The Society for Cognitive Rehabilitation, Inc.

Recommendations for Best Practice in Cognitive Rehabilitation Therapy: Acquired Brain Injury

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Practical Innovation in Cognitive Rehabilitation Therapy

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Executive Summary

The long-term effects of cognitive difficulties following brain injury are an established fact. The Society for Cognitive Rehabilitation is committed to developing and ensuring best practice within the field of Cognitive Rehabilitation.

This document was produced at a time when various organizations are producing Guidelines and Standards for neurological rehabilitation. It aims to present the basis for best practice in one aspect of this, namely Cognitive Rehabilitation, so that planners, managers, practitioners, people with brain injury, and their families can determine what is required.

The major part of the document is comprised of 81 Recommendations, under a variety of headings, which have been designed to comprehensively cover clinical practice in a range of acquired brain injury settings. These recommendations are supported with evidence in the form of expert opinion.

In addition, a section has been included to enable the reader to gain a quick overview of best practice. This is presented in the form of an Evidence Base. While not complete, this evidence base is a good starting point for anyone who needs to explore this in more detail. All references are included in full.

The Purpose of this Document

The cognitive effects of brain injury, and the implications of this for future quality of life, have been well documented in the literature (Turner-Stokes, 2003). It is now an established fact that cognitive problems are one of the most disabling long-term consequences of brain injury.

The National Academy of Neuropsychology (NAN) in the United States has produced a brief Position Statement on CRT (2002). In the United Kingdom, the Royal College of Physicians and the British Society for Rehabilitation Medicine have produced Guidelines for both post acute brain injury rehabilitation and stroke rehabilitation, which stress the importance of understanding and dealing with cognitive problems (Turner-Stokes, 2003; Royal College of Physicians, 2004).

Cognitive Rehabilitation Therapy (CRT) is central to brain injury rehabilitation success. However, there is still debate about which treatments work best, under which conditions, and for which patients. As a result, there have been a number of meta-reviews, some of which are ongoing, of the vast and ever expanding published literature in this field (Chestnut, 1999; NIHCD, 1999; Cicerone et al., 2000; Cappa et al., 2003; Frattali et al., 2003). These reviews aim to summarize the scientific evidence that is available.

There is also a need to take into account expert opinion. The Society for Cognitive Rehabilitation (SCR) consists of a Board and an Advisory Board, composed of a large number of experts in the field of cognitive rehabilitation.

It is therefore appropriate and timely that the Society for Cognitive Rehabilitation (SCR) produces this document: “Recommendations for Best Practice.” This document should be considered a “work in progress,” which will be updated as new evidence is published. It is based on clinical experience supported by published evidence.

The purpose of this document is to:

- Provide a comprehensive list of recommendations for best practice based on published evidence and expert opinion.
- To act as a more detailed resource than has been produced as a result of the meta-reviews, position statements, and guidelines documents.
- To help improve clinical practice across a wide variety of settings that provide CRT.

Please contact us with your feedback and suggestions:

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SECTION ONE: THE FRAMEWORK

1. Historical Perspectives

Recommendation 1.1:

Brain injury rehabilitation programs must include cognitive assessments and treatments (CRT).

Recommendation 1.2:

CRT should be included at every stage of rehabilitation, from coma to community, as appropriate to the needs of the individual with brain injury.

Recommendation 1.3:

All staff working within brain injury rehabilitation must be trained to understand cognition and its impact upon their own professional inputs.

CRT has developed as a result of growing knowledge about the long-term effects of brain injury. CRT was used by the British and German military in their attempts to rehabilitate troops during the two World Wars (Pentland et al., 1989; Poser et al., 1996).

Since the Second World War, CRT has become an integral part of brain injury rehabilitation:

> The history of CRT is both old and new. World Wars I and II led to considerable development of methods of rehabilitation of all kinds. However in the 1970's and 1980's the field of CRT experienced the greatest change. This revolution was stimulated first because rehabilitation researchers and therapists became interested in cognitive psychology, which had gone through a period of rapid growth in the 1960's. Also, certain distinguished figures such as Alexander Luria advanced a number of important ideas about neurocognition and the treatment of cognitive impairments.
>
> Parente, R. & Herrmann, D. (1996). Retraining cognition. Aspen, Maryland, p. 1.

> 'Although TBI may result in physical impairment, the more problematic consequences involve the individual's cognition, emotional functioning and behaviour.' The consensus recommends that 'rehabilitation of persons with TBI should included cognitive and behavioural assessment and intervention.'
>
> National Institutes of Health Consensus Development Conference Statement
> Rehabilitation of Persons with TBI. Convened in 1998. Put to press in 1999.

Cognitive impairments in memory, reasoning, attention, judgement and self awareness are prominent roadblocks on the path to functional independence and a productive lifestyle for the person with a brain injury . . . it became dramatically evident to professionals, patients and their families that cognitive impairments, which interact with personality disturbance, were among the most critical determinants of ultimate rehabilitation outcome. Therefore cognitive rehabilitation became an integral component of brain injury rehabilitation.

National Academy of Neuropsychology position statement on Cognitive Rehabilitation.
May 2002. wwwnanonline.org.

Until the past decade, CRT was not addressed in textbooks or made the object of professional conferences. In recent years, various hospitals around the country established CRT as part of their treatment offerings. There is now a professional organisation, the Society for Cognitive Rehabilitation that has established certification requirements for CRT professionals.

Parente, R. & Herrmann, D. (1996). Retraining cognition. Aspen, Maryland, p. 5.

It can no longer be said that cognitive rehabilitation is a 'new field.'

Sohlberg, M.M. & Mateer, C.A. (2001). Cognitive Rehabilitation:
An integrative neuropsychological approach. The Guilford Press, p. ix.

Cognitive retraining has been an accepted therapeutic intervention in the areas of psycholinguistics and special education for learning disability in children and adults for several decades.

Berrol, S. (1990). Issues in cognitive rehabilitation. Arch Neurol 47, 219-220.

The British Society for Rehabilitation Medicine (BSRM) emphasises the importance of cognitive deficits following TBI: 'Acquiring new knowledge and skills is particularly difficult when there are cognitive deficits. All those who are involved with the patient who has a brain injury must understand cognitive impairments and how they alter what the patient is able to comprehend comply with and achieve'.

Rehabilitation after traumatic brain injury. (1998). BSRM. Working Party Report.

Cognitive Rehabilitation is central to any treatment program designed for the traumatically brain injured individual.

Cognitive Rehabilitation. (1994). Rattock, J. & Ross, B.P.
Ch. 21 in Neuropsychiatry of TBI. (Eds.) Silver J.M., Yudofsky S.C., & Hales, R.E., American Psychiatric Press Inc., Washington, DC.

95% of rehabilitation facilities serving the needs of persons with brain injury provide some form of cognitive rehabilitation, including combinations of individual, group and community based therapies.

Cicerone, K.D. et al. (2000). Evidence based cognitive rehabilitation: Recommendations for clinical practice.
Arch Phys Med Rehabil 81, 1596-1615.

The Helios Program reports on good practice at various stages post injury; 'as patients show signs of regaining consciousness they should be transferred to

a rehabilitation hospital setting, where a structured program of activities not only promotes the redevelopment of cognitive skills, but also prevents behavioural deterioration.' This work is recommended to continue into the post acute stage: 'cognitive, emotional and social assessment and intervention', and into the prevocational stage: 'At the psycho-social/pre vocational stage the emphasis is on building social autonomy by cognitive, emotional and social training.'

Guidelines for good practice. The Helios Programme. (1996). Working Group on Brain Injury Rehabilitation in the Functional Rehabilitation Sector of the European Union Helios II programme.

The BSRM states: 'Cognitive, emotional and behavioural problems are extremely common following acquired brain injury . . . where cognitive impairment is causing management difficulties or limiting response to rehabilitation, specialist advice should be sought and if appropriate, the patient referred to a formal rehabilitation program focused on ameliorating the consequences of their cognitive deficits directly or indirectly.'

Guidelines for Rehabilitation following acquired brain injury in adults of working age. (2003). 7th Draft. Produced by the BSRM Working Group. Section 7.5.2.

The program must be based on the results of physical, cognitive, executive, communication, psychosocial and functional assessments in accordance with the stated purpose.

South Thames Brain Injury Rehabilitation Association,
Minimum Recommended Standards for Post Acute Brain Injury Rehabilitation. (2000). Standard 4.2.

The program must be based on the results of physical, cognitive, communication, psychosocial, functional and environmental assessments.

Turner-Stokes L. (2002). Clinical Governance in Rehabilitation Medicine.
The state of the art in 2002. Clinical Rehabilitation 16 (suppl. 1): 1-58. Appendix 1:
Standards for specialist in-patient and community rehabilitation services, p. 41, Standard 5.1.

Cognitive rehabilitation must be available because, sometimes, more direct attempts to remediate functional skills (for example hygiene, cooking) are unsuccessful due to underlying cognitive dysfunction.

Vogenthaler, D. (1987). An overview of head injury:
Its consequences and rehabilitation. Brain Injury 1(1): 113-127.

The Brain Injury Special Interest Group of the American Congress of Rehabilitation Medicine (ACRM BI-ISIG) was set up in 1994 to examine the role of psychology in CRT. The group identified the positive role and value of CRT.

Bergquist, T.F. & Malec, J.F. (1997). Psychology: Current practice and training issues in treatment of cognitive dysfunction. Neurorehabilitation 8, 49-56.

