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# Errorless Learning: Skills & Knowledge to Address Cognitive Impairment

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## Course Presenter



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## Course Objectives

- ▶ After this course, the participant will be able to explain the role of memory in the teaching and learning process of occupational therapy evaluation and intervention.
- ▶ After this course, the participant will be able to describe the underlying theory and evidence supporting the use of errorless learning as part of the occupational therapy process.
- ▶ After this course, the participant will be able to describe how to use errorless learning to design evidence-based occupational therapy intervention plans.

## Introduction

- ▶ Cognition is an important part of everyday life
  - ▶ Provides individuals with the opportunity to engage in meaningful and valuable occupations
  - ▶ Facilitates opportunities for adaptation and development across the lifespan

(American Occupational Therapy Association [AOTA], 2013)



# Cognitive Function

- ▶ Information-processing
- ▶ Attention
- ▶ Memory
- ▶ Executive functioning
- ▶ Mathematical abilities
- ▶ Speech and language function
- ▶ Visual perception
- ▶ Praxis and motor planning

(AOTA, 2013; Gillen et al., 2015)



# Cognitive Dysfunction

- ▶ Impairment in cognition
  - ▶ Attention
  - ▶ Information processing
  - ▶ Memory
  - ▶ Executive function
  - ▶ Mathematical abilities
  - ▶ Speech and language function
  - ▶ Visual perception
  - ▶ Praxis and motor planning

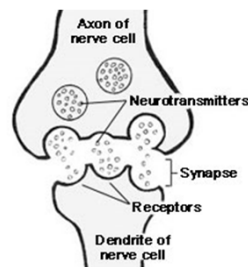
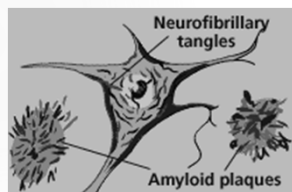


(AOTA, 2013, p. S10)

## Etiology of Cognitive Dysfunction

- ▶ Dementia
- ▶ Multiple sclerosis
- ▶ Stroke
- ▶ Traumatic brain injury
- ▶ Neoplasm
- ▶ Developmental disability
- ▶ Schizophrenia
- ▶ Bipolar disorder
- ▶ Substance abuse disorders
- ▶ Parkinson's disease

(AOTA, 2013, p. S10)



## Cognitive Dysfunction Conundrum

- ▶ Severity
- ▶ Progression
- ▶ Specificity

(AOTA, 2013)



## Cognitive Dysfunction and the Occupational Therapy Plan of Care

- ▶ Referrals to increase occupational performance
- ▶ Occupational therapy process full of teaching and learning
- ▶ Impairments impede memory, learning, and problem-solving
- ▶ Challenged to improve outcomes and provide evidence-based care
  - ▶ Third-party reimbursement
  - ▶ Medicare Part B and G-codes
  - ▶ Patient Protection and Affordable Care Act

(Crowe & Gabriel, 2013; Leland, Crum, Phipps, Roberts, & Gage, 2015; Mroz, Pitonyak, Fogelberg, & Leland, 2015)

## Structured Teaching and Learning Strategies

- ▶ Recent evidence suggests that structured teaching and learning strategies, such as errorless learning, may improve occupational performance outcomes for clients with cognitive impairment

(Clare & Jones, 2008; Crowe & Gabriel, 2013; Haslam, Hodder, & Yates, 2011)

- ▶ Teaching and learning is based on memory

**LEARN**  
TEACH

# Review of Memory

THE BASIS OF ERRORLESS LEARNING FOR INDIVIDUALS WITH COGNITIVE IMPAIRMENT

## Definition of Terms

### Memory

- Process of encoding, storing and retrieving information

(Clare & Woods, 2003)

### Learning

- Activation of the memory system and other cognitive processes to help attain new knowledge and skills

# Memory Process

- ▶ Encoding
  - ▶ Receive information by sensory systems
  - ▶ Make sense of the information
  - ▶ Categorize it or make associations
- ▶ Storing
  - ▶ Store information in brain and memory
    - ▶ Various memory structures in the brain
    - ▶ Based on the associations and categorizations that are made
- ▶ Retrieving
  - ▶ Accessing and using information



(Crowe & Gabriel, 2013)

