



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

COGNITIVE REHABILITATION PART 2 - THE HOW: AN IN-DEPTH VIEW OF THE TREATMENT PROCESS

In a previous article (CRT part 1: The What and Why), an overview was provided of the principles and assumptions underlying the process of cognitive rehabilitation. Briefly, cognitive rehabilitation interventions are designed for clients who experience cognitive deficits as a result of acquired brain injury (ABI) such as traumatic brain injury, cerebrovascular accidents (stroke), or neurodegenerative diseases. Cognition, in general, can be explained as a collection of abilities, such as attention, memory, problem solving, and orientation that enable us to think, understand the world around us, and in turn, empower us to behave in a goal-oriented manner.

As a consequence, cognitive deficits after brain injury can lead to a variety of behavioural and emotional difficulties, including frustration, irritability, impulsivity, emotional lability, depression and anxiety. Therefore, to ensure successful re-integration into society for clients with ABI, clinical experience (and a substantial body performance research) suggests that maximum benefit from rehabilitative efforts occur when there is an integrated team effort between Occupational Therapists, Physiotherapists, Cognitive Rehabilitation Therapists, Neuropsychologists, Counsellors, and other professional staff. Notwithstanding, while the goals of cognitive rehabilitation include the client's ability to increase self-sufficiency through teaching him/her also to manage emotional and behavioural difficulties after ABI, the present article will concentrate mainly on the role of the Cognitive Rehabilitation Therapist in order to clarify the contribution of cognitive rehabilitation to the rehabilitation process. As such, it will provide an insight into both the assumptions on which cognitive rehabilitation efforts are based and the treatment process itself.

Assumptions (Neuroplasticity and Compensation): Cognitive rehabilitation would and could not have any effect on the client if the brain would not have the capacity to change (neuroplasticity). **Neuroplasticity** is a primary characteristic of our brain, underlying our ability to learn and develop, to remember, to change our behaviour, and, in short, to adapt to ever-changing external (environmental) and internal circumstances. In addition, neuroplasticity can be seen at the level of the organism (behavioural level), but, importantly to cognitive rehabilitation, neuroplasticity can also be observed at the level of brain systems and brain cells (see, for example, van Cranenburgh, 2007).

This latter aspect is the basis of the brain's ability to re-organize itself after experiencing an insult (ABI), or, in other words, to **compensate** for damaged functional systems, and, as such, can be understood by analogy to a right-handed musician's ability to play a violin. Compared to a non-violinist, this musician's brain has more brain cells assigned to the fingers of the left hand in order to allow for that hand's increased dexterity (van Cranenburgh, 2007). Thus, the musician's brain has made compensatory changes to adapt to increased stimulation (i.e. repeated practice and experience due to internal



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motivation), resulting in a changed behavioural output, which is increased dexterity.

In sum, behaviour is the product of the brain, neither of which is constant. When behaviour changes, so does the brain. The reverse is true as well: when the brain changes, so does behaviour (Stuss, Winocur, and Robertson, 2008). It follows that therapeutic stimulation (cognitive exercises as well as education) can modify brain cell networks, which in turn supports restitution of function (for a more detailed discussion, see for example Kolb and Gibb in Stuss et al., 1999).

Treatment Process: The guiding principle that is the natural consequence of the aforementioned assumptions is that behavioral change, of whatever nature, in fact depends on actual changes in neural (brain cell) networks. This occurs in everyone as a natural consequence of growth and learning, whether one is living with a brain injury or not. This principle is thus the main pillar on which the treatment process rests, although it should be emphasized that this does not imply that the goal of treatment is aimed primarily at restitution of lost or disrupted brain functions, but rather that because of the brain's capacity to reorganize itself, treatment strategies can produce behavioral change by a variety of means. This can include restoration of function where this is possible, but can equally well relate to establishing effective compensatory or substitution mechanisms.