2. Defining CRT

Recommendation 2.1:

It is essential to have a clear definition of CRT in order to direct the assessment and treatment activities.

In order to define CRT, it is essential to have a clear idea of what the term 'Cognition' refers to:

> What we call cognition is a complex collection of mental skills that includes attention, perception, comprehension, learning, remembering, problem solving, reasoning and so forth. These mental attributes allow us to understand our world and to function within it. After a brain injury, a person typically loses one or more of these skills. Cognitive rehabilitation is the art and science of restoring these mental processes after injury to the brain.
>
> Parente, R. & Herrmann, D. (1996). Retraining cognition. Aspen, Maryland, p.1.

This general definition gives an overview of what CRT is, but the definition in most common usage was published by the American Congress of Rehabilitation Medicine, Brain Injury Special Interest Group (ACRM BI-SIG) in 1997:

> CRT is a 'systematic, functionally oriented service of therapeutic cognitive activities and an understanding of the person's behavioural deficits. Services are directed to achieve functional changes by:
>
> - Reinforcing, strengthening or establishing previously learned patterns of behaviour, or
> - Establishing new patterns of cognitive activity or mechanisms to compensate for impaired neurological systems.'
>
> Bergquist, T.F. & Malec, J.F. (1997). Psychology: Current practice and training issues in treatment of cognitive dysfunction. Neurorehabilitation 8, 49-56.

This definition has been adopted by the Commission on Accreditation of Rehabilitation Facilities (CARF) and by the National Academy of Neuropsychology (NAN) in their position statement on Cognitive Rehabilitation (May 2002).

3. Individuals involved in CRT

Recommendation 3.1:

CRT provision crosses disciplinary boundaries. Attempts should be made to utilize the skills brought to this field by a variety of individuals who have received their training in related subjects. Practitioners of CRT should be licensed/qualified in a relevant discipline.

Recommendation 3.2:

Relevant and extensive postgraduate training in CRT should be completed by all individuals who provide the CRT service.

The following references support the view that CRT is a cross-disciplinary provision and is not, nor should be, the sole domain of any single discipline:

> These services (cognitive rehabilitation) are provided by college educated individuals who, for the most part, have completed a social science curriculum (i.e., psychology, sociology, special education).
>
> Raymond, M.J. (1994). Neuropsychological consultation in rehabilitation. New Jersey Rehab, March issue, pp. 18-27.

> Because its roots are interdisciplinary, practitioners of CRT come from several areas.
>
> Parente, R. & Herrmann, D. (1996). Retraining cognition. Aspen, Maryland, p. 5.

> With a view toward efficacy, cognitive deficits should be treated within a comprehensive neurorehabilitation program that incorporates a wide variety of treatment modalities. Physiatry and physical therapy, individual counselling, family interventions, vocational issues, and community re-entry all need to be addressed. Unless all of these are integrated into the treatment program, successful outcome of the rehabilitation process is jeopardised.
>
> Rattok, J. & Ross, B.P. (1992). A Practical Approach to Cognitive Rehabilitation. NeuroRehabilitation, 2(3): 31-37.

> Since the cognitive deficits of patients with TBI can undermine skill learning in all disciplines, it is incumbent upon staff to develop as many opportunities as possible in which cognitive difficulties are the focus of treatment, and to incorporate remedial strategies in all therapeutic encounters to maximise learning and outcome.
>
> Waxman, R. & Gordon, W.A. (1992). Group-Administered Cognitive Remediation for Patients with Traumatic Brain Injury. NeuroRehabilitation, 2(3): 46-54.

Wilson (2002) illustrates clearly the recognition that there is a need to incorporate information from a wide variety of sources if there is any hope of achieving a meaningful model of CRT. Crossing disciplinary boundaries is one way in which this goal can be furthered.

The Brain Injury Interdisciplinary Special Interest Group of the American Congress of Rehabilitation Medicine specifies the training necessary for qualified practitioners in cognitive rehabilitation, including:

> Documented course work, relevant experience, and formalised training in the understanding of neurological, behavioural, and cognitive functioning and specialised training in the rehabilitation of cognitive disorders.
>
> Head Injury ISIG of ACRM. (1992). Guidelines for Cognitive Rehabilitation. NeuroRehabilitation 2(3): 62-67.

The Society for Cognitive Rehabilitation is a non-discipline specific body, which seeks to bring together everyone who is providing, or who is interested in, CRT. The SCR recognizes that different professions have different skills that can be brought to the field for the benefit of the clients/patients.

Recommendation 3.3:

The person with brain injury should be seen as an integral member of the team.

Recommendation 3.4:

The person with brain injury must be involved in the cognitive treatment endeavor in the following aspects:

a) The rationale for the training must be endorsed by the individual
b) The methods and materials to be used for cognitive training must be understood and accepted by the individual
c) The need for persistent motivation to engage must be accepted by the individual.

These authors document that clients who were active participants in their goal setting and monitoring of progress showed superior goal attainment and maintenance.

Webb, P.M. & Glueckhauf, R.L. (1994). The effects of direct involvement in goal setting on rehabilitation outcome for persons with traumatic brain injuries. Rehabilitation Psychology 39, 179-188.

Recommendation 3.5:

The family/support system of the person with brain injury plays an important role in intervention and should be actively involved throughout treatment.

Clinical evidence and research data suggest a relationship between the family's ability to adapt and cope with the trauma and the patient's success in rehabilitation. That is, there is a dynamic relationship between the patient and family such that the injury has a dramatic impact on the family system, and the family's response to the injury has an impact on treatment outcome. Thus, there is a critical need to develop effective family treatment interventions.

Maitz, E.A. & Sachs, P.R. (1995). Treating families of individuals with traumatic brain injury from a family systems perspective. J Head Trauma Rehabil 10(2): 1-11.

Rehabilitation success . . . depends upon a true *collaboration* with the client and family members or other significant support persons in the client's life . . . Collaboration (1) facilitates the identification of therapeutic goals that matter to those individuals affected by brain injury; (2) shapes the intervention process so that it will work for real individuals in real-world contexts; (3) acknowledges that family members other than the person with the injury also need support; and (4) can enhance the rehabilitation research process to develop and evaluate effective interventions.

Sohlberg, M.M. & Mateer, C.A. (2001). Cognitive Rehabilitation. Guilford, NY, pp. 401-404.

SECTION TWO: ASSESSMENT & TREATMENT

4. Assessment

Recommendation 4.1:

A standard battery of assessments should be administered in each setting that provides CRT.

Recommendation 4.2:

The assessment battery should provide sufficient information to form hypotheses about the underlying cognitive impairments and deficits that interfere with the person's cognitive functioning.

Recommendation 4.3:

The results of the assessment battery should enable the therapist to make decisions about which treatments are necessary, rather than merely describing the problems.

For instance, it is not considered to be appropriate to a rehabilitation setting if a memory test, for example, just tells the examiner that the patient has a verbal memory deficit of so many points or standard deviations; rather the memory test should enable the examiner to decide which aspect of the memory process is failing and, therefore, where to target the therapy.

Recommendation 4.4:

In rehabilitation settings, standardized psychometric assessments, questionnaires, structured interviews, and behavioral observations across a range of functional settings should all be used without giving stronger emphasis to any one approach.

Recommendation 4.5:

It is essential to cross-reference the results of tests with each other and with tests done in different departments (wherever this is possible) and with testing done on different days or at different times of day.

With some experience, typical patterns of deficits and strengths can be readily identified from such a battery in the majority of patients. Where such patterns are not clear, then expert advice must be sought, usually from a neuropsychologist or neuropsychiatrist.

Recommendation 4.6:

Wherever possible assessment results should be shared with the brain-injured person. They should be explained in terms that the individual can understand and explicitly related back to the functional problems that have been identified.

Recommendation 4.7:

A cognitive treatment plan should be drawn up with the brain-injured person, as a direct result of the assessments. Agreement should be reached on this between the therapist and brain-injured person.

Recommendation 4.8:

Reassessment should be undertaken at regular intervals in order to monitor and report on progress.

Account must be taken of test-retest biases, but it is acknowledged that there is a lack of repeatable batteries. The guiding philosophy on retesting should be to demonstrate to the client/patient that he or she is making progress. Sometimes this will mean utilizing tests that may have a retest bias. However, this underscores the importance of using questionnaires, structured interviews, and behavioral observations alongside formal tests.

Neuropsychological, or formal, assessments are necessary, but not sufficient for establishing levels of functioning in everyday life:

> The clinical neuropsychological examination is a useful but limited tool. Full appreciation for its diagnostic, predictive and rehabilitation-guiding strengths and weaknesses is as much related to the clinical training of the examiner as to technical expertise and administration of the various tests. . . .
>
> Test scores do provide some indication of overall intellectual performance and a general idea of relative dysfunction on the neuropsychological measures used. However, there are many forms of intelligence or competency that are not well tapped by even a very thorough neuropsychological examination. These include social intelligence or the ability to get along well with other people, work capacity, susceptibility to fatigue, desire to do well, responsibility, etc. These are all capacities that

people possess which can be expected to exacerbate or minimise the impact of certain cognitive deficits. . . .

The exact relationship of these scores to ultimate level of psychosocial adjustment and to specific intervention activities is still far from well understood…If we are going to make recommendations about the reintegration of an individual into the community following brain damage, based on test results, we need to have a better understanding of how our current test procedures relate to such aspects of functioning as job performance and independence in activities of daily living.

