

# Differential Effects of Parent Training and Stimulant Medication with Hyperactives

A Progress Report

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*Abstract.* During a 3-month intervention program, 43 hyperactive children and their families were assessed and followed. Families were randomly assigned to one of three groups: parent training in behavior modification while the child was administered a placebo; parent training plus methylphenidate; and methylphenidate only. All groups showed improved home and school behavior. However, only with medication were there also gains on measures of attention and impulse control. The results also revealed greater improvement in the area of academic achievement and classroom behavior in the medication groups as compared with children on placebo. There was no evidence of significant benefit from the addition of parent training to the administration of medication.

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Hyperactivity is one of the most common behavior problems of childhood, affecting an estimated 5 to 10% of school-age children (Wender, 1975). The treatment of choice for hyperactivity has been stimulant medication and, in fact, it appears to be the most thoroughly documented treatment in child psychiatry (Gittelman-Klein et al., 1976a). Well-controlled double-blind studies have demonstrated improvements with the use of stimulant medication on laboratory measures of attention and impulse control as well as im-

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proved behavior at home and school as rated by parents, teachers, and trained observers (Barkley, 1977; Firestone et al., 1978; Whalen and Henker, 1976). However, follow-up investigations with children treated almost exclusively with stimulants have not supported these benefits on a long-term basis. Additionally, there is little evidence that this type of treatment affects academic achievement (Barkley and Cunningham, 1978).

Behavior therapy has been advocated as an alternative to stimulants in the treatment of hyperactive children, and several studies have directly compared behavioral and pharmacological interventions. Three paradigms are prominent in this body of literature: systematic case studies (S. G. O'Leary and Pelham, 1978; Pelham, 1977; Stableford et al., 1976); single subject experiments (Ayllon et al., 1975; Shafto and Sulzbacker, 1977; Wulbert and Dries, 1977); and group outcome studies (Christensen and Sprague, 1973; Loney et al., 1977; Wolraich et al., 1978).

A review of this literature indicates that although the single subject design studies unanimously support the equivalence or superiority of behavioral interventions as compared to stimulant medication on both behavior and academic achievement, they might best be conceptualized as "laboratory analogues" since they are generally far removed from the reality of clinical implementation (Backman and Firestone, 1979). For example, procedures in these reports require teacher-student ratios of one-to-one to one-to-three. In typically larger classrooms teachers might not be interested in, or able to carry out, the rather elaborate programs. The most crucial deficiency, however, is the inappropriate administration of medication. Researchers either arbitrarily chose a certain dosage of medication or did not report why particular dosages were selected. Also, there was no attempt to ascertain whether a particular child might be an adverse responder to the medication. The fact that in some studies hyperactive children were solicited through newspaper ads might increase this possibility. In clinical practice, correct dosages are established by titrating the daily frequency and dosage based on teachers' and parents' reports. A major deficit in the studies is the lack of generalization and follow-up data. This is particularly important for the study of behavioral interventions since there are documented cases of failure to generalize (Mash and Dalby, 1979), and there is no store of information to fall back on as there is with stimulant drug research (Weiss et al., 1975; Whalen and Henker, 1976).

The most meaningful data comparing the effectiveness of behavior therapy and stimulant medication on hyperactive children derive from the group outcome literature. These studies, utilizing feasible behavioral interventions, have allowed the assessment of treatment procedures with large numbers of children. Generally, these results indicate that stimulant medication is the most effective form of treatment where the goal is improved classroom and interpersonal behavior.

In summary, although the literature contains some exemplary studies, three major problems still exist. First, rarely are well-established and realistic clinical procedures utilized—studies by Gittelman-Klein et al. (1976a, 1976b) and Loney et al. (1977) are exceptions—and rarely is the issue of “cost-benefit” addressed. Finally, there is a paucity of data concerning the long-term effects of treatment on the behavior and academic progress of the children studied.

The present research also attempts to compare the relative merits of behavioral and pharmacological intervention with hyperactives and is a progress report at the end of the second year of a 5-year project. It is intended that by the end of the investigation, 80 hyperactives and their families will have completed treatment procedures and will have been followed for up to 3 years. Included in the data collection are parental characteristics (MMPI, IQ, marital satisfaction, etc.), demographic data (education, income, size of family, etc.), medical data on the hyperactive children (pregnancy and birth complications, minor physical anomalies, height, etc.), educational progress (standardized academic achievement tests, and behavioral data (rating scales filled out by parents and teachers). This report deals only with the academic achievement and behavioral data, since larger numbers of children are needed for the multivariate approach required of the final analysis.

