

**Summary of Evidence Based Interventions for Treatment of Cognitive Impairments in People with Acquired Brain Injury**

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**DISCLOSURES**

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**Has no financial or other interest to disclose**



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**Learning Objectives**

- Define the acquisition, application and adaptation stages of cognitive rehabilitation
- Write specific short-term tactical goals for cognitive rehabilitation clearly linked to long-term strategic goals and the ACRM evidence-based recommendations
- Employ a decision-tree to assist in determining the most appropriate cognitive rehabilitation intervention to implement
- Identify the key intervention approaches for impairments of attention, memory, executive functions and social communication, based on the literature of evidenced based practices.



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**Evidence-Based Cognitive Rehabilitation: Recommendations**

- Cicerone et al, Arch Phys Med Rehab, 2000, 2005 and 2011
- Researchers (Cognitive Rehabilitation Task Force of ACRM BI-ISIG) pursued comprehensive and methodical review of 370 articles (from 1971-2008) to derive 3 types of recommendations:
  - Practice Standards
  - Practice Guidelines
  - Practice Options
  - Did also state “Not recommended”



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**Classification of Level of Evidence**  
*Cicerone et al, 2000, 2005 & 2011 combined*

Class I/la (N = 65)	Studies with well designed, prospective, randomized controlled trials
Class II (N = 54)	Prospective, nonrandomized cohort studies; or clinical series with well-designed controls that permitted between subject comparisons of treatment conditions
Class III (N = 251)	Clinical series w/o concurrent controls, or studies with results from 1 or more single cases w/ appropriate methods



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Recommendation	Description – as to whether the treatment be specifically considered for persons with neurocognitive impairments and disability
Practice Standard	Based on at least 1 well-designed class I study with an adequate sample, with support from class II/III evidence; providing <b>substantive evidence</b> to support a recommendation.
Practice Guideline	Based on 1 or more class I studies with methodologic limitations, or well-designed class II studies with adequate samples; providing evidence for <b>probable effectiveness</b> to support a recommendation.
Practice Option	Based on class II or class III studies that directly address the effectiveness of a treatment, providing evidence of <b>possible effectiveness</b> to support a recommendation.

*Cicerone et al, 2000, 2005 & 2011*

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## Levels of Recommendation for Rehabilitation Strategies

- Practice Standard: "substantial evidence"
- Practice Guideline: "probable effectiveness"
- Practice Option: "possible effectiveness" but requires further research

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## Cognitive Rehabilitation Manual (2012)

- Based on the systematic reviews (Cicerone et al., 2000, 2005, 2011)
- First draft by Ed Haskins, Ph.D.
- Edits, additions and revisions made by members of the ACRM Cognitive Rehabilitation Manual Sub-Committee. Externally-reviewed by 24 novice to expert therapists and subsequent revisions. Reviewed by the Clinical Practice Committee of ACRM.
- Final version available in April 2012



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## Barriers to Translation of Research into Clinical Practice

- Clinical methods not often described in sufficient detail
- Practitioners do not have easy access to literature or time to read literature
- Training programs for practitioners do not include BI specific cognitive rehabilitation strategies
- Rehabilitation organizations have reduced training budgets
- Staff turnover results in experience drain

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## Goals of Cognitive Rehabilitation

- "...ameliorate injury-related deficits in order to maximize safety, daily functioning, independence and quality of life"
- Achieved in a step-wise manner with emphasis on 4 long term goal areas:
  - Problem orientation, awareness and goal setting
  - Compensation
  - Internalization
  - Generalization

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## Problem Orientation, awareness and goal setting

- Recognizing specific problem(s) that require intervention
- Collaborating to establish meaningful short- and long-term goals
- Awareness and goal setting is a major therapeutic priority; foundation for most intervention



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## Compensation



- Providing clients with the necessary tools
- Positively impacts functioning despite persistent or chronic impairments
- Often the end goal for cognitive rehabilitation
- Examples:
  - External memory aids
  - External templates for decision making

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### Internalization

- The clinical process of gradually increasing the automaticity of practiced strategies which facilitates independence through the use of compensatory strategies and tools.



