Behavioral Interventions to Protect Cognitive Health among Community Dwelling Older Adults

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What’s the problem?

- Cognitive health is a public health priority
- Age is best known risk factor
- Not inevitable
- Health care and economic resources
- Most feared consequence of aging

(Alzheimer's Association and Center for Disease Control and Prevention, (CDC), 2013); Harrison, Weintraub, Mesulam, Rogalski, 2013; Marist Poll, 2012; Phlen, 2013)
PICO Question

- Do behaviors within six dimensions of wellness influence cognitive health among community-dwelling older adults over age 60?
Theoretical Framework

Six Dimensions of Wellness (Hettler, 1976)
Cognitive Health Protection & Wellness Behaviors

- Regular physical activity
- Rich social networks
- Intellectually stimulating activities
- Positive emotional outlook
- Spiritual behaviors
- Occupations involving data or human interaction

(Strout and Howard, 2012; Strout and Howard, 2014)
Application of the Rasch Model to Measure Five Dimensions of Wellness in Community Dwelling Older Adults

What is COLLAGE?

COLLAGE, The Art & Science of Healthy Aging® is a consortium of aging services organizations working to advance healthy aging and improve outcomes of older adults living independently. Members of the consortium – continuing care communities, moderate-income and federally subsidized housing programs, and home care and community-based agencies – use a unique, holistic, evidence-based assessment tool and person-centered process to improve quality of life and successful aging. As of November, 2011, there are over 60 non-profit sites in 22 states that participate in the membership consortium and use the COLLAGE Web-based software system.
Sample Selection

- Members of COLLAGE consortium
- Completed a Wellness Assessment Tool 2007-2012
- Lived in the community
- Male or female
- >60
- Final sample= 5,604
Approach

• 22 items from Wellness Assessment tool
• Align with 5 dimensions of wellness
Social Wellness

**Definition**: Ability to form and maintain positive personal and community relationships (Hettler, 1976).

**Items from Wellness Assessment**

- Has close friends in community?
- Feels can count on friends for companionship?
- Has opportunity to give and receive physical affection?
- Feels community environment is supportive?
- Participates as a volunteer on campus
Measurement

- Rasch analysis
- Convert ordinal, nominal data to interval data
- Logit
Logit

- Compares subject ability with item difficulty
- Person’s ability = level of wellness the person demonstrated
- Item difficulty = level of wellness associated with item
- Probability of wellness depends on the level of wellness a person demonstrates relative to the level of wellness associated with the item

(Andrich, 1988)
The Rasch Rating Scale of Dichotomous Variables

• Pass/fail structure
• Yes=1
• No=0
• As wellness associated with person increases, probability of endorsing wellness items moves closer to one
• No credit for answers closer to the “best”
Rationale for Partial Credit Model

• WEL represents various degrees of wellness
• Example
  – How satisfied are you with your life as a whole in the last 3 days?
    • Delighted
    • Pleased
    • Mostly satisfied
    • Mixed
    • Mostly dissatisfied
    • Unhappy
Five Dimensions of Wellness and Predictors of Cognitive Health Protection in Community-Dwelling Older adults: A Historical COLLAGE Cohort Study

Research Question

Which of the five dimensions of wellness is most strongly associated with cognitive ability among community dwelling older adults?
Dimension to Cognitive Health Protection

Dimension of wellness

Research

Intervention

Cognitive Health Protection
Sample Selection

- 5,605 Male and female community dwelling older adults, COLLAGE cohort
- 60 years and older
- 24 United States
- Correlational, predictive Cohort Study
Logit Values into Physical Dimension of Wellness

Healthy diet + Physical Activity + Hydration + Weight = Physical Dimension
Cognitive Performance Score

0 = Cognitively Healthy

6 = Severe cognitive impairment
Emotional, Spiritual, Social, Intellectual, Physical

(Strout and Howard, 2014; Wallyear, 2013)
(Strout and Howard, 2014; Wallyear, 2013)
The Mediator Role of Positive Emotion Interventions and Cognitive Health in Community Dwelling Older Adults: A Longitudinal COLLAGE Cohort Study

Emotional Wellness and Cognition

- Poor emotional wellness associated with cognitive decline
- Low mood
- Depression
- Neuroticism
- Depressive symptoms
- Anxiety

(Wilson, et al., 2007; Boyle, et al., 2010; Wang, 2009; Kohler, et al., 2010; Yates, Clare, Woods, 2013)
Theoretical Framework

Fredrickson & Cohn, 2008, Figure 48.1.

