External cognitive compensatory strategies may be effective in improving functional independence (ADL’s and IADL’s) in young adults with acquired/traumatic brain injury.

Prepared By: Donna Barrett, MSc (OT) candidate, Queen's University
Date: February 22, 2005 (planned review date February 2007)

CLINICAL SCENARIO:
In developing O.T. cognitive programs for individuals with acquired brain injury, insurance companies require the completion of a cost projection of such services, prior to approving them. These cognitive programs are primarily made up of the use of external cognitive compensatory strategies (paper/pencil or electronic planners, digital voice recorders, verbal cueing etc.). These treatment plans are often very costly and long term/intensive and include the use of a rehab assistant to deliver parts of the training. It is important to be able to justify to funders the effectiveness of such cognitive programs in order to obtain services for these clients.

CLINICAL QUESTION:
Are external cognitive compensatory strategies effective in improving functional independence (ADL’s and IADL’s) in young adults with acquired/traumatic brain injury?

SUMMARY of Search, “Best Evidence” appraised and Key Findings:
- One systematic review (1999) was found
- One review article (2000) was located, outlining Practice Standards, Practice Guidelines, and Practice Options based upon a systematic review of the literature.
- Of 18 other articles reviewed, only 3 met the inclusion/exclusion criteria. These included:
  - 2 case studies that support a functional improvement in TBI clients who used external cognitive compensatory strategies;
  - 1 ABA single case experimental design demonstrated the effectiveness of the NeuroPage to improve functional independence and employability.

CLINICAL BOTTOM LINE:
There is weak evidence to demonstrate the effectiveness of external cognitive compensatory strategies impact on functional independence (ADL’s/IADL’s) in young adults with traumatic brain injury. Although practitioners agree that the desired outcome of cognitive rehabilitation is improvement in daily function, many of the commonly used outcome indicators are intermediate measures (lab tests) rather than health outcomes. The question remains do improved scores on lab tests accurately predict whether the patients’ performance with function adequately in the context of real life, where other factors that are not present during lab tests (i.e. distractions etc.) are evident. Future high quality research designs that address functional outcome with this population is required. In the meantime, Carney et al (1999) state that until we have done the necessary work to be able to demonstrate what is operating to produce improvement, we are bound to practice the services and care at our disposal for this population.

Limitation of this CAT: This summary of evidence has been prepared by a single reviewer and has not been externally peer reviewed.

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SEARCH STRATEGY:

<table>
<thead>
<tr>
<th>Databases and sites searched</th>
<th>Search Terms</th>
<th>Limits used</th>
</tr>
</thead>
</table>
| Cochrane Database of Systematic Reviews/DARE | Brain injury  
Cognitive rehabilitation                                           | • N/A       |
| MEDLINE                      | Brain Injuries exp  
Rehabilitation  
Disability evaluation/or “activities of daily living”/or functional independence.mp | • N/A       |
| CINAHL                       | Brain Injuries  
Rehabilitation, Cognitive  
Activities of Daily Living  
Functional status/or functional independence.mp/or “Activities of Daily Living” | • N/A       |
| AMED                         | Brain Injuries  
Rehabilitation/or cognitive rehabilitation.mp  
Disability evaluation/or Activities of Daily Living/or functional independence.mp | • N/A       |
| EMBASE                       | Head Injury  
Rehabilitation  
Memory  
Functional independence.mp                                           | • N/A       |
| PsycInfo                     | Traumatic Brain Injury  
Cognitive Rehabilitation  
Activities of daily living/or functional independence.mp | • N/A       |
| PubMed                       | Activities of daily living  
Memory  
Brain Injury                                                           | • N/A       |

INCLUSION AND EXCLUSION CRITERIA:

- **Inclusion Criteria:**
  - Adults (≥16 years of age) with acquired brain injury
  - English studies
  - Studies addressing functional independence (at home, school or in the community)
  - Community based intervention (post discharge)
  - Use of external cognitive compensatory strategies ONLY in programming
  - Articles available at Queen’s

- **Exclusion Criteria:**
  - Stroke/CVA
  - Dementia
  - Schizophrenia/Mental Illness
  - Children (<16 years of age)
  - Acute care intervention
  - Programs that included other type of cognitive rehabilitation (other than external cognitive compensatory strategies.

