

DOCUMENT RESUME

ED 409 681

EC 305 727

AUTHOR Stern, Catherine; And Others  
TITLE Qualitative Analysis of Graphomotor Output in Children with Attentional Disorders.  
INSTITUTION Brown Univ., Providence, R.I.  
PUB DATE 96  
NOTE 7p.; Paper presented at the Annual Convention of the American Psychological Association (104th, Toronto, Ontario, Canada, August 1996).  
PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)  
EDRS PRICE MF01/PC01 Plus Postage.  
DESCRIPTORS \*Attention Control; \*Attention Deficit Disorders; Conceptual Tempo; Disability Identification; Elementary Education; \*Hyperactivity; \*Perceptual Motor Learning; Qualitative Research; Screening Tests; Visual Perception  
IDENTIFIERS \*Repeated Patterns Test

ABSTRACT

Graphomotor output was assessed in children with attentional problems using the Repeated Patterns Test (RPT). Forty-eight subjects, ages 8 to 13, who met standard criteria for Attention Deficit Hyperactivity Disorder (ADHD), participated, of whom 24 had primarily Inattentive Type and 24 had Combined Type ADHD. Both groups had intact visuomotor integration and visual perception abilities. Results revealed that, compared to age-matched normally developing children, both groups demonstrated impairments on this test. The additional feature of hyperactivity further impaired performance. It was concluded that the differences between groups on the RPT reflect underlying inattention, impulsivity, and/or executive dysfunction typically associated with Attention Deficit Disorder. The RPT was judged to be a sensitive tool for the evaluation of graphomotor output in children with attention problems and possibly a valuable instrument to include in assessments. (Author/DB)

\*\*\*\*\*  
\* Reproductions supplied by EDRS are the best that can be made \*  
\* from the original document. \*  
\*\*\*\*\*

**QUALITATIVE ANALYSIS OF GRAPHOMOTOR OUTPUT IN CHILDREN WITH ATTENTIONAL DISORDERS.**

ED 409 681

**Catherine Stern, Ph.D., Ann C. Marcotte, Ph.D.,  
Carolyn Brenner, B.S., and Amy Grabow**

**Brown University School of Medicine and Department of Pediatrics,  
Memorial Hospital of Rhode Island**

Graphomotor output was assessed in children with attentional problems using the Repeated Patterns Test. Forty-eight subjects between the ages of 8 - 13, meeting DSM-IV criteria for Attention Deficit Hyperactivity Disorder participated. Twenty-four subjects had primarily Inattentive Type and 24 had Combined Type. Both groups had intact visuomotor integration and visual perception abilities. Results revealed that compared to normal children, both groups demonstrated impairments on this test. The additional feature of hyperactivity further impaired performance. The RPT is a sensitive tool for the evaluation of graphomotor output in children with attentional problems, and may be a valuable instrument to include in assessments.

**Please note: This paper was presented at the 104th Annual Convention of the American Psychological Association, Toronto, Ontario, Canada, August, 1996.**

PERMISSION TO REPRODUCE AND  
DISSEMINATE THIS MATERIAL  
HAS BEEN GRANTED BY

C. Stern

TO THE EDUCATIONAL RESOURCES  
INFORMATION CENTER (ERIC)

U.S. DEPARTMENT OF EDUCATION  
Office of Educational Research and Improvement  
EDUCATIONAL RESOURCES INFORMATION  
CENTER (ERIC)

- This document has been reproduced as received from the person or organization originating it.
- Minor changes have been made to improve reproduction quality.

- Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

EC 305 727

# QUALITATIVE ANALYSIS OF GRAPHOMOTOR OUTPUT IN CHILDREN WITH ATTENTIONAL DISORDERS

## Introduction

The constellation of behaviors typically associated with Attention Deficit Hyperactivity Disorder (ADHD) include inattention, impulsivity and hyperactivity. These behaviors are manifested across a range of cognitive and behavioral domains. In a number of neuropsychological studies, children with ADHD have been shown to demonstrate a difficulties in fine motor control which has been reflected in poor performance on tasks sensitive to fine motor dexterity as well as in poor handwriting. The Repeated Patterns Test (RPT) has been shown to be an efficient and reliable way to assess graphomotor-output in children (Waber and Bernstein, 1994). In their study, Waber and Bernstein demonstrated that children referred to a learning disabilities clinic could be reliably distinguished from an age and gender matched normal control group on this easy to administer test. Specifically, children with LDs were shown to have difficulty, relative to normal peers, in the generation of a continuous pattern. Waber and Bernstein speculate that the RPT may be sensitive to both attentional and motor functions, in that this test allows one to observe a child's ability to sustain a repetitive motor activity, as well as to successfully inhibit one motor movement in order to begin another.

