

PREMATURITY

Behavioural and Emotional Functioning in Preterm Infants

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Introduction

It has now been well documented that premature infants are at significant risk for neurodevelopmental disabilities.^{1,2} Studies in this area have typically focused on the motor and cognitive sequelae of prematurity, paying less attention to temperament, behaviour, and emotional disturbances. Recent data suggest that premature infants are also vulnerable to abnormalities in behavioural and social development, which may be the precursors of subsequent learning disabilities and psychiatric disorders which occur during mid-childhood.^{3,4}

Subject

Recent improvements in neonatal intensive care have led to an increased number of survivors among infants with very low birthweight (VLBW, <1 500 g) and extremely low birthweight (ELBW, <1 000 g).² These infants are at greater risk for behavioural and emotional problems. Our review focuses on problems from birth until preschool age, in infants born at less than 34 weeks of gestational age.

Problems

During the 1990s, several studies were conducted regarding behavioural and emotional functions in preterm infants. However, methodological flaws in study designs precluded any firm conclusions regarding these functions. Flaws included the use of clinical rather than population-based samples, a broad range of gestational ages in relation to the birthweights of subjects, small sample size, lack of psychometrically sound assessment tools, lack of controls, and failure to provide information on medical and psychosocial risk factors.^{5,6,7}

In addition, research findings could be deemed inconsistent based on the fact that multiple respondents reported on child behaviour from different contexts. The majority of studies related to infant temperament and behaviour have been obtained through maternal ratings. But maternal ratings of temperament have been viewed as reflecting the characteristics of the mother, rather than the infant.⁶ Several investigators have reported a substantive association between maternal mental health and behaviour in children.⁷⁻¹⁰ Maternal reports of behavioural problems and social competence often differ from those of teachers, who tend to relativise children's behaviour in relation to that of their peers.¹¹ Similarly, there is often discordance between maternal and clinical ratings. Assessment by clinicians may not reflect a child's usual disposition.

Research Context

Infants who are <1 500 g are more likely to experience significant medical complications, such as severe respiratory distress, haemorrhages in the brain, and poorer nutrition, all of which may have long-lasting effects on the central nervous system. These biological effects are compounded by social risk factors, which are more prevalent among families of infants who are born prematurely.¹² Further, premature infants may be hospitalized for prolonged periods, resulting in extended separation from parents, increased anxiety, and possible interference with parent-infant attachment. Therefore, it is not surprising that behavioural and emotional sequelae are more prevalent among preterm infants.

Key Research Questions

Further initiatives regarding premature infants are required in the following areas:

1. Reviews of evidence supporting increased behaviour and social problems among VLBW and ELBW infants during infancy and preschool years.
2. Examinations of how biological and social factors contribute to the development of behavioural problems.

Recent Research Results

Infant Temperament

Infant temperament is a highly relevant factor in development, as early difficulties may predispose preterm children to subsequent behavioural maladjustments,¹³ and affect the quality of their relationships with caregivers.⁶ Based on standardized parent report measures, preterm infants and children have typically been found to demonstrate less adaptability, rhythmicity, activity, attention, and persistence than do full-term infants.¹⁴⁻¹⁶ Premature infants have also been found to be more intense in their moods, more difficult to soothe, more passive, and less socially responsive.¹⁷ As toddlers, preterm infants have been found to be arrhythmic, less persistent and adaptable, and more susceptible to negativity.¹⁸ At preschool and early school ages, some tendencies towards increased activity and intensity, and lack of persistence remain.¹⁸ Literature in the field indicates that premature infants may initially be more challenging to parents. Changes in temperament over time may be influenced by both biological and environmental factors.^{16,18}

However, although premature infants as a group are at greater risk for developing problems with temperament, these problems only occur in a minority of infants. Only those studies that have limited their sample to VLBW infants and infants with significant medical complications are associated with differences in temperament. Prematurity per se does not appear to be a risk factor for abnormalities in temperament.

Behavioural Functioning

Although some studies report negligible findings, overall, the literature suggests that premature infants are particularly vulnerable to behavioural adjustments and emotional problems.

Findings have been much more consistent when the prevalence of ADHD is considered. Marlow et al.¹⁹ reported that at 5 to 6 years of age, both parents and teachers found the children to be more overactive and fidgety than controls. In a study by Szatmari et al.,²⁰ a higher incidence of ADHD was found in parent reports at age 5, but no significant difference was noted in teacher reports. Other studies on VLBW populations have also found a higher frequency of inattention, hyperactivity, or have diagnosed ADHD by school age.^{4,21,22} ADHD appears to be more common among premature infants who exhibit neurodevelopment problems²⁰ and those with lower birthweights and gestational ages.⁴ There seems to be some indication that males are at increased risk, and that adverse social conditions may exacerbate these behaviours.⁶ Premature children do

not appear to be at risk for conduct problems, as long as adverse environmental conditions are controlled.

Emotional Disturbance

Several studies have found a higher level of anxiety, depression, and emotional dysfunction in children born prematurely.^{5,22,23} However, other studies failed to find a similar associations.^{4,24,25} These contradictory findings may be attributable to wide-ranging gestational ages among subjects, differences in socio-economic status, and varying parenting characteristics.