## METHOD

### *Subjects*

Children between 5 and 9 years of age, referred to the Learning, Psychiatry, or Psychology outpatient services of the Children's Hospital of Eastern Ontario, were participants in the investigation. The children fit the DSM-III criteria of attention/deficit disorder with

hyperactivity, showing overactivity, short attention span, impulsivity, aggressiveness, and oppositional behavior, both at home and school since before 3 years of age. The Hyperactivity Index of the Conners (1969) behavior rating scale for teachers was required to be 15 or higher (Goyette et al., 1978) and Peabody Picture Vocabulary IQs had to be 85 or higher. All children were living at home with at least one parent. Excluded from the sample were children who showed definite signs of brain damage, epilepsy, or psychosis.

#### *Procedure*

All children in the study had been referred to the Department of Psychology by physicians. If the family met the criteria for inclusion, a full description of the project was presented in addition to information on methylphenidate. After the family agreed to participate, further appointments were scheduled for data collection, and signed informed consent was solicited. Children were then assigned randomly to one of four groups. In one group, the parents received counseling on behavior modification and the children received placebo (PT + P), while in another group of children, the parents received similar counseling and the children received methylphenidate (PT + M). In yet another group, parent training was provided and children received methylphenidate, but the methylphenidate was replaced with placebo (PT + W) at about the fourth month, immediately after the posttreatment measures were obtained. The final group was not told about the parent training and received only methylphenidate (M). Since the report covers only the pre- and posttreatment analyses, the PT + M and PT + W groups were combined, and are referred to as the PT + M group. Parents, teachers, therapists, and those testing the children were unaware of the medication conditions.

Behavioral counseling for 80% of the patients was provided by a Ph.D. level psychologist (MJK) and various trainee cotherapists. The remaining patients were provided with behavioral counseling by a graduate cotherapist of this program (M.A. level) with yet another trainee cotherapist. Once in the project, a hospital pediatrician (JD) or the child's physician supervised the medication. A psychologist (PF) was responsible for providing the patients with medication and placebo as well as supervising all psychological intervention.

It should be noted that the nature of the medical care system in Ontario ensures that virtually all health services are free and that

people are at liberty to choose from among various agencies without recourse. Thus, there was no fee for treatment.

After the screening and testing, parents were seen alone or with their spouse for approximately three sessions over 5 weeks. Parents were required to read a book on child management (Patterson, 1971) and demonstrate knowledge of behavioral principles. They were then invited to join a parents' group for six sessions (four to five sets of parents) where more specific behavior management programs were discussed. Parents were also instructed on how to work with school personnel, and home-school contracts were set up. Two consultation sessions were also provided to the teachers by the therapists.

#### *Medication*

Medication was given to the children just prior to the initiation of the parents into the group meetings. Parents were instructed to give their children 5 mg of the medication morning and noon every day, including weekends, until a correct dosage was established. Medication was raised or lowered in 5 mg steps, based upon parental and teacher reports by telephone contact over a 3- to 4-week period. Dosages were determined either by a reported decrease in problematic behavior or indications of negative side effects. Once the appropriate dosage was established, children received medication only on school days. The average dosage of methylphenidate was 22 mg per day with a minimum of 10 mg and a maximum of 30 mg. Two children were switched to dextroamphetamine because of poor reactions to methylphenidate, and they responded well to the new medication. Four other children had adverse side effects with both medications and thus could not be kept in the study.

### RATING SCALES

#### *Conners Rating Scale*

Conners (1969) has developed a widely used rating scale for teachers (TRS). This scale of 39 items has been factor-analyzed to give four factors: (1) conduct-problem; (2) inattentive-passive; (3) tension-anxiety; and (4) hyperactivity. The score for each factor is based upon the mean of the items within the factor (a 4-point scale; 0 to 3 is used). The TRS has been used extensively to assess the ef-

fectiveness of psychotropic medication with hyperactive children and has been repeatedly shown to be sensitive to drug effects (Firestone et al., 1978).

Conners (1970) also developed a rating scale for parents. Goyette et al. (1978) have demonstrated through statistical analyses that a new factor, the Hyperactivity Index, correlates highly with the TRS hyperactivity scores. Thus, the Hyperactivity Index was used as a measure of home and school behavior.

