Mind Your Step

Preventing Falls in Dementia

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Overview

- Functional Changes with Dementia
- Epidemiology
- Fall Risk Assessment
- Fall Prevention Interventions

Functional Changes with Dementia

- Memory
  - Short term memory
  - Multistep commands are problematic
- Executive Function
  - Decreased ability to multi-task
  - Decreased insight and problem-solving
  - Impulsiveness
- Visual-Spatial
  - Difficulty perceiving 3 dimensions

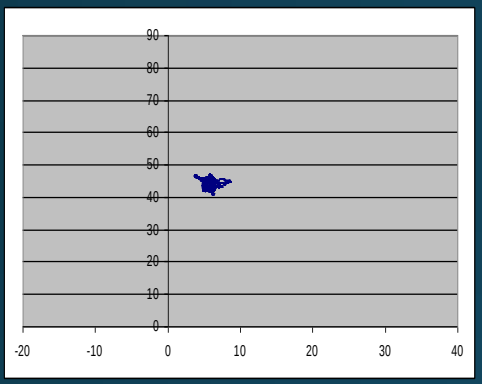
Functional Changes with Dementia

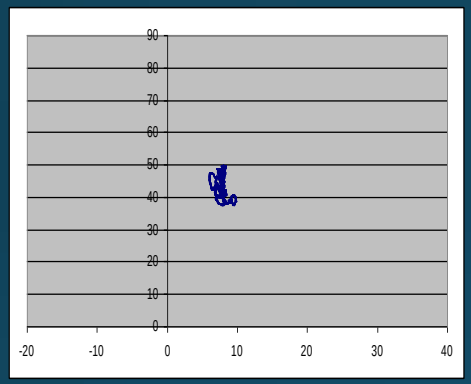
- Balance and Gait
  - Changes happen early in disease process and progress
    - Early stage – result of executive function changes
    - Middle stage – sarcopenia
  - Difficulty with multi-tasking
    - Walking and talking at the same time – gait becomes more unstable (Montero-Odasso et al. 2011)
  - Mobility aids
    - Multi-tasking
    - Challenges the executive function
      - Difficulty navigating around obstacles (Muir-Hunter & Montero-Odasso. In press)

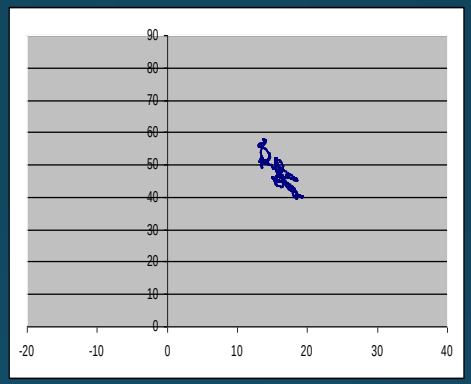
Balance in Alzheimer's Disease

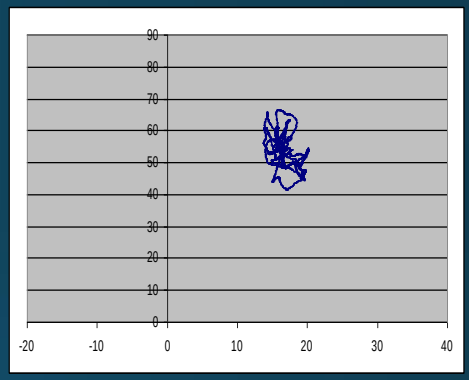
Modified Clinical Test for Sensory Integration in Balance

