Cognitive Intervention for Early Stage Dementia:
Past, Present, and Future

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Presentation to AZNS - 12/10/14

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Stories and Myths
1. Basic Coverage of Dementia

• A progressive neurobiological disorder that affects one's ability to think correctly

• Dementia results in/from:
  • atrophy (decay and death of brain cells)
  • Plaques (protein deposits in the brain)
  • Tangles (nerve cells getting tangled with each other)
  • Micro-strokes (in vascular/mixed dementia)
  • Loss of glutamate

• Dementia is not a disease
  • group of symptoms
Signs of Dementia

- Repeating the same story or question over and over
- Getting lost in familiar places
- Delusions or agitated behavior
- Problems with language, movements, or recognizing objects
- Memory or concentration problems
- Difficulty following directions
- Getting disoriented about time, people, and places
- Neglecting personal safety, hygiene, and nutrition
Risk Factors for Dementia

• Aging
• Genetics

• Smoking
• Uncontrolled Diabetes
• Hypertension
• High Cholesterol

• *Lack of Mental Stimulation*
Types of Dementia

- Alzheimer's dementia
- Vascular dementia
  - often arises from stroke or arteriosclerosis (hardening of the arteries) in the brain
  - Produces microvascular ischemic changes (very small strokes) in the brain
- Other types of dementia:
  - Parkinson’s disease
  - Huntington’s disease
  - HIV
  - Lewy Body
  - Frontotemporal (e.g., Pick’s disease)
Alzheimer’s Dementia

• Alzheimer’s is a type of dementia.
  • It is the among the most common forms of dementia.
• Causes problems with memory, thinking, and behavior.
• 1 in 3 seniors will die with Alzheimer’s or another form of dementia
• More than 6 millions Americans are living with dementia of the Alzheimer’s type

Source: Alzheimer’s Association
Causes of Alzheimer’s Disease

- A build-up of proteins in the brain
  - Plaques - deposits of the protein beta-amyloid that accumulate in the spaces between nerve cells
  - Tangles - deposits of the protein tau that accumulate inside of nerve cells
- Age
  - 1 out of 8 people over 65 and almost one out of every two people over the age of 85 has the disease
  - The risk nearly doubles every five years for someone over the age of 65
- Family History - Genetics
  - If you have a blood relative that has developed the disease, you are 2 - 3 times more likely to develop it
  - If more than one family member your risk increases
- Lifestyle Factors
  - Head injuries
  - Unhealthy diets and lack of exercise
  - Smoking and other uses of tobacco
  - Excess alcohol consumption
  - Low social interaction, or lack of intellectually stimulating activities
- Poor Heart Health

Source: Alzheimer’s Association
Symptoms of Alzheimer’s

- Memory loss that affects daily life
- Challenges in planning or solving problems
- Difficulty completing familiar tasks
- Confusion with time or place
- Trouble understanding visual images and spatial relationships
- New problems with speaking or writing
- Misplacing things and unable to find them
- Decreased or poor judgment
- Withdrawal from social activities
- Changes in mood & personality
Medications – Cognitive enhancers to help produce necessary chemicals in the brain for proper brain function. Many have side effects and have to be monitored closely. The effectiveness of medications varies greatly.

Behavioral Assessments – Identifying particular behaviors and their ‘triggers,’ or what seems to cause the behaviors and work to create new approaches to events that cause negative behaviors.
Intervention Mechanisms

• **Cognitive Rehabilitation (Intervention)** - Treating the brain like a muscle and exercising it with mental stimulation.
  - *Theoretically*, this creates new connections and helps the brain to grow in new areas and limiting the effects of cortical shrinkage (atrophy)

• **Home Care** - Helps bring social interaction and limits agitation with continuity of care provided by the same caregiver(s).
  - Allows someone with dementia to be actively involved and engaged with a person who is not mentally limited or cognitively impaired.
Causes of Dementia

• Fixed Cognitive Impairment
  • Irreversible but non progressive
  • Traumatic brain Injuries
  • Strokes or infections in the brain
  • Temporary reductions in the brain’s supply of oxygen
  • Excessive alcohol use
• Slowly Progressive
  • Begins gradually and worsens progressively - irreversible
  • Alzheimer’s Disease, Vascular Dementia - a build up of proteins in the brain: plaques and tangles
  • Can be caused by Hypothyroidism - reversible with treatment
  • Family History
• Rapidly Progressive
  • Worsens over weeks to months - irreversible
  • Prions - an infectious agent composed of protein in misfolded form
  • Causes of slowly progressive dementia are sometimes present
  • Encephalopathy and delirium are reversible - possible causes are brain infection, inflammation, tumors, drug toxicity, and or metabolic causes like liver and kidney failure
Anatomy of Dementia: Cortical Atrophy

Source: Alzheimer’s Association
Anatomy of Dementia: Inhibited GlucoseMetabolism
Anatomy of Dementia: Neuroimaging

Vascular Dementia

T1                  T2               FLAIR
Anatomy of Dementia: Societal Costs

• Dementia care costs around 1 percent of the world’s gross domestic product (GDP).

• 2010: total estimated worldwide costs of dementia $604 billion
  • If dementia care were a country, it would be the world’s 18th largest economy (ranking between Turkey and Indonesia).
  • If dementia care was a company, it would be the world’s largest by annual revenue, exceeding Wal-Mart ($414 billion) and Exxon Mobil ($311 billion).

