Cognitive Changes in Older Adults, Part 1: Differentiating Types

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Cognitive Changes in Older Adults, Part 1: Differentiating Types

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Session Description

Part 1 of 2. In working with older adults, home health physical therapists will invariably encounter memory issues. The ability of physical therapists to have an impact on individuals with dementia is often questioned, potentially affecting both referrals and care. In order to provide effective care for our patients, it is imperative that we have an understanding of and can differentiate among the different types of cognitive changes affecting our patients. Part 1 will focus on the different types of cognitive changes typically seen in older adults, how to differentiate among them, and options available to the physical therapist for assessing cognition, managing behaviors and maximizing the effectiveness of PT interventions with this population.
Session Learning Objectives

1. Identify cognitive changes that occur due to typical aging.
2. Differentiate among pathological cognitive changes often seen in older adults.
3. Discuss the role of the physical therapist in the care of the older adult with cognitive changes.
4. Differentiate among options for assessing cognition available to the physical therapist.

NORMAL AGE-RELATED CHANGES

- Physiological
  - Overall decrease in brain size and weight
  - General slowing of electrical activity in brain
  - Changes in regional blood flow
  - Some changes in neurons/dendrites
  - Functional impact
    - Motor coordination/falls
    - Cognitive functioning
NORMAL CHANGES (cont’d.)

• Deficits in integrative behavior
  – Judgment
  – Perception
  – “Stick-to-it-iveness”
  – Creativity

NORMAL CHANGES (cont’d.)

• Difficulty performing under stress/managing stress
  – Social
  – Physiological

NORMAL CHANGES (cont’d.)

• Decreased STM
  – Usually able to recall with cueing or other stimulus
  – “Recognition memory”

• Dementia is not a feature of normal aging
DELERIUM

• DEFINITION
  – Acute onset of confusion, usually related to toxic or metabolic derangement; usually reversible

DELIRIUM (cont’d.)

• CHARACTERISTICS
  – Confusion
  – Restlessness
  – Agitation
  – Poor attention span
  – Reversed night-day cycle
  – Hallucinations
  – Paranoia
DELIRIUM (cont’d.)

• CAUSES
  – Metabolic disruption
    • Hypoglycemia, renal failure, hypoxia, ...
  – Infection
    • UTI, pneumonia, ...
  – Toxicity/drugs
    • ETOH, Digoxin, OTC sleep/cold/allergy meds., anti-hypertensives, ...

DELIRIUM (cont’d.)

• TREATMENT
  – Identify and treat underlying cause (ex., cause = hypovolemia, Rx = rehydration)
  – Usually returns to baseline, however prognosis is variable depending on cause

• P.T. INTERVENTION
  – Usually none due to acute nature; P.T. may be on hold during identification and Rx of delirium

MILD COGNITIVE IMPAIRMENT (MCI)
MCI – OVERVIEW

• Represents a cognitive decline that is:
  – Greater than changes noted with typical aging
  – Not quite dementia
• Consensus lacking on definition and mgt.
• Often noted by the individual
• Possibly noted by those around individual
• May be reversible
  – Depression
  – Medication side effects
  – May reverse w/o intervention
  – May recur and progress after apparent reversal

MCI – OVERVIEW (cont’d.)

• Prevalence
  – 10-20% of those >65 y/o
  – ~16% of those 70-89 y/o
• Prevalence related to dementia
  – Dementia in general population
    • 1-2% annually
  – Dementia in those identified with MCI
    • 5-10% annually
    • (Petersen, 2011)

MCI -- TYPES

AMNESTIC
- Single domain
- Multiple domains

NON-AMNESTIC
- Single domain
- Multiple domains
MCI – TYPES (cont’d.)

• AMNESTIC
  – Memory loss primary feature
  – Other cognitive functions may remain intact
    • If other functions remain intact – AMNESTIC SINGLE DOMAIN
    • If other functions affected – AMNESTIC MULTIPLE DOMAIN
  – Little impact on function
  – In clinical trial, 90% progress to pAD (cited in Bensadon and Odenheimer, 2013)
    • Men > women

MCI– TYPES (cont’d.)