Negative emotions

Undoing effect

(Fredrickson, 200; Frederickson, 2001)
Hypothesis

1) Among community dwelling older adults age 60 and older, those who report more negative emotions will be at higher risk for developing cognitive decline over time.

2) Among community dwelling older adults 60 and older, those who engage in activities that cultivate positive emotions will experience fewer negative emotions and will demonstrate less risk for cognitive decline over time.
Sample

- 492 adults
- 60 and older
- Live in community at time of assessment
- COLLAGE consortium
- Completed a Wellness Assessment and Community Health assessment between 2007 and 2013
- **Cognition: Cognitive Performance Scale (CPS)**

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Item</th>
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<tbody>
<tr>
<td>CHA</td>
<td>Is short term memory OK</td>
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<td>What is the level of cognitive skills for daily decision making?</td>
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<td></td>
<td>What is the level of ability in making self understood?</td>
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<tr>
<td>WEL</td>
<td>How would you rate your memory?</td>
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<td></td>
<td>Are you interested in a program to improve your memory?</td>
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<tr>
<td>FS</td>
<td>Is procedural memory OK?</td>
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<tr>
<td></td>
<td>What is the level of ability in eating?</td>
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</tbody>
</table>
## Mood & Activities to Promote Positive Emotions

<table>
<thead>
<tr>
<th>Mood</th>
<th>Activities to Promote Positive Emotions</th>
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</thead>
<tbody>
<tr>
<td>Made negative statements (CHA)</td>
<td>Acupuncture (WEL)</td>
</tr>
<tr>
<td>Persistent anger with self and others (CHA)</td>
<td>Aromatherapy (WEL)</td>
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<tr>
<td>Withdrawal from activities of interest (CHA)</td>
<td>Massage (WEL)</td>
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<td>Meditation (WEL)</td>
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<td></td>
<td>Music Therapy (WEL)</td>
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<td>Therapeutic touch (WEL)</td>
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</table>
Statistical Analysis

- Logistic regression
- CPS at 1 year (dichotomized intact and impaired)
- Negative emotion (dichotomized present, not present)
- Positive emotion activities (participate, not participate in activity)
- Controlled for age, gender, diabetes, CHD, education
- SAS 9.3
Demographic Results

• Descriptive statistics
• 70.3% female
• 40.9% graduate or professional degree
• 11.8% diabetes
• 17.7% coronary heart disease
• 0% CHF
Negative Emotion Association with CPS score
Controlling for age, gender, education, and chronic disease

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR</th>
<th>Lower</th>
<th>Upper</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative statements</td>
<td>0.313</td>
<td>0.020</td>
<td>0.872</td>
<td>0.03</td>
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<tr>
<td>Anger</td>
<td>3.064</td>
<td>1.218</td>
<td>7.704</td>
<td>0.01</td>
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<tr>
<td>Withdrawal</td>
<td>3.740</td>
<td>1.388</td>
<td>10.079</td>
<td>0.00</td>
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</tbody>
</table>

**OR represent the increase in odds of a poor CPS scores with the presence of the condition. 95% CI**
Activity Participation Association with CPS Controlling for Age, Gender, Education, and Chronic Disease

**OR represent the increase in odds of a poor CPS scores with preference for the activity**

<table>
<thead>
<tr>
<th>Activity</th>
<th>OR</th>
<th>Lower</th>
<th>Upper</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acupuncture</td>
<td>0.932</td>
<td>0.335</td>
<td>2.595</td>
<td>0.893</td>
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<tr>
<td>Aromatherapy</td>
<td>1.179</td>
<td>0.269</td>
<td>5.172</td>
<td>0.827</td>
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<tr>
<td>Massage</td>
<td>0.784</td>
<td>0.382</td>
<td>1.607</td>
<td>0.506</td>
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<tr>
<td>Meditation</td>
<td>0.990</td>
<td>0.431</td>
<td>2.277</td>
<td>0.982</td>
</tr>
<tr>
<td>Music therapy</td>
<td>0.779</td>
<td>0.303</td>
<td>2.005</td>
<td>0.605</td>
</tr>
<tr>
<td>Therapeutic touch</td>
<td>1.910</td>
<td>0.469</td>
<td>7.771</td>
<td>0.366</td>
</tr>
</tbody>
</table>
Limitations