# Memory Systems

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>▶ Short-term memory               <ul style="list-style-type: none"> <li>▶ Temporary memory system used in every day tasks</li> <li>▶ Short-term storage and retrieval<br/>(Poirier, Saint-Aubin, Mair, Tehan, &amp; Tolan, 2015)</li> </ul> </li> <li>▶ Long-term memory               <ul style="list-style-type: none"> <li>▶ Accumulated memory across the lifespan</li> <li>▶ Made up of many different memory systems</li> </ul> </li> <li>▶ Semantic memory               <ul style="list-style-type: none"> <li>▶ Knowledge of definitions and facts<br/>(Oren, Willerton, &amp; Small, 2014)</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>▶ Episodic memory               <ul style="list-style-type: none"> <li>▶ Information about events and episodes in the past<br/>(Tulving, 2002)</li> </ul> </li> <li>▶ Procedural memory               <ul style="list-style-type: none"> <li>▶ Knowledge of sequences, procedures, and tasks<br/>(Oren et al., 2014)</li> </ul> </li> <li>▶ Prospective memory               <ul style="list-style-type: none"> <li>▶ Remembering to do something in the future<br/>(Oren et al., 2014)</li> </ul> </li> <li>▶ Working memory               <ul style="list-style-type: none"> <li>▶ Ability to store and use information at the same time<br/>(Riley, 2009, p. 181)</li> </ul> </li> </ul> |
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## Use of Memories in Everyday Tasks

### Implicit Processing

- ▶ Unconscious effort
- ▶ Automatic retrieval and use of memory
- ▶ Semantic and procedural memory

### Explicit Processing

- ▶ Conscious effort
- ▶ Increased cognitive processing and use of multiple systems to use memory for task performance
- ▶ Short-term, episodic, prospective and working memory

(Crowe & Gabriel, 2013; Riley, Sotiriou, & Jaspal, 2004)

## Impact of Memory on the Teaching and Learning Process

- ▶ Individuals learn by using memory
- ▶ Processing of memory and the use of various memory systems can influence how individuals learn

(Crowe & Gabriel, 2013)

- ▶ Implicit processing, procedural memory, and semantic memory generally more efficient in those with cognitive impairment due to residual skills

(Crowe & Gabriel, 2013)

- ▶ Use these processes to promote learning and improved occupational performance

(Crowe & Gabriel, 2013)

# Errorless Learning

SKILLS AND KNOWLEDGE TO PROMOTE IMPROVED OUTCOMES

## Introduction to Errorless Learning

- ▶ Teaching and learning strategy whereby errors are prevented during the learning process
- ▶ Characterized by
  - ▶ Environment set-up to reduce errors
  - ▶ Teach by modeling and cueing
  - ▶ Prevent random guessing or performance
  - ▶ Fade cues and prompts to promote recall

(Cohen, Ylvisaker, Hamilton, Kemp, & Claiman, 2010, p. 356)

## Errorless Learning

- ▶ Uses implicit processing
- ▶ Optimizes residual cognitive abilities and skills
  - ▶ Procedural and semantic memory
- ▶ Impacts individuals with moderate to severe cognitive impairment and memory deficits

(Crowe & Gabriel, 2013; Kern & Reddy, 2014)

## Errorless Learning versus Trial-and-Error Learning

### Errorless Learning

- ▶ Errors are not completed during the learning process
- ▶ Individuals are not encouraged to process errors if they indeed occur
- ▶ Good for individuals with moderate to severe cognitive impairment

### Trial-and-Error Learning

- ▶ Errors are completed during task performance
- ▶ Individuals are encouraged to process errors and problem-solve correct performance
- ▶ Best for individuals with intact to minimally impaired cognitive impairment

(Kern & Reddy, 2014)

## Procedures and Protocols for Errorless Learning

- ▶ No standard protocol for errorless learning
- ▶ Many different types and strategies described in the literature
- ▶ All have the same features and concepts
  - ▶ Provide optimal support during the learning process—achieve the “just right challenge”
  - ▶ Eliminate or minimize the occurrence of errors
  - ▶ Scaffold, cue, and grade
  - ▶ Reduce prompts as success is achieved
  - ▶ Training starts with the activity analysis and breakdown in performance

(Crowe & Gabriel, 2013)