• NON-AMNESTIC
  – Memory mostly intact
  – Declines in:
    • Language
    • Visuospatial skills
    • Attention
  – Decline in 1 area – NON-AMNESTIC – SINGLE DOMAIN
  – Decline in >1 area – NON-AMNESTIC – MULTIPLE DOMAINS
  – May be precursor to non-pAD dementia

MCI

• Diagnosis
  – Amnestic
    • History
      – Forgetting important dates, recent events
        » If interfering with function, suggests dementia
    • Testing
      – Short Test of Mental Status
      – Montreal Cognitive Assessment tool
      – MMSE not sensitive enough
      – Functional Activities Questionnaire can help differentiate MCI from dementia
      – MRI: possibly some hippocampal and general cerebral atrophy
MCI -- MANAGEMENT

- Medical
  - Currently none
    - Lack of success with medication possibly due to heterogeneity of patients
    - Monitor for progression to dementia, then treat type of dementia

MCI -- MANAGEMENT (cont’d.)

- Behavioral
  - Modifiable psychosocial factors appear to have protective role in cognitive level and rapidity of decline
  - Modify via counseling, social intervention
  - Linked to negative outcomes
    - Chronic conditions
    - Social isolation
  - Linked to positive outcomes, including general health benefits
    - Purpose in life
    - Social support, social circles

MCI -- MANAGEMENT (cont’d.)

- Cognitive – Three types
  - Cognitive stimulation
    - Broad goal of improving cognitive and social skills
    - Primarily used in LTC for residents with dementia
  - Cognitive training
    - Goal to maintain or improve cognitive functioning
    - Cognitive-task specific
      - Attention, memory, etc.
      - Transfers to “real life” activities?
  - Cognitive rehabilitation
    - Most common
    - Most amount of dedicated research
MCI – MANAGEMENT (cont’d.)

• Cognitive (cont’d.)
  – CR and CT primarily occur in memory centers/research
  – Evidence for improvement limited
  – Little evidence of carryover to day to day life
    • Possible due to measurement limitations
    • Appears to improve components related to processing and driving
  – Improvement in self-perception
    • Decrease depressive symptoms

MCI – MANAGEMENT (cont’d.)

• Self
  – Lifestyle
  – Nutrition
  – Exercise/physical fitness
    • Most effective: Combined strength, flexibility and cardiovascular training
  – Nutrition??

MCI – MANAGEMENT (cont’d.)

• Self – Lifestyle/Health management
  – Sleep apnea
  – Obesity
  – DM
  – Physical/mental exercise
  – Medication mgt.
MCI – MANAGEMENT (cont’d.)
• Physical Therapy
  – Consider adding cognitive test to examination
    • For consideration with Rx
    • Possible referral for further testing
  – Strong education (pt./family) component
    • Utilize memory aids
      – “Low-tech”
      – “Hi-tech”
    • Simplify tasks

MCI – MANAGEMENT (cont’d.)
• Physical Therapy
  – Treat deficits noted
    • Repetition
    • Engage family when possible
    • Encourage moderate exercise
    • Provide written instructions
      – Large print
      – Bold important information
      – ≤ 8th grade reading level
      – Drawings/photos when possible

ALZHEIMER’S DISEASE
ALZHEIMER’S DISEASE

• Definition
  – A progressive dementia, characterized by a slow decline in memory, language, visuospatial skills, personality, and cognition
  (Miller, et al, 1994)
  – Alzheimer’s disease is a progressive, degenerative disorder that attacks the brain's nerve cells, or neurons, resulting in loss of memory, thinking and language skills, and behavioral changes.
  (Alzheimer’s Foundation of America, 2016)

