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The Fate of “Small Twins”: A Four-year Follow-up Study of Low Birthweight and Prematurely Born Twins

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Abstract. This follow-up study of twins includes 35 families from the Stockholm area. One section concerns the physical and mental development of the twins. The other sections compare the development of the children with their parents' expectations of them and the parents' feelings about the delivery. Seven twin pairs (20%) in the total group were born before 37 complete gestational weeks. Thirty-seven of the twins weighed less than 2,500g at birth; of these, 23 (9 boys and 14 girls) weighed less than 2,500g, although they were born after 37 gestational weeks. At four years of age, 22 of the 68 twins still showed some impairment of locomotor, language/speech and emotional development, as assessed by the Griffiths Mental Development Scales. All the prematurely born and small-for-date infants were in this group. There also seems to be a relationship between developmental problems and the mother's negative or ambivalent expectations concerning the twin pregnancy.

Key words: Twins, Prematurity, Low birthweight, Locomotor development, Language/Speech development, Mental development, Performance

INTRODUCTION

Several studies have pointed out that mental development is more delayed in twins than in singletons, especially with respect to cognitive performance and language development [4,13,18,19]. Some of these studies are old and probably not entirely representative any longer because of the better understanding today of early child development.

We have shown earlier in a follow-up study of locomotor and language development in 34 twin pairs [2] that there were no differences in language, locomotor or total mental development between fullterm twins and singletons at four years of age. However, twins

who weighed less than 2,500g at birth, because of immaturity or growth retardation, had significantly lower locomotor and total scores.

The aim of this study was to follow more closely the low birthweight twins longitudinally and correlate various background factors and risk factors at birth with their mental and physical development at 9 and 18 months and again at four years of age.

MATERIAL AND METHODS

Initially, the study comprised 35 parents who were expecting twins. One child in a twin pair was stillborn; the sample, therefore, consists of 34 twin pairs of whom 12 are monozygotic (MZ). Thirty-seven infants are female and 31 male. Six of the infants were born with physical handicaps; one had a distal myelomeningocele (MMC), one twin pair had craniosynostosis of the sagittal suture, and three infants showed significant skeletal malformations. None of the twins had any signs of cerebral injury at birth.

At the ages of 9 and 18 months and again at four years, their development was evaluated using the Griffiths Mental Development Scale [9,10]. Details of this methodology have been published previously [1]. In short, the test includes six subscales for different development parameters: locomotor (A), personal-social (B), hearing and speech (C), hand and eye coordination (D), performance (E), and practical reasoning (F). A total score is also calculated.

All tests were carried out in the homes of the twin families within 7 days prior to, or 7 days after, the above-mentioned ages. Behaviour observations and records concerning their concentration, spontaneity and activity were made. Premature twins were defined as those born before 37 complete gestational weeks and low birthweight twins as those with a birthweight less than 2,500 g.

The data have been analysed with the "Statistical Analysis System" (SAS) [16]. The t-test was used to calculate differences between mean values, expressed as quota values, in different groups. These differences were validated by variance analysis. The development quotas were estimated from each subscale and the total test. The following symbols used in the Tables indicate significance levels of the statistical analysis:

*** $p < 0.001$, ** $0.001 < p < 0.01$, * $0.01 < p < 0.05$. No significance: $p > 0.05$.

RESULTS

All six infants born with physical handicaps were among the group of twins who showed some impairment at 4 years of age. Seven twin pairs (14 children, ie. 20%) were born before 37 complete gestational weeks. Three of these pairs were MZ boys, three were DZ boys and one pair was a boy and a girl. At 9 and 18 months of age, the prematurely born children had significantly lower quotients in all subscales and in the total test than the twins born after 37 weeks. When they were 4 years old, the prematurely born children still had lower quotients on all subscales, but the differences were significant only in the locomotor, hand and eye coordination, practical reasoning, and total tests (Table 1). Thirty-seven (> 50%) of the twins had a birthweight of less than 2,500g (23 of these,

Table 1 - Mental development in twins related to gestational weeks

	N	9 months		18 months		4 years	
		M	SD	M	SD	M	SD
A-scale							
< 37 wk	14	98.2**	26.1	101.6*	15.1	88.5**	14.9
≥ 37 wk	54	126.1**	17.7	111.4*	8.6	101.4**	13.2
B-scale							
< 37 wk	14	97.9**	5.4	101.7**	7.7	96.5	14.1
≥ 37 wk	54	104.3**	7.0	108.8**	9.7	104.5	12.3
C-scale							
< 37 wk	14	86.8**	9.1	94.5*	8.2	96.9	17.7
≥ 37 wk	54	98.8**	10.5	102.7*	14.3	107.1	21.2
D-scale							
< 37 wk	14	94.7**	6.5	95.9**	5.6	88.5*	16.1
≥ 37 wk	54	102.4**	8.2	105.3**	8.3	102.9*	14.9
E-scale							
< 37 wk	14	96.7**	5.2	103.3*	9.1	93.0	14.4
≥ 37 wk	54	105.8**	9.5	109.4*	11.4	102.6	18.9
F-scale							
< 37 wk	14					89.8*	15.4
≥ 37 wk	54					102.1*	17.1
Total mental development							
< 37 wk	14	95.0**	7.9	99.5**	5.1	92.3**	3.80
≥ 37 wk	54	105.3**	7.4	107.5**	7.6	103.6**	12.80