Prigatano, G.P., Pepping, M. & Klonoff, P. (1986). Cognitive, personality and psychosocial factors in the neuropsychological assessment of brain injured patients. Ch. 7 in Clinical Neuropsychology of intervention. (Eds.) B.P. Uzzell & Y. Gross. Martinus Nijhoff Publishing, Boston.

Ongoing assessment is valuable and desirable. Consistent use of procedures that generate meaningful scores allows quantitative tracking of results. The person with brain injury can be taught to tabulate his or her own scores on charts provided for the individual. Especially desirable is the entry of scores on a structured spreadsheet that produces a graphic display of results. People with brain injury who learn to do this may acquire vocationally valuable skills.

Rosamond Gianutsos. (2005). Personal communication.

Recommendation 4.9:

Wherever possible, assessment results and the treatment plan should be explained, discussed, and agreed with the caregiver or significant other.

Recommendation 4.10:

The assessment results should be used by the therapy team to help them make a prognosis for what they can achieve with the person with brain injury. This should be stated clearly in writing, with justifications, to the brain-injured person and his or her caregiver or relative. These form the 'Outcome goals.'

Recommendation 4.11:

Treatment goals should be specified as a result of the assessment. These should include outcome goals, long-term goals, and short-term goals. These should be agreed with the person with brain injury.

Recommendation 4.12:

All goals should be written as SMART goals and clearly documented.

The acronym SMART ensures that goals are:

S - Specific, M - Measurable, A - Attainable, R - Realistic/Resourced, and T - Timely and Time bonded.

This provides structure for the brain-injured person and allows both the person and you to monitor progress to see improvements. You should have a clear objective for each session or activity, i.e., exactly what the person should be able to do by the end of the session. An objective is something that can be stated clearly and precisely, which you can observe the person doing. State clearly what is to be achieved, under what specific conditions, by when, and the level of correct response required. Be realistic in setting these aims and objectives. Do not develop objectives at so high a level that you and the person become frustrated. Review your objectives and if they are too high, modify them.

Each of the components represented by the SMART acronym should be present; otherwise, the goal will not happen.

McMillan T & Sparks C. (1999). Goal Planning and neurorehabilitation. Neuropsychological Rehabilitation 9, 345-361.

5. Restoration and Compensation

Recommendation 5.1:

CRT treatments should encompass attempts at restoration of lost function at the same time as teaching compensatory strategies to minimize the cognitive impairments.

Recommendation 5.2:

The person with brain injury should never be told that his or her old cognitive functions can be fully restored; they should be advised that the aim is to maximize or optimize these skills, while learning new ways of doing things to minimize the problems (compensation).

The argument over whether to overcome the neurological problem or to compensate for it has been ongoing for a couple of decades. This should not be seen as an "either/or" situation. It is more appropriate to match the approach to the needs of each client/patient.

It can be seen from the ACRM definition that CRT is concerned with both compensating for cognitive difficulties and with restoring lost cognitive functions. In fact this is a theme that is echoed in the works of many published authors, for example:

> Although cognition has been studied for a long time, procedures for assisting in the restoration of cognitive functions are only now being developed. Minimally, we ought to be able to help people identify their losses. Additionally, people can be helped in coming to terms with the problem and working out methods to cope with it. Finally, attempts can be made to restore lost function. Often people ask if training is directed at compensation or at restoration of function. The most prudent answer is 'both.'
>
> Gianutsos, R. (1980) What is cognitive rehabilitation?
> Journal of Rehabilitation, Jul/Aug/Sep, pp. 36-40.

> General cognitive therapeutic strategies consist of teaching compensatory skills and brain retraining. Through practice and repetition, impaired cognitive functions can be strengthened. This may occur by reinforcing foundation skills such as attention/concentration, reaction time, visual processing, and the ability to organise new information. These basic building blocks . . . can be integrated into more complex functional behaviours (dressing, cooking, balancing a chequebook and operating an automobile). Pencil and paper tasks, computer software programs, and video feedback are used for developing these skills.
>
> Raymond M.J. (1994) Neuropsychological Consultation in rehabilitation.
> New Jersey Rehab, March issue, pp. 18-27.

CRT is 'a process whereby people with brain injury work together with health service professionals and others to remediate or alleviate cognitive deficits arising from a neurological injury.'

Wilson, B. (2002). Towards a comprehensive model of cognitive rehabilitation. Neuropsychological Rehabilitation 12(2): 97-110.

Evidence for experience dependent plasticity of the brain, including cell regeneration, means that rehabilitation can aim at reinstituting impaired cognitive function, as well as at training compensatory strategies for the function.'

Robertson, I.H. (1999). Setting goals for cognitive rehabilitation. Curr Opin Neurol 12(6): 703-8.

Sometimes we try to restore lost functioning, or we may wish to encourage anatomical reorganisation, help people use their residual skills more efficiently, find an alternative means to the final goal (functional adaptation), use environmental modifications to bypass problems or use a combination of these methods.

Wilson, B. (2002). Towards a comprehensive model of cognitive rehabilitation. Neuropsychological Rehabilitation 12(2): 97-110.

There is an increasing body of evidence and opinion demonstrating that restoration approaches are valid:

Interventions to improve neural network and cognitive function may involve particular types of experience and stimulation (e.g., complex environments) with experience-dependent changes demonstrable in the biology of neural connections, small blood vessels and even the organisation of brain layers.

National Institutes of Health Consensus Development Conference Statement Rehabilitation of Persons with TBI. Convened in 1998. Put to press in 1999.

Theoretically direct retraining of impaired cognitive functions appears to be possible. If accomplished such training would be of substantial help to patients.

From the NIH report. Prigatano, G.P. (1998). Cognitive Rehabilitation: An impairment oriented approach embedded in a holistic perspective.

My first point is that restoration is an appropriate goal for the beginning of therapy because it just might work. To the extent that it does work, it will obviate the need for alternative treatments and reduce the total need for rehabilitative services. To those who are concerned about the ethics of holding out false hope, I would propose that we should question the proprieties of ruling out hope. . . . the point is, who really has the knowledge to justify the elimination of hope?

Gianutsos, R. (1991). Cognitive rehabilitation: Neuropsychological speciality comes of age. Brain Injury 5(4): 353-368.

Cognitive exercise helps change the brain itself. It seems almost self evident that this should be the case . . . systematic cognitive activation may promote dendritic sprouting in the victims of stroke or head injury; this in turn facilitates

> the recovery of function . . . it is logical that the more broad based a cognitive workout regimen the more general the effects.
>
> Goldberg, E. (2001) The Executive Brain, OUP, p. 204.

Retraining tasks do more than just restore lost functions; they also can be instrumental in helping patients to develop compensatory strategies and vice versa. This illustrates that restoration and compensation approaches are not mutually exclusive:

> This study looked at two groups of patients, 15 in each group. Group 1 received four 45-minute session over 4 weeks in computer tasks on a visual remediation-training task without instruction in compensatory training. Group 2 had four 45-minute sessions over 4 weeks, consisting of instruction in the use of three internal compensation strategies (verbalisation, chunking and pacing). 80% of both groups used compensatory strategies. Therefore many people following brain injury will develop these themselves whilst doing the appropriate training tasks. It is therefore appropriate and beneficial to use retraining tasks.
>
> Dirette, D.K., Hinojosa, J. & Carnevale, G.J. (1999).
> Comparison of remedial and compensatory interventions for adults with acquired brain injuries.
> J Head Trauma Rehabil 14(6): 595-601.

> Restorative training focuses on improving a specific cognitive function, whereas compensatory training focuses on adapting to the presence of a cognitive deficit. Compensatory approaches may have restorative effects at certain times. Some cognitive rehabilitation programs rely on a single strategy (such as computer assisted cognitive training), while others use an integrated or interdisciplinary approach. A single program can target either an isolated cognitive function or multiple functions concurrently. . . . Compensatory devices, such as memory books and electronic paging systems, are used both to improve particular cognitive functions and to compensate for specific deficits. Training to use these devices requires structured, sequenced and repetitive practice.
>
> National Institutes of Health Consensus Development Conference Statement
> Rehabilitation of Persons with TBI. Convened in 1998. Put to press in 1999.

Recommendation 5.3:

Whichever mix of restoration and compensation approaches are used, the therapy needs to be systematic, structured, and repetitive according to the needs of each particular client/patient.

> The training must be progressive and adapted to each training subject. The training schedule must be repetitious and intense.
>
> From the NIH report. Prigatano, G.P. (1998). Cognitive Rehabilitation:
> An impairment oriented approach embedded in a holistic perspective.

The treatment consists of hierarchically organised treatment tasks and provides exercises, which require repetitive use of the impaired cognitive system in a created, progressively more demanding sequence. . . .

Luria theorised that recovery of function can occur through new learned connections established through cognitive retraining exercises specifically targeted at the source of problems for the basic processes that have been disrupted. . . . In the process specific approach to cognitive rehabilitation, practice or drills are simply a means of attacking deficient cognitive capacity; the exercises do not have any inherent value in and of themselves. . . .

The process specific approach is different from general stimulation in that a constellation of related tasks, all of which target the same component of a particular cognitive process, are systematically and repetitively administered. . . .

