Maximizing Skill Development in Cognitively Impaired Patients

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Preview

• How we make new memories.
• Cognitive and memory impairment
  – What’s affected?
  – What’s not?
  – The importance of attention
• Improving attention and awareness
• Executive functioning
  – Risk factors
  – Falls
• Dual task training

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The Human Capacity to Learn

• Atkinson and Shiffrin (1968) asked participants to listen to a list of 20 words and then immediately write them down, in any order.
• What would a graph look like if we graphed the percentage of words recalled as a function of their position in the original reading?
• Would people recall the first words best? The middle words? Or, the last words?

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• The last words were recalled at a higher rate because they were still in short-term memory.
• The first words were also recalled at a high rate because they were rehearsed more. The words at the beginning of the list actually made it into long-term memory.
• The dip in the middle is due to:
  – Increased distracters
  – Lack of cognitive resources
  – Lack of rehearsal
The Human Capacity to Learn

• So how do we get information from short term memory into long term memory?
• Rehearsal, rehearsal, rehearsal….

The Human Capacity to Learn

• How much new information can someone attend to at one time?
• How many instructions can a patient remember at one time?
• The answers to the above questions depend on one’s short term or working memory capacity.
The Human Capacity to Learn

- Miller (1956) estimated that adults can hold about seven digits, plus or minus two, in their short term memory.
- The capacity of short-term memory is related to intelligence and ability to learn and comprehend instructions.

Short-term or Working Memory is Like a Bookshelf

- Many older adults (and some TBI patients) experience a reduction in their short term memory capacity. In addition, complex information further reduces the capacity.
- Miller had participants recall simple lists of numbers, whereas you are probably asking patients to hold onto much more complex information.
Video Example

• How many instructions is this patient getting? Can you count all of them?

Ways to Maximize Treatment Efficacy

• Recommendations
  1. Keep instructions and feedback within the capacity of STM.
  2. Recognize STM deficits as they will dramatically affect patients’ ability to remember and use information.
  3. Try assessing STM capacity.

Ways to Measure Short-term or Working Memory

• You can assess STM capacity by using one of two items from the Mini Mental State Exam. Either have the patient count backwards by sevens from one hundred or have them spell “world” forwards and backwards. In addition, therapists can assess the number of digits someone can repeat back after a 5 second delay. The average is about seven.
Three Types of Memory

- Procedural memory or motor learning
- Semantic memory or "encyclopedic knowledge"
- Episodic memory or "autobiographical memory"
There is a very predictable order of loss.

• First episodic is lost
• Then semantic is lost
• Finally, in some cases, procedural memories are lost

Dissociation between implicit/explicit memory

• People with dementia and/or traumatic brain injury (TBI) can learn implicitly. Or, in other words, they can make new procedural memories.

• HM: mirror drawing figures
Rehabilitating Procedural Memory

"what we think we know..."

- Errorless learning in AD (Clare et al., 2002)
- Preserved Procedural in TBI (Ward et al., 2002)
- Preserved Procedural in AD (DeVreese et al., 2002)
- Preserved Procedural in MS (Seinela et al., 2002)
- Patients with anomia can learn new words (Fillingham et al., 2006)

Any Memory Failure Can Be Attributed to One of the Three Memory Processes

- Encoding
- Storage
- Retrieval
Common Question
Why can grandma recall poetry that she learned when she was 8 years old, but not her phone number?

Take advantage of existing procedural memories.
- Procedural learning is preserved in most TBI cases and patients with neurodegenerative diseases.
- Is the task already represented with procedural memories?
- Take advantage of existing procedural memories.
  - Observe and analyze approach to task
  - Use the existing skills as a starting place

Barriers to New Learning
- Many problems associated with aging and an impaired ability to be attentive and learn new information can be linked to the frontal lobes.
- Frontal lobes help people attend to what is important and ignore irrelevant stimuli.
- An inability to ignore irrelevant stimuli will further reduce cognitive resources (e.g., patient with frontal lobe damage, normal aging or ADD).
Barriers to New Learning

- **Frontal Lobe Functions**
  - Inhibition - prevents us from just responding to the environment, rather than executing plans.
  - Attention
  - Planning
  - Problem solving
  - Regulate social behavior (related to inhibition)
  - Short term memory
  - Executes motor behavior

Frontal Lobe Hypothesis

- Older adults often have impaired frontal lobe functioning, which can lead to a myriad of cognitive difficulties.
  - Information overload?
  - Frontal lobes inhibit thoughts and behavior.
  - Levels of processing

Frontal lobes, attention, and memory

- Odd Question:
Frontal lobes, attention, and memory

- Not all rehearsal and practice is the same because attentional resources vary.
- Levels of processing matters (Craik & Lockhart, 1972) and is related to attention.