ALZHEIMER’S DISEASE

• Prevalence
  – One of the 2 most common dementias, along with multi-infarct dementia
  – 6th leading cause of death in US
  – Affects approximately 11% of adults over the age of 65
    • Est 5.1 million >65 y/o in 2015
  – Affects approximately 33% percent of adults over the age of 85
    • Number doubles every 5 yrs > 65 y/o
  – Females > Males

(sources: CDC, Alz. Assn., others)

ALZHEIMER’S DISEASE

• Etiology
  – Cause unknown
  – Relationship between genetics, abnormal processing of amyloid, and age
    • Prevalence increases with each decade
    • Possible abnormality of chromosome 21 (found in early onset of pAD), also 14 & 19
    • Progressive accumulation of neurofibrillary tangles
ALZHEIMER’S DISEASE

• Risk factors
  – Age
  – Family history
  – History of depression
  – Estrogen deficiency??
  – Lack of education
  • May relate to SES status

ALZHEIMER’S DISEASE

• Risk factors
  – Head trauma
  – Down’s Syndrome
  – History of ETOH

ALZHEIMER’S DISEASE

• Diagnosis
  – No definitive diagnosis in vivo
  • MRI, CT, r/o other causes
  • Imaging helpful generally in advanced stages
  • Autopsy
  – 85% - 95% accuracy when diagnosed using NINCDS/ADRDA criteria
ALZHEIMER’S DISEASE

• Criteria
  – Established dementia (cognitive/neuropsych. tests)
  – Sign. deficiencies in ≥ 2 areas of cognition
  – Progressive deterioration of memory and other cognitive functions
  – Onset from 40 - 90 (usu. after 65 yrs)
  – r/o other possible causes
    • Dx of exclusion

ALZHEIMER’S DISEASE

• Pathology
  – Cell death/cerebral atrophy
  – Progressive accumulation of neurofibrillary tangles among pyramidal cells
  – Destabilization of neuronal environment
    • Beta-amyloid
    • Apoptosis
    • Presence of certain proteins may increase abnormal changes

ALZHEIMER’S DISEASE

• Presence of certain proteins may increase abnormal changes
ALZHEIMER'S DISEASE


ALZHEIMER'S DISEASE

http://www.psyweb.com/Documents/00000003.jsp (accessed 1/12/16)

ALZHEIMER'S DISEASE


http://www.uccs.edu/biology-educational-resources/alzheimers-disease.html accessed 1/12/16
ALZHEIMER’S DISEASE
• Pathology
  – Impaired judgment may be related to changes in parietal/frontal lobes
  – Psychiatric disorders related to changes in parietal and limbic regions
  – Motor behaviors in late Dz process related to changes in processing at level of hypothalamus, and changes in multi. cortical projection systems

ALZHEIMER’S DISEASE
• Clinical Manifestations
  – Impaired higher functioning
  – Inability to learn new information
  – Impaired storage and retrieval (free recall)
  – Impaired recognition memory
  – Initially regresses to earlier period in life
  – Loss of “older” memories and events from early life

ALZHEIMER’S DISEASE
• Clinical Manifestations
  – Personality changes
    • Indifference
    • Egocentricity
    • Impulsivity
    • Irritability
ALZHEIMER’S DISEASE

• Clinical Manifestations
  – Language deficits
    • Difficulty with word-finding
    • Anomia
    • Diminished comprehension

ALZHEIMER’S DISEASE

• Clinical Manifestations (cont’d.)
  – Visuospatial deficits
    • Navigating environment, cooking, manipulating mechanical objects
    • Abnormal drawing -- lose ability to draw 3D objects
  – Mathematical/money handling problems
  – Disorders of sleeping, eating, and sexual behaviors
  – Occ’l periods of depressed moods

ALZHEIMER’S DISEASE

• Treatment
  – Currently none
  – Treat co-morbidities
    • Cognitive status may interfere
  – New medications may improve memory
    • Possible side effects
  – Control environment
  – Counsel family
ALZHEIMER'S DISEASE

