

THE DIAGNOSIS OF MENTAL RETARDATION IN INFANCY

A FOLLOW-UP STUDY

BY

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There seems to be an increasingly firm conviction among psychiatrists and psychologists that developmental tests in infancy have little or no predictive value. For instance, Bowlby (1951) wrote in his famous monograph that 'mental tests have no predictive value in the first 18 months of life'. Kirman (1953) wrote that 'few people are so bold as to claim to be able to measure intelligence in babies or to predict the future course of their mental development'. Eysenck (1953) wrote that 'intelligence testing before the age of 6, or 5 at the earliest, should be discouraged', because, he said, 'testing before the age of 2 has no predictive accuracy at all for adult intelligence'. Apgar, Girdany, McIntosh and Taylor (1955) wrote of the meagre value of Gesell rating of adaptive behaviour at 2 years as compared with the Stanford Binet test at 5 years. Wittenborn (1957) concluded that developmental tests were of very little value in determining the intelligence of babies for the purposes of adoption. Sontag, Baker and Nelson (1958) wrote that levels of I.Q. at pre-school age have hardly any predictive value. Karelitz (1958) wrote that 'it is now recognized that psychological tests of infants cannot be used to predict the child's future development'. Kirman (1958) wrote 'in regard to mental deficiency it is possible to recognize only severe mental defect at an early stage', and 'the predictive value of tests under the age of 5 years is very low'.

Many of these statements are incontrovertible. Correlation coefficients calculated between the results of assessments of ability made first in infancy and later in childhood are known to be very low. When the first assessment is made before the age of 2 years they commonly approximate to zero and may even be negative (Bayley, 1940).

Until a correlation coefficient rises to the order of 0.9 prediction of one variable from another is very

little superior to a prediction based upon chance. It is frequently forgotten, however, that a low correlation between two sets of scores may not be incompatible with reasonably accurate prediction within certain narrow limits within the total range of the two measures. If the two measures follow an approximately Gaussian distribution and if the particular narrow limits, within which accurate prediction is possible, lie at either extreme of the distributions, then the contribution of the relatively few scores involved may be negligible in the calculation of a product moment correlation coefficient. It seems that such is the case in the prognosis of mental retardation, for it has long been known that the I.Q. of dull children is much more constant than it is in normal or super-normal children (Terman and Merrill, 1937). For this reason psychologists (e.g. Valentine, 1950), who would not subscribe to the general usefulness of early testing, have advocated procedures, including tests, for early diagnosis of mental defect, and Goodenough (1949) commented, 'in as much as radical changes in the treatment of backward and feeble minded children are more likely to depend upon the results of mental tests than is the case with children of normal or superior intelligence, the greater dependability of the intelligence quotient at the lower levels is a matter of considerable importance for those actively concerned with the welfare of children'. Vernon did not rule out early testing for the detection of mentally defective children when he wrote 'indeed the various tests of developmental level sometimes applied to babies from 0 to 2½ years provide practically no indication of later intelligence, except perhaps in cases of severe mental defect' (Vernon, 1957).

We imagine that any paediatrician would agree that in the majority of cases the diagnosis of severe mental retardation can readily be made in

TABLE 1

AGE OF DIAGNOSIS OF MENTAL RETARDATION WITH OR WITHOUT CEREBRAL PALSY*

Age of Diagnosis (months)	Mental Retardation Alone		Mental Retardation with Cerebral Palsy		Total	
	Total	Percentage of whole	Total	Percentage of whole	Total	Percentage of whole
0-3	27	6.4	11	6.0	38	6.3
Second 3	39	9.3	8	4.4	47	7.8
6-12	52	12.4	28	15.4	80	13.3
12-24	60	14.3	36	19.8	96	16.0
Later than 24	240	57.4	99	54.4	339	56.5
Total	418		182		600	

* Cases of mongolism, cretinism, hydrocephalus and anencephaly excluded.

infancy, though no one would deny that there are some cases which present great difficulty.

In the last 11½ years in the Department of Child Health, at the Children's Hospital, Sheffield, of 600 consecutive children thought to be mentally retarded, other than cases of mongolism, cretinism, hydrocephalus or anencephaly, the diagnosis was made in 261 (43.9%) before the second birthday (Table 1).

