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Behavioral Interventions to Prevent, Delay, or Mitigate Dementia Effects

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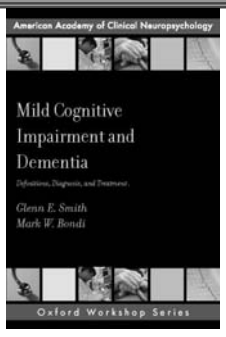
Learning Objectives

- Discuss the current state of knowledge about the impact of behavioral interventions intended to prevent or delay dementia.
- Describe a multicomponent intervention program (HABIT) that combines promising behavioral interventions to help maintain function in people with Mild Cognitive Impairment
- Explain the effect of behavioral interventions on caregivers of individuals with memory loss

Disclosures

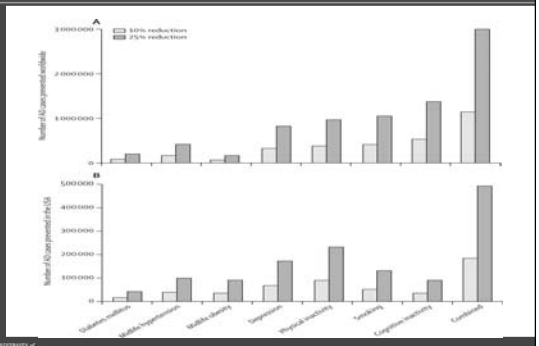
- I receive funding from PCORI and have received funding from the NIH.
- I receive royalties from the book *MCI and Dementia; Definitions, Diagnosis and Treatment*
- 'Brain Fitness' research described herein was supported by grants from Posit Science Inc. to Mayo Clinic, USC and UCSF. I have no financial interests in this company.
- The Mayo HABIT program to be discussed today generates revenue for Mayo. I do not receive additional direct financial beyond normal salary benefit from the delivery of this program



Outline

- The Opportunity of Mild Cognitive Impairment
- Secondary Prevention
  - Cognitive training
  - Physical Exercise
  - Compensation
  - Integrated approach
- Break
- Psychology's role in Tertiary prevention
  - Dementia behavior management

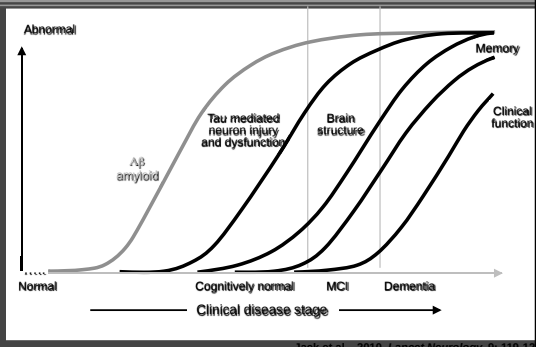
Primary Prevention: Barnes and Yaffe, Lancet Neurology, 2011



Delaying/Preventing AD

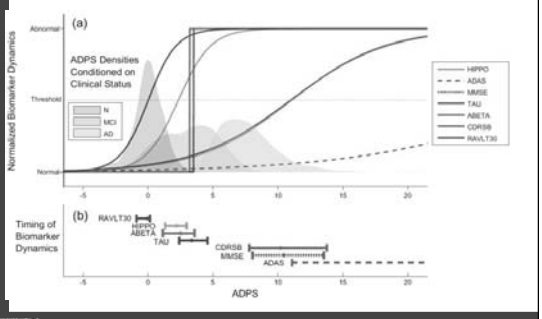
- Some people die with AD changes in their brain without ever showing dementia in life
  - It is possible to have cognitive/functional resilience (reserve) in the presence of brain disease
- If we could delay clinical onset of AD more people would die without showing dementia
  - Can we enhance cognitive reserve?
- Or we at least we can theoretically compress the period of morbidity
  - We can enhance functional resilience

Dynamic Biomarkers of the Alzheimer's Pathological Cascade

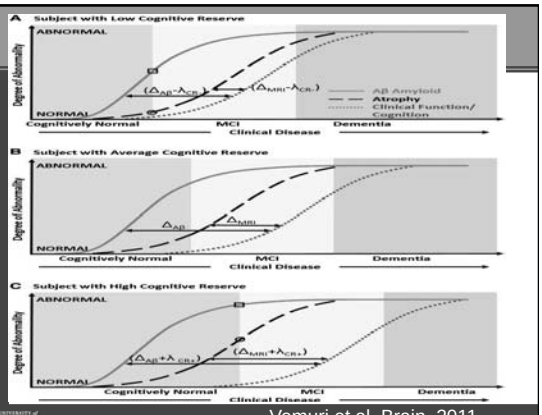


Jack et al., 2010. *Lancet Neurology,* 9: 119-12

In ADNI, Key AVLT Delayed Recall is earliest biomarker to become abnormal

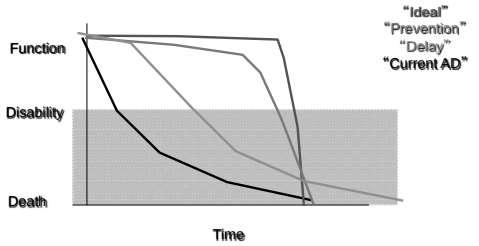


Jedynak, B et al, 2012, *Neuroimage*. ADNI=Alzheimers Disease Neuroimaging Initiative.



Vemuri et al. Brain, 2011

Prevention ?



The Opportunity of MCI

Timeline

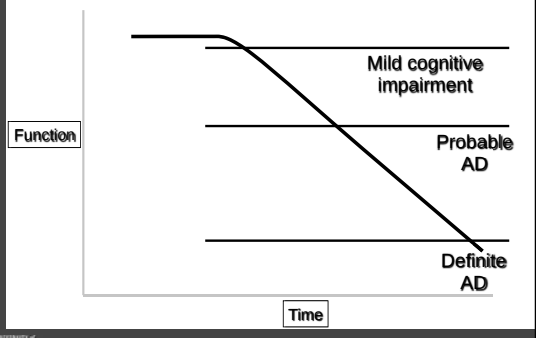
	Total MCI articles in Pubmed
• 1986-AAMI et al	
• 1991-MCI Flicker Ferris and Reisberg	
• 1994-APOE and mild memory impairment	320
• 1996-MCI paper in NP journals	
• 1999-MCI 'Petersen criteria'-Petersen, Smith, Waring et al.,	1763
• 2004-Winblad et al MCI consensus criteria	
• 2011-MCI due to …NIA-Alz Assn Sperling	
• 2012-National Plan to Address Alzheimers	
• 2013- DSM-5 mild Neurocognitive DO	11963
• 2015- National Alzheimer's Plan	

CONCEPTUAL FRAMEWORK
COGNITIVE CONTINUUM

Normal

Mild Cognitive Impairment

Dementia

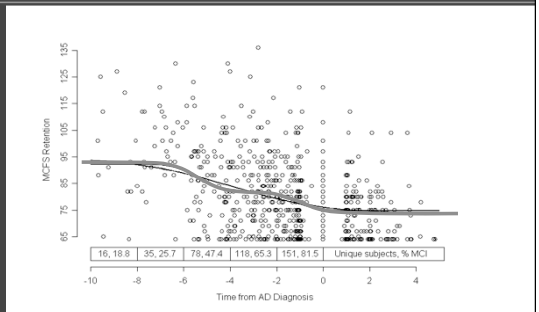


The Final Result?

We're so glad we could figure out you have this potentially horrible disease.

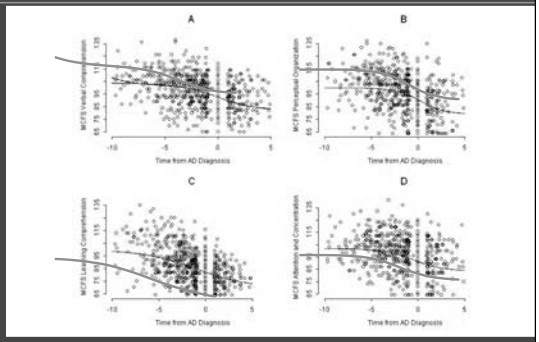
See you next year!

Mixed Effects Model of Memory (RET) Decline in the 10 Years Prior to AD Dx

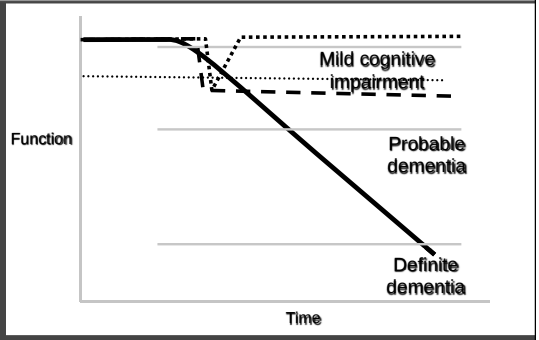


Smith et al, 2007. *Neurology,* 69:133-139

Mixed Effect Models: Other MCFS



Smith et al, 2007. *Neurology,* 69:133-139



Prevention

- Primary
  - measures provided to individuals to prevent the onset of a targeted condition.
- Secondary
  - measures that identify and treat asymptomatic persons who have already developed risk factors or preclinical disease but in whom the condition is not clinically apparent.
- Tertiary
  - the care of established disease, with attempts made to restore to highest function, minimize the negative effects of disease, and prevent disease-related complications.

