BORN TOO SMALL—IS OUTCOME STILL AFFECTED?

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More than a decade has passed since the Newcastle research team published their data showing that children born 'too soon' or 'too small' in 1960-62 had behavioural, temperamental and intellectual impairments five to seven years later (Neligan *et al.* 1976). Those who were born 'too small' in the Newcastle Survey of Child Development were at the greater disadvantage. Adverse effects of being light-for-dates were seen in a wide range of different measures of performance. Effects were seen in children of 36 to 44 weeks gestation with birthweights below the 10th centile, but the effects were particularly marked in those with birthweights below the 5th centile. Children born 'too soon' but with otherwise normal intra-uterine growth, and protected from the dangerous neonatal complications of preterm birth, continued to develop normally. The authors drew two important conclusions. First, when a child's growth pattern has been seriously below average in the period before birth, subsequent development may not be remedied by improvements in postnatal care. Second, in a representative population sample, biological factors operating largely before birth (such as placental 'insufficiency') proved to be overshadowed in importance by social and environmental factors operating largely after birth (such as social class and quality of care).

It is now appreciated that this is an over-simplification, as light-for-dates fetuses are a heterogeneous group. Aetiology varies, as does the timing of any insult affecting growth (Chiswick 1985, Brar and Rutherford 1988). Although advances in neonatal paediatrics have led to major improvement in short-term mortality and morbidity over the last two decades, concern and uncertainty still exist about the long-term effects of being born light-for-dates (Allen 1980, Teberg *et al.* 1988).

The present study consisted of the assessment at the ages of 10 and 11 of children who had been born in 1973 and 1974 and addressed itself to two inter-related questions. First, if environmental factors are controlled, do light-for-dates children have reduced performance at school age? Second, is it still true that being very light-for-dates—below the 5th centile (Neligan *et al.* 1974) in the 1976 study, and below the 2nd centile in the present study—is associated with widespread impairments?

The present study population, like Neligan and colleagues', came from Newcastle, and many similar assessment techniques were used. However, the present study differered in that a matched control sample of children of appropriate birthweight was used for comparison purposes, whereas Neligan and colleagues took a random sample of control children, then adjusted for social class in the final analysis. The present study also focused on a more extreme group, *i.e.* those below the 2nd centile for birth-

weight, and in the highest risk group, *i.e.* males, as previous research has demonstrated that boys showed more differences in temperament, behaviour and intelligence at follow-up (Neligan *et al.* 1976, Parkinson *et al.* 1981).

We set out to test three hypotheses:
(1) Despite modern technology, there will still be differences in the behaviour, temperament, cognition and achievement of children born severely light-for-dates compared with controls.
(2) These differences will be specific to certain dimensions of behaviour and temperament rather than general to all dimensions.
(3) It will be possible to identify an excess of minor physical anomalies in children who were light-for-dates.

Patients and method

The study sample of boys was selected from the 6900 children born to mothers resident in Newcastle upon Tyne in 1973 and 1974 and still living in or near Newcastle at the time of the study. An attempt was made to find all singletons born at 36 to 42 weeks gestation with birthweights below the 2nd centile. Gestational age was determined from the mother's menstrual dates, and validated by the paediatric and obstetric assessments in the medical records. Of 53 cases initially identified, 15 had moved out of the area, and because of limited resources were not followed up. There was no evidence that these families were different from the families remaining in the area. Of the boys still living in the area, six were non-caucasian, two had uncertain gestational ages and two were found at the time of the study to be profoundly disabled, both physically and mentally. These last two boys attended special school but lived at home. Both had such severe language and motor disabilities that they could not be assessed by the methods used in this study. Congenital cytomegalovirus infection may have been responsible for one child's disability but no aetiological explanation was found for the other child. Maternal and social information was obtained for these two boys, but the boys themselves were not assessed in detail.

