EFFECTS OF REGULAR AEROBIC ACTIVITY ON NEURAL FUNCTION IN PERSONS WITH ALZHEIMER'S DISEASE

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Problem Statement

- ***Currently no AD cure***
- **Pharmaceutical –** ***limited symptom affect***
- ***Limited research in human subjects***

Rationale

- Alzheimer's Disease - Most common form of dementia – 35+ million worldwide

  U.S.A 5.3 million – 2010 7.7 million – 2030

  Cost to society: 2005 – $91 billion, Medicare

  2007 – $146+ billion, additional – caregivers / productivity

  (*Alzheimer's Association, 2008*)

- *Multifactorial biological influences / complexity posit need to consider alternatives – from pharmaceutical intervention to alternative methods of prevention / attenuation*

- Alternative – Exercise: Documented research relied on *self-report and / or integrated modalities* (aerobic and resistance exercise).

Exercise hypothesis

- "Exercise enhances neural function, attenuates AD symptoms & delays AD onset"

1. Rats exercised daily - 18 days (treadmill) – increased learning & motor coordination *(Carro et al., 2001).*
2. AD transgenic mice exercised daily - 5 mths – AD symptom attenuation *(Adlard et al., 2005)*.
3. Mice exercised (voluntary wheel running) – BDNF up regulated – evident after 3 to7 nights *(Cotman et al., 2002)*.
4. Community-dwelling older adults exercised regularly – reduced cognitive impairment & dementia incidents *(Lytle et al., 2004)*.

Methodology

- Participants (N = 19)
  - Caucasian adult volunteers
  - Residents: Holy Redeemer Hospital / St Josephs Manor *(Meadowbrook, PA, USA)*
  - Mixed gender: females n = 14 males n = 6
  - Age: 78 to 99 years (mean age = 85.5 SD 5.2 yrs)
  - Probable AD: mild n = 12 moderate n = 7
  - Walking aids: walker n = 13 cane n = 1

❑Treatment: Aerobic activity – Walking

30-min a day 3 times per week for 12 consecutive weeks

(Monday, Wednesday and Friday; 10 am)

❑Assessment instruments:

➢Cognitive function — MMSE – Mini mental state exam.

➢Executive function (Balance & Mobility) — BBS – Berg balance scale.

TUG – Timed up and go.

ADL – Activities of daily living.

➢ Cognition [$t(18) = 5.74, p < .001$)]

