Evaluation and Treatment of Attention and Memory after Brain Injury, Part 2

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Speaker Information

- Certified Brain Injury Specialist
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Relevant Disclosures

Financial:

- Received an honorarium and travel compensation
- Owner of Caroline Gammill, Neuro SLP, LLC

Non-financial:

- None

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Objectives

Summarize	Summarize neurological bases of attention and memory impairments due to stroke or TBI.
Outline	Outline evidence-based treatment practices for attention and memory impairments from both rehabilitative and compensatory approaches
Review	Design treatment plans/goals for case studies based on real patients with attention and memory impairments using best practices.

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Have you ever…

- Had a patient memorize a list of random words?
- Had a patient memorize a set of random pictures?
- Had a patient ask, "What does this have to do with anything?" or "How is this going to improve my memory?"
  - ….and not been able to give a good answer?
- Not known *what* to do with people with memory impairments and so tried some things you logically think maybe, kind of, *probably* work?

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*Can memory **actually improve** (impairment-based level) in a person who had a TBI?*

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*Can memory **actually improve** (impairment-based level) in a person who had a stroke?*

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The Real Question

Can we really (re)train an ability or cognitive process?

Based on neuroplasticity

If not, should we train performance on a specific task?

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How do we make memories?

- Encoding
- Storage
- Retrieval
- Reporting

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Encoding

- Information comes into our memory system through sensory input:
  - Visual
  - Acoustic
  - Semantic

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Storage

Nature of memory stored:
- Duration
- Capacity
- Type of information

Short-term

Long-term

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Short-term memory

- Limited capacity resource
- Working memory (Chai et al., 2018)
  - Prefrontal cortex (Rypma & Desposito, 1999)
  - Cingulate cortex
  - Parietal lobe
  - The mental workspace for executive functions and metacognition

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Long-term memory

- Limitless-capacity resource
- Time-oriented:
  - Retrospective
  - Prospective
- Explicit/Declarative
  - Episodic
  - Semantic
  - (Metamemory – Sohlberg & Turkstra, 2011)
- Implicit
  - Procedural
  - Emotional
  - (Priming - Sohlberg & Turkstra, 2011)

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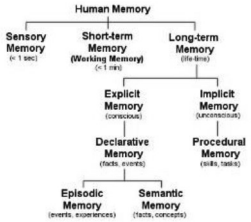

(Human Memory, 2019)

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Memory Impairments

- Anterograde memory loss
- Retrograde memory loss
- Nondeclarative memory is generally preserved
- Posttraumatic amnesia (PTA)

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Treatment Principles

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Direct Instruction

Systematic design and delivery of instruction for learning and generalization of facts, concepts, procedures, skills, and strategies (Sohlberg & Turkstra, 2011)

Key techniques (Sohlberg & Turkstra, 2011)

- Task analysis
- Training in a broad range of examples
- Using simple, consistent wording in instructions
- Modeling with faded prompts
- High rate of correct massed practice
- Cumulative review

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A Framework

Systematic Instruction: people with memory impairments benefit most from structured training that includes:

- Explicit models
- Errorless learning
- Strategies to promote learner engagement
- Carefully guided practice

Key: deliberately use specific techniques designed to enhance likelihood information will be learned and stored in memory (Sohlberg & Turkstra, 2011)

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Strategy Instruction

Teaches learners to monitor their own thinking

AKA **metacognitive strategy instruction**

Sohlberg & Turkstra, 2011:

- Help learners see the big picture by using graphic organizers or outlines of important concepts
- Use questions or prompts to encourage learner self-assessment
- Teach learner to use self-regulation scripts to summarize and elaborate on content ("Have I checked my work?")

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Assessment

- Repeatable Battery for the Assessment of Neuropsychological Status (RBANS)
- Scales of Cognitive and Communicative Ability for Neurorehabilitation (SCCAN)
- California Verbal Learning Test-II (CVLT-II) (Delis et al., 2000)
- Brief Test of Head Injury
- Cognitive-Linguistic Quick Test +
- Cognistat (Kiernan et al., 2002)
- Multifactorial Memory Questionnaire (https://www.baycrest.org/Baycrest_Centre/media/content/form_files/MMQ-Manual-2018_ebook.pdf)
- Everyday Memory Questionnaire
- Appendix of systematic review in WHO-ICF domains (Tate, Godbee,& Sigmundsdottir, 2013)

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Research Says...