Because the earlier study of Neligan *et al.* (1976) showed that parenting and social factors were important, a deliberate decision was made to control for social class. Matched controls with birthweights above the 2nd centile were selected from each index child's school class. Controlled variables were age of child, social class (based on father's occupation), and single parenthood.

Follow-up of the cases and controls consisted of an interview at the child's home to obtain parental and social histories, a developmental history of the child and home observation (Bradley and Caldwell 1977). There was further assessment of the child and mother at the clinic, or if they failed to attend, on a second home visit.

Assessment of the mother was carried out using the Chess temperament questionnaire (Thomas and Chess 1977), malaise inventory (Rutter *et al.* 1970), adult Eysenck Personality Questionnaire (EPQ) (Eysenck and Eysenck 1975), and verbal IQ test (Raven *et al.* 1976). The mother completed questionnaires describing the child's temperament (Garside *et al.* 1975), which gave dimensions of withdrawal, activity, mood and irregularity; and the Newcastle Behaviour Inventory (Kolvin *et al.* 1975), which gave measures of neurotic, anti-social (conduct) and psychosomatic behaviour.

At the clinic the child was weighed and measured and examined for minor physical anomalies (Waldrop and Goering 1971). He underwent neurological testing for the presence of choreiform movements, and imitation of gestures (Bergès and Lézine 1963). Cognitive function was tested using the short form of the Weschler Intelligence Scale for Children (WISC-R) (Wechsler 1974). The short form test (vocabulary and coding) has been found to be a practical and useful device (Sattler 1982). The Young Reading Test (Young 1968) was also used to assess reading attainments. Personality was assessed using the Eysenck Personality Questionnaire (Eysenck and Eysenck 1975).

The children's teachers were asked to rate each child for classroom behaviour according to the Conners Teacher Questionnaire (Conners 1969), for temperament using a modified teacher

TABLE I
Weight and gestation at birth

	1960-62 singleton births < 10th centile (boys and girls)		*1973-74 singleton births < 2nd centile (boys only)*	
	Index (N = 141)	*Control (N = 187)*	*Index (N = 30)*	*Control (N = 30)*
Mean gestation in days (SD)	281 (12·7)	281 (12·6)	271 (12·5)	280 (7·0)
Mean birthweight in grams (SD)	2537 (289)	3508 (482)	2258 (228)	3387 (310)

temperament questionnaire (Thomas and Chess 1977), and for educational attainment in literacy skills (reading, writing and number concept) using the Newcastle Educational Questionnaire (Fundudis *et al.* 1979).

Visits were made to the homes of the two profoundly disabled boys, but it was impossible to assess them using the methods of this study. Similarly, the school questionnaires were inappropriate.

Statistical analyses

Group differences were compared statistically using χ^2 and t tests. Outcome measures were tested to see whether they correlated with weight or gestation at birth; partial correlations were also undertaken to allow for the effects of maternal smoking, and for the mother's malaise, neuroticism (EPQ) and care-rating scores during the home observation (Bradley and Caldwell 1977). Outcome measures were also tested for correlation with the extent to which weight for gestation at birth deviated from population norms (z score).

In an attempt to identify the most important explanatory factors among a range of factors, we carried out a series of multiple regression analyses using parametric methods. This was a staged exercise, as there were a large number of potential explanatory variables. Multiple regression analysis does not simply consider the correlation between the various associated factors within a predictive set (predictive variables) and subsequent performance (dependent variables); it also takes into account the correlations between the associated factors themselves. Thus an explanatory factor may have a relatively low predictive weight in regression analysis because it is duplicated by being correlated with another explanatory factor.