U.S. Preventative Services Task Forces' Guide to Clinical Preventive Services (2d edition, 1996)

Approaches

- Physical Exercise
- Cognitive training
- Compensation

Physical Exercise

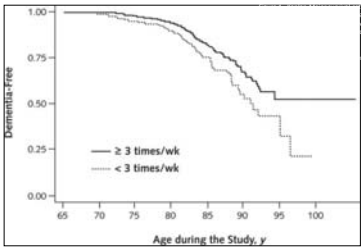
Physical Exercise and Cognition

- Meta-analysis
- 16 prospective epidemiological studies
- Relative risk highest physical activity compared to lowest:
- Regular exercise and physical activity:
  - 0.72 for dementia (CI 0.60-0.86, p<0.001)
  - 0.55 for AD (CI 0.36-0.84, p=0.006)
  - 0.82 for PD (CI 0.57-1.18, p=0.28)

Hamer & Chida. Psychol Med 2009;39:3-11

Annals of Internal Medicine

Figure 1.



Larsen et al. Exercise Is Associated with Reduced Risk for Incident Dementia among Persons 65 Years of Age and Older. Annals of Internal Medicine. 144(2):73-81, January 17, 2006.

Mayo Clinic Study of Aging

Table 2. Primary Analyses for Any Frequency of Exercise vs None (≤1 Time per Month)

Frequency of Exercise Intensity	No. (%) Mild Cognitive Impairment (n=198)	No. (%) Normal Cognition (n=1126)	OR (95% CI)[a]	P Value
Physical Exercise in Midlife				
Light				
None	25 (12.6)	104 (9.2)	1.00 [Reference]	
Any	173 (87.4)	1022 (90.8)	0.90 (0.55-1.47)	.68
Moderate				
None	58 (29.3)	193 (17.1)	1.00 [Reference]	
Any	140 (70.7)	933 (82.9)	0.61 (0.43-0.88)	.008[b]
Vigorous				
None	127 (64.1)	670 (59.5)	1.00 [Reference]	
Any	71 (35.9)	456 (40.5)	0.82 (0.59-1.15)	.25
Physical Exercise in Late Life				
Light				
None	52 (26.3)	184 (16.3)	1.00 [Reference]	
Any	146 (73.7)	942 (83.7)	0.69 (0.47-1.00)	.048
Moderate				
None	103 (52.0)	426 (37.8)	1.00 [Reference]	
Any	95 (48.0)	700 (62.2)	0.68 (0.49-0.93)	.02[c]
Vigorous				
None	171 (86.4)	969 (86.1)	1.00 [Reference]	
Any	27 (13.6)	157 (13.9)	1.14 (0.72-1.81)	.58

Geda et al. Arch Neurol. 2010;67(1): 80-86.

Moderator variables

- Gender?
  - Mayo Clinic Study on Aging found equivalent effect for men and women.
  - Canadian Study of Health and Aging: association in women but not men

Geda et al. Arch Neurol. 2010;67(1): 80-86; Middleton et al. Journal of Neurological Sciences. 2008;269:80-84.

Moderator Variables

- APOE status?
  - Arizona APOE cohort
  - Women only
  - Aerobic fitness associated with better cognition in ApoE-e4 homozygotes currently cognitively normal

Etnier et al. Psychobiology and Behavioral Strategies; 2007

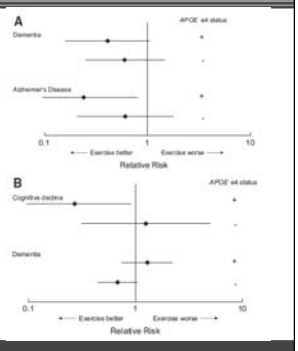
APOE genotype

Rockwood & Middleton (2007)

Summary of 3 studies

Panel A:
Leisure time physical activity reduced risk for all, but more in e4 carriers

Panel B:
Inconsistent results
High vs. low exercise



Rockwood & Middleton. Alzheimer's Dement. 2007 Apr 3 (2 suppl): S38-44

Exercise as an Intervention: 2010 Meta-Analysis

29 RCTs; Most with cognitively normal older adults

Cognitive Domain	Effect size
Attention/speed	g = 0.158 (CI=0.055-0.260; p = .003)
Executive function	g = 0.123 (CI = 0.021-0.225; p = .018)
Working memory	g = 0.032 (CI = -0.103-0.166; p = .64)
Memory	g = 0.128 (CI = 0.015-0.241; p = .026)

Smith et al. Psychosomatics Medicine. 2010;72:239-252.

Meta Analysis

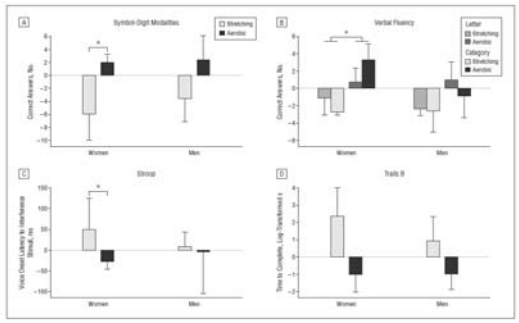
- Conclusion: Aerobic exercise benefits attention, speed, executive function, and memory in healthy older adults.
- Duration and intensity did not have a moderating effect
- Improvements in executive function smaller in MCI, but memory improvement stronger (g=.24)

Smith et al. Psychosomatics Medicine. 2010;72:239-252.

MCI specific trials

Scherder et al. Aging & Mental Health 2005; 9(3): 272-280.	• Small N. MCI Walking vs. face/hand exercise vs. control. Immediate EF benefit but dissipated.
Van Uffelen et al. Br J Sports Med 2008; 42:344-351	• Randomized, placebo controlled. MCI. Walking and Vitamin D. No main effect
Lautenschlager et al. JAMA 2008; 300(9): 1027-103	• "subjective memory impairment" but some MCI, RCT, education vs. exercise. "modest" improvement
Baker et al. Arch Neurol. 2010;67(1): 71-79	• aMCI; High intensity aerobic exercise vs. stretching control; 6 month intervention; sex difference with increased impact in women but some impact in both. Executive functioning measures
Lam et al. Int J Geriatr Psychiatry. 2011;26:733-740	• Chinese study; CDR 0.5; Tai Chi vs. stretching/toning; 1 year intervention; Tai Chi group more likely to be stable after intervention
Smith et al. J of Alzheimer's Disease. 2013;197-215	• Small N. 12 weeks, 4x/week supervised treadmill. MCI vs. Normal Control. fMRI activation during memory task improved in both and AVLT improved from baseline in MCI.

Aerobic Activity vs. Stretching



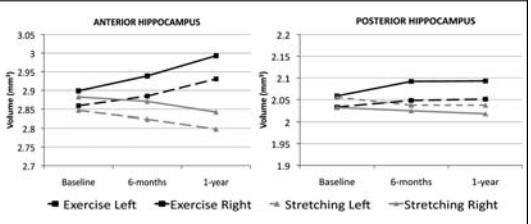
Baker et al. Arch Neurol 2010; 67:71-79.

Hippocampal Volumes

- Single blind RCT
- 120 cognitively normal older adults
- Aerobic exercise vs. stretching/toning control
- 3 days/week, one year

Erickson et al. PNAS 2011;108(7):3017-3022.

The exercise group showed a selective increase in the anterior hippocampus and no change in the posterior hippocampus.



- Aerobic group increased anterior hippocampal volumes by around 2%.
- Greater changes in serum BDNF associated with greater increase in hippocampal volumes bilaterally
- Reverses age-related volume loss by 1-2 years.
- Change in hippocampal volume also correlated with change in memory performance

Erickson K I et al. PNAS 2011;108:3017-3022

PNAS

Conclusions

- Physical activity definitely improves cardiovascular health
- Physical activity modestly improves cognition in older, cognitively normal adults
- Initial trials mixed but suggest physical activity may also help cognition in individuals with MCI.
- Meditative activities may also have a positive impact on brain health.

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Cognitive Training

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Approaches

- Cognitive stimulation
- Cognitive training
- Cognitive rehabilitation

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General 'Brain Maintenance' Products

Product	Company	Platform	Description	Validation	Price
Brain Age (2)	Nintendo	Nintendo DS	Math problems, memory games, Suduko	Very limited	$99
Fitbrains .com	Vivity Labs	Online	Memory, language, concentration games	Very limited	Free or $80/yr
Happy-neuron .com	Scientific Brain Training	Online	Attention, language, memory, visual-spatial and executive function	Low	$100/yr
Lumosity.com	Lumos Labs	Online	Attention, memory, problem solving	Low	$80/yr
Mindfit/ Cognifit PC	Cognifit	Software/ Online	"14 cognitive abilities that are susceptible to aging"	Low	$149

Adapted from; Fernandez, A & Goldberg, E. (2009). *The Sharpbrains Guide to Brain Fitness.* San Francisco, Sharpbrains.

