PERFORMANCE OF CHILDREN EXPERIENCING SCHOOL WORK DIFFICULTY ON THE GRAHAM-KENDALL MEMORY-FOR-DESIGNS TEST

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Abstract

School children, ages 9 to 12, were examined for possible differences related to school learning difficulty as measured by the Graham-Kendall Memory-For-Designs Test (MFD). The MFD performance of three 15-member groups, one experimental and two controls, was compared. A null hypothesis that no significant differences on MFD performance exist between experimental and control groups was adopted for this study. It was further hypothesized that no significant differences exist between these groups on levels of administration, timed (memory) or untimed (copying). Utilizing a 2 x 3 analysis of variance, no significant differences were observed between groups on MFD performance. Additionally, the analysis of variance supported the hypothesis of no significant differences between groups when comparing levels of test administration. Study findings resulted in the following conclusions. First, the MFD does not seem to be a reliable research instrument for the study of learning disorders in children and has questionable usefulness in a test battery for the clinical study of learning disabled children. Second, the MFD does not gain in usefulness when it is administered as a copying technique. Third, performance on the timed administration seemed unrelated to performance on the untimed administration.

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Compulsory school attendance laws have made education the primary occupation of American children. For most children (those who adjust well to the school situation and who successfully resolve doubts and fears concerning their new environment), the school experience is a good one. A healthy motivation toward learning is created in these children and motivation, of course, is one of the factors most commonly associated with academic and personal success.

There is another group of children, however, for whom the initial school experience is not a good one. These are the children who show some degree of learning difficulty. Such disturbances are more prevalent than previously realized and are found four times more frequently among boys than among girls, especially in reading (Coville, Costello, and Rouke, 1960).

The principal learning disturbances are subject disabilities in reading, writing, arithmetic, and spelling. Because these subjects provide the basic tools for almost all subsequent educational development, these deficiencies not only are problems in themselves, but also may lead to the development of secondary problems. Broadly speaking, their primary causation may be either psychological or organic, although most often it seems to be of a psychological nature (Koppitz, 1958). Specific causative factors will vary widely depending upon the concepts and areas of specializations of the particular "expert" consulted. Wide disagreement exists among so-called "experts" as to the nature and cause of learning disability. One point upon which all experts readily agree is that early detection and identification of

learning disabled children is essential. From this point, it naturally follows that a psychological measure which accurately and reliably predicts learning difficulties can serve a useful and valuable function. This study looks at one such instrument, the Graham-Kendall Memory-For-Designs Test (MFD), and examines its usefulness as a predictor of learning deficiency.

Historical Review

The reproduction of geometric designs has been shown by various researchers to be of great diagnostic value for some pathological conditions (Bender, 1958; Lord and Wood, 1942; Graham and Kendall, 1960). Visual memory has also been shown to be of prime importance in dealing with school difficulties and other types of learning problems (Wood and Schulman, 1940). One of the earliest clinical researchers was Lauretta Bender (1938). Adopting an approach which tested the teachings of the gestalt psychology school represented in the works of Wertheimer, Koffka, and Kohler, Dr. Bender offered to children, adults, and mentally defective and emotionally disturbed patients, visually perceived configurations with the request that the designs be copied (Bender, 1938). There were nine of these patterns in all adapted from Wertheimer's classical 1923 paper (Bender, 1938). Dr. Bender believed that the final product or individual reproductions of these patterns revealed modifications of the original pattern according to, "the integrating mechanism of the individual who has experienced it" (Bender, 1938, p. 3).

Working with a Miss Anita Ruben, Dr. Bender standardized the Visual-Motor Gestalt Test on eight hundred school and nursery children (Bender, 1938). The intent was to develop a maturation test of performance in the visual-motor gestalt function at an age when the language function including reading and writing is developing. Children, ages three to eleven, were tested in suburban schools, public day nurseries, and hospital wards and out-patient departments of the pediatric and psychiatric departments of Bellevue City Hospital (Bender, 1938). In summary, this study found that children below the age of eleven reproduced these designs in a way that differed from older children and adults. Children at the age of eleven were found to reproduce all the designs adequately with the adults adding only certain perfections in motor skill and detail in size and distance (Bender, 1938).