Repetition is perhaps the hallmark of the process specific approach to cognitive rehabilitation. This orientation is based, in part, on the Lurian concept, which states a direct retraining of cognitive processes can result in a reorganisation of higher level, thought processes. In order to do this, however, multiple trials providing stimulation and activation of the target process are required to achieve neurologic reorganisation. The notion is that the repeated taxing of the same neurological system facilitates and guides the reorganisation of function. Thus the process specific approach requires implementation of repetitive exercises within the planned program that places demands on the patient to perform an impaired skill….

As soon as the patient has mastered a particular exercise or group of exercises, higher-level treatment tasks targeting the same cognitive component need to be available so that the continued stimulation and activation of the objective cognitive processes can occur. The final principle of process specific therapy is a reminder that the ultimate measure of success in therapy lies with improvement in living and work status rather than change on test scores.

Sohlberg, M.A. & Mateer, C.A. Introduction to cognitive rehabilitation and practice. Paper on the net (www.pacelearningrx.com/cognitiverehab.html).

6. The Importance of Integration with other aspects of the Multi-disciplinary team

Recommendation 6.1:

CRT cannot be seen as a "stand alone" therapy, but must form part of the multi-disciplinary approach.

Cognitive Rehabilitation is central to any treatment program designed for the traumatically brain injured individual. Although specific cognitive exercises have their own unique place as training tools, when used in isolation, they are of doubtful value in aiding a traumatically brain injured person to attain true functionality. However, when utilised as part of a comprehensive interdisciplinary program of rehabilitation for TBI, they can be crucial and efficacious components of treatment.

Cognitive Rehabilitation. (1994). Rattock, J. & Ross, B.P. Ch. 21 in Neuropsychiatry of TBI. (Eds.) Silver, J.M., Yudofsky S.C. & Hales, R.E., American Psychiatric Press Inc., Washington, DC.

There are five principles that guide the implementation of the therapies to be discussed below (medical care, physical therapy, speech therapy, occupational therapy, cognitive rehabilitation, psychological counselling, behaviour management, art, and music therapy, therapeutic recreation). They are:

- Implement these various practices as early after the injury as is feasible. Research has shown that doing so enhances eventual outcome.
- Provide the services in an holistic manner.
- Provide services in an interdisciplinary manner.
- Various therapies must focus on both the micro deficits and macro deficits simultaneously. While it is important to remediate specific cognitive problems within a laboratory/treatment setting, it is equally important to focus on the client's functional domain (i.e., daily living activities). Therefore, attempts to remediate a cognitive problem should occur on both 'fronts' simultaneously.
- The design and implementation of the various therapeutic regimens should emanate from a comprehensive, systematic, interdisciplinary evaluation process.

Vogenthaler, D. (1987). An overview of head injury: Its consequences and rehabilitation. Brain Injury 1(1): 113-127.

7. Psychosocial Factors

Recommendation 7.1:

CRT should incorporate work on the patient's awareness and psychosocial skills (e.g., coping, anxiety, mood, self-esteem, self-concept, motivation, locus of control, adjustment).

The neuropsychological rehabilitation of traumatically head-injured people can best be achieved by a holistic and integrated program. Such a program must co-ordinate cognitive remedial interventions with efforts to improve functional skills and interpersonal functions, providing specialised methods of clinical management designed to ameliorate problems stemming from poor compliance, lack of adequate malleability, lack of sufficient awareness and lack of acceptance of one's existential situation.

Ben-Yishay, Y. & Gold, J. (1990). Therapeutic milieu approach to neuropsychological rehabilitation. Ch. 11 in Neurobehavioural sequelae of traumatic brain hope. (Ed.) Wood R.L., Taylor and Francis, London.

Cognitive and affective impairments are related to the achievement of rehabilitation goals during the early stages after TBI and stroke.

Prigatano GP & Wong JL. (1999). Cognitive and affective improvement in brain dysfunctional patients who achieve inpatient rehabilitation goals. Arch Phys Med Rehabil 80: 77-84.

'When emotional and motivational disturbances become the focus of rehabilitation as well as cognitive impairments, improved psychosocial outcomes have been reported.' He then describes three aspects of this: patients' overall energy to sustain mental effort on cognitive tasks, insight/self-awareness, speed of information processing. He states that all three of these are very important to remediate following TBI. . . .

When the direct retraining of an underlying cognitive impairment is attempted, it should be recalled that both cognitive and affective functions are intimately interconnected. Consequently they must be addressed simultaneously to maximise their usefulness for the patient. . . .

Training must help patients to adjust to whatever permanent disabilities they have sustained and provide them with appropriate methods for doing so from both cognitive and psychotherapeutic perspectives.

From the NIH report. Prigatano, G.P. (1998). Cognitive Rehabilitation: An impairment oriented approach embedded in a holistic perspective.

Description is provided of the holistic model of treatment that addresses cognitive, social, emotional and functional aspects of brain injury together: 'Clinically the holistic model makes sense and despite its apparent expense, in the long term it is probably cost effective.'

Wilson, B. (2002). Towards a comprehensive model of cognitive rehabilitation. Neuropsychological Rehabilitation 12(2): 97-110.

The term cognitive rehabilitation covers any intervention strategy or technique that enables patients and their families to come to terms with, manage or to reduce acquired cognitive deficits.

Rehabilitation after TBI. (1998).
British Society Rehabilitation Medicine (BSRM) Working Party Report.

Sohlberg and Mateer (2001) suggest that the term 'cognitive rehabilitation is too narrow and it is better to talk about rehabilitation of individuals with cognitive impairments.' Wilson agrees that 'this seems a sensible suggestion as it implies that people with cognitive impairment may have additional problems that should also be addressed in rehabilitation programmes'.

Wilson, B. (2002). Towards a comprehensive model of cognitive rehabilitation.
Neuropsychological Rehabilitation 12(2): 97-110.

8. Functionally Oriented

Recommendation 8.1:

CRT treatment goals are tailored to enhance the individual's ability to function as independently as possible in the least restrictive setting. The end result of CRT must be to improve quality of life and real life skills.

Treatment aims shall be directed towards enhancing the overall outcome. All CRT endeavors shall be tailored to enhance the functional abilities of the client to promote the client's ability to live as independently as possible in the least restrictive environment. Treatment goals are directed towards maximizing independence in skills needed for daily life and the ability to enjoy life.

Ideally, all rehabilitative efforts aim towards returning the individual with TBI to the community. For some, this means return to work and family responsibilities. For others, this means living in the community with needed services and supports.

All CRT treatment is directed towards maximizing the level of independence through helping the individual maximize their remaining cognitive skills, along with the use of cognitive compensatory strategies and practical application of daily living skills using these strategies.

> Wilson stresses the need for CRT to focus on functional competence as the end point.
>
> Wilson, B. (2002). Towards a comprehensive model of cognitive rehabilitation. Neuropsychological Rehabilitation 12(2): 97-110.

> CRT is: 'The systematic use of instruction and structured experience to manipulate the functioning of cognitive systems such as to improve the *quality or quantity of* cognitive processing in a particular domain. Cognitive rehabilitation is, therefore, a specialised component of more general rehabilitation, the aim of which is the maximisation of the functional independence and adjustment of the brain-damaged individual.
>
> Robertson, I. (1999). Setting goals for cognitive rehabilitation. Current Opinion in Neurology 12, 703-708.

> CRT is 'the therapeutic process of increasing or improving an individual's capacity to process and use incoming information so as to allow increased functioning in everyday life.'
>
> Sohlberg, M.M. & Mateer, C.A. Introduction to cognitive rehabilitation and practice. Paper on the net (www.pacelearningrx.com/cognitiverehab.html).

The final principle of process specific (cognitive rehabilitation) therapy is a reminder that the ultimate measure of success in therapy lies with improvement in living and work status rather than change on test scores.

Sohlberg, M.M. & Mateer, C.A. Introduction to cognitive rehabilitation and practice. Paper on the net (www.pacelearningrx.com/cognitiverehab.html).

In short cognitive rehabilitation should focus on real life functional problems, it should address associated problems such as mood or behavioural problems in addition to the cognitive difficulties and it should involve the person with brain injury, relatives and others in the planning and implementation of cognitive rehabilitation. Within the discussion on what to focus of trauma makes the point that the end point is functional improvements.

Wilson, B. (2002). Towards a comprehensive model of cognitive rehabilitation. Neuropsych Brain Rehabilitation 12(2): 97-110.

Recommendation 8.2:

Each functional task needs to be analyzed in terms of its constituent functions, and those functions that are impaired need to be compensated for in order to make possible the normal performance of that functional task.

Recommendation 8.3:

The therapist must make explicit to the brain-injured person how these impairment-based goals link with functional competence.

Recommendation 8.4:

Opportunities to practice in real life settings should be provided as part of this process in order to develop generalization and transfer of learning.

9. Models

Recommendation 9.1:

CRT cannot be informed by a single model (such as cognitive neuroscience), but needs to incorporate models from diverse areas of human function.

'Rehabilitation is one of many fields that needs a broad theoretical base incorporating frameworks, theories and models from a number of different areas'. Gianutsos (1989) stated, 'Cognitive rehabilitation came of mixed parentage including neuropsychology, occupational therapy, speech and language therapy and special education.' McMillan and Greenwood (1993) stated, 'These authors understood that cognitive rehabilitation should not be confined by one theoretical framework or model.' A description is given of the holistic model of treatment that addresses cognitive, social, emotional and functional aspects of brain injury together: 'Clinically the holistic model makes sense and despite its apparent expense, in the long term it is probably cost effective'. A diagramatic provisional model of CRT is proposed to encompass the variety of aspects that need to be considered when undertaking CRT.

