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Clinical reasoning in cognitive rehabilitation therapy

E.T. van Schouwen-van Kranen*
The Society for Cognitive Rehabilitation, Enkhuizen, The Netherlands

Abstract.
BACKGROUND: Many who provide cognitive rehabilitation therapy (CRT) are unaware of the theoretical rationale that underlies their decisions concerning therapeutic intervention. Can the survivor form goals for treatment? When should treatment end? When should the therapist retrain skills, provide remedial cognitive treatments, or simply adapt surroundings because a survivor is too handicapped to be treated at all?
OBJECTIVE: This paper combines theory with the author's experience to provide therapists with a structure for clinical reasoning in their daily practice.
METHOD: The discussion begins with a description of different models of recovery after brain injury. It goes on to discuss similarities, commonalities, and general principles that can be derived from all of them. It ends with suggestions for treatment that serve as useful guidelines for therapists in their practices.
CONCLUSION: Combining the clinician's clinical intuition with knowledge of the theory of CRT can greatly improve the quality of treatment the therapist provides.

1. Introduction

Therapists who provide cognitive rehabilitation therapy often do so from clinical intuition, without regard to any theoretical rationale for their choices. There are however, a number of well-developed models and systems of treatment that, when combined with clinical intuition, can greatly improve the quality of treatment the therapist provides. The author therefore, combines these theories with her own clinical experience and offers this merger as a structure for clinical reasoning. This amalgamation is intended as a guide for individuals conducting cognitive rehabilitation interventions. Although it is beyond the scope of this paper, the techniques described here can be applied both within and across team based interdisciplinary and transdisciplinary treatment approaches and programs. The discussion begins with a description of different models of recovery after brain injury. It goes on to discuss similarities, commonalities and general principles that can be derived from all of them. It ends with suggestions for treatment that serve as useful guidelines for therapists in their practices.

1.1. Methods and theories

According to Wikipedia, the on-line encyclopedia (www.Wikepedia.com), "Cognitive rehabilitation therapy is a program to help brain-injured or otherwise cognitively impaired individuals restore normal functioning, or to compensate for cognitive deficits. It entails an individualized program of specific skills training and practice plus metacognitive strategies. Metacognitive strategies include helping the patient increase self-awareness regarding problem-solving skills by learning how to monitor the effectiveness of these skills and

*Address for correspondence: E.T. van Schouwen-van Kranen, Hersenwerk, Postbus 108, 1600 AC Enkhuizen, The Netherlands. Tel.: +31 06 14175696; www.hersenwerk.nl; E-mail: schouwen@hersenwerk.nl.

self-correct when necessary". Cognitive rehabilitation therapy (CRT) focuses on the re-attainment of cognitive skills, which have been lost or altered because of brain injury. The goal of treatment is to improve the ability to carry out everyday tasks. The process includes re-attainment of skills through direct retraining, use of compensatory strategies, and use of external aids (Malia & Brannagan, 2005).

Recent reviews of the accumulating empirical evidence regarding CRT efficacy post brain injury indicate greatest overall improvement from programs and therapies that involve complex, sophisticated, integrated, and holistic interventions (Mateer et al., 2005; Cicerone et al., 2008). These programs typically focus on psychosocial/emotional aspects of recovery. They address a variety of impairments and disabilities and they emphasize participation, independence, and self-managed adaptation, along with adaptive strategy use for all aspects of life in the real world. Holistic programs are not only evidence based; they are also a treatment standard (Schutz and Trainor, 2007; Cattelani, Zettin, Zoccolotti, 2010; Martelli et al., 2012).

Figure 1 is a hierarchy of Cognitive and executive processes (van Schouwen, 2009, Malia et al., 2004, Sohlberg and Mateer,1989). The figure illustrates which processes survivors have retained and which are still lacking after their brain injury. At the bottom of the hierarchy is attention. Without attention, information processing is not possible. The more the survivor can attend, the more efficient the information processing systems become. Attention is analogous to the lens in a camera. The wider the lens can open, the more information gets in. However, efficient cognitive processing requires not only attention, but also memory and executive monitoring.

Memory training will not be effective without first repairing the person's attentional processes. Likewise, it will be difficult to work with higher order executive skills without first repairing the survivor's memory system. Three basic memory systems require scrutiny and therapy: the procedural memory, the episodic memory and semantic memory. Procedural memory is retention of behavioral scripts such as sports, employable skills, and sequences of body movements like dances. Initially, the therapist has to decide which of these three types of memory is most feasible with the survivor. A survivor who is emerging from a coma may be able to start learning simple procedural skills via repetitive drill and practice. Forms of procedural memory and learning may be shaped classically (Pavlov, 1927) or instrumentally (Skinner, 1953, 1968). They may also involve progressive shaping of behavior (Bandura, 1977) or errorless discrimination (Evans et al., 2000). Regardless of the procedure the therapist chooses, it is important to remember that this type of training is perhaps the only effective CRT at this stage of the survivor's recovery.