#### *Assessment of Emotional Adjustment*

Weiss et al. (1975) utilized this scale in a long-term follow-up of children on methylphenidate and chlorpromazine, and on a control group. This is a 3-point scale based upon an interview with the parents: 1, normal; 2, slightly disturbed; 3, severely disturbed. These data were collected by an interviewer who was not involved with treatment and thus acted as an independent assessor.

#### *School Performance*

Two aspects of school performance were measured throughout the duration of this study to determine the effects of the various types of intervention with regard to academic success in reading achievement and arithmetic.

The Gates-MacGinitie Reading Tests were used to measure the child's reading achievement. Basically, the Gates-MacGinitie is a series of tests designed to measure the child's vocabulary and reading comprehension at each level from kindergarten through grade 9. Each level of the Gates-MacGinitie has a Vocabulary Test and a Comprehension Test.

Achievement in arithmetic computation was measured by using the Arithmetic Subject Test of the Metropolitan Achievement Tests. This is a widely recognized and well-standardized test battery used to appraise students' progress from grades 1 to 9.

#### *Reaction Time Apparatus*

The reaction time apparatus has been used previously (Firestone et al., 1978) and has been shown to discriminate between normal and hyperactive subjects, in addition to being sensitive to the effects of methylphenidate (Cohen et al., 1971; for a full description see Firestone and Douglas, 1975). Two measures are available on this task: mean reaction time, and the total number of inappropriate responses to warning signals or responses while the subject was not to respond with the apparatus. These responses are designated "impulsive responses."

## RESULTS

During the 2 years, 91 families met the inclusion criteria and were offered treatment. Of these, 43 followed the treatment prescriptions and completed the posttests. The other children and their families were distributed in the following fashion:

12 families refused treatment;

6 families dropped out of the program right after the pretests;

14 families either stopped attending the parent training sessions or were unable to assimilate the required techniques and were thus not included in the study;

6 families were unable to administer medication or placebo adequately;

2 children originally diagnosed as hyperactive were, upon reconsideration after two individual sessions with the parents, diagnosed primarily as adjustment reaction of childhood;

1 child demonstrated a psychotic process on psychological tests during treatment and was thus eliminated from the study;

1 family moved out of town;

in 2 families, marital discord became so great as to preclude parent training;

4 children responded adversely to both stimulant medications and were dropped from the study.

There were 18 children in the PT + M group, 13 in the PT + P group, and 12 in the M group.

The mean age of the children in the study was  $7.32 \pm 1.09$  years and the mean Peabody Picture Vocabulary IQ was  $116 \pm 14$ . Analyses of variance indicated there were no significant differences between the three treatment groups on these variables.

Data were further analyzed to determine the effect of each treatment (within treatment) and also to assess whether treatments differed from each other (between treatment). As mentioned earlier, there were four groups: PT + P, PT + M, PT + W, and M. However, since this is only a pre-postanalysis, the PT + M and PT + W groups were collapsed to form PT + M condition. The between-treatment differences were analyzed by an analysis of covariance in which the posttreatment scores were adjusted for any initial differences between the groups. The within-treatment effects were established by using t-tests for correlated means. Because no prediction could be made, two-tailed tests were used (Gittelman-Klein et al., 1976a).

The within-treatment analyses revealed that all treatment groups showed several significant gains. As table 1 indicates, the three

groups showed improved academic achievement on Metropolitan Grade Equivalent scores. However, only in the medication groups were there similar gains on the Gates-MacGinitie Verbal scores and some improvement on the Comprehension scores. Significant improvement was evident on reaction time and impulse control in the medication but not placebo children.

A significant correlation was found between the mothers' and fathers' ratings on the Hyperactive Index ( $r = .59$ ,  $p < .001$ ). Hence, only mothers' ratings will be reported, although it is of interest to note that fathers, generally, rated their children less hyperactive than mothers— $\bar{X}$ 's of 18.62 and 20.81 respectively;  $t(4.22) = 41$ ,  $p < .001$ .

All groups improved uniformly on the Conduct-Disorder, Inattentive-Passive, and Hyperactivity Index factors as well as emotional adjustment. However, the Anxiety factor was not affected by the intervention.