The four sets of independent variables chosen were perinatal factors; physical family factors (*e.g.* mother's height, ordinal position of the child); factors reflecting social environment; and family psychological and relationship factors. The best predictors from each group were then combined in final multiple regression analyses. The five explanatory (independent) variables chosen for the final regression set were ordinal position of the child, mother's height, mother's IQ, family's occupational class, and z score (the deviation of the child's birthweight from the mean for gestational age). The outcome (dependent) variables chosen for analysis were five measures of cognition and achievements, an index of imitation of gestures, six subscales of the Conners school behaviour questionnaire, and the neuroticism score on child EPQ. These were thought to be the most important outcome measures. The technique of summing the relevant coefficients has been outlined previously (Neligan *et al.* 1976, p. 72). This approach was followed so as to allow an estimate of the best predictors in relation to the range of measures of outcome.

Results

The birthweights of the index group ranged from 1560g to 2495g (mean 2258g), and of the control group from 2865g to 3830g (mean 3387g) (Table I).

Two of the initial 30 cases (6·7 per cent)

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TABLE II
Cognitive assessment of boys at follow-up

	1960-62 births <10th centile, studied when 5 to 6		*1973-74 births <2nd centile, studied when 10 to 11*	
	*Index**	*Control*	*Index**	*Control*
Intelligence quotient[1, 2]	93·9	103·0	95·3	97·4
Verbal quotient[2]			100·8	99·7
Language quotient[3]	92·9	100·7		
Reading quotient[4]			91·1	91·7

*Excluding two children born in 1960-62 and two children born in 1973-74 who were too intellectually disabled to be testable.
[1]Wechsler Preschool and Primary Scale of Intelligence at six years ($p<0·01$).
[2]Wechsler Intelligence Scale for Children (Revised) at 10 to 11 years.
[3]Illinois Test of Psycholinguistic Abilities at five years ($p<0·05$).
[4]Young Reading Test at 10 to 11 years.

in the light-for-dates group were profoundly disabled. There were no such cases in the control group. No other forms of disability were recognised in either group. After exclusion of the two disabled boys, no significant differences between the study and control groups were found for any of the following variables: the families' social class, history of unemployment, experience of overcrowding (person/room ratio) or interpersonal relationships; parents' educational backgrounds; mothers' age, marital status, previous obstetric history, personality (other than neuroticism), temperament or IQ; or the child's history of accidents or separation from parents.

However, there were significant differences between the groups for several maternal factors. The number of mothers smoking during pregnancy, and at the time of interview, was significantly higher in the light-for-dates group, as was the mother's neuroticism score (EPQ) and malaise score. The ratings for involvement and stimulation of the child at home observation were lower for the light-for-dates group, and there was a significantly higher physical punishment score. Mothers of light-for-dates infants were of significantly shorter stature and had had a significantly higher incidence of fetal distress and complications at delivery.

Some results of cognitive assessment of each group are shown in Table II. The mean IQ and reading quotient of the index and control groups were similar.

The children in the light-for-dates group had significantly lower height and weight centiles at the age of 10 and 11 than the controls. This is to be expected (Neligan *et al.* 1974). In two aspects of the minor physical anomaly score, *i.e.* increased head size and gap between the toes, the light-for-dates group also showed significantly more abnormalities, although the total physical anomaly scores were not significantly different.

It was thought possible that division of the boys into categories of 'light-for-dates' and 'not light-for-dates' was not sufficiently sensitive, so correlations were performed for outcome, with birthweight as the independent variable. However, no measure of outcome correlated significantly with birthweight after controlling for family and social factors. Only neurotic behaviour at home correlated significantly ($p<0·01$) and inversely with gestational age after controlling for family and social factors.

