The ACTIVE Cognitive Intervention Trial

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Evidence for cognitive training benefits

Beneficial effects of three classes of interventions:
1. Cognitive Training
2. Blood Pressure Management
3. Increasing Physical Activity

Conclusion: Moderate strength evidence for cognitive training, based largely on the ACTIVE Trial
Cognitive training

“In conclusion, some RCT evidence, based largely on the ACTIVE trial, suggests that cognitive training can improve long-term cognitive function and maintenance of independence in instrumental activities of daily living in adults with normal cognition….. Although inconclusive, this encouraging RCT evidence, bolstered by additional data from longitudinal cohort studies on the benefits of education and cognitively stimulating activities, supports public health communications about cognitive training as a tool for delaying or slowing ARCD.” (p. 6)

ACTIVE

- RFA initiated by NIA and NINR

ACTIVE - Advanced Cognitive Training for Independent and Vital Elderly

- Randomized Controlled Clinical Trial
- Common multi-site intervention protocol with “proven interventions”
- Include intent-to-treat analyses

Primary Aim of ACTIVE

- To test the efficacy of three cognitive interventions to improve or maintain the cognitively demanding activities of daily living.
- Important Shift in Major Outcome of Cognitive Training Research
  - Primary outcome is cognitively demanding activities, NOT Basic Cognitive Abilities. Outcome of ACTIVE trial specified by RFA
  - Thus, the pre-specified ACTIVE design necessarily had to use basic intervention strategies which are known to be challenging for achieving real-world transfer
ACTIVE trial timeline

• **1995-1996**
  - RFA initiated by NIA and NINR
  - Multi-site trial funded (6 sites): Penn State, Johns Hopkins, Indiana Univ School of Medicine, Hebrew Senior Life/Harvard, Wayne State, Univ of Alabama, Birmingham

• **1997-2001**
  - 3-arm randomized pilot trial completed (N = 147)
  - 4-arm RCT completed (N = 2802)
  - 2-year follow-ups (N = 2244)

• **2002-2010**
  - 5-, 10-year follow-ups (N’s = 1879, 1220); 2- & 5-year papers published

• **2011-2015**
  - 10-year paper published

• **2016-present**
  - 20-year follow-up data linkage study funded by NIA
  - Supplement on race and social determinants of health funded by NIA
  - Special issue on race and social determinants of health in *Journal of Aging and Health*
Does intervening on **basic** abilities transfer to real-world tasks?

Baseline Characteristics:

- Mean age: 73.6
- Range: 65-94
- Gender: 75.9% female
- Race: 26% African American
- Education: HS diploma 88.6%
- Marital Status: 35.6% married
- Cognitive Status: MMSE 27.3

Multi-site Trial: N = **2802**

Funded by NIA and NINR

Source: Jobe et al. (2001).

**Controlled Clinical Trials**
ACTIVE cognitive training

**Memory**
- Focus on verbal episodic memory
- Mnemonic strategies for remembering words/main ideas (e.g. “Memory man”)

**Reasoning**
- Ability to solve problems that follow a serial pattern
- Practiced strategies, abstract reasoning tasks (e.g. letter series), reasoning problems related to activities of daily living.

**Speed**
- Visual search skills and the ability to identify and locate visual information when attention is divided
- Computer tasks with visual or auditory distraction

**No-contact Control**
3 levels of training outcomes

- Training on Basic Abilities
- Transfer to Everyday Functioning (IADL)
- Transfer to Secondary Outcomes
Effect sizes at 5 years on cognitive ability outcomes

10-year trajectory of IADL difficulty, by training group

Source: Rebok et al. (2014). Journal of the American Geriatrics Society
Why did the ACTIVE cognitive training work?

• In-person training with a certified instructor
• Group-based social engagement (3-5 persons/group)
• Active engagement in learning exercises
• Focus on real-life examples
• Emphasis on using trained strategies to solve everyday life problems
• Additional booster sessions beyond initial training
• Multiple practice opportunities
Many unknowns ..... 

No agreed-upon protocol for cognitive training, c.f., physical exercise

- How much training should be given?
- How long should the training last?
- For whom does the training work best?
- How should the training be delivered (e.g., classrooms, web-based)?

Are we targeting the right cognitive abilities?

Why so little generalization to everyday function?
ACTIVE study firsts

• First large-scale, randomized trial of cognitive training in a community sample of well-functioning older adults
• First study to employ multiple booster trainings
• First study to show that cognitive training effects are durable and are maintained for up to 10 years
• First demonstration of the long-term transfer of training effects on cognitive ability to daily function
• First study to examine very long-term (20+ years) cognitive training effects
What’s next?

• Direct, **head-to-head comparisons** of cognitive training and other approaches (e.g., ICE-ACT Trial; Yoon et al., 2019)

• What is the **optimal combination of cognitive training and other intervention approaches**? Broader/stronger benefits?

• What are the **personal/environmental barriers** to use of cognitive training (e.g., low-SES, stigma and low self-efficacy, gender and race, resource-poor rural & urban environments, internet access & technical savvy)?

• What is **optimal dose** – initially and for ongoing booster sessions? Could effects be even larger? Combining UFOV and alertness training results in larger proximal gains (Van Vleet et al., 2016)

• Studies on **underlying mechanisms** of effective training, maintenance, and transfer
## ACTIVE Steering Committee

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Thank you!

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