## Procedures for Errorless Learning

- ▶ Backward Chaining Approach
  - ▶ Teaching procedures and tasks in the reverse order in which they are typically performed
  - ▶ Individuals must master each step before learning the next sequence of the task
  - ▶ Provide cues using verbal, visual, and tactile prompting
  - ▶ Fade prompts and cues as success is attained
  - ▶ Minimizes errors in the learning process

(Caffó et al., 2014; Rayner, 2011)

## Procedures for Errorless Learning

- ▶ Vanishing Cues Approach
  - ▶ Perform activity analysis
  - ▶ Start at the area of breakdown
  - ▶ Initiate teaching
  - ▶ Give the client the correct answer or sequence of the task
  - ▶ Have the client repeat the answer or perform the sequence of the task
  - ▶ Guide the client by prompting, cueing, and providing contextual support
  - ▶ Repeat sessions and sequences
  - ▶ Reduce prompts, cues, and contextual support over time as success is achieved

(Crowe & Gabriel, 2013, p. 259)

## Procedures for Errorless Learning

- ▶ Modeling Approach
  - ▶ Perform task analysis and identify area of breakdown in successful task performance
  - ▶ Demonstrate the task
  - ▶ Ask the individual to repeat performance of the task after the therapist's demonstration
  - ▶ Provide support to avoid errors during performance of the task—cues, prompts, and contextual support
  - ▶ Avoid guessing and trial-and-error processing of information
  - ▶ Repeat task
  - ▶ Fade prompts and cues over time

(Crowe & Gabriel, 2013, p. 260)

## Review of the Evidence Supporting Errorless Learning

- ▶ Stroke
  - ▶ Ferland, Larent, Rowland, & Davidson (2013)
    - ▶ Case study approach using EL to teach self-care and diabetic management routines in the home to a young female post hemorrhagic stroke
    - ▶ Successful in training self-care and diabetic management routines with consistency in care and approach to return client to home

## Review of the Evidence Supporting Errorless Learning

- ▶ Brain Injury
  - ▶ Kelly & Nikopoulos (2010)
    - ▶ Case series for two gentlemen post traumatic brain injury
    - ▶ Errorless learning to train basic self-care tasks; different tasks for each case
    - ▶ 30 minute sessions, 2-3 x/day, 2 weeks

## Review of the Evidence Supporting Errorless Learning

- ▶ Dementia
  - ▶ Dechamps et al. (2011)
    - ▶ 14 participants with dementia in 2 nursing home
    - ▶ Taught how to use an umbrella, make tea, use a cell phone
    - ▶ Six, thirty-minute sessions

## Review of the Evidence Supporting Errorless Learning

- ▶ Schizophrenia
  - ▶ Kern & Reddy (2014)
    - ▶ Teaching entry-level work tasks in one, forty-five to fifty-five minute group session with 2-4 participants
    - ▶ Teaching social-problem solving ability in groups with 6-8 participants; 2, 3-hour sessions over 2 days
    - ▶ Community work training with the use of errorless learning to train job skills; 87% percent success rate with errorless learning compared to 56% success rate with trial-and-error learning

## Review of the Evidence Supporting Errorless Learning

- ▶ Autism
  - ▶ Rayner (2011)
    - ▶ Case series to teach three boys with autism how to tie shoelaces
    - ▶ Compared backward chaining to video prompting
    - ▶ Backward chaining was more efficient and effective
    - ▶ Participants attained more steps

## Current Research

- ▶ Research is focused in areas of speech and language pathology, neuropsychology, and gerontology
  - ▶ Quality of research has varied
- ▶ Limited research in occupational therapy
  - ▶ Traumatic brain injury and dyspraxia
- ▶ Studies need to be carefully designed
  - ▶ Need to control for confounding variables
  - ▶ Use outcome measures for ADL
- ▶ Collaborative research projects with other disciplines

(Crowe & Gabriel, 2013)

## Implications for Occupational Therapy Practice

- ▶ Analyze the client and the occupation
- ▶ Understand where is the breakdown in occupational performance
  - ▶ Initiation
  - ▶ Sequencing
  - ▶ Object use
  - ▶ Recall
  - ▶ Attention
  - ▶ Memory
- ▶ Training should focus on the breakdown of occupation performance



(Crowe & Gabriel, 2013)

## Implications for Occupational Therapy Practice

- ▶ Integrate errorless learning at the area of occupational breakdown
- ▶ Learning and use of techniques may be built into the occupation to facilitate complex learning
  - ▶ Start with smaller components
    - ▶ Learning time of dinner
  - ▶ Move to larger components after these are mastered
    - ▶ Going to the dining room for dinner