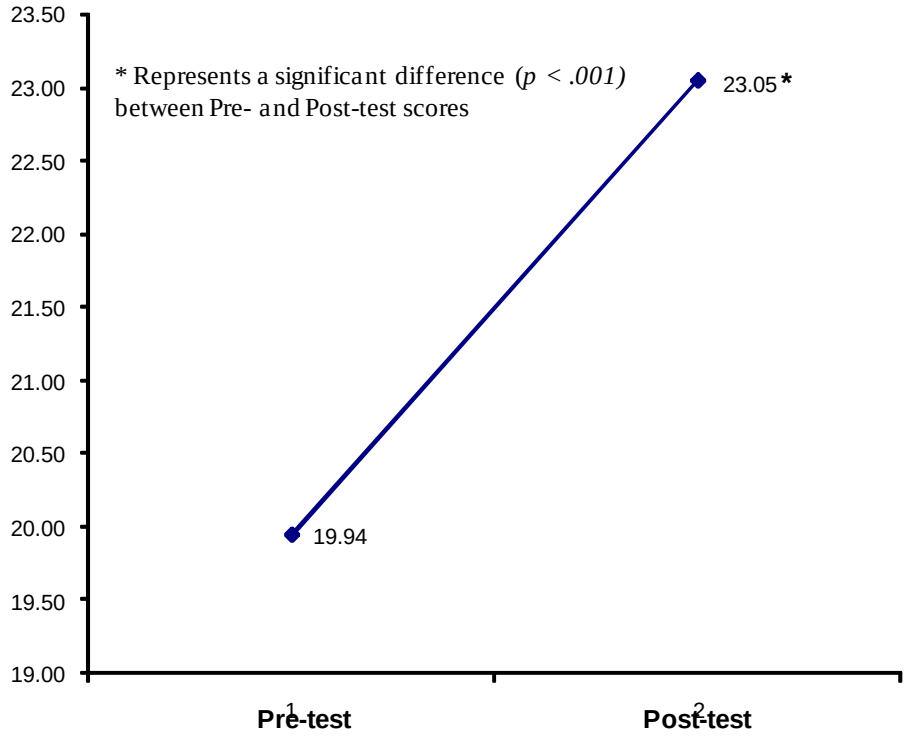

Figure 1. Cognitive function mean scores

Change in score = 3.11 (15.59% increase)

➢ Cognition sub-categories

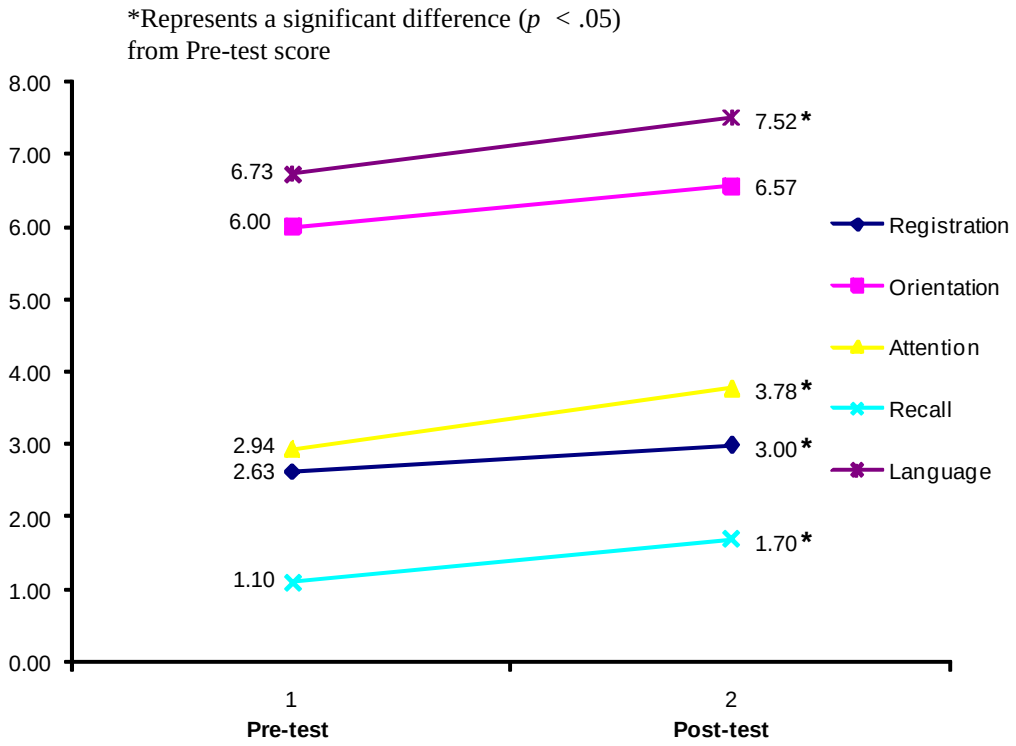

Figure 2. Cognitive function sub-categories mean scores

Significant change in score in 5 of 6 sub-categories

➢ Balance [t(18) = 7.43, p < .001]