Systematic review (Swanson et al., 2001): Using direct instruction AND strategy instruction together produced largest effect sizes in education than either strategy alone

Neuropsychology literature has reached the same conclusions for adults with acquired neurogenic memory disorders

Cognitive psychology: exploit residual memory and compensate for weakness to best support client learning

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PIE Framework

- Plan
- Implement
- Evaluate
- Consider
  - Person
  - Program
  - Environment
- Sohlberg & Turkstra, 2011

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Planning

1) Identify learner characteristics
2) Define treatment target
3) Specify desired outcome
4) Design individualized training plan

(Sohlberg & Turkstra, 2011)

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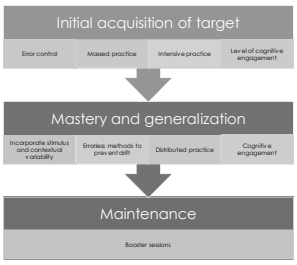
Implementation: Three Phases of Training



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Evaluation: Three Phases of Training

- Session
- Generalization
- Maintenance
- Impact

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Agenda of Therapy Session

- Probe
- Practice
- Review

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What is there not *evidence for?*

"Brain training" computer games (Stojanoski et al., 2018)

Memorizing word lists

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What IS there evidence for?

- Attention Process Training (Sohlberg & Mateer)
- Memory strategies (small-moderate effects; less effective for severe TBI; maintenance unclear)
- Visual Imagery for Prospective Memory
- Errorless Learning
- Error-controlled techniques:
  - Method of Vanishing Cues
  - Spaced Retrieval
- Training multi-step routines with systematic instruction
- Task-specific strategies

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Management Options

- Restorative(?)/generalized approaches
  - Memory practice drills (?)
  - Mnemonic strategy training
  - Prospective memory training
  - Metamemory training
    - PQRST
- Domain-specific approaches
  - Mnemonic strategy training for *specific information*
  - Spaced retrieval
  - Method of vanishing cues
- (Sohlberg & Mateer, 2001)

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Errorless Learning

Favorable outcomes (Parkin et al., 1998; Winter & Hunkin, 1999; Todd & Barrow, 2008; Lloyd, Riley, & Powell, 2009; Bowman, Linberg, Hemmingsson, & Barfai, 2010)

- Route recall
- Training use of electronic aids to increase independence in apartment living
- Procedures/skills (touch typing)

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Error-Controlled Instructional Techniques

- Method of vanishing cues (MVC): present full stimulus (picture of a person and name), then reduce cues
- Spaced retrieval training

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Method of Vanishing Cues

- Goal: initial target acquisition
- May involve elaboration techniques

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Spaced Retrieval Training

- Manipulate time intervals
- Errorless learning
- Can be combined with MVC in initial training phase
- Goal: long-term retention
- May involve elaboration techniques

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Systematic Instruction: Key Training Variables

- Reduce hyper-specificity of training conditions to facilitate flexible learning
- Increase effortful processing to promote generalization
  - Elaboration ("Daisy is a dog" vs "Daisy is joyful dog who is a goldendoodle, loves mud, and once ate 22 sugar cookies off the counter.")
  - Self-generation ("What is it about your niece that's interesting to you and will help you remember her name?")
- People with less severe impairments in declarative memory processes may benefit from strategies that encourage effortful processing during encoding and retrieval
- People with profound impairments in declarative memory may benefit more from errorless procedures (Anderson & Craik, 2006)
- Sufficient practice
- Spacing or distribution of practice

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Ecologically-Valid Tasks

- Target is information or skills the person would include in their own daily lives (review by Sohlberg & Turkstra, 2011):
  - Face-name associations
  - Training use of external memory aids
  - Learning computer tasks
  - Academic skills

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Memory Aids

- External
  - Planner
  - Calendar
  - Phone
  - Alarm
- Internal
  - Visualization
  - Grouping

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Treatment

WHAT ARE YOU TRYING TO TREAT?

