A 30-Month Follow-up of Hyperactive Children

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A 30-month follow-up study of 26 clinically selected hyperactive children was carried out to investigate sample composition and predictors of outcome. Outcome was measured in terms of continued need for stimulant medication at 30 months. Significant differences were found in the hyperactive group in terms of age, psychometric assessment, and family structure. A large number of hyperkinetic children came from single-parent families, but a significant proportion of these did not require medication. In the follow-up study, IQ was found to be the most important predictor of continued need for medication at 30 months. This indication of severity in the group still requiring medication at 30 months was confirmed by maternal, teacher and clinician ratings, and objective tests of sustained attention (vigilance) and inhibition. A large number of young hyperactives (aged 48-71 months) showed significant discrepancies, in both directions, between the verbal and performance components of the Wechsler IQ.


Most follow-up studies of hyperkinetic children (Minde et al., 1971; Huessy and Metoyer, 1973; Riddle and Rapoport, 1976; Campbell et al., 1977) have agreed that a percentage of children diagnosed as hyperactive continue to show problems in their learning, attention and social behaviour with increased maturity. However most studies have selected children with an IQ over 80 or 85, which obscures the effect of IQ upon outcome, and few studies have examined the question of heterogeneity of sample selection (Levine and Obergland, 1980). The study by Minde et al. (1971) investigated 37 children who had been diagnosed 4 to 6 years earlier as hyperactive by two of the authors. All of the children had an IQ of at least 85 on the Wechsler Intelligence Scale for Children (WISC). Each hyperactive child was paired with a child of the same sex immediately following him or her alphabetically in the class-room list. Outcome measures were school reports, a behavioural checklist by teachers, group IQ tests, and other social information. The normal children scored significantly higher than hyperactive classmates on group IQ tests. The hyperactive children had a significantly higher failure rate in all academic subjects and displayed more behavioural problems than controls.

The least academically successful of the hyperactive children had significantly lower IQs and lower Performance IQs. When hyperactive children were matched with normal controls on the basis of group IQs, the academic and behavioral standing of the hyperactive children was significantly inferior.

Satterfield et al. (1980) recently reported findings at the end of the second year of a 3-year prospective study of 61 hyperactive boys. They found that the combination of a clinically useful stimulant medication and psychological treatment regime was associated with an unexpectedly good outcome at the end of 1 and 2 years and on all factors of the Conners’ teacher and parent rating scales, and a significant improvement in psychosocial adjustment.

The problem of interpreting follow-up studies of hyperactive children is that the samples are usually selected on the basis of clinical evaluation and parent/teacher rating scales, without any objective measures of hyperkinesis. Consequently it is difficult to isolate factors which predict improvement or lack of improvement in subsequent follow-up results. Improvements attributed to treatment might well be due to other factors such as maturation.

Barkley (1977) has reviewed stimulant drug research with hyperactive children. Based on 110 studies, he found that about 75% of hyperactive children placed on stimulant medication are judged as improved in the short term. In contrast, the follow-up studies reviewed found that the long-term psychological adjustment of the children studied was essentially unaffected by stimulant drug treatment. Several factors were noted as limiting the extent to which the results of the studies reviewed are comparable. These were (1) variety of definitions used to define hyperkinesis; (2) differences in methodology of the studies; (3) variations in drugs used, dosage, and the time children were on drugs; (4) variations in the criteria of improvement; and (5) differences in measures used.
The present study aimed to follow a group of clinically selected hyperactive children for 30 months, and to investigate homogeneity of sample selection, as well as predictors of outcome. It was hypothesized that children who still required medication at 30 months would form a homogeneous “attention-disordered” group while children not requiring long-term medication might form a heterogeneous group. A difference from previous studies is that objective tests of attention and inhibition were used to assess hyperactivity at initial testing and at outcome. Also psychometric factors which might predict outcome were examined.

Method

A group of 26 children diagnosed clinically as hyperactive, using the criteria described in the Diagnostic and Statistical Manual of American Psychiatric Association (Draft, DSM III 1978) for Attention Deficit Disorder with hyperactivity were followed. The age, sex and socioeconomic class (SES) (Congalton, 1969) of all the children were noted when first seen. The Wechsler Intelligence Scale for Children (WISC) or the Wechsler Pre-School and Primary Scale of Intelligence (WPPSI) was administered at day 0. The children were also rated by mother, teacher, and child psychiatrist on Conners’ abbreviated parent-teacher rating scale for hyperactivity (Guy, 1976) at day 0 and 30 months later. The Vineland Social Maturity Scale (Doll, 1965) was also rated at follow-up. Objective tests of sustained attention (vigilance) and inhibition were carried out for all children at day 0, and month 30. These consisted of the Continuous Performance Test (CPT) (Rosvold et al., 1956) and the Draw-a-Line Slow Test (DALS) (Maccoby et al., 1965). These tests were used to calculate a weighted age-normalized discriminant function which has been shown to discriminate hyperkinetic children (Levy and Hobbes, 1981). Medication was ceased for at least 24 hours prior to final testing. Intelligence differences for the three medication groups, never on medication, taken off medication by month 30, and still on methylphenidate at follow-up are shown in table 2. The group should also be noted that when children were taken off medication during the course of the study, this decision was made in conjunction with parent and teacher assessments of the child’s behaviour at home and at school.