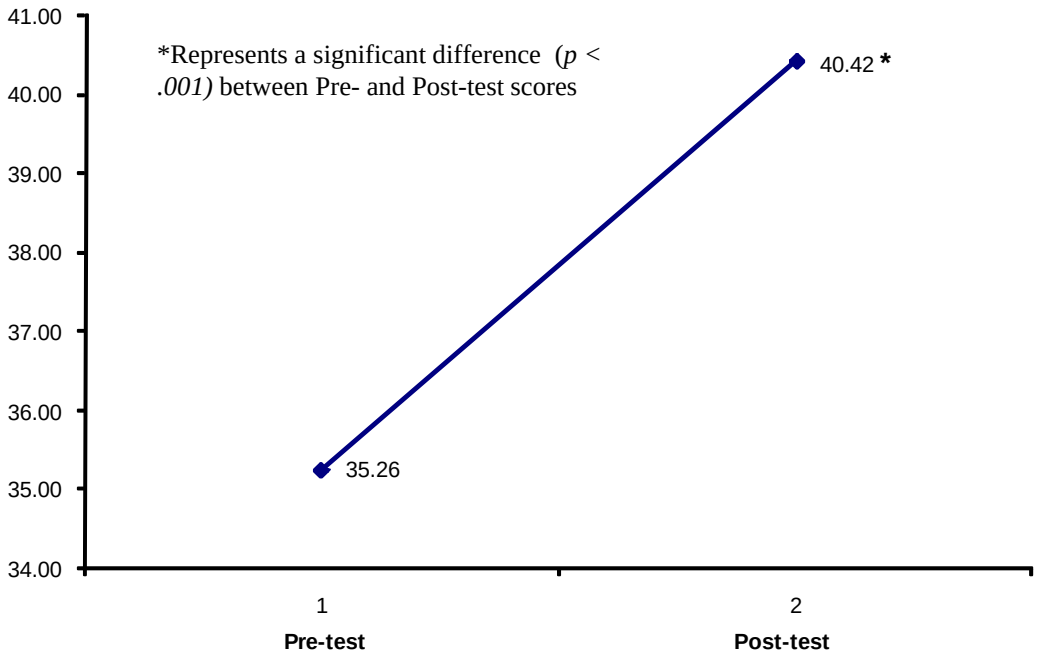

Figure 3. Balance mean scores

Change in score = 5.16 (14.63% increase)

➢ Mobility [t(18) = 3.82, p < .001]