The usefulness of the Bender Visual-Motor Gestalt Test (BV-MG) in discovering problems that are primarily due to problems in visual-motor perception was explored in a later study by Elizabeth Koppitz (Koppitz, 1958). Using the BV-MG test, Koppitz attempted to differentiate between children whose achievement in reading, writing and spelling was above average, and those below average (Koppitz, 1958). Koppitz (1958) asserted on the basis of this study that above average and below average students in the first four grades can be significantly differentiated by use of the BV-MG test.

In 1962, Aileen Clawson published a manual, The Bender Visual-Motor Gestalt Test For Children, the contents of which pertain

exclusively to the characteristics of children's productions on the test. Now in its sixth printing, the manual contains sample reproductions, clinical observations, experimental findings, and a sample record form (Clawson, 1962).

In 1963, Tolar and Schulberg published an evaluative review of the research which has been derived from the BV-MG test. Tolar and Schulberg (1963) concluded from their review that the BV-MG appeared to be a logical choice for studying many aspects of school achievement and the Bender Visual-Motor Gestalt Test was in some way related to school performance, especially reading.

Dr. Bender was not alone in the study of visual memory and geometric design reproduction. Louise Wood and Edythe Schulman (1940) reported that, "Experience with school difficulties and other types of learning problems has shown that visual memory is one of the important factors to be considered" (p. 591). These two researchers discovered testing of this function was limited by the scarcity of standardized measures and found the Ellis Visual Designs Test to be the only available measure of visual memory (Wood and Schulman, 1940). The test had not been standardized and it was from the study conducted by Wood and Schulman (1940) that the Ellis Visual Designs Test took its standard form. They concluded in their discussion section that the Ellis Visual Designs Test might be useful, "in bringing to light visual disabilities in memory and reproduction" (Wood and Schulman, 1940, p. 602).

Subsequent researchers, Elizabeth Lord and Louise Wood, used the Ellis Visual Designs Test as they searched for a mental test which would reveal a fundamental organic defect which they hoped would always be associated with poor school work (Lord and Wood, 1942). Their work compared case histories and data collected from two studies made independently, one in a children's hospital, the other in a child guidance center in Boston (Lord and Wood, 1942). A clinical pattern had been observed in which children with an organic defect showed a good intelligence rating in contrast to extreme difficulty on the Ellis Visual Designs Test (Lord and Wood, 1942). Often children referred to the hospital Out-Patient Department as school problems, presented a similar pattern of abilities and disabilities on the psychological tests (Lord and Wood, 1942).

The conclusions drawn by Lord and Wood were (1) that the Ellis Visual Designs Test could be a valuable aid in diagnosing organic defects and (2) that the test seemed to be a sensitive indicator of poor integration (Lord and Wood, 1942). A strong suggestion was made that this poor integration was probably associated with, or fundamental to, poor concentration and poor execution of written work in all school subjects (Lord and Wood, 1942).

Of the two tests just described, the BV-MG appears to be the visual-motor test most favored by researchers and clinicans in the study of organic or pathological conditions (Anglin, Pullen, and Games, 1965). Subsequent research has broaden its application to many other areas of study and the BV-MG has become the standard of comparison for other tests of the visual-motor function (Anglin, Pullen, and Games, 1965; Quattlebaum, 1968; McManis, 1974).

Graham-Kendall Memory-For-Designs Test

The Graham-Kendall Memory-For-Designs Test (MFD) developed by Francis Graham and Barbara Kendall is another test which involves the presentation of simple geometric designs and the reproduction of these designs from memory. The manual for the MFD was first published in 1946 but was presented in revised form in 1960 (Graham and Kendall, 1960). The latter manual consolidated material from earlier articles on standardization and validity of the test and included the results of additional experience gained from its use as a clinical and research tool (Graham and Kendall, 1960).