To this end, we examined the RPT performance of children between the ages of 8 and 13 who had been diagnosed with Attention Deficit Disorder (Combined Type; ADHD) or Attention Deficit Disorder (Inattentive Type; ADD). We hypothesized that both groups would have difficulty on this task relative to a normal controls. We further hypothesize that the addition of hyperactivity would serve to adversely impact performance on this test.

## Method

**Subjects.** Subjects were identified retrospectively from clinic files and were included in the study if they met DSM-IV (APA, 1994) criteria for ADHD and the inclusionary criteria described below. All clinical subjects were seen for evaluation in a Neurodevelopmental Clinic at a metropolitan university-affiliated medical center.

All subjects had obtained a Full Scale IQ (on either the WISC-R, WISC-III or Stanford Binet) of greater than 80. If no IQ score was available, a child was included only if he or she had never been referred for special education testing. All subjects spoke English as their primary language. No subject was on medication for the treatment of ADHD at the time of their evaluation. Selection for inclusion in this study was made without knowledge of subjects' performance on any of the neuropsychological tests.

A total of 48 subjects, between the ages of 8 and 13 were included in the study. Twenty four subjects (16 male and 8 female, mean age in years = 10.8) were diagnosed as having ADD. Twenty four subjects (20 male and 4 female, mean age in years = 9.8) were diagnosed as having ADHD. The difference in age between the two groups did not reach statistical significance. The gender distribution of the subjects in this study is generally consistent with those reported for children with ADHD, i.e. three to four times as many males as females (APA, 1994). Demographics are summarized in Table 1.

**Table 1: Subject Demographics**

	ADD	ADHD
<b>N</b>	24	24
<b>Gender: Male</b>	16	20
<b>Female</b>	8	4
<b>Age: Mean (in years)</b>	10.8	9.8
<b>SD</b>	1.8	1.8
<b>Range</b>	8-13 years	8-13 years

**Procedure.** To rule out the possibility that deficits in visuospatial perception or visual motor integration might affect subjects performance on the RPT, we examined the subjects' performance on the Hooper Visual Organization Test (HVOT; Hooper, 1958) and the Beery Developmental Test of Visual Motor Integration (VMI; Beery, 1989). The RPT (see Figure 1) was administered as described by Waber and Bernstein (1994). All tests were administered as part of a larger battery of neuropsychological tests.

**Figure 1: Repeated Patterns Test**



**Data Reduction.** The HVOT and VMI were scored in the standard manner.

Normative data published by Kirk (1992) was used for the HVOT and normative data published by Beery (1989) was used for the VMI. For the RPT data, the quality of each of the five patterns was scored on the basis of a 5-point rating scales using templates provided by Waber and Bernstein (1994). Each of the five patterns was scored by three independent raters, for a total of 240 ratings. Raters were blind to subject diagnosis, age and gender. On 85% of the ratings, the three raters were in exact agreement (34%) or two of the three raters were in exact agreement with the

third score deviating by one point (51%). For each pattern, an average score was calculated based on upon the three independent ratings. The scores for each of the five patterns were summed to generate a single global quality score for each subject. Z-scores were calculated using the appropriate age and gender norms published by Waber and Bernstein (1994).

## Results

Data for the three tests are presented in Table 2. In both groups of subjects, there was no evidence of impairment in visual perception or visual construction as demonstrated by performances falling within the average range on the HVOT and VMI. Thus performance on the RPT was not influenced by underlying deficits in visual perception or visuomotor integration.

**Table 2: Neuropsychological Data**

	ADD	ADHD
Mean VMI (standard score)	97.3	92.8
SD	10.8	8.2
Mean HVOT (z score)	.27	-.02
SD	1.24	.85
RPT (z score)	-1.08	-2.43
SD	.63	1.7

On the RPT, both subjects with ADHD and ADD earned significantly lower quality scores as compared to normative data, with z scores falling greater than one mean below the normative population. A statistically significant difference was found between the quality of subjects with ADHD and ADD, with subjects with ADHD earning significantly lower scores,  $F(1,46) = 9.32, p < .01$ .

## Discussion

In summary, this quick, easy to administer to test served to reliably distinguish a group of children with ADD and ADHD from age-matched controls. The lower performance of the two groups does not appear to be accounted for by frank deficits in visual-motor integration or visual perception. Rather the differences between the two groups on the RPT reflects underlying inattention, impulsivity and or executive dysfunction that is typically associated with Attention Deficit Disorder. Furthermore, the results of this study suggests that the additional component of hyperactivity incrementally impairs performance on the RPT. Ultimately, the RPT may be a useful device to add to a comprehensive neuropsychological battery for screening of attentional disorders and may be a time efficient and economic tool for the determination of medication effects in this population.

