

Child Neuropsychology

The emergence of child neuropsychology as a sub-specialty of neuropsychology dates back almost 20 years. Recent progress may be attributed, in a large part, to the first theoretical conceptualisations of the brain-behaviour relationship within the developing brain, together with the acknowledgement that the consequences of early brain insult may continue into adulthood. Prior to that time, research and clinical practice with children suffering from central nervous system (CNS) disorders was conducted within an adult neuropsychology paradigm, with methodological approaches and theoretical interpretations limited by these models. There was little understanding of the unique contribution of the developing brain to both the nature and outcome of CNS disorders. Today clinicians and researchers acknowledge that it is inappropriate to measure children's abilities on the basis of adult models alone. Rather, the state of CNS development, the level of cognitive ability, and the psychosocial context of the child must each be integrated to gain an understanding of a child's neuropsychological profile, to predict likely recovery and outcome, and to determine efficacious management and intervention strategies. For children, the pattern of neurologic and cognitive impairment may not be stable, but rather vulnerable to the influences of recovery, ongoing development, and the emergence of new skills. Some skills may be delayed, others deficient, or abnormal. This picture of change and variability provides significant challenges for the clinician working within a developmental context, and requires a model of practice that allows for long-term care and follow-up of children and families through the various transitions from infancy to childhood, adolescence and adulthood.

In keeping with adult models, any significant CNS insult or dysfunction will impact in at least three domains: the biological, the neurobehavioural, and the psychosocial, resulting in initial changes to the CNS, as well as to the child's neurobehavioural abilities and social environment. Initial insult may result in disruptions to cerebral circulation, changes in intracranial pressure, damage to or loss of tissue, or epilepsy. Such damage will then be associated with neurobehavioural deficits including motor impairment, language deficits, attentional problems and memory dysfunction. Behavioural and social difficulties commonly follow, due to the direct effects of CNS pathology, and as a secondary consequence. Over time, and in the context of ongoing development, cumulative problems may emerge. For instance, within the CNS, insult may lead to an interruption or deviation to the normal developmental process. Transfer of cognitive functions may occur within the brain, causing "crowding effects" within healthy brain tissue, resulting in aberrant functional localisation or impaired levels of cognitive ability. At the same time, psychosocial function may become increasingly problematic, due to failure of the child to acquire appropriate social skills, increasing social isolation, and associated family stresses. The long-term consequences of these multiple and interacting factors may result in a picture of global dysfunction. However, appropriate and timely intervention and follow-up, based on knowledge of the disorder, its symptomatology and likely outcome, may prevent such poor prognosis, and enable the child and family to understand and manage these problems successfully.

While current developmental models have broadened the focus of child neuropsychology, none has incorporated all aspects of importance — nature and severity of insult, post-injury complications, age (developmental stage) at insult, time since insult, pre-morbid characteristics, gender, social context and access to remediation and rehabilitation. The challenge for the future is to develop such theories, which, out of necessity, require longitudinal studies of the natural history of various forms of childhood brain damage and dysfunction. To this end, such research is being conducted for a number of diseases and disorders common to childhood, including traumatic brain injury, epilepsy, cerebral infections and tumors, and various toxicities. These studies are likely to confirm that some of the tenets of adult neuropsychology are also true for child populations. For example, it is already established that, as for adults, children sustaining more severe CNS insult suffer greater neuropsychological impairment, but that with time from insult recovery can be documented. The more complex issues related to the impact of developmental stage, both neurologic and cognitive, the effect of injury and insult on ongoing developmental processes, and the role of the environment remain unclear.

While there has been an escalation in research and theory development, advances in the practice of child neuropsychology have been slower to emerge, both in research and clinical contexts. At the most basic level, the tools available have been limited, and often inappropriate. Most assessment procedures have been designed for use with adult populations primarily, and are not particularly attractive or motivating for children. Normative data, when available, are frequently poorly constructed and based on small samples, making detection of deviant performances unreliable. Additionally, there are few tests available which span a wide age-band, resulting in the need to administer different measures with different age groups, further limiting the reliability of comparisons of ability profiles over time. The limitations of the tools employed, in combination with the relatively immature state of knowledge in the field, make diagnosis and prediction of outcome problematic. With increasing interest and enthusiasm in the field, these deficiencies are being acknowledged. New tests, developed specifically for children and reflecting age-appropriate themes and content, are gradually emerging. Many of these tests reflect a combination of traditional adult neuropsychology techniques and theoretical perspectives as well as an understanding of cognitive-developmental issues.

Child neuropsychology is founded on the belief that good practice requires not simply the collection of test data and observations, but the interpretation of these data in the context of age, developmental stage, injury/insult severity, and psychosocial context. On the basis of such multidimensional information, realistic interventions, appropriately tailored to the child's neuropsychological profile and psychosocial environment, can be developed and implemented to achieve optimal outcome. The purpose of this issue is to address some of the core issues in child neuropsychology, in the context of common developmental and acquired CNS disorders, and with particular relevance for clinical practice. The issue includes both empirical and review papers, providing readers with an up-to-date snapshot of the energy and innovation emerging in clinical and research practice within the child context in Australia. Stargatt et al. address the complex area of childhood cancers, employing the biological/behavioural/psychosocial framework to consider advances in this area, and to highlight limitations in current knowledge. Couper et al. focus on examining the links between

focal brain pathology and social/moral development, again emphasising the need to consider multiple functional domains when attempting the understand the impact of brain insult in the developing brain. Lah et al. and Tucker and Rothwell document current thinking in the area of childhood epilepsy, emphasising the complexity of this field, and the need to tackle rather than avoid the multitude of factors impacting on children's development. These two papers provide readers with an insight into ways of understanding the consequences of childhood epilepsy via both traditional and novel assessment procedures. Finally, Anderson describes the opportunities for use of functional neuroimaging techniques in children, emphasising the value of thoughtfully customising these modern techniques to the needs and abilities of young children.

Vicki Anderson, PhD

*Murdoch Children's Research Institute
Department of Psychology, Royal Children's Hospital
University of Melbourne*