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### Generalization

- Application of appropriate strategies for managing deficits in personally relevant areas of everyday functioning






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### Stages of Cognitive Rehabilitation

Stage of Treatment:	Goals:	Type of Strategies Used:
<b>Acquisition</b>	1. teach purpose and procedures of treatment model 2. help patient recognize and accept deficits and benefits of treatment	External
<b>Application</b>	1. improve effectiveness & independence in compensating for deficits 2. promote internalization of strategies	1. External 2. Internal
<b>Adaptation</b>	1. promote transfer of training to tasks including those that are less structured, more novel, complex, and/or distracting 2. promote generalization of skills from the structured therapy setting to less structured environments such as home, community, and work	1. External and Internal 2. External and Internal

*Sohlberg & Mateer, 2001*

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### External Versus Internal Strategies

<p><b>External</b></p> <ul style="list-style-type: none"> <li>Those external to the patient; e.g. use of notebooks, electronic devices, cue cards...</li> <li>LTG of external strategies is to enable patient to compensate for their impairments <b>INDEPENDENTLY</b> by using aids.</li> </ul>	<p><b>Internal</b></p> <ul style="list-style-type: none"> <li>Any self-generated procedure whose purpose is to enhance conscious control over thoughts behaviors or emotions.</li> <li>LTG of internal strategies is to enable patient to become so familiar/adept with process they can use it globally and without external assistance</li> </ul>
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### Patient Progress Outcomes

- Patient never develops necessary awareness to compensate; patient learns to perform simple routine and action sequences procedurally
- Patient independent with use of external aids; some internalization, but still needs external guidance
- Patient able to internalize fully-learned strategies; can apply in specific situations or tasks.
- Patient generalizes learned skills to a range of situations and/or tasks.

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### Treatment Planning and Goal Writing

Treatment planning and goal setting is a collaborative process.

Essential Ingredients:

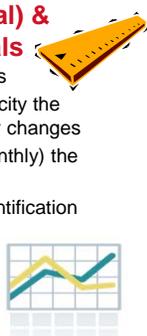
- Objective measurement of progress on short-term tactical goals,
- Collaborative appraisal of progress, and
- Constructive counseling

Very important to assist the patient in modifying goals and sustain motivation and engagement in the therapeutic process

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### Writing Short-term (tactical) & Long-term (Strategic) Goals

- Writing & measuring short-term tactical goals
  - Quantification essential! The more specificity the behavioral feedback the faster behavior changes
  - Monitor and chart (daily, weekly, monthly) the patient's progress
  - Promote patient engagement in quantification
  - Enhance motivation for treatment



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### Writing Short-term (tactical) & Long-term (strategic) Goals

- LT (Strategic) Goal: "improve ability to independently compensate for memory deficits using external aids"
- ST (Tactical) Goal: "patient will initiate four simple household tasks on a daily basis with minimal assistance using a memory notebook"

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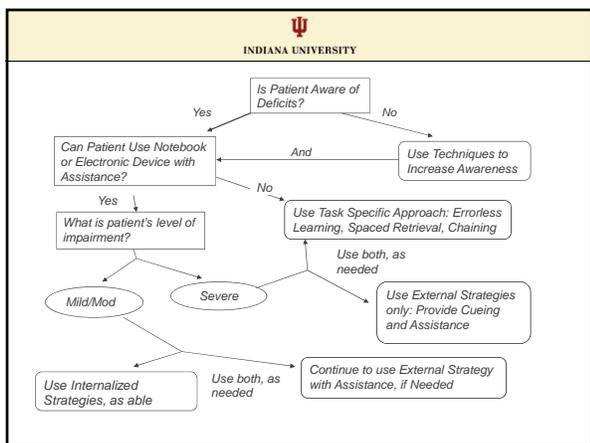
### Comprehensive Template for Goal Writing

Five Essential Factors	Example
Type of Task	"Patient will perform.... household tasks that require scheduling
Complexity of Task	that are simple
Level of Cueing or Assistance Needed	with minimal assistance
Type of Strategy Employed	to use a memory notebook strategy
Measurement of Performance (e.g., speed, accuracy)	at 100% accuracy."

