



Support for brain health, cognitive aging, and acquired brain injury

COGNITIVE REHABILITATION PART 1 - THE WHAT AND WHY

Acquired brain injury is a relatively common cause of disability that can affect many areas of a person's ability to carry out activities in daily life. Muriel Lezak, author of the widely referenced *Neuropsychological Assessment* (2004), states that neuropsychological impairments caused by brain injury may be characterized in terms of three functional systems. These are: (1) intellect, in other words the information-handling aspect of behaviour; (2) emotionality, which refers to feelings and motivations; and (3) control, which has to do with how behaviour is expressed. She points out that, *"Brain damage rarely affects just one of these systems. Rather, the disruptive effects of most brain injuries, regardless of their size or location, usually involve all three systems."*

Although the core difficulty for a brain injury survivor thus often resides in the direct impact on cognitive functioning, the consequences of brain injury also include behavioural and emotional difficulties, including frustration, irritability, impulsivity, emotional lability, depression and anxiety. These behavioural and emotional difficulties can have a crippling effect on clients' well-being, their relationships, and thereby their everyday functioning. In addition, cognitive dysfunction and its behavioural and emotional consequences will usually outlast any physical symptoms. Therefore, these emotional and behavioural difficulties must be attended to in conjunction with the treatment of the actual cognitive dysfunction if the brain injury client is to recover to a level at which s/he can contribute to society again.

Cognitive rehabilitation refers to a set of techniques and interventions intended to alleviate cognitive deficits so as to promote better everyday life functioning. Cognitive rehabilitation has been defined by the Brain Injury Interdisciplinary Special Interest Group (BI-ISIG) of the American Congress of Rehabilitation Medicine as a *"Systematic, functionally-oriented service of therapeutic cognitive activities, based on an assessment and understanding of the person's brain-behavior deficits."* This is achieved through interventions that *"...are directed to achieve functional changes by (1) reinforcing, strengthening, or reestablishing previously learned patterns of behavior, or (2) establishing new patterns of cognitive activity or compensatory mechanisms for impaired neurological systems"* (Harley, et al., 1992, p.63).

According to the US Centers for Disease Control and Prevention (CDCP), 1.4 million people sustain a traumatic brain injury (TBI) every year; 1.1 million of these are treated and released from hospital. Most of these injuries are sustained as a result of falls (28%), traffic accidents (20%), and being struck by an object (19%). The cost of TBI, including medical cost and loss of productivity, has been estimated to equal \$60 billion in the United States alone in 2000. The loss of productivity is arguably the point at



Support for brain health, cognitive aging, and acquired brain injury

which cognitive rehabilitation can make a positive impact at the societal level, simply because cognitive dysfunction and its emotional and behavioural consequences are often the reason for *prolonged* loss of productivity. More clearly, a client with TBI may present with difficulties in arousal, attention, concentration, memory, problem solving, decision making, insight and other areas of cognition that impede his/her ability to function in everyday activities. Examples of disrupted competencies include the ability to plan and initiate activities, the ability to carry out tasks that require concentrated effort, and the ease with which former work functions can be performed. The consequences may be job loss, return to parental home or entering an assisted living facility after having lived independently, and reduced social and leisure activities, all of which will compound the difficulty of re-gaining satisfying employment and independence. In other words, treatment of cognitive dysfunction (i.e. cognitive rehabilitation) is central to the treatment and recovery of individuals with brain injury because of the widespread impact of cognitive deficits on safety, functional independence, productive living, and social interaction.

When TBI occurs, the brain can suffer a variety of injuries, and its consequences may not necessarily be obvious to those around the injured person. Injuries associated with TBI fall into two categories: a) focal and b) diffuse. As the name suggests, focal injury to the brain can be found at predictable sites of the brain, depending on the cause of the TBI, and thus, they can be localized and easily identified via imaging methods (brain scans). Such injuries result from so-called impact injuries and may include contusions (bruising of the brain) and different types of haematoma (an area of blood as a result of vessel leakage or bleeding). In an impact injury, the brain, which is submerged in fluid within the skull, hits (impacts) the inside of the skull because of acceleration/deceleration forces. In short, while the skull suddenly stops moving, the brain continues moving over the jagged inside of the skull until it is stopped by the inner skull surface. Areas that can be injured in this way include those responsible for memory, insight, and higher level cognition (i.e. decision making, problem solving, mental flexibility).

However, when the forces that lead to TBI include rotation, pulling, and shaking of brain tissue within the skull, diffuse injuries can occur as well. It should be noted that rotation, pulling, and shaking of the brain can be part of the acceleration/deceleration forces mentioned above. Diffuse injuries are characterized by the fact that they: a) are widespread within the brain, and b) occur at the cellular level [e.g. the actual injury plus the brain's injury response), thereby causing injury to the neuron/axon, which results in the neuron's decreased ability to function properly. Difficulties resulting from diffuse injury may include decreased information processing speed (slowed thinking speed) and reduced information processing capacity.

Of course, brain dysfunction can also occur as a result of other causes, such as stroke,



Support for brain health, cognitive aging, and acquired brain injury

diseases like multiple sclerosis or certain viral infections, and other types of injury such as asphyxiation (interruption of oxygen to the brain as a result of choking or near-drowning). Although the consequences of such injuries may differ from TBI and among themselves, the techniques of cognitive rehabilitation can also be of assistance in alleviating these types of difficulty.

To conclude, impairments of cognitive functions are among the most common and important problems that can lead to disability after acquired brain injury. As such, clients with acquired brain injury will often benefit from cognitive rehabilitation. With its goal to assist the client to achieve his/her most independent or highest level of functioning through a) improving cognitive and behavioural skills, b) compensating for cognitive and behavioural limitations via teaching strategies, and c) assisting clients to understand and manage behavioural and emotional reactions to changes in their functioning, cognitive rehabilitation has the potential to give clients with acquired brain injury a new lease on life by mitigating emotional and financial cost to clients, their care givers, and society at large.

A more in-depth discussion regarding the ins and outs of cognitive rehabilitation in practice can be found in the two associated newsletters, listed below:

Cognitive Rehabilitation Part 2- The How: an in-depth view of the treatment process

Cognitive Rehabilitation Part 3- The Client: a closer look at the brain injury survivor's experience

References

- CDCP <http://www.cdc.gov/ncipc/tbi/TBI.htm>
- Rees L., Marshall S., Hartridge C., Mackie D., & Weiser M. (2007). Cognitive Intervention post acquired brain injury. *Brain Injury*, 21(2), p.: 161-200.
- Harley JP., Allen C., Braciszkeski TL., Cicerone KD., Dahlberg C., Evans S., Foto M., Gordon WA., Harrington D., Levin W., Malec J., Millis S., Morris J., Muir C., Richert J., Salazar E., Schiavone DA., & Smigielski JS. (1992) Guidelines for cognitive rehabilitation. *NeuroRehabilitation*, 2:3, 62-67.
- Lezak MD, Howieson DB, Loring DW, Hannay HJ, & Fischer JS (2004) *Neuropsychological Assessment*. New York, NY: Oxford University Press.