Since birthweight alone is not a measure of how severely the birthweight falls below the population 'norm', we calculated a z score for each child, which is a measure of the extent to which a child's birthweight differed from the population mean, when standardised for gestation. For example a score of -1 indicates a birthweight 1 SD below the

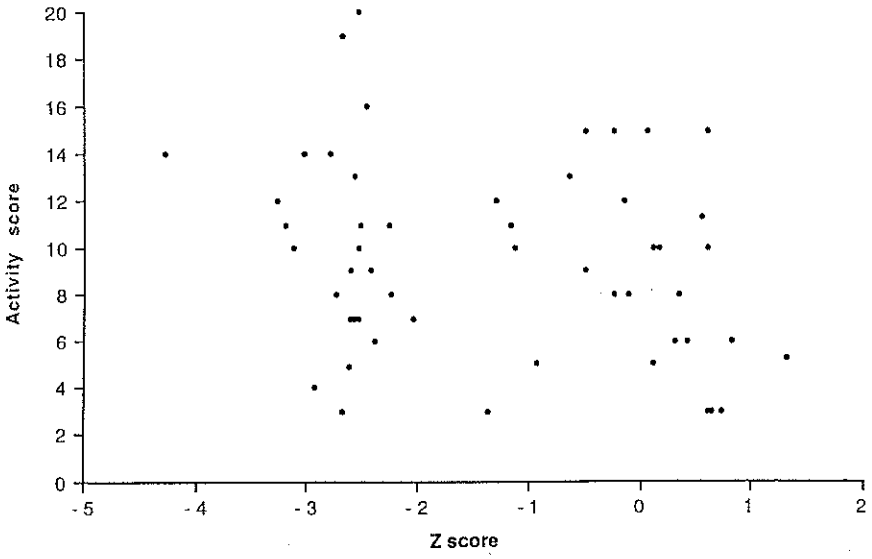

Fig. 1. Relationship between excess activity at school and weight for gestation at birth (z score). (Completed school questionnaires = 53/60.)

mean. The association of z score with one dimension of outcome is shown for illustrative purposes in Figure 1.

As can be seen from Table III, for both the case and control groups there were significant correlations between the z score and aspects of behaviour and temperament at school which were suggestive of the attention deficit disorder. No significant correlations were found between z score and other aspects of outcome such as IQ, reading quotient, educational assessment by the Newcastle Educational Questionnaire, or minor physical anomalies.

Of the five predictors of outcome included in the final multiple regression analysis, the two best predictors were ordinal position of the child and mother's IQ. Next in magnitude were mother's height and family occupational class. Of the five variables chosen, z score (that is deviation of the child's birthweight from the mean for gestational age) proved to be the poorest predictor. The six outcome variables (out of a possible 16) predicted by ordinal position were widely distributed across the behaviour and cognitive spectrum; the five variables predicted by mother's IQ mainly related to cognition and school achievements; the four variables predicted by mother's height covered a range of behavioural and temperamental items, as well as comprehension; and the three variables predicted by occupational class covered cognition and psychosomatic behaviour. Finally, z score predicted only distractability and poor approachability.

TABLE III

Significant partial correlations between various outcome measures and weight for gestation at birth (z score)

Outcome	*Correlations* (r)*	*p*
School report:		
Temperament and behaviour:		
Distractable[1]	−0·30	<0·01
Inattentive[2]	−0·26	<0·03
Withdrawn[1]	−0·27	<0·03
Excess activity[1]	−0·24	<0·04
Excess intensity[1]	−0·22	<0·05
Behaviour—total score[2]	−0·28	<0·05
Child's personality (EPQ):		
Toughminded	−0·26	<0·03
Neuroticism	−0·22	<0·05
Child's neurology:'		
Poor gesture imitation	−0·25	<0·03
Choreiform movements score	−0·24	<0·04

*Based on combined data for index and control children.
[1]School temperament questionnaire (Thomas and Chess).
[2]School behaviour questionnaire (Conner).

Discussion

Neligan and his co-workers in 1976 described differences at follow-up between light-for-dates children and controls. The group who were light-for-dates at birth performed less well on a wide range of psychometric tests, had an excess of abnormalities of behaviour and temperament, which appeared to represent a pattern of hyperactivity, showed more abnormalities on neurological examination, and continued to grow more slowly after birth. These differences were more marked in children below the 5th centile for birthweight than in children below the 10th centile, and were most marked when boys were studied separately. However, it was also concluded that 'family factors' (such as care of the child) exerted a very important influence on outcome.