Targeted 'Brain Training' Products

Product	Company	Platform	Description	Validation	Price
Brain Fitness	Posit Science	Software	Auditory processing speed.	Moderate	$395
Insight	Posit Science	Software	Visual and auditory processing speed.	Low-Moderate	$395
Intelligym	Applied Cognitive Engineering	Software	Peripheral vision, decision making for basketball/ hockey	Low	$99
CogniFit Senior Driver	Cognifit	Software/ Online	"14 cognitive abilities that are susceptible to aging"	Low	$99

Adapted from; Fernandez, A & Goldberg, E. (2009). *The Sharpbrains Guide to Brain Fitness.* San Francisco, Sharpbrains.

Stanford Longevity Center Statement

"We object to the claim that brain games offer consumers a scientifically grounded avenue to reduce or reverse cognitive decline when there is no compelling scientific evidence to date that they do. The promise of a magic bullet detracts from the best evidence to date, which is that cognitive health in old age reflects the long-term effects of healthy, engaged lifestyles. In the judgment of the signatories below, exaggerated and misleading claims exploit the anxieties of older adults about impending cognitive decline. We encourage continued careful research and validation in this field."

"A Consensus on the Brain Training Industry from the Scientific Community." Max Planck Institute for Human Development and Stanford Center on Longevity, accessed (add date), http://longevity3.stanford.edu/blog/2014/10/15/ the-consensus-on-the-brain -training-industry-from-the-scientific-community/

Extended Practice and Aerobic Exercise Interventions Benefit Untrained Cognitive Outcomes in Older Adults: A Meta-Analysis

Advanced Cognitive Training for Independent and Vital Elderly (ACTIVE) Willis, Unverzagt, et al

- Training normal older adults in mnemonics (M), processing speed (PS) and reasoning (R).
- Training effects lasted over 5 years.
- 'MCI' pts could benefit from R and PS but not M training.
- Little or no transfer

Transfer

Dimension of Transfer	Near	Far
Temporal	Immediately after training completion	Weeks to years after training with no practice in between
Functional	Same mind-set for training as for transfer task	Different mind-set for training than for transfer task
Modality: sensory	Same sensory modality for training as for transfer task	Different sensory modality for transfer task than for training
Modality: Testing Format	Same testing format for training as for transfer task	Different testing format for training than for transfer

Dalton, S., Smith, G., (2011) Consumer based brain fitness programs. In P. Hartman-Stein and A. LaRue (Eds). *Enhancing Cognitive Fitness in Adults*. New York; Springer.

CLINICAL INVESTIGATIONS

A Cognitive Training Program Based on Principles of Brain Plasticity: Results from the Improvement in Memory with Plasticity-based Adaptive Cognitive Training (IMPACT) Study

Glenn E. Smith, PhD,* Patricia Housen, PhD,† Kristine Yaffe, MD,‡§¶ Ronald Ruff, PhD,‖* Robert F. Kennison, PhD,‖** Henry W. Mahncke, PhD,†† and Elizabeth M. Zelinski, PhD†

JAGS, 2009

Improvement in Memory with Plasticity-Based Adaptive Cognitive Training: Results of the 3-Month Follow-Up

Elizabeth M. Zelinski, PhD, Laila M. Spina, PsyD, Kristine Yaffe, MD, Ronald Ruff, PhD, Robert F. Kennison, PhD, Henry W. Mahncke, PhD,ww and Glenn E. Smith, PhD

JAGS, 2011

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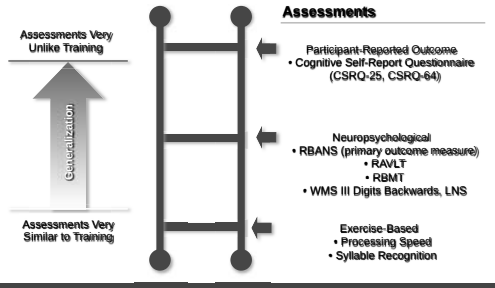
A Ladder of Assessments To Measure 'Transfer'



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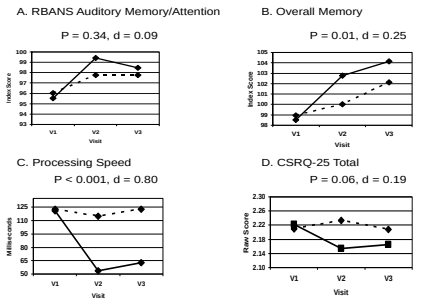
Baseline, End of Treatment and 3-month Follow-up



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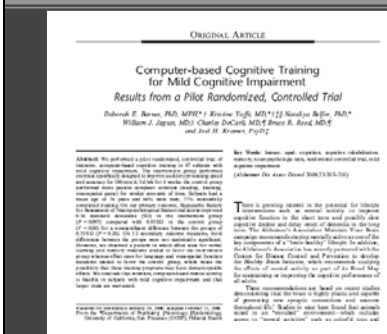
Iowa Healthy and Active Minds Study (IHAMS)- Wolinsky et al, 2013, PLOS-one

- *Road Tour*-Posit Science
  - Part of *Insight*, now *BrainHQ*
- 681 Subjects
  - Middle age and older
- Speed of processing and useful field of view gains transferred to Trails, Symbol Digit, and Stroop
- Effect sizes .2-.35



ORIGINAL ARTICLE

Computer-based Cognitive Training for Mild Cognitive Impairment

Results from a Pilot Randomized, Controlled Trial

•47 with persons with MCI

•Nonsignificant difference between the groups SD (P=0.26).

•Effect Size

0.33

Conclusion

- Cognitive training targeting perceptual discrimination and processing speed can enhance working memory in normal older adults
- Similar effect sizes are evident in MCI patients
- Effect wanes if training is discontinued
- Remains to be seen if this leads to improved 'cognitive reserve' in MCI

Memory Compensation Techniques

CROSS SECTIONAL COGNITIVE CONTINUUM

Normal

+ declarative memory, + procedural memory

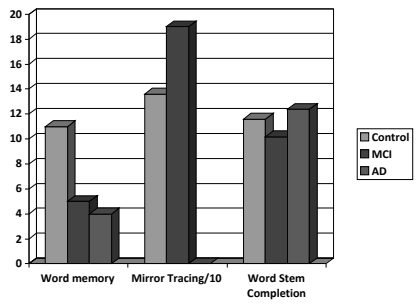
Mild Cognitive Impairment

↓ declarative memory, + procedural memory

Dementia

↓ declarative memory, ↓ procedural memory

Declarative and Procedural Memory performances



Yutsis, Castro, Fields, & Smith unpublished data

Cognitive Interventions

- Improving/Restitution
  (**Cognitive Stimulation/Cognitive Training**)
  - Trying to get back to baseline functioning
  - "Rebuilding" the circuits in the brain
  - Strengthening the ability
- Compensating
  (Cognitive Training/Cognitive Rehabilitation)
  - Learning ways to get around cognitive deficit in daily life.
  - Adapting to the deficit

Cognitive Rehabilitation/ Compensation Approaches

- Internal strategies
  - Mnemonics
  - Face name associations
- External strategies
  - Environmental adaptations (e.g
  - Memory notebooks

Literature in a Snapshot

- When you focus on learning a specific piece of information, it works (Valenzuela & Sachdev, 2009, *Am J Geriatr Psych*)
- Some reports of improvement in ADLs
  - Using mixed intervention of education, memory mnemonics, relaxation, and memory aid use (Kurz et al., 2008, *Int J Geriatr Psychiatry*; Londos et al., 2008, *Am J AD Other Demen*)
- Focused memory training have not demonstrated transference to ADLs

Literature in a Snapshot

- Improved mood and QOL (e.g., Kurz et al., 2008, *Int J Geriatr Psychiatry*; Londos et al., 2008, *Am J AD & Other Demen*)
- Significant methodological limitations (e.g., Hampstead, Gillis, & Stringer, 2014)
  - Multiple interventions at once
  - Small samples
  - Low emphasis on real word generalizability

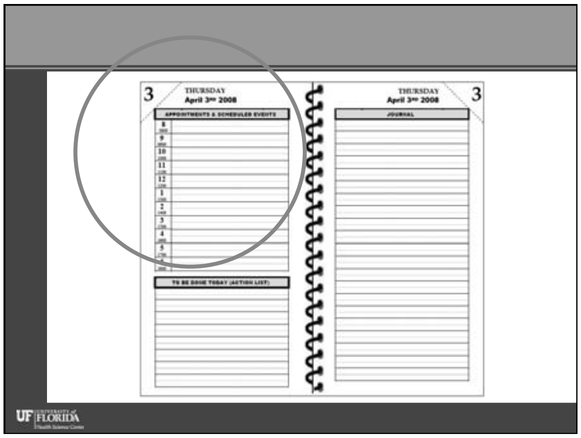
Memory Support System (MSS)

- Training to use a calendar/note taking system to compensate for memory loss
- Capitalize on preserved skills in early memory loss
  - Exploit intact procedural or "habit" memory
- Compensation aids may perhaps extend the time individuals can function independently and offer symptom reduction