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### Treatment Considerations when Designing Training Procedures

<p><b>Task specific vs. general approaches</b></p> <ul style="list-style-type: none"> <li>- Task specific protocols focus on procedural learning for a specific task (e.g., medication)</li> <li>- General Approaches are broad and aimed at an overall domain (e.g., memory)</li> </ul>	<p><b>External vs. Internal Strategies</b></p> <ul style="list-style-type: none"> <li>-Memory Mnemonics (Internal)</li> <li>-Procedural (External)</li> <li>-Impairment Level                             <ul style="list-style-type: none"> <li>• Mild: benefit from both</li> <li>• Severe: tend to benefit from external</li> </ul> </li> </ul>
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### Neurobehavioral and Psychosocial Factors that Influence Process and Outcome

- Patient Variables
  - Values and Priorities
  - Coping skills
  - Self-worth and self-efficacy
- Awareness
  - Anosognosia
  - Domain-specific
  - Brain Injury Knowledge
- Severity and Range of Impairment
- Emotional Reactions
- Premorbid Psychiatric issues
- Family Factors

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## Monitoring Cog. Rehab. Progress

**Specific task data**



**"Big Picture" Progress**



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## What does the research recommend for cognitive interventions?

- Executive Function
- Attention
- Memory
- Social Communication

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## Executive Functioning??

- The integrative cognitive processes that determine goal-directed and purposeful behavior
- Includes abilities to:
  - Formulate goals and solve problems
  - Anticipate the consequences of actions
  - Plan and organize behavior
  - Initiate relevant behaviors
  - Monitor and adapt behavior to fit a particular task or context

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## Executive Functions and Brain Dysfunction

- **Cognitively** - Problems with awareness, anticipating problems, analyzing situations, planning solutions, executing those solutions, maintaining a flexible approach to tasks, and monitoring themselves.
- **Behaviorally**- fail to think before they act, impulsivity or disinhibition, initiation deficits, hyperverboisity, poor emotional control and cognitive inflexibility.

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## BI-ISIG Recommendations for the Treatment of Executive Dysfunction

**Practice Standard:**

**Metacognitive strategy training (self-monitoring and self-regulation)** for deficits in executive functioning after TBI, including impairments in emotional self-regulation, and as a component of interventions for deficits in attention, neglect and memory

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### BI-ISIG Recommendations for Treatment of Executive Dysfunction (cont'd)

**Practice Guideline:**

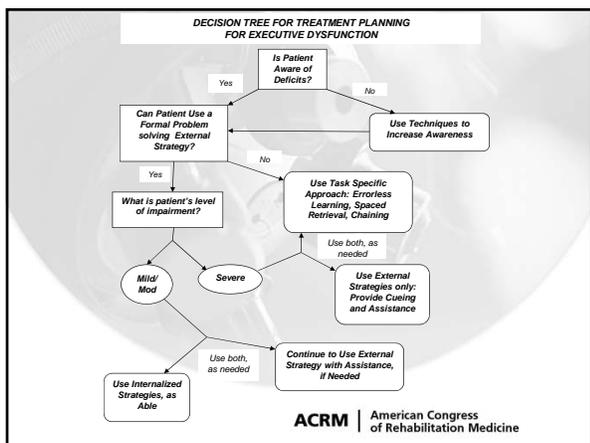
Training in **formal problem-solving strategies** and their application to everyday situations and functional activities during post-acute rehabilitation after TBI

**Practice Option:**

**Group-based interventions** may be considered for remediation of executive and problem-solving deficits after TBI

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<p><b>Bottom-up Approaches</b></p> <ul style="list-style-type: none"> <li>• Restorative</li> <li>• Repetitive practice exercises and drills</li> <li>• Task-specific</li> <li>• e.g., attention training</li> </ul>	<p><b>Top-Down Approaches</b></p> <ul style="list-style-type: none"> <li>• Compensatory</li> <li>• Learning and use of strategies</li> <li>• Generalize to many contexts</li> <li>• e.g., problem solving training</li> </ul>
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### Examples of Formal Problem Solving Models

- Ylvisaker and Feeney, 1998: Goal/Plan/Do/Review
- Levine et al., 2000: Stop/Define/List/Learn/Check
- Lawson and Rice, 1989: What/Select/Try/Check

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### Major Factors in Formal Problem Solving Models

- Patient is trained to use a structured sequence when addressing a problem.
  - Awareness
  - Anticipate/Plan
  - Execute/Monitor
  - Self Evaluate