The report which follows concerns the first part of a follow-up study of children who were thought to show retardation of mental development in infancy, however slight and uncertain.

Method of Study

The study is based on 135 children who were considered by members of the Department of Child Health to be mentally retarded when first examined. All were under the age of 2 and all were born in 1953 or before. Cases of mongolism, cretinism, hydrocephalus and anencephaly were excluded. Children with cerebral palsy have been included, provided that a diagnosis of mental retardation was made. Subsequent reports will deal with children born in 1954 and later, when they reach the age of 5 years. In five children the mental retardation followed tuberculous meningitis, in three it followed pyogenic meningitis, and in two it followed encephalitis. The others were of pre-natal or natal origin. Three cases were complicated by congenital hypotonia, and three by blindness.

Every possible effort has been made to ensure that all cases thought to be retarded have been included. A triple check on the indexing of diagnoses is in use, and we do not think that any cases have been missed from our list. We can certainly say that every case indexed as mental retardation has been included in the study. There is therefore no question of the cases being in any way 'selected'.

The original diagnosis was made on the basis of simple developmental tests culled from the Gesell schedules, including as many different fields of development as possible. We did not, in other words, make the mistake of relying on motor tests alone for our opinions. We paid great attention to the developmental history, and followed that by the physical and developmental examination, interpreting our findings in the light of the history, as was done in the Yale Clinic of Child Development under Gesell. The method of developmental study has been summarized elsewhere (Illingworth, 1957). The diagnoses were made in the ward or in the out-patient department in the course of ordinary out-patient work, but not in a special clinic. About 95% were seen by the senior author of this paper (R.S.I.) but in some the initial diagnosis was made by other members of the Department of Child Health.

The age of the initial diagnosis of retardation is shown in Table 2.

TABLE 2

AGE OF INITIAL DIAGNOSIS OF MENTAL RETARDATION

Age (months)	Number	Percentage of Whole
0 to 3	19	14
3½ to 6	17	13
6 to 12	41	30
12 to 24	59	43

It will be seen that the diagnosis was made in the first three months in 19 children; in the first six months in 36 children, and in the first year in 77.

The majority of the children have been under continual observation in the out-patient department. Once a diagnosis of retardation was made, however, the child was included in the study even though subsequent observation indicated that the initial opinion was incorrect.

The follow-up study was based on intelligence

tests carried out by school medical officers, educational psychologists and by the Institute of Education. The usual test employed was that of Terman and Merrill. The patients came from a wide area, mostly within a radius of about 80 miles, and further uniformity in testing was impossible.

The oldest child at the time of follow-up was 10 years of age.

Children not Traced. Two children could not be traced: (1) the son of an itinerant gipsy. The boy was seen at the age of 18 months, when a diagnosis of spastic quadriplegia with amentia was made. He was not seen again; (2) a girl of 3 months was admitted to the hospital on account of vomiting. There was some retardation of motor development and it was thought that the knee jerks were exaggerated. She was thought to be slightly retarded. The following note was included in the letter to the family doctor: 'A definite prognosis as to the mental retardation cannot yet be given, and the baby will obviously need further observation to determine the progress of development.' By the age of 6 months it was decided that she was normal. The opinion was confirmed at 11 months, and she was not seen again. She subsequently emigrated.

Results

The results are summarized in Table 3. Of the 77 children in whom the diagnosis of mental retardation was made in the first year, 26 had died, and one was not traced. Of the 59 children diagnosed in the second year, six had died and one could not be traced. Most of the deaths occurred at home, so that autopsy findings were available in only 10, all of whom had gross brain anomalies obvious to the naked eye. Of the remaining 22 who died, the

diagnosis of severe mental deficiency had been confirmed by intelligence tests after the age of 5 in one, but we cannot provide evidence of the correctness of the diagnosis in the remainder, who died before the fifth birthday. Most of them, however, had been under continued observation in the out-patient department, and the diagnosis was not altered in any.