Originally the MFD was intended to be a reliable research instrument to determine if an inability to reproduce simple geometric designs was associated with organic impairment and, in the event it proved useful, as an addition to a test battery for the clinical study of possibly brain-damaged patients (Graham and Kendall, 1960). According to the authors, "An effort was made, not to measure some function of theoretical significance, but rather to crystallize in the scoring system those differences in response to the test which distinguished criterion groups" (Graham and Kendall, 1960, p. 148).

A group of 70 mixed brain-disordered patients were matched for age, education, and occupation with a group of 70 controls (Graham and Kendall, 1960). Subjects for the standardization study were obtained by referral from private physicians and from various St. Louis clinics and hospitals, chiefly from neuropsychiatric services (Graham and Kendall, 1960). Cases were included only when there was evidence of an organic syndrome, i.e. impaired intellectual function manifested in confusion, disorientation, recent memory defect, poor judgment, etc., or of convulsive symptomatology, and there were positive findings from at least one of three other methods of examination: 1) information from neurological examination of abnormal

sensorimotor or reflex behavior suggesting a lesion in central nervous tissue; 2) information from history and laboratory tests permitting identification of an etiological agent; and 3) information from x-ray studies, electroencephalogram, craniotomy, or pathological examination confirming and/or localizing the lesion (Graham and Kendall, 1960). The diagnoses of individual brain-disordered patients were credited to the examining physicians at the installations from which the subjects were obtained (Graham and Kendall, 1960).

The present manual (1960) combined data from new samples with data from the two original groups permitting comparison of brain-disordered groups with control groups and making for more homogeneous subgroups of both (Graham and Kendall, 1960).

Results of independent research by Barbara Kendall (1948) revealed no significant correlation between reading difficulty and MFD performance in children from 6 to 16 years of age. On this basis, cases of reading disability were included in population samples in the normative studies of the MFD Test (Graham and Kendall, 1960).

By 1948, and before the manual was presented in revised form in 1960, Graham and Kendall (1960) advocated a more practical method of controlling for age and intellectual development. They found, by calculating the multiple regression of chronological age and vocabulary test score, that it was possible to predict for each subject the performance which would be commensurate with his/her age and vocabulary level (Graham and Kendall, 1960). Graham and Kendall (1960) reasoned that the difference between the predicted

score and the actual score would give a measure of the individual's performance freed from the effects of age and intellectual development. Tables were included in the revised manual to permit easy calculation of these difference scores (Graham and Kendall, 1960).

An effort was made to devise a scoring system that would detail those differences in response to the test which distinguished criterion groups (Graham and Kendall, 1960). (see Appendix A for scoring instructions).

Data from the population samples presented in the revised manual indicated that the MFD significantly and reliably differentiated brain-disordered subjects from those without brain disorder (Graham and Kendall, 1960). The reported (1960) mean score of the matched group was 3.47 (SD of 4.62) while that of the brain-disordered group was 11.54 (SD of 7.3). According to Graham and Kendall (1960), both the differences in variance and in mean score were significant at better than the .01 level (F = 2.57 and t = 7.73, respectively). The revised manual showed a correlation of .99 between total raw scores as assigned by the authors for the 140 original validation subjects and the manual reported on a study which showed 93% agreement in independent scoring of individual designs (Graham and Kendall, 1960). A .92 reliability coefficient of internal consistency, the split-half method, was also reported for the scoring method devised (Graham and Kendall, 1960).

In addition, the MFD test seemed to distinguish equally well the various brain-disordered subgroups and, with the use of difference

scores, appeared statistically free of variance due to age and intellectual development factors (Graham and Kendall, 1960).

The Memory-For-Designs Test was used by C. Etta Walters (1961) to investigate the relationship between visual-motor and reading abilities in second grade children. A χ^2 of 8.1803, comparing 20 good and 4 poor MFD scores for high readers and 3 good and 8 poor MFD scores for low readers, was significant beyond the .01 level. Although only thirty-five second grade children were studied, Walters felt that results suggested reading retardation was related to visual-motor development as measured by the Memory-For-Designs Test (Walters, 1961).