• Prognosis
  – Initial stage, changes in cortical functioning noted
  – Middle stage, behavioral and motor deficits
  – Final stage, mute and unable to comprehend
ALZHEIMER’S DISEASE

• Prognosis
  – Nutritional status significantly declines
  – Death generally occurs within 7 - 11 years after diagnosis (range 2 - 25 years)
  – Death usually due to dehydration or infection

ALZHEIMER’S DISEASE

• P.T. Intervention
  – Although memory diminished, performance improves with therapy
  – Patient presents with generalized weakness
  – Incidence of falls increased
    • Postural reflexes decreased
    • Visual perception impaired
    • Movements stereotyped, rigid

ALZHEIMER’S DISEASE

• P.T. Intervention
  – Keep exercises simple
  – Use familiar, goal-oriented tasks
  – Use repetitive treatments, techniques
  – Be creative
    • Dolls, music/songs
    • History, picture books
ALZHEIMER’S DISEASE
• P.T. Intervention
  – Watch body language/facial expressions
  – Be aware of tone of voice
  – Use short, basic commands
  – Demonstrate
  – Change task/topic if no success
  – Use distraction when needed

ALZHEIMER’S DISEASE
• In general
  – Individual tends to get “stuck” in mid-teens to late-twenties (possibly into thirties)
  – Reality orientation vs. validation therapy
    • Early – Reality orientation
    • Later – Validation therapy

MULTI-INFARCT DEMENTIA/VASCULAR DEMENTIA
MULTI-INFARCT DEMENTIA

• Accounts for approximately 15% of all dementia
• May co-exist with pAD
• Due to multiple “mini-strokes” (TIA’s)
• Onset generally more rapid than pAD
• Somewhat treatable/preventable

MULTI-INFARCT DEMENTIA

• Diagnostic Criteria
  – Impairment in STM and LTM
  – Absence of delirium
  – Focal neurologic S-N-S
  – Stepwise deterioration with “patchy” deficits
  – Evidence of repeated strokes

MULTI-INFARCT DEMENTIA

• Diagnostic Criteria
  – Memory/intellectual impairments result in social/occupational disabilities
  – At least 1 of the following:
    • Impaired abstract thinking
    • Impaired judgment
    • Other disturbances of higher cortical functioning
    • Personality change
MULTI-INFARCT DEMENTIA

http://neurowiki2014.wikidot.com/individual:vad-nps accessed 1/12/16

- MID vs. pAD
  - Onset and course generally more rapid
  - Hx of CVD
    - HTN
    - PVD
    - DM
    - h/o stroke
  - Course less predictable than pAD
  - May have focal signs
MULTI-INFARCT DEMENTIA

• Medical Management
  – Usually treated with ASA
  • May use other anti-coagulants
  – May arrest progression of, or even temporarily improve, dementia
  – Prognosis essentially poor

MULTI-INFARCT DEMENTIA

• P.T. Intervention
  – Varies depending on presentation
  – Anecdotally, may find relatively good strength/ROM
  – Motor planning problems
  – Be consistent
  – Educate family
NPH
- Ventricles are enlarged while CSF pressure is normal
- Non-obstructive
- Typical “triad”:
  - Dementia
  - Gait disturbance
  - Urinary incontinence

NPH (cont’d.)
- No statistics available
  - Approx 2 to 20/million
- Adults ≥ 50 y/o fastest growing population with hydrocephalus
  - Better Dx
- Mimics pAD, PD, and other dementias

NPH (cont’d.)
- DIAGNOSIS
  - MRI
  - Lumbar puncture
- TREATMENT
  - Shunt placement
- PROGNOSIS
  - Variable, possible complete recovery of function
EXERCISE AND COGNITIVE CHANGES

PROBLEM

• Older adults with cognitive dysfunction:
  – have multiple physical and physiological changes as well
  – Are at greater risk of falling than cognitively intact counterparts
  – Are at greater risk of injury
  – Are less likely to return to baseline level of function

  (Marchetti and Whitney, 2006)

PROBLEM (McGough ET AL, 2011)

• Gait speed and executive functioning
  – 201 sedentary subjects with amnestic MCI (aMCI)
  • Executive function tested with
    – Trail-making test, part B
    – Stroop interference test
  • Gait speed
    – Usual pace for 8’
    – Fast pace for TUG
PROBLEM (McGOUGH ET AL, 2011; cont’d.)