A. Control









RS_EO

RS_ES

DS_EO

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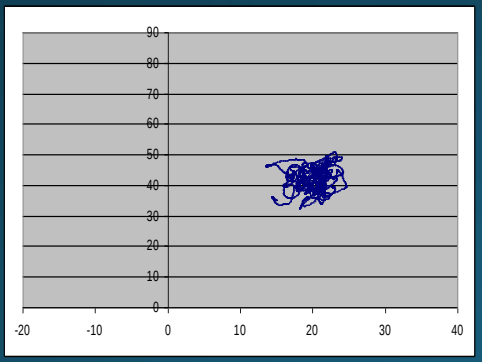
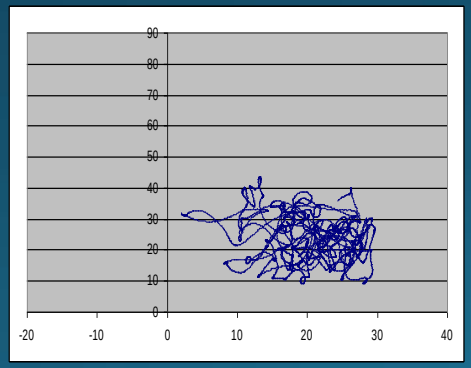
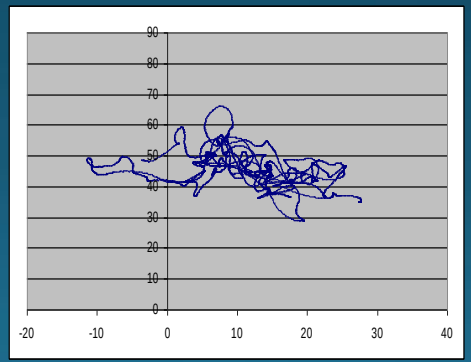
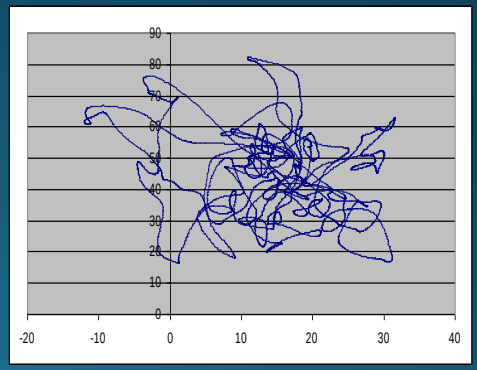








B. Alzheimer disease

Gait in Alzheimer's Disease

Older adult with normal cognition

a) Usual

b) Usual gait while performing serial sevens counting

Older adult with Alzheimer's Disease

a) Usual gait

b) Usual gait while performing serial sevens

Functional Changes with Dementia

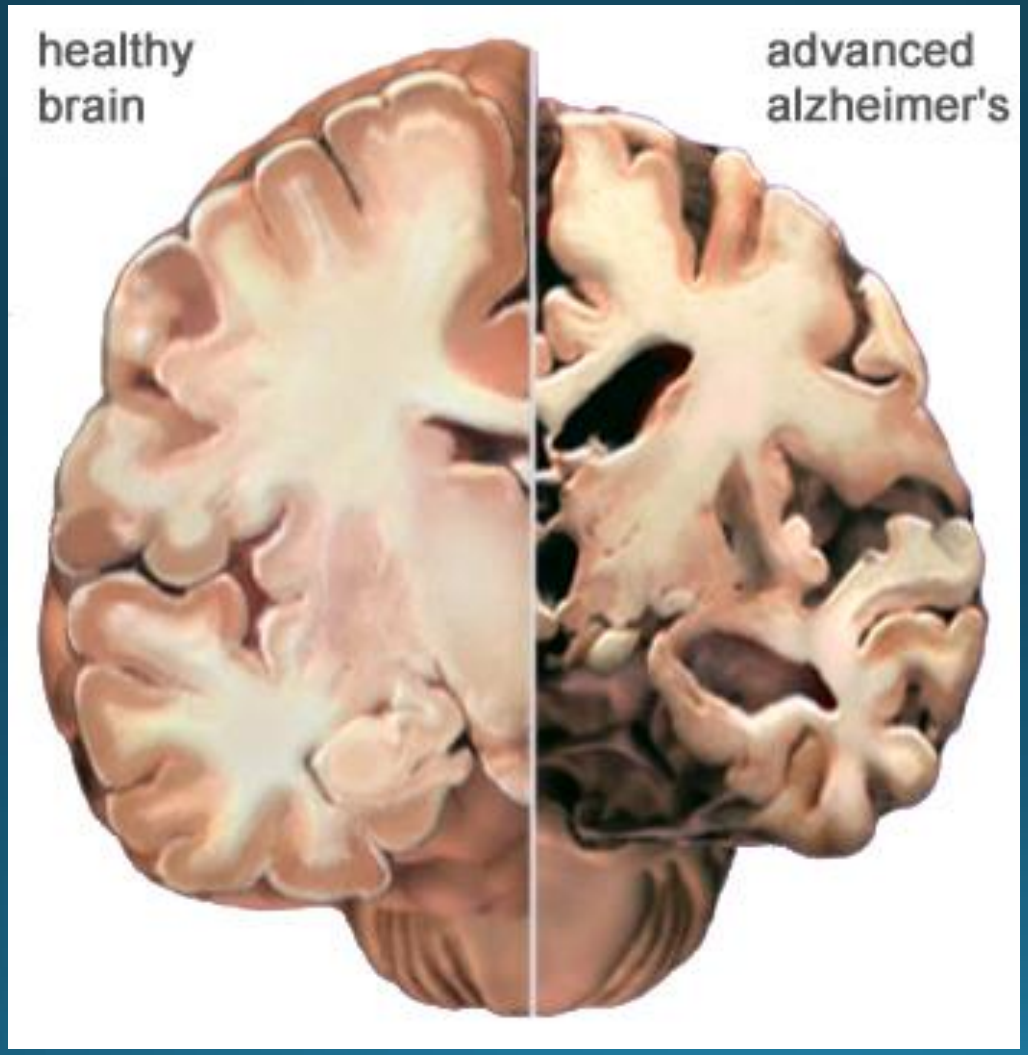
- Speech, Language and Communication (Orange & Ryan 2000)
  - Changes happen early in disease process
  - 88-95% people with Alzheimer's disease have communication problems