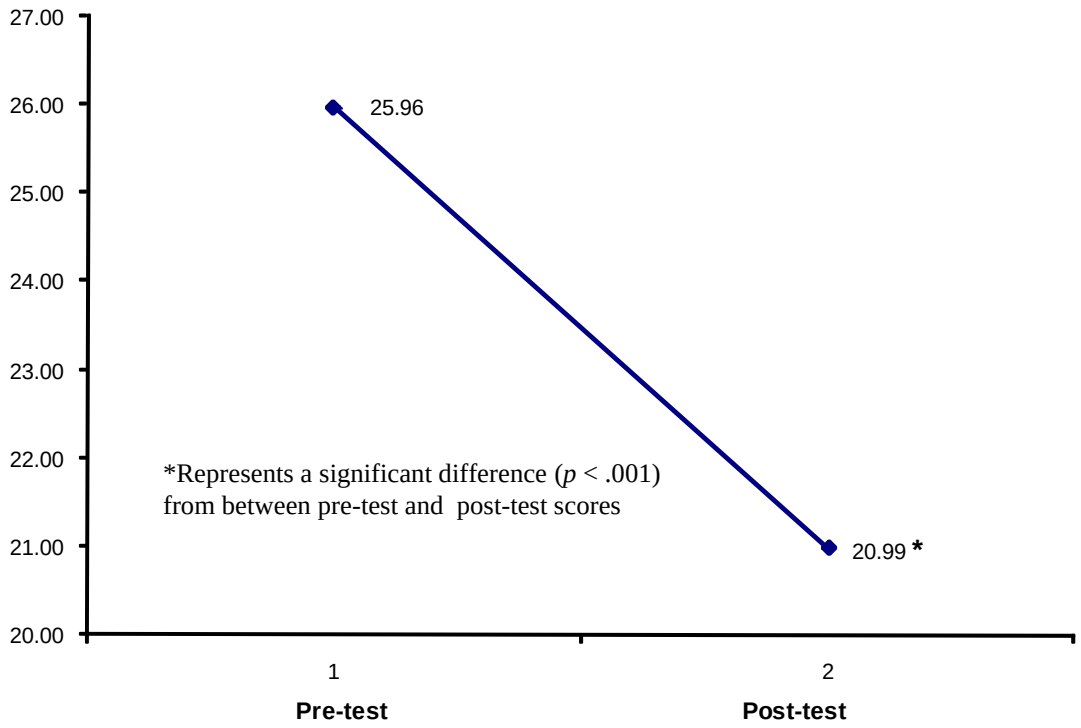

Figure 4. Mobility mean scores

Change in score = 4.97 (19.97% decrease)

➢ Activities of daily living [t(18) = 1.48, p < .156]

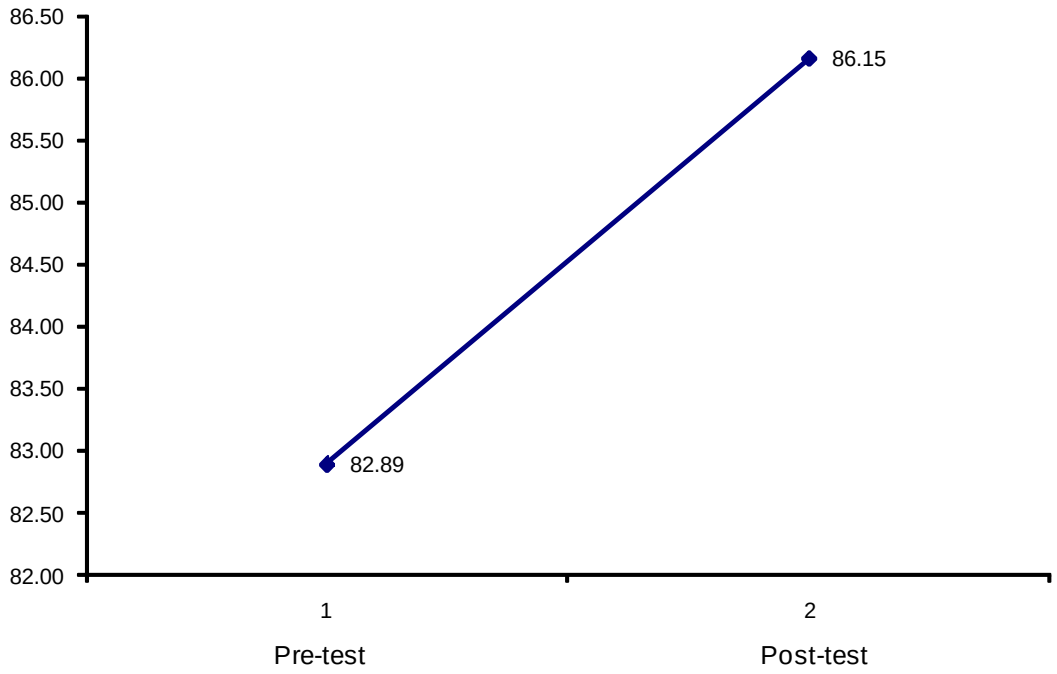

Figure 5. Activities of daily living mean scores.