Training Sessions

- Manualized approach with training stages
- 3, 2, and 1 session(s) a week for 2 weeks each, for a total of 6 weeks.
- Sessions provide
  - orientation
  - modeling
  - practice use
  - homework assignments

Greenaway et al. 2008, *Am J Alzheimers Dis Other Demen*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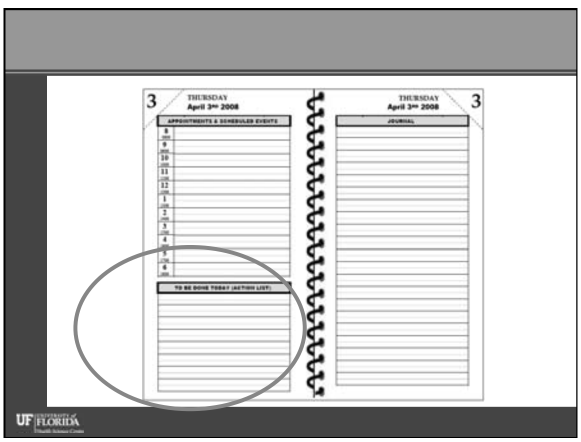
THURSDAY
April 3rd 2008
APPOINTMENTS & SCHEDULED EVENTS
JOURNAL
TO BE DONE TODAY (ACTION LIST)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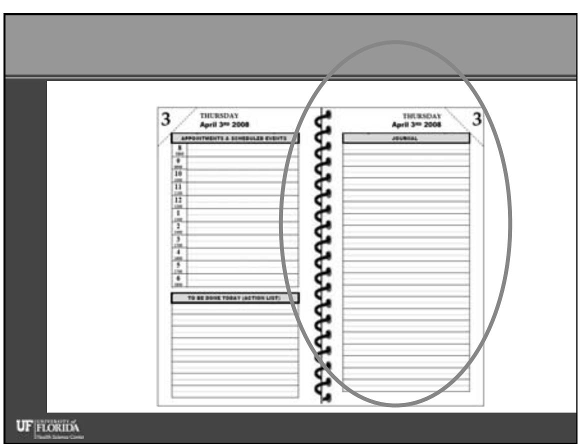
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THURSDAY
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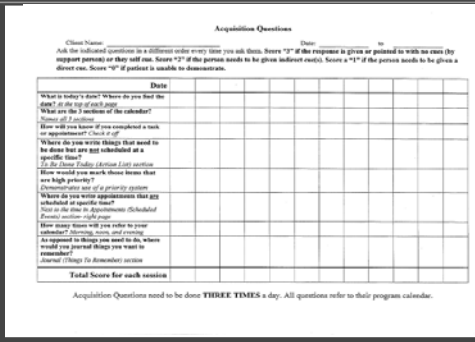
Example of Practice Questions



Acquisition Questions

Client Name: _____ Date: _____ to _____

Ask the indicated questions in a different order every time you ask them. Score "3" if the response is given or pointed to with no cues (by support person) or they self cue. Score "2" if the person needs to be given indirect cue(s). Score a "1" if the person needs to be given a direct cue. Score "0" if patient is unable to demonstrate.

Date										
What is today's date? Where do you find the date? *At the top of each page*										
What are the 3 sections of the calendar? *Names all 3 sections*										
How will you know if you completed a task or appointment? *Check it off*										
Where do you write things that need to be done but are not scheduled at a specific time? *To Be Done Today (Action List) section*										
How would you mark those items that are high priority? *Demonstrates use of a priority system*										
Where do you write appointments that are scheduled at specific time? *Next to the time in Appointments (Scheduled Events) section—right page*										
How many times will you refer to your calendar? *Morning, noon, and evening*										
As opposed to things you need to do, where would you journal things you want to remember? *Journal (Things To Remember) section*										
Total Score for each session										

Acquisition Questions need to be done **THREE TIMES** a day. All questions refer to their program calendar.

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Progressing through the Learning Phases

Acquisition:

- How will you know if you completed a task or and appointment?

Application:

- Did you make it to all of your appointments and get all of your planned tasks done yesterday?

Adaptation:

- Do you have anything that did not get done? What would you do if you had not gotten everything done?

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Support Partner's Role

- Partner asks Intervention Questions 2-3 times a day that apply to learning phases
- It is essential that the partner practice with the patient between sessions to form the HABIT
- Partner is trained to appropriately cue and question (a skill they can use beyond the calendar!)
- Partner participation maximizes the benefits of training while not overwhelming the person with multiple daily appointments

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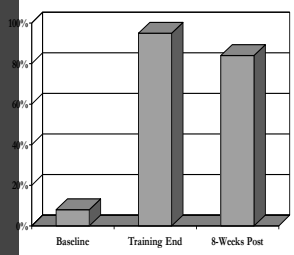
Measuring Adherence

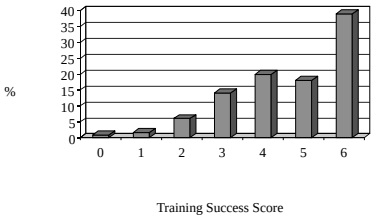


- Recommendation of note taking/ calendar use may be ineffective for most

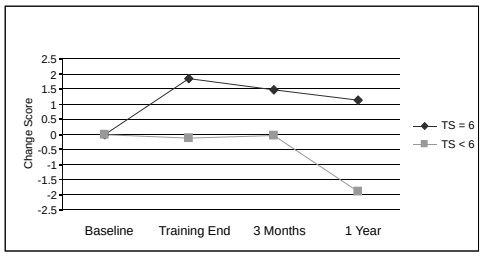
n = 20, *p* < .001

Greenaway et al. 2008, *Am J Alzheimers Dis Other Demen*

Levels of Compensation Training Success for a cohort of MCI patients

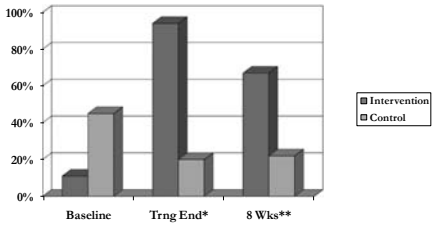


Memory-based ADLs (Ecog) Relative to Training Success



TS=training success

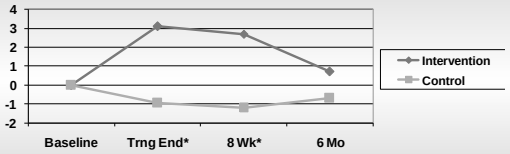
Adherence



* $p < .001$; ** $p < .01$

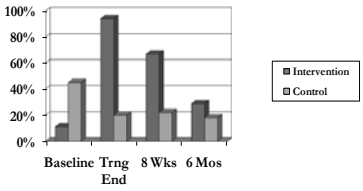
Activities of Daily Living

- Utilized the E-Cog (Farias, 2005)
- Range on the memory scale from 8-32

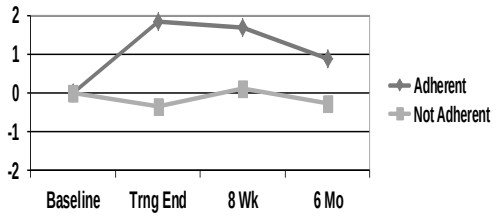


*$p < .01$ Effect size for 6 months ***d* = .42**

Activities of Daily Living



Activities of Daily Living by Adherence



Mood, Self Efficacy, and QOL

- MCI individual:
  - Significantly improved memory self efficacy by training end
- Program partner:
  - By 8 week and 6 months post, intervention group reported significantly better mood, trend toward worsening mood in controls
  - By 6 months, control group had significant worsening of caregiver burden

What Can the Psychologist Help With?

- Teaching a compensation strategy for improved/ maintained independence
- Teaching organization in keeping up with things
- Helping improve medication/ medical regimen adherence
- Fostering return to work, hobbies, lifestyle
- Encouraging reflection on what is most important (what is most important in your life to remember)

Intervention is not just for the Patient!

Rationale for Social Support

- Joosten-Weyn et al. 2008
  - 22 MCI patients/caregivers in group therapy
  - Patients: Increase in acceptance
  - Caregivers: Increased awareness of memory and behavioral problems
- Sampson et al. 2009
  - Social engagement in 10,720 individuals (13% MCI)
  - Mortality risk greater in medium and low social engagement groups

Rationale for Social Support (cont.)