Wilson, B. (2002). Towards a comprehensive model of cognitive rehabilitation. Neuropsychological Rehabilitation 12(2): 97-110.

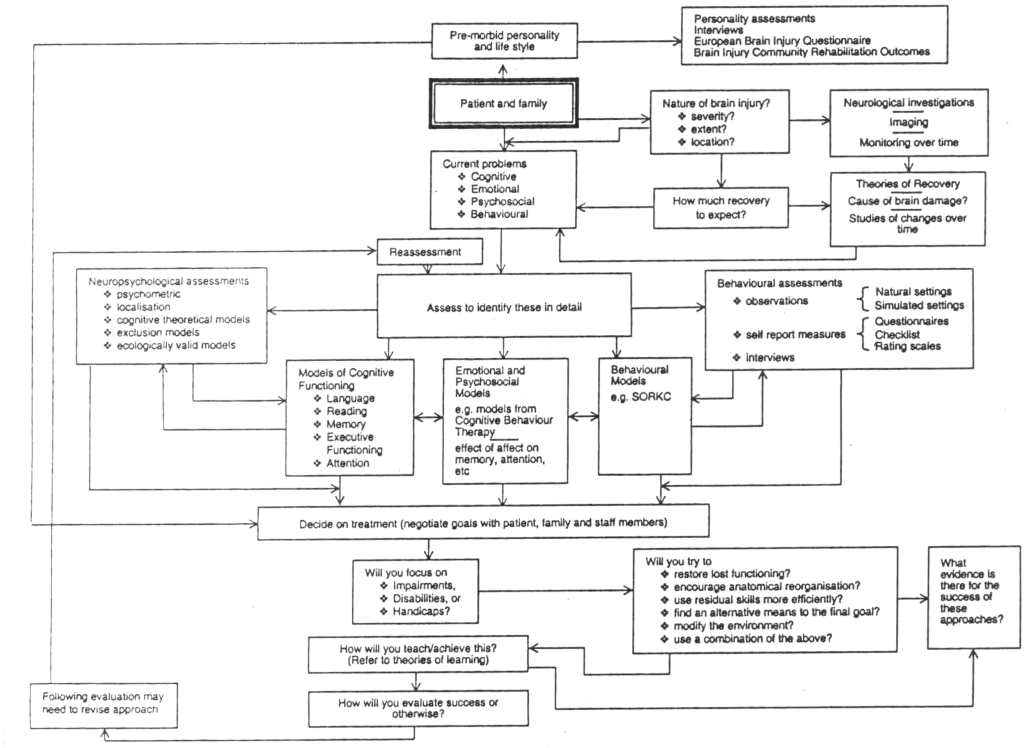
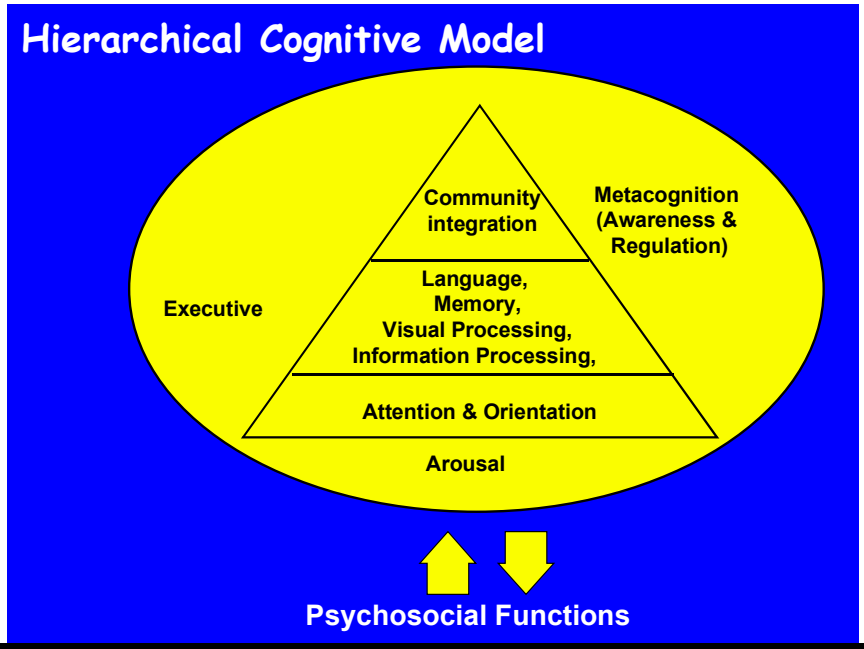


Figure 1. A provisional model of cognitive rehabilitation.

Barbara Wilson's (2002) provisional model of cognitive rehabilitation.

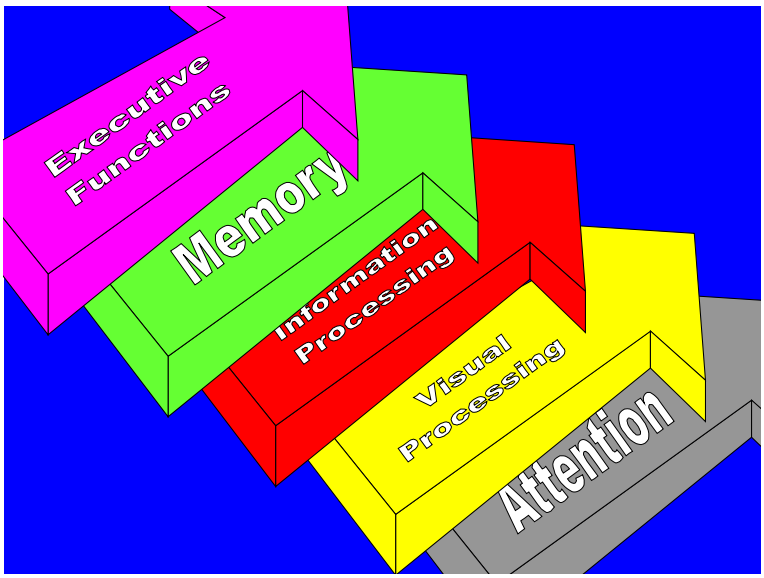
Recommendation 9.2:

Cognitive skills should be considered as a hierarchy.



Recommendation 9.3:

The following five cognitive skill areas should be comprehensively assessed and, wherever necessary, treated.



Attention skills include the following aspects: Sustained, Selective, Alternating, and Divided.

Visual Processing skills include the following aspects: Acuity, Oculomotor Control, Fields, Visual Attention, Scanning, Pattern Recognition, Visual Memory, and Visual Cognition or Perception.

Information Processing skills include the following aspects: Auditory and other Sensory Processing skills, Organisational Skills, Speed, and Capacity of Processing.

Memory Skills include the following aspects: Orientation, Episodic, Prospective, Encoding, Storage, Consolidation, and Recall.

Executive Skills include the following aspects: Self-Awareness, Goal Setting, Self-Initiation, Self-Inhibition, Planning and Organization, Self-Monitoring, Self-Evaluation, Flexible Problem Solving, and Metacognition.

Recommendation 9.4:

Attention skills should be seen as the underlying foundation of all other cognitive skills. Assessment and treatment should always begin at this level if problems are evident.

Recommendation 9.5:

It is essential to work on executive skills and awareness at all stages of cognitive development.

Recommendation 9.6:

It is important to determine whether the commonly reported memory difficulties are dependent upon attention or information processing failures, i.e. secondary manifestations of impulsivity, attention deficits, and information processing failures or the result of interactions among these three functions.

There are four approaches to successful cognitive rehabilitation (Malia & Brannagan, 2000):

1. Education
2. Process Training
3. Strategy development and implementation
4. Functional Application

Recommendation 9.7:

The four approaches to CRT should be used concurrently with all patients but the relative balance between them will alter according to the presenting neurological condition (e.g., tumors may not benefit from process training), stage post-injury, awareness level of the patient, and time constraints of the staff.

10. Education

Recommendation 10.1:

All individuals with brain injury should receive education appropriate to their abilities and needs. In an inpatient center, this is usually best done through a formal education group. In settings or circumstances that preclude this, the therapist should ensure that the individual receives appropriate education at sufficient intensity and with adequate repetition to ensure learning. The following recommendations do not necessarily apply if it is not possible or appropriate to run an education group.

Recommendation 10.2:

Wherever possible, all individuals with brain injury should attend an education group at least once, so long as their language skills, attention skills and awareness levels permit.

Recommendation 10.3:

The decision to include in or exclude from an education group should be made by mutual consent of the whole team at the treatment planning or multidisciplinary team meeting, wherever this is possible.

Recommendation 10.4:

Education should take place in a formal education group and in individual sessions. It should be seen as an ongoing process rather than only occurring on one occasion

Recommendation 10.5:

The education group should take place regularly. In institutions it is often helpful to run this for one hour each day until the content has been covered (see recommendation 10.8).

Recommendation 10.6:

The education group should be conducted by therapists with training/expertise in running therapeutic groups. It is recommended that two therapists should be involved in the group.

Recommendation 10.7:

There should be a minimum of 3 and a maximum of 7 patients in any group.

Recommendation 10.8:

Education should cover the following areas:

- Neuroanatomy, understanding the own brain injury and what rehabilitation is all about.
- Cognitive problems following brain injury.
- Emotional problems following brain injury, how to cope with the changes one experiences and developing a new sense of self.