  - Early – aware of communication difficulties
    - Word finding problems
    - Problems understanding complex sentences, metaphors, analogies
    - Problems with reading comprehension

  - Middle – less aware of communication difficulties
    - Pronounced word finding problems
    - Problems with simple commands
    - Limited reading comprehension

  - Late – mute or use of non-sense words
    - Empty talk
    - Yes/no responses may be unreliable

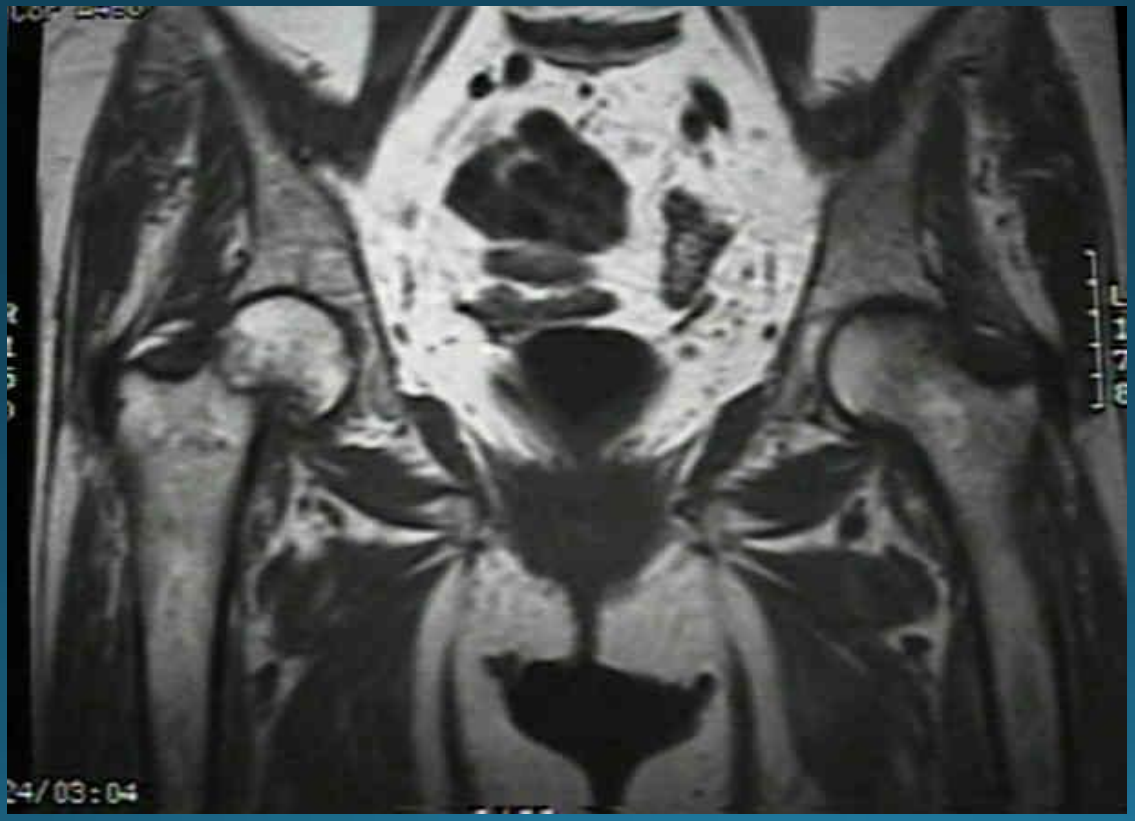
Neuropathology of Alzheimer's Disease



(http://www.alz.org/braintour/healthy_vs_alzheimers.asp)

Falls in Older Adults with Dementia

- Why focus on this population of older adults?



