

New Developments in Cognitive Rehabilitation Research

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Predominant Cognitive Problems in Traumatic Brain Injury (TBI)

- **Attention/concentration**
- **Memory**
 - **Anterograde**
 - **Prospective (more related to frontal executive systems)**
- **Executive function**



Predominant Behavioral Problems

- **Paucity of behavior**
- **Socially inappropriate behavior**
- **Failure to complete complex action routines**
- **Aggression**
- **....Tied in various ways to previous cognitive impairments**

Status of Treatment

- **Controversy remains about how to characterize the cognitive and behavioral impairments**
- **Drug treatments are in use but poorly studied**
- **Learning-based treatments are common but also poorly studied**



3 Examples of TBI Research at MRRI

- **Recovery from prolonged unconsciousness**
- **Treatment of TBI-related attention deficits**
- **Using external memory aids to facilitate maintenance of treatment goals**

Recovery from Prolonged Unconsciousness

- **Small % of individuals remain vegetative or minimally conscious for prolonged periods or permanently**
- **No treatments documented to improve recovery (“coma stim”, hyperbaric oxygen, drugs)**
- **Need large numbers of patients for controlled trials, due to unpredictable recovery**

Observational research completed

- **7 Centers in US and Europe have enrolled > 150 patients in VS, MCS > 4 weeks**
- **Injury severity, etiology, localized lesions, complications, recorded in acute care**
- **Measures of function (Disability Rating Scale) recorded weekly in rehabilitation along with therapy intensity and drug exposure**
- **Predict function at 16 weeks post-injury**

Results

- **DRS at enrollment, time between injury and enrollment, rate of change in 2 weeks after enrollment all highly predictive ($p < .0001$)**
- **NO lesions or early complications predictive**
- **Amantadine exposure may be therapeutic; dantrolene sodium may have adverse influences – both potentially confounded**

Next step

- **Recently funded by NIDRR for a multi-center Randomized control trial of amantadine vs. placebo. Stratification for variables found to predict prognosis**
- **Joseph Giacino, PhD, JFK/Johnson, PI; John Whyte, MD, PhD, co-PI. 8 Clinical sites, data coordinating center at Columbia**

Attention Deficits after TBI

- **Attention complaints are common**
- **Appear to be most related to interface between basic attention mechanisms and frontal executive systems**
- **Preliminary work developed a series of tasks that distinguish patients from controls**
- **Current study seeks to explore impact of psychoactive treatments on those measures**

Current Study

- **Double-blind placebo-controlled repeated cross-over design using methylphenidate (MP)**
- **Multiple measures of attention including controlled information processing measures, standardized neuropsych measures, videotaped records of behavior, real-time observation, family ratings**

Results

- **MP leads to robust improvements in speed of information processing**
- **Improves family ratings of attentiveness**
- **Unlike ADHD, does not improve on-task behavior or decrease orienting to irrelevant stimuli**

Future Studies

- **Complete fMRI study that examines attentional activation patterns in patients vs. controls and, in patients, on vs. off MP**
- **Repeat with pure dopamine agonist, pure norepinephrine agonist to examine different contributions of different neurotransmitter systems**



Using an external memory aid to facilitate goal retention

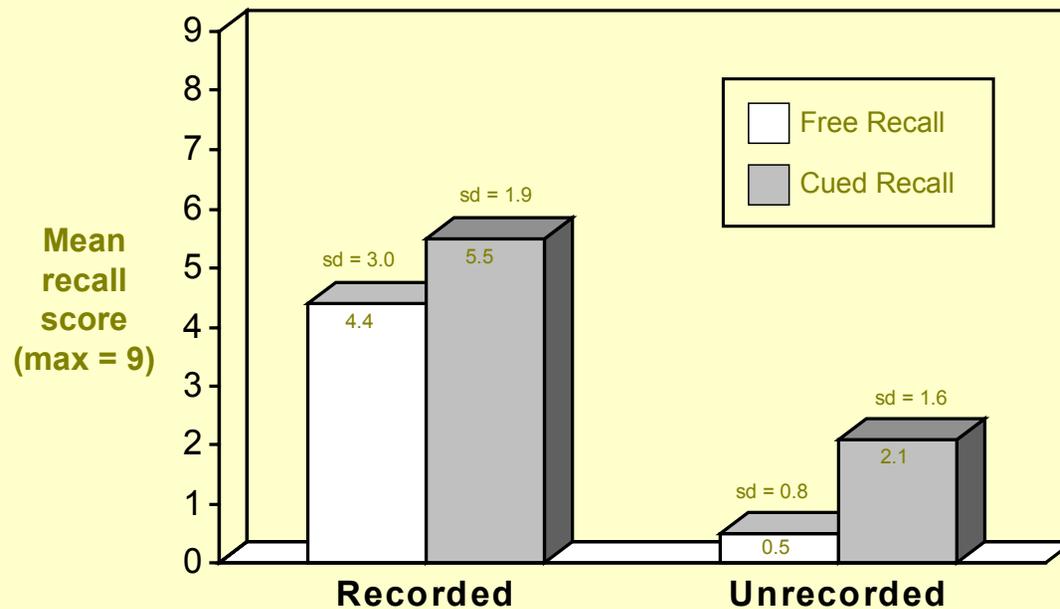
- **Many patients with severe TBI have severe memory deficits.**
- **In the extreme case, these deficits interfere with remembering one's own treatment goals.**
- **Current strategy is to discuss treatment goals frequently, ask patients to write them down in a notebook. Still poorly retained.**

Preliminary study

- **Tessa Hart, PhD, PI**
- **Recruited a sample of *** post-acute TBI clients with severe memory deficits from community reentry program**
- **Identified with case managers 6 treatment goals. 3 randomly selected for recording in subject's voice on portable voice organizer; 3 retained in notebook mode**
- **Voice organizer alarm 3 times/day at self-chosen times; subject listened to goals**

Results

Comparison of Recorded vs. Unrecorded Therapy Goals



Next step

- **Larger trial looking at whether use of portable voice organizer not only enhances memory for goals, but affects frequency of goal-related target behaviors**

General Points

- **Progress from basic understandings of cognition to treatment**
- **Treatment response can inform theory**
- **Many practical problems to be solved in order to conduct clinical research, particularly, but not exclusively, when treatments are non-pharmacological**