The analyses of covariance were quite revealing. Significant differences between groups on posttest scores were found on the Gates-MacGinitie Verbal grade equivalent  $F(2, 26) = 3.34$ ,  $p < .05$ , mean reaction times  $F(2, 39) = 8.14$ ,  $p < .001$ , and the teachers' Hyperactivity Index  $F(2, 39) = 8.49$ ,  $p < .001$ . Since there were significant differences between the covariants on these measures,

Table 1  
Mean Academic, Attention, and Impulse Control Scores

	PT + M (N = 13)	PT + P (N = 13)	M (N = 12)
Metropolitan			
Pre	2.13 ± 1.14	1.88 ± 1.16	1.77 ± .03
Post	2.49 ± 1.16*	2.30 ± 1.43*	2.58 ± 1.54*
Gates-MacGinitie Verbal Grade	(N = 18)	(N = 13)	(N = 12)
Pre	2.54 ± 1.28	2.62 ± 2.11	2.33 ± 1.71
Post	3.10 ± 1.45*	3.14 ± 2.52	3.22 ± 2.03*
Gates-MacGinitie Comprehension			
Grade	(N = 15)	(N = 7)	(N = 8)
Pre	2.37 ± .94	3.79 ± 1.74	2.59 ± 1.09
Post	2.70 ± 1.04	4.21 ± 1.92	4.14 ± 1.79*
Reaction Time	(N = 18)	(N = 13)	(N = 12)
Pre	.90 ± .24	.86 ± .25	.93 ± .35
Post	.70 ± .25*	.84 ± .32	.70 ± .26*
Impulsive Responses	(N = 18)	(N = 13)	(N = 12)
Pre	20.41 ± 16.16	16.33 ± 15.71	17.89 ± 14.58
Post	9.76 ± 11.64*	13.42 ± 16.75	10.00 ± 12.47*

\*  $p < .01$  based upon two-tailed t-tests for correlated means.



t-tests for adjusted cell means were carried out in order to compare effects across treatments (Winer, 1971, p. 772). On the Gates-MacGinitie and reaction time tests, both medication groups showed significant improvement over the placebo group ( $p < .01$ ), but did not differ from each other. The analysis of the teachers' Hyperactivity Index resulted in a significant difference between M and PT + M ( $p < .01$ ) as well as M and PT + P ( $p < .001$ ). In addition, there was a trend favoring the superiority of PT + M over PT + P ( $p < .08$ ).

### DISCUSSION

The results of this study are consistent with previous research investigating the effects of medication and behavior therapy with hyperactive children and are rather encouraging. It seems that parent training, as used in this investigation, can be implemented to affect some positive change with most hyperactives in a regular outpatient clinic. Medication has also demonstrated its effectiveness in dealing with many problems related to hyperactivity. Improved home and classroom behavior, emotional adjustment, and aca-

Table 2  
Mean Emotional Adjustment and Connors' Scores by Teachers and Parents

	PT + M (N = 18)	PT + P (N = 13)	M (N = 12)
Conduct Disorder			
Pre	.72 ± .52	.95 ± .57	.78 ± .62
Post	.25 ± .25*	.51 ± .52*	.22 ± 1.9*
Inattentive Passive			
Pre	1.47 ± .62	1.22 ± .43	1.46 ± .45
Post	.91 ± .74*	.67 ± .47*	.72 ± .55*
Anxiety			
Pre	.53 ± .39	.38 ± .34	.56 ± .34
Post	.49 ± .49	.37 ± .35	.48 ± .51
Teachers' Hyperactivity Index			
Pre	18.11 ± 3.20	18.23 ± 3.34	18.33 ± 4.43
Post	8.90 ± 4.93*	11.77 ± 4.83*	4.68 ± 3.34*
Mothers' Hyperactivity Index			
Pre	20.00 ± 4.94	21.47 ± 4.50	21.33 ± 5.85
Post	13.50 ± 7.26*	14.9 ± 6.58*	13.58 ± 4.99*
Emotional Adjustment			
Pre	12.81 ± 3.49	13.17 ± 3.54	13.75 ± 2.43
Post	9.56 ± 2.80*	11.17 ± 3.64*	9.5 ± 2.13*

\*  $p < .01$  based upon two-tailed t-tests for correlated means.

ademic achievement were evident in all treatment groups. However, the gains were greater with medication, and there were also desirable changes in attention and impulse control. Whether the academic gains in the medication groups were due to increased "performance" or actual "achievement" remains to be demonstrated. Only further testing with these children while they are off medication can answer this question. The improved attention and impulse control, it is safe to say, will probably disappear once children are no longer on medication (Firestone et al., 1978). It is clear, however, that children in the medication groups demonstrated greater improvement in classroom behavior than those on placebo. In fact, there is no evidence in the data of a significant benefit from the addition of parent training.

