Stimulant medication enhances the ability of children with AttentionDeficit/Hyperactivity Disorder to attend to a task

CITATION: Solanto, M., Wender, E., & Bartell, S. S. (1997). Effects of methylphenidate and behavioral contingencies on sustained attention-deficit hyperactivity disorder: A test of the reward dysfunction hypothesis. *Journal of Child and Adolescent Psychopharmacology, 7,*123–136.

LEVEL OF EVIDENCE: IA1a

RESEARCH OBJECTIVE/QUESTION
To test the effects of contingency manipulation on a laboratory measure of attention in children with ADHD; to compare these effects to those of methylphenidate (MPH) on the same task; to examine possible interaction between the contingency schedule and drug interventions.

DESIGN

X			Single case		Case control
	Cohort	X	Before–after		Cross-sectional

2 x 2 factorial design with 2 levels of drugs and 2 levels of behavioral intervention

SAMPLING PROCEDURE

	Random		Consecutive
X	Controlled		Convenience

SAMPLE

N = 22	M range = 6–10 years	Male = 19	Ethnicity: 16 = White, 5 = Hispanic, 1 = Asian Indian	Female = 3

PARTICIPANT CHARACTERISTICS

- 8 had ADHD only
- 7 had oppositional defiant disorder (ODD)
- 4 had anxiety
- 2 had ODD + anxiety
- 1 had ODD + dysthymia + anxiety

MEDICAL DIAGNOSIS/CLINICAL DISORDER
- ADHD (DSM-III)
- Comorbidity with ADHD

OT TREATMENT DIAGNOSIS
Fine motor difficulties (handwriting), attention to tasks (classroom)

OUTCOMES
Sustained attention

Measures	Reliability	Validity
Continuous Performance Test (CPT)* [computer program] with auditory feedback	NR	NR

NR = Not reported
*****CPT has been used in several studies.

Outcome—OT terminology
Performance components:
- Cognitive integration and components

Outcome—ICIDH-2 terminology
- Impairments

INTERVENTION
Computer targets were presented. Participants were asked to press a button on a joystick when a white S followed by a blue T appeared on the screen.
- Auditory feedback during game.
- Behavioral contingencies consisted of pennies that could be exchanged for desired toys.
- MPH consisted of 0.6 mg/kg.

Description
- Ability to discriminate between target and false targets.
- CPT training session.
- Test session: Participants who had stimulants prescribed were asked to abstain from their usual dosage for a least 1 full day before testing.
- Each session consisted of 10 trial blocks.

Conditions:

a. Placebo + feedback
b. Placebo + contingencies
c. Drug + feedback
d. Drug + contingencies

Who delivered
Not specified

Setting
Classroom-like setting (laboratory)

Frequency
On each of the 4 test days (which occurred 2 times weekly), each participant was tested at baseline and again on 1 of the 4 treatments.

Duration
2 weeks

Follow-up
N/A

RESULTS

- MPH produced increases in mean hit rate and the ability to discriminate between the target and the false target (measured as *d*')
- Behavioral intervention, comprised of reward + response cost, increased the mean level of CPT performance, indexed by *d*', and had no effect on the false-alarm rate.
- Examination of performance over time revealed that the deterioration in *d*', which was seen at baseline and in the placebo + treatment condition, was forestalled by MPH but not by administration of the exogenous contingencies of reinforcement + response cost.
- Task-irrelevant and other disinhibited behaviors, as measured by CPT behavior checklist, were reduced by MPH but not by the contingencies.
- Contingencies were less effective than MPH in increasing mean *d*'. Furthermore, the addition of the contingencies to the drug treatment did not yield a further increment in performance.

CONCLUSIONS

- Contingency treatment improved mean *d* as compared to placebo + feedback but, in contrast, had no effect on the slope of performance deterioration.
- Addition of contingencies to MPH improved sustained attention on a laboratory task (and reduced task-irrelevant and other disinhibited behaviors), whereas behavioral contingencies did not.

LIMITATIONS

Absence of a non-ADHD group prevents statements about whether treatments act specifically on factors related to ADHD. Sample size was small (22), and participants were not assessed for comorbidity.

- 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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