Of the remaining 101 children, 59 on follow-up examination were ineducable, 24 had an I.Q. of 50 to 75, 13 had an I.Q. of 76 to 94, and five had an I.Q. of 100 or more. Table 3 shows an attempt to correlate the grading in infancy with that at school age. It must be emphasized that the grading in infancy was a rough one only in most cases. It will be seen that of 67 children who were thought to have severe mental retardation in infancy, 55 were subsequently proved to be ineducable: while of 20 children who were thought in infancy to be slightly retarded, only two proved to be ineducable.

The five children who were thought in infancy to be retarded, but who were later shown to have an I.Q. of 100 or more, are of special interest. Below are summaries of their case histories:

TABLE 4
CORRELATION BETWEEN ROUGH GRADING IN INFANCY AND SUBSEQUENT I.Q. SCORE

Degree of Retardation	Rough Grading in Infancy	Grading at School Age	
		Ineducable	I.Q. over 50
Severe	66	55	12
Moderate	16	6	10
Slight	20	2	18
Total	102*	63	40

* One died.

TABLE 3
FINAL ASSESSMENT OF RESULTS

Age of Initial Diagnosis (months)	Mental Retardation Alone (MR) or Mental Retardation with Cerebral Palsy (CP)	Intelligence Test Results (I.Q.)				Died			Not Traced
		100+	76-94	50-75	-50	Autopsy evidence of gross cerebral anomaly	Died after 5th birthday proved mental defective	No autopsy	
0-3 ..	MR CP	1 —	3 1	1 1	2 1	3 1	1 —	1 2	1 —
3-6 ..	MR CP	— —	— —	3 —	6 1	2 1	— —	2 2	— —
6-12 ..	MR CP	— 3	3 —	2 3	12 6	1 1	— —	4 5	— —
12-24 ..	MR CP	— 1	4 2	7 7	21 10	1 —	— —	2 3	— 1
Total ..		5	13	24	59	10	1	21	2

Case 1. This boy was admitted at the age of 2 months with a history of frequent convulsions for the previous three weeks. He was found to be backward in development. He had begun to smile in response to his mother at 2 months and to vocalize at 3 months. There was complete head lag in ventral suspension and when he was pulled to the sitting position. At 4½ months the head control was that of an 8 to 10-week-old baby. A subdural tap was negative, but an air encephalogram was thought to show some cortical atrophy. At 10 months he was thought to be average in development.

On follow-up examination at the age of 9 years he was found to be a normal child with an I.Q. of 122.

Comment. There was good reason for considering that the prognosis here was poor. It is well recognized that air-studies often correlate badly with developmental potential, but in this case there was the combination of retarded development with a history of frequent convulsions.

Case 2. This boy was found at the age of 7 months to have a spastic hemiplegia. An assistant, without stating his reasons, wrote that the boy had a low level of intelligence, but added that it was difficult to be sure. He was still thought to be mentally retarded at the age of 3. The diagnosis of hemiplegia was confirmed, but at the age of 7 his I.Q. was 100.

Comment. The difficulty of assessing the intelligence in cases of cerebral palsy is well known. Perhaps this boy could be termed a 'slow starter'.

Case 3. This interesting girl was seen just before her first birthday. She had been slightly retarded in her developmental history. She had been born at term. She had begun to smile at the age of 11 weeks, to grasp an object voluntarily at 6 months, and to imitate her parents at 8 months. She was not able to sit, the motor development being that of a 5-month-old child. The opinion expressed was 'minimal birth injury, almost normal mentally'. At the age of 9 she had virtually no physical disability, and the I.Q. was 118.

Comment. In retrospect the diagnosis was correct. At the age of 9 the girl was not as nimble on her legs as other children, but there was no definite disability. There was unquestionably a mild generalized retardation when she was first seen a few days before her first birthday.

Case 4. This boy caused great difficulty in diagnosis. He was seen just before the first birthday, on account of backwardness in development. He was unable to sit without support, or to chew, but had begun to say single words with meaning. The comment written was 'There is a striking dissociation in his development. I think that he shows a combination of mental retardation with physical defect. Further observation is essential'.

At the age of 3 years athetoid movements became obvious. At the age of 4 he was a typical athetoid child with an I.Q. of 100.

Comment. In retrospect one feels that one would make the same mistake again.