J. G. Lyle (1968) conducted a more exhaustive investigation into the same area. As part of a larger study, 54 retarded readers (Retardeds) and 54 adequate readers (Controls), were administered the MFD. To make the test more directly a measure of memory, a new scoring system, based on the number of lines omitted, added, or displaced, was devised (Lyle, 1968). Performance was scored by simply counting lines incorrectly located, added or missing (Lyle, 1968). Lyle (1968) found that the standard MFD scoring system discriminates as well between retarded readers of normal intelligence and matched controls as it does between the reproductions of brain-injured and normals, F (1,96) = 12.76, p. $<$.01. In Lyle's (1968) view, this suggests that reading retardation may be a symptom of minimal cerebral dysfunction. The devised scoring system did not improve the discriminative value indicating to Lyle that it is not merely the number of errors but the type of error which is important in distinguishing between groups (Lyle, 1968). Retarded readers seemed to make the same kind of qualitative MFD errors that brain-injured patients make although the mean raw quantitative score of the Retardeds was below the border-line of pathology specified for the MFD (Lyle, 1968).

Problem

The Memory-For-Designs Test (MFD) standardized by Frances Graham and Barbara Kendall involves the presentation of simple geometric designs and the reproduction of these designs from immediate memory. The reproduction of geometric designs has been shown by various researchers to be of great diagnostic value for some pathological conditions (Bender, 1958; Lord and Wood, 1942; Graham and Kendall, 1960). Visual memory has also been shown to be of prime importance in dealing with school difficulties and other types of learning problems (Wood and Schulman, 1940). The studies cited in the historical review would seem to indicate that organic or pathological conditions and learning deficiencies are commonly affected by problems in memory and visual-motor perception (Bender, 1938; Wood and Schulman, 1940; Lord and Wood, 1942; Koppitz, 1958; Lyle, 1961; Walters, 1961; Clawson, 1962; Tolar and Schulberg, 1963). The independent research of Barbara Kendall (1948) revealed no significant correlation between reading difficulty and MFD performance in the children tested. Her findings appear to contradict the findings of researchers previously mentioned.

Cassel (1949) raised the question whether individuals with brain injury have difficulty on memory-for-designs tests because they are unable to remember or because they are unable to reproduce them. Graham and Kendall (1960) pointed out that the presence or absence of memory was confounded by other factors, the complexity of the designs used and the nature of the individuals tested. In determining the difficulty level of the task, all of these factors were used, memory, complexity of designs, and general intelligence level of subjects (Graham and Kendall, 1960).

Because the Walters (1961) and Lyle (1968) findings contradicted the results of Barbara Kendall's (1948) independent research, this study was undertaken to examine the usefulness of the Graham-Kendall Memory-For-Designs Test as a predictor of learning deficiency.

The primary purpose of the study was to determine whether children, ages 9 to 12, with reading and/or learning disability differ in MFD performance from children who have no reading and/or other learning disability.

The secondary purpose was to determine whether these children will differ in performance because of a difference in exposure, timed (memory) or untimed (copying).

A final purpose was to determine whether performance is related to being in a particular group during a particular kind of exposure.

In view of the preceding review of the research literature, the following hypotheses are put forth:

1. There will be no significant difference in MFD performance scores between children experiencing school work difficulty (experimental group) and children experiencing no more than the usual school learning difficulty (control group).
2. There will be no significant difference between groups, experimental and control, on the timed versus untimed exposure.
3. Performance scores will demonstrate no significant difference between experimental group children on a timed exposure and experimental group children on an untimed exposure.