Change in score = 3.26 (3.9% increase)

➢ Falls [z = 2.392, p < .017]

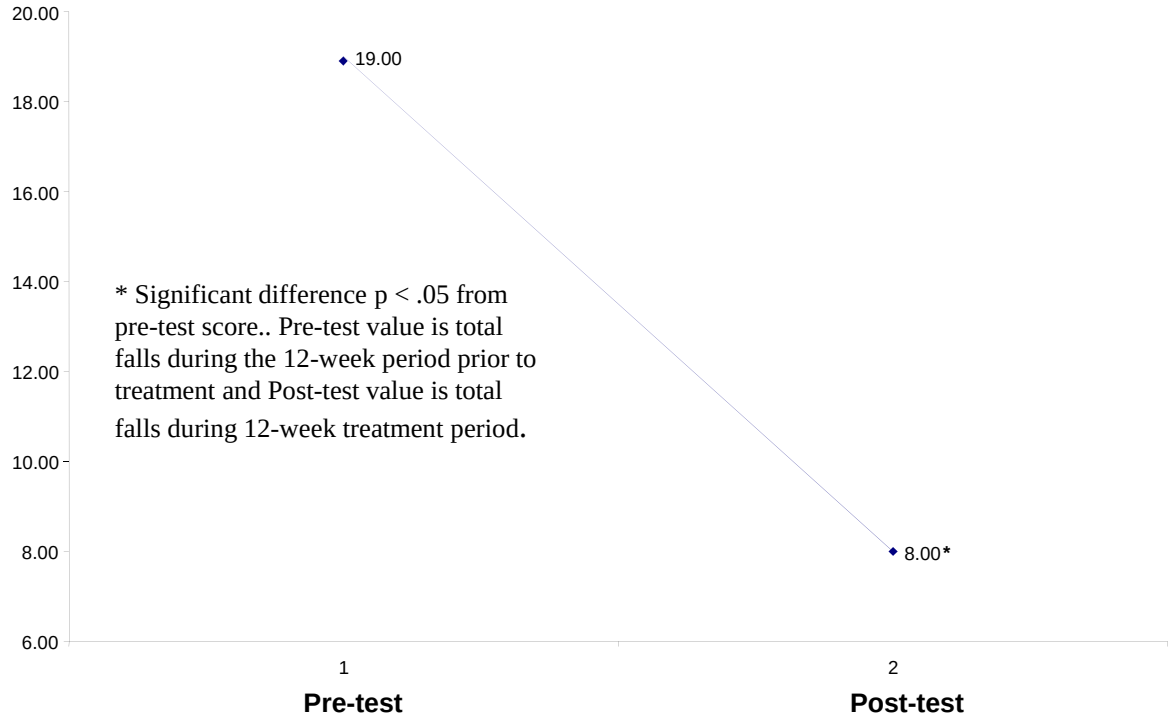

Figure 6. Incidence of Falls mean scores

Change in score = 11.00 (57.89% decrease)

Caregiver review

- **Pre-treatment:**
  - **non cooperative**
  - **repeated dialogue**
  - **lack of interest / disassociation**

- **Post-Treatment:**
  - ✓ **cooperative**
  - ✓ **reduced repeated dialogue**
  - ✓ **increased interest in activities**

Discussion

- **Outcomes support exercise hypothesis…**

Posits: Exercise induces BDNF – initiates numerous metabolic pathways…

Enhances…

…Neural function (e.g., neurotransmitter modulation, protein synthesis, and energy metabolism).

Reduces…

…ß-Amyloid aggregation associated with neural plaque formation and neural degradation.

Implications

- Elderly benefit neurologically from regular aerobic activity (cognitive & executive function)…
- Neural function enhancement through exercise impacts quality of life in elderly (sensing environment, mobility, & independence)…
- Non-pharmaceutical AD intervention (exercise attenuates AD symptoms)…

Future AD research

1. Determine effectiveness of different exercise modalities (e.g., specificity, duration, and intensity).

2. Biomarkers: Examine changes in biomarkers due to regular physical activity.

3. Identify mechanisms by which BDNF is exercised-induced – BDNF / IGF-1 relationship,

Cultural change

- Education paradigm = mindset change
  - physical activity vs. exercise
  - enable active lifestyle across lifespan

Use it or lose it - ***applies to neural function !!!***

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