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Children born small for gestational age are not at special risk for preschool emotion and behaviour problems

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ABSTRACT

Despite the wealth of literature examining long term outcomes of preterm low birthweight children, few studies have directly assessed the developmental impact of being born full term but small for gestational age (SGA). We aim to determine whether (i) being SGA increases preschool behavioural problems and (ii) other risk factors operate differently in SGA and appropriate for gestational age (AGA) controls. 550 New Zealand European mothers and their 3.5 year old children participated in this study. All children were born at full term (>37 weeks' gestation) and approximately half were SGA (≤sex specific 10th percentile for gestation) the remainder were AGA controls. Extensive data were collected at the child's birth, 1 year and 3.5 years. Behavioural problems were measured when children were 3.5 years, using the Strengths and Difficulties Questionnaire (SDQ). Multiple regression analyses were used to examine the associations between risk factors and behavioural problems; statistical weighting was used for analyses of the total study group. There was no significant difference in behavioural problems between SGA and AGA groups. In the total sample the significant predictors of behavioural problems included: mothers' school leaving age; smoking during pregnancy; maternal alcohol use during pregnancy; and absence of the father. Predictors of behavioural problems were found to be the same for SGA and AGA groups. These results do not support the view that SGA is a risk for behavioural preschool difficulties or that SGA children are sensitised to risks known to be associated with such difficulties in the preschool years.

1. Introduction

Behaviour and emotional problems are of particular concern in the preschool age group as once established they often persist throughout childhood and adolescence and, in some cases, continue into young adulthood [1,2]. The prevalence rates of these problems vary between 10% and 20% [3,4] with between study differences in estimates due to the limitations of diagnostic tools used to classify problem behaviour. Gathering prevalence estimates for this age group is complicated as the preschool developmental period is one of the most challenging in terms of defining and measuring psychiatric symptomatology. On the whole, the literature suggests that externalising problems (e.g., hyperactivity, impulsivity, and oppositional defiant symptoms) are more prevalent in males [5,6], and internalising problems (e.g., phobias, anxiety and depression) are more prevalent in females [7].

Childhood emotional and behavioural problems, particularly in the preschool years, are multi-factorial in determination. Sociodemographic factors include young maternal age [8], limited parental education [9], low socio-economic status [4] and low levels of social support [10]. Furthermore, perinatal exposures to nicotine [11], alcohol [12] and stress [13] are also important. Some of the strongest support is for prematurity [14–19] and/or being small for gestational age (SGA: [14,19–21]) both of which have been related to the onset of childhood disorders such as ADHD [22,23], anxiety and depression [24] and learning difficulties [25]. Understanding these particular associations is complicated as both are linked to (i) a suboptimal prenatal environment (which is often as a result of foetal exposure to one or more of the factors previously described), and (ii) prematurity and SGA are often combined in studies of the risks associated with low birthweight. Many factors have been found to be associated with SGA and/or IUGR including; low maternal pre pregnancy weight

Abbreviations: SDQ, Strengths and Difficulties Questionnaire; SGA, small for gestational age; AGA, appropriate for gestational age; ABC, Auckland Birthweight Collaborative.

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[26,27], maternal smoking during pregnancy [28,29] and maternal hypertension [29]. In addition, genetics have also been found to be involved in both IUGR and being born SGA (for a review see [30]). It is unclear exactly how poor intra uterine growth affects the foetal brain to cause psychopathology. One possibility is that there is a restriction in blood flow through the placenta which results in IUGR. This in turn causes the foetus to receive less oxygen than would normally be expected, increasing the risks to the foetus during pregnancy, delivery, and afterwards. Furthermore, such foetal hypoxia can result in damage to catecholamine receptors in the brain (e.g., dopamine; [31,32]).

To date, only one study has investigated the behavioural development of *full term* SGA [33]. (The definition of *full term* is important as it rules out the possibility that the child's birthweight is a consequence of prematurity factors). Sommerfelt and colleagues [33] studied a relatively large group of SGA (n = 318) and AGA (n = 307) 5 year old children and found behavioural problems were not more common amongst the SGA children. Furthermore, being born SGA was not found to make an individual more sensitive to the negative impact of common risk factors [33]. The present study extends this research in similar size sample of full term SGA and AGA preschool children in a study with a longitudinal cohort design. This has allowed for the collection of a number of risk factors at different points throughout the child's development. Here we aim to: [1] to determine whether SGA children are at increased risk for emotional and behavioural problems compared with AGA children; and [2] to examine whether the risk profile for SGA children is different to that of AGA children, and if not we also aim to examine the prevalence and risk profile for the total study group using statistical weighting to allow for the complex weighting design.