Social Competence and Adaptive Functioning

Premature children tend not to initiate social behaviours,²⁶ show less pleasure in interacting with their mothers, and are less responsive to social interactions.²⁷ To some extent, problems with social abilities are a function of lower intellectual levels in VLBW infants.²⁸ When heavier birthweight infants are included, these problems are less obvious. Children born prematurely appear to be at risk for poorly developed adaptive skills, which become more apparent later in life.^{29,30,31}

Contribution of Biological and Social Factors

Most studies demonstrate that behavioural problems are associated with adverse environmental conditions, such as lower socio-economic status, maternal depression, and family stress. The impact of these negative factors may be greater in VLBW than in normal birthweight children. A nurturing home environment fosters development of self-regulatory behaviours.³² Multiple regression analyses indicate that temperament, environment, and the interactions between development and the quality of the home environment predict attention problems in childhood.³³ Temperament and behaviours were related to gestational age and cognition, showing weak correlations with periventricular leukomalacia, intraventricular haemorrhage, and cerebral palsy.^{17,33}

Conclusions

As a group, infants and young children born prematurely are described as being more withdrawn, less adaptable, less persistent, and less temperamentally stable in their infancy compared to full-term infants.³⁴ These characteristics are more prevalent in infants who are VLBW, and those with medical complications. Children born prematurely also have difficulties in global behaviours, particularly with regard to the prevalence of ADHD, but they do not appear to be at risk for

developing conduct disorders. Problems with social competence and adaptive functioning are also more common in these infants than in their full-term peers. Again, these characteristics appear to be restricted to infants under a 1 500 g birthweight, those with neurological and intellectual problems, and those living in adverse environmental and social circumstances. Infants with <750 g birthweights are at greatest risk for developing attentional problems.³⁵ Recent reports suggest that very premature infants born in the 1990s continue to have behavioural difficulties and attentional problems³⁶ that persist to school age.³⁷

Implications

Given the higher survival rates among preterm infants, the cumulative toll on the health care system related to behavioural and emotional difficulties will likely grow. In designing effective interventions, it is therefore important to understand the relative contribution of underlying biological and social factors. Further investigation is required to determine whether lending support to parents can alter parental behaviours and improve the quality of mother-infant attachments and infant responsivity. Meanwhile, it is important to inform parents of ELBW infants of the increased likelihood of behavioural problems, so that they are better prepared to cope and seek appropriate remediation. To this end, health care professionals should focus on early diagnosis and treatment.

References

1. Anderson P, Doyle LW. Neurobehavioral outcomes of school-age children born extremely low birth weight or very preterm in the 1990s. *JAMA-Journal of the American Medical Association* 2003;289(24):3264-3272.
2. Hack M, Fanaroff AA. Outcomes of children of extremely low birthweight and gestational age in the 1990s. *Early Human Development* 1999;53(3):193-218.
3. Nussbaum NL, Grant ML, Roman MJ, Poole JH, Bigler ED. Attention deficit disorder and the mediating effect of age on academic and behavioral variables. *Journal of Developmental and Behavioral Pediatrics* 1990;11(1):22-36.
4. McCormick MC, Gortmaker SL, Sobol AM. Very low birth weight children: Behavior problems and school difficulty in a national sample. *Journal of Pediatrics* 1990;117(5):687-693.
5. Sommerfelt K, Troland K, Ellertsen B, Markestad T. Behavioral problems in low-birthweight preschoolers. *Developmental Medicine and Child Neurology* 1996;38(10):927-940.
6. Chapieski ML, Evankovich KD. Behavioral Effects of Prematurity. *Seminars in Perinatology* 1997;21(3):221-239.
7. McCormick MC, Workman-Daniels K, Brooks-Gunn J. Behavioral and emotional well-being of school-age children with different birth weights. *Pediatrics* 1996;97(1):18-25.
8. Spiker D, Kraemer HC, Constantine HA, Bryant D. Reliability and validity of behavior problem checklists as measures of stable traits in low birth weight, premature preschoolers. *Child Development* 1992;63(6):1481-1496.
9. Fergusson DM, Lynskey MT, Horwood LJ. The effect of maternal depression on maternal ratings of child behavior. *Journal of Abnormal Child Psychology* 1993;21(3):245-269.

