

Mode of Delivery and Developmental Characteristics in a Thousand Dunedin Three Year Olds: A Report from the Dunedin Multidisciplinary Child Development Study

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SUMMARY

A study of 1037 representative Dunedin children delivered by a variety of modes was described. The results showed that there were no significant differences in maternal general mental ability, training in child development, or background of child experiences among the five delivery groups studied. Also, there were no significant differences between children who were spontaneous deliveries or any of the other groups in age at which the developmental milestones were achieved, nor in any of the developmental characteristics assessed.

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INTRODUCTION

Apgar (1965) stated that "the many reviews on the subject of perinatal problems and the central nervous system, in general, show that complicated deliveries are followed by a decrease, in varying degrees, in mental function of the child" (p.75). In a retrospective study, Akesson (1966) found a significant association between breech delivery and mental retardation. In a later prospective study, however, Hambert, Akesson (1973) failed to confirm an association between breech delivery and later problems of development. Barker, Edwards (1967) in a large study (N = 50 000) found a small but significant decrease in verbal reasoning scores of children who had been occipito posterior presentations and an increase in the scores of children delivered by caesarean section. In a study of the first year of development of preterm infants, Bishop and others (1965) found that any presentation other than vertex was associated with an increased incidence of developmental delays and neurological abnormalities. They also found that both breech delivery and caesarean section were associated with poor outcome in the first year of life compared with spontaneous deliveries or those assisted with forceps.

This study re-examines the relationship between mode of delivery and child development by comparing the early development and three year developmental status of 1037 three-year-old children delivered by various methods.

METHOD

Subjects: The sample comprised 1037 three-year-old children being studied as part of the Dunedin Multidisciplinary Child Development Study. This sample was described by Silva and others (1978).

Methods of Data Collection: Mode of delivery was recorded at the time of birth and was classified as spontaneous (N =

742, 71.6 percent), vertex delivery with forceps (N = 145, 14.0 percent), vertex delivery with forceps rotation (N = 74, 7.1 percent), caesarean section (N = 48, 4.6 percent), and breech delivery (N = 28, 2.7 percent). Breech delivery included assisted breech and breech extraction with or without forceps to the after coming head.

The children and their mothers were recalled for follow up assessment when the children were within a month of their third birthdays (Silva, 1976).

In order to ascertain whether the groups, classified according to mode of delivery, were of similar background characteristics, a test of general mental ability (Thurstone, Thurstone, 1975) was administered to the mothers and details relating to the mother's training in child development and child experiences were gathered. These measures of background characteristics and their relationship with socio-economic status and child intelligence have been described elsewhere (Silva, Fergusson, 1976).

The mothers were interviewed to determine the age at which their children achieved six milestones of development. If they were uncertain, the mothers were not encouraged to guess and the results were recorded as not known. The following milestones of development were included: smiling; sitting unaided; able to pivot without falling; walking six steps alone; self-feeding with a spoon; six single words used appropriately; talking in sentences (four or more syllables) and able to be understood. Except for smiling, which was recorded in weeks, the milestones were recorded to the nearest month.

Five aspects of child development were assessed as follows: verbal comprehension and expression (Reynell, 1969), intelligence (Dunn, 1965), fine motor co-ordination (Silva, 1976), and gross motor co-ordination (after Bayley, 1961 and described by Silva, 1976).

Methods of Statistical Analysis: The means of each measure were computed for each of the five delivery groups and the differences were tested for statistical significance using analysis of variance. The 0.01 level of significance was adopted for rejection of the null hypothesis. This rather exacting level was selected because of the possible practical importance of the findings. As Guilford (1965) points out, a demanding significance level serves to reduce the probability of "Type I errors" (rejecting the null hypothesis when it is true) but increases the possibility of Type II errors (accepting the null hypothesis when it is false).

RESULTS

It is shown in Table 1 that there were no significant differences among the groups in terms of maternal general mental ability and training in child development, nor in background child experiences.

