Characterizing sleep-wake activity patterns across the spectrum of AD/ADRD

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Our Aim: develop a platform to collect and share 24hr activity data across the NACC/ADRC network
Team expertise in actigraphy and multimodal harmonization

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Real life sleep and physical activity represents high impact science.

Digital biomarkers for early detection and disease specificity.
Passive 24hr activity monitoring is low burden and scalable.

Lowest amplitude = highest AD risk

HR 0.79
CI 0.65-0.96
p=0.02

Axivity AX3
$190

7 days Axivity AX3
N>100,000

UK Biobank
- Genetics
- MR Imaging
- Longitudinal
- Midlife Sample
- Health Records
- Deep Clinical Phenotyping
- Clinical & Demographic Heterogeneity
- PET Imaging
- CSF & Plasma
- Neuropathology
- Longitudinal Health Records

NACC

NIA F32AG074625
Winer et al. (2024) Alz Res Ther
Our success at Stanford ADRC demonstrates feasibility.

Since Fall 2021, n=191 individuals

<table>
<thead>
<tr>
<th></th>
<th>Healthy Aging</th>
<th>Alzheimer’s disease</th>
<th>Lewy body disease</th>
<th>Other ADRD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total N (%)</td>
<td>105 (55)</td>
<td>37 (19)</td>
<td>40 (21)</td>
<td>9 (5)</td>
</tr>
</tbody>
</table>

![Graph showing mean 24h activity](image)

![Graph showing sleep efficiency](image)

![Graph showing Tau PET x Sleep](image)
Develop infrastructure for standardized multi-site actigraphy data

Stanford Actigraphy Hub → ADRC Participant (14 days of recording) → Stanford Actigraphy Hub + Acceptability Pilot Survey

AX3 .cwa (raw file) → Visual QC by trained scorer → accelerometer python package → .csv time series (30s epoch) → Impute missing data

GGIR R package → Summary statistics (.csv file)

sleep physical activity

NACC Repository

file upload to secure server

Processing at Stanford:
- nparACT R package
- cosinor2 R package
- 24-hour IV/IS analysis
- 24-hour Cosinor analysis

Stanford Actigraphy Hub → file upload to secure server

Summary statistics (.csv file) → NACC Repository

Stanford Actigraphy Hub → Acceptability Pilot Survey

NACC Repository

Developed infrastructure for standardized multi-site actigraphy data

Stanford Actigraphy Hub → file upload to secure server

Summary statistics (.csv file) → NACC Repository

Stanford Actigraphy Hub → Acceptability Pilot Survey

NACC Repository
Real world sleep and physical activity data will be a valuable resource towards digital biomarkers for ADRD