

# Social–Emotional Difficulties in Very Preterm and Term 2 Year Olds Predict Specific Social–Emotional Problems at the Age of 5 Years

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**Background** Very preterm children have increased risk for social–emotional problems. This study examined relationships between early social–emotional difficulties and later social–emotional problems, and whether this differed by group (very preterm or term). **Methods** Participants were 189 children born less than 30 weeks gestation or less than 1,250 g at birth and 78 term-born children. Parent-report questionnaires were used to assess social–emotional development at 2 (Infant Toddler Social Emotional Assessment) and 5 years of age (Strengths and Difficulties Questionnaire). Social risk and children's cognitive development were collected at the age of 5 years. **Results** Emotional symptoms at the age of 5 years were predicted by internalizing problems at the age of 2 years, conduct problems and hyperactivity/inattention at the age of 5 years were predicted by externalizing problems at the age of 2 years, and peer relationship problems and prosocial behaviors at the age of 5 years were predicted by social–emotional competence at the age of 2 years. Relationships were not moderated by group. **Conclusions** Implications for early detection of social–emotional problems and provision of targeted interventions are discussed.

**Key words** longitudinal; preterm; social–emotional problem.

From as early as age 2 years, children born very preterm (<32 weeks gestation) or very low birthweight (<1,500 g) are at increased risk for social–emotional problems, such as internalizing disorders, dysregulation, and poor social–emotional competence compared with their term-born peers (Delobel-Ayoub et al., 2006; Spittle et al., 2009). By school age, studies have shown that very preterm/very low birthweight children have a greatly increased risk for symptoms of internalizing problems, depression, anxiety, and Attention-Deficit/Hyperactivity Disorder compared with term-born children (Anderson & Doyle, 2003; McCormick, Workman-Daniels, & Brooks-Gunn, 1996; Saigal & Doyle, 2008; Samara, Marlow, & Wolke, 2008). Consistent with the ongoing trajectory of risk, research

suggests that early social–emotional difficulties are good predictors of later problems in very preterm children. Gray, Indurkha and McCormick (2004) found evidence that once preterm children had developed emotional/behavioral difficulties, their stability over time was moderate. More recently, 41% of very preterm children in the EPIPAGE study who had increased social–emotional problems at 5 years were reported to have increased social–emotional difficulties at 3 years (Delobel-Ayoub et al., 2009). The strongest predictors of psychiatric diagnosis for extremely preterm children (<26 weeks gestation) at 11 years were recently reported to be internalizing behaviors, attentional and conduct problems, and functional disability at the age of 6 years (Johnson et al., 2010).

No previous studies have examined the predictive validity of social-emotional difficulties measured as early as 2 years in both very preterm and term children while also controlling for important potentially confounding factors, such as children's cognitive development and social risk. Controlling for confounding factors is important because others have indicated that the increased rates of social-emotional difficulties in very preterm children compared with term-born children may be partly explained by delayed cognitive development (e.g., Botting, Powls & Cooke, 1997; Hack et al., 2005; Samara et al., 2008). Social risk is likely to be another factor influencing the increased rates of social-emotional problems in very preterm children as factors, such as lower education, difficult life events, and smoking during pregnancy have been linked with both preterm birth and social-emotional development (Delobel-Ayoub et al., 2006; Jansen et al., 2009; Spittle et al., 2009).

The first aim of the current study was to examine whether social-emotional difficulties at the age of 2 years were predictive of social-emotional problems at age 5 years for very preterm and term-born children, controlling for cognitive development and social risk. We predicted that higher levels of early difficulties would predict later social-emotional problems. The second aim was to examine whether the relationships between social-emotional development at ages 2 and 5 years differed between very preterm and term children. This aim was considered exploratory due to lack of previous research examining this question.

## Method

Participants were families from the Victorian Infant Brain Studies (ViBeS) cohort, which included 227 infants born at <30 weeks gestation or with a birthweight <1,250 g at the Royal Women's Hospital, Melbourne Australia, between 2001 and 2003. Informed parental consent was obtained for all participants, and the study was approved by the Royal Women's Hospital's Research and Ethics Committee. The ViBeS cohort also included 77 children born at term (>36 weeks gestation), who were recruited at birth from the Royal Women's Hospital maternity wards ( $n = 46$ ) or at 2 years from maternal health centers in Melbourne Australia ( $n = 31$ ). Enrolment in the ViBeS cohort involved neonatal brain imaging, and this increased the challenge in recruiting full-term children, resulting in fewer children in the term group. Children's social-emotional development was assessed at the age of 2 years (corrected), along with the family's level of social risk. At the age of 5 years (corrected),

the primary caregiver completed questionnaires assessing their child's social-emotional development, and cognitive development was assessed. Five-year data for 46 children were incomplete for the following reasons: 2 children had died, 8 children were not assessed due to significant neurosensory impairment, 8 families had declined to participate, 18 families had re-located interstate or overseas, and the questionnaires were not completed for 10 children. Two-year data were missing for a further 24 children, resulting in a final sample of 234 children for this analysis, including 170 very preterm (75% of original sample) and 64 term (83% of original sample).