- By 2030, worldwide societal costs will increase by 85 percent (a very conservative estimate considering only increases in the number of people with dementia).

Acceleration

• World’s population is aging with more speed and is experiencing increased difficulty

*World*:
• 1 in 3 seniors die with dementia
• 25 percent of caretakers are long-distance providers
• Cost world more than more than $200 billion by giving away 17.5 billion unpaid hours of care each year

• By 2050, it is expected that AD will cost $1.2 trillion as the number of dementia increases
Silver Tsunami

• Baby Boomers = babies born after January 1\(^{st}\), 1946 to 1964
  • Largest generation ever in the US
• 80 million Americans are expected to apply for retirement benefits over the next two decades
• 2017 - more SS benefits paid out than coming in
  • Exhaustion of trust fund by 2041

Source: U.S. Census Bureau, International Baby Boomers

Source: McKeel Matera, Market Institute Analysis
Population Projections Program
US Census Bureau, 2000
Silver Tsunami

U.S. Senior Population (65 and older)

2009
39.6 million
U.S. senior population, 2009
12.9%
percentage of the U.S. population in 2009

2030
72.1 million
projected number of U.S. seniors by 2030
19%
projected percentage of U.S. population in 2030

*Source: U.S. Administration on Aging

Number of Seniors alive in the USA

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<th>Year</th>
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<td>87m</td>
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Anatomy of dementia: sociocultural implications

This Baby Will Live to Be 120
(National Geographic, May, 2013)
http://ngm.nationalgeographic.com/2013/05/longevity/hall-text
Cognitive Rehabilitation

- Systematic program to assist individuals with impairments in thinking
  - Various etiologies: traumatic brain injury, stroke, etc.
  - Goal is to restore back to normal functioning
  - Entails an individualized program of specific skills training + metacognitive strategies
    - Increasing self-awareness + problem skill strategy
- Shown to be effective in aiding people with a variety of neurocognitive impairments
- 2002 - study analyzed 47 treatment comparisons and reported "a differential benefit in favor of cognitive rehabilitation in 37 of 47 (78.7%) comparisons" (Sohlberg and Mateer)
- 2009 - US Dept. of Defense found that adults with TBI who receive comprehensive cognitive rehabilitation therapy report significant improvement on measures of quality of life compared to patients who receive a less intense form of therapy

(US DoD)
Cognitive Intervention for Dementia

- Neuropsychological assessment is widely established as a necessary component of diagnosing dementia
  - Although it’s role in intervening in dementia is poorly understood
  - Research is lacking and somewhat mixed
Cognitive Intervention Programs for Dementia

• A Wiser Mind
  • http://awisermind.com/

• Mayo Healthy Action to Benefit Independence and Thinking (HABIT) Program
  • http://www.mayoclinic.org/diseases-conditions/alzheimers-disease/expert-blog/habit-program/bgp-20055932

• Cognitive Stimulation Therapy
  • http://www.cstdementia.com/

• Cognitive Therapeutics Method
  • http://cognitivetherapeutics.com/About/faqs.php
Research on Cognitive Intervention for Dementia

- Lack of Research in this Area
- Research has been mixed

• Moore, Sandman, McGrady, & Kesslack (2007). Memory training improves cognitive ability in patients with dementia.
  • A memory training program can be beneficial for patients with mild to moderate AD
    • Improves some aspects of memory and behavior
    • Behavior interventions + pharmacological therapies may optimize functional ability and provide a framework to further enhance cognition functioning in patients with dementia
Research on Cognitive Intervention for Dementia

- Mayo Clinic
  - Glenn Smith, Ph.D.
- Emory University
- Harvard University
- University of Pennsylvania
  - Cognitive Intervention for MCI
• Myths, although prevalent and pervasive, are not reality

• Myths need to be combatted with the aide of accurate education that is widely-dispersed and easily digested
  • Telling a different story

• Aging ≠ dementia
  • Dementia is not an inevitable reality as one ages, and should not be accepted as such

• Cognitive intervention may be an effective mechanism of preventing the onset and lessening the extent of dementia
  • Possible future: Cognitive intervention + medication
Questions?
Select References


Cognitive Rehabilitation for Dementia: SMART Program

- SMART = Strategic Memory and Alzheimer’s Rehabilitation Training
- Cognitive rehabilitation program for dementia
  - Used for prevention of onset for dementia and/or lessening the extent of existing dementia
- Increase in brain resiliency via new (novel) learning
- Improvement in quality of life via cognitive perseveration
- Use of SMART-certified home caregiver professionals
- Personalized neuropsychological consultation from Dr. John DenBoer
SMART Program

• **Structure:**
  • 14-week cognitive rehabilitation program
  • Employed caregiver, which is an essential component of the program
  • Minimum of 3 hours of caregiver-client activity per week
  • Suitable for Stage 1-3 dementia
  • 6 cognitive modules:
    • Attention/Concentration
    • Memory
      • Verbal, Visual
    • Executive Functioning
    • Speech and Language
    • Processing Speed
    • Mod and Psychological Problems
  • Designed to increase dendritic connections via new/novel learning exercises
How does SMART Work?

• Initiates Novel learning
  • Promotes neural binding
    • Which, in turn, promotes the release of glutamate
  • Release of glutamate serves to decrease the progression of cortical atrophy
• Increases dendritic connections and spine density
• Presence of caregiver essential to adherence and compliance of program
SMART Program: Research

Approximate Course of Dementia

Cognitive Functioning

TIME

*Based on approximately 350 patients