- Joosten-Weyn et al. 2011
  - 93 MCI/caregiver dyads and 30 wait-list controls
  - Acceptance increased group therapy vs. controls
- Williams et al. 2010
  - 25 systematic reviews, 250 research studies
  - Higher risk of AD
    - Degree of loneliness
    - Decreased social networking
    - Diminished activity level

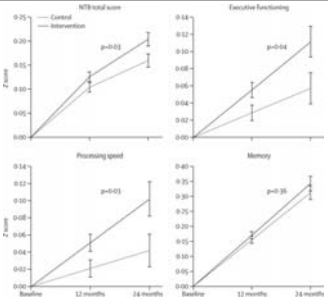
Rationale for Education

- Focus on dementia education for caregivers
- Caregiver depression higher when less knowledge (Blieszner & Roberto 2010)
- Savvy Caregiver Program (Hepburn et al. 2007)
  - 52 dementia caregivers
  - Psychoeducation or wait-list control
  - Knowledge, skills, and information on attitudes and self-care
  - Improvements: Competence, mastery, sense of self, distress
- Graham et al. 1997
  - 109 dementia caregivers
  - Greater knowledge
    - Less depression
    - More competence and confidence

The Case for Multicomponent Programs

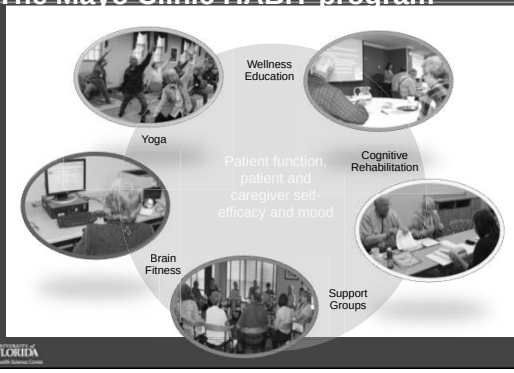
- Olazaran et al. 2010
- Nonpharmacological therapies (NPTs) in AD and related disorders (ADRD)
- Meta-analysis of 179 randomized, controlled trials belonging to 26 intervention categories
- Key findings:
  - Multicomponent interventions based on caregiver support and education delayed institutionalization of persons with ADRD
  - Effects on cognition, ADLs, behavior, and mood similar to effects obtained by medication
  - No side effects from NPTs and more readily individualized than medication
  - NPTs should be complementary to medication

Finnish Geriatric Intervention Study to Prevent Cognitive Impairment and Disability



Ngandu, T, el al., A 2 year multidomain intervention of diet, exercise, cognitive training, and vascular risk monitoring versus control to prevent cognitive decline in at-risk elderly people (FINGER): a randomised controlled trial. The Lancet, 2015,http://dx.doi.org/10.1016/S0140-6736(15)60461-5

Bringing it All Together: The Mayo Clinic HABIT program



Healthy Action to Benefit Independence and Thinking

- 50 hours of programming (5 components, 1 hour each day x 10 days)
  - Individualized calendar training (compensation training)
  - Computer lab: Brain Fitness (Posit)
  - Physical activity (Yoga)
  - Separate group support for participant and partners
  - Wellness education
- Program partner required

Program Philosophy

- Research suggests multiple lifestyle factors impact brain health and we frequently make these recommendations to our patients.
- Research also suggests patients are usually unable to initiate these behaviors on their own.
- HABIT is designed to help launch these behaviors and we believe that these habits, when supported by a partner, can compensate for certain memory deficits and promote optimal wellness for mind and body.

HABIT Research Findings

Mood, self-efficacy, functional capacity, quality of life, caregiver burden

Measures

- Center for Epidemiologic Studies Depression Scale (CES-D)
- REACH Anxiety Inventory
- Quality of Life-AD (QOL)
- Self-Efficacy Scale in MCI
- Neuropsychiatric Inventory (NPI)
- Caregiver Burden Questionnaire
- Everyday Cognition (E-Cog)

Methods

- Self- and caregiver-report survey data
- 149 HABIT participant/caregiver dyads
  - Baseline, intervention end, 3 months
  - 56 dyads 1-year data
- 66 Control dyads (MCI/partner, no HABIT)
  - "Baseline" and 3 months later

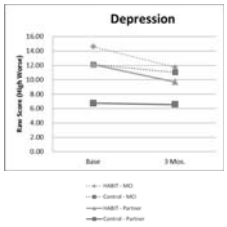
Demographics (MCI)

HABIT Participants		Control Patients	
Age	73.90 (8.10)	Age	73.80 (7.70)
Education	16.10 (2.40)	Education	15.80 (2.80)
Sex	81 M / 69 F	Sex	41 M / 25 F
MCI Duration	1.20 (1.30)	MCI Duration	2.20 (2.70)*
DRS Total	127.70 (10.20)	DRS Total	131.50 (6.10)*

Demographics (Caregivers)

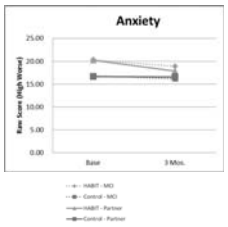
HABIT		Controls	
Age	69.30 (10.30)	Age	68.40 (10.40)
Education	16.30 (2.20)	Education	15.50 (2.70)*
Sex	55 M / 95 F	Sex	19 M / 47 F
Relationship	84.8% sps/ptnr	Relationship	83.3% sps/ptnr
	8.1% daughter		12.1% daughter
	0.7% son		0.0% son
	2.0% other fam		3.0% other fam
	3.4% friend		0.0% friend

Summary of Results (3 months)



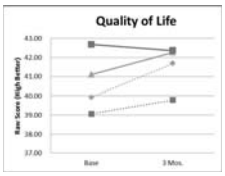
- HABIT MCI Participants: less depression ($p = .002$)
- Control MCI Patients: trend towards less depression ($p = .06$)
- HABIT Caregivers: less depression ($p < .01$)
- Control Caregivers: NO CHANGE

Summary of Results (3 months)



- HABIT MCI Participants: less anxiety ($p < .01$)
- Control MCI Patients: NO CHANGE
- HABIT Caregivers: less anxiety ($p < .01$)
- Control Caregivers: NO CHANGE

Summary of Results (3 months)



- HABIT MCI Participants: improved QOL ($p = .000$)
- Control MCI Patients: NO CHANGE
- HABIT Caregivers: trend towards improved QOL ($p = .07$)
- Control Caregivers: NO CHANGE

Summary of Results

- Compared to Controls, MCI HABIT Participants reported a greater sense of self-efficacy and improvement in QOL 3 months post intervention
- Compared to Caregivers of Controls, HABIT Caregivers reported a greater decrease in perceived burden at 3-month follow-up
- Similar trends at 1-year follow-up
- Higher memory compensation learning scores associated with better Total Everyday Cognition score 1 year post HABIT ($p < .001$)

Conclusions

- Multicomponent programs may be as important, if not more so, than medication in the near term in delaying functional decline.
- Programs such as HABIT create an opportunity for partners to pull together, not pull apart to face the diagnosis of MCI.
- Active participation in confronting illness increases both individuals' chances of success.

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Comparative Effectiveness of Behavioral Interventions to Prevent or Delay Dementia (CEBIPODD)

Funded by the Patient Centered Outcomes Research Institute (PCORI)

5/2014-4/2017

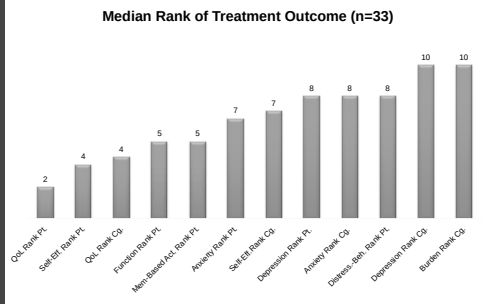
Comparative Effectiveness of Behavioral Interventions to Prevent or Delay Dementia

- 15 sessions across 4 sites
- 300 participants targeted
- New design to test multicomponent outcomes
  - Subtractive not additive
- Randomizes Sessions not individuals

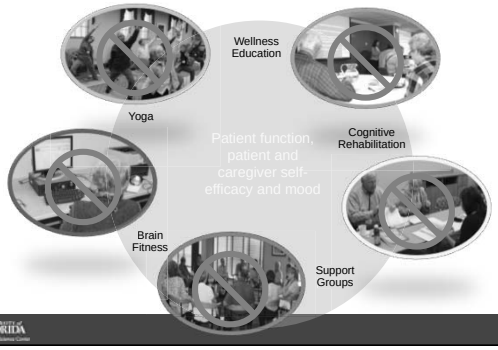
Comparative Effectiveness of Behavioral Interventions to Prevent or Delay Dementia

- Patients and caregivers determine most important outcome(s)
- One 10-day session at each site (AZ, FL, MN) quarterly
- 18 month outcome
- Booster sessions at 6 and 12 months

Caregiver Rankings of Priority of HABIT Outcomes (Gonzalez et al.,2014)



PCORI- CER Grant Studying HABIT



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Break

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Tertiary Prevention: Person Centered Approaches to Dementia Behavior Management

Learning objectives

At the end of this session participants will be able to describe:

- Three disease specific challenging behaviors seen in dementia
- Three mediators of challenging behavior in dementia
- Three person centered strategies for reducing challenging behavior

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Case 1: A family needs your help

- 83-year old woman
- Hallucinating
- 'Agitated'

What Else Do You Want To Know ?

Standard Hx

- Macular degeneration
- MMSE 22/27 (copy design, write sentence, follow written command not administered)
- Rheumatoid arthritis
- prednisone, Cymbalta, Aricept, ropinirole
- Hx of parkinsonism, fluctuations, ? RBD
- Sees small children
- Early morning confusion, ? dream content
- Agitated when staff don't take action to help the children etc.
- Many times recognizes hallucinations as such

What To Recommend ?