It is demonstrated in Table 2 that there were no significant differences among the groups in age at which the children smiled, sat, walked, fed themselves with a spoon, or talked.

Finally, it can be seen in Table 3 that there were no dif-

ferences among the groups in terms of verbal comprehension and expression, intelligence, and fine or gross motor co-ordination.

DISCUSSION

The results from this study showed that there were no significant differences in maternal general mental ability, training in child development, or background of experiences among the five delivery groups. These data served to emphasise that there were no significant differences in the background characteristics of children which might have affected the results obtained by the children in the various developmental tests. As has been pointed out by various writers (Wiener, 1962), many follow up studies of children who experienced perinatal problems have lacked adequate data on the backgrounds of the subjects and have not controlled for these factors in their analysis of developmental characteristics.

This study found that contrary to some previous studies, there were no significant differences between children who were spontaneous deliveries or any of the other groups in age at which the milestones were achieved, nor in any of the developmental characteristics assessed. Despite the tendency for breech delivery and caesarean section to have a disproportionate percentage of preterm infants (Buckfield, personal communication), the findings from this study do not suggest that any particular mode of delivery is associated with a lowering in intellectual functioning or any other adverse outcomes.

The findings suggest that a search for relationships between complications of delivery and adverse outcomes should focus on more specific, potentially damaging factors in the perinatal period, as mode of delivery alone is not, apparently, related to later developmental characteristics.

Table 1.—Means for maternal general mental ability, training in child development and child experiences: a comparison of mode of delivery

Measure	Method of Delivery										Error Root Mean Square	Significance
	Spontaneous		Forceps		Rotation Forceps		Caesarean Section		Breech			
	N	m	N	m	N	m	N	m	N	m		
Maternal general mental ability	724	39.3	143	41.3	72	40.6	45	42.2	27	38.2	14.76	NS
Maternal training in child develop.	742	2.6	145	2.6	74	2.7	48	2.8	28	2.5	1.01	NS
Child experiences	742	18.2	145	18.0	74	18.3	48	18.6	28	16.6	3.58	NS

Table 2.—Means for age of attainment of developmental milestones: a comparison of modes of delivery

Measure	Method of Delivery										Error Root Mean Square	Significance
	Spontaneous		Forceps		Rotation Forceps		Caesarean Section		Breech			
	N	m	N	m	N	m	N	m	N	m		
Smiling	607	6.1	120	5.9	65	5.4	37	6.2	24	6.3	1.90	NS
Sitting	651	7.5	125	7.5	68	7.4	41	7.3	24	8.0	1.82	NS
Walking	732	13.6	141	13.6	73	13.6	47	13.6	27	14.1	2.84	NS
Feeding self	646	15.7	126	15.4	63	16.3	43	17.2	22	17.3	4.16	NS
Talking (single words)	622	16.3	122	16.1	63	15.6	44	15.9	23	19.0	5.11	NS
Talking (sentences)	654	24.7	131	24.2	64	24.1	40	24.2	26	25.0	5.54	NS

Table 3.—Means for developmental measures: a comparison of modes of delivery

Measure	Method of Delivery										Error Root Mean Square	Significance
	Spontaneous		Forceps		Rotation Forceps		Caesarean Section		Breech			
	N	m	N	m	N	m	N	m	N	m		
Verbal comprehension	734	34.7	144	36.3	74	32.2	48	35.1	28	32.3	8.75	NS
Verbal expression	734	35.8	144	37.2	74	34.9	48	35.7	28	32.4	8.40	NS
Intelligence	697	23.2	142	24.8	72	23.1	43	25.8	25	22.3	9.56	NS
Fine motor co-ordination	726	6.4	145	6.3	73	6.2	46	6.3	24	6.2	1.03	NS
Gross motor co-ordination	698	20.7	137	20.9	70	20.3	45	19.6	26	18.5	4.38	NS

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