The present study differed from that of Neligan and colleagues in that we studied boys only, and controlled for social class from the outset. Our study population was older than the 1960-62 population when assessed (10 to 11 instead of five to seven years old), and our index group was also more extreme, being below the 2nd centile for birthweight (Neligan *et al.* chose cases below the 10th centile, or, for some purposes, below the 5th centile). Both studies drew their case material from the same geographically defined population, and both excluded children who had moved away from the area. There was no evidence that the families who had moved away differed from those who remained in the area. More importantly, all families approached agreed to participate in this study, and all completed the assessments. We would have been concerned if cases had been lost through failure to co-operate. Like Neligan, we chose to exclude children who were profoundly disabled and could not be assessed. However these two boys represent only 6·7 per cent of the study group. The 1973-74 cohort was smaller than the 1960-62 cohort, but actually contained more children with a birthweight below the 2nd centile, because the 1960-62 survey only studied about half of the children who qualified for inclusion by weight and gestation at birth.

Assessment methods common to both studies were the Eysenck Personality Questionnaires for mother and child, the home temperament inventory, the imitation of gestures score and the measure of chloreiform movements. In the present study we used different assessments of the child's home and school behaviour, but the dimensions obtained were similar to those in Neligan and colleagues' study. Unlike them, we also used school assessments of the child's temperament and achievement. The psychometric tests also differed between the two studies.

Social and family factors

It was thought necessary to chronicle the social and family factors since, despite controlling for social class, it remained possible that such factors could modify the child's performance. Environmental influences over a number of years could either enhance or diminish the child's innate physical and psychological potential in many ways. The work of Butler and Golding (1986) demonstrates the importance of these factors. In the present study, however, there were few parental or social differences between the two study groups because a deliberate attempt was made to match for some key variables. On the other hand, significant differences were found in a number of crucial independent variables, which were of two types.

(1) There were significant differences in the mother's personality, with evidence of neuroticism (EPQ) and minor psychiatric disturbance (malaise score). It is likely that these factors are concomitants of smoking (see biological factors) and possibly contribute to a predisposition to smoking. We have not extensively assessed these associations.

(2) There was evidence of poor quality of care of children who had been born light-for-dates, as assessed by the home observation technique of Bradley and Caldwell (1977).

Therefore certain important maternal and environmental factors were present in our light-for-dates children, despite controlling for social class, and these factors may have influenced outcome. In our multiple regression analysis, we followed the method used by Neligan *et al.* (1976) of summing relevant coefficients. It is

again evident, as it was in 1976, that perinatal factors have small effect as compared to family and psychosocial factors. Because of differences in the regression sets chosen, the rank order of the sum of coefficients of each explanatory variable differs between the two studies, although the pattern of findings is similar.

Biological factors

Theoretically, biological insults at birth or in the postnatal period could directly or indirectly affect neurological function, and this in turn could increase the child's vulnerability to adverse environmental factors, or directly impair the child's subsequent performance (Drillien 1964, Neligan *et al.* 1976). Light-for-dates babies may be less able to adapt to the birth process and thus have a worse outcome. In practice, significant group differences were found for four perinatal factors, namely maternal smoking during pregnancy, maternal height, fetal distress and obstetric intervention during labour, and it is easy to see how the last three factors could interact. The effect of mother's height on birthweight is well recognised and it is thought that the mechanism is environmental (through the size of the uterus) rather than genetic. Similarly, it is widely recognised that smoking during pregnancy retards intrauterine growth, an effect independent of social class (Brooke *et al.* 1989).

Intelligence and school performance

Apart from the two boys who were profoundly physically and mentally disabled and who were impossible to assess, we found few differences in outcome measures between the light-for-dates and control groups. In particular, being born 'too small' did not adversely affect school and intellectual achievements. This is in contrast to Neligan and colleagues' findings for the children born in 1960-62. However, as in 1960-62, the most powerful influences on outcome proved to be social and family circumstances.

