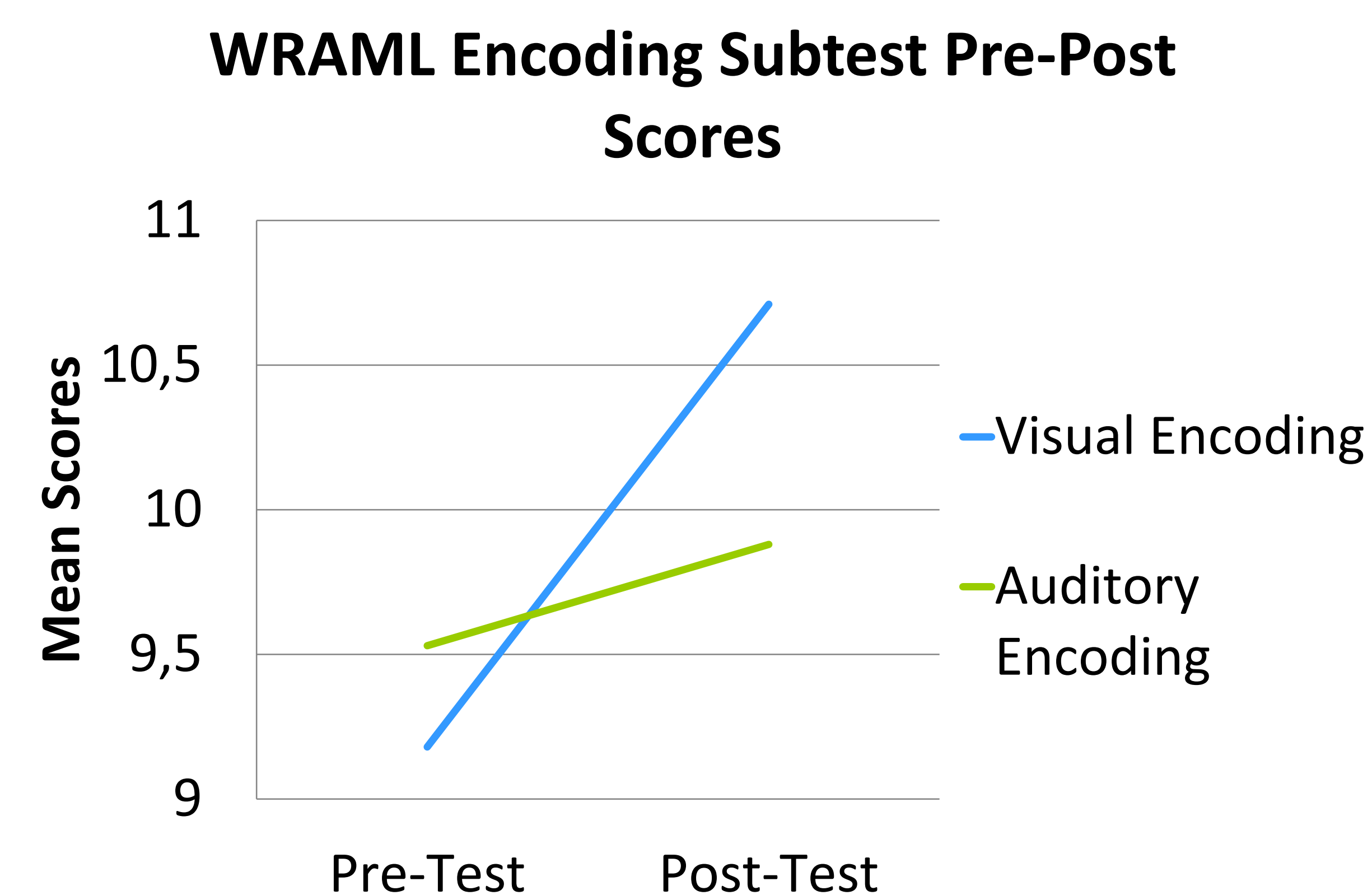
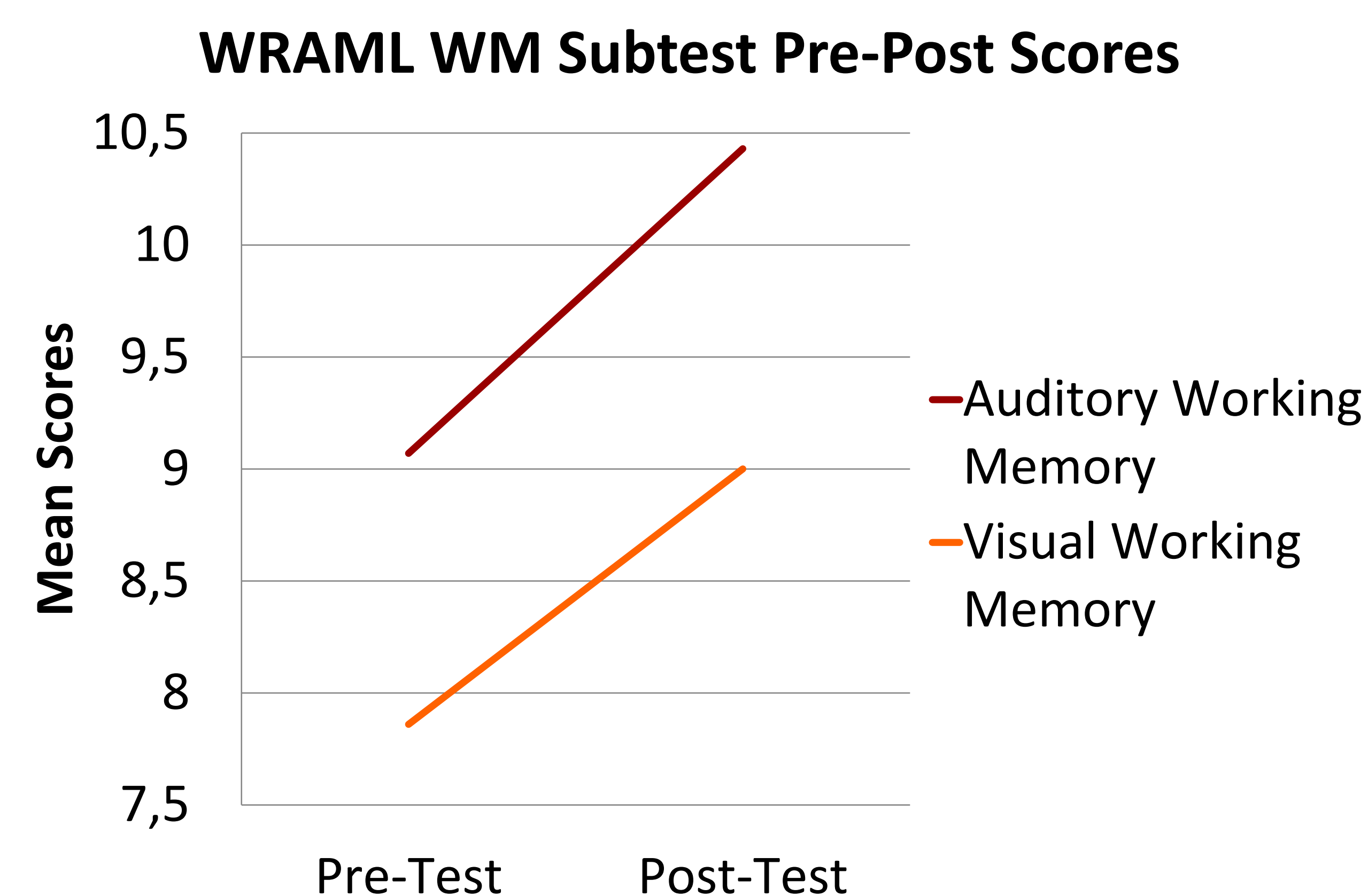
Students were pre-tested using the WRAML before initiating the cognitive training sessions. Following pre-testing, the students participated in 30-minute training sessions, four days a week, completing a total of 20 hours using the Captain's Log program. A set of visual and auditory working memory games was presented in a rotating schedule so that an equal amount of time was spent on training each skill. Trained research assistants ensured that students followed the schedule, as well as encouraged and motivated the students to stay on task. At the end of the trainings the student were re-assessed using the WRAML.

Results

Overall, the findings support the hypothesis that remediation of working memory in children with learning differences is possible through computerized-cognitive training.

	t-test	p-value	Cohen's d
Auditory Working Memory	-2.379	.033*	.476
Visual Working Memory	-2.929	.012*	.636
Visual Encoding	-2.21	.042*	.536
Auditory Encoding	-.636	.534	.121

*indicates statistical significance at the .05 level



Discussion

This project provides evidence that computerized cognitive training can be effectively integrated into the daily curriculum of school-age children. Our findings are consistent with previous research demonstrating that game-based training can remediate cognitive skills such as working memory and encoding (see Gray et al., 2012; Kirk et al., 2015; Rode et al., 2014). Moreover, this study provides further evidence (see Delavarian et al., 2015) that cognitive training can be successfully integrated into the daily curriculum; such results lay the framework for school-based executive function interventions which may play an integral role in the academic success of children. A number of issues need to be addressed in future research. These include

- the use of true control and treatment groups which will allow for a better measure of treatment efficacy
- examining near and far transfer effects to establish the generalizability of treatment effects
- the use of longitudinal studies to help clarify whether treatment effects are sustained or not

References

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