Results

Significant differences were found in the hyperactive group in terms of age, psychometric assessment and family structure at initial testing.

Family Structure at Initial Testing

As noted earlier 38% of the hyperkinetic children came from single-parent families.

Follow-Up Results

As described above, 18 of the 26 hyperactive children were treated with methylphenidate following initial testing. These 18 were generally the more severe of hyperactives. The likelihood of a child being placed on medication was inversely related to single-parent structure, as shown in table 1. There was a significant relationship (\( p = 0.025 \)) between the proportion of children from single-parent families and those not treated with medication after initial testing.

By month 30, 11 children were still on medication, prior to final testing. Intelligence differences for the three medication groups, never on medication, taken off medication by month 30, and still on methylphenidate at follow-up are shown in table 2. The group

### TABLE 1

<table>
<thead>
<tr>
<th>Family Structure Differences in Medication vs. No Medication Groups</th>
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<tbody>
<tr>
<td>Children Treated with Methylphenidate</td>
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<tr>
<td>4/18 (22%)</td>
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</tbody>
</table>

* Tested using the hypergeometric distribution \((N = 26, n = 16, k = 8, x = 2)\).

### TABLE 2

<table>
<thead>
<tr>
<th>Median IQ of Medication Subgroups</th>
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<tbody>
<tr>
<td>Not Treated with Methylphenidate</td>
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<tr>
<td>100.0 at 30 Months</td>
</tr>
<tr>
<td>( p ) Value*</td>
</tr>
</tbody>
</table>

* Tested using Mann-Whitney \( U \) Test \((U = 23, n_1 = 10, n_2 = 12)\) comparing those on medication at month 30 with those off medication at month 30.
still on medication had a significantly lower median IQ ($p = 0.01$).

Maternal, teacher and clinician ratings and discriminant function scores at initial and follow-up assessments for the three medication groups are shown in figure 1. (The left and right hand scales indicate the range of ratings or discriminant function scores, while the slope of each scale represents change from day 0 to month 30 for each test.)

It can be seen from figure 1 that the group of children still on methylphenidate at month 30 showed no improvement in mother, teacher or clinician ratings, or in discriminant function scores over that period of time. The two groups with "normal" IQ scores showed improvements in both subjective ratings and objective discriminant function scores over the same period. Thus the objective test scores (discriminant function scores) showed the same pattern of improvement as the subjective maternal, teacher and clinician ratings. Thus there was a significant relationship between IQ score at initial testing and outcome in terms of the need for medication at month 30.

**Psychometric Differences**

It was noted that a large number of the younger hyperactives (aged 48 months to 71 months) showed differences between the verbal and performance components of the WISC or WPPSI greater than 11 points, as shown in table 3. These psychometric discrepancies (verbal or performance) were found in similar representative proportions in all three medication groups (that is those children not requiring medication, those who came off medication within 30 months, and those who still required medication at 30 months). Thus the discrepancies were unrelated to IQ level.

Five of the 11 "young hyperactives" had significant performance deficits, while 3 of the 11, had significant verbal deficits. Thus eight (73%) of "young hyperactives" had a significant verbal or performance discrepancy. This proportion differs considerably from the percentages described by Kaufman (1976) and Shore (1951) for the WISC-R and WISC respectively they found in both cases that 31% of a total standardization sample showed verbal or performance deficits greater than 11.

**Social Maturity**

Normalized scores for the Vineland Social Maturity Scale indicated a significant positive correlation of social maturity with IQ, and a significant negative correlation with discriminant function scores (table 4).

**Discussion**

The psychometric and family structure data indicate that the clinically selected sample was not homogeneous. The "younger hyperactives" were children with either significant Verbal or Performance IQ discrepancies which may improve with age. On the other hand the "older hyperactives" had a median IQ of 87, and are less likely to show a significant IQ improvement with age.

The fact that 75% of the children who were not treated with medication came from single-parent families suggests that some of these children, initially diagnosed as hyperactive, may have had reactive behaviour disorder.

The follow-up data confirms the importance of IQ in predicting prognosis of hyperkinesis in childhood, measured by rating scales, objective tests and continued need for stimulant medication. Most previous
studies have arbitrarily selected children with IQs above 80 or 85 and this may have masked the importance of initial IQ in determining outcome. In the present study only the group of children with a median IQ of 85 still required medication at 30 month follow-up. This indication of severity at 30 months was confirmed by maternal, teacher and clinician ratings and discriminant function scores. Hyperactivity would therefore appear to be a syndrome related to immaturity and/or low mental age.

Perhaps the terms minimal brain dysfunction syndrome or hyperactive syndrome have been misleading in suggesting a unitary basis for what appears to be a pattern of behavior seen in immature children or low IQ children. Clements and Peters (1962) description of psychometric patterns found in minimal brain dysfunction children appear to hold true in this study. The “young hyperactives” tended to have either significant verbal or performance deficits in their WISC or WPPSI scores. On the other hand the “older hyperactives,” and the children who still required medication after 30 months had relatively lower IQs. The “hyperactive syndrome” would appear to represent a pattern of behavior, determined in part by factors related to IQ, family structure, and early developmental lags. Children initially diagnosed as hyperactive may thus be retrospectively grouped according to IQ level and social factors. However it is important that children who remained hyperactive according to subjective ratings and objective tests of vigilance were those children with relatively lower IQ levels and this same group of children still required medication 30 months after the initial assessment.

References