Falls in Older Adults with Dementia

- Annual fall risk 60-80% (Shaw 2007)

- Increased risk for fall-related injuries:
  - hip fractures (Kallin 2005; Tinetti 1988)
  - ↓ functional outcomes
  - ↑ institutionalization (Morris 1987)
  - ↑ mortality
  - ↓access to rehabilitation (Beaupre 2008)

Age and Ageing 2012; 41: 299–308
doi: 10.1093/ageing/afs012
Published electronically 27 February 2012

SYSTEMATIC REVIEW

The role of cognitive impairment in fall risk among older adults: a systematic review and meta-analysis

Susan W. Muir[1,2], Karen Gopaul[2], Manuel M. Montero Odasso[1,2,3,4]

- Cognitive impairment not consistently associated with falls
  - 56% of studies positive association
- Measures of global cognitive function (i.e. MMSE)
  - Only 38% found positive association
  - Not sufficient to identify fall risk
  - No consensus on score that denotes increased risk
- Measures of executive function consistently associated with falls

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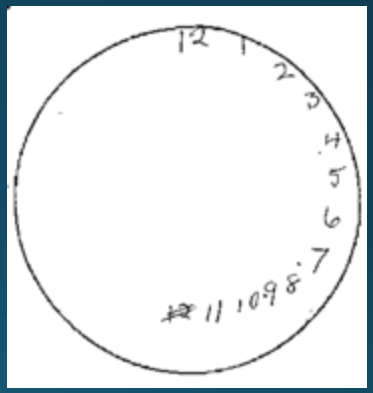
ASSOCIATION OF EXECUTIVE FUNCTION IMPAIRMENT, HISTORY OF FALLS AND PHYSICAL PERFORMANCE IN OLDER ADULTS: A CROSS-SECTIONAL POPULATION-BASED STUDY IN EASTERN FRANCE

S.W. MUIR[1], O. BEAUCHET[2], M. MONTERO-ODASSO[1,3,4], C. ANNWEILER[2], B. FANTINO[2], M. SPEECHLEY[3]

- N= 4480, older adults 65-97 years old
- Fall Outcomes: any fall, recurrent falls, injurious falls
- Results:
  - 24% of sample had abnormal CDT
  - 28.1% had history of falls in past 12 months
  - EF association:
    - Any fall RR=1.13, 95%CI(1.03, 1.25)
    - Major soft-tissue injury RR= 2.42, 95%CI (1.47, 4.00)
  - EF associated with performance on TUG
    - Worse EF associated with longer time to complete the TUG



(http://www.ganfyd.org/index.php?title=Clock_test)

Dementia and Fall Risk

- What is unique about older adults with dementia who fall?
  - More likely to be older, female, living in institution
  - Higher prevalence of risk factors shared with cognitively normal older adults (Shaw 2007)
- Dementia may be a proxy for many possible and related fall risk factors:
  - Behavioural issues
  - Lack of insight
    - Increased risk-taking activity
  - Mobility deficits
  - Difficulty with performance of activities requiring divided attention
  - Visual-spatial deficits

Risk Factors for Falls in Dementia

- Demographic – conflicting evidence on age and sex
- Balance
- Gait
- Vision
- Functional Status
- Medications
- Psychosocial
- Cortical changes
- Dementia severity
- Other

(Fernando et al. Under review)

Fall Risk Assessment

Fall Risk Assessment in Older Adults with Dementia

- Two important considerations with different intents for assessment in people with known cognitive impairment:
  - How does cognitive impairment influence the person's ability to follow instructions?
  - How does the cognitive impairment influence the physical performance?