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RESULTS OF SEARCH

The search resulted in 1798 hits. Based on inclusion and exclusion criteria, 5 relevant studies were located and categorized as shown in Table 1 (based on Levels of Evidence, Center for Evidence Based Medicine, 1998).

Table 1: Summary of Study Designs of Articles Critically Appraised

<table>
<thead>
<tr>
<th>Level of Evidence</th>
<th>Study Design/Methodology of Articles Retrieved</th>
<th>Number Located</th>
<th>Sources(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1 a</td>
<td>Review Article: Evidence Based Practice Guidelines</td>
<td>1</td>
<td>Medline (ref 2) CINAHL (ref 2) EMBASE (ref 2) AMED (ref 2)</td>
</tr>
<tr>
<td>Level 1 a</td>
<td>Systematic Review</td>
<td>1</td>
<td>Medline (ref 1) CINAHL (ref 1) EMBASE (ref 1) AMED (ref 1)</td>
</tr>
<tr>
<td>Level 2</td>
<td>Randomized Control Trials</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Level 3</td>
<td>Controlled trials, cohort or case-control analytic studies</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Level 4</td>
<td>Case series: Post test only, pre-test/post-test</td>
<td>3</td>
<td>CINAHL (ref 3, 4) AMED (ref 3) PubMed (ref 3) EMBASE (ref 4,5) PsycInfo (ref 4)</td>
</tr>
<tr>
<td>Level 5</td>
<td>Expert opinion including literature/narrative reviews, consensus statements, descriptive studies and individual case studies</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

BEST EVIDENCE:
The following articles were identified as the “best” evidence and selected for critical appraisal. Reasons for selecting these papers were:

Articles reviewed for this CAT:

   - Chosen because it was published after the systematic review and dealt with functional outcomes and external cognitive compensatory strategies ONLY.

   - Chosen because was not included in the systematic review and dealt with functional outcomes, following the provision of treatment related to external cognitive compensatory strategies.

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   • Chosen because it was included in the systematic review. The observational design was deemed weak however the authors felt it was a “useful study as it generated a hypothesis about an intervention that may have potential to prosthetically improve memory for persons with TBI” (Carney, N. 1999). Study looked at external strategies ONLY.

   • Chosen because it was written after the systematic review and provides practice standards, guidelines and options based upon a thorough and rigorous literature review.

   • Chosen because it is the systematic review, which covers all relevant literature up to 1999 and provides a declarative statement about the existing evidence and need for future research.
SUMMARY OF BEST EVIDENCE:

Table 2: Description and appraisal of: Adults with traumatic brain injury: three case studies of cognitive rehabilitation in the home setting. Schwartz, S. M., 1995.

<table>
<thead>
<tr>
<th>Purpose of Study:</th>
<th>To discuss the use of occupational therapy in the home setting and the individual application of treatment methods.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intervention Investigated:</strong></td>
<td>Treatment methods included:</td>
</tr>
<tr>
<td></td>
<td>(a) saturational cueing with behavioural chaining and positive reinforcement,</td>
</tr>
<tr>
<td></td>
<td>(b) a coordinated team approach incorporating family or significant others and other therapists, and</td>
</tr>
<tr>
<td></td>
<td>(c) environmental adaptations.</td>
</tr>
<tr>
<td></td>
<td>A decision making model and a dynamic assessment approach was used as a framework for treatment planning.</td>
</tr>
<tr>
<td><strong>Subject/Design:</strong></td>
<td>The study design was a case study, where the client’s baseline performance was used as the control.</td>
</tr>
<tr>
<td></td>
<td>Client # 1 was 50 year old married male, who experienced a TBI; data collected at 5, 8, 12 and 16 months post injury</td>
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<tr>
<td></td>
<td>Client # 2 was a 30 year old single male who incurred a TBI in a car accident; data collected at 6, 13, 19 months post injury</td>
</tr>
<tr>
<td></td>
<td>Client # 3 was a 32 year old mother of 2, with hypereosinophilia and chronic asthma, she suffered a seizure and had brain damage subsequent to a 24 hour coma; data collected at 11 and 18 months post injury. In addition, separate data collected after 1, 3, 4, 5, 6, and 12 months of day planner training.</td>
</tr>
<tr>
<td><strong>Outcome Measures (Primary and Secondary)</strong></td>
<td>Client and family report and clinician observation.</td>
</tr>
<tr>
<td><strong>Results</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Client # 1</strong> gained a higher level of independence in transferring, short term memory, giving appropriate social responses, reading large print words; gained total independence with brushing teeth, shaving, managing urinal, upper extremity dressing, initiating social activities (attending YMCA); experienced no change with dressing lower extremity, wheelchair mobility, concrete thinking, word retrieval.</td>
</tr>
<tr>
<td></td>
<td><strong>Client #2</strong> gained a higher level of independence in showering, dressing, memory of weeks activities, length of attention span, initiation of activity and execute routine responds to cues to scan environment, visual spatial skills, flexibility in conversation; gained total independence with shaving, orientation to date and reading 2 step directions (assist to initiate); home health attendant is reduced from 24 hour care to 8 hours of care/day.</td>
</tr>
<tr>
<td></td>
<td><strong>Client # 3</strong> gained a higher level of independence in grocery shopping, meal planning, monitoring food in the fridge, money management, child care, appointments and following through on task completion; gained total independence with short term memory strategies, writing appointments in planner, taking planner with her in community, attending appointments and maintaining a to do list.</td>
</tr>
<tr>
<td><strong>Authors' Conclusions</strong></td>
<td>These case studies demonstrate the effectiveness of occupational therapy on performance areas for patients with TBI in the home setting. The contribution the home based O.T. makes in overall cost effectiveness needs to be documented as intervention facilitates independence which can reduce nursing or attendant care costs.</td>
</tr>
</tbody>
</table>