2. Methods

The Auckland Birthweight Collaborative (ABC) study is a longitudinal cohort with disproportionate sampling. The methodology for phases one to three of the ABC study has previously been described in detail [29]. Participants are mothers and their singleton infants which were born full term in the Auckland and Waitamata Healthcare regions, between 16 October1995 and 30 November 1997. Approximately half of the infants were SGA with birthweights equal to or below the sex-specific tenth percentile for gestation, and the remainder was a random sample of infants born AGA [34]. Infants were excluded from the study if they were born outside a designated study region, were from multiple births or had congenital abnormalities likely to affect growth or development.

Data collection has occurred in three phases: phase one, birth; phase two, 1 year; and phase three, 3.5 years. Extensive psychological, developmental, social and physical data were collected for children and their families at all phases. Due to the differential in response rates from ethnic groups at earlier phases, this study has been restricted to New Zealand European mothers and their infants. There were 871 New Zealand European mothers and infants enrolled at birth who were eligible to take part at 3.5 years; of these 550 (63%) were successfully followed up when children were aged 3.5 years. Complete SDQ scores were available for 538 children (SGA = 225, AGA = 313).

Factors associated with attrition at phase three have previously been reported in detail [35]. In summary, respondents were more likely to be older, married, of high socio-economic status, have tertiary education, and be non-smokers. Respondents and non-respondents did not differ in gestational age, birthweight, infant sex, parity and levels of family social support or maternal stress.

2.1. Outcome measure

Child behaviour was measured at phase three using the parent format of the Strengths and Difficulties Questionnaire (SDQ; [36]). SDQ is a 25 item scale which asks about both positive and negative emotional and behavioural attributes on 5 subscales — conduct, emotion, hyperactivity-inattention, peer group relationships and pro-social behaviour. Each item is scored on a 3 point Likert scale of 0 = '*not true*', 1 = '*somewhat true*' and 2 = '*certainly true*'. The total scores for each subscale are calculated by summing scores on items relevant to a particular problem, for example the hyperactivity-inattention subscale consists of items such as '*restless*, *overactive*, *cannot stay still for long*' (range = 0–10). The SDQ also provides a total difficulties score (range = 0–40) which is calculated by summing all subscale scores except pro-social (as the authors suggest the presence of pro-social behaviours is considered to be conceptually different to the absence of other behaviours). The SDQ has a good test-retest stability and the internal consistencies of the subscales range from 0.62 to 0.75 [37]. Cut-off points used in this study to define 'normal', 'borderline' and 'abnormal' scores were taken from UK norms published on the SDQ website (www.sdqinfo.com). This study focused on the prediction of the total behavioural difficulties subscale because of the greater reliability of the total difficulties scale compared with the individual subscales (which are defined by 5 items). In this study children were defined as having an abnormal behavioural total difficulties score if they had a total difficulties score in the abnormal or borderline range. At phase three of the study SDQ data were collected for 538 children.

Measurement of risk factors

(i) Maternal perceived stress. This was measured at phases one and three using the 10-item Perceived Stress Scale [38]. This scale was designed to measure the degree to which situations in life are appraised as stressful. We created a categorical variable using a 75th percentile cut off, scores that fell above this were considered as high.

(ii) Social support. The Family Support Scale [39] measures different sources of support for families rearing young children. This variable was examined categorically with low levels of social support defined by a total score that was less than or equal to the 25th percentile of scores in this study.

(iii) Parental smoking and maternal alcohol use during pregnancy. Smoking data were collected at birth and coded as a dichotomous variable ('*yes*' or '*no*') for mothers who reported having smoked the year before pregnancy and fathers who smoked up to the time of the child's birth. Maternal alcohol consumption during pregnancy was recorded at the time of the child's birth and coded as '*no alcohol*', '*1–7 units of alcohol per week*', and '*>7 units of alcohol per week*'.

(iv) Child activity level. At phase three, parents were asked if their child was more active, less active or had the same levels of activity compared with other children of the same age. The '*increased activity level*' and '*same activity level*' categories were combined as there were no significant differences in risk of emotional and behavioural difficulties between the groups.

(v) Demographic factors. Data on a child's sex, parental marital status, maternal school leaving age and maternal age at the child's birth was collected at the time of the child's birth (phase one).

Ethical approval was obtained from the North Health Regional Ethics Committee.

2.2. Statistical analyses

The difference in prevalence of emotional and behavioural problems between SGA and AGA groups was examined using chi-square. The association of problems with potential risk factors was studied at all phases of the study using simple and multiple regression