Bréart and Poisson-Salomon (1988) have reviewed the recent literature and concluded that intelligence is usually normal in children who were moderately light-for-dates at birth. Low *et al.* (1982) studied 76 children from the ages of one to six who were born in the 1970s with birthweights below the 10th centile, and compared the outcome with 88 controls with birthweights above the 25th centile. Although the light-for-dates group were smaller in stature at follow-up, there were no significant differences in intellectual or neurological function. Nilsen *et al.* (1984) compared 50 light-for-dates children (birthweight less than the 10th centile) born in 1962 and 1963 with 59 children with birthweights greater than 4500g: at the age of 18, they found that the light-for-dates group had similar intelligence to the controls and to the national cohort, although height and weight were less. Ounsted *et al.* (1984) studied 138 children born between 1970 and 1974 with birthweights more than 2 SD below the mean. Follow-up at the ages of one, four and seven years revealed that this group had lower height, weight and head circumference compared with controls, but developmental scores were not significantly lower for the light-for-dates group. None of the above studies controlled for social class when selecting controls, and any exclusions, such as multiple births, are not recorded.

Other studies suggest that there is a poor outcome for light-for-dates babies. Fitzhardinge and Steven (1972) compared 96 children with birthweights more than 2 SD below the mean for the hospital of birth in 1960 to 1966 with 36 sibling controls of normal birthweight and of the same sex as the index case. They found an increased incidence of minimal cerebral dysfunction, EEG abnormality, speech defects and school failure in the light-for-dates group at the ages of four, six and eight. However, subsequently Westwood *et al.* (1983) studied the same cohort of light-for-dates children when they were 13 to 19 years old, using controls matched for gestation, sex, ethnic origin and social class. As with the Fitzhardinge and Steven study, multiple births and babies with congenital anomalies and congenital infection were excluded, but Westwood and colleagues also chose to exclude babies with evidence of perinatal asphyxia. They reported that the light-for-dates group had lower height, weight and head

circumference, even after adjusting for socio-economic factors. Lower verbal and full-scale IQs were also reported for the light-for-dates group, but the correlation became insignificant after adjusting for socio-economic factors.

Rantakallio (1985) carried out a population study identifying 1154 children with birthweights below the 10th centile, born in 1966. Information obtained from national registers and schools suggested that light-for-dates children had increased infant mortality and educational subnormality, although there was no increase in major neurological handicap. The results were not adjusted for social class. Vohr and Oh (1983) compared 21 preterm children with birthweights below the 10th centile born in 1975 and 1976 with 20 preterm controls matched for birthweight, but not for social class. Assessment up to the age of five revealed smaller stature in the light-for-dates group, and lower IQ and development quotient. Regression analysis revealed a relationship between IQ and socio-economic status for both the light-for-dates and control groups. Fancourt *et al.* (1976) found poor performance among light-for-dates children at the age of three to four years, which was not explained by social class differences. When the same cohort of children was assessed at the age of five to nine (Parkinson *et al.* 1981), although no difference was found between the school achievement scores of the light-for-dates and control groups, the effect of social class on outcome was more marked in the light-for-dates group. Hill *et al.* (1984) studied 33 babies born in 1964 and 1965, of unspecified birthweight for gestation, who looked 'malnourished' at birth, and compared them with 13 well-nourished controls, said to be of the same socio-economic status. Follow-up to 12 to 14 years revealed lower IQs and increased need for special education in the malnourished group.

This review demonstrates that there have been few population-based studies which matched for social class when selecting controls, although many authors have acknowledged the influence of socio-economic status on outcome. Most studies have examined all children born at term with a weight below the 10th centile; only those of Fitzhardinge and Steven (1972), Westwood *et al.* (1983) and Ounsted *et al.* (1984) concentrated their attention on children who were more severely light-for-dates than this. It appears that more differences were found between light-for-dates children and controls born in the 1960s than among children born in the 1970s, but inconsistency of social class matching makes accurate comparison difficult.