- Older adults’ ability to use their attentional resources can be increased if they are asked to make a decision about the material (e.g., is each of the following words concrete or abstract?).
- Logan et al. (2002) found that older adults activated more of their frontal lobes and remembered more information.
- The above task may be similar to asking patients to judge their past, current, or future performance.
Increase Attention and Learning

- Group therapy sessions can dramatically improve patients' attention, memory, and learning.
  - They can “teach” each other
  - They may be more invested
  - Dishabituation - a change in the environment usually leads to increased attention

Helping Patients Process Information at a Deeper Level: Generation Effect

- The generation effect refers to an enhanced ability to remember information that is self-generated compared with material that is passively presented.
- Generating information helps activate the frontal lobes and enhances recall. In addition, generation may lead to greater attention and interest, which can also improve memory performance. (Taconnet & Isingrini, 2004)
- Recent research found that patients with mild dementia and memory impairment related to MS benefited from self-generating information (Basso et al., 2008)
- By having patients generate solutions to problems they will be more likely to remember the correct behavior.

How can you help patients process information at a deeper level?

- Predictions
- Postdictions
- Retention testing that is announced beforehand
- Mental imagery
- Teaching others, group therapy
- Generation effect (use systematic cuing strategy)
- Be aware of hearing deficits
Frontal Lobe Impairment and Inhibition

• Patients with frontal lobe impairment often have difficulties inhibiting certain behaviors.
  – This is more common for automatized or procedural memories (e.g. crossing legs after THR).

Frontal Lobe Impairment and Inhibition

• An extreme example of what happens with frontal lobe impairment can be seen in people with Antisocial Personality Disorder (formerly known as “psychopaths”)

Normal Brain  APD

Frontal lobes: Impulse control problems

• What behaviors do geriatric, demented and TBI patients have a difficult time inhibiting?
• Hint: many times these behaviors are automatized or procedural (i.e., they have been done many times)
Frontal lobes: Impulse control problems

- Postural tendencies: lifting, crossing legs (THR)
- Waiting for all of the instructions
- Shoveling food
- Not cutting up food in small enough pieces
- Getting up with no one around or without device
- Bending over
- Hurrying to the bathroom
- Premorbid gait deviations
- Inappropriate social behavior
- Inappropriate laughter

Frontal lobes: Impulse control problems

- Saying answers before the right time
- Getting started before all the instructions have been given
- Can’t stop working on the previous task
- Emotional perseveration
- Keep saying the wrong answer each time a certain question is asked
- Sexual or socially inappropriate behavior
- Off-target verbosity

Assessing Frontal Lobe Functioning

- Trail Making Test
- Off-target verbosity
Trail Making Test

- The trail making test assesses patients' level of attention, concentration, resistance to distraction, and cognitive flexibility (i.e., executive and frontal lobe functioning).
Off-target Verbosity

- A lack of inhibition can be seen in speech patterns. Off-target verbosity is characterized by speech that lacks focus and coherence.

On-target Verbosity

In response to the question, “How much education did you get?”, an on-target response would be:

“I finished high school and then a bit of college.”
Off-target Verbosity

An off-target response would be:

“Well, let’s see. I went to school in _____ where, uh, uh, I grew up in __________. Back in those days, why, they didn’t have the big high schools that they have now. When I went back there a few years ago in... uh, I don’t remember exactly when it was. I think it was the summer of 1980 or maybe it was 1981. I went for my brother’s 50th anniversary and I didn’t recognize the place at all. We went to a small school, the only school in town. It was the only place to go. All the children were in one room. The school only went to grade 9 or uh, uh, I think it was... was it grade 9? No, it was only grade 8 because _____(neighbor’s daughter) left to go to nursing school and she had to go to ______ to finish Grade 9. She never finished nursing anyway. She got married but it didn’t last long.”

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Recommendations for Patients with Frontal Lobe Impairment

• Recommendations
  – Recognize the limits of attentional capacities
  – Recognize the effects of distracters (in the clinic and in the home)
  – Recognize the difficulty patients will have inhibiting old behaviors (i.e., getting out of a chair without a walking aid)
  – Meet with patients while they are at their peak circadian arousal
  – Assess frontal lobe ability

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More Recommendations for Patients with Frontal Lobe Impairment

• Recommendations
  – Capture interest
  – Use reality-based tasks (practice is more meaningful and pertinent)
  – Teach self-monitoring of distractibility and the functional relevance
  – Challenge with dual and multi-tasks to make the primary task automatic

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Decreases in Executive Functioning is Associated with Increased Fall Risk

- Cognitive flexibility and response inhibition is related to balance and mobility in people who had strokes more than a year earlier (Liu-Ambrose et al., 2006).