Test-Retest Reliability of Balance Measures In AD

Test	Test-Retest Reliability (ICC)	Minimal Detectable Change	Recommend for Clinical Use
BBS	0.95	16.66 points	No
TUG	**0.72-0.94**	**2.42-5.88 seconds**	**Yes**
TUG – manual dual task	**0.70**	**2.03 seconds**	**Yes**
TUG – cognitive dual task	0.51	4.69	No
Functional Reach Test	0.81-0.84	3.15-12.64 cm	No
Gait speed	**0.86-0.96**	**0.11-0.27 m/s**	**Yes**
Chair Stand Test (time to 5 reps)	**0.80**	**2.73 sec**	**Yes**
Chair Stand Test (reps in 30 sec)	0.84	3.49 reps	No
Figure 8 Step Test	0.91	17.35 sec	No
FICSIT (4 balance positions)	0.79	1.52	No
Groningen Meander Walk Test	**0.94**	**2.96 sec**	**Yes**

(Muir-Hunter et al. 2015, Ries et al. 2009, Suttanon et al. 2011, Bossers et al. 2013, Blankevoort et al. 2013, Farrell et al. 2011, Suzuki et al. 2009)

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journal homepage: www.elsevier.com/locate/gaitpost

Gait assessment in mild cognitive impairment and Alzheimer's disease: The effect of dual-task challenges across the cognitive spectrum

Susan W. Muir [a,c], Mark Speechley [b], Jennie Wells [a,c], Michael Borrie [a,c], Karen Gopaul [c], Manuel Montero-Odasso [a,b,c,*]

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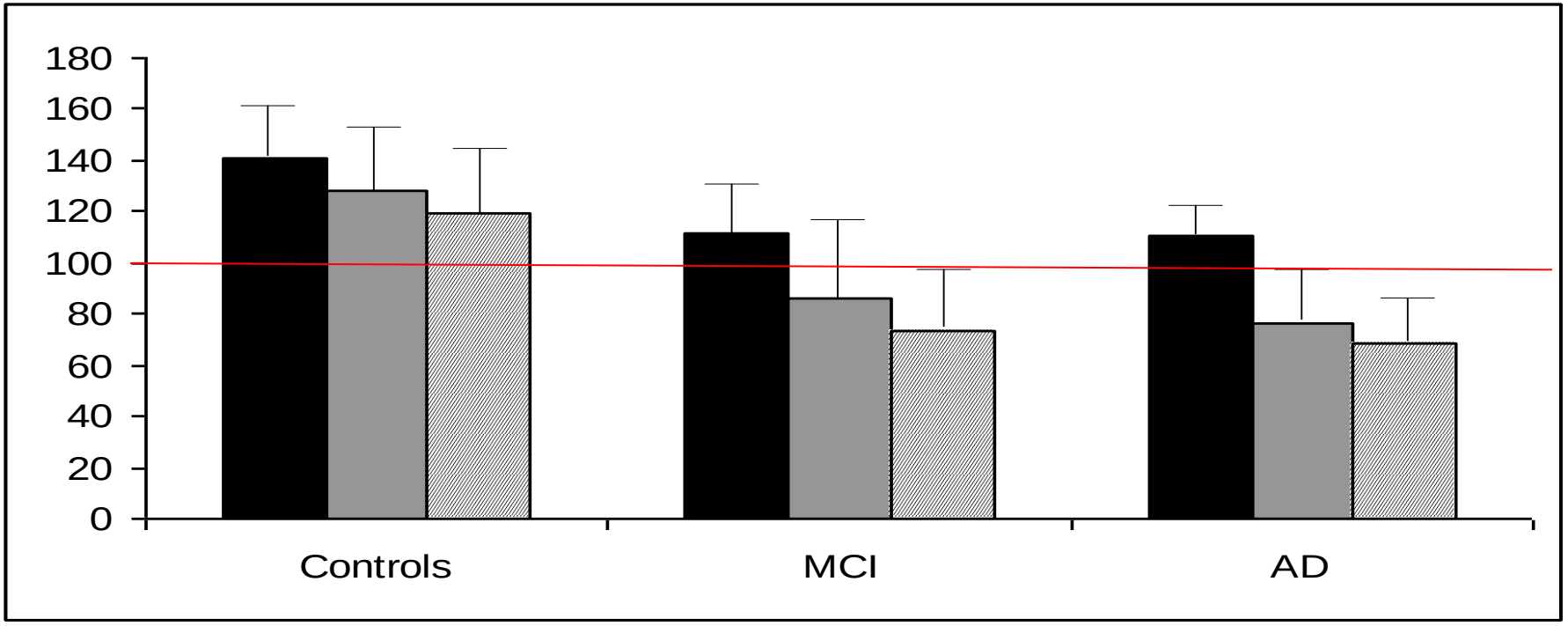
- Dual-task paradigm
  - Observing people during a gait or balance task while they perform a secondary task
- Relevant
  - Most activities of daily living involve the simultaneous performance of two or more cognitive and motor tasks
  - Representative of real life situations where falls are likely to occur