## Measures

The Infant-Toddler Social and Emotional Assessment (ITSEA, prepublication version; Briggs-Gowan & Carter, 2000) is a 135-item parent-rated measure of children's social-emotional development completed when children were aged 2 years. The ITSEA has four domains: internalizing problems (e.g., withdrawal, anxiety); externalizing problems (e.g., aggression, impulsivity); dysregulation (e.g., sensory sensitivity, negative emotionality) and social-emotional competence (e.g., compliance, attention). Age- and gender-specific *t*-scores were calculated for the four domains [mean = 50, standard deviation (SD) = 10, range 25–80]. Higher scores on the externalizing, internalizing, and dysregulation domains represent increased problems, while higher scores on the social-emotional competence domain represents increased competence. Test-retest reliability and internal consistency for the ITSEA are satisfactory (Carter, Briggs-Gowan, Jones, & Little, 2003).

The Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997), a questionnaire assessing children's emotional symptoms, conduct problems, hyperactivity/inattention, peer problems, and prosocial behavior at the age of 5 years was completed by the parents. Scores on each of the scales range from 0 to 10. Higher scores indicate a greater degree of difficulty for the problem domains and increased skills in the prosocial scale. The cut off for "clinically significant" difficulties is the 90th percentile for the problem scales and the 10% percentile for the prosocial scale. The SDQ has satisfactory inter-rater test-retest reliability and good validity with independently diagnosed psychiatric disorders (Goodman, 2001).

The early academic and language skills composite scores from the Kaufman Survey of Early Academic and Language Skills (K-SEALS; Kaufman & Kaufman, 1993), and the matrices subtest from the Kaufman Brief Intelligence Test-Second Edition (K-BIT 2; Kaufman & Kaufman, 2004) were collected at the age of 5 years as a

proxy for cognitive development. Both the K-SEALS and K-BIT have a mean of 100 and SD of 15. There is good evidence for the reliability and validity of the K-SEALS and K-BIT, and both correlate well with other measures of intelligence (Kaufman & Kaufman, 1993; 2004).

An overall familial social risk score was calculated based on a composite measure assessing six social risk factors known to be related to child development collected at the age of 2 years (family structure, education of primary caregiver, occupation and employment status of primary income earner, language spoken at home, and maternal age when the child was born). Each domain was scored on a 3-point scale where 0 represented lowest risk, and 2 represented highest risk to give a total scores 0–12 (e.g., Roberts et al., 2008; Treyvaud et al., 2009).

### Analysis

Data were analyzed using STATA 10 (StataCorp, 2007). Due to the difference in the scales of the scores on the measures of social–emotional development at ages 2 and 5 years, a transformed version of the ITSEA scores was used in analysis where the total *t*-score was divided by its standard deviation ( $SD = 10$  by definition) so that effects could be interpreted as the difference in SDQ per 10 unit or one SD change in the ITSEA. Sociodemographic characteristics of the sample were compared between groups (very preterm, term) and between families who did and did not complete questionnaires using chi-squared tests, Mann–Whitney U-tests, and *t*-tests as appropriate. Relationships between social–emotional development at ages 2 years (ITSEA) and 5 years (SDQ) were examined with regression equations fitted using generalised estimating equations (GEEs) with an exchangeable correlation structure and robust standard errors to allow for correlations between twins/triplets in the study (Carlin, Gurrin, Sterne, Morley, & Dwyer, 2005; Hanley, Negassa, de B. Edwardes, & Forrester, 2003). Initially, each ITSEA domain was included in a separate univariable regression model for each SDQ domain to identify which 2-year behaviors were predictive of 5-year outcomes. Next, all significant ITSEA domains were included in a single regression model for each 5-year domain, adjusted for cognitive development and social risk. To test whether the relationships between ITSEA at 2 years and SDQ at 5 years were the same for very preterm and term children, interaction effects were examined in regression analyses for each outcome domain.