**Level of Evidence: 4**

**Critical Appraisal**

**Validity (Methodology, rigor, selection, bias)**
The case study design is subject to issues of internal validity such as history, maturation, subject selection and in this case, the lack of objective outcome measures. The external validity or the ability to generalize the results to the whole population is compromised due to interaction of selection of subjects and treatment. This study does not describe how subjects were selected. In addition, external validity threats include reactive effects of experimental arrangements, multiple interactions, as subject 1 had the intervention of a psychologist part way through the treatment, and inadequate selection of outcome measure used to test the treatment.

**Importance of Results**
The results are favorable, and the treatment is realistic in terms of changing over time to meet and adjust to client needs. However in this study design, only 3 cases were used, impacting the clinical significance. The treatment effect varied from client to client. The case study design is meant to establish some effectiveness and to prompt further research in the field. This article accomplishes this goal.

**Implications for Practice/Applicability**
The results cannot be generalized to the whole population due to the study design. The outcome demonstrates weak, descriptive evidence to answer the clinical question in this CAT.


**Purpose:**
The purpose of this study was to show the success when the strengths of a process-specific functional treatment approach were used in a therapy program for an adult patient with mild traumatic brain injury.

**Intervention:**
- Identification of the daily activities that the client was unable to perform and the cognitive deficits that were attributable to those tasks (i.e. distractibility).
- Treatment then focused on teaching compensatory strategies for the cognitive deficits and applying them during the practice of each functional task. Examples include the use of cue cards, timers, checklists, etc.
- Treatment occurred over a 4-month period. Treatment began 1-year post injury and occurred in the home.
- Frequency of therapy sessions was not stated, although inferred to be weekly.
- This intervention could easily be replicated with modifications to individual client needs.

**Subjects/Design:**
The case study design is intended to explore a treatment/intervention when there is little knowledge. It is a descriptive study and no control group exists.

**Outcome Measures:**
- Client and spouse report via the use of a checklist, indicating successful completion of each activity and whether the activities were completed within the estimated time frames.
- Measurements were taken at baseline, 4 months (end of treatment) and 1 year follow up.

**Results:**
- Not reported in terms of statistical significance.
- Client at the end of treatment reported independence with all activities originally targeted in the home and community and at 1 year post treatment, reported that he maintained that level of independence and occasionally no longer needed the external cues.
- In addition, the client stated that he had been able to generalize the strategies to other activities not addressed in rehab, including his previous job.

**Conclusions:**
Developing compensatory strategies for cognitive deficits within the context of real life tasks that are unique to each patient enables the patient to learn their new strategies within familiar home and work environments. This increases the number of opportunities a patient has in practicing their new skills and eliminates the uncertainty of how cognitive processes generalize from abstract to real life tasks.