Several authors have described episodic memory in their writings (Kolb, 1984; Lewin, 1946; Piaget, 1936; Romiszowski, 1984). Their descriptions often portray a type of memory that occurs when the opportunity arises. For example, teaching social skills by

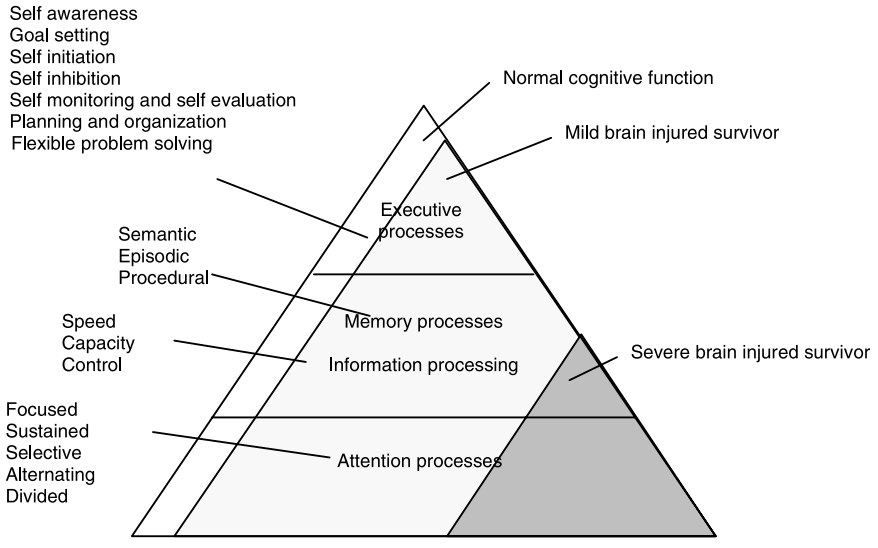

Fig. 1. Hierarchy of cognitive and executive processes.

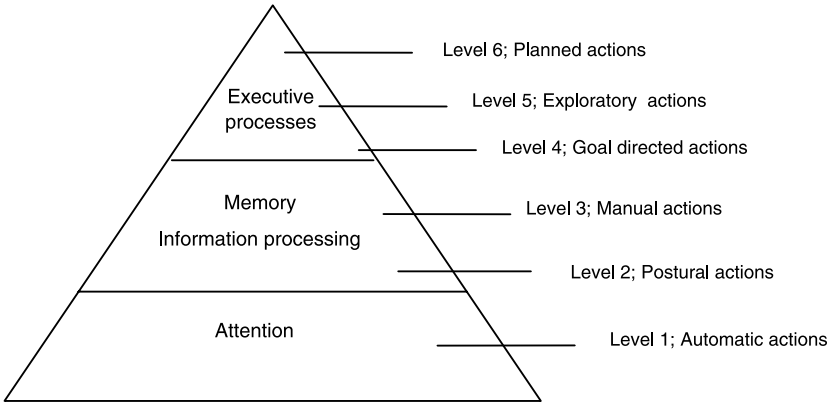

Fig. 2. Allen's (1992) Cognitive Disabilities Model.

video recording a social encounter then showing the survivor aspects of his or her behavior that may be perceived as inappropriate capitalizes on the recency of that unique experience and context. Job coaching shapes performance on the job by focusing on immediate job related experiences that occur during the workday. Ideally, life coaches could use those behaviors that occur from minute to minute as learning experiences for the survivor.

Semantic memory is, perhaps, the most abstract of the three processes; it requires assimilation of new information, which first requires attention and the ability to concentrate. Secondly, it requires the ability to amalgamate this newly acquired information into the rules of life that we call wisdom. Semantic memory is a deep level of encoding that permits visualization of concepts and integration of new information with old into a complex neural network. Semantic memory cannot occur unless the survivor has progressed to the point where he or she is capable of formulating planned actions, can organize, can think in a future sense, anticipate, and demonstrate cognitive flexibility.

