ALZHEIMER’S DISEASE IN ADULTS WITH DOWN SYNDROME

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ALZHEIMER’S DISEASE

- Most common type of dementia
- Progressive deterioration of cognitive functioning that ultimately prevents performance of everyday activities
ALZHEIMER’S DISEASE

• 5.3 million Americans; 110,000 in Wisconsin

• Prevalence will increase; ~ 10,000 Baby Boomers turn 65 per day

• 7th leading cause of death
ALZHEIMER’S DISEASE

• No cure
• Treat symptoms; temporarily slow the progression of disease
• Critical need to find ways to treat the disease, delay onset, and prevent
DOWN SYNDROME

Reprinted from Shaw, 2013
DOWN SYNDROME

- 1 in 800 live births worldwide; ~255,000 children in US
- Intellectual disability
- Impairments in language, motor, and cognitive skills
- Facial appearance - flat face, short neck, slanting eyes, etc.
- Physical features - low muscle tone, loose joints
- Health conditions - problems with thyroid, heart, intestines, hearing loss
DOWN SYNDROME AND ALZHEIMER'S DISEASE

**General population:** Rare before age 50; 5-10% of adults aged 65+ yrs; 15-30% of those aged 80+ yrs

**Down syndrome:** 9% of adults in 40; 33% of adults in 50s; 50% of adults in 60s+ yrs
WHY THE HEIGHTENED RISK?

- Chromosome 21 codes for the amyloid-β precursor protein (APP) gene

- Accumulation of amyloid-β plaques in brain plays key role in development of Alzheimer's disease
NEUROPATHOLOGY IN ALZHEIMER'S DISEASE

Healthy

Alzheimer’s Disease

Neurofibrillary tangles

Amyloid-β plaques

Image: Jannis, Dempsey, & Fredenburg; Jannis Productions/NSF
PERCENTAGE OF HEALTHY ADULTS WITH HIGH AMYLOID-B PLAQUES

General population data: Rowe & Villemagne, 2011
Down syndrome data: Hartley et al., 2014
PROGRESSION OF ALZHEIMER’S DISEASE

Reprinted from Tarawneh & Holtzman, 2010
PROGRESSION OF ALZHEIMER’S DISEASE

Healthy  Mild Cognitive Impairment  Early  Middle  Late

Neuronal integrity

Amyloid plaques

Neurofibrillary tangles
NEURODEGENERATION IN AGING DOWN SYNDROME ( NIAD STUDY)

• Track early brain changes associated with Alzheimer’s disease in adults with Down syndrome

• How does Alzheimer's disease develop? When could we intervene? Why do symptoms progress faster in some individuals than others? Can we come up with accurate early screeners?

University of Pittsburgh
University of Cambridge, UK
Waisman Center, University of Wisconsin-Madison
BRAIN IMAGING

- Magnetic resonance imaging (MRI)
- Positron emission tomography (PET)
AMYLOID-B

- Tissue ratios calculated for cortical regions-of-interest (ROI) and normalized to cerebellum (SUVR)

- PiB+ = above the cutoff in cortical areas of the brain
NEUROPSYCHOLOGICAL TESTS
SCREENING AND DIAGNOSIS ALZHEIMER'S DISEASE IN DOWN SYNDROME
SCREENING INTERVIEWS

- National Task Group Early Detection Screen for Dementia (NTG-EDSD)
- Dementia Scale for Down Syndrome (DSDS)
# DIRECT ASSESSMENTS

<table>
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<tr>
<th>Area</th>
<th>Measures</th>
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<tbody>
<tr>
<td>Verbal Learning/Memory</td>
<td>Cued Recall Test, Wechsler Memory Scale, 4&lt;sup&gt;th&lt;/sup&gt; edition Story Recall Logical Memory I and II subtests</td>
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<tr>
<td>Visual Memory</td>
<td>Rivermead Behavioral Memory Test for Children Visual Memory subtests</td>
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<tr>
<td>Attention/Processing Speed</td>
<td>WISC-Revised Digits Forward, Corsi Block Tapping Forward, NEPSY Visual Attention subtest</td>
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<tr>
<td>Executive Functioning/Working Memory</td>
<td>Stroop Dog and Cat Task, WISC-IV Digit Span Backwards, Corsi Block Tapping Backward</td>
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<td>Visuospatial Construction</td>
<td>Developmental Test of Visual-Motor Integration, 5&lt;sup&gt;th&lt;/sup&gt; edition, Purdue Pegboard, WISC-IV Block Design and Haxby Extension</td>
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<tr>
<td>Language</td>
<td>NEPSY 2&lt;sup&gt;nd&lt;/sup&gt; edition Word Generation Semantic Fluency subtest, Expressive-One Word Picture Vocabulary Test, Peabody Picture Vocabulary Test, 4&lt;sup&gt;th&lt;/sup&gt; edition</td>
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MEMORY
VISUOSPATIAL ORGANIZATION
EXECUTIVE FUNCTIONING
CHANGE CYCLE 1 TO CYCLE 2 BY PIB GROUP

Free and Cued Recall

Cycle

1

15 17 19 21 23 25 27 29 31 33 35 37 39

2

PiB- to PiB-
PiB+ to PiB+
PiB- to PiB+
BASELINE AND CONTEXT

- **Baseline assessment** by age 35 years
  - cognitive abilities, memory, motor functioning, everyday living skills, and social and behavioral functioning

- **Consider medical conditions**
  - Vision loss/impairment, hearing loss, hypothyroidism, sleep apnea, celiac disease

- **Consider life transitions**
  - Transfer of care, death of parents, work or staff transitions
COMMUNICATION TIPS FOR PROFESSIONALS AND CAREGIVERS
COMMUNICATING

- **Body language** – your mood affects their mood
- **Positive non-verbal communication** – comfort, care, and demonstration
- **Gain attention** - sit in front of them and at same level
- **Simple and clear** - break down activities into a set of simple (one-step) instructions; speak clearly and at a natural rate of speech
- **Avoid open-ended questions or conversations require recent memory** – may add confusion and agitation
- **Distract and redirect** – go for a walk, change the mood
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