Describing Brain Activity of African-American Older Adults with Alzheimer’s Disease

A Pilot Study

Ezra C. Holston, PhD, RN
Orvis School of Nursing, University of NV, Reno
Acknowledgment

• Ethnic Minority Fellowship Program sponsored by the American Nurses Association and funded by the Substance Abuse and Mental Health Services Administration
• Drs. Leslie S. Prichep and E. Roy John, Directors, Brain Research Laboratories, New York University School of Medicine, New York University
• Dr. Barry Reisberg, Director, Milhauser Laboratories, New York University School of Medicine, New York University
• The College of Nursing, New York University
• Most common type of dementia (Alzheimer Association, 2016; news-medical.net, July 2016)

• Over 32 million have AD worldwide (news-medical.net, July 2016)

• By 2030, over 50 million with AD; (Alzheimer Association, 2016; news-medical.net, July 2016)

• Now 5.6 million live with AD in US; (Alzheimer Association, 2016)

• To date, no TX stops or reverses AD progression (Prof. Gunhild Waldemar, 2nd Congress of European Academy of Neurology, 2016)

• “We need a better understanding of neurodegenerative mechanisms—beyond memory disorders” (Prof. Gunhild Waldemar, 2016)
AD Known Facts

• 6th cause of death in US; (CDC, 2016.)

• 2nd cause of death for cents in US; (Xu, 2016)

• Every 71 secs, elderly person gets AD; (CDC, 2016)

• 1 in 9 persons 65 and older has AD; (Alzheimer Association, 2016)

• African Americans with AD have highest mortality rate than older adults with other dementia (Alzheimer Association 2021; Fortune et al, 2013)
AD Known Facts: African-Americans

- Silent epidemic in minority older adults—2030, over 6 million diagnosed with AD; (Alzheimer’s Association, 2004.)
- No change in assessing for AD in minority older adults since 1992; (Hall, et al., 2009.)
- Non-cognitive changes occur prior to memory complications; (Holston, 2008; Smith-Gamble, et al, 2002)
- Measurement bias/social constraints limit assessment accuracy (Shadlen, et al., 2000)
- Higher risk of death than any other older adults with other dementias; (Freels, et al., 2002.)
• Change in brain’s bioelectricity prior to signs of neuropathological changes (Bobinski, et al 1998)

• Prior to MCI/AD, increased theta observed in normal-functioning older adults (Holston, 2003; Prichep, et al 2006)

• MCI hallmark sign linked to increased theta (impairment measurable) (Prichep, et al 2006)

• Neuropsych & functional symptoms linked to brain activity changes (Holston, 2003; Soininen, et al 1992)
Theta Activity Generator

Ventral Tegmental Area

N. Accumbens & septal nuclei

Hippocampus

Cingulate

Theta Activity

dopamine

serotonin

acetylcholine

glutamate

(John 2002.)
The EPAD Theory

To identify a reliable electrophysiological biomarker that will reduce race-based, AD-related health disparity, leading to early and accurate AD screening and diagnosing of older African-American adults.
Specific Aims

1. Describe brain activity changes across 2 groups of older adults with and without AD (African-American and Caucasian). 
   *Hypothesis:* Brain activity changes consistent with AD will be observed only in groups with a diagnosis of AD.

2. Describe differences in brain activity across the 2 groups of older adults with AD. 
   *Hypothesis:* Brain activity changes for African-American older adults with AD will differ from the brain activity changes for Caucasian older adults with AD.
Two main groups by ethnicity: Older African-American adults and older Caucasian adults; age ≥ 65 years.
- Two sub-groups for each main: older adults with AD and older adults without AD.

Total sample size: 76 (38/main group).
- Power: .69-.70,
- Moderate effect size: .25,
- Moderate correlation of relative measures: .50,
- Significance level: .05.
Analyzing Data-EEG Data

- 24-48 artifact-free epochs (2.5 secs each),
- Quantify epochs into monopolar and bipolar derivations,
- Calculate power, coherence, asymmetry for cortical regions,
- Computer power for parietotemporal strip (T5,P3,Pz,P4,T6) and alpha/theta ratio
**Analyzing Data - Statistical Analysis**

- Use SPSS and SAS,
- Descriptive statistics,
- Analysis of Variance (ANOVA),
- Internal consistency.

<table>
<thead>
<tr>
<th>Aim</th>
<th>Procedure</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Descriptive statistics</td>
<td>Characterize brain activity changes for the 2 groups of older adults within each ethnic group.</td>
</tr>
<tr>
<td>2</td>
<td>ANOVA</td>
<td>Determine the difference in brain activity changes for the 2 groups of older adults with AD.</td>
</tr>
</tbody>
</table>
Results

• No data collection or analyses.
• All paperwork printed, numbered, collated, and distribution-ready.
• Recruitment & data collection sites prepped.
  ▪ Cleveland Clinic Lou Ruvo Center for Brain Health,
  ▪ Sanford Center for Aging,
  ▪ UNLV Simulation Center, and
  ▪ UNR Neurology Core.
Results

- Supplier, Applied Neuroscience, Inc., registered with NSHE,
- Portable EEG acquisition systems purchased,
- Software licenses secured
  - NeuroGuide,
  - NeuroStat,
  - LORETA Current Density Normative Database.
Conclusion

• Get funding for recruitment and data collection.

• Analyze data and disseminate findings in presentations and publications.

• Use findings as preliminary data for
  ▪ R21: Relating Electrophysiological Biomarkers to Clinical Symptoms of Alzheimer’s disease (AD) in Older African-American Adults with/without AD.
    ▷ Design: Repeated measures design over 2-year period.
    ▷ Sample: 62 participants.
    ▷ Power = .80; small effect size = .15; moderate correlation among representative measures (based on preliminary findings) = .50; significance level = .05).