Allen's (1992) Cognitive Disabilities Model identifies 6 levels of cognitive functioning that are portrayed in Fig. 2. With extended therapy, survivors usually move towards the highest level of cognitive functioning. However, survivors who suffer from Alzheimer's or Parkinson's disease will often move towards the lower levels of functioning. Figure 2 is especially useful for therapists who are planning treatment for a TBI survivor; it allows the therapist to determine the types of treatment that would likely be most effective at each stage of recovery. Each stage is discussed in detail below.

1.1.1. Cognitive level 1: Automatic actions

Attention in level 1 is limited to internal cues, such as hunger, taste, and smell. Individuals are conscious but largely unresponsive to external stimuli. Actions are in response to comfort or discomfort or to follow near reflexive one-word directives, like "sip" or "turn". Procedural, episodic, and, semantic memory capacities are negligible. Minimal attention is directed to movement in the environment and on things that come in direct contact with the body. Any therapeutic activity involves the here and now, expanding the range of simple communicative responses, and increasing the amount of time the person can remain vigilant.

1.1.2. Cognitive level 2: Postural actions

In level 2 the survivor attends primarily to internal cues and proprioceptive cues from muscles and joints that are elicited by one's own familiar body movements. Actions derive from the reflexive effect on the body alone, like sense of balance and position, relief from pressure or pain. Functional behavioral actions are limited to spontaneous and imitated gross motor actions. The individual is severely apraxic and agnosiac. The survivor pays little attention to objects and because objects do not serve as recognition cues for behavior, the survivor is unable to use most objects in a meaningful way. Planning and organizing and even simple activities of daily living are not possible. Episodic- and semantic-memory capacities are negligible. Procedural-memory capacities are severely impaired such that the person does not remember how to eat, dress, toilet and often how to speak. Attention seems to be focused on movement, touch and sound in the environment. Anything done with the survivor has to be done in the moment.

Therapy usually concerns expanding the range of gross motor actions and increasing the person's ability to communicate.

1.1.3. Cognitive level 3: Manual actions

In level 3 the attention is directed toward tactile exploration and simple touch activities. Objects that can be touched or handled provide recognition cues for what to do and trigger procedural memories. The actions are neither planned nor goal directed. They are often repeated to verify that similar results occur. Consequently, perseverative apraxic actions are common. The survivor has difficulty understanding verbal information; visual cues may go unnoticed and the intangible components of tasks or situations are usually ignored. Episodic and semantic memory is severely impaired. Therapy focuses on the present; exercises concern manually manipulating objects and learning which movements manipulate effectively.

1.1.4. Cognitive level 4: Goal directed actions

Level 4 survivors retain basic conceptual information about the world although episodic and semantic memory capacities are significantly impaired. The person is able to use what is seen in the environment that cue specific actions but is not able to process the new information required to perceive consequences and safety hazards. Executive thought processes; including the ability to inhibit irrelevant cues are limited. Attention is directed toward visible and tactile cues and is sustained throughout short-term familiar activities. Performance is based on routines in which the person uses familiar objects, spaces and sequences however, there is little in the way of cognitive flexibility, self-awareness and problem solving skills. Effective interventions involve exercises that create routines for daily living in familiar places, with familiar objects and familiar social support.

1.1.5. Cognitive level 5: Exploratory actions

At level 5, the survivor has limited executive processes and slow processing of abstract information. Episodic and semantic impairments limit or slow the performance of complex tasks. He or she will also have difficulty with simultaneous attention to complex and multiple cues, such as non-verbal or hypothetical concepts, written cues and other symbolic or interpretive cues. There are also problems with short-term or working memory, judgment, reasoning, planning, and anticipation of the consequences of behavior. The survivor is able to reason using direct, concrete, visible cues; however, without executive control, he or she may make faulty plans or need assistance to evaluate the plan and problem solve. Therapy includes training with scripted behaviors for problem solving in new or unstructured situations.

1.1.6. Cognitive level 6: Planned actions

In level 6, the survivor demonstrates selective attention for multiple cues and abstract symbolic concepts. It is therefore possible to train abstract reasoning and executive skills to plan action sequences, to speculate about outcomes, and to anticipate errors. Attention is focused and the person can inhibit irrelevant cues. Episodic-, semantic-, and procedural-memory capacities are intact. At this level planning, problem solving and learning do not depend solely on overt visuospatial activity, concrete external cues, or both. The survivor begins to show automaticity, i.e., learned skills begin to transfer or generalize automatically to other areas of daily living.