- Homogenous sample
- Sensitivity of CPS
- Length of follow up time (1 year)
- Precision of positive emotion activity measurement
- Positive activity items
Implications

- Negative emotions increased risk for cognitive decline
- Assessments that trigger negative emotions used to guide patient-centered cognitive decline prevention plans
- Positive emotions as a mediator for negative mood should be examined in future research with more precise cognitive and emotion measures over a longer duration
Behavioral Interventions within Six Dimensions of Wellness that Protect Cognitive Health for Community Dwelling Older Adults: A Systematic Review

Hierarchy of Evidence

- Systematic Reviews
- Randomized Controlled Trials
- Cohort Studies
- Case Reports
- Expert Opinion

Building the Science to Protect Cognitive Health

- Dimension of wellness
- Research
- Intervention

Cognitive Health Protection
Objective

• To systemically identify, appraise, and summarize research on the effect of behavioral interventions to prevent cognitive decline in community-dwelling older adults, using a holistic wellness framework.
Method

- Conducted in concordance with PRISMA guidelines
- Systematic Review
- PubMED MEDLINE, EMBASE, CENTRAL, CINAHL, PsychoINFO, ALOIS, and The (NYAM) Grey Literature Report
Criteria for Inclusion

• Randomized Control Trial (RCT)
• Community dwelling male or female adults ≥60
• Include measurement from at least 3 of 7 cognitive domains: Executive function, attention, episodic memory, language, processing, speed, working memory
• Include outcome comparison variable, control group
• Occupational Wellness: volunteering, work/career
• Social Wellness: social engagement in groups (e.g. movies, concerts, activities), support groups (e.g. reminiscing about life), pets
• Intellectual Wellness: computerized games, crossword puzzles, education courses, reading, musical instruments, arts/crafts, cooking, writing
• Physical Wellness: physical activity (walking, running, gardening, yoga, Pilates, weight training, video fitness, group fitness, diet)
• Emotional Wellness: stress reduction interventions (e.g. meditation, yoga, positive affirmations, stress education classes)
• Spiritual Wellness: religious activity involvement (e.g. attending church, prayer, Bible study), spiritual activities (e.g. Reiki)
APPENDIX 1. SEARCH STRATEGY FOR PUBMED MEDLINE

1. Cognition[MeSH]
2. Cognition Disorders/prevention and control[MeSH]
3. Memory[MeSH]
4. Memory Disorders/prevention and control[MeSH]
5. Mental Processes[MeSH]
6. Dementia/prevention and control[MeSH]
7. Attention[MeSH]
8. Language[MeSH]
9. Psychomotor Performance[MeSH]
10. Neuropsychological Tests[MeSH]
11. Geriatric Assessment[MeSH]
12. cognitii*
13. memory or memori* or recall
14. attention
15. language or speech or speak*
16. “executive function”
17. OR/ 1-16

18. Independent Living[MeSH]
19. home based or home-based
20. community dwelling or community-dwelling or community-based
21. independent living
22. OR/18-21

23. Aged[MeSH]
24. Aged, 80 and over[MeSH]
25. Aging[MeSH]
26. elder*
27. “older adults” or “older people”
28. seniors or “senior citizens”
29. OR/23-28

30. 17 AND 22 AND 29

31. Physical Fitness[MeSH]
32. Motor Activity[MeSH]
33. Exercise Movement Techniques[MeSH]
34. Exercise Therapy[MeSH]
35. Walking[MeSH]
36. Diet[MeSH]
37. Health Services/utilization[MeSH]
38. Health Behavior[MeSH]
39. Health Promotion[MeSH]
40. Self Care[MeSH]
41. Life Style[MeSH]
Article Selection Process

3,812 articles identified from database searches

3,582 articles excluded through title review

230 abstracts received

3 articles added from authors’ knowledge of the literature

178 articles excluded
(106) <3 cognitive outcome measures
(28) did not meet intervention inclusion criteria
(28) not RCT
(12) did not meet age inclusion criteria
(4) duplicate records

52 full-text articles retrieved
Article Selection Process

52 full-text articles retrieved

37 articles excluded
(22) <3 cognitive outcome measures
(10) not RCT
(2) did not meet age inclusion criteria
(3) not research

