



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

**Medication and behavior therapy, alone or together, improve classroom behavior of children with Attention Deficit/Hyperactivity Disorder (ADHD)**

**CITATION:** Carlson, C. L., Pelham, W. E., Milich, R., & Dixon, J. (1992). Single and combined effects of methylphenidate and behavior therapy on the classroom performance of children with attention-deficit hyperactivity disorder. *Journal of Abnormal Child Psychology*, 20(2) 232.

**LEVEL OF EVIDENCE: IA1a**

**RESEARCH OBJECTIVE/QUESTION**

Single and combined effects of two interventions (stimulants and behavioral intervention) in the treatment of ADHD.

**DESIGN**

|  |        |   |              |  |                 |
|--|--------|---|--------------|--|-----------------|
|  | RCT    |   | Single case  |  | Case control    |
|  | Cohort | X | Before-after |  | Cross-sectional |

RCT = randomized control trial  
A counterbalance design was used.

**SAMPLING PROCEDURE**

|   |            |  |             |
|---|------------|--|-------------|
|   | Random     |  | Consecutive |
| X | Controlled |  | Convenience |

DSM-III criteria

**SAMPLE**

|      |                                  |         |              |          |
|------|----------------------------------|---------|--------------|----------|
| N=24 | Age=110 months<br>(SD=17 months) | Male=24 | Ethnicity=NR | Female=0 |
|------|----------------------------------|---------|--------------|----------|

NR=Not reported

## **PARTICIPANT CHARACTERISTICS**

Seven participants met criteria for a codiagnosis of conduct disorder, and an additional 12 met criteria for a diagnosis of oppositional disorder but not conduct disorder.

## **MEDICAL DIAGNOSIS/CLINICAL DISORDER**

ADHD

## **OT TREATMENT DIAGNOSIS**

N/A

## **OUTCOMES**

Behavioral and academic performance of children with ADHD

| <b>Measures</b>   | <b>Reliability</b>  | <b>Validity</b>      |
|---|---|----------------------|
| 1) Behavioral measures: Classroom Observations of Conduct and Attention Deficit Disorders (COCADD) Observational Scheme (adapted) direct observations of physical aggression/intrusion, verbal intrusion, talking to self, and leaving seat<br>2) Academic measures: Timed arithmetic task, timed reading task, and assigned seat work<br>3) Self-rating: a self-rating questionnaire was administered to participants each day | $r = .92$ (on-task)<br>$r = .96$<br>(disruptive behavior) | Y, but not discussed |

### **Outcome—OT terminology**

Performance areas:

- Work and productive activities
- Educational activities

Performance components:

- Psychosocial skills and psychological components: social and self-management
- Cognitive integration and cognitive components

### **Outcome—ICIDH-2 terminology**

Impairments

Activity limitations

## **INTERVENTION**

- Stimulant medication (placebo vs. 0.3 and 0.6)
- Behavioral therapy (behavior therapy and regular class)

### **Description**

- Classroom procedures: 6 different classes
- Behavioral management conditions: classrooms were managed with a comprehensive behavior management program consisting of social and token (point) reinforcement, classroom structure, rules, feedback, time out, home-based daily report program.

## **Who delivered**

- Developmental specialists
- Undergraduate research assistants

## **Setting**

School

## **Frequency**

- 60 min classes
- Children in the summer program were grouped together with peers of similar age; each group of 12 children participated in a variety of recreational and academic activities throughout the day.

## **Duration**

8-week intensive summer program

## **Follow-up**

N/A

## **RESULTS**

- Analyses revealed a main effect of medication and a trend for a main effect of behavior modification condition, for on-task behavior.
- Analyses of disruptive behavior revealed main effects for behavior modification condition and medication as well as a significant behavior modification by medication interaction.
- Follow-up analyses were conducted to compare performance in each of 2 classroom settings for each dosage of methylphenidate (MPH). These analyses revealed a similar pattern of results for the two variables.

### Full behavior modification condition:

- a) Lower rates of on-task behavior on placebo than on 0.3 mg/kg or 0.6 mg/kg MPH
- b) Rates of disruptive behavior on placebo were significantly higher than on 0.6 mg/kg and showed a trend toward being higher than on 0.3 mg/kg. No differences in on-task or disruptive behavior were found between the 2 MPH dosages.

### Regular classroom setting:

- a) Children on 0.6 mg/kg displayed significantly higher rates of on-task and lower rates of disruptive behavior than those on 0.3 mg/kg.
- b) Children on placebo showed significantly poorer performance on both measures than children on either 0.3 mg/kg or 0.6 mg/kg MPH.

### Academic measures:

- a) Significant main effects of medication were found for number of timed math problems attempted, timed reading percentage correct, and percentage of seatwork completed.
- b) Follow-up comparisons of medication effects revealed that children on placebo performed more poorly than those on 0.3 mg/kg or 0.6 mg/kg, with no significant differences in performance found between the 2 MPH dosages.

### Self-rating measures:

- a) Analyses revealed main effects of behavior modification condition on question 8 (How fair was the teacher to you today?)
- b) Significant effects on medication were found for Question 3 (How well did you follow the rules in class today?)
- c) Follow-up analyses revealed that children receiving 0.3 mg/kg or 0.6 mg/kg MPH rated themselves as performing better, trying harder, following rules better, completing more work, and working more accurately than those on placebo. In addition, children on 0.6 mg/kg MPH perceived that their pill helped more and their teachers were fairer than did children on placebo.

## **CONCLUSIONS**

- Children showed significantly higher rates of on-task behavior, lower rates of disruptive behavior, and higher rates of following rules when receiving MPH than when receiving placebo. The medication effects on on-task and disruptive behavior interacted with classroom setting such that in regular classroom settings, increasing the dose of MPH had a linear effect of increasing dosage.
- The study seems to suggest that low dosages of MPH are sufficient to maximally improve children's behavior when behavioral classroom techniques are used.

## **LIMITATIONS**

All subjects had prior exposure to the behavior modification classroom in the 5 weeks prior to the observation weeks. Nineteen of the 24 subjects also had one other psychiatric diagnosis (either conduct disorder [CD] or oppositional defiant disorder [ODD]), perhaps limiting the generalizability of the results to the ADHD population that is comorbid for CD or ODD.

- 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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For more information about the Evidence-Based Literature Review Project, contact the Practice Department at the American Occupational Therapy Association, 301-652-6611, x 2040.

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