### Results

Compared to children who were not followed up at the age of 5 years ( $n = 46$ ), those who were followed up ( $n = 258$ )

were not significantly different on social, perinatal, and 2 year assessment measures (data not shown). Table 1 shows the social, perinatal, and age-5 SDQ and cognitive development data of the final sample. Compared with children born at term, children in the very preterm group were more likely to have younger mothers ( $p = .045$ ), primary caregivers with lower education level ( $p = .001$ ), and a higher social risk score ( $p = .001$ ). After controlling for cognitive development and social risk, compared with children born at term, children born very preterm also had higher scores on the emotional symptoms ( $p = .01$ ), hyperactivity/inattention ( $p = .01$ ) and peer problem ( $p = .01$ ) scales. Differences between very preterm and term-born children in the VIBeS cohort on 2-year old social–emotional and 5-year-old cognitive outcomes have been previously reported in detail (Roberts et al., 2010; Spittle et al., 2009).

### Relationship Between Age 2 and 5 Social Emotional Outcomes

The relationships between 2- and 5-year-old social–emotional development for all children (very preterm and term) adjusted for cognitive development and social development are shown in Table II. Higher scores on emotional symptoms at the age of 5 years were predicted by higher scores on internalizing difficulties at the age of 2 years (percentage of variance explained,  $R^2 = .12$ ); higher scores on conduct problems at the age of 5 years were predicted by higher scores on externalizing difficulties at the age of 2 years ( $R^2 = .24$ ); higher scores on hyperactivity/inattention at the age of 5 years were predicted by higher scores on externalizing difficulties at the age of 2 years ( $R^2 = .20$ ); higher scores on peer relationship problems at the age of 5 years were predicted by lower scores on social–emotional competence at the age of 2 years ( $R^2 = .09$ ); and higher scores on prosocial behaviors at the age of 5 years were predicted by higher scores on social–emotional competence at the age of 2 years ( $R^2 = .18$ ).

### Interaction Effects on Relationship Between Age 2 and 5 Social Emotional Outcomes

Examination of whether the relationships between social–emotional outcomes at ages 2 and 5 years described previously varied between groups (very preterm, term) revealed little evidence of interaction effects (interaction  $p$  for emotional symptoms = .40; for hyperactivity/inattention = .66; for peer relationship problems = .09; for prosocial behavior = .34). However, there was some evidence of interaction effect for conduct problems ( $P = .05$ ); while there was a positive relationship between early externalizing problems and later conduct problems in both groups, the very preterm group had a steeper gradient

Table I. *Characteristics of the Study Population*

	Very Preterm (n = 170)	Term (n = 64)
Birthweight (g) M (SD)	965 (221)	3305 (514)
Gestational age (weeks), M (SD)	27.3 (2.0)	39.0 (1.4)
Male, n (%)	89 (53)	29 (45)
Singleton, n (%)	107 (63)	60 (94)
Maternal age (years), M (SD)	32.2 (5.7)	33.8 (4.3)
Primary caregiver education <sup>a</sup>		
Did not complete high school, n (%)	21 (12)	1 (1)
Completed high school, n (%)	99 (58)	25 (40)
Tertiary education, n (%)	46 (30)	38 (59)
Social risk, median (IQR)	2 (1–3)	1 (0.2)
SGA, n (%)	16 (9)	1 (1)
IVH grade III/IV, n (%)	6 (4)	–
Moderate–severe white matter brain abnormality, n (%)	27 (14)	–
Oxygen at 36 weeks, n (%)	60 (32)	–
SDQ Emotional symptoms scale, M (SD)	2.1 (1.9)	1.3 (1.5)
SDQ Conduct problems scale, M (SD)	1.7 (1.6)	1.6 (1.6)
SDQ Hyperactivity/inattention scale, M (SD)	4.3 (2.6)	3.0 (2.1)
SDQ Peer problems scale, M (SD)	1.7 (1.9)	0.9 (1.4)
SDQ Prosocial behavior scale, M (SD)	7.9 (2.1)	8.1 (2.1)

Note. M = mean; SD = standard deviation; SG = small for gestational age; IVH = intraventricular haemorrhage on cranial ultrasound; SDQ = Strengths and Difficulties Scale.

<sup>a</sup>n = 166 for very preterm group.