## References

- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th edition). Washington, DC.
- Hooper, H.E. (1958). The Hooper Visual Organizational Test Manual. Los Angeles, CA: Western Psychological Services.
- Kirk, U. (1992). Evidence for early acquisition of visual organization ability: A developmental study. The Clinical Neuropsychologist, *6*(2), 171-177.
- Beery, K.E. (1989). The Developmental Test of Visual Motor Integration. Modern Curriculum Press, Cleveland.
- Waber, D.P., & Bernstein, J.H. (1994). Repetitive graphomotor output in learning-disabled and nonlearning-disabled children: The repeated patterns test. Developmental Neuropsychology, *10*(1), 51-65.



# REPRODUCTION RELEASE

(Specific Document)

EC 305727

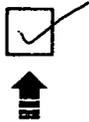
## I. DOCUMENT IDENTIFICATION:

Title: Qualitative analysis of graphomotor output in children with attentional disorders	
Author(s): C. Stern, A.C. Marcotte, C. Breunel, A.N. Grabow	
Corporate Source:	Publication Date: 6/96

## II. REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system, *Resources in Education* (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic/optical media, and sold through the ERIC Document Reproduction Service (EDRS) or other ERIC vendors. Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to the document.

If permission is granted to reproduce and disseminate the identified document, please CHECK ONE of the following two options and sign at the bottom of the page.



Check here  
**For Level 1 Release:**  
Permitting reproduction in microfiche (4" x 6" film) or other ERIC archival media (e.g., electronic or optical) and paper copy.

The sample sticker shown below will be affixed to all Level 1 documents

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

\_\_\_\_\_ Sample \_\_\_\_\_

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

Level 1

The sample sticker shown below will be affixed to all Level 2 documents

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN OTHER THAN PAPER COPY HAS BEEN GRANTED BY

\_\_\_\_\_ Sample \_\_\_\_\_

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

Level 2



Check here  
**For Level 2 Release:**  
Permitting reproduction in microfiche (4" x 6" film) or other ERIC archival media (e.g., electronic or optical), but not in paper copy.

Documents will be processed as indicated provided reproduction quality permits. If permission to reproduce is granted, but neither box is checked, documents will be processed at Level 1.

"I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce and disseminate this document as indicated above. Reproduction from the ERIC microfiche or electronic/optical media by persons other than ERIC employees and its system contractors requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service agencies to satisfy information needs of educators in response to discrete inquiries."

Sign here → please

Signature: 	Printed Name/Position/Title: Catherine Stern, Ph.D. Fellow in Pediatric Neuropsychology	
Organization/Address: Brown University School of Medicine Memorial Hospital of Rhode Island Dept. of Pediatrics 111 Brewster St Pawtucket RI 02860	Telephone: 401-729-2831	FAX: 401-729-2854
	E-Mail Address: Catherine_Stern@Brown.edu	Date: 3-5-97





**COUNSELING  
and  
STUDENT SERVICES  
CLEARINGHOUSE**

**School of Education  
101 Park Building  
University  
of  
North Carolina  
at Greensboro  
Greensboro, NC  
27412-5001**

**Toll-free: (800)414-9769  
Phone: (910) 334-4114  
Fax: (910) 334-4116  
INTERNET:  
ERICCASS@IRIS.UNCG.EDU**

**Garry R. Walz, Ph.D., NCC  
Director  
Jeanne Bleuer, Ph.D., NCC  
Associate Director**

*Improving  
Decision Making  
Through  
Increased Access  
to Information*

**ERIC®**



November 11, 1996

Dear 1996 APA Presenter:

The ERIC Clearinghouse on Counseling and Student Services invites you to contribute to the ERIC database by providing us with a written copy of the presentation you made at the American Psychological Association's 104th Annual Convention in Toronto August 9-13, 1996. Papers presented at professional conferences represent a significant source of educational material for the ERIC system. We don't charge a fee for adding a document to the ERIC database, and authors keep the copyrights.

As you may know, ERIC is the largest and most searched education database in the world. Documents accepted by ERIC appear in the abstract journal Resources in Education (RIE) and are announced to several thousand organizations. The inclusion of your work makes it readily available to other researchers, counselors, and educators; provides a permanent archive; and enhances the quality of RIE. Your contribution will be accessible through the printed and electronic versions of RIE, through microfiche collections that are housed at libraries around the country and the world, and through the ERIC Document Reproduction Service (EDRS). By contributing your document to the ERIC system, you participate in building an international resource for educational information. In addition, your paper may be listed for publication credit on your academic vita.

To submit your document to ERIC/CASS for review and possible inclusion in the ERIC database, please send the following to the address on letterhead:

- (1) Two (2) laser print copies of the paper,
- (2) A signed reproduction release form (see back of letter), and
- (3) A 200-word abstract (optional)

Documents are reviewed for contribution to education, timeliness, relevance, methodology, effectiveness of presentation, and reproduction quality. Previously published materials in copyrighted journals or books are not usually accepted because of Copyright Law, but authors may later publish documents which have been acquired by ERIC. Finally, please feel free to copy the reproduction release for future or additional submissions.

Sincerely,

  
Jillian Barr Joncas  
Acquisitions and Outreach Coordinator