Method

Subjects

The subjects in this study were divided into two groups, experimental and control. The experimental group consisted of children, ages 9 to 12, referred to the diagnostic clinic at the Institute for Exceptional Children and Adults, Belmont, North Carolina. The reason for referral was that these children did poorly in school or had exhibited some problem in learning. Control groups were composed of children in the same age category from the public and private school systems of Gaston County, the political subdivision which includes Belmont, North Carolina. Two groups were used to gain a better estimate of the MFD performance for so-called "normal" children. Regular classroom teachers were asked to select students who were experiencing no more than the usual or expected learning difficulty and whose classroom performance was considered satisfactory by the teachers. Control children were accepted who, in the teacher's opinion, demonstrated satisfactory school performance skills. Parental occupation was used to match these children on socio-economic status with children in the experimental group using the U. S. Bureau of Census Occupational Categories. The decision was made to statistically control age and intelligence factors utilizing the difference score method described in the MFD manual (Graham and Kendall, 1960). Predicted scores from chronological age and the WISC-R vocabulary subtest score were obtained from regression equations described in the manual. Graham and Kendall (1960) used these equations to prepare convenient tables to aid in the calculation of difference scores. Children in the

experimental group were visually screened by a registered nurse for visual acuity, far-point and near-point fusion, depth perception, color perception, hyperphoria and usable vision on far-point and near-point. The history of the control group children was screened to eliminate children with uncorrected visual defects.

Materials

Materials used in this study included pencils, recording sheets, MFD manual, 15 geometric design cards (5 in. cardboard squares), WISC-R manual, and scoring protocols.

Procedure

Staff members of the Institute for Exceptional Children and Adults (ISECA) routinely administered the MFD to children in the experimental group as a component of a diagnostic battery of tests. The WISC-R was also a part of this routine administration. The established procedure, before administrating any other part of the test battery, was to administer the WISC-R Vocabulary subtest followed by the MFD test. Manual directions in both cases were diligently followed and each child was individually tested. Test instructions for the MFD were as follows:

"I am going to show you some cards with drawings on them. I will let you look at a card for five seconds; then I will take it away and let you draw from memory what you have seen. Be sure to look at the drawing carefully so that you can make yours just like it. Don't start to draw until I take the card away. Ready, here's the first one."

The examiner then showed the card for 5 sec., holding it at right angles to the child's line of vision. As it was withdrawn, the child was told, "Now draw it just like the picture."

The first part of the MFD administration was concluded when the child had been exposed to all 15 designs. The child was then given additional paper and the reproductions of the first designs were removed.

"Now, I'm going to show you the cards a second time. You are to copy the design exactly as it appears on each card. Tell me when you have finished and I will show you the next card. Ready, here's the first one."

The examiner then placed the card in plain view on the desk in front of the child, the bottom edge of the card in horizontal alignment with the border of the desk.

The control groups were administered only the WISC-R Vocabulary subtest and the MFD test by the same ISECA staff members used to test the experimental group. Once again, the procedure was to administer the WISC-R Vocabulary subtest followed by the MFD test.

Test protocols were independently scored and tabulated by an ISECA staff member with previous experience in scoring the MFD test. Test scores of <u>all</u> children, experimental and control, with identifying information removed, were pooled and scored blindly. Predicted scores were determined by the author. A difference score was obtained for each child by subtracting the predicted score from the raw score. Obtained scores were analysed statistically using the analysis of variance technique.

Results

A 2 x 3 analysis of variance was used to analyse test data (see Table 3). The analysis compared referral source (experimental versus control), timed versus untimed exposure, and interaction. The sample scores for each group on both administrations, timed and untimed, are listed in Table 1. Table 2 shows the sample mean and standard deviation for each group.

Hypothesis one stated that MFD performance scores will demonstrate no significant difference between children in the experimental group and in the two control groups. As no significant difference was found on this comparison, $F\ (2,84) = .91$, $p. > .05$, the null hypothesis was accepted.