Person centered

- Retired librarian
- Widowed
- 2 children
- Loved to read
- Loved opera

Recommendations

- Provide audio books, favorite opera on ipod
- Discuss trade offs of parkinsonism control vs. hallucination management with patient and determine her preferences
- When hallucinations do occur attribute to ‘those darn medicines acting up again’ to provide context reduce stigma

Person Centered Strategies

- Behavioral Symptoms Nomenclature
- Approach
- Empirical basis
- Proactive interventions
- New opportunities
- You're the team

Plan for today

- Behavioral Symptoms Nomenclature
- Dementia Behavioral Assessment and Approach
- Empirical basis
- Proactive interventions
- New opportunities
- You're the team

Non-cognitive symptoms of dementia

- Functional Impairments
- Psychiatric Symptoms
- Behavioral Disturbance/Symptoms

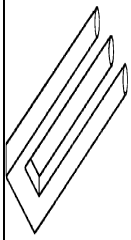
Alzheimer and Auguste D-1908

- Woman with delusions of infidelity
- Later described cognitive impairment

Challenge of psychiatric nomenclature in cognitive impairment

- Delusions
- Paranoia
- Psychosis

Cognitive Impairment and Behavioral Disturbance



- Hallucinations in delirium and/or dementia (10-25%)
  - Hallucinations-a false perception without a stimulus basis
  - Misperceptions-an incorrect perception of a existing stimulus (30%)
    -

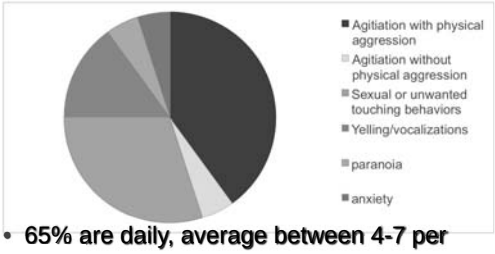
Cognitive Impairment and Behavioral Disturbance

- Delusions in dementia (30-40%)
  - Delusion-fixed beliefs incorrect belief without perceptual base
  - Illusion-belief based on erroneous interpretation of stimulus
  - Confabulation/déjà vu' -sense of familiarity, mis-remembering

Cognitive Impairment and Behavioral Disturbance

- Agitation
  - Striking other patients violating his or her space
  - Yelling out
  - Refusing Cares

Behavior problem types

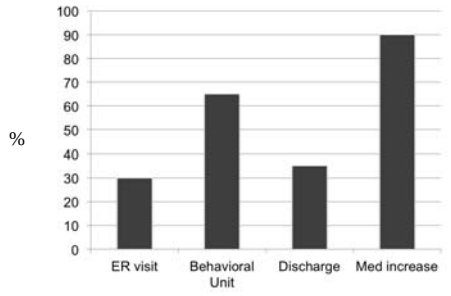


- **65% are daily, average between 4-7 per week**
- **45% have more than one behavioral target**

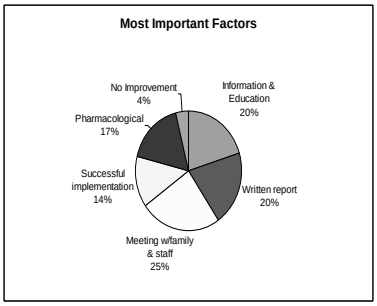
Additional Factors

- In 70% of cases etiology of dementia not specified
- In 20% of cases there is conflict between staff and family
- In 80% of cases residents are observed to be content less the 50% of the time

If intervention not available or not effective



Most Important Components of Consult



Family and staff aggregate rating

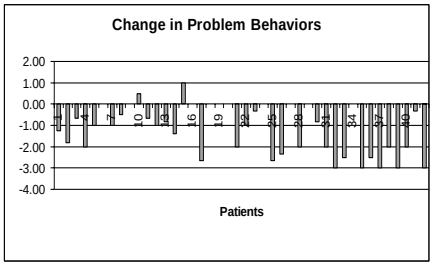
Philosophy

- There will be behavior problems in dementia
  - Reduction in frequency or intensity is a treatment success
- Environment can adapt more readily the dementia patient
- Behavior is communication
  - Must detect what behavior is trying to say

Approaches

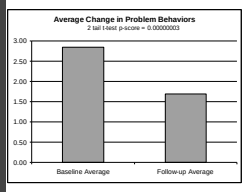
- Behaviors compete in real time
  - Activities based care
  - Tasks appropriate to level of impairment
- Be proactive not reactive
  - avoid PRN approaches
- Use what they give you
  - memory impairment potentiates distraction
  - Utilization behavior potentiates engagement

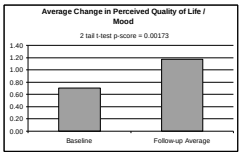
Problem Behaviors Frequency



0=a few times a month, 1=1-2 times week, 2=3-4 time, week 3=daily

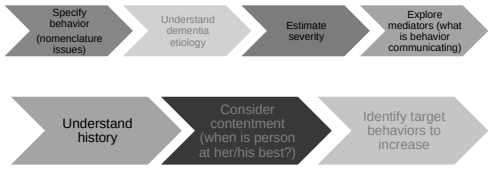
Behavior Change





0=a few times a month, 1=1-2 times week, 2=3-4 time, week 3=daily

A Person Centered Behavior Management Approach



Case 1

- Behavior=real hallucinations (not misperceptions)
- Etiology=LBD
- Severity=mild
- Mediators=physical medical (meds)
- History=mother/librarian/opera lover
- Targets=more ‘reading/music’, increase medication attribution

Diagnosis and Behavioral Disturbance

- Alzheimer's Disease
  - Memory based syndromes (e.g. 'delusions')
- Lewy Body Dementia
  - Hallucinations or sleep/wake syndromes
- Frontotemporal Dementias
  - Disinhibition or impulse control syndromes
- Depression Anxiety based syndromes
- Alcohol, Wernicke-Korsakoffs
  - confabulation

Cases

- Case 2 (65 y.o. man-FTD)
  - Only words were '100%'
  - Aggressing towards others
  - Eating all the food once the cart arrived
- Case 3 (78 y.o. woman- CVAs including cerebellar stroke)
  - Ataxia
  - 'Striking' during cares

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"All dementias converge"

As all degenerative dementias worsen, most parts of the brain become involved so they begin to look more alike

Behavior is communication

- As language skills decline, overt behavior will fill the void. This implies:
  - Behavior is not random
  - Behavior is adaptive for that person
  - Behavior is goal directed

Overt behavior replaces language as skills decline

What is behavior communicating

- Pain
- Boredom
- Overstimulation/Understimulation
- Depression
- Apprehension

Mediators of Disruptive Behaviors in Dementia

- Physical Health Factors
- Psychological Health Factors
- Environment, Task, Approach
- Social History

Why Difficult Behaviors Occur

Physical & Emotional Health

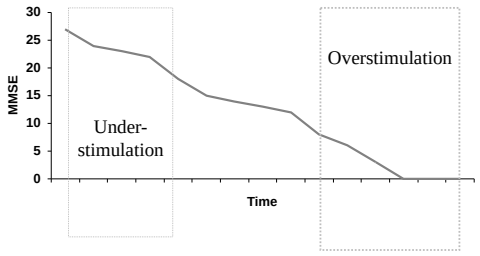
- **Effects of medications**
- **Impaired vision or hearing**
- **Acute or chronic illness**
- **Dehydration**
- **Constipation**
- **Depression**
- **Fatigue**
- **Physical discomfort**

Why Difficult Behaviors Occur

The Environment

- **Too large, too cluttered, too noisy**
- **Misinterpreting stimuli**
- **Too much or too little stimulation**
- **Loss of orientation**
- **Sensory confusion**
- **Unpredictable, unstructured or unfamiliar environment**
- **The "mood"**

Course of decline



Why Difficult Behaviors Occur

The Task

- **Too complicated**
- **Too many steps**
- **Task unfamiliar (even if they have done it many times before)**
- **Feeling rushed**
- **Fear of the task**

Why Difficult Behaviors Occur

Our Approach and Communication Style

- **Not understanding what is being said**
- **Inability to feel understood**
- **Caregiver verbal and non-verbal approach**
- **Inconsistency of caregivers**

Why Difficult Behaviors Occur

Social History

- **Left work every day at same time**
- **Always took baths not showers**
- **Took care of the kids**
- **Observant of religious traditions**
- **Was sexually abused**

Cases

- Case 4 (78-year-old woman with AD)
  - Can recall certain recent events
  - Wants brother to 'get her out'
  - Verbally abusive to staff, aggressive behavior to residents entering her room
  - Helped discover cortisone

Approaches

- Adequate redirection
  - Join, validate, distract
- Illusion of control
- Emotional mirroring
- Appropriate level of stimulation

Cannot create a behavior vacuum

- Behaviors compete in real time
- Increasing frequency of desired behaviors will reduce the frequency of undesired behaviors
- Ask 'when is the person at there best?'

ABCs of Behavior

'Wild type'

Antecedent → Behavior → Consequence

Traditional Behavior Management (requires memory!)