Table II. *Prediction of 5-Year Old SDQ Social–Emotional Outcomes by 2-Year-Old ITSEA Social–Emotional Outcomes (Coefficients and 95% Confidence Interval for Multivariable Regression Analyses) (n = 234)*

	Emotional symptoms	Conduct problems	Hyperactivity/ inattention	Peer problems	Prosocial behavior
Internalizing	0.55 (0.35, 0.74)**	–	–	–	–
Externalizing	–	0.77 (0.54 to 0.99)**	0.87 (0.59 to 1.23)**	–	–
Dysregulation	–	–	–	–	–
Competence	–	–	–	–0.38 (–0.66 to –0.09)*	0.74 (0.46 to 1.02)**

Note. Competence = social–emotional competence.

\* $p < .01$ . \*\* $p < .001$ .

(regression coefficient = 0.64, 95% CI = 0.35–0.93,  $p < .001$ ) than the term group (regression coefficient = 1.06, 95% CI = 0.78–1.34,  $p < .001$ ).

## Discussion

This study provides evidence that early social–emotional difficulties were predictive of later social–emotional problems for very preterm and term children. While these findings are consistent with previous research examining continuity of social–emotional problems over time (e.g., Delobel-Ayoub et al., 2009; Gray et al., 2004; Johnson et al., 2010), to the best of our knowledge, this is the first time social–emotional difficulties in very preterm children as young as 2-years old have been associated with later

social–emotional problems. Importantly, all of these results were found after accounting for social risk and cognitive development. Furthermore, the current study extends previous research by demonstrating that there is specificity in the relationships between early and later social–emotional problems, for example, by showing that early internalizing difficulties are more strongly associated with later emotional symptom problems than early difficulties in other domains.

The predictive value of early social–emotional difficulties to later social–emotional problems at school age was similar for both very preterm and term-born children. The finding that prematurity status does not appear to alter the relationship between early and later social–emotional difficulties combined with the fact that increased rates of social–emotional problems in very preterm children can



be observed as early as the toddler years (e.g., Spittle et al., 2009) suggests that the factors that increase the risk for social–emotional problems in very preterm children may exert their influence early in the child’s life. For example, factors such as brain abnormalities, postnatal parental mental health problems, and altered early parent–child relationships, which occur within the first year of life, are all more common in very preterm children compared with term-born children (e.g., Feldman & Eidelman, 2007; Nomura et al., 2007; Volpe, 2009; respectively). These factors have all been linked with poorer social–emotional outcomes in very preterm children (e.g., Spittle et al., 2009; Treyvaud et al., 2009, 2010), and as many are present from birth, it is likely they begin to exert their influence on developmental pathways very early in the child’s life. It is important to note that although the associations between early and later social–emotional problems appear to be similar for very preterm and term children, due to the increased rates of such problems in the very preterm population, early monitoring and intervention with very preterm children and their families is important, and may help to decrease the number of very preterm children exhibiting clinically significant social–emotional problems by school age.

It is important to note the reasonably low  $R^2$  values for the relationship between early and later social–emotional problems, which ranged between .09 and .24. This suggests that other factors, in addition to early social–emotional difficulties, are influencing the development of social–emotional problems at 5 years and require further study. One of the challenges associated with examining children’s social emotional development over time is that often different measures are used. While the SDQ is a widely used and well validated measure of social–emotional development (Goodman, 2001), it is only currently appropriate for children aged 3–16 years and could not be used at the 2-year-old assessment. As the ITSEA does not have a total score, we could not examine the links between overall social–emotional problems over time. However, the domains of the SDQ and the ITSEA were similar and specific relationships between similar domains were found. The reliance on parent-report questionnaires of child development also raises the possibility that parental factors such as parental mental health may influence their responses. The use of another informant, such as teacher or child ratings of children’s social–emotional problems would help to strengthen these findings, however, obtaining multiple sources of information can also be difficult for younger children, as many 2-year olds would not be regularly cared for by adults other than their parents. Finally, given the large number of univariable

regression analyses conducted, the results presented here are considered exploratory and require replication.

Understanding the specific behaviors during the toddler years that may increase a child’s risk for later social–emotional difficulties is critical information for early identification of social–emotional difficulties in order to provide families with appropriate intervention and support as early as possible. As mentioned previously, knowledge of the influence of other factors such as parental mental health and parenting behavior is also important as these factors represent potentially modifiable influences on children’s development. The results from the current study have implications for early childhood professionals working with parents with term-born as well as very preterm children. The results suggest that children with early social–emotional difficulties have a higher risk of continued problems in this area, and addressing parental concerns about behavior or social–emotional development early may prevent these difficulties from becoming entrenched by school age.

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