**Level of Evidence: 4**

**Critical Appraisal**

**Validity**
This study is a descriptive case study and as such leaves itself vulnerable to issues of validity including: history, maturation and selection of the subject. In addition, the external validity or the ability to generalize the results to the whole population (mild-severe ABI) is compromised due to possible interaction of selection and treatment, reactive effects of the experimental arrangements, inadequate independent variables, and the Hawthorne and Rosenthal effects. This design is subject to some bias particularly in light of the sample size (n=1). Intervention biases may have been present as the article states that the client received psychiatric counseling to address anxiety and depression while undergoing 4 months of cognitive rehab.

**Importance**
This case study is important in terms of initiating research in this area. Enough evidence is produced to support further research and to improve the level of evidence by use of an alternative study design. The benefits outlined in this article warrant further investigation and costs that may be involved. The clinical importance of the results was discussed and is relevant given the lack of research with regards to functional outcomes in cognitive rehabilitation.

**Implications for Practice/Applicability**
The results are important and apply to the part of my patient population outlined in the critical appraisal question (young adults). The recommendations however are weak given the study design and may slightly influence me to use caution in clinical decision making regarding the extent that one should continue to implement cognitive rehab programs.

This study addresses the functional outcomes of a cognitive compensatory strategy program with a young adult with TBI and is consistent with my research question and inclusion/exclusion criteria. A review of the literature indicates that plenty of data exists with regards to cognitive programs positively impacting intermediate test scores (lab test scores), but limited evidence is available that those improvements in scores translates into improvement in health or functional outcomes.

Table 4: Description and appraisal of: Evaluation of a NeuroPage: A new memory aid.

Purpose of Study:
To determine the efficacy of the NeuroPage, a portable paging system in individuals with neurologically impaired subjects all who present with significant everyday memory problems due to organic memory impairment or frontal lobe damage.

Intervention Investigated:
The intervention used an external cueing system, the NeuroPage.

- Following a record of memory diary, an average of 3 “problem” areas were identified for treatment.
- Common treatment reminders included: (a) good morning, today is…. (b) take your medication now… (c) fill in your diary… (d) don’t forget to take your (keys/bag/stick/folder etc.) and (e) make your packed lunch.

Subject/Design:
- ABA pre-post test design. Fifteen subjects with organic memory problems 6 months to 13 years post injury.
- Most were living at home with families, one lived alone, one in residential care and one transitioned from acute hospital to living alone after discharge.
- No controls and no blinding techniques were used.
- Baselines were taken on memory failures for 2-6 weeks. Treatment lasted 12 weeks and data was collected during this phase in the same manner as it was at baseline. Post baseline data was collected for 3 weeks, the pager was then removed and recordings were taken to determine whether problems reached their baseline levels or not.

Outcome Measures (Primary and Secondary)
- Rivermead Behavioural Memory test (to establish inclusion criteria; ranging from mildly to severely impaired)
- Memory diary records were used pre and posttest. The memory diary records were used at baseline for 2 weeks prior to the study to identify practical real life problems. Specific problems were selected for treatment. Memory diaries were kept through the course of baseline, treatment and post treatment.
- Everyday memory functions were the measure used to determine outcomes.

Results
- Results varied significantly, however the mean success for the whole group at baseline was 37.08 (SD 24.86) and the mean success in treatment was 85.56 (SD 18.58).
- An odds ratio test showed that all subjects benefited significantly from the device.
- The mean success post treatment was 74.46 (SD 28.23), again performance varied significantly from person to person.

Authors’ Conclusions
The NeuroPage is a very simple to use but highly complex compensatory technique that has the potential to enhance independence and employability, accelerate discharge from acute and rehabilitation services and reduce stress. It is a cost-effective device (an average of $50 US per patient per month), comparing well to drug regimes and salaries for healthcare assistants.

Level of Evidence: 4

Critical Appraisal

Validity
The observational design of this study weakens its value as evidence of effectiveness. The study “generates a hypothesis about an intervention that may have potential to prosthetically improve memory for persons with TBI”. (Carney, 1999). The internal validity is compromised by history, maturation, testing and subject selection. The external validity or how generalizable the results are to the population at large is compromised by the Hawthorne effect, the outcome measures used, interaction of subject selection and treatment.