Behavior ← Consequence

Dementia Behavior Management

Antecedent → Behavior

No Short Cuts in Re-direction

- Join
- Validate
- Distract
  - (If memory impaired)
- Redirect

Plan for today

- Behavioral Symptoms Nomenclature
- Approach
- Empirical basis
- Proactive interventions
- New opportunities

Managing Difficult Behaviors

possible strategies...

- **Anger/Agitation**
  - **Alternate quiet and active periods**
  - **Simplify environment**
  - **Over-stimulation/Under-stimulation(bored)**
  - **Offer failure free activities**
  - **Provide choices**
  - **Consider your verbal and non-verbal message**
  - **Join, Validate, Re-Direct**

Managing Difficult Behavior

possible strategies...

- **Suspiciousness or Paranoia**
  - **Learn favorite hiding places (keep spare items)**
  - **Explain misinterpretation if appropriate**
  - **Do not argue or disagree**
  - **Respond to the feeling behind the words**
  - **Join, Validate, Distract**

Managing Difficult Behaviors

possible strategies...

- **Difficulty with tasks and/or personal cares**
  - **Demonstrate, get them started (apraxia; difficulty initiating and completing a task)**
  - **Provide distraction (something to hold)**
  - **Offer choices, provide "control"**
  - **Use Humor**
  - **Reassure, comfort, distract**

Managing Difficult Behaviors

possible strategies...

- **Excessive or repetitive actions**
  - **Respond to the emotion**
  - **Remind with brief statement**
  - **Use written or picture reminders**
  - **Consider waiting to discuss plans**
  - **Consider items in environment (coats)**
  - **Remember - question is new to person**

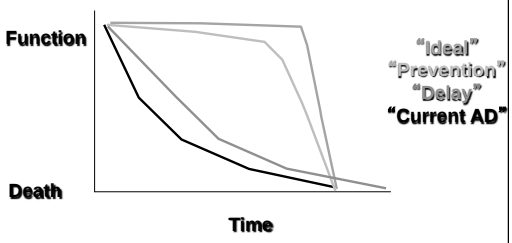
KEY POINTS

- **Behavior = Communication**
- **Approach is everything!**
- **Communication is everything!**
- **The environment sets the tone for behaviors**
- **Re-direction begins with validation & joining**
- **Don't create a behavior vacuum**
- **Choose your battles**

Cases

- Case 4 (84 y.o. man with long hx of renal failure, comorbid AD)
  - Combative during and after dialysis
- Care 5 (86 y.o. woman with AD)
  - Combative during weekly 'vitals'

QoL ?



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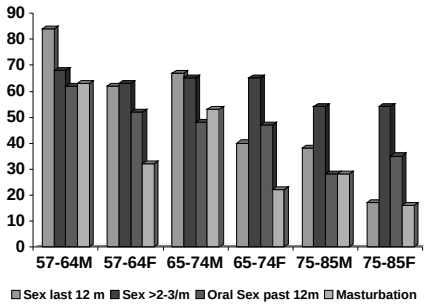
When to initiate palliative care in degenerative dementia ?

Intimacy and Sexuality in Dementia

Sexually Active Seniors %



Lindau et al; 2007, NEJM

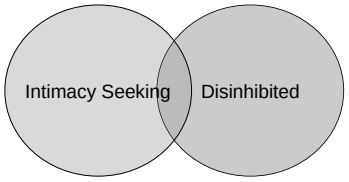
Sexual Behaviors in facilities same as at home

- Flirtation/sexual talk
- Touch
- Intercourse
- Masturbation

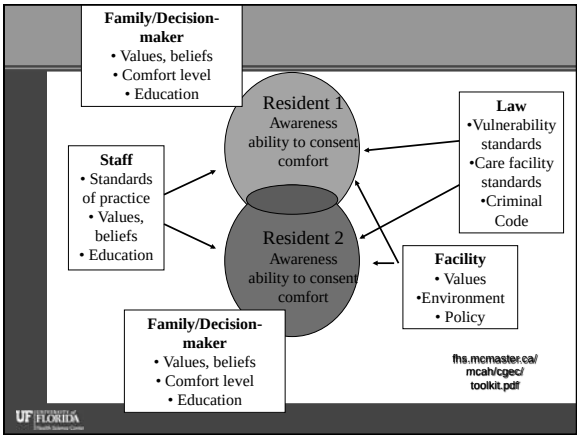
Frequency of 'sexual' behavior problems in dementia

- 18% -Sexual aggression-Ryden (1988)
- 2.6-8%-Sexually inappropriate behaviors-(Harris and Weirs-1998)
- 5-25%- 'Inappropriate behaviors' -(Ott et al, 2000).
  - Included sexual behaviors, noisemaking, smearing feces
  - increasing with dementia severity
  - no difference male to female

Sexual Behaviors



De Medeiros et al., (2008)



Steps to Institutional Policy regarding Sexual Behaviors

1. Assemble a Team
2. Study the Issues
3. Focus groups?
4. Review other organizations' policies
5. Create working definitions of key concepts
6. Pre-define interventions
7. Draft Policy
8. Implement Policy
9. Evaluate Policy

•fhs.mcmaster.ca/mcah/cgec/toolkit.pdf•

Assessing Sexual Situations

LEVEL 1	Intimacy/ Courtship behaviors
LEVEL 2	Verbal sexual talk/ language
LEVEL 3	Self-directed sexual behaviors
LEVEL 4	Physical sexual behaviors directed towards co-resident with agreement
LEVEL 5	Unwanted, overt physical sexual behaviors directed toward others

http://www.rgpc.ca/best/BPC%20-%20Sexuality/SexualityPracticeGuidelinesLLGDraft_17.pdf

Level 1 Intimacy/ Courtship behaviors

- **No risk associated with this behavior, if both persons consenting :** Overall goal of staff response is to provide socially appropriate context for relationship that offers comfort and reassurance.
- This behavior is viewed primarily as an intimacy relationship between two adults that are mutually consenting, implied by behavior toward each other.
- Source of urgency associated with this behavior is usually staff and/or family discomfort. Staff may wish to protect family.
- The couple may need to have intimacy needs recognized and privacy respected. (Schofield, 2002)

http://www.rgpc.ca/best/BPC%20-%20Sexuality/SexualityPracticeGuidelinesLLGDraft_17.pdf

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LEVEL 2 Verbal sexual talk/ language

- **Low level of risk associated with this behavior:**
- Often occurs during personal care.
- Staff to recognize their feelings of unease
- Respond respectfully.
- Punitive language not helpful
- Redirected into a more socially appropriate context.

http://www.rgpc.ca/best/BPC%20-%20Sexuality/SexualityPracticeGuidelinesLLGDraft_17.pdf

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LEVEL 3 Self-directed sexual behaviors

- **Low level of risk.**
- Assess for safety/health (e.g. excessive behavior may lead to skin/peri issues).
- Focus on creative solutions for the resident (this may include sexually-explicit materials &/or vibrators),
- Maintain privacy, dignity, safety and least restriction (Zeiss & Kasl-Godley, 2001).

http://www.rgpc.ca/best/BPC%20-%20Sexuality/SexualityPracticeGuidelinesLLGDraft_17.pdf

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LEVEL 4 Physical sexual behaviors directed towards co-resident with agreement

- Moderate level of risk associated with this behavior. SPRING INTO…ASSESSMENT
- Is dementia sufficiently mild so the capacity to make decisions regarding basic needs and immediate gratification such as sexual activity is retained (Post, 2000).
- Any signs of sexual overtures that are actually unwelcome. Does one partner in the pairing look distressed, upset, worried?

http://www.rgpc.ca/best/BPC%20-%20Sexuality/SexualityPracticeGuidelinesLLGDraft_17.pdf

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LEVEL 4 Physical sexual behaviors directed towards co-resident with agreement

- What is the extent of sexual behaviors?
- Can the residents give an account of behaviors they would find acceptable/unacceptable?
- Do they have the ability to say “no” or indicate refusal and/or acceptance?
- Do they have the ability to avoid exploitation?

http://www.rgpc.ca/best/BPC%20-%20Sexuality/SexualityPracticeGuidelinesLLGDraft_17.pdf

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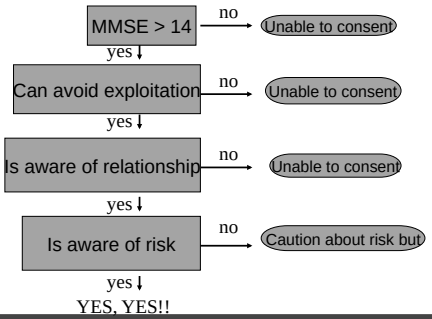
Assessing for Competency to Participate in a sexual relationship Lichtenstein 1997



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Sexual Behavior: Nonpharmacologic Treatments

- **DBART Philosophy #2; 'Cannot create a behavioral vacuum**.
  - What behaviors will you increase?
    - Appropriate touch
    - Belonging…pet therapy, an inanimate object to 'care' for, reminiscing,

"Appropriate Touch"

- Hand shakes
- Holding Hands
- Massage
- Hair care
- Dancing

Sexual behavior: Pharmacologic treatments

- "No randomized controlled trials exist for any treatment of sexual disinhibition in dementia and there are no trials comparing different pharmacological agents."