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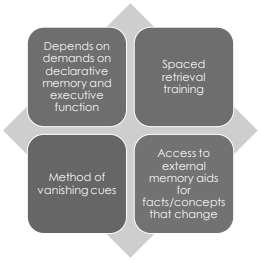
Training Facts and Concepts



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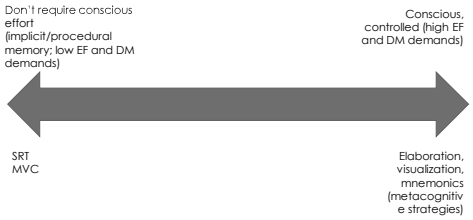
Training Technique Requirements



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Training Facts and Concepts

- Identify specific needs
- For severe episodic and semantic memory impairments, error-control methods with SR most effective (Ehlhardt et al., 2008)
- Internal memory strategies for mild-moderate memory impairments most effective
- For strategy relying on declarative memory:
  - More meaningful information is learned and retained better
  - Abstract concepts more difficult to learn than concrete concepts
  - Facts and concepts from highly populated categories are more difficult for recall than less-populated categories
  - Face-name associations are difficult to learn

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Training Facts and Concepts

- For methods relying on implicit memory:
  - Simpler is better
  - Generalization of implicit learning is limited

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Training Facts and Concepts: Case (Oberg & Turkstra, 1998)

- SN: 18-year-old male with severe TBI
- Right frontal hematoma and left temporal lobectomy with encephalomalacia in left temporal region
- Language and memory below average; perseveration in words, gestures, and ideas
- Excellent procedural learning and memory
- Treatment: 100 words needed for goal of working in field of ophthalmology
- Implementation:
  - Reviewing words and definitions
  - Matching words to synonyms
  - Matching words to definitions
  - Filling in the blanks in sentences wit target words
  - Generating definitions with help from the dictionary
  - Generating synonyms with help from the dictionary
  - Using each word in a self-generated sentence
  - Giving self-generated definitions to a classmate for feedback

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Training Functional Multistep Routines

Moderate-severe memory impairments

Examples:

- Cooking
- Laundry
- Medication management
- Picking up a prescription
- Grocery shopping
- Work tasks (bookkeeping, answering the phone, filing)
- School tasks (accessing locker, bringing class materials, schedule management)
- Using Facebook/posting on Tik Tok/posting an Instagram story

Task analysis: define the series of steps for the client

- Sufficient detail
- Customization

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Training Functional Multistep Routines: Sample Goals

- The client will complete a 5-step laundry procedure when given a verbal prompt from her caregiver and when following a written checklist in the laundry room with 100% accuracy.
- The client will complete a 6-step lawnmowing routine following a combination of systematic instruction and environmental modification on Saturdays over 3 weeks.
- The client will complete a 4-step procedure for bringing materials to class following Spaced Retrieval Training and a prompt in his locker for 6/7 classes over 1 school day.
- **Long-term goal:** Following training using systematic instruction emphasizing errorless instruction, Mr. Smith will independently complete his 5-step cooking routine on 3 consecutive occasions at home after his wife sets out all the ingredients and the recipe. Mrs. Smith will demonstrate a decrease of 3 points on the Caregiver Burden Index. (Sohlberg & Turkstra, 2011)
- **Short-term objective for initial acquisition:** Using systematic instruction, Ms. Richards will independently demonstrate the five steps for filling her medication box and taking out the correct pills in response to the alarm during therapy for 3 consecutive sessions over a 2-week period.

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Training Functional Multistep Routines

- Multilevel evaluation: specify –
  - Therapy approach (systematic instruction)
  - Target routine (five-step cooking procedure)
  - Progress measurement (completion of all steps in the routine)
  - Criterion for mastery (3 consecutive sessions)
  - Level of independence (independent)
  - Context (at home)
  - Conditions for completing the target routine (when the ingredients are set out)
- Vary training stimuli/prompts to elicit practice of the routine
- Initial acquisition phase:
  - Minimize errors
  - Move from massed to distributed practice
  - Provide sufficient practice

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Training Functional Multistep Routines: Maintenance

Incorporate natural supports

Set up for cumulative review

https://www.guilford.com/sohlberg3-forms

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1	2	3	4
Limit demands	Modify task or environment	Reinforce residual abilities	Increase independence

Training the Use of External Cognitive Aids

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External Cognitive Aids

- Device complexity
- Target task
- Area of cognitive compensation
- Target population
- Availability

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External Cognitive Aids

Low-tech/specific task:
- Alarm/watch
- Timer
- Pill box reminder
- Mail sorter baskets
- Posted instruction on appliance
- Color coding files

Low-tech/multifunction:
- Post-It notes
- Checklists
- Appointment calendars
- Voicemail