2. A model of insight

This cognitive hierarchy interfaces nicely with model of insight created by Crosson et al. (1989), as seen in Fig. 3. Crosson described three forms of awareness; *intellectual awareness, emergent awareness,* and *anticipatory awareness*. Intellectual Awareness is the survivor's declarative understanding of their limitations. The survivor demonstrates knowledge of their problems, what these problems have in common, and what the general implications of these problems are in daily life. However, to demonstrate intellectual awareness, the survivor must be able to communicate. Survivors at earlier stages of recovery, for example, who demonstrate only postural and manual abilities, may show intellectual awareness in the sense that they acknowledge their problems, but they do not show any emergent or anticipatory awareness. They often simply echo what doctors or caregivers have told them many times. However they lack the behavior and insights that should be related to their intellectual awareness. Emergent Awareness is apparent when a survivor recognizes injury related problems and is able to either solve them or compensate for them. This can only be documented through observation of a survivor's behavior. Training focuses on executive skills, self-monitoring, and problem solving. Because awareness training is context specific, the window of opportunity occurs only when a problem emerges. The first signs of emergent insight appear when the survivor's

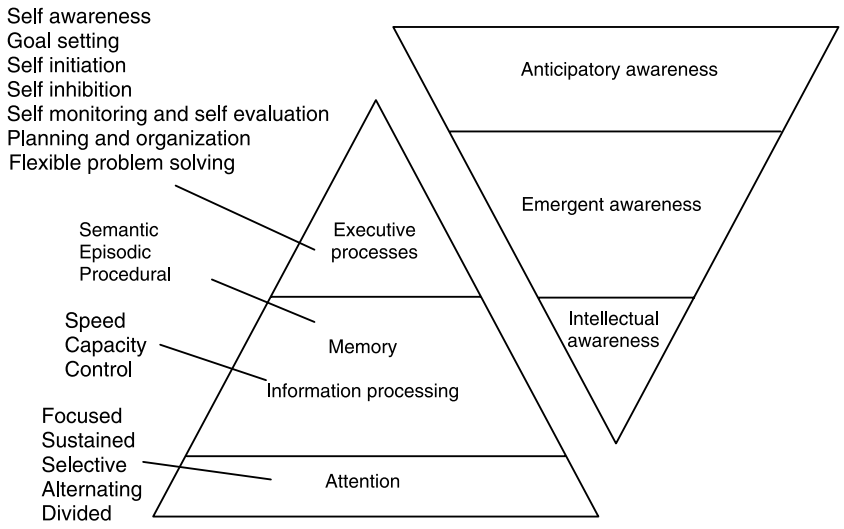

Fig. 3. A model of insight (Crosson et al., 1989).

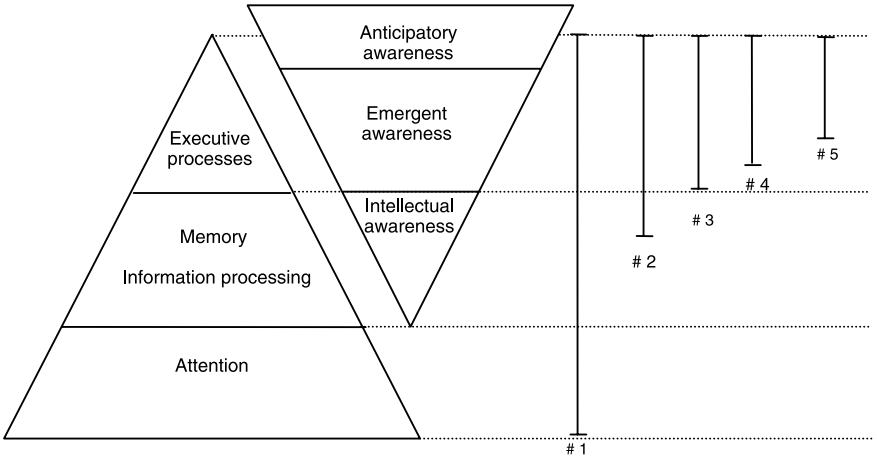

Fig. 4. Clinical reseasoning framework (van Schouwen, 2011). #1; Learning based on procedural memory and is error free. Learning occurs during performance and in the context of performance. # 2; Learning based on episodisic memory and is error free. Learning occurs during performance and in the context of performance. # 3; Learning based on episodisic memory and the evaluation of error in performance Learning occurs during performance and in the context of performance. # 4; Learning based on episodisic memory and is based on trial and error. Learning occurs during performance and in the context of performance. # 5; Learning based on semantic memory and is error based. Learning occurs out of context and extend to future performance.

behavior becomes goal-directed and he or she demonstrates self-monitoring skills. These survivors compare what they know with what they are doing and are familiar with the performance they should be demonstrating. Often these survivors still lack problem-solving skills and they may demonstrate cognitive inflexibility. A survivor regains anticipatory awareness when he or she is able to predict or anticipate the situations in which their problems are likely to occur, and then take appropriate action to deal with the situation proactively. This can only be documented through observation of a survivor's behavior. Anticipatory awareness requires metacognition, the ability to evaluate their thinking, to anticipate the future, and to develop plans of action.