Tucker I. (2010). Management of inappropriate sexual behaviors in dementia: a literature review. International Psychogeriatrics. 22:683-92.

Plan for today

- Behavioral Symptoms Nomenclature
- Approach
- Role of Medications
- Empirical basis
- Proactive interventions
- New opportunities

VA study: A systematic review of non-pharmacological interventions for behavioral symptom of dementia

Cognitive Emotion Oriented interventions	
Reminiscence Therapy	Not supported
Simulated presence therapy	May have adverse effects
Validation Therapy	Insufficient evidence

'O' Neil et al, VA-ESP Project #05-225:2011

VA study: A systematic review of non-pharmacological interventions for behavioral symptom of dementia

Sensory stimulation interventions	
Acupuncture	No evidence
Aromatherapy	Insufficient evidence
Light Therapy	Insufficient evidence

'O' Neil et al, VA-ESP Project #05-225:2011

VA study: A systematic review of non-pharmacological interventions for behavioral symptom of dementia

Sensory stimulation interventions	
Acupuncture	No evidence
Aromatherapy	Insufficient evidence
Light Therapy	Insufficient evidence
Massage	Beneficial effects
Music Therapy	Has potential

O'Neil et al, VA-ESP Project #05-225:2011

VA study: A systematic review of non-pharmacological interventions for behavioral symptom of dementia

Behavior Management Techniques	
Functional analysis, token economies habit training, muscle relaxation	Some support
Other	
Animal therapy	Potential benefit
Exercise	Improved sleep

'O' Neil et al, VA-ESP Project #05-225:2011

Agency for Healthcare Research &Quality

Challenges to studies in this area

- Many different behavioral phenotypes will be combined under same label
  - Wandering, yelling, striking might all be called agitation
- In randomized studies must assume common cause for behavior
  - However same behavioral phenotype will have many different causes/mediators

Challenges to studies in this area

- Often dealing with low frequency behaviors
- Frequently studying reactive not proactive interventions
- Ignores different etiologies and severity levels of people in providing standardized intervention
- Problems of treatment diffusion

A gold standard study

- Cohen-Mansfield, J., Libin A., and Marx, M.S., (2007) Nonpharmacological Treatment of Agitation: A Controlled Trial of Systematic Individualized Intervention, *J Gerontol A Biol Sci Med Sci (2007) 62 (8): 908-916.*
- Randomized facilitets.
- Individualized treatments
- Found decreased agitation, increased pleasure

Plan for today

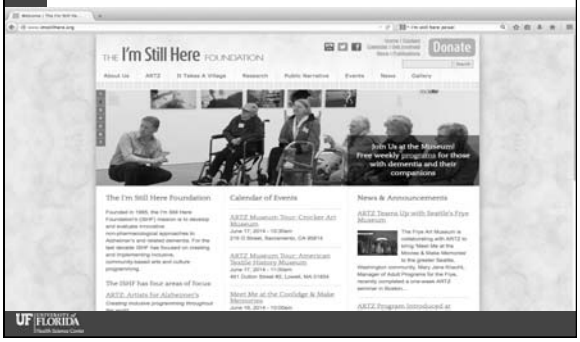
- Behavioral Symptoms Nomenclature
- Approach
- Role of Medications
- Empirical basis
- Proactive interventions
- New opportunities

Systematic Proactive approaches

- ARTZ for Alzheimers
- I'm Still Here
- Music and Memory project

Systematic Proactive Approaches

- I'm Still Here Programs-Zeisel



Systematic Proactive Approaches

- ARTZ for Alzheimers

Systematic Proactive Approaches

- Music and Memory project
  www.musicandmemory.org

Systematic Proactive Approaches

- Intergenerational school or daycare

Plan for today

- Behavioral Symptoms Nomenclature
- Approach
- Role of Medications
- Empirical basis
- Proactive interventions
- New opportunities

Telemedicine Practice

- DBART model conducive to telemedicine
- Use facilities existing equipment or Fedex computer
- Skype, iChat, Vidyo or others

Business Model Direct Payment

- Psychologist
  - Review faxed records, see patient, conduct mental status, interview team, bill Diagnostic Interview
- Psychiatrist
  - same as above bill appropriate EM code
- Both add qualifier

Business Model
Cost offset

- Defer inpatient admissions
- Short Length of stay
- Avoid readmission

Advantages

- Increase access with no additional personnel costs; drive time replaced by televisits
- Telemedicine modifier codes exist
- Could eventually make service available throughout state by offering instructions on how to link to us.
- Builds care facilities dementia management capacity

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What about billing?

*www.cms.gov/Outreach-and.../**Medicare**.../**telehealth**srvcsfctsht.pdf*

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Medicare & Medicaid Services

Medicare Learning Network

Official CMS Information for Medicare Fee-For-Service Providers

Telehealth Services

RURAL HEALTH FACT SHEET SERIES

This publication provides the following information about calendar year (CY) 2013 Medicare telehealth services:

- Originating sites;
- Distant site practitioners;

eligible beneficiary via a telecommunications system. For eligible telehealth services, the use of a tele-communications system substitutes for an in-person encounter.

Originating Sites

An originating site is the location of an eligible Medicare beneficiary at the time the service being furnished via a telecommunications system occurs. Medicare beneficiaries are eligible for telehealth services only if they are presented from an originating site located in a rural Health Professional Shortage Area or in a county outside of a Metropolitan Statistical Area. Entities that participate in a Federal telemedicine demonstration project approved by (or receiving funding from) the Secretary of the Department of Health and Human Services as of December 31, 2000, qualify as originating sites.

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The chart below provides the CY 2013 list of Medicare telehealth services.

Service	Healthcare Common Procedure Coding System (HCPCS)/CPT Code
Telehealth consultations, emergency department or initial inpatient	HCPCS codes G0425 – G0427
Follow-up inpatient telehealth consultations furnished to beneficiaries in hospitals or SNFs	HCPCS codes G0406 – G0408
Office or other outpatient visits	CPT codes 99201 – 99215
Subsequent hospital care services, with the limitation of 1 telehealth visit every 3 days	CPT codes 99231 – 99233
Subsequent nursing facility care services, with the limitation of 1 telehealth visit every 30 days	CPT codes 99307 – 99310
Individual and group kidney disease education services	HCPCS codes G0420 and G0421
Individual and group diabetes self-management training services, with a minimum of 1 hour of in-person instruction to be furnished in the initial year training period to ensure effective injection training	HCPCS codes G0108 and G0109
Individual and group health and behavior assessment and intervention	CPT codes 96150 – 96154
Individual psychotherapy (effective for services furnished on or after January 1, 2013)	CPT codes 90832 – 90834 and 90836 – 90838
Psychiatric diagnostic interview examination (effective for services furnished on or after January 1, 2013)	CPT codes 90791 and 90792
End-Stage Renal Disease (ESRD)-related services included in the monthly capitation payment	CPT codes 90951, 90952, 90954, 90955, 90957, 90958, 90960, and 90961
Individual and group medical nutrition therapy	HCPCS code G0270 and CPT codes 97802 – 97804
Neurobehavioral status examination	CPT code 96116
Smoking cessation services	HCPCS codes G0436 and G0437 and CPT codes 99406 and 99407
Alcohol and/or substance (other than tobacco) abuse structured	

Medicare will pay if…

- CMS considers county underserve as defined by Health Professional Shortage area
- Patient is seen in Skill Care facility or underserved clinic
- Direct visual contact with pt is made
- We use telemedicine modifier
- Facility can also receive originating site facility fee HCPCS code Q3014.
  -

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Conclusion

- It is possible in fact essential to manage behavioral challenges 'in situ'
- Behavioral strategies are essential, medications are helpful for specific targets
- Telecommunications can teleport in additional sets of eyes, ears, and brains

Conclusions

- PRNs are too late; manage antecedents
- Person's history should be your guide
- Consider iatrogensis, opportunities for comfort care

Conclusions

- The underlying basis for cognitive impairment will influence the type and course of behavioral disturbance
- Disruptive behavior may at times represent a form of adaptive communication
- Cannot create a behavioral vacuum
  - What is it you want the person to do ?

Conclusions

- Behavioral approaches may be effective in managing/tolerating behaviors
- Can augment or supplant medication approaches

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  - 5T32 HD007447-18: Mayo Rehabilitation Research Training Center (Fields)
  - R01NR 12419-01: A Multicenter Rehabilitation Intervention for Amnestic Mild Cognitive Impairment (Greenaway & Locke)
  - Alzheimer's Association NIRG: A Memory Compensation Intervention for Mild Cognitive Impairment (Greenaway)
  - Emory University ADRC NIRG-07-58843 Pilot grant: Interventions for Amnestic Mild Cognitive Impairment (Greenaway)
  - Mayo Clinic Clinical Research Award and Clinical Practitioner Investigator Award: Memory Support System for Amnestic Mild Cognitive Impairment (Greenaway and Smith)

Questions?

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