• Results
  – Decreased executive functioning associated with decreased gait speed

**Decreased gait speed has been associated with increased risk of falls.

GEDA ET AL, 2010

• MCI and exercise
  – Population based case control study
  – Retrospective look at exercise level
  – Subjects
    • 198 with MCI (59% male), 1126 with normal cognition (50% male)
    • Stratified according to age
    • 70 - 79 y/o
    • 80 - 93 y/o
  – Moderate exercise in mid-life/late-life associated with decreased risk of developing MCI

FOSTER ET AL (2011) -- review

• MCI, AD and neural plasticity
  – Individuals w risk factors for dementia
    • Regular exercise protective against dementia/AD despite genetic pre-disposition for AD
    • In mice w genetic pre-disposition, marked plasticity in hippocampus specifically noted, along with improvement in cognitive tasks
FOSTER ET AL (2011) – review (cont’d.)

MCI, AD and neural plasticity
- 10-yr prospective study found decrease in bio-markers for AD in individuals participating in AHA recommended exercise
- Minimal change (decrease) in hippocampus
- Biomarkers indicate reversal of changes assoc. with AD in sedentary individuals who began training
  - Effects appear to be specific to hippocampus

FOSTER ET AL (2011) – review (cont’d.)

MCI, AD and plasticity
- Multiple (animal and human) studies demonstrate increase in BDNF in response to exercise
  - Role of BDNF unclear
    - Decrease in hippocampus assoc. with decrease in cognitive function
    - Strong association with hippocampal functioning
    - Mediates various neurotransmitters in various parts of brain
  - Animal studies show increase in capillary growth in response to exercise

FOSTER ET AL (2011) – review (cont’d.)

MCI, AD and plasticity
- “Insulin-like Growth Factor” (IGF-1) and β-endorphins assoc. w hippocampus and cognitive tasks; both increase in response to exercise
- Moderate exercise:
  - Decreases systemic inflammation
  - Boosts immunity
  - Decreases systemic cholesterol
HUUSKO ET AL (2000)

- Huusko et al, 2000
  - RCT, 238 subjects
  - Standard care vs. comprehensive geriatric rehabilitation
  - MMSE
    - Mild, moderate, severe dementia
    - Those with mild and moderate dementia in Rx group more likely to return to indep living than control group
      - At 3 month follow-up of those with moderate dementia, 63% in rehab group living independently vs 17% in control group
      - At 1 yr follow-up of those with moderate dementia, 66% in rehab group living independently vs 33% in control group

HUUSKO ET AL (2000)

- REHAB GROUP FOLLOW UP
  - Living indep at 3 mos:
    - 63% with moderate dementia
    - 91% with mild dementia
  - Living indep at 1 yr:
    - 66% with moderate dementia
    - 77% with mild dementia

- CONTROL GROUP FOLLOW UP
  - Living indep at 3 mos:
    - 17% with moderate dementia
    - 67% with mild dementia
  - Living indep at 1 yr:
    - 33% with moderate dementia
    - 76% with mild dementia

BLANKEVOORT ET AL (2010)

- Effects of physical activity on balance, mobility and ADLs in older adults w dementia
  - Systematic review
  - Screened 104 articles, included 16 studies

- Effects of physical activity on balance, mobility and ADLs in older adults w dementia (cont’d.)
  - Findings:
    - Physical activity beneficial in all stages of dementia
    - Multi-component interventions led to larger improvements in balance, gait speed, functional mobility
    - Progressive strength training only with less impact
    - LE strength improved in all types of resistive training
  - Only 4 studies used BADLs & endurance as outcomes
    - All multi-component interventions
    - Improvements noted

SUMMARY OF STUDIES

- MCI and dementia adversely affect motor function and performance
- Moderate exercise has been found to be protective against MCI and age-related dementias
- Exercise has been demonstrated to positively affect neuroplasticity of brain, especially in hippocampal area and functions
  - Animal studies
  - Some human studies

SUMMARY OF STUDIES (cont’d.)

