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## Treatment of Acquired Executive Function Deficits in Adults

2016 Fall ISHA Conference

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### Disclosures

1. Honorarium and support for travel from ISHA
2. Salary from Indiana University
3. Member of American Congress of Rehabilitation Medicine
  - Publisher of the Cognitive Rehabilitation Manual



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### Learner Objectives

1. List three evidence based treatments for adults with executive function disorders
2. Describe the target population(s) for whom metacognitive strategies are appropriate
3. Write objective and measurable EF goals for targeted populations



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## Executive Functioning Defined

1. Self-directed
  - a. Cognitive processes that influence goal-directed behavior (abstract thinking, awareness, flexibility)
    - Attention (sustaining and shifting)
    - Memory
  - b. Behavioral self-control processes (disinhibited, impulsive, hyperverbose, inflexible)
  - c. Emotional self-control processes (emotional control, easily overwhelmed or labile)
2. Critical to daily functioning
  - Poorer prognosis for recovery with EF deficits
  - Can impact other areas of recovery due to difficulty with self monitoring and error correction
3. Involves *recruitment, coordination and integration* of cognitive skills
  - Anticipate, plan, execute, monitor, adapt, learn and react



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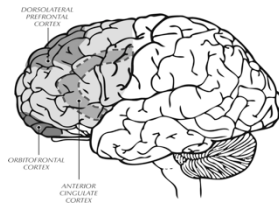
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## Neural Bases

- Frontal lobes
  - Orbitofrontal
    - initiation and self-regulation
  - Dorsolateral prefrontal cortex
    - problem solving and reasoning, planning, cognitive flexibility
  - Anterior cingulate gyrus
    - initiation, motivation and mental-state inferencing
  - Anterior poles – self-awareness



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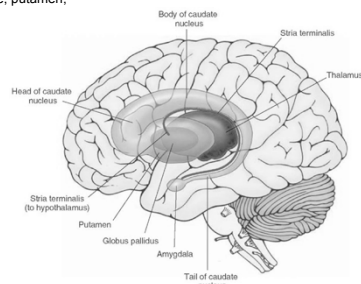
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## Neural Bases

- Associated neural networks
  - Cerebellum, caudate, putamen, limbic components



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## Populations

1. Acquired Brain Injury
2. Stroke
  - 50% of those sampled (acute) demonstrated EF deficits and were "pronounced" in those with TIA and other stroke risk factors (Zinn et al., 2007)
  - Persons with aphasia are at risk for EF problems
3. Other medical conditions that affect brain function
  - Parkinson's disease
  - Brain neoplasm\*\*
  - Anoxia
  - Encephalitis\*\*
  - Multiple sclerosis
  - Dementia
  - Others (epilepsy\*\*, Huntington's disease, AIDS, systemic lupus erythematosus, Lyme disease)

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## Impairments of EF Dysfunction

1. Cognitive
2. Emotional
  - Inhibition related impairments "pseudopsychopathic" (Ylvisaker & Feeney, 1998)
    - Impulsive, socially inappropriate, lack of concern for others
  - Initiation related impairments "pseudodepressed" (Ylvisaker & Feeney, 1998)
    - Apathetic, reduced drive and intent, inattentive and reduced emotional reaction
3. Behavioral
  - "Positive symptoms" - Failure to think before acting, impulsive, hyperverbose, inflexible
  - "Negative symptoms" - poor initiation, low drive, spontaneity

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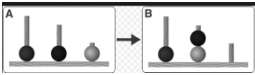
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## Evaluation of EF Impairments - Cognitive

- Wisconsin Card Sorting Test® (WCST) (Grant and Berg, 1993)
  - Ages 6.5 to 89, 20-30 minutes
  - [http://www.psychtoolkit.org/experiment-library/experiment\\_wcst.html](http://www.psychtoolkit.org/experiment-library/experiment_wcst.html)



- Tower of London (Culbertson & Zillmer, 2005)
  - Ages 7 to 80, 10-15 min



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### Evaluation of EF Impairments - Cognitive

- Functional Assessment of Verbal Reasoning (FAVRES) (McDonald, 2005)
  - Student version for 12-19 year olds; 18-79 years old, 60 min\*
  - <https://www.ccdpublishing.com/favres.aspx>
  - Plan an Event, Schedule a Work day, Decide on a Gift, Build a Case to Solve a Common Problem
  - Accuracy, timing, reasoning
- Behavioural Assessment of Dysexecutive Syndrome (BADS) (Wilson et al., 1996)
  - 16-87 years old, 40 minutes
  - Rule shift cart test, action program, zoo map, key search, action program, temporal judgment test, modified 8 elements
- Delis-Kaplan Executive Function System (D-KEFS) (Delis et al., 2001)
  - 8-89 years, 90 minutes\*
  - Nine stand alone tests



