



# AOTA Evidence Briefs

## Attention Deficit/Hyperactivity Disorder

*\*A product of the American Occupational Therapy Association's Evidence-Based Literature Review Project*

### A#15

#### **Cognitive training combined with medication may reduce impulsivity in children with ADHD**

Hall, C. W., & Kataria, S. (1992). Effects of two treatment techniques on delay and vigilance tasks with attention deficit hyperactive disorder (ADHD) children. *Journal of Psychology, 126*, 17–25.

**Level: IIA1a**

Nonrandomized control trial, 2 groups, 20 or more participants per condition, high internal validity, high external validity

#### **Why research this topic?**

Questions about the long-term benefits of medication as a treatment for attention-deficit/hyperactivity disorder (ADHD) have led to alternative treatments such as behavior modification and “cognitive training” (training in strategies to control impulsive behavior). The alternatives seem promising but have their own problems; chief among them, mixed results and difficulties in generalization of behavior. Also, their acceptability has become an important concern.

#### **What did the researchers do?**

Hall and Kataria (1992), of East Carolina University and East Carolina School of Medicine (both in Greenville, North Carolina), respectively, designed a study to test the effects of two treatments, behavior modification and cognitive training, on the same children when they were on and off medication. The study also sought parents’ and children’s views on the acceptability of the treatments.

The researchers recruited 21 children who had been diagnosed with ADHD by the Learning Clinic of East Carolina School of Medicine. Eighteen were boys, 3 were girls. Their average age was 7.6 years. All were taking methylphenidate (Ritalin).

The children were randomly assigned to one of three groups: behavior modification, cognitive training, or control. All three groups performed two game-like tasks on a portable electronic unit called the Gordon Diagnostic System. One task, Delay, called for a child to delay his or her response for at least 6 seconds and thereby earn a reward. The other task, vigilance, called for the child to focus on a display of flashing numbers and press a button every time he or she saw one specific number followed by another specific number. Children in the behavior modification group received a nickel for every two correct responses on the two tasks. Children in the cognitive training group received training in how to approach the tasks. Children in the control group simply performed the tasks, without reinforcement and without training.

The researchers were interested in the following outcome areas: *capability of sustained attention* (as measured by the number of correct responses on the vigilance task); *impulsivity* (as measured by an efficiency ratio computed from responses on the delay task and separately by the number of errors of commission on the vigilance task); and *perceptions of treatment acceptability* (as measured by the Intervention Profile—Parents Questionnaire, a modification of the Intervention Rating Profile–15).

Assessors evaluated the children's performance on the Gordon Diagnostic System before the study began (using standard procedures), then twice more over the next 6–8 weeks. In the second assessment, some of the children in each group were tested while they were on medication, the others while they were off medication (at least 24 hours). In the third assessment, the children previously tested while they were on medication were tested while they were off medication, and the other children were tested while they were on medication.

### **What did the researchers find?**

When the cognitive training group was on medication, their impulsivity, as reflected by performance on the delay task, improved **significantly** (see *Glossary*).

On capability of sustained attention, there was a trend (a difference approaching but not reaching significance) toward better performance by the children in all three groups when they were on medication. On impulsivity, as reflected by performance on the vigilance task, there was a trend for children in the behavior modification group to perform better in the medication-alone condition than in the combined or intervention-alone conditions.

Parents whose children were in the cognitive training group rated the acceptability of that treatment significantly higher (marginally,  $p=.049$ ) than parents in the control group rated their children's treatment.

### **What do the findings mean?**

For therapists and other providers, the findings provide very little support for combining medication and this type of intervention. There were significant benefits on the delay task when medication was combined with cognitive training. The effect was not present, however, for behavior modification and medication on the delay task, or for either intervention and medication on the vigilance task.

### **What are the study's limitations?**

The study has two limitations. First, it addresses only short-term effects. Previous research on short-term effects has produced mixed results. More research is needed, with larger samples. Second, the interventions themselves "represent only a very small segment of what is labeled cognitive or behavioral interventions" (p. 23). Also, the sensitivity and validity of the depression measure is questionable because there was no significant effect of medication.

## **Glossary**

**significance (or significant)**—A statistical term, this refers to the probability that the results obtained in the study are not due to chance, but to some other factor (such as the treatment of interest). A significant result is likely to be generalizable to populations outside the study.

Significance should not be confused with clinical effect. A study can be statistically significant without having a very large clinical effect on the sample. For example, a study that examines the effect of a treatment on a client's ability to walk may report that the participants in the treatment group were able to walk significantly longer distances than the control group. However, if you read the study you may find that the treatment group was able to walk, on average, 6 feet, whereas the control group was able to walk, on average, 5 feet. Although the outcome may be statistically significant, a clinician may not believe that a 1-foot increase will improve his or her client's function.

■ Terminology used in this document is based on two systems of classification current at the time the evidence-based literature reviews were completed: *Uniform Terminology for Occupational Therapy Practice—Third Edition* (AOTA, 1994) and *International Classification of Functioning, Disability and Health (ICIDH-2)* (World Health Organization [WHO], 1999). More recently, the *Uniform Terminology* document was replaced by *Occupational Therapy Practice Framework: Domain and Process* (AOTA, 2002), and modifications to *ICIDH-2* were finalized in the *International Classification of Functioning, Disability and Health* (WHO, 2001).

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