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### Sample Formats

- [Goal Management Training - template](#)
- [Goal Plan Do Review – template](#)
- [Goal Plan Do Review - expanded](#)
- [Goal Plan Do Review – sample](#)

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### Targets of Metacognitive Strategy Training for Behavioral Dysregulation

- Awareness
- Impulsivity
- Disinhibition
- Anger Management
- Perseveration



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### Major Features of Metacognitive Strategy Training for Executive Deficits

- Internally controlled: The timing and execution of the strategies are self-generated by the patient and under the control of internal cognitive processes.
- This is in contrast with strategies under external control, i.e., under the control of a therapist or caretaker.

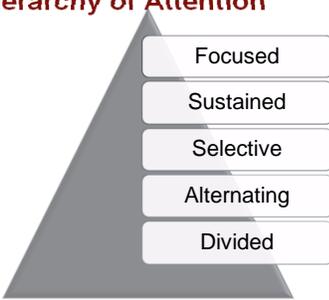
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### Major Features of Metacognitive Strategy Training for Executive Deficits

- Generalizable
- Individualized and contextualized (“real-world” problems)
- Personally relevant
- Internally controlled: self-generated
- Rely on practice and repetition

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### Hierarchy of Attention



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### BI-ISIG Recommendations for the Treatment of Attention Impairments

Practice Standard:

- Remediation of attention during *post-acute* rehabilitation after TBI.
- Remediation of attention deficits after TBI should include:



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### BI-ISIG Recommendations for the Treatment of Attention

Practice Option:

**computer-based intervention** may be considered as an adjunct to clinician-guided treatment for the remediation of attention; sole reliance on computer-based tasks without some involvement and intervention by a therapist is not recommended.

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### Attention Process Training (APT): Foundation

- Hierarchically organized, clinical theory of attention.
- APT I, II, III
- 5 different tracks:

```

graph TD
    ATTENTION[ATTENTION] --> FOCUSED[FOCUSED]
    ATTENTION --> SUSTAINED[SUSTAINED]
    ATTENTION --> SELECTIVE[SELECTIVE]
    ATTENTION --> ALTERNATING[ALTERNATING]
    ATTENTION --> DIVIDED[DIVIDED]
    
```

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### Attention Process Training (APT): Generalization Activities

Example: Alternating Attention

Naturalistic Setting	Functional Task
Residential	Cooking while monitoring the washer/dryer cycles
Vocational	Switching between phone and typing task
Community	Transportation: walking while consulting map

(Sohberg et al., 2001)

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### Time Pressure Management (TPM) Training: Foundation

- Compensates for mental slowness.
- Utilizes a structured problem-solving strategy to assist in regulating information input.
- Can be applied to the treatment of attention, memory, problem solving, and apraxia.
- Includes strategies to both prevent and manage time pressure.

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### Application of TPM – Trip Planning

**Strategic level**

- Preventing time pressure
- Analyzing situation for time pressure
- Anticipation and planning

**Tactical level**

- Preventing and managing pressure
- Anticipation and planning
- Execution and self-monitoring

**Operational level**

- Managing overwhelming time pressure
- Execution and self-monitoring
- Emergency plan
- Self evaluation

**Actions**

- *Far in advance* - Research and book hotel, airfare, car rental
- *Week before* -check forecast, make travel arrangements (to/from airport), purchase last minute items (ex: sunscreen), make packing list
- *Day before* – check in/print boarding pass, finish packing, confirm travel arrangements, organize money, ID, carry on items
- *Day of* – wear slip on shoes, have ID and boarding pass easily accessible, leave extra time
- *At airport* – ask an employee for help; have airline contact information accessible

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### Clinical Assumptions of Working Memory Rehabilitation

- Attention problems become more pronounced in situations that demand attention to rapidly presented information and/or multiple sources of information
- Attention can be improved by addressing underlying problems with working memory
- Patients can be taught to use strategies to help allocate attention resources and manage the rate of information processing

(Cicerone, 2002)

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### Level 1: N-Back Procedures

2

2

5

5

4

4

7

7

3

3

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### Level 1: N-Back Procedures

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### Working Memory Training: Strategies

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### Components of Memory

(Sohlberg & Mateer, 2001)

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### BI-ISIG Recommendations for Treatment of Memory Deficits

**Practice Standard:**

**Memory strategy training** is recommended for mild memory impairments from TBI, including the use of internalized strategies (e.g., visual imagery) and external memory compensations (e.g., notebooks).