Case 5. This boy with kernikterus was seen at the age of 1 year, 11 months. The comment made was, 'I think that his I.Q. is 80 to 90, but that may turn out to be an underestimate'. At the age of 5 it was 100.

Comment. This underestimate of his ability was so trivial that it was of no significance.

The intellectual potential of 11 other children was considerably underestimated. Four of them were seen in the first year, and the remainder in the second year. Only two had cerebral palsy. Of the nine thought to be severely retarded, five were later found to have an I.Q. of 50 to 75, and the others had an I.Q. of 86, 87, 88 and 94 respectively. Of the other two, one was thought to have a developmental quotient of 50 to 60, while the I.Q. proved to be 80; and the other was thought at 9 months to have a D.Q. of 60, while the subsequent I.Q. was 80.

Four children fared less well than was expected. Three of these had cerebral palsy. Two were seen in the first year. Two were thought to be slightly retarded in infancy: one was given a D.Q. of 60, and another was thought to be moderately retarded. All were later found to be ineducable.

It is interesting that while 16 fared better than we expected, only four fared materially worse than expected. This fact alone should emphasize the need for caution in giving a developmental prognosis.

Discussion

It is clearly incorrect to assert without qualification that developmental tests in infancy have no predictive value. There are obvious difficulties, in that there are so many variable factors which may affect development. There are children who appear to be backward at first, and who subsequently catch up to the average, or at least reach a much higher level than was expected. There are children who are average at first and subsequently deteriorate, as a result of a degenerative disease of the brain, encephalitis, lead poisoning, hypoglycaemia, or other causes. There are great difficulties in making a correct estimate of the capability of an infant with cerebral palsy. The fact remains, however, that mental retardation can be diagnosed in infancy, at least in a high proportion of cases.

For practical purposes the diagnosis of mental retardation is probably the most important single

function of developmental tests in infancy. It is particularly important for the assessment of suitability for adoption. Though it may be of academic interest, it is not of much practical importance to be able to predict whether an infant is going to have an I.Q. of 110 or 140: but it may well be important to know whether he will have an average I.Q. or one of about 70: and it may certainly be important to know whether he is likely to have an I.Q. of about 50. For practical purposes, therefore, developmental tests in infancy are of great value, and we disagree entirely with those who assert the opposite.

We are particularly anxious to emphasize that the estimates made in children discussed in this paper were made in the ordinary busy out-patient clinic or in the ward. They were not made in a special clinic. They were made by the paediatrician in the ordinary course of his work, in the presence of students and postgraduates, and not by a psychologist. That, we feel, is as it should be. Rough developmental assessment must be part of the routine daily work of any paediatrician.

We have deliberately not discussed all the difficulties of developmental assessment. We have set out merely to present a factual statement of our findings. We do not propose to discuss the difficulties of predicting mental superiority in an infant. We aimed at proving that in one aspect, and that the most important from the practical point of view, developmental tests in infancy are of the utmost value.

No one should think that the art of developmental prognosis is easy. It is beset with innumerable hazards. This must be emphasized, for it would be a tragedy to tell a mother that a child is going to be an idiot when in fact he will be normal or a genius. The wise paediatrician does not give a prognosis to the mother until he is certain, and in very many cases that can only be after repeated examinations have clearly demonstrated a retarded rate of developmental progress.

Summary

It has been shown that developmental tests in the first two years of life have an invaluable predictive value with regard to the early diagnosis of mental retardation.

The study was based on 135 children in whom mental retardation was diagnosed in the first two years, even though subsequent observation showed that development had become normal. In 77 of these the diagnosis was made in the first year. Cases of mongolism, cretinism, hydrocephalus or anencephaly were excluded. Intelligence quotients were estimated at the age of 5 to 10. Two children could not be traced. Thirty-two died, and in the 10 in whom an autopsy was carried out, a gross cerebral anomaly was found.

Of the remaining 101 children, 59 on follow-up examination were found to be ineducable (I.Q. below 50), 24 had an I.Q. of 50 to 75, and five had an I.Q. of 100 or more.

It was noted that while only four children fared worse than was expected, some 16 children fared better than the original developmental level had led us to expect.

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