3. Combining models and theories

The aim of CRT is to improve the ability to carry out everyday tasks. The process includes re-attainment

of skills through direct retraining, use of compensatory strategies, use of external aids, and learning new knowledge or skills. Knowledge can be factual (knowing facts, objects, events, people or what to do in given situations) or conceptual (specific concepts, rules and principles). Skills refer to actions (intellectual or physical) and to reactions (to ideas, things, or people) which a person performs in a competent way in order to achieve a goal (Romiszowski, 1984). When the described models and theories are combined, a clinical reasoning framework can be developed as shown in Fig. 4 that directs decision-making regarding how to teach survivors new knowledge and skills.

A survivor who is emerging from coma may start learning simple procedural skills via repetitive drill and practice. He or she will not have emergent awareness and may only benefit from errorless learning procedures and learning behavioral scripts. In this stage of recovery, rehabilitation concerns "reproductive skills", containing automated "reflexive" actions that make up sensorimotor skills, attitudes, habits and the following of algorithms.

The episodic memory is necessary to learn "productive skills" that contain more complex types of activity; these require planning and heuristic decision-making (Romiszowski, 1984). Productive skills are necessary to formulate and to use compensatory strategies and external aids. Because the survivor has no emergent awareness, errorless learning techniques may be the only effective way to train new skills (Wilson, 2009). Learning that involves episodic memory occurs in the here-and-now, i.e., during the immediate episode of life. During this stage, much of learning occurs on error trials. Once the survivor regains emergent awareness, mistakes that occur during the episode can serve as learning opportunities.

4. Getting results

The models and theories outlined above provide useful guidelines for therapists who work with brain injury survivors at different stages of recovery. The models consistently outline a graded hierarchy of recovery with simple skills at the bottom of the hierarchy ascending into more complex skills at the top. Many survivors will never reach the top rungs of the hierarchy and the therapist should not expect that they would. The only feasible goal for the TBI survivor is that he or she will improve. The primary goal for the person with a progressively degenerative condition is to forestall the inevitable decline as long as possible.

These theories of recovery also agree on the importance of the hierarchy per se. Clearly, cognitive rehabilitation requires a graded sequence of treatment starting with the simplest of activities that emphasize orientation in time, place and to person, progressing through various levels of attention and concentration training, before memory skills can be addressed. All of these levels of cognitive functioning require repair before the therapist will have any success retraining higher-level executive skills. Starting at too high a level in the hierarchy will usually be a waste of time.

A therapist may only have time to address one of the gross levels cognition, attention, memory, processing, or executive functioning. Within each system are several subsystems that are also organized hierarchically. It is therefore necessary to formulate a plan of action at each level and to make the goal to complete the next level in the sequence. This treatment plan may be especially difficult for a survivor to accept because it may seem that the treatment is progressing too slowly. It is therefore important for the therapist to remind the survivor that skipping any stage of treatment will likely result in a return to it later.

These models create as many questions as they answer and it is important for therapists to consider these questions at the beginning of the treatment process. For example, the awareness hierarchy theory implies that the ultimate goal of CRT is to get the person to the point of anticipatory awareness. To achieve this goal however, the therapy may take a lifetime and there will be many obstacles along the way; not the least of which is the question of whether the survivor ever possessed this type of awareness before their injury? Is the survivor willing to invest the requisite amount of time, effort, and resources necessary to achieve the goal? Does the survivor's lifestyle require that level of awareness? Another related question concerns the survivor's stated goals for treatment. Many will state unrealistic or unmeasurable goals such as "I just want to be what I was before." However, without clear benchmarks for what the person was before, it is impossible to determine if he or she would ever regain that particular state. Perhaps the only meaningful goal is to show that there has been measureable improvement over the course of treatment.

Finally, it is important to measure improvement in terms of concrete standards that are salient to the survivor and his or her family. Although standardized test scores and rating scales may provide useful indices for

academic pursuits, family members and survivors seldom understand nor care about them. They are much more interested in obvious measures such as changes in everyday independence, return to work, or improved communication skills. For example, the fact that the family can now leave the survivor home alone without worry often seems like an enormous gain to a caregiver. These are the types of changes that foster hope and hope is what sustains the ongoing effort that we call CRT.

Declaration of interest

The authors declare that there is no conflict of interest.

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