

Cambridge University Press

978-0-521-87179-2 - Neurodevelopmental Outcomes of Preterm Birth: From Childhood to Adult Life

Edited by Chiara Nosarti, Robin M. Murray and Maureen Hack

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## Preface

At a time of exciting advances in neonatal intensive care and neuroimaging methods, when surviving preterm children represent an increasing percentage of the population, we conceived the current volume to provide the first single-source reference on the latest findings from research into the neurodevelopmental outcome following preterm birth.

New knowledge about the long-term cognitive, neurosensory, neurobiological, social, and behavioral correlates of preterm birth has emerged in the past decade mainly from two sources. Firstly, from “historical” studies of the initial preterm survivors who were examined from birth and have now reached adulthood. Secondly, from more recent studies using sophisticated neurodevelopmental assessments of the preterm infant at term, including neonatal magnetic resonance imaging techniques, which may potentially be used to identify the mechanisms underlying variations in outcome later in life; this may enable subgroups of individuals who are at increased risk of neurodevelopmental problems to benefit from appropriate intervention strategies which may be devised.

In this volume, many of the most admired and prolific investigators in different areas of preterm research present a comprehensive and up-to-date perspective on their work and areas of expertise, including directions for the future. We have been extremely fortunate to secure contributions from these researchers who have been instrumental in increasing the existing knowledge of the neurodevelopmental sequelae of preterm birth.

The volume is divided into six sections. The first introductory section presents an overview of the epidemiology of preterm birth and associated environmental and biological risk factors (Chapter 1). A historical account of the developments in neonatal care for preterm infants over the past 50 years is then provided, together with an exploration of the mechanisms of brain injury in the vulnerable preterm brain, which provides a powerful means for the development of preventative strategies (Chapter 2). A summary of the current state of knowledge of the clinical outcomes

following various types and degrees of brain injury from a neurological perspective is then given (Chapter 3). Here we need to remember not only the importance of studying patterns of neurological and developmental disorders associated with very preterm birth, but also the context of the constantly changing and improving nature of neonatal intensive care.

The second section of the volume documents progress in neuroimaging research using various techniques, such as neonatal cranial ultrasound (Chapter 4), structural (Chapter 5) and functional (Chapter 7) magnetic resonance imaging, and diffusion tensor imaging (Chapter 8). Neonatal neuroimaging studies have identified several types of white and gray matter alterations in preterm infants compared to controls, and have also shown that severely abnormal findings can help to predict adverse neurodevelopmental outcomes. Valuable guidelines for the use of the various neonatal imaging techniques are provided (Chapter 4). Existing knowledge concerning longitudinal changes in the preterm brain in the framework of normal brain development is discussed in Chapter 6. Apart from the identification of injury–impairment relationships, an encouraging finding which emerges from neuroimaging data is the suggestion that processes of brain plasticity may enable the preterm brain to compensate, to an extent, for injuries that would cause severe loss of function in an adult, but often only result in mild impairment of functioning in preterm-born individuals.

The third section addresses research into the behavioral outcome following preterm birth, with specific chapters on childhood and adolescent (Chapter 9) and adult outcomes (Chapter 10). Although intrauterine and neonatal factors seem to be important in the pathogenesis of psychiatric disorders, no consensus has yet been reached concerning the interpretation of the association between preterm birth and psychopathology. Some methodological challenges in the field are discussed here.

The fourth section considers research on neuropsychological functioning following preterm birth.



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Individual chapters provide summaries of research into the cognitive domains which have been found to be affected in preterm populations, such as language (Chapter 13), memory and learning (Chapter 14), and executive function (Chapter 15). Furthermore, this section includes an overview on the cognitive and functional profile of the preterm child (Chapter 11). Issues concerning neuropsychological outcomes as possible mediators of the effects of biological risks are also discussed. In addition to potential cause–effect inferences, Chapter 12 outlines methodological considerations which readers need to take into account when interpreting the results of outcome studies of individuals born very preterm/very low birth weight.

The fifth section links the current knowledge of the neurodevelopmental processes in preterm individuals with the environment in which they grow up. Chapter 16 summarizes studies investigating the educational attainment of preterm children and describes the substantial social impact of the often reported academic problems, both in terms of economic costs associated with educational resources and in terms of psychosocial adjustment of the preterm-born individual later in life. The impact of environmental variables, which may interact with and affect educational as well as neurodevelopmental outcome, sometimes independent of biological risks, are discussed in Chapter 17. A detailed overview of the results of intervention programs aimed at improving the neurodevelopmental outcome of very preterm individuals by limiting cognitive and behavioral complications, and providing cognitive enhancers, is given in Chapter 18. The results of published studies support the effectiveness of early intervention programs in improving the short- and medium-term cognitive outcomes, but they appear

too heterogeneous to provide guidance on what may be the optimal duration and intensity of the intervention. Further research into ways of minimizing the impact of perinatal complications, especially in infants at greater biological (the extremely immature and low birth weight infants) and environmental risk (the socioeconomically disadvantaged), is warranted.

In the final section we summarize what is known to date about the neurodevelopmental sequelae of preterm birth, what the findings explain, and what research challenges are still unmet. We highlight some areas of research which could help further our understanding of the pathways to risk as well as resilience after preterm birth. These include the study of the molecular basis and genetic contribution to susceptibility to brain injury and of ways to modify the socio-demographic environment in which preterm infants grow and develop, including wider availability of and accessibility to intervention programs (Chapter 19).

We hope that this volume will be a valuable source of reference for pediatricians and neurologists, psychiatrists and psychologists, educators and neuroscientists alike, as we have attempted to discuss the implications of research findings for clinical practice. Apart from providing an up-to-date and concise summary of the explosion of research in this field, this volume aims to provide an accessible source of information across several disciplines. This book will have served its purpose if it succeeds in inspiring the next generation of researchers and clinicians to further knowledge of the pathophysiology of preterm birth and its neurodevelopmental sequelae, and lead on to the design and implementation of appropriate intervention services for individuals at risk of short- and long-term complications.