Importance of Results
The results are important to demonstrate that external cueing devices can be effective. The device also lends itself well to a potential for future randomized control trials, comparing its effectiveness with day planner effectiveness, for example. A limitation of the service includes the fact that clients must be able to read simple, pager size display and respond by pressing a button.

Implications for Practice/Applicability
The client population is the appropriate age range and the client diagnosis includes but is not exclusive to TBI. The evidence is weak, due to study design, but suggests considering using this device for TBI memory problems.
Table 5: Description and appraisal of: Evidence based cognitive rehabilitation:
Recommendations for clinical practice, [Review article]. Cicerone, K. D., Dahlberg, C., Kalmar, K.,

<table>
<thead>
<tr>
<th>Purpose of Study:</th>
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<tbody>
<tr>
<td>“To establish evidence based recommendations for the clinical practice of cognitive rehabilitation, derived from a methodological review of the scientific literature concerning the effectiveness of cognitive rehabilitation for persons with TBI or stroke.” (Cicerone, 2000).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Design:</th>
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<tbody>
<tr>
<td>Clinical Practice Guideline</td>
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<tr>
<th>Subject/Methods:</th>
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<tr>
<td>MedLine search using key words: attention, awareness, cognition, communication, executive, language, memory, perception, problem solving, reasoning, rehabilitation, remediation and training. Reference lists from articles were also reviewed. A total of 655 articles were compiled. Exclusion criteria included: theoretical, descriptive or review papers; papers without adequate specification of interventions; subjects other than TBI or stroke; pediatric subjects; pharmacologic interventions; and non-English papers, leaving 232 articles for review. Further exclusion of single case reports without data, subjects other than TBI and stroke and nontreatment studies. End results 171 articles for evaluation. All articles were reviewed by 2 committee members and each were classified according to their strength of their methods. Class I included prospective, RCT. Class II included prospective cohort studies, retrospective case control studies, or clinical series with well designed controls. Class III included clinical series without concurrent controls or studies with appropriate single subject methodology.</td>
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<tr>
<th>Outcome Measures (Primary and Secondary)</th>
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<tr>
<td>Articles were assigned to 1 of 7 categories according to their primary area of intervention: attention, visual perception, constructional abilities, language and communication, memory, problem solving and executive functioning, multimodal interventions and comprehensive holistic cognitive rehabilitation.</td>
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</table>

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<tr>
<th>Results</th>
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<tbody>
<tr>
<td>Of the 171 articles, 29 were rated as Class I, 35 as Class II, and 107 as Class III. Three types of recommendations were made based upon the information. Practice Standards: based on at least one well designed Class I study with adequate sample, or overwhelming Class II evidence that directly addresses the effectiveness of the treatment in question, providing good evidence to support a recommendation as to whether the treatment be specifically considered for persons with TBI. Practice Guidelines: based upon well designed Class II studies with adequate samples, that directly addresses the effectiveness of the treatment in question, providing fair evidence to support a recommendation as to whether treatment be specifically considered for persons with TBI. Practice Options: based upon Class II or III studies with additional grounds to support a recommendation as to whether the treatment be specifically considered for persons with TBI, but with unclear clinical certainty.</td>
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<tr>
<th>Authors’ Conclusions Relevant to TBI:</th>
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<tbody>
<tr>
<td>Practice Standards: Compensatory memory strategy training is recommended for persons with mild TBI; Practice Guidelines: training in formal problem solving strategies and their application to everyday situation and functional activities is recommended post-acute rehab for TBI; Practice Options: use of memory notebooks or other external aids to facilitate the acquisition of specific skills and knowledge may be considered for persons with moderate to severe memory impairments after TBI and should directly apply to functional activities, rather than as an attempt to improve memory function per se.</td>
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<tr>
<th>Level of Evidence: 1</th>
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Critical Appraisal