**Practice Guideline:**

Use of **external compensations** with direct application to functional activities is recommended for people with severe memory deficits after TBI or stroke.

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### BI-ISIG Recommendations for Treatment of Memory Deficits

**Practice Options:**

- For people with severe memory impairments after TBI, **errorless learning techniques** may be effective for learning specific skills or knowledge, with limited transfer to novel tasks or reduction in overall functional memory problems.
- Group-based interventions** may be considered for remediation of memory deficits after TBI.

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### Decision Tree for Treatment Planning In Memory Dysfunction

Cognitive Rehabilitation Manual, Figure 3.1

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### Considerations in Choosing a Strategy

- Severity of impairment
- Nature of the information to be remembered
- Functional, personally meaningful tasks
- Patient should understand, have input into goals and strategies-active collaboration.



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### Types of External Devices

- Notebooks
- Other written planning systems
- Electronic planners, PDA's
- Smart cell phones
- Computerized systems
- Auditory or visual systems
- Task-specific



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### Which Type of External Device?

- The particular task the patient wishes to perform
- The patient's goals, abilities, disabilities and preferences
- The physical features (or limitations) of available technology: audio features, digital options, cost, downloadable apps
- The environment in which technology is going to be used.
- The familiarity to the patient.

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### General Guidelines for External Memory Strategies

- Constant and easy access to the external device or notebook.
- Training of all staff and family members in the use of device.
- Errorless learning techniques and use of procedural memory for severely impaired patients.
- Multiple learning & generalization trials.

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### Memory Notebook

- Comprises the core of external memory compensations, along with electronic devices.
- Possible sections:
  - Things to do
  - Memory log
  - Daily schedule
  - Homework
  - History and background
  - Handouts
  - Contacts



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### Stages in Memory Notebook Training

Acquisition	Application	Adaptation
<p><b>Goal:</b> To learn the names, purpose, &amp; use of each section</p> <p><b>Strategies:</b> Errorless learning, spaced retrieval</p>	<p><b>Goal:</b> To use notebook on functional tasks in clinic</p> <p><b>Strategies:</b> Feedback, cues, repetition</p>	<p><b>Goal:</b> To use notebook in naturalistic settings</p> <p><b>Strategies:</b> Feedback, cues, repetition, updating</p>

(Schiberg & Mateer, 2001)

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### Strategies for Severe Memory Impairment: Overview

- Appropriate for clinically important functional skills training, e.g., safe transfers
- Domain specific learning; limited generalization
- Attempts to maximize functioning through recruitment of procedural memory

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### Effective Strategies for Severe Impairment

A Venn diagram with three overlapping circles. The top circle is labeled 'Errorless Learning', the bottom-left circle is 'Spaced Retrieval', and the bottom-right circle is 'Chaining'.

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### Errorless Learning

- Presents information in a way that minimizes the possibility of making mistakes.
- Therapist presents simple information, and requests the patient to immediately repeat.
- More effective when combined with spaced retrieval or with chaining techniques.

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### Memory Strategy Training

- Internal, self-instructional strategies for storage and retrieval of declarative information.
  - Verbal or non-verbal
  - Can be facilitated by external strategies
- Most effective for those with mild to moderate memory impairments

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### Memory Strategy Training

**Encoding strategies**

A diagram showing a grey oval labeled 'New Information' with an arrow pointing to a yellow oval labeled 'Known Information' and a grey oval labeled 'Cues'.