- Moderate physical activity may reverse MCI
- Individuals with mild to moderate dementia demonstrate significant improvement in function and level of independence with comprehensive rehab following hip fracture
- Multicomponent interventions demonstrate improvement in LE strength, gait speed, balance, ADLs and mobility
COGNITIVE SCREENING TOOLS

GERIATRIC TOOL KIT

• Dementia screening (multiple)
• Pain assessment for individuals with dementia
• Depression screening
• Available at:
  http://geriatrictoolkit.missouri.edu/cog/

COGNITIVE SCREENING TOOLS

• Folstein Mini-Mental Status Exam
  – Poor sensitivity for MCI (17%)
  – Proprietary
  – Not discussed
COGNITIVE SCREENING TOOLS (cont’d.)

• Montreal Cognitive Assessment (MoCA)
  – Time to administer: 10 minutes
  – Tools: Pen/pencil, paper, stopwatch, pictures
  – Scoring: 30 points total, > 26 is normal
  – Sensitivity: MCI 90%, mild pAD 100%
  – Specificity: MCI 100%, mild pAD 100%

COGNITIVE SCREENING TOOLS (cont’d.)

• MoCA (cont’d.)
  – Domains tested
    • Alternate trail making (A-1-B-2-C-3…E-5)
    • Visuoconstructional skills (cube and clock)
    • Naming (animals)
    • Memory
    • Attention
    • Sentence repetition
    • Abstraction
    • Delayed recall
    • Orientation

SUMMARY

• Cognitive changes tend to occur with aging
• While some cognitive changes are normal, others are not
• Delirium is an acute cognitive change that is generally reversible once the cause has been identified.
• MCI is a form of cognitive change that is more than typical, but not enough to meet the criteria for dementia
SUMMARY (cont’d.)

• MCI sometimes reverses itself temporarily or permanently
• Moderate exercise appears to have a protective effect against dementia
• Cognitive status may be improved through exercise
• Individuals with dementia demonstrate improvement in various functional and some life domains with physical therapy/rehab
  – Gains greatest with those with mild to moderate dementia

THANK YOU!!

REFERENCES

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- Alzheimer’s.net. www.alzheimers.net (accessed multiple times)
REFERENCES (cont’d.)


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• Toussant EM, Kohia M. Review of literature regarding the effectiveness of physical therapy after hip fracture in elderly persons. J Gerontol: MED SCI. 2005;60A:1285-1291.

FORMS AND DOWNLOADS

• ICF CHECKLIST:
  • http://www.who.int/classifications/icf/training/icfchecklist.pdf

• BEERS LIST:
  • https://www.dcri.org/trial-participation/the-beers-list
  • http://www.guideline.gov/content.aspx?id=37706

• GUIDELINES ON DEMENTIA:
  • https://provider.ghc.org/all-sites/guidelines/dementia.pdf

FORMS AND DOWNLOADS

• FUNCTIONAL ACTIVITIES QUESTIONNAIRE:
  • https://search.ghc.org/vis/cgi-bin/query-meta
    • which provides link to:
    • https://provider.ghc.org/open/caringForOurMembers/patientHealthEducation/screeningSchedules/dementiaQuestionnaire.pdf
  • http://www.nia.nih.gov/research/cognitive-instrument/functional-activities-questionnaire

• GERIATRIC TOOL KIT:
  • http://geriatrictoolkit.missouri.edu/cog/