<table>
<thead>
<tr>
<th>Validity</th>
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<tbody>
<tr>
<td>This study reviewed a large volume of articles. The external validity, or how generalizable it is to the whole population is limited by the inclusion/exclusion criteria. It is only generalizable to the adult TBI population and specific conclusions in this review were extracted only for that population. The article also looked at recommendations for the stroke population, however they were not extracted for the purpose of this review.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Importance of Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>The results are important in that they provide practitioners with practical, evidence-based direction in terms of practice standards, guidelines and options. They provide an up to date review of the literature (as of 2000) and continue to reinforce that higher quality research is required in this field.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Implications for Practice/Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>The conclusions provide direction, albeit limited to practitioners working with adult TBI clients. It is helpful to know that the literature supports through Class III studies, the use of external cognitive compensatory strategies, in a functional context and that this treatment MAY be considered to improve function.</td>
</tr>
</tbody>
</table>

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**Purpose of Study:**

**Design:**
Systematic Review

**Subject/Methods:**
A search of MEDLINE, HealthStar, CINAHL, PsycINFO, and the Cochrane Library was completed with and produced 600 potential references. **Exclusion criteria included:** not TBI (i.e. CO poisoning), pediatric, pharmacological intervention, case report, instrument development, alcohol/drug abuse as an outcome, stroke, editorial or no data, acute care intervention and non-English. From 600 articles, 114 passed the exclusion criteria. **Inclusion criteria** were data specific to question, sound scientific methods, rehabilitation as an intervention, independent variables specific to the question, dependent variables specific to the question. Of the 114, 53 articles met the inclusion criteria. An additional 20 articles were included based upon reference lists of reviewed articles and peer recommendations, for a total of 73. Of those, 41 were excluded as review articles, too few subjects, retrospective, and descriptive in nature. The descriptive and observational data were excluded but used in the review process to provide a basis for understanding and interpreting the evidence.

**Outcome Measures (Primary and Secondary)**
Levels of Evidence were determined using: **Class I** - well designed RCT; **Class II a** – RCT’s with design flaws and multicenter or population based longitudinal cohort studies; **Class II b** – non RCT, case control studies and well designed case series; **Class III** - case reports, uncontrolled case series and expert of consensus opinion. The article states that there are no standard set of outcome measures for TBI rehab that can be used across clinics to evaluate patient progress and program effectiveness. Relevant health outcomes included ADL, long term measure of disability, long term measure of impairment, independence, relationships, family life, satisfaction and long term financial burden.

**Results**
Of the remaining 32 articles, 11 were RCTs (5 relevant health outcomes; 6 intermediate outcomes); 4 comparative studies (1 employment outcome; 3 intermediate outcomes); 8 studies of the relationship between intermediate test and employment; 9 observational studies (1 relevant health outcomes; 8 intermediate outcomes).
1. Does cognitive rehab improve health outcomes? One small RCT and one observational study provide evidence of the direct effect of compensatory cognitive devices (alarms, planners etc.) on reducing everyday memory failures for TBI. Level II a RCT provides evidence that cognitive rehab reduces anxiety and improves self-concept and interpersonal relationships for persons with TBI.
3. Does cognitive rehab improve performance on intermediate measures of cognitive function? Evidence from 3 small Class I trials that practice, with/without the use of a computer, improves short-term recall on lab tests of memory for TBI. It is not known if these improvements were clinically meaningful to the individual.
4. Do intermediate measures of cognitive function associate with health outcomes? No studies meeting the criteria for review reported an association between lab tests and functional independence, ADL’s or measures of everyday memory.

**Authors’ Conclusions:**
“Although group differences were rarely observed, recovery across groups occurred. Until we have done the work necessary to be able to demonstrate what is operating to produce improvement, we are bound to practice the services and care at our disposal for this population”. (Carney, 1999).

**Level of Evidence:** 1

**Critical Appraisal**

**Validity**
External validity of this systematic review is subject to its inclusion/exclusion criteria and the original review questions.

**Importance of Results**
The results are extremely important in terms of evaluating the current literature and raising questions for this area of practice. The authors recommend that we begin to formulate definitions for cognitive rehabilitation and it’s subcomponents. They also question to what extent it can be divided into parts for the purpose of evaluating the effectiveness of the components before such division renders the evaluation meaningless.

**Implications for Practice/Applicability**
This review has significant implications for practice, but more importantly, for future research. In fact, further review of the literature, beyond 1999, demonstrate an impetus on the part of other researchers in the field, to provide the necessary evidence. One case study included in this CAT is an example.

REFERENCES:

Levels of Evidence Based On:


Articles critically appraised:

Level 1 Evidence


Level 4 Evidence


Related Articles (not selected for individual appraisal)


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