**Retrieval strategies**

Enhance patient's ability to find and retrieve information at the time of recall

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### Types of Metacognitive Techniques

- Association
- Elaboration
- Organizational

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## Association Techniques

Technique	Description
Visual Peg Method	Target items are linked with a standard set of peg words which are already learned in a set sequence.
Method of Loci	Linking information to specific (external) visual reference
Visual Imagery	Linking information to specific (internal) visual reference
Absurdity	Humor and high levels of interaction make associations stronger

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## Organizational Techniques

Technique	Description
First Letter Mnemonics	Use the first letter of each of a series of words to form a single word or pseudo-word. <b>HOMES = Huron Ontario Michigan Erie Superior</b>
Semantic Clustering	Grouping items in a list into smaller categories
PQRST	Self-instructional technique to learn and recall complex written information  P review Q uestion R ead S tate T est

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## Deficits in Social Communication

- Impact success with: Communicating needs and thoughts
  - Listening and understanding others
  - Giving and interpreting nonverbal communication
  - Regulating emotions in social interactions
  - Following social boundaries and rules
  - Working with others to solve tasks, and
  - Being assertive

(Hawley & Newman, 2006)

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## Impact into daily life

- Fewer employment opportunities
- Poorer quality of life, decrease in life satisfaction
- Problems in social relationships
- Reduced community integration with social isolation
- Higher risk for depression



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## What the Evidence Supports: Recommendations by ACRM BI-ISIG

**Practice Standard**

“Specific interventions for functional communication deficits, including **pragmatic conversations skills**, are recommended for social communication skills after TBI”

**Practice Option**

“**Group based interventions** may be considered for remediation of language deficits after left hemisphere stroke and for social-communication deficits after TBI.”

Cicerone et al 2011

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## Translating Directly Into Clinical Practice

- Group Treatment specific to social communication deficits
- Specific treatments for emotion perception deficits  
Errorless learning  
Self-Instructional training
- Individual psychotherapy, supplementing group based treatment programs

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## Group Treatment for Social Communication Deficits

- Hawley & Newman (2006, 2008, 2010)  
*Group Interactive Structured Treatment-GIST: for Social Competence, Hawley and Newman, (2006, 2008), [www.braininjury.com/socialcompetence.com](http://www.braininjury.com/socialcompetence.com)*
- McDonald and colleagues (2008)  
*Improving First Impressions: A Step-by-Step Social Skills Program, McDonald et al., (2009), <http://www2.psy.unsw.edu.au/Users/Smcdonald/resources.html>*

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## Group Treatment Applied to Social Communication Deficits

- Group Process
- Individual Goal Setting
- Feedback
- Practice and Repetition
- Self-Monitoring
- Generalization of Skills

Dahlberg et al, 2007, McDonald et al, 2008

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## Tx of emotion perception deficits

- Aim = improve ability to recognize & interpret others' nonverbal cues – facial expressions, affective tone, gestures, body posture, proximity.
- In learning, cues are hierarchically organized:
  - Knowledge base
    - conventional emotional contexts
    - Emotions associated with particular scenarios
    - Discriminating between similar or co-occurring emotions (e.g. anger/disappointment;
  - Judge static emotional cues from line drawings, then photographs, to videos
  - Presented in one modality (i.e. visual) → multiple modalities (i.e. visual and auditory)
- Final goals include making social inferences about speaker's intentions, truthfulness, emotional state; interpretation of situational cues.

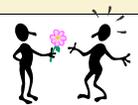
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## Treating Deficits in Emotion Perception After TBI

*Bornhofen & McDonald, 2008a, 2008b*

- Interpreting conventional emotional contexts (birthday party)
- Judging static visual emotion cues
- Judging dynamic emotional cues
  - Therapist modeling
  - Role play and videotaping
- Making social inferences based on emotional demeanor and situational cues

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- Start with easy discriminations
- Extensive practice
- Discourage guessing if unsure
- For example: "Wide eyes and raised eyebrows in surprise"
- Video example: [Photo labeling](#)

*Bornhofen & McDonald, 2008*

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## Self-Instructional Training in Treating Emotional Perception Deficits

- Verbalization of procedural steps.
- Learn to use self-guided statements to intensify attention, discriminate emotions, make decisions and correct errors.
- Assist with making social inferences on dynamic emotional and situations cues.
- Used toward end of treatment; key skills established

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## Self-Instructional Training

- Acronym – **WALTER**
  1. **W**hat am I deciding about?
  2. What do I **A**lready know about it?
  3. What do I need to **L**ook/**L**isten for?
  4. Try out my answer.
  5. Evaluate how it went.
  6. Reward myself for having a go!

Bornhofen & McDonald, 2008; delineated by  
Meichenbaum and Cameron, 1973

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