Hypothesis two stated that there would be no significant difference between experimental and control groups on the timed versus untimed exposure. The analysis of variance indicated that a significant relationship did exist between some groups, $F\ (1,84) = 18.20$, $p. < .05$. Further comparison of selected group means by the use of Tukey's honestly significant difference (HSD) approach to the problem of multiple comparisons revealed that the experimental group did not differ from the two control groups on this factor. Therefore, the hypothesis that there would be no significant difference between experimental and control groups on the timed versus untimed exposure was accepted.

The third and final hypothesis stated that performance scores will demonstrate no significant difference between experimental group children on a timed exposure and experimental group children on the untimed

exposure. Upon investigation, this factor yielded a value that was not significant, F (2,84)= .78, p. > .05. Consequently, hypothesis three was accepted.

Table 1

Group Performance Scores for Each Subject on the MFD

	Groups		
	Experimental	Control 1	Control 2
Timed Exposure			
	-3	2	-4
	-3	-1	-4
	-1	3	-4
	-1	-2	2
	-4	-4	-2
	-3	5	1
	-2	-2	-2
	4	10	-3
	8	3	2
	-3	0	4
	3	-1	3
	-1	-4	-1
	-4	4	1
	0	1	-5
	-3	-1	1
	Σ = -5	Σ = 13	Σ = -11
Untimed Exposure			
	-3	-1	-2
	-3	-3	-3
	-1	-3	-4
	-2	-3	-4
	-4	-4	-4
	0	0	-1
	-4	-2	-2
	-2	-2	-4
	0	-3	-3
	-3	-3	1
	-2	-2	-2
	-1	-4	-4
	-4	-4	-4
	-1	-1	-2
	-3	-1	-1
	Σ = -33	Σ = -36	Σ = -39

N = 15

Table 2

Sample Means and Standard Deviations of Each Group

	Groups		
	Experimental	Control 1	Control 2
Timed Exposure			
	M = -.33 SD = 3.50	M = .87 SD = 3.74	M = -.73 SD = 2.91
Untimed Exposure			
	M = -2.2 SD = 1.37	M = -2.4 SD = 1.24	M = -2.6 SD = 1.50

Table 3

Analysis of Variance

Source of Variation	df	SS	MS	F	p
Within	84	565.59	6.73		
Between	(5)				
Timed vs untimed	1	122.50	122.50	18.20	< .05
Referral Source	2	12.19	6.10	.91	> .05
Interaction	2	9.82	4.91	.73	> .05
Total	89	690.10			

MS = ss/df

$F = \frac{MS}{MSW} = \frac{122.50}{6.73} = 18.20$

$F = \frac{MS}{MSW} = \frac{6.10}{6.73} = .91$

$F = \frac{MS}{MSW} = \frac{4.91}{6.73} = .73$

Table 4

Tukey's HSD Test for Selected Group Means

Test statistic

$$9 = \frac{M_1 - M_2}{\sqrt{MSw/h}}$$

Timed Exposure

Experimental vs Control 1

$$\frac{-.3 - -.867}{\sqrt{6.73/15}} = \frac{-1.167}{\sqrt{.45}} = \frac{-1.167}{6.70} = -1.74, \text{ p. } > .01$$