* $p < 0.05$ ** $p < 0.01$

N = number of twins

M = mean

SD = standard deviation

WK = weeks

9 boys and 14 girls, weighed <2,500 g, although they were born after 37 complete weeks). The differences between low birthweight twins vs. those of normal birthweight were less than those for premature twins vs. twins born at term. However, at 4 years of age, the differences were significant in the locomotor, the hand and eye coordination, performance and total scales (Table 2).

Table 3 illustrates the physical and emotional problems which were evident at 4 years of age. A total of 22 children (32%) had significant physical or psychological problems. These complications influenced primarily the locomotor, language/speech and emotional development scales. Five of the twins showing retardation of psychomotor develop-

Table 2 - Mental development in twins related to birthweight

	N	9 months		18 months		4 years	
		M	SD	M	SD	M	SD
A-scale							
< 2.500 g	37	106.3**	20.9	106.6*	13.1	94.4**	13.2
≥ 2.500 g	31	119.6**	17.1	112.9*	5.6	104.9**	13.6
B-scale							
< 2.500 g	37	102.0	7.7	106.1	10.4	101.4	13.7
≥ 2.500 g	31	104.3	6.3	109.5	8.8	105.1	12.0
C-scale							
< 2.500 g	37	93.7*	10.7	99.0	12.3	105.6	17.0
≥ 2.500 g	31	99.9*	11.1	103.9	15.2	104.9	25.0
D-scale							
< 2.500 g	37	99.1*	9.4	100.0**	8.2	96.2*	16.0
≥ 2.500 g	31	103.3*	6.6	107.6**	7.6	105.1*	15.1
E-scale							
< 2.500 g	37	102.2	8.8	105.7*	12.4	95.7*	14.8
≥ 2.500 g	31	106.6	9.9	111.4*	9.2	106.9*	20.9
F-scale							
< 2.500 g	37					98.1	15.7
≥ 2.500 g	31					102.6	19.2
Total mental development							
< 2.500 g	37	100.5**	8.8	103.5**	7.8	98.5*	12.5
≥ 2.500 g	31	106.7**	6.9	109.0**	6.9	105.2*	14.1

* p<0.05 **p<0.01

Table 3 - Physical or psychological impairment at four years of age

	Male	Female	Total	% of total
Psychomotor retardation	5	3	8	11.8
Impaired hearing	2	0	2	2.9
Impaired vision	0	2	2	2.9
Delay in speech/language	8	0	8	11.8
Emotional problems	2	0	2	2.9
No physical or psychological problems	14	32	46	67.7

Table 4 - Mental development in the twins with physical and psychological disorders (group I) compared to those without (group II)

	N	9 months		18 months		4 years	
		M	SD	M	SD	M	SD
A-scale							
Group I	22	100.7***	15.5	105.6*	8.5	89.2***	12.8
Group II	46	118.0***	20.1	111.3*	11.3	103.8***	12.5
B-scale							
Group I	22	101.0	7.3	102.5**	8.5	94.0***	13.0
Group II	46	104.0	7.0	110.2**	9.2	107.5***	10.7
C-scale							
Group I	22	92.9	13.3	93.3**	13.7	91.8**	24.3
Group II	46	98.2	9.9	105.0**	12.3	111.7**	15.6
D-scale							
Group I	22	96.4**	6.2	99.2**	7.6	90.8***	15.1
Group II	46	103.3**	8.5	105.6**	8.6	104.8***	14.7
E-scale							
Group I	22	101.0*	8.5	105.6	10.4	91.6***	16.6
Group II	46	105.8*	9.6	109.6	11.6	105.2***	18.0
F-scale							
Group I	22					89.0***	13.9
Group II	46					105.5***	16.5
Total mental development							
Group I	22	98.4**	7.2	101.3**	9.9	91.5***	12.8
Group II	46	105.7**	8.2	108.3**	8.0	106.4***	11.2

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

ment had been prematurely born, one was born with a birthweight of less than 2,500g at full term, and two (a MZ twin pair) had craniosynostosis. One of the two boys with impaired hearing had been prematurely born. The two girls with impaired vision were a MZ twin pair, born at term with a low birthweight (2,100 and 2,320 g). They had a limited peripheral visual field but good central vision. These girls also showed a delay in language development. Six of the 8 children with delayed language and speech development were premature. Four of these 6 children were also small for dates. One of the boys with mental retardation was later found to have tuberous sclerosis. Two boys with severe emotional disturbances were premature as well as small for dates, having been born in the 32nd gestational week. Thus, all except three of the infants with physical and emotional problems were either born prematurely or weighed less than 2,500g at birth. Table 4 illustrates mental development, assessed by the Griffiths scales, in relation to those physical and psychological disorders listed in Table 3. It is clearly seen that the differences increase with age in all subscales and in the total tests.