Behaviour and temperament

In our study of boys at the age of 10 and 11, deviation of birthweight below the mean for gestational age appears to have a small but significant effect on behaviour and temperament, with a pattern of abnormal features representative of the attention deficit disorder, *i.e.* distractibility, poor attention and high activity (McDevitt and Carey 1978, Bell and Wardrop 1982). Neligan *et al.* (1976) found a high incidence of hyperactive behaviour in their light-for-dates children—boys in particular. Drillien (1964) reported hyperactive behaviour in 'premature' infants and others have also reported this behaviour in light-for-dates infants (Fitzhardinge and Steven 1972, Offord *et al.* 1979, Walther and Ramaekers 1982, Walther 1988).

Conclusions

There are three possible explanations for the improved intellectual outcome found in this study. First, there have been many changes in perinatal care in the last 30 years. In the early 1960s, intra-uterine growth retardation was not widely recognised, so there was little obstetric intervention to ameliorate its effects. Increased knowledge has led to increased monitoring of these mothers and to early delivery, on occasion, if the fetus is growing badly. Similarly, in the early 1960s the problem of neonatal hypoglycaemia was not widely recognised, and newborn babies often received little food in the first two days of life, food being withheld for even longer from those 'sickly' babies who were probably most in need of early feeding. The technology for intravenous nutrition was also poorly developed and it is possible that some of the babies in the study by Neligan and

colleagues study who were born 'too small' may have experienced undiagnosed hypoglycaemia, which has now been shown to have an effect on neuro-developmental outcome (Lucas *et al.* 1988). On the other hand, by the 1970s, when the children in this study were born, the potential risk of hypoglycaemia in light-for-dates babies was well recognised. To overcome this risk, neonatal care was of higher intensity, with early feeding, prophylactic intravenous therapy where necessary, and improved diagnosis and treatment of hypoglycaemia. Therefore it may be that improved obstetric and neonatal management has led to the favourable outcome for the light-for-dates babies in this study.

Second, it is possible that children who are severely light-for-dates at birth have intellectual deficits during early school-life, which later disappear. The data of Fitzhardinge and Steven (1972), Vohr and Oh (1983) and Westwood *et al.* (1983) could be interpreted in this way, but failure to control for the effect of family function and home background makes detailed interpretation difficult. It is unfortunate that our cases were not seen and assessed when they were five to seven years old, as well as when they were 10 to 11 years old; this should be investigated in any future study. Nevertheless, anomalies or deficits that resolve with time are clearly of less practical importance than differences that persist or increase during childhood.

Third, matching for social and family background in the selection of control children (as was done in the present study) may be better than using random controls and applying some form of multivariate analysis to assess the inter-relationship of the various factors.

Whichever of these interpretations is correct (all three may have contributed to our findings), it is now clear that there are very few significant long-term consequences for most light-for-dates children, given present standards of antenatal care and perinatal management. More work is necessary to confirm whether this is true for children with documented evidence of slow head-growth for many weeks before birth. The study of Parkinson *et al.* (1981) suggests that prolonged slowing of head-growth before birth influences outcome. Similarly, the long-term effects of being light-for-dates have not yet been sufficiently explored (Murray *et al.* 1988). In the meantime, we need to be aware that social influences and family factors have a much more profound influence on a child's subsequent development than any of the biological factors that result in a child being born even extremely light-for-dates, and we need to renew our commitment to investigating these important postnatal influences.

Neligan entitled his posthumous (1976) monograph *Born Too Soon or Born Too Small*, but it is now clear that very few term babies are born so small that they are *too small* to be capable of developing unscathed, given good postnatal social and family care.

