Psychological Rehabilitation of Children and Adolescents with Acquired Brain Injury

As we are often told, the child is not just a small adult. In brain injury, a range of variables makes working with children and adolescents qualitatively different from working with adults for instance, developmental factors, functional plasticity, social and family factors.[1] After a brain injury, there are differences in the problems experienced by the child and family and in difficulties experienced by the clinician. Furthermore prognosis will be less clear in children than adults. All these differences have implications for service organisation. In order to provide valid assessment, comprehensive formulation, effective treatment, and accurate prognosis, services for children with brain injury should be provided by clinicians with specialist knowledge of these factors and with the skills to work with them.[2]

Developmental Factors and Prognosis

Younger people tend to recover more rapidly from brain injury than older people. Injury in preschool years is associated with a recovery curve that plateaus at 6 months whilst in older children the figure is more like 12 months.[3] A more extensive 2-year recovery phase is quoted for adults with brain injury. This difference may reflect either faster neuronal recovery in the child or less recovery potential due to attenuated developmental processes in the child.

The so-called Kennard Principle proposes that it is better to have a brain injury earlier than later in life. This is not necessarily the case, and disagreement on this issue is probably due to confusion in the meaning of 'outcome' or ignorance about the nature of brain plasticity.[4] Although children and adolescents are more likely than adults to survive following brain injury, such an event will alter the entire subsequent developmental trajectory for a child. The relative contribution of plasticity and vulnerability in the developing nervous system has been discussed at length in the literature in an attempt to explain outcome. On one hand, the earlier the damage, the greater the potential for recovery due to plasticity.[5] On the other hand, early disruption can cause vulnerability to severe and global maldevelopment.[6] Developmental neuropsychology provides a synthesis of these views. It is likely that cognitive development involves a process of interaction between genetic determination and experience that effects a gradual modularisation of cognitive functions.[7] In the young child, lack of early module development gives greater plasticity; hence modules can be relocated in early but not late lesions. Conversely this leads to vulnerability as there are no modules present in early lesions, so the system has to learn the whole function of the module from scratch with potentially impaired experience. Adults might only lose some part of an already developed module. In short, neither vulnerability nor plasticity alone completely explains the range of consequences of childhood brain injury. Rather, a range of factors interacts to influence outcome (see Table 1).

Problems with cognition

The effects of a brain injury on cognitive processes are dependent on age at injury.[8] A central difference between children and adults is that while the effects of the injury are immediately obvious in adults, children's development is disordered after injury and some deficits may take a considerable time to appear. Table 2 outlines differential cognitive effects of injury on the brain in children and adults.

The problem of interaction between cognition and environment

There is a dynamic development of cognitive resources in children as they grow up and adaptation to an increasingly complex world is a normal developmental task. For example, in transfer to secondary education, there is a greater requirement for abstract thinking, multi-tasking and organising. A child with a brain injury may cope adequately at primary school where the demand on independent ability is relatively low and the level of support is high. At secondary school, expectations of independent cognitive function increase and the level of assistance reduces. A consequence of the injury is a loss in the child's 'dynamic and relative interpretation of the environment',[9] ie an inability to keep up with the increase in environmental demands so that the child will inevitably struggle to keep up with his peers.

Problems with behaviour & emotion

Across the age range, brain injury is associated with behavioural difficulty:

- Hyperactivity, bedwetting, oppositional and antisocial behaviour have been reported in injured children
- Disinhibition and social inappropriateness, cheekiness, embarrassing remarks may be aversive to others thus isolating the child
- Agitated or aggressive behaviour commonly occurs within the sub-acute phase of a brain injury for any age
- Executive and intellectual deficits may be associated with a failure to adapt to environmental or social rules at home, school or work
- Impulsivity and sexual disinhibition may leave the child or adult vulnerable.

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Table 1. Injury characteristics and recovery from early brain insult[8]

	Plasticity	*Vulnerability*
Severity of lesion	*Bimodal effect such that small lesions and very large lesions may lead to interhemispheric reorganisation*	*More severe insults result in greater vulnerability*
Nature of lesion	*Focal lesions, eg stroke, tumour*	*Generalised trauma, eg traumatic brain injury, infections*
Age at onset	*Greatest in initial 12 months of life and decreasing through childhood*	*Greatest for prenatal insults and decreasing through childhood*
Gender	*More common in females, especially for left hemisphere*	*More common in males, greater for right hemisphere*
Psychosocial context	*High socioeconomic status, access to rehabilitation, early intervention*	*Low socioeconomic status, limited resources*

Table 2. Effects of brain injury on cognition in children and adults[1,8]