10. Boyle MH, Pickles AR. Influence of maternal depressive symptoms on ratings of childhood behavior. *Journal of Abnormal Child Psychology* 1997;25(5):399-412.
11. Kohen DE, Brooks-Gunn J, McCormick M, Graber JA. Concordance of maternal and teacher ratings of school and behavior problems in children of varying birth weights. *Journal of Developmental & Behavioral Pediatrics* 1997;18(5):295-303.
12. Keller CA. Epidemiological characteristics of preterm births. In: Friedman S, Sigman M, eds. *Preterm Birth and Psychological Development*. New York, NY: Academic Press; 1981:3-15.
13. Carey WB, McDevitt SC. Revision of the infant temperament questionnaire. *Pediatrics* 1978;61(5):735-739.
14. Gennaro S, Tulman L, Fawcett J. Temperament in preterm and full-term infants at three and six months of age. *Merrill-Palmer Quarterly* 1990;36(2):201-215.
15. Langkamp DL, Kim Y, Pascoe JM. Temperament of preterm infants at 4 months of age: Maternal ratings and perceptions. *Journal of Developmental & Behavioral Pediatrics* 1998;19(6):391-396.
16. Hughes MB, Shults J, McGrath J, Medoff-Cooper B. Temperament characteristics of premature infants in the first year of life. *Journal of Developmental & Behavioral Pediatrics* 2002;23(6):430-435.
17. Sajaniemi N, Salokorpi T, von Wendt L. Temperament profiles and their role in neurodevelopmental assessed preterm children at two years of age. *European Child & Adolescent Psychiatry* 1998;7(3):145-152.
18. Oberklaid F, Sewell J, Sanson A, Prior M. Temperament and behavior of preterm infants: A Six-year follow-up. *Pediatrics* 1991;87(6):854-861.
19. Marlow N, Roberts B, Cooke R. Motor skills in extremely low birthweight children at the age of 6 years. *Archives of Disease in Childhood* 1989;64(6):839-847.
20. Szatmari P, Saigal S, Rosenbaum P, Campbell D, King S. Psychiatric disorders at five years among children with birthweight <1000g: A regional perspective. *Developmental Medicine & Child Neurology* 1990;32(11):954-962.
21. Levy-Schiff R, Einat G, Mogilner M, Lerman M., Krikler R. Biological and environmental correlates of developmental outcome of prematurely born infants in early adolescence. *Journal of Pediatric Psychology* 1994;19(1):63-78.
22. Pharoah POD, Stevenson CJ, Cooke RWI, Stevenson RC. Prevalence of behavior disorders in low birthweight infants. *Archives of Disease in Childhood* 1994;70(4):271-274.
23. Weisglas-Kuperus N, Koot H, Baerts W, Fetter WPF, Sauer PJJ. Behavior problems of very low- birthweight children. *Developmental Medicine & Child Neurology* 1993;35(5):406-416.
24. Schothorst PF, VanEngeland H. Long-term behavioral sequelae of prematurity. *Journal of American Academy of Child & Adolescent Psychiatry* 1996;35(2):175-183.
25. Ross G, Lipper E, Auld P. Social competence and behavior problems in premature children at school age. *Pediatrics* 1990;86(3):391-397.
26. Achenbach TM. *Manual for the child behaviour checklist and 1991 profile*. Burlington, VT: University of Vermont, Department of Psychiatry; 1991:4-18.
27. Grunau RVE, Whitfield ME, Petrie JH. Pain sensitivity and temperament in extremely low birth-weight premature toddlers and preterm and full-term controls. *Pain* 1994;58(3):341-346.
28. Hoy EA, Sykes DH, Bill JM, Halliday HL, McClure BG, Reid MM. The social competence of very-low-birthweight children: Teacher, peer, and self-perceptions. *Journal of Abnormal Child Psychology* 1992;20(2):123-150.
29. Hack M, Taylor HG, Klein N, Eiben R, Schatschneider C, Mercuriminich N. School-age outcomes in children with birth weights under 759 g. *New England Journal of Medicine* 1994;331(12):753-759.
30. Saigal S, Szatmari P, Rosenbaum P, Campbell D, King S. Cognitive abilities and school performance of extremely low birth weight children and matched term control children at age 8 years: A regional study. *Journal of Pediatrics* 1991;118(5):751-

31. Saigal S, Pinelli J, Hoult L, Kim MM, Boyle M. Psychopathology and Social Competencies of Adolescents Who Were Extremely Low Birth Weight. *Pediatrics* 2003;111(5 Pt. 1):969-975.
32. Robson AL, Pederson DR. Predictors of individual differences in attention among low birth weight children. *Journal of Developmental & Behavioral Pediatrics* 1997;18(1):13-21.
33. O'Callaghan MJ, Harvey JM. Biological predictors and co-morbidity of attention deficit and hyperactivity disorder in extremely low birthweight infants at school. *Journal of Paediatrics & Child Health* 1997;33(6):491-496.
34. Riese ML. Temperament in Full-Term and Preterm Infants: Stability over Ages 6 to 24 Months. *Journal of Developmental & Behavioral Pediatrics* 1988;9(1):6-11.
35. Taylor HG, Hack M, Klein NK. Attention deficits in children with <750 gm birth weight. *Child Neuropsychology* 1998;4(1):21-34.
36. Delobel-Ayoub M, Kaminski M, Marret S, Burguet A, Marchand L, N'Guyen S, Matis J, Thiriez G, Fresson J, Arnaud C, Poher M, Larroque B, EPIPAGE Study Group. Behavioral outcome at 3 years of age in very preterm infants: the EPIPAGE study. *Pediatrics* 2006;117(6):1996-2005.
37. Anderson P, Doyle LW, Victorian Infant Collaborative Study Group. Neurobehavioral outcomes of school-age children born extremely low birth weight or very preterm in the 1990s. *JAMA* 2003;289(24):3264-3272.