- Older adults ability to complete the Trail Making Test predicts their walking speed on a 7 meter course (Ble et al., 2005).
- Dual tasking situations seem to pose the greatest difficulty in mobility tasks.

- Impaired cognition and attention may also affect:
  - balance (Dault et al., 2001; Maki et al., 2001)
  - gait (Holzer et al., 2006; Ble et al., 2005)
  - anticipatory postural adjustment (DiFabio et al., 2004; Persad et al., 1995)
  - reactive postural responses (Brauer et al., 2001)
What are risk factors for impairments in executive functioning and attention?

- **Traumatic Brain Injury** - Attention problems (e.g., focused, sustained, & divided) are some of the most common cognitive symptoms among TBI patients.
  - Many moderate to severe TBI patients report attention problems, even two years after injury
  - TBI is associated with greater difficulties in goal-directed behaviors that require sustained attention and inhibition as compared to stimulus driven behaviors (Kim et al., 2005).

- **Parkinson’s disease (PD)** is associated with attention and memory problems.
  - PD patients have difficulty inhibiting attention from distracting stimuli (Deijen et al., 2006)
  - PD is associated with being “disorganized because of a lack of planning and concentration” (Poliakoff et al., 2008)
  - PD is associated with lower levels of dopamine in the basal ganglia and in the dorsolateral prefrontal cortex, which is involved with attention

- **Depression** - Depression impairs attention (selective & sustained) and inhibition (Cui et al., 2006; Lockwood et al., 2002)
  - Severity of depression is correlated with the severity of executive deficits
  - Executive functioning deficits persist in older adults who achieved remission after pharmacological treatment
  - Depression-executive dysfunction syndrome
What are risk factors for impairments in executive functioning and attention?

• Alzheimer’s disease and Mild Cognitive Impairment are both associated with decreases in attention and executive functioning (Levinoff et al., 2005).

• Strokes
• Lack of cognitive stimulation

Dual Task Training
Dual Task Training

• “Slower walking speed while counting backward was associated with recurrent falls, suggesting that changes in gait performance while dual tasking might be an inexpensive way of identifying frail older adults prone to falling.” (Beauchet et al., 2008)
• Moreover, let’s improve people’s ability to dual task and thereby possibly decrease the chance of future falls.

<table>
<thead>
<tr>
<th>Mobility</th>
<th>Manual</th>
<th>Cognitive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking</td>
<td>Carry water</td>
<td>Remember fact/word/sentence during mobility</td>
</tr>
<tr>
<td>Walking with eyes closed</td>
<td>Pour water</td>
<td>Read from a magazine or phonebook.</td>
</tr>
<tr>
<td>Walking up stairs</td>
<td>Pull things out of a bag</td>
<td>Environmental object recognition</td>
</tr>
<tr>
<td>Walking on uneven surfaces</td>
<td>Turn pages of a magazine</td>
<td>Say the alphabet backwards</td>
</tr>
<tr>
<td>Avoiding obstacles in the world</td>
<td>Dial a phone</td>
<td>Remember a phone number, recite</td>
</tr>
<tr>
<td>Walking backwards to sit down</td>
<td>Write a note</td>
<td>Hold a conversation, keep eye contact</td>
</tr>
<tr>
<td>Getting out of chair on incline footing</td>
<td>Blow your nose</td>
<td>Generate words (verbs, nouns, A-Z)</td>
</tr>
<tr>
<td>Sit out of chair rapidly</td>
<td>'Put a shirt</td>
<td>Count backwards by sevens</td>
</tr>
<tr>
<td>Propel a wheelchair</td>
<td>Thread a belt</td>
<td>Think of things you need to do this month</td>
</tr>
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<td>Drink a beverage</td>
<td>Remember a phone number, route</td>
</tr>
<tr>
<td>Getting out of chair on incline</td>
<td>Blow your nose</td>
<td>Initiate a conversation, keep eye contact</td>
</tr>
<tr>
<td>Get inside a chair rapidly</td>
<td>Shout a shout</td>
<td>Generate words (verbs, nouns, A-Z)</td>
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**Train Your Brain: How to Maximize Memory Ability in Older Adulthood**

Train Your Brain was written to provide older adults, and the people who work with them, with practical and scientifically based suggestions and interventions on how to maintain and even improve memory ability. Most chapters begin with research summaries, followed by practical suggestions for taking advantage of the identified factors that affect memory. This book is an excellent resource for anyone interested in maintaining memory ability.

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