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MINOR PHYSICAL ANOMALIES IN HYPERACTIVE, RETARDED AND NORMAL CHILDREN AND THEIR FAMILIES

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HYPERACTIVITY is a term currently employed to describe a heterogeneous group of children who exhibit overactivity, irritability, impulsivity and attentional deficits. The recent interest in this syndrome results from the difficulty that these children experience in adjusting to the expectations of their environment, at home, in school with their peer group, and the possible higher risk of emotional problems, alcoholism and interpersonal problems in later life (Morrison and Stewart, 1971, 1973a).

Several etiological explanations including pre-natal or birth trauma, neuro-developmental lag, psychogenic factors and genetic transmission, have been proposed, but the heterogeneous nature of the syndrome has led many investigators to suggest that a single etiological theory is insufficient to encompass the various combinations of behavioral indices observed in these children (Wender, 1971; Douglas, 1974).

Recent attempts to delineate etiological factors in the hyperactive syndrome have led to the study of minor physical anomalies (MPA) and the presence of a high number of MPA in hyperactive children has been well documented (Firestone *et al.*, 1976; Rapoport and Quinn, 1975; Waldrop and Halverson, 1971; Waldrop *et al.*, 1968). These so-called MPA are such things as malformed ears, enlarged head circumference, hypertelorism, etc. which are often found in Down's Syndrome but without concomitant major morphological aberrations are themselves of little

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cosmetic or medical concern. The presence of MPA is also associated with idiopathic retardation (Smith and Bostian, 1964), school failure (Rosenberg and Weller, 1973), congenital deficiencies in speech and learning (Waldrop and Halverson, 1971) as well as learning disabilities and autism (Stegg and Rapoport, 1975).

Despite the ample documentation of MPA, their development and role in behavior disorders is unclear as yet. Smith and Bostian (1964) attribute these MPA to an abnormality in the process of embryonic differentiation which may also affect the brain and central nervous system. Quinn and Rapoport (1974) found an association between MPA and pregnancy complications as well as activity level in hyperactive boys. In addition, high stigmata scores were associated with a history of hyperactivity in fathers. These authors suggest that the findings are consistent with a genetic etiology which may be phenocopied by an insult in pregnancy, probably in the first trimester of pregnancy.

The goals of the present study were twofold: (1) to compare the frequency of MPA in hyperactive, retarded and normal control children, and (2) to establish the rate of MPA in the families of these children.

METHOD

Subjects

The three groups of *S*s consisted of boys from the various clinics of the Children's Hospital of Eastern Ontario whose families were willing to participate in the study. The first group consisted of 13 boys previously diagnosed as being hyperactive by a pediatrician and clinical psychologist, along with their parents and siblings. The second group consisted of nine boys previously diagnosed as being in the mild or moderate range of retardation of idiopathic etiology, along with their parents and siblings. The third, a control group, consisted of 15 boys who had been attended to in the medical and out-patient clinics for minor medical problems, along with their parents and siblings.

Apparatus

Weighted MPA scores were obtained using the modified MPA survey and scoring method of Waldrop and Halverson (1971). Male and female norms for head circumference for children to 18 years were obtained from Nellhaus (1968). Norms for intercanthal distance were obtained from Finegold and Bossert (1974). Adult norms for head circumference were unavailable for females but the values for 18 year olds from Nellhaus proved adequate. Rapoport (personal communication, 1977) was able to provide norms for adult male (19 years of age and over) head circumference.

The teachers of children were required to fill out Conners' (1969) rating scale for teachers. This scale of 39 items has been factor analyzed to give five factors: (1) conduct-problem, (2) inattentive–passive, (3) tension–anxiety, (4) hyperactivity, and (5) sociability. The score for each factor is based upon the mean of the items within the factor (a four-point scale, 0–3 is used).

RESULTS

Analyses of variance were carried out in the five factors of Conner's rating scale (Table 1) and significance was achieved in the inattentive–passive factor $F\ (2, 28) = 4{\cdot}09$, $P < 0{\cdot}03$, the tension–anxiety factor $F\ (2, 28) = 4{\cdot}85$, $P < 0{\cdot}02$, and the hyperactivity factor $F\ (2, 28) = 3{\cdot}96$, $P < 0{\cdot}02$. Newman–Keuls tests were performed ($P < 0{\cdot}05$) indicating that the retarded children were rated as more problematic on the inattentive–passive and tension–anxiety factors than the other two groups who did not differ from each other. On the hyperactivity factor the hyperactives were rated significantly higher than the normal or retarded children who did not differ from each other.

TABLE 1.
MEAN FACTOR SCORES ON CONNERS' RATING SCALE FOR TEACHERS

	Hyperactive	Retardates	Controls
Inattentive–passive	1·13 ± 0·65	1·63 ± 0·70	0·70 ± 0·82
Tension–anxiety	0·75 ± 0·61	1·42 ± 0·76	0·55 ± 0·60
Conduct-problem	0·68 ± 0·48	0·42 ± 0·31	0·42 ± 0·52
Hyperactivity	1·38 ± 0·62	0·75 ± 0·56	0·57 ± 0·81
Sociability	0·65 ± 0·67	1·0 ± 1·12	0·35 ± 0·50

As Table 2 indicates, there was a significant difference in MPA between the groups F (2, 35) = 15·83, $P < 0·001$. A Newman–Keuls multiple comparison indicated that the hyperactive and retarded children had significantly more MPA