	Children	*Adults*
Processing Speed	*Decrement in processing speed which can be mistakenly attributed to lack of concentration* *This impairment will have a pervasive effect on education as the pace of learning required in school increases*	*Decrement in processing speed* *Strategies will be needed to allow extra time*
Intelligence	*Fluid intelligence is impaired* *Fewer crystallised resources* *Longer term severe and global deficits in intellect and social cognition are associated with early injury*	*The loss of fluid and sparing of crystallised resources is dependent on location and type of lesion*
Attention	*Deficits in the focus, division and ability to sustain attention may mean distractibility from play, study or road safety* *Child may have difficulty developing attentional control*	*Attention problems are common post head injury, especially after diffuse damage* *Difficulty regaining control of attention*
Language	*Language is central to the child's socio-cultural and intellectual development* *Children losing language due to left hemisphere damage before 6 years are likely to regain these skills due to plasticity* *Complete recovery is less likely with injury after the critical period of language development*	*Presence of expressive and / or receptive language problems is dependent on location of lesion* *After the acute phase a stable picture of language is revealed*
Memory	*Young children are unlikely to spontaneously report a difficulty* *The younger child has less knowledge acquired previously* *New learning deficits can have a cumulative effect as the child fails to keep up – a minor problem can develop into a major difficulty* *The task is to acquire skills*	*Previously may have acquired strategies for remembering* *Retrograde memory largely intact* *Anterograde memory impaired* *Prospective memory impaired* *Implicit memory is more resilient to injury than explicit memory* *The task is to regain skills*
Perceptual and motor skill	*Problems are common in the acute stages* *Psychomotor slowness and dyspraxia persist after a mild injury, which can adversely affect social and scholastic functioning*	*Problems common in acute stages* *Persistence dependent on severity* *Has implications for activities of daily living*
Executive Function	*Longer term difficulty with executive skill development* *Frontal lobes are still developing late into the second decade* *Apparent recovery from injury* *Difficulties may become apparent in later childhood and be 'grown into'*	*Impairments usually evident in the post-acute phase* *Lack of insight may prevent adaptation to change in condition*

Emotional consequences are usually an interaction between organic and psychological factors, which can be difficult to differentiate:

- In children, symptoms may resemble those found in mental health disorders: somatic complaints, impaired control of affect or anxiety resulting in compulsive behaviour
- In adults, common emotional changes are agitation, heightened or flattened affect, mood swings and depression. This may represent frustration with the slow rate of recovery and a negative view about the future due to loss of skills
- In both groups, anxiety, fear or post-traumatic stress disorder is not unusual if a traumatic incident has occurred.

Socio-cultural problems

The child's place in the family structure is different from that of the adult's, which can be an advantage or disadvantage. Children's social networks are complex, comprising family, education system and cultural community. This potentially makes them more difficult than adults to work with, but presents wider possibilities for intervention. The mutually gratifying teaching-learning process between child and adult is abruptly interrupted by head injury, which makes the acute post-injury phase a stressful period for the family.[10] If this can be successfully negotiated, having a supportive family to bring newly-learned rehabilitation techniques home provides opportunities for continued adaptation. Conversely, children from disadvantaged social backgrounds and those with limited support show greater impairment and slower recovery than those who are rich in social resources. Reduced access to services, special education and significant psychiatric problems may all impact on future recovery.[8]

Service Organisation: Assessment

There are methodological differences in psychological assessment between adults and children with brain injuries. Although the child is involved in the interview, parents or teachers are primary informants too. A developmental history is fundamental and, along with information about nature of injury, provides the basis for hypotheses of the assessment. Age-normed tests are specifically designed to suit developmental stages and sometimes require greater flexibility in administration than with adults. Therefore, assessment tends to gather information from more sources and attempts to account for changes in dynamic factors.

Service Organisation: Rehabilitation

Combined with assessment the fundamental components of interventions for child brain injury are rehabilitation and education.[2] In rehabilitation, principles that are employed across the age range are restoration of function (eg regaining physical or speech ability with therapy), functional adaptation (eg self-instructional training for a behavioural problem) and environmental modification (eg use of mobile phone for memory impairments).[8] Inpatient rehabilitation is far more commonly provided for adults than children. Holistic rehabilitation, which aims for psychosocial adjustment and compensation for cognitive disorders in a therapeutic environment, is the most theoretically developed and studied. Evidence supporting its efficacy is tentative yet positive.[11]

With paediatric rehabilitation, there is greater emphasis on providing services in the community. Access to specialist services is more likely when neurosurgery or intensive care is necessary or when complex difficulties and transitions are part of the formulation. Once medically stable many children will receive little systematic rehabilitation and there is a tendency to return home as soon as possible. Few trials with robust methodology have been published in paediatric brain injury rehabilitation,[12] but there is evidence to suggest Cognitive Behavioural Therapy for brain injury is effective in reducing emotional distress and improving cognitive function in adults.[13] Interventions combining patient and family work appear to be more effective than purely patient focused therapy.[14]

Service Organisation: Education

Unlike in the adult world, compulsory education is required for children with brain injury from age five to age 16. It is therefore important to work out the educational trajectory of the child, assess whether return to school is possible

and whether additional support is required. It is the responsibility of the health service to highlight special educational needs of a child after a brain injury. There is increasing responsibility on schools for meeting the special educational needs of pupils. A statutory assessment, which outlines provision needed on returning to school, should include assessment results from a multidisciplinary team. As recovery progresses, rehabilitation is best integrated with educational content. For this reason a paediatric neuropsychologist will continue with follow-up appointments to monitor developmental progress and liaison with schools to recommend therapeutic intervention. As special educational provision has not been systematically provided to children with brain injury there is limited evidence regarding its efficacy.[12] However, an intervention aimed at empowering parents in their interaction with teachers and other professionals involved in their child's care has been favourable.[15]

Conclusion

There are qualitative and quantitative differences between children and adults in presentation and management of psychological aspects of brain injury. Outcome is more difficult to predict in children than in adults and prognosis for children will be unclear until adulthood. For this reason it is important to provide ongoing neuropsychological assessment for children. Children's services are more systemic in nature and work with the family as a whole. Rehabilitation services for adults have greater inpatient involvement whereas support for children's recovery moves rapidly from health to education sectors. There is growing evidence for the use of rehabilitation and special educational support for children with brain injury. Advances in technology of psychological interventions in health and education provide exciting possibilities for clinical work and research with children and adolescents with brain injury.

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