Table 5 - Mental development in twins related to the mother's expectations of the twin pregnancy

	N ⁽¹⁾	9 months		18 months		4 years	
		M	SD	M	SD	M	SD
A-scale							
Negative/ambiv.	22	114.7	24.8	108.2	10.5	93.9*	14.7
Positive	46	111.3	18.0	110.1	11.0	101.6*	13.6
B-scale							
Negative/ambiv.	22	101.3	8.3	103.4	8.0	100.8	12.8
Positive	46	103.9	6.4	106.9	10.2	104.2	13.2
C-scale							
Negative/ambiv.	22	95.3	10.2	99.9	14.7	99.0	25.8
Positive	46	96.9	11.9	101.8	13.5	108.3	17.6
D-scale							
Negative/ambiv.	22	97.8*	9.3	103.2	8.9	100.2	15.3
Positive	46	102.6*	7.6	103.6	8.8	100.3	16.7
E-scale							
Negative/ambiv.	22	104.1	8.7	107.5	10.6	97.3	15.0
Positive	46	104.3	10.0	108.6	11.7	102.5	20.0
F-scale							
Negative/ambiv.	22					95.6	16.5
Positive	46					102.3	17.6
Total mental development							
Negative/ambiv.	22	102.7	9.2	105.7	7.2	98.2	13.4
Positive	46	103.7	8.3	106.2	8.1	103.2	3.7

* $p < 0.05$ N⁽¹⁾ = number of infants

At the first interview which took place before delivery 11 of the mothers were ambivalent or negative with regard to their twin pregnancy. Five of these had premature deliveries and 14 of their 22 infants had a birthweight of less than 2,500 g. With the exception of the locomotor scale at five months, the twins at all ages had higher quotients when the mothers had had a positive attitude to the twin pregnancy (Table 5). The differences, however, are only significant in the hand and eye coordination subscale at 9 months, and in the locomotor subscale at 4 years of age. The differences between the two groups generally seemed to increase over time.

DISCUSSION

In this study we wished to look closely at the differences in performance between twins who were born at term and those who were either born prematurely or weighed less than

2,500 g. None of the infants weighed less than 1,240g and there were no birth injuries. The parents were a rather homogeneous group of middle class people with ready access to medical care both during pregnancy and later. Moreover, throughout this study the infants were carefully examined at different stages of their development. Despite all these positive factors, one third of the twins lagged a little behind at 4 years of age. Furthermore, *all* those either born prematurely or weighing less than 2,500g at birth were among this group of poor performers. This strongly suggests that the previously observed differences between singletons and twins [11,19] resulted from the higher percentage of prematurity in twin pregnancies rather than from the twinning itself. This would be consistent with other studies [3,6].

The number of infants is too small to permit more than a crude division into fullterm versus prematurely born infants (defined as more or less than 37 complete gestational weeks) and newborns with a low birthweight (<2,500 g). Such a division does not take into account real growth retardation (eg. defined as a birthweight less than 2 SD of the normal weight, irrespective of the gestational age). With this somewhat arbitrary division of the study group into normal sized and fullterm infants and "others", it is evident that these "others" show an impaired development at 4 years of age (Tables 1 and 2). The really interesting finding in this small but thoroughly examined group of twins, is that impairment seems to be more pronounced in those subscales which measure various aspects of physical development as opposed to those which describe language functions. This finding is not consistent with the theory which blames prematurity solely for the previously often observed lag in speech development in twins [17]. It should be noted that, of the 22 children who at four years of age had some physical or psychological impairment 17 were boys (Table 3). This is consistent with other studies of mental development in singletons and twins [3,8,12].

It has been suggested that the psychological wellbeing of the mother during pregnancy influences the behaviour of the child [5]. Neifert & Thorpe [15] conclude that the occurrence of twins clearly means a unique and challenging parental experience which begins during pregnancy and reaches crisis proportions after delivery when the parents are confronted with caring for two babies. The mothers' anxiety may make it more difficult for them to develop a good and close relationship with their children during their first years. Goshen-Gottstein [7], who used a longitudinal observation method to study how mothers cope with the heavy demands created by twins, concluded that ambivalence was frequently expressed by projecting negative feelings to one of the twins and positive feelings to the other. Prenatal factors therefore, such as the parents' expectations, may add to the inferior results of the premature twins.

Psychoanalysts have pointed out the great importance of a good and close relationship between mother and child. This relationship with the mother is necessary for the child to develop deeper relations with other persons later in life. Many of the mothers who delivered prematurely continued to be anxious and depressed. It is, of course, impossible to determine whether the state of depression often seen is a prolonged postpartum depression or whether it results from the difficulties in caring for twins. It is an interesting fact that in 4 of the 7 families with prematurely born twins, the parents had marital problems which eventually led to separation. Only one other separation has occurred in the entire study group.

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