Recommendation 10.9:

Generally, the brain-injured person should be fully apprised of his or her cognitive problems, the fact that he or she has had a brain injury and the likely prognosis for the individual cognitively, at the earliest stage possible. If this is not done, there should be a clear and compelling reason.

This will often be started during the assessment phase, but will certainly be completed immediately after assessment. This aspect of education is considered to be an ongoing process which aims to help the patient to develop appropriate self-awareness, heighten self-esteem, develop confidence, develop feelings of personal control, and develop a trusting, working relationship with the therapist.

The importance of education cannot be overemphasized. Without good awareness much of what is subsequently offered will have no lasting effects on the brain-injured person's life once he or she leaves the rehabilitation environment. Education should continue as long as is necessary; in some cases, this may mean years.

Recommendation 10.10:

A range of appropriate materials should be available for the brain-injured person, including books, CD-ROMs, Internet access, and relevant articles, along with the education group notes.

11. Process Training

The purpose of process training is essentially to stimulate poorly functioning neurological pathways in the brain in order to maximize their efficiency and effectiveness. This will sometimes mean using new undamaged pathways (redundant representations) and, sometimes, old partially damaged pathways. Process training therefore aims to overcome the damage.

Process training is not general stimulation or drill training, although this may have some benefits they are not specific and may not generalize to real life. Process training relies on two components:

- Good comprehensive assessment
- Analysis of the results according to a practical cognitive model

The analysis should always ask, “Why is that problem occurring?” until an impaired component skill or cluster of skills is revealed. A task, or preferably a series of tasks, is then designed to develop and improve the impaired skills. If this approach is successful, then any real life skills that rely on that underlying impaired skill should improve as it improves.

The analysis should essentially result in the generation of a hypothesis, which is then tested with appropriate training materials. Formal reassessment helps to determine the accuracy of the hypothesis.

Recommendation 11.1:

Process training should be used with the majority of people with brain injury to work on the hypothesized underlying impairments, at the same time as working on functional goals.

Recommendation 11.2:

Process-training approaches must rely on the results of a comprehensive assessment that seeks to help the therapist analyze the underlying causes of functional breakdowns.

Recommendation 11.3:

Process-training exercises should be extensive. A wide range of exercises should be available to target particular impairments. In order to avoid mere training on a task, Individual process training exercises should not usually be repeated an excessive number of times. It is better to work towards generalization of the skill by

using multiple exercises, each targeting the impairment in slightly different ways.

Recommendation 11.4:

Process training exercises should be arranged systematically in a structured program that will help lead the person with brain injury towards accomplishment of a range of functional skills or behaviors.

Recommendation 11.5:

Regular reassessment should be completed to ensure that the person with brain injury is moving towards his or her functional goals. The results of this should determine the direction and progress through the process training exercises.

Experience shows that the use of process training materials that have been designed on the basis of neuropsychological theories, and arranged into a structured program format, usually lead to good gains in the majority of patients (Malia et al., 1993, 1995, 1995, 1995, 1996, 1998; Bewick et al., 1995; Raymond et al., 1996, 1996, 1999; Bennett et al., 1998; Fuii et al., 2001).

The reasons for progress on these process-training exercises are complex, but the relationship between the following factors is thought to play a major role in the success:

1. The development of awareness through the exercises.
2. The structured programmed approach to the materials.
3. Daily concrete feedback and concrete goals.
4. The relatively short time frames to complete blocks of work.
5. The development of patient self-confidence.
6. The development of patients' feelings of being in control.
7. The massed practice available via homework exercises.
8. Activation of neurological pathways through appropriately targeted repetitive cognitive exercises.
9. The development and utilization of compensatory strategies to improve performance.
10. Process training is a neutral activity and most patients do not feel threatened by it; this enables them to accept constructive feedback more readily.
11. The activities are easily quantifiable and scoreable.
12. Results can be easily graphed to demonstrate improvement and this, in turn, leads to improved motivation and self-esteem.

Recommendation 11.6:

Process-training exercises should incorporate a strong emphasis on developing self-awareness of problems and their implications for the future. This can be achieved via self-prediction and self-rating scales, as well as daily feedback.

Recommendation 11.7:

SMART goals should be written for each process training exercise.

Recommendation 11.8:

Ideally, blocks of process-training exercises should be completed intensively over relatively short time periods, interspersed with reassessment, feedback with the person with brain injury, and reevaluation of the next step.

Recommendation 11.9:

Intensive work can be enhanced with the aid of process training exercises being given for homework sessions, whenever this is possible.

Recommendation 11.10:

Each process training exercise should be scored as soon after completion as possible. The score should be compared with previous scores on the same exercise and related to self-predicted and self-rated scores. In many cases, it is a good idea to present this information in a graphical format. The score should also be related to the criterion for success specified in the SMART goal.

Recommendation 11.11:

Process training should be used in conjunction with strategy training; the process training exercises can be used to show the person with brain injury how well the implementation of a strategy improves his or her performance. This, in turn, should be related to the functional activities training.

12. Strategies

It is not always possible to utilize new neurological pathways in the brain to overcome the problems, so strategies can then be taught to compensate for the remaining difficulties. Strategies can be divided into two types: external and internal. External strategies consist of those things that are external to the person, such as alarms, notebooks, notes, and calendars. Internal strategies are those mnemonics that cannot be observed by anyone else, such as visualizations and word associations (Malia & Brannagan, 1997).

Internal strategies require greater cognitive capacity than external strategies because the strategy has to be remembered at the very time when the person is beginning to struggle with a task, i.e., when he or she is becoming overloaded (Malia & Brannagan, 2004).

The independent use of strategies is entirely dependent upon the level of awareness that the person with brain injury has. If the individual has no awareness, then he or she will not perceive the need to implement a strategy, even when he or she beings to fail on a task. This level of awareness problem therefore necessitates the use of environmental modification and/or strategies implemented by other people. If the brain-injured person has good awareness, he or she can reasonably be expected to implement taught strategies independently (Malia & Brannagan, 2004).

Recommendation 12.1:

Strategy training should be used with the majority of people with brain injury to minimize the problems they are experiencing.

Recommendation 12.2:

The person with brain injury should be advised that he or she may always need to use the taught strategies, which will involve learning a new way of operating.

Recommendation 12.3:

External strategies are easier to apply than internal strategies. They should therefore be the strategies that are taught first.

Recommendation 12.4:

Strategy training should be matched to the level of awareness shown by the person with brain injury. As awareness increases, different strategy training should be incorporated.

Recommendation 12.5:

The value of strategies can be taught very quickly on the process training exercises. Process training and strategy training should therefore be incorporated simultaneously in the majority of rehabilitation programs for individuals.

13. Functional Activities Training

Recommendation 13.1:

All cognitive rehabilitation tasks should focus on improving real life functioning.

Recommendation 13.2:

Functional activities should be used in two distinct ways:

- As a vehicle within which to treat the cognitive skill deficits
- To train the person to complete the particular functional task

Goals should be written for each of these approaches.

Recommendation 13.3:

Functional goals should be selected in close consultation with the person with brain injury. They should be goals that are valuable and important to the person with brain injury, rather than to the therapist.

Recommendation 13.4:

Functional activities should be broken down into their component parts and these should be related to the process training and strategy training components of the rehabilitation program in each case.

14. Awareness

Recommendation 14.1:

Awareness should be considered to be the key to successful rehabilitation. A great deal of the rehabilitation work should aim at developing appropriate awareness of cognitive skills and how these are important in the direction the person with brain injury will take in the future.

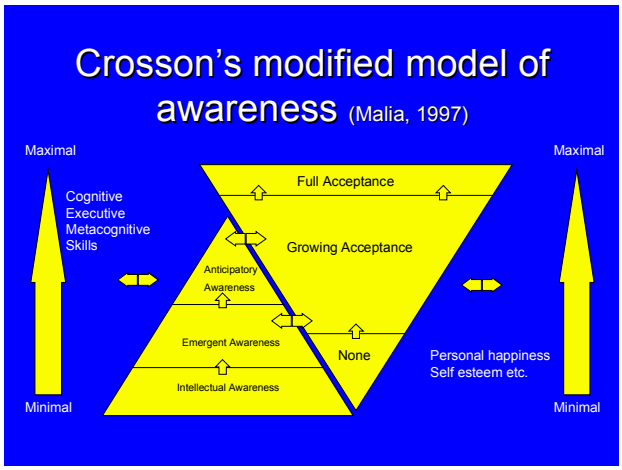
Recommendation 14.2:

The development of appropriate awareness should be directly worked on, rather than left to chance.

> Patients' lack of awareness regarding the existence or severity of deficits after brain injury represents a particular area of significance and is often a central concern for neuropsychological interventions. . . .
>
> Clinically the findings suggest that for patients unable to engage in treatment due to their unawareness of deficits, priority needs to address the patient's awareness deficits and resistance in therapy. One of the most common and costly errors of treatment may be the failure to confront the patient's unawareness. . . .
>
> Therapist actions that can facilitate collaboration need to be considered in neuropsychological remediation; schema like Crosson and coworkers (1989) distinction among types of awareness deficits represent a valuable start in this direction.
>
> Cicerone, K.D. & Tupper, D.E. (1991). Neuropsychological rehabilitation treatment of errors in everyday functioning. Ch. 11 in (Eds.) Tupper, D.E. & Cicerone, K.D., The neuropsychology of everyday life: Issues in development and rehabilitation. Academic Publ., Kluwer, Boston.