Experimental vs Control 2

$$\frac{-.3 + >.33}{.670} = \frac{0.433}{.670} = .65, \text{ p. } > .01$$

Untimed Exposure

Experimental vs Control 1

$$\frac{-2.2 + 2.4}{.670} = \frac{.20}{.67} = .30, \text{ p. } > .01$$

Experimental vs Control 2

$$\frac{-2.2 + 2.6}{.670} = \frac{.40}{.67} = .60, \text{ p. } > .01$$

Discussion

This study examined the usefulness of the Graham-Kendall Memory-For-Designs Test as a predictor of learning deficiency. The investigation compared MFD performance of children who were experiencing school learning problems with the performance of children who, according to their teachers, demonstrated satisfactory learning skills. The research of Lyle (1968) and Walters (1961) indicated that the MFD would reliably and significantly discriminate these children on performance. This indication was at variance with the earlier research of Barbara Kendall (1948). In this study, the MFD was evaluated in terms of its ability to differentiate the two groups of children and results of the study revealed that the test could not discriminate the two groups with any measureable degree of significance. The most obvious explanation for such an occurrence is that the population studied differed from the population the test was designed to study. The MFD was originally intended to be a useful addition to a test battery for the clinical study of possibly brain-damaged patients (Graham and Kendall, 1960). While learning disabled children may share some things in common with such patients (poor memory, for example) that would affect MFD performance, it seems unlikely that enough commonality would exist to permit identification by a measure sensitive to brain-damage.
It was discovered in the present study that the performance of these children did differ in ways which were not taken into account by the scoring system. Most of these ways are qualitative and difficult

to objectify, yet can be seen in adopted strategies, freedom from distractibility, confidence, focused attention and concentration.

The utility of the MFD when administered as a copying test was also investigated. A study by Cassel (1949) had suggested that poor performance on the MFD might be as related to an inability to reproduce the designs as it is related to poor memory. Graham and Kendall (1960) countered this argument by pointing out that design difficulty was affected not only by poor memory but by the complexity of the designs and the nature of the individuals tested. They further asserted that the difficulty level of the test was such that a copying test would be so easy as to make group comparisons unprofitable (Graham and Kendall, 1960). The MFD was evaluated as to its ability to distinguish groups on a memory and copying basis. In the event the test was able to discriminate experimentals from controls, the test was further evaluated to determine its ability to differentiate the performance of the experimental group on the memory portion from the performance of the experimental group on the copying portion. Inasmuch as test results showed an inability to discriminate experimental from controls, the lack of significant findings comparing the experimental group performance on the two administration procedures was inconsequential. Even though the study did find that some groups did significantly better on one test administration than they did on the other, the MFD was unable to significantly define the important groups, experimental versus controls. Such results are in agreement with the predictions of Graham and Kendall (1960).

In summary, the following conclusions may be drawn from this study:

1. The MFD does not seem to be a reliable research instrument for the study of learning disorders in children and has questionable usefulness in a test battery for the clinical study of learning disabled children.
2. The MFD does not gain in usefulness when it is administered as a copying technique.
3. Performance on the timed administration seemed unrelated to performance on the untimed administration.

For future study of learning disabled children, it is suggested that research focus on areas of qualitative difference such as strategems and personal attributes, i.e. confidence, self-esteem, ability to concentrate, and the like.

Finally, the results of this study appeared to show that the differences between minimal brain dysfunction and learning deficiency are so subtle as to be undetected by the present Graham and Kendall quantitative scoring system.

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APPENDIX A

Memory-For-Designs Scoring Instructions

Graham and Kendall (1960) scored MFD test results according to the following instructions:

> The total score on the test is the sum of scores for each design. The score for each design is determined by the number and kind of errors made, so that the higher the score, the poorer the performance. A score of 0 is given to a satisfactory reproduction or to an omitted or incomplete reproduction, a score of 1 is given when more than two easily identifiable errors are made but the general configuration or gestalt is retained, a score of 2 when the reproduction does not satisfy the above criteria (where the general configuration has been lost), and a score of 3 when the figure is reversed or rotated. Illustrative samples covering the most common reproductions of each design are shown in the appendix (revised manual) ...
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> It should be emphasized again that the weight given to different types of errors was assigned on an empirical basis. Orientation errors were more frequent in the brain-damaged Ss and, consequently, were penalized relatively heavily. Similarly, approximately as many control Ss omitted or failed to complete designs as did brain-disordered Ss. For this reason, no penalty is given for incomplete or forgotten designs ...
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> The above scoring method gives a raw score on the test. It is also possible to obtain a score (Difference Score) for an S which statistically controls for the effects of chronological age and vocabulary level. This is done by calculating the difference between an S's obtained raw score and the score which would be predicted for him on the basis of the multiple regression of chronological age and vocabulary on test score. Convenient tables for obtaining predicted scores are given in the appendix (revised manual) ...