18 studies included
100% studies targeted to physical or intellectual wellness

38% influenced multiple wellness dimension

16% influenced emotional dimension

59 different cognitive measures, many without operational definitions

72% tested 12 week dose

28% tested fewer than 12 week dose
Brain exercises most commonly studied

Walking most common intervention

50% of research demonstrated statistically significant outcomes

Intellectual dimension most significant

44% highest quality CONSORT rating
<table>
<thead>
<tr>
<th>Instrument</th>
<th>Executive Function</th>
<th>Attention</th>
<th>Memory</th>
<th>Language</th>
<th>Processing Speed</th>
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</thead>
<tbody>
<tr>
<td>Alzheimer’s Disease Assessment Scale—Cognitive Subscale</td>
<td>Lam²⁸</td>
<td>Lam²⁸</td>
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<td>A Quick Test of Cognitive Speed</td>
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<td>Ijuin²⁷</td>
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<tr>
<td>Auditory Verbal Learning Test</td>
<td>Mortimer³⁰</td>
<td>Mortimer³⁰</td>
<td>Van Uffelen³⁴</td>
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<td>Bell Cancellation Test</td>
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<td>Chinese Auditory Verbal Learning Test</td>
<td>Mortimer³⁰</td>
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<td>Clock Drawing Test</td>
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<td>Consortium to Establish a Registry for</td>
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<td>Alzheimer’s Disease Word List Procedure</td>
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<td>Concept Shifting Test</td>
<td>Slegers³²</td>
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<td>Cogstate Battery</td>
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<tr>
<td>Category Verbal Fluency Test</td>
<td>Lam²⁸</td>
<td>Bozoki²¹</td>
<td>Mortimer³⁰</td>
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<tr>
<td>Color Word Stroop Test</td>
<td>Cheng²⁵</td>
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<td>Delayed Word List Recall</td>
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<td>DS</td>
<td>Ijuin²⁷</td>
<td>Lam²⁸</td>
<td>Noice³¹</td>
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<td>Delay Recall</td>
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<td>Lam²⁸</td>
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<td>Digit Symbol Substitution Test</td>
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<td>East Boston Memory Test</td>
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<td>Eriksen Flanker Task</td>
<td>Barnes²⁰</td>
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<tr>
<td>Everyday Problems Test</td>
<td>Ball¹⁹</td>
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<td>Exercise Performance</td>
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<td>Hopkins Verbal Learning Test</td>
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<td>Letter Series</td>
<td>Ball¹⁹</td>
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<td>Letter Sets</td>
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<td>Memory Controllability Inventory</td>
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<td>Motor Choice Reaction Time</td>
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<td>Modified Stroop Test</td>
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<td>Observed Tasks of Daily Living</td>
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<td>Problem Solving (Means-End-Problem-Solving Procedure)</td>
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<td>Rey Auditory Verbal Learning Test</td>
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<td>Rey-Osterrieth Complex Figure</td>
<td>Carlson²³</td>
<td>Mortimer³⁰</td>
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<td>SCWT</td>
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<td>Stroop Test</td>
<td>Mortimer³⁰</td>
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<td>Story Recall Task (East Boston Memory Test)</td>
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<td>TMT</td>
<td>Mortimer³⁰</td>
<td>Lam²⁸</td>
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<td>TMT—Chinese Version</td>
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<td>TMT—Japanese Version</td>
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<td>TMT A</td>
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<td>TMT A and B</td>
<td>Barnes²⁰</td>
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<td>TMT B</td>
<td>Bugos,²² Carlson²³</td>
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<td>Toulouse-Pieron Concentration Test</td>
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<td>Useful Field of View</td>
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<td>Verbal Fluency Test</td>
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<tr>
<td>Word List Recall</td>
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Discussion

• Physical and intellectual behaviors demonstrate a protective effect on cognition.
• Walking, tai-chi, and piano lessons are examples of behaviors older adults can engage in to protect cognition.
• Social, spiritual, emotional, occupational wellness behaviors are understudied.
• Variation in cognitive measurement tools limits data pooling and comparison.
• Standard use of NIH Toolbox Cognition Battery could improve analysis of cognitive health protection interventions for older adults.
GROW: Green Leafy Vegetable Gardens to Promote Older Adult Wellness
Thank you! Questions?