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SUMMARY

A cohort of boys weighing below the 2nd centile at birth between 1973 and 1974 were assessed at 10 to 11 years of age. Control children from the same population were matched for social class and age. Two boys in the light-for-dates group were profoundly disabled and were excluded from assessment. After these exclusions, there were no differences in intelligence or school achievement between the two groups, although tests of temperament and behaviour suggested some correlation between features of the 'attention deficit disorder' and the extent to which birthweight deviated from normal. Matching for social class is likely to have eliminated the confusing environmental and family influences associated with the poor outcome reported in a previous study of light-for-dates boys. In addition, improved perinatal care is likely to have contributed to the protection from long-term sequelae of the light-for-dates infants in the present study.

RÉSUMÉ

Nés avec un petit poids: le devenir est-il toujours affecté?

Un groupe de garçons d'un poids de naissance au dessous de deuzième percentile et nés en 1973 et 1974 ont été examinés à 10 ou 11 ans d'âge. Des enfants contrôles de la même population ont été appariés pour la classe social et l'âge. Deux garçons dans le groupe des faibles poids de naissance présentant des incapacités sévères ont été exclus de la comparaison. Après cette exclusion, il n'y avait pas de différence d'intelligence ou de résultats scolaires entre les deux groupes bien que les tests de caractère et de comportement suggéraient une corrélation entre les symptomes du "trouble de déficit d'attention" et l'écart du poids de naissance par rapport à la normale. L'appariement pour la classe sociale a probablement éliminé les influences d'environnement et de famille responsables du mauvais devenir constaté dans une étude précédente. De plus, il est probable que lamélioration des soins péri-nataux a contribué à la protection de ces bébés à faible poids de naissance vis à vis de séquelles à long terme.

ZUSAMMENFASSUNG

Hypotroph geboren: welche Wirkung hat das auf den Outcome?

Eine Gruppe von Jungen, die bei ihren Geburt in den Jahren 1973 and 1974 ein Gewicht unter der zweiten Perzentile hatten, wurden im Alter von 10 bis 11 Jahren untersucht. Aus derselben Population wurden Kontrollkinder entsprechender Socialschicht und gleichen Alters ausgewählt. Zwei der hypotrophen Jungen waren hochgradig behindert und wurden aus der Gruppe herausgenommen. Nach diesem Ausschluß fand sich zwischen den beiden Gruppen kein Unterschied in Bezug auf Intelligenz und Schulleistungen, obwohl Temperaments- und Verhaltenstests auf eine Korrelation zwischen Anzeichen für eine Aufmerksamkeitsstörung und dem Grad der Gerburtsgewichtsabweichung hindeuteten. Eine Gruppeneinteilung nach der Sozialschicht hat die störenden Umwelt- und Familieneinflüsse eliminiert, die bei einer früheren Untersuchung dieser Jungen mit dem schlechten Outcome assoziiert wurden. Darüber hinaus hat die verbesserte perinatale Versorgung sicher dazu beigetragen, diese Babies vor Langzeitschäden zu bewahren.

RESUMEN

Nacido demasiado pequeño: ¿su curso posterior sigue afectado?

Un grupo de niños con peso por debajo del segundo percentil al nacer entre 1973 y 1974, fueron evaluados a los 10 y 11 años de edad. Se tuvo un grupo control de la misma edad y clase social. Dos niños del grupo de bajo peso tenían una deficiencia muy profunda por lo que fueron eliminados del estudio. Después de estas exclusiones no habian diferencias entre ambos grupos en inteligencia y éxito escolar, aunque los tests de temperamento y conducta sugerían cierta correlación entre las características de alteración con déficit de la atención y el grado de desviación del peso de nacimiento. El comparar según la clase social parece lo mejor para eliminar la confusión en las influencias ambientales y familiares asociadas a un curso pobre, vistas en un estudio previo realizado en estos niños. Además la mejora en el cuidado perinatal ha contribuido seguramente a la protección de estos niños de bajo peso al nacer de secuelas a largo plazo.

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