Lifestyle and Alzheimer's Disease in Down Syndrome

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Alzheimer's Disease

- Most common type of dementia
- 6.5 million Americans
 - 10% of individuals 65 yrs+
 - 120,000 people with Alzheimer's disease in Wisconsin
- By 2050, estimated that 12.7 million Americans aged 65 yrs+ with Alzheimer's disease



Image: Jannis, Dempsey, & Fredenburg; Jannis Productions/NSF

 $A\beta$ plaques

Tau tangles

Down Syndrome and Alzheimer's Disease

Sporadic late onset:

- Rare before age 50 years
- 80% of those affected aged 75 yrs+

Autosomal dominant populations

- Amyloid precursor protein (APP) on chromosome 21
- Presenilin 1 (PSEN1) on chromosome 14
- Presenilin 2 (PSEN2) on chromosome 1
- Mean age of onset in 40s and 50s

Down syndrome:

• 90% lifetime prevalence



lulita et al., 2022; Alzheimer's Association 2023

Timing of Alzheimer's Disease in Down Syndrome



Cognitive decline is related to PET biomarkers of amyloid-beta (A β) and, especially, tau PET

Hartley et al., 2020; Hartley et al., 2022



Are <u>modifiable</u> aspects of lifestyle related to variability in the timing of Alzheimer's Disease in Down syndrome?

Employment Activities

Assembler (n = 2)Assembly line job Bakery Helper (n = 1)Helps bake; lift and carry Bracelet Maker (n = 1)Makes bracelets College Student (n = 2) Attends college Dishwasher (n = 5)Washes Dishes Dry Cleaning Attendant (n = 1)Gets stains out of clothes Nursery School Attendant (n = 2) Monitors and plays with children

Janitor (n = 15) Cleaning; minor maintenance Scanner/Bagger, grocery store (n = 5)Scans items; puts items into bags Walmart Associate (n = 1)Greets: assists customers Garment Sorter (n = 1)Sorts merchandise; hangs clothes Hand Packager (n = 5) Folds and packages items Office Helper (n = 5) Shreds, sorts, creates labels, filing Warehouse Worker (n = 1)Sorting, organizing

Library Aid (n = 2) Put books away; inventory, organize