Once a client's specific deficits have been identified via clinical interview and standardized assessment, the Cognitive Rehabilitation Therapist decides on specific cognitive exercises for this client with the goal to re-activate and stimulate the impaired components (i.e., attention, memory, information processing, executive functions including planning, organization, decision making, and problem solving). Importantly, proper functioning of these components is integral to more complex behaviors needed in everyday activities. Secondly, these components are hierarchically organized: if attention is impaired, then functioning of other systems relying on attention (i.e. memory, executive functions) will most likely also be impaired (Malian, Berwick, Raymond, Bennett, 2002). Thus, although the ultimate goal of cognitive rehabilitation should be the reduction of disability (i.e., behavioral consequences of cognitive impairments that prohibit clients from functioning in everyday life), a primary goal involves repairing or supporting the fundamental or component functions of cognition prior to concentrating on the rehabilitation of more complex behaviors employed in everyday activities.

As a consequence, cognitive exercises are designed to support neuroplasticity via activating and stimulating specific cognitive components (i.e., attention) that the client needs to function in everyday life. Moreover, only if downstream cognitive components function properly can the therapist focus on re-training more upstream cognitive functions such as memory and/or information processing. For example, during a



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specific attention exercise, the client may be asked to pay attention to a stimulus (i.e. listen to the word “*Tree*”) for a specified period of time (usually 5 minutes per day) while the therapist reads a random selection of words, which includes the stimulus (“*Tree*”). If the client’s ability to sustain his/her attention for the specified period is impaired (i.e. he/she sometimes misses the reading of the word “*Tree*”), the therapist can specifically teach and train the client in strategies helpful in remaining focussed on the task. Similarly, during a memory exercise, the client may be asked to use internal memory strategies to support the recall of a 10-word list read by the therapist. During an Information-processing exercise, a client may be required to sequence an array of pictures into a logical order and tell a story that makes sense. If the client exhibits difficulty on either exercise, the therapist may provide: a) feedback on which internal memory strategies would be appropriate and why/how to use them, or b) strategies that support improved information processing (i.e., simplifying information, self-talk/self-monitoring).

In summary, while an immediate goal of cognitive rehabilitation is the restoration of fundamental component functions of cognition, a second goal lies in the education of the client regarding a) his/her own functioning; and b) applicable strategies on how to support the remediation of deficits.

The purpose of education during the treatment process is twofold. The first goal lies in increasing clients’ awareness, thereby helping them to understand those *cognitive and behavioural* components that are their strengths and weaknesses with the aim to enable them to identify appropriate strategies and adjust them to their own needs. The second goal lies in assisting clients to understand, recognize, and manage their behavioural and emotional reactions to changes in their functioning, thereby helping them to optimize control over the emotional aspects of their functioning, including management of impulsivity, stress, and anger. In addition, an essential element to the education process is the teaching of metacognitive skills (self-regulating one’s own behaviour), such as the ability to talk oneself through the steps of solving a problem. Verbalizing the necessary steps to complete a task or action provides a more concrete pathway (i.e. a cognitive railing so to speak) to get to the specified goal.

To conclude, the brain controls cognition, affect, and behaviour. When this capacity is disrupted (for example by acquired brain injury), impaired cognition and its emotional and behavioural consequences (frustration, depression, anxiety, anger, and impulsivity) are the most common symptoms, and, as such, the culprits of disability. To ameliorate disability, the Cognitive Rehabilitation Therapist translates clients’ improved cognitive functioning into improved real world functioning by teaching them how to apply newly learned strategies to a number of similar real world situations as well as how to adapt strategies to novel situations with the goal of increasing *flexible* information processing. Thus, providing clients with a framework and thereby with the tools to enable them to



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deal with similar as well as new real world situations (metacognitive skills) is a cornerstone of cognitive rehabilitation. Accordingly, cognitive rehabilitation treatment is ultimately geared towards developing greater independence, improving everyday functioning and achieving academic and vocational goals.

References

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