The lack of a no treatment control and the improvement with all forms of treatment necessitates reservation in interpreting the present findings in general, and for the behavior therapy groups in particular. It could be argued that the improvements with behavior therapy are really a placebo effect, since the gains were most apparent on those measures affected by parents and teachers (e.g., rating scales and emotional adjustment), and that stimulant medication resulted in significantly greater gains than parent training on a number of measures. However, several previous studies utilizing similar measures with placebo conditions (Firestone et al., 1978; Gittelman-Klein et al., 1976b) and waiting list controls (Firestone et al., 1980; D. K. O'Leary et al., 1976) have not found similar improvement. It appears, therefore, that the demonstrated change is not due to a time or placebo effect. Another criticism that might be levied against the conclusion of improved behavior with all interventions concerns the notoriety of behavior rating scales as reliable indicators of change, without concurrent validation by observational data. Two recent studies are of importance in this regard. Jacob et al. (1978) showed that the Hyperactivity Index is significantly correlated with ratings of hyperactivity by trained observers in a classroom situation. However, Gittelman-Klein et al. (1976a) found that the TRS findings were the same as observations by trained observers only in medication groups. Children whose teachers were receiving behavioral consultation were rated as improved on the TRS but not by the observers.

A particularly interesting development has occurred with the PT + W children who, at approximately the fourth month, without the knowledge of parents and teachers, had their medication slowly replaced by placebo. The parents and teachers of 7 out of 8 of

these children contacted the project within 5 weeks of the substitution to complain about the reemergence of difficult and disruptive behavior. Reference was often made to inattentiveness and tantrums as well as oppositional and aggressive behavior. Ethical considerations dictated that these children be placed on medication again, and there was a subsequent improvement in behavior, as reported verbally by parents and teacher. A similar phenomenon was not apparent in the placebo children who went through a similar procedure of having their original pills replaced (placebo to placebo). In this instance, only 1 child was placed on medication within 2 weeks of the posttests. Two other children were placed on medication 3 months after the posttests after parents and teachers expressed concern over the children's lack of academic and interpersonal progress. Subsequent verbal reports indicated that the children were progressing better with medication. It seems almost as if there was a "contrast effect" in the PT + W group—it may be that these adults grew accustomed to better behavior from the children while on medication than they were able to show on placebo, although the behavior of all children on placebo in both groups improved over baseline.

In the assessment of the efficacy of the treatment procedures, several factors that are not readily analyzed in a statistical fashion merit consideration. The 51% rejection and attrition rate, which is similar to the attrition in other parent training programs (Firestone et al., 1979), reveals that parents are often not as concerned with their children's problematic behavior as professionals might wish. Several categories of "dropouts" were noted. Several parents simply wanted a full psychological assessment of their children and agreed to participate in the project to expedite this desire. Another sizable group of parents dropped out of the project due to the amount of work required with respect to behavioral intervention (e.g., charting and attending meetings). This appeared to be particularly problematic with single parents and younger parents (Firestone et al., 1979). A smaller number of parents were simply unable or unwilling to carry through with the regularity required in administering medication to their children. Although no children were eliminated from the study due to lack of school cooperation, a small number of teachers were reluctant to carry out the required procedures because of personal convictions or lack of time and resources.

Another important factor that concerns treatment efficacy is cost. Parent training has demonstrated that it is an affordable in-

tervention when the goal is improved home and school behavior. After the diagnostic session, each family spent approximately 12 hours in therapy—3 individual sessions and 6 with other parents. In addition, approximately 3 hours per child were devoted to teacher consultation by a therapist. Only 8 hours of consultation were required aside from the normal procedures to deal with family or marital issues. Nevertheless, the approximately 2 hours per patient (aside from diagnosis) required to distribute the medication, inform the parents about its effects and side effects, and monitor the titration procedures by telephone were considerably less than the time commitment to parent training.

It appears quite clear that both behavioral and pharmacological interventions are of some benefit to hyperactive children. Quite possibly the most effective intervention would include some combination of therapeutic techniques such as medication, parent training, and educational services. Presently, the personal and demographic characteristics of hyperactive children and their families that might predict response to one or a combination of the interventions offered in this study is under investigation, but is not yet available. Until that time, however, there is no evidence in the present data to support the strategy of using stimulant medication only as a last resort, as has been suggested by some (Grinspoon and Singer, 1973). Rather, given the fact that there are often considerable personnel constraints in clinical settings that result in some children, including nonhyperactives, being denied services altogether, it is suggested that the judicious application of stimulant medication be the first intervention with hyperactives. Other forms of treatment such as behavioral intervention could be provided when available or necessary.

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