(Crowe & Gabriel, 2013)

## Implications for Occupational Therapy Practice

### ADL Independence

- ▶ Improve sequencing of ADL
- ▶ Improve use of external memory aid or adaptive equipment during ADL
- ▶ Recall items needed for ADL
- ▶ Improve routine compliance

### Quality of Life

- ▶ Improve autonomy in ADL routines
- ▶ Improve independence in socialization
- ▶ Decrease dependence on caregivers
- ▶ Improve occupational competency and mastery
- ▶ Improve self-esteem

(Crowe & Gabriel, 2013)

## Implications for Occupational Therapy Practice

### Fall Risk Factors

- ▶ Increase walker use
- ▶ Increase recall of safe transfer techniques
- ▶ Decrease wandering
- ▶ Improve recall of weight-bearing or total hip precautions

### Caregiver Burden

- ▶ Increase independence in ADL
- ▶ Decrease wandering
- ▶ Decrease repetitive questioning
- ▶ Improve medication compliance

(Crowe & Gabriel, 2013)

## Case Application of Errorless Learning: Mr. Smith

- ▶ **Alzheimer's Dementia:** Mr. Smith is a 78 year-old long-term care resident of a skilled nursing facility. He has a diagnosis of Alzheimer's dementia with comorbidities of osteoarthritis, cardiomyopathy, hypertension, and diabetes. He was referred to skilled occupational therapy to promote improved performance in self-feeding occupations. Upon initial evaluation, Mr. Smith had a Modified Barthel Index score in feeding of 2 out of 10 indicating maximal assist with self-feeding. Mr. Smith required max cues to initiate, sequence, and terminate scooping of food. His Global Deterioration Scale score is a 6 indicating moderately severe dementia and severe cognitive decline.

## Case Application of Errorless Learning: Mr. Smith

- ▶ **Alzheimer's Dementia:** The occupational therapist chose a vanishing cues errorless learning approach to train Mr. Smith in initiation, sequencing, and termination of self-feeding occupations. Mr. Smith was seen for 30 minute treatment sessions. Initially the frequency was set at 5 times-a-week for 2 weeks. On week 3, Mr. Smith was seen 3 times-a-week, and on week 4, he was seen 2 times-a-week. Cues started with tactile, verbal, and visual and faded as Mr. Smith was successfully able to complete the task.

## Case Application of Errorless Learning: Mrs. Jones

- ▶ Stroke: Mrs. Jones is a 58 year-old female who is a client in a transitional care unit of a rehabilitation hospital. Mrs. Jones was admitted to rehabilitation status post fall with left hip fracture. She is toe-touch weight-bearing on the left lower extremity. In addition to this recent diagnosis, Mrs. Jones experienced a stroke one year ago and has residual moderate cognitive deficits. These deficits significantly impact Mrs. Jones's ability to integrate weight-bearing recommendations into functional transfers and activities of daily living. Upon admission to the transitional care unit, she scored a 2 on the Functional Independence Measure for toileting, lower body dressing, tub transfers, and toilet transfers, indicating maximal assist in these areas. Prior to her fall and hip fracture, Mrs. Jones was modified independent or a 6 in these areas, requiring increased time.

## Case Application of Errorless Learning: Mrs. Jones

- ▶ Stroke: The occupational therapist chose the modeling approach to errorless learning to teach Mrs. Jones how to use a walker and maintain weight-bearing precautions during dressing, toileting, and transfer tasks. Mrs. Jones was seen twice a day for 30 minute sessions over a twenty day period. With repetition and practice, Mrs. Jones was able to discharge to home with a walker and scores of 5 indicating supervision was needed for lower body dressing, toileting, toilet transfers, and tub transfers. This enabled Mrs. Jones to go home with supervision rather than discharge to a skilled nursing facility.

## Summary

- ▶ Errorless learning and structured teaching strategies can improve occupational performance outcomes for individuals with cognitive impairment
- ▶ Be mindful of how treatment sessions are structured and tap into residual skills and abilities
- ▶ Provide support, fade prompts, and increase repetition
- ▶ Further evidence is needed examining the efficacy of errorless learning as part of the occupational therapy plan of care

## Q and A



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