Recommendation 14.3:

All staff members should be trained to understand awareness, how it links to cognitive skills and what can be done to enhance it. A model should be used to guide this process.



Intellectual awareness has been achieved when the person is able to demonstrate that he or she knows what his or her problems are and what they have in common, i.e., "I keep forgetting things people say to me and this is because I have had a brain injury." This can be documented through self-rating charts and assessments.

Emergent awareness has been achieved when the person is able to demonstrate that he or she knows a problem is happening as it is occurring without prompting, i.e., on line awareness of a problem. This can only be documented through observation of his or her behavior.

Anticipatory awareness has been achieved when the person is able to predict or anticipate the situations in which his or her problems are likely to occur. This only can be documented through observation of the person's behavior. It is only at this stage that the person will be able to implement compensatory strategies for cognitive deficits unaided. Thus, the development of awareness levels needs to be taken into account when setting goals and making prognoses about rehabilitation efforts.

Crosson, B. et al. (1989). Awareness and compensation in post acute head injury rehabilitation. Journal of Head Trauma Rehabilitation 4, 46-54.

Recommendation 14.4:

Education, process training, and strategy training approaches should all be matched to the level of awareness.

Recommendation 14.5:

Level of awareness of cognitive weaknesses and strengths should be explicitly documented in the treatment plan. CRT therapists should encourage other team members to do this as well for each domain of function, e.g., physical, executive, emotional, communication, and ADLs.

Recommendation 14.6:

The importance of awareness, why it is often compromised following brain injury, and what will be done to try to improve it, should all be explained to the person with brain injury as part of his or her educational program.

Even when the person with brain injury achieves anticipatory awareness in the rehabilitation environment, he or she may still believe he or she will wake up one day and everything will be fine. This is quite common. Thus, the second part of the model deals with the **level of acceptance** of one's problems. This forms part of the journey towards a 'new sense of self,' which is at the core of every rehabilitation program (Ben-Yishay & Daniels-Zide, 2000).

Recommendation 14.7:

The importance of developing a new sense of self should be emphasized to every person with brain injury.

15. Reporting

Recommendation 15.1:

Assessment should result in the production of a document that clearly lists each of the problems, including the level of severity, and an analysis of the underlying causes of the difficulties. This same document should include the predicted length of treatment, the goals to be achieved by discharge and the short-term objectives to achieve these. This document forms the basis of the treatment plan.

Recommendation 15.2:

Treatment plans should be provided for the person with the brain injury, (unless he or she is unable to benefit from it due to severity of cognitive impairment), any caregivers or family members, and all relevant staff members.

Recommendation 15.3:

The treatment plan should not be finalized until the person with brain injury indicates that he or she has understood and agrees to the content. This may involve some negotiation and/or education.

Recommendation 15.4:

The treatment plan should be written in a manner that is easily comprehended by the person with brain injury.

Recommendation 15.5:

Progress notes should be maintained regularly in order to document any major events which take place during therapy.

Recommendation 15.6:

The treatment plan is the guide that should be followed in designing the treatment. If new issues arise, or progress is better or worse than predicted, then this needs to be annotated on a revised treatment plan.

Recommendation 15.7:

Progress on the treatment plan should be reviewed regularly with all team members, including the person with brain injury. It is recommended that this review take place every 2-3 weeks in an institutional setting or after a pre-determined number of sessions in other settings, e.g., after every 10 treatment sessions.

SECTION THREE: THE EVIDENCE BASE FOR CRT

16. Introduction

A common question asked of CRT is “does it work?” This is too simplistic a question. CRT involves multiple facets, and the challenge is to determine when and in what way each of these facets works best.

A huge amount of effort has been, and continues to be, expended on these types of questions, which is only to the credit of this field, since the same quantity and quality of research does not exist for the following aspects of brain injury rehabilitation:

- The value and role of medicine
- The value and role of psychology
- The value of occupational therapy
- The value of physical therapy
- The value of speech and language therapy (outside of
- dysphasia following stroke)

Evidence-based practice is an essential component to gaining greater understanding, but it is not the whole story. The people who undertake evidence-based studies need to have a good understanding of the field, particularly because brain injury rehabilitation is such a complex area (see section 20). This has not always been the case:

> If any methodology is applied without considering the complexities of the phenomena under investigation and other relevant sources of information, inaccurate or incomplete conclusions can easily be made in the name of science. . . . let us not replace careful clinical observation and judgement with statistics and research design and call it ‘good practice.’
>
> Prigatano, G.P. (2000). Letters to the Editor. J of Head Trauma Rehabilitation 15(1): x.

> My comments are offered as someone who worked with Carney et al. to prepare the report, (and I) reviewed much of the research. . . . Many of us would agree that practice should be based on empirical research. . . . the shortcomings (of this review) were exacerbated by the reviewers’ lack of familiarity with the material. I view the evidence-based report on cognitive rehabilitation as substantially flawed.
>
> Kreutzer, J.S. (2000). Letters to the Editor. J Head Trauma Rehabilitation 15(1): x.

The following references illustrate the evidence and expert opinion, as well as point out some of the problems with establishing evidence based practice. It is recommended that the meta-reviews be read in detail to obtain further information.

17. Evidence Base

There is increasing evidence that intervention through retraining or provision of compensatory memory aids can result in improved cognitive functioning.

Wilson (1998). Recovery of functions following non-progressive brain injury. Curr Opin Neurobiol 8(2): 281-7.

Since the mid 1980's the effectiveness of CRT has been repeatedly evaluated and several reviews have documented its efficacy (Butler & Namerow, 1988; Gianutsos, 1991; Glisky & Schacter, 1989; Godfrey & Knight, 1987; Gordon & Hibbard, 1991; Gouvier, 1987; Hayden, 1986; Parente & Anderson-Parente, 1991; Prigatano & Fordyce 1987; Seron & Deloche, 1989; Sohlberg & Mateer, 1989; Wehman et al., 1989; Wood & Fussey, 1990). Each of these reviews attests to the success of one or more methods of CRT.

Parente, R. & Herrmann, D. (1996). Retraining cognition. Aspen, Maryland, p.1.

A review of the literature for CRT in TBI published from January 1988 to August 1998 was conducted by the National Institute for Health Consensus Development Panel. This review included 11 randomised clinical trials. The NIH statement provides 'state of the art information regarding effective rehabilitation measures for persons who have suffered a TBI and presents the conclusions and recommendations of the consensus panel regarding these issues. Although studies are relatively limited, available evidence supports the use of certain cognitive and behavioural strategies for individuals with TBI. . . .

Cognitive exercises, including computer-assisted strategies, have been used to improve specific neuropsychological processes, predominantly attention, and memory and executive skills. Both randomised controlled studies and case reports have documented the success of these interventions using intermediate outcome measures. Certain studies using global outcome measures also support the use of computer assisted exercises in cognitive rehabilitation. Compensatory devices, such as memory books and electronic paging systems, are used both to improve particular cognitive functions and to compensate for specific deficits.

National Institutes of Health Consensus Development Conference Statement Rehabilitation of Persons with TBI. Convened in 1998. Put to press in 1999.

The American Congress of Rehabilitation Medicine (ACRM) conducted a meta-analysis of CRT. Cicerone et al. took 171 articles on cognitive rehabilitation from a referenced set of 655 published articles, assigned them to different categories of cognitive function and to level of evidence (Class I, II or III, see note below). 29 were class I, 35 were class II, and 107 were class III. 20/29 of the Class I studies (69%) support clearly the effectiveness of CRT. 62/64 class I and class II studies combined (97%) showed improved functioning among people receiving CRT.

Cicerone, K.D. et al. (2000). Evidence based cognitive rehabilitation: recommendations for clinical practice. Arch Phys Med Rehabil 81, 1596-1615.

Class I = prospective, randomised controlled and well designed studies
Class II = prospective, non-randomised studies, retrospective, non-randomised case control studies, or clinical series with controls
Class III = studies with no controls, or single case studies

In 1999, a Task Force was set up under the auspices of the European Federation of Neurological Societies with the aim to evaluate the existing evidence for the clinical effectiveness of cognitive rehabilitation and to provide recommendations for practice based on this evidence:

There is enough overall evidence to award a grade A recommendation (based on Randomly Controlled Trial studies) to some forms of cognitive rehabilitation in patients with neuropsychological deficits in the post acute stage after focal brain lesion (stroke, TBI). These include neglect and apraxia rehabilitation after stroke, attention training after TBI . . . and memory rehabilitation with compensatory training in patients with mild amnesia.

Cappa S.F. et al. (2003). EFNS guidelines on cognitive rehabilitation: report of an EFNS task force. European Journal of Neurology 10, 11-23.

The AHCPR panel formulated five questions addressing the effectiveness of early rehabilitation in the acute care setting, intensity of rehabilitation, cognitive rehabilitation, supported employment, and case management. For the question on cognitive rehabilitation, 15 randomised controlled trials and comparative studies that met specified inclusion criteria were placed into evidence tables. They report that there is evidence from two small studies (class I and class III) that a personally adapted electronic device, a notebook and an alarm wristwatch, reduce everyday memory failures for people with TBI. There is evidence from one study (class IIa) that compensatory cognitive rehabilitation reduces anxiety and improves self-concept and relationships for people with TBI. Evidence from two studies (class I and class IIb) supports the use of computer aided cognitive rehabilitation to improve immediate recall on neuropsychological testing, but the clinical importance of this finding has not been validated.