Dual-Task Testing: Gait Velocity



Gait Variable	Group	Usual Gait	Naming Animals	Serial Sevens	Repeated Measures Two-way ANOVA* (p-value)
Gait Velocity (cm/sec)	Control (n=16)	140.41 (21.50)	128.55 (28.16)	119.50 (26.30)	Group <0.0001* Condition 0.4875 Interaction 0.0134*
	MCI (n=18)	111.56 (20.82)	86.32 (27.98)	73.59 (27.69)	
	AD (n= 19)	110.63 (14.39)	76.29 (26.53)	68.29 (26.55)	

Dual Task Testing to Assess Fall Risk

1. The type of secondary task to utilize with gait testing (e.g. cognitive or motor) cannot be determined.
2. Unable to grade the level of dual task test difficulty
3. If the secondary task is a cognitive one, specific recommendations cannot be made as to the category of cognitive task to perform
4. The form of the dual task test result to use to quantify future risk cannot be determined.
5. The threshold or magnitude of change in the dual task gait test that would identify fall risk cannot be recommended.
6. Measures of maximal postural sway in quiet standing with eyes open or closed under dual task conditions are not associated with future fall risk.

Conclusion: Dual task testing can be used to evaluate the role of cognition in gait for a specific individual

(Muir-Hunter & Wittwer, Physiotherapy 2015)

Fall Prevention in Older Adults with Dementia

American & British Geriatrics Society Fall Prevention Guidelines 2011

- Summary statement:
  - "At this time, there is insufficient evidence to recommend, for or against, single or multifactorial interventions in community-living older adults with known cognitive impairment."

- So what do we do?

Fall Prevention among Older Adults with Dementia

- Why a lack of response for multifactorial interventions?
  - Different underlying mechanisms for some risk factors for falls
  - Dementia carries unique set of risk factors that are not addressed by interventions originally designed for cognitively normal older adults
  - Need to consider what factors may be modifiable
  - Type of dementia
  - Disease severity
  - Failed to address the need to have modification in the interventions due to limitations of the disease

Fall Prevention among Older Adults with Dementia

Community setting:

- Systematic review & meta-analysis (Burton et al. 2015)
- 4 articles – 3 RCT and 1 single group pre/post test

- Findings:
  - Mean number of falls lower in exercise group
  - Reduced risk of being a faller by 32% - RR=0.68, 95%CI (0.55, 0.85)
  - No change on tests:
    - Step Test
    - Physiological Profile Assessment

Fall Prevention among Older Adults with Dementia

Nursing home setting – studies tend not to exclude people with cognitive impairment/dementia

- Jensen et al 2003 – multifactorial intervention
  - Intervention: Staff education on fall prevention, environment adaptations, exercise, drug review, hip protectors and post-fall problem solving conferences
  - Outcome: Reduction in falls in people MMSE>19 and fewer femoral fractures in people with MMSE<19
- Becker et al. 2003 – multifactorial intervention
  - Intervention: Staff & resident education on fall prevention, environment adaptations, progressive balance & resistance exercises, hip protectors
  - Outcome: reduction in rate of falls and fallers

Pragmatic Recommendations for Reducing Falls in Older Adults with Dementia

- Balance and gait changes are an early feature of dementia
  - People with MCI should not be treated using guidelines for people who are cognitively normal
  - Standard tests may not identify problems in early stages of disease
  - Tests may be too complicated for people to follow
- Assessment of executive function should be standard
- Multifactorial assessment
  - Review of medication – psychotropics, cardiac
  - Assessment for orthostatic hypotension
- Physical activity programs
- Environmental modification
- Calcium and Vitamin D

Future Directions in Fall Prevention in Older Adults with Dementia

- Recognized as patient population with unique challenges, needs and require better treatment options

- More research is required:
  - Risk factors for falls
  - Specifics of interventions
  - Older people with dementia are a heterogeneous group
    - Different dementia types
    - Different living situations
    - Different disease severity

Fall Prevention in Dementia: In Summary

- Falls in the cognitively impaired are multi-factorial
  - Not due to same factors or interaction of factors as in the cognitively normal older adult
  - Careful consideration of the disease deficits in instituting intervention:
    - Memory
    - Visual-spatial deficits
    - Attention/executive function deficits
- Quantification of risk needs careful consideration
  - How we define cognitive impairment
  - How we assess functional impairment linked to falls
- Older adults with cognitive impairment/dementia can benefit from rehabilitation
  - Able to make gains in strength, gait speed and balance

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