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### Evaluation of EF Impairments: Awareness

- Self-Regulation Skills Interview (SRSI) (Owensworth et al., 2000)
  - 6 questions with screener for basic level of intellectual awareness
  - Goals: rehab planning, progress monitoring, evaluation of tx outcomes
- Dysexecutive Questionnaire (DEX) (Wilson et al., 1986)
  - Part of the Behavioural Assessment of the Dysexecutive Syndrome (BADS)
  - 20 items – client and caregiver versions
  - 4 areas of change: emotional/personality, motivational, behavioral changes, cognitive changes

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### Evaluation of EF Impairments: Awareness

- Frontal Systems Behavioral Scale [FRSBe] (Grace and Malloy, 2001)
  - 18-95 year olds
  - Behavior associated with damage to frontal lobes and systems (apathy, disinhibition, executive dysfunction)
  - Two 46-item rating forms (self-rating & family rating), 5 point Likert scale
- Mayo-Portland Adaptability Inventory (MPAI-4) (Malec & Lezak, 2008 )
  - Children, adults & adolescents
  - Physical, cognitive, emotional, behavioral and social problems, post ABI via 3 subscales (ability, adjustment, participation indices)
  - Ratings by person with ABI, staff, significant others
- LaTrobe (Douglas et al., 2000)
  - 13-17 years old; 18-64 years old, 20-40 minutes
  - Perceived communication ability in TBI survivors
  - LCQ-S for survivors, LCQ-O for "close other"
  - Example

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### General Considerations

1. Impact of awareness – metacognitive training
  - Intellectual awareness (general awareness)
  - Emergent awareness (online use)
  - Anticipatory awareness (anticipate and use)
2. Severity of injury and degree of impairment
  - Direct strategy approaches
3. Structured approach to problems

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### Other Considerations

1. Psychological issues
  - Premorbid psychological issues
  - Premorbid personality traits
  - Premorbid copying methods
2. Collaboration and referrals to specialists
  - Psychotherapist
  - Group treatment
3. Non-confrontational approaches
4. Perceived control
5. Cultural values

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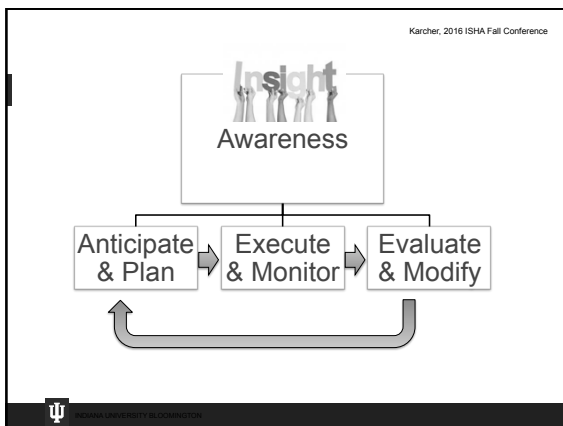
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## Behavioral and Emotional Strategies

1. Development of awareness of impairments and negative outcomes
2. General framework
  - Discrepancy between self-perception and reality
  - Select functional and relevant targets that are easily structured
  - Provide clear objective feedback
  - Repetition, procedure learning (structure for self-evaluation)
  - Education and environmental supports for client and care team
3. Raise awareness versus highlighting failure

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## Predict-Perform-Evaluate

Goverover et al., 2007

1. Task introduction
2. Client
  - Sets goal (objective and measurable e.g., accuracy, latency, # errors)
  - Predict performance
  - Anticipate and plan for possible errors or problems
  - Chose strategy to address anticipated error or problems
  - Assess amount of assistance needed to be successful
3. Perform task
4. Self-estimate performance on tasks AND complete structured self assessment
5. Debrief with therapist and observations are compared
6. Record experience and suggestions for next time

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## Predict-Perform-Evaluate – Goal Writing

Adapted from Haskins et al., 2012, p.42

1. Long term goal
  - Accurate prediction of performance at home/work/community to increase independence and use of compensatory strategies
2. Short term goal
  - Client will independently predict time and accuracy of performance on trials of X within 10% of actual performance in 90% of opportunities
  - Client will independently generate strategies to improve ability to complete tasks with increased accuracy and time, based on review of objective previous performance on trials of academic tasks

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### Other Behavioral and Emotional Strategies

1. Identification of examples of behavioral or emotional dysregulation
  - Job coach, family, staff
  - Objective information and ABCs
    - Personalized structured recordings using logs, journals, or memory notebooks
2. Identify and label the problem – “mantra” to focus on the solution
  - “Use my breaks”
  - “Stop, listen, speak”
  - Examples from BISSG and
3. Combined psychotherapy and metacognitive strategies
4. Acquisition → Application → Adaptation