TABLE 2. FAMILY MEMBERS' MPA SCORES

Subgroup	Group		
	Hyperactive	Retarded	Control
Index *Ss*	4·00 ± 2·0 (13)*	4·67 ± 1·65 (9)	1·40 ± 0·91 (15)
Families	2·82 ± 1·86 (39)	2·72 ± 1·82 (29)	1·79 ± 1·31 (71)
Fathers	2·43 ± 1·72 (7)	1·00 ± 0·71 (4)	1·75 ± 0·75 (12)
Mothers	2·72 ± 1·62 (11)	2·63 ± 1·60 (8)	1·20 ± 1·01 (15)
Male sibs	4·13 ± 2·64 (8)	3·18 ± 1·72 (11)	2·10 ± 1·64 (31)
Female sibs	2·73 ± 1·44 (15)	3·17 ± 2·48 (6)	1·77 ± 1·01 (13)

*Sample size.

than the controls, but did not differ from each other. Similarly, the families of the hyperactive and retarded children had more MPA than controls F (2, 136) = 6·80, $P < 0·002$ but did not differ from each other. The ages of the three groups of children did not differ (Table 3).

TABLE 3. MEANS AND STANDARD DEVIATIONS FOR AGES OF HYPERACTIVE, RETARDED AND CONTROL CHILDREN

Group	Age
Hyperactive	10 yr 1 month (1 yr 11 months)*
Retarded	11 yr 4 months (3 yr 5 months)
Control	11 yr 8 months (2 yr 9 months)

*Standard deviations in brackets.

Hyperactive and control children did not have more MPA than their parents or sibs F (3, 46) = 2·33, $P > 0·05$; F (3, 80) = 1·39, $P > 0·05$. However, there was evidence of a difference in MPA scores within the families of retarded children F (3, 30) = 2·98, $P < 0·05$. A multiple comparison of the means revealed that this

difference was due to fathers having significantly fewer MPA than their retarded children. No other reliable differences between family members were present. It is quite probable that this finding is artifactual, due to the low number of fathers (four) within this group. In fact, as Table 4 points out, a considerable number of

TABLE 4. NUMBER OF FATHERS ABSENT DUE TO SEPARATION OR DIVORCE

	Group		
Family status	Hyperactive	Retarded	Control
Fathers absent	4	4	0
Total cases	12	8	15

fathers were absent from the homes of hyperactive and retarded children, as compared to the controls, due to divorce or separation. A chi square analysis revealed this difference to be significant ($\chi^2 = 8{\cdot}53$, $P < 0{\cdot}02$.

DISCUSSION

In the present study, the investigator was aware of the group affiliations of the families prior to obtaining the MPA surveys. This has been the case in much of the MPA research. However, when blind techniques have been utilized, the findings have been very similar (Firestone *et al.*, 1976; Waldrop *et al.*, 1976; Waldrop and Goering, 1971). This would seem to suggest that expectations on the part of investigators have had minimal effects. Furthermore, the fact that 10 subjects, chosen at random, were examined for MPA by an independent, trained observer and a Pearson correlation coefficient of 0·90 was obtained ($P < 0{\cdot}01$), supports this contention.

The finding of higher MPA scores in the hyperactive and retarded children is consistent with previous studies (Firestone *et al.*, 1976; Halverson and Victor, 1976; Quinn and Rapoport, 1974). The fact that the frequency of anomalies was similar in these two groups of children further suggests that although "atypical" children may have more anomalies than "normals", there is a lack of specificity as far as the topography of the disorder is concerned (Links, 1977; Firestone, 1977).

Of particular interest is the finding that probands and their families had similar MPA scores. Although no behavior rating scales or diagnostic evaluations were undertaken on other family members, informal conversations revealed that in only one family was there a report of a sibling having required professional mental health intervention. This finding supports a genetic hypothesis in regards to the transmission of MPA, but does not allow explanation concerning why one member of a family with high MPA becomes a behavior problem while others do not. Conceivably, as suggested by Rapoport and Quinn (1975), it is only those children who have numerous MPA and have suffered pre- or para-natal complications that develop behavior disorders. Nevertheless, to date, there is no evidence that MPA, alone or associated with birth complications, are sufficient to predict atypical behavior. In fact, the suggestion that MPA might be used as "markers" in the early detection of problem children (Rapoport and Quinn, 1975; Steg and Rapoport, 1975; Waldrop and Halverson, 1971) becomes somewhat questionable since the

number of false positives within a family would be extremely high. On the other hand, high MPA sibs may indeed have had behavior problems, but presented less of a problem to their parents. Possibly, treatment is sought only for the most disruptive child in a family, the others appearing quite normal by comparison. Further evaluation of the genetic hypothesis and the role of MPA and birth complications in the etiology of behavior disorders would require a twin study.

The finding of increased marriage breakdown in the families of the hyperactive and retarded *S*s can be interpreted in two ways. The difficulties associated with raising a problem child may put increased stress on parents, thus facilitating marriage breakdown. On the other hand, one might speculate that the problems present in the child are to some extent present in one or more of the parents and that this factor contributes to marriage breakdown. In the case of the hyperactive children, this particular interpretation would be consistent with the findings of Morrison and Stewart (1971, 1973a, 1973b, 1974) who report an increased incidence of alcoholism, hysteria and sociopathy among the parents of hyperactive children.

SUMMARY

Hyperactive, retarded and normal children as well as their siblings and parents were examined for the frequency of minor physical anomalies (MPA). The results indicated that the hyperactives, retardates, their siblings and parents had equal numbers of MPA that were significantly higher than in the normal control children and their families who did not differ from each other. It was noted that there were more fathers absent due to divorce or separation in the two patient groups.

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