Chestnut, R.M. et al. (1999). Rehabilitation for traumatic brain injury. Summary, Evidence Report/Technology Assessment: Number 2. Agency for Health Care Policy and Research (AHCPR), Rockville, MD.

Rattock et al. studied three types of treatment:

- Cognitive remediation, small group interpersonal communication training, therapeutic community activities and personal counselling
- Similar to mix one, but omitted the cognitive remediation and stressed the small group interpersonal communication training
- Emphasised cognitive remediation and eliminated the small group interpersonal activities.

Results showed that all three mixes produced near and far transfer of remedial training in certain circumscribed areas of cognition, but that systematic cognitive remedial training yielded additional specific carryover cognitive effects. Carry over to everyday life was best done by mix one, although all were effective.

Taken together the findings from this study appear to disprove the arguments of those critics of cognitive remediation who question both its validity and efficacy on the grounds that it can produce no more than practice effects rather than a genuine improvement in cognitive functioning . . . the evidence from this study points to the superiority of the balanced mix of treatments over the other two variations.

Rattock, J.D. et al. (1992). Outcome of different treatment mixes in a multidimensional neuropsychological rehabilitation programme. Neuropsychology 6(4): 395-415.

Palmese and Raskin found that the Attention Process Training program (Sohlberg & Mateer, 1986) improved attention and performance speed in each of the three people studied with mild TBI.

Palmese, C.A. & Raskin, S.A. (2000). The rehabilitation of attention in individuals with mild TBI, using the APTII programme. Brain Injury 14(6): 35-48.

There have been no Cochrane reviews of traumatic brain injury to date—they have all focused exclusively on stroke. These reviews conclude that there is insufficient evidence to support or refute the effectiveness of CRT following stroke. However, these reviews only examine Class I evidence—there are not enough of these studies and many authors advocate the use of well designed Class II and Class III studies to be included, and in many cases state that these are preferable for this patient group (Cope, 1998; Cappa et al., 2003):

The Cochrane Library, Issue 1 concludes that there is some indication that training improves alertness and sustained attention, but no evidence to support or refute the use of cognitive rehabilitation for attention deficits to improve functional independence following stroke.

Lincoln NB, Majid MT & Weyman N (2003).
Cognitive rehabilitation for attention deficits following stroke (Cochrane review).

The Cochrane Library, Issue 1 concludes that there is insufficient evidence to support or refute the effectiveness of cognitive rehabilitation for memory problems after stroke.

MT Majid, Lincoln NB & Weyman N (2003).
Cognitive rehabilitation for memory deficits following stroke (Cochrane review).

18. CRT treatment can help with emotional and psychosocial issues

The present data suggest that structured activities can ameliorate some of the emotional adjustment difficulties, even if years have passed since the injury.

Ruff, R.M. & Niemann, H. (1990). Cognitive rehabilitation versus day treatment in head injured adults: Is there an impact on emotional and psychosocial adjustment? Brain Injury 4(4): 339-347.

Carney et al. looked at 600 potential references; 32 of these were used. Two randomised controlled trials and one observational study provided evidence

that specific forms of CRT reduce memory failures and anxiety, and improve self-concept and interpersonal relationships for persons with TBI.

Carney, N.A. et al. (1999). Effect of cognitive rehabilitation on outcomes for persons with TBI: A systematic review. J Head Trauma Rehabil 14, 277-307.

19. CRT treatment can have a significant effect on brain structures

Of the three cases used in this study, two began their CRT programme at 1 and 2 months post-injury and were both diagnosed as severely injured. All cases demonstrated significant increases in regional cerebral blood flow in the areas of brain damage and adjacent to them. These changes were maintained at follow up done 12-45 months post-injury.

Laatsch, L. et al. (1997). Impact of cognitive rehabilitation therapy on neuropsychological impairments as measured by brain perfusion SPECT. Brain Injury 11(12): 851-863.

20. Determining if CRT works is a complex issue

Rattock and Ross describe their efforts to measure the efficacy of CRT using a rational scientific approach, involving pre- and post-testing on a range of measures including a neuropsychological battery, specific domain measures, functional real life skills, and quality of life. This allowed improvements to be measured both on the specifically treated domain and in terms of generalization to other tasks.

They report that these brave attempts to use this scientific approach have been equivocal due to the following: ‘the neuropsychological batteries currently in use are not sensitive enough to detect small changes in specific cognitive domains; and CRT cannot be provided as the sole intervention due to the emotional and physical difficulties also presented by the patients.’

They report that the proof of efficacy of outcome in CRT lies in the overall improvement of everyday life activities, social life, and work related situations.

Cognitive Rehabilitation. (1994). Rattock, J. & Ross, B.P. Ch. 21 in Neuropsychiatry of TBI. (Eds.) Silver, J.M., Yudofsky, S.C. & Hales, R.E., American Psychiatric Press Inc, Washington, DC.

The NIH consensus conference addressed several questions, including: ‘What are the common therapeutic interventions for the cognitive and behavioural sequelae of TBI? What is their scientific basis and how effective are they?’ The report states that, despite many descriptions of specific strategies, programs or interventions, limited data on the effectiveness of cognitive rehabilitation programs are available due to the following factors: ‘Heterogeneity of subjects, interventions and outcomes studied . . . the studies have also been limited by small sample size, failure to control for spontaneous recovery, and the unspecified effects of social contact. . . . It is

important to recognise that a great deal of the scientific evidence to support the use of these approaches derives from relatively limited studies that should be replicated in larger, more definitive clinical trials.

National Institutes of Health Consensus Development Conference Statement Rehabilitation of Persons with TBI. Convened in 1998. Put to press in 1999.

These problems of proof of efficacy are not peculiar to CRT, but apply to all rehabilitation studies. Studies of efficacy remain hampered by myriad methodological problems and a lack of long term health outcome results:

One major shortcoming in the area of TBI rehabilitation is the inability to compare studies. This arises because of insufficient description of study cohorts, lack of any uniformity in choices of outcome measures, and inadequate characterisation of rehabilitative interventions. Not only are most studies not comparable with each other, but most individual investigations would be extremely difficult to replicate with any probability of reproducing similar results.

This in the context of rehabilitation studies from TBI generally—not just for CRT.

From the NIH report. Chestnut, R.M. et al. (1998) Agency for health care policy and research. Evidence based practice report.

Readers may be interested to know that in all the recent evidence based medicine initiatives concerning neurotrauma and neurorehabilitation, the outcome has been essentially the same—few of the treatments investigated are adequately supported by scientific evidence. In a recent review of neurosurgical strategies for management of acute severe head injury, only three of fourteen commonly used procedures met evidence based medicine criteria for effectiveness associated with a high degree of clinical certainty.

Giacino, J.T. (2000). Letters to the Editors. J Head Trauma Rehabilitation 15(1): ix.

This level of evidence (21%) in such an invasive and potentially damaging area of medicine (neurosurgery) falls far short of the evidence base reported for the efficacy of CRT (67-97%, Cicerone et al. 2000)!

There are problems with studying efficacy that include the following:

- Partitioning out the effects of spontaneous recovery from the treatment effect
- The effects of concurrent treatments, i.e., language therapy and physiotherapy, which may assist with emotional adjustment, which then can interact with the cognitive gains
- The standardised treatment usually required for experimental research reduces the opportunity to tailor the treatment to the needs of the individual.

From the NIH report. Ruff, R.M. (1998). Cognitive Rehabilitation: Research Approaches.

- CRT is rarely offered in isolation
- CRT cannot be easily studied in a 'blind' or 'double blind' experimental design
- It is difficult to maintain experimental control for the length of time one would expect to be required for meaningful change of brain function
- CRT is not just about restoration; rehabilitation includes compensation and environmental re-design—which are patently helpful, e.g., giving a patient a talking watch (modified to prevent resetting), which keeps a cortically blind stroke survivor from waking his wife all night to find out if it is time to get up

Rosamond Gianutsos (2005). Personal Communication.

One approach, which is responsive to all of these issues, is the single-case experimental design strategy. This approach is considered to be highly applicable to the problems facing researchers in this field.

21. CRT has face validity

> Clinical evidence is now categorised as class I, II, or III. The premium evidence is from class I studies based on the randomised controlled trial. These studies are challenging to design, are expensive, and have the potential for creating ethical dilemmas. . . .
>
> When class I evidence is not available, all remaining treatments are likely to be labelled as experimental. The conference should remain aware that some ABI rehab management has face validity. Development of consensus statements, including standards and guidelines for ABI rehab, must therefore rely on class II and class III, as well as class I, evidence. Conclusions must, in the end, be based largely on these levels of evidence, including expert opinion, because of the limitations and lack of objective class I data.
>
> From the NIH report. Cope, N.D. (1998).
>
> While many clinicians have been pessimistic, saying that treating these cognitive and related personality disturbances is futile, it has been our experience that intensive rehabilitative efforts can substantially help many individuals.
>
> > Prigatano, G.P. & Fordyce, D.J. (1986). Cognitive dysfunction and psychosocial adjustment after brain injury. Ch 1 in Neuropsychological rehabilitation after brain injury (Eds.) Prigatano, G.P. et al., Johns Hopkins University Press, Baltimore, MD.
>
> Useless therapies whither on the vine, or continue without building consensus support. There is a consensus of support for CRT—as demonstrated by near universal inclusion in ABI rehabilitation programs.
>
> Rosamond Gianutsos (2005). Personal Communication.

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