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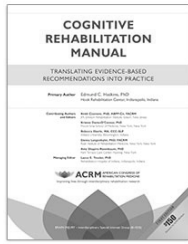
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### Evidence for EF Treatment

Cognitive Rehabilitation Task Force of the BI Interdisciplinary Special Interest Group of ACRM (BI-ISIG) – Systematic Review

- Practice Standard = metacognitive strategy training
  - Self-monitoring and self regulation
  - Component of intervention for attention, neglect and memory
- Practice Guideline = formal problem solving strategies training
  - Systematic approach to problems (analyze, plan, implement, review)
- Practice Option = group based interventions



Haskins, E.C., Clonone, K., Dams-O'Connor, K., Eberle, R., Langerbahn, D., Shapiro-Rosenbaum, A., & Theiler, L. (2012). Cognitive Rehabilitation Manual: Translating Evidence-Based Recommendations into Practice. Reston, VA: American Congress of Rehabilitation Medicine.



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### Stages of Treatment

1. Acquisition
  - Purpose and procedures of the treatment
  - Recognize and accept deficits and usefulness of treatment
  - Goals: verbalize steps of strategy, name situation in which to use strategy
2. Application (scaffolding)
  - Improve effectiveness and independence using strategy
  - Work toward internalization of strategies
  - Goals: apply steps with X support,
3. Adaptation
  - Transfer of training from more to less structured, more complex, less familiar
  - Generalization of skills to home, community work
  - Goals: Initiate use of x strategy, use in the community by patient or family report



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## Metacognitive Strategy Training

1. Our ability to think about thinking
  - Monitoring our own thoughts and behavior
    - Impairment – poor awareness
  - Use of that information to make changes
    - Difficulty "learning" from our mistakes
2. Developmental process
3. Direct instruction
  - Applicable to other cognitive domains
    - Problem solving, behavioral and emotional dysregulation



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## Metacognitive Strategies

1. Verbal Mediation/Self-Talk (Cicerone & Wood, 1987; Cicerone & Giacino, 1992)
2. Awareness Intervention Protocol (Cheng & Mann, 2006)
3. Goal Management Training (Levine et al., 2000)
4. Problem-Solving therapy (PST) (van Cramon et al., 1991)
5. Goal Plan Do Review (Ylvisaker and Feeney, 1998)
6. Time pressure management (TPM) (Fasotti et al., 2000; Winkens et al., 2009)

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## Verbal Mediation

Cicerone & Wood, 1987

Goals

- Improve planning, awareness and attention
- Reduce unwanted behaviors

1. Talk through each step of task out loud
  - Cue as needed (visual or verbal)
  - Reduce support
2. Fade verbalization to whisper while repeating steps
3. Repeat steps internally (inner speech)

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## Awareness Intervention Protocol


Cheng and Man, 2006

Goal

- Awareness of knowledge about deficits

Procedure

- Predict performance on a procedure
- Perform procedure
- Compare outcome with prediction
  - Self-monitoring, clinician feedback, goal setting

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## Formal EF/Problem Solving Strategies


General framework

1. Identify the problem
2. Set goals
3. Plan a solution
4. Execute the steps of the solution
5. Monitor (ongoing) and review (ongoing and after)
6. Inform future solutions

Acquisition → Application → Adaptation



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graph TD; ID[ID problem] --> GS[Goal setting]; GS --> CP[Create plan]; CP --> EP[Execute plan]; EP --> MR[Monitor and review]; MR --> ID;
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## Goal Management Training

Levine et al., 2000

Goal: Control activation or inhibition of actions that influence task completion

Five Stages

1. Orienting
2. Goal selection
3. Task analysis and subgoals
4. Encode and retain goals
5. Compare outcome to goals/subgoals

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### Goal Management Training – Goal Writing

Example goals adapted from Haskins et al., 2012, p.41

- Will apply GMT with visual support in functional activities at home and in the community in 90% of opportunities
- Will state all steps of a problem with visual support with 90% accuracy across two sessions
- Will I'll select appropriate solution in structured task with 90% accuracy across two sessions
- Will review solution outcomes with 90% accuracy across two sessions
- Will demonstrate use of GMT strategy at home per family report/journal entry in unstructured situations 2-3 times per week for one month

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### Problem Solving Training

Van Cramen et. al., 1991

1. Break down problems into manageable parts
2. Trained patients on five aspects of problem solving behavior
  - Problem orientation – recognition
  - Problem definition and formulation
  - Generate alternatives – brainstorm
  - Decision-making – pros/cons
  - Solution verification – recognize and self correct
3. General to specific cueing then fading
4. Improvement in task specific aspects; some worsened (more confused, considered more aspects of problems?)