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External Cognitive Aids

High-tech/multifunction
- Smart phone

Matching Person and Technology Assessment (Scherer, 2003)

Compensation Techniques Inventory (https://www.guilford.com/add/forms/sohlberg3.pdf)

Identify:
- Need(s)
- Cognitive impairment
- History of aid use
- Environmental factors

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Training External Cognitive Aids

Teach the mechanics of using the aid

Organize the supports to use the aid in context

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Medication Apps/Devices

- Medisafe Medication Reminder (free)
- Tabtime Vibe Vibrating Pill Timer Reminder
- Med Minder
- Mango Health
- MyMeds Medication Management (free)
- Dosecast Medication Reminder (free)
- Pillboxie

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Memory/Cognitive Apps

Spaced Retrieval Therapy
Google Keep (memo app syncs across devices; can add pictures, voice, or text notes –free!)
It's Done! (list of daily tasks)
CanPlan (breaks down tasks into steps)
Qcard (designed by/for brain injury to track appointments, guided tasks, and reminders)
Speak Today (reads calendar events aloud)
Bring! (visual grocery shopping app)

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Training the Use of Metacognitive Strategies

- Monitor our own thoughts
- Use that information to make changes that improve our thinking and behavior

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General Metacognitive Strategies

- Metacognitive Strategy Instruction (MSI; Kennedy et al., 2008)
  - Identify goal
  - Anticipate what they need to do to reach goal
  - Identify possible solutions to challenges
  - Self-monitor and evaluate progress
  - Modify behavior if not making progress

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Strategies to Enhance Learning New Declarative Information

- Elaboration
- Visualization
- Creating mnemonics

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Task-Specific Metacognitive Strategies

DEFINE TASK AND CONTEXT

IDENTIFY PROCESS THAT REDUCES BARRIERS FROM THE COGNITIVE IMPAIRMENT

IMAGE-NAME MATCH METHOD: REMEMBER PEOPLE'S NAMES –

- Identify distinguishing feature
- Generate a keyword that represents a concrete object for the name
- Convert the keyword to a mental image
- Visualize the face with the prominent feature enlarged with the name's image on top of the enlarged feature

TRAVELING TO NEW PLACES

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Treatment Dosage

High-intensity treatments in sub-acute or chronic stage post-onset are most effective (Sohlberg & Turkstra, 2011)

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Delivery Models

- Care providers can be effective trainers (Campbell et al., 2007)
- Group intervention for memory strategies (Troyer et al., 2008)
- Telehealth

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Conclusions

Treatment doesn't have to be either restorative or compensatory

- If it is restorative, make it *functional* and *meaningful*

Comprehensive, holistic therapy is best (Swirsky-Sacchetti & Rider, 2018)

- Address the whole person and picture

Begin with the end in mind

Individualize therapy programs and try multiple strategies

Collaborate with the client to create a program for their lifestyle

Use the client's existing technology and strategies

Provide clear, ongoing instructions and feedback about therapy performance and progress

- Written or visual goal logs

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Case: Dave – (Sohlberg & Turkstra, 2011)

- 22-year-old college student
- Severe TBI in a motorcycle accident – bilateral frontal lobe lesions; 1 year post-injury
- Previously gifted student; now moderate declarative memory impairment and severe executive dysfunction, with impairments in attention, organization, inhibition, and identification of relevant material
- Poor awareness of cognitive and behavior problems initially; but good general awareness of strengths and limitations
- Motivated to return to school; change from history to psychology major; motivated to engage in ST only if immediately applicable (no delayed gratification)
- Taking an introductory psychology course
- Difficulty remembering to attend ST sessions and other appointments
- Teacher very organized and provides handouts and notes

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Case: Dave

- What intervention approach(es) would benefit him?
- What immediate supports does he need?
- How will you measure progress?
- How will you measure generalization?
- How will you measure maintenance?

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Case: Rita

- 57-year-old; works in Social Security office
- CVA in RH frontal lobe; 3 months post injury
- Highly motivated and wants to be independent
- Difficulty with EF: organization, planning, and sequencing
- Deficits in declarative memory and initiation
- Motivated to return to work:
  - Interview
  - Typing
  - Filing
  - Procedures
  - Multi-tasking

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Case: Rita

- What intervention approach(es) would benefit her?
- What immediate supports does she need?
- How will you measure progress?
- How will you measure generalization?
- How will you measure maintenance?

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