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### Goal Plan Do Review

Yivisaker and Feeney, 1998

- Awareness
  - Problem recognition
  - Goal personalization
  - Analyze and define the problem
- Anticipate/Plan
  - Identify critical information
  - Generate solutions
  - Pros and cons
  - Chose best solution
  - List steps of the chosen solution
  - Learn steps of the solution
- Execute/Self-Monitor
  - Execute solution while focusing on steps
- Self-Evaluate
  - Verify effectiveness of solution
  - Self correct
  - Request feedback



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graph TD; Goal[Goal] --> Plan[Plan]; Plan --> Do[Do]; Do --> Review[Review];
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### Goal Plan Do Review in Action

Remember the stages of treatment (acquisition/application/adaptation)

1. Acquisition
  - Learn the relevance to their situation and procedures
  - Goal: client can explain rationale and steps
2. Application
  - Use strategy in structured situation along side the therapist (scaffold cues and difficulty)
  - Use of worksheet and other visual supports (modify based on cognitive need)
3. Adaptation
  - Generalization of skills to situations outside the clinic
  - Homework and self analysis



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### Goal Plan Do Review – Goal Writing

1. Long term goal
  - Client will demonstrate improved functional problem solving at home/work/ community via application of GPDR strategies
2. Short term objectives
  - Client will verbalize/write steps of GPDR independently/visual/verbal cues with 90% accuracy across two sessions
  - Client will verbalize/write GPDR steps given a functional complex problem with 80% accuracy across two sessions
  - Client will independently demonstrate use of GPDR in functional role-play of a complex problem with 80% accuracy across two sessions



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### Goal Plan Do Review - Case Study

Jane was a x year old woman post right hemisphere stroke. Reduced initiation of IADLs, reduced efficiency completing IADLs, both she and husband frustrated by change in personality and independence

GPDR training

- Acquisition using worksheet to teach steps and relevance to her own goals
- Began with more complex worksheet with some success
- Thoroughness of "do" was an issue
- Modification of GPDR worksheet for use at home
- Feedback from her husband



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## Time Pressure Management

Winkens, I., Van Heugten, C.M., Wade, D.T., & Fasotti, L., 2009


Reduce problems associated with mental slowness by reorganizing execution of tasks

- Prevent or manage time pressures and *compensate* for slowness

Developed for TBI but could benefit others with mental slowness (e.g., stroke or MS), 8-12 hours once per week

Three levels of decision making

1. Strategic level – decisions and actions BEFORE
2. Tactical level – anticipate and adapt BEFORE
3. Operational level (level at which time pressure is most significant) – IMMEDIATE decisions and action taken



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## Time Pressure Management

Break up tasks into manageable parts to prevent (strategic) or manage (tactical) pressures; shift actions to strategic and tactical levels


TPM Stages

Stage 1 - ID the problem based on client strengths and weaknesses (awareness, predict/perform, objective data collection in problem situations)

Stage 2 - Strategy teaching – time to manage the pressure

1. Analyze for time pressure
2. ID what can be done BEFORE starting the activity
3. Contingency/emergency plan
4. Monitor performance

Stage 3 - Generalization



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## Time Pressure Management – Goal Writing

1. LTG: Consistently implement TPM strategies at home/work/community for complex, multi-step tasks
2. STO
  - Client will verbalize steps of TPM with visual support with 90% accuracy across 2 sessions
  - Client will write/verbalize steps of complex situation with visual/verbal support with 90% accuracy across two sessions
  - In a functional role-play situation, client will demonstrate steps of complex situation with visual/verbal support in 80% of opportunities across two sessions
  - Client will report three instances of TPM application during home/work/community activities on a tracking sheet across three weeks



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## Group Treatments for EF

1. Rusk Problem Solving Group Protocol (Langenbahn et al., 2008)
  - Goals: increase awareness of effects of emotional dysregulation on cognition & manage uncontrolled emotions from impacting thinking
  - Two 12-session sets of training sessions that include self-regulation among other areas
  - Self regulation worksheet
2. Brain Injury Coping Skills Group (BICS) (Backhaus et al., 2016)
  - Goal: improve perceived self efficacy and psychological functioning using a combined family client CBT group
  - Significant improvements in PSE in BI coping skills participants (both survivors and caregivers) post treatment and 3 mo post follow-up
  - 16 two-hour weekly session; psychoeducation, CBT, and instruction in stress management and problem-solving strategies
    - 6 modules (Intro to BI, Expectations for Recovery, Tips on managing challenging problems; learning about depression, Four Rs of stress management, Communicating effectively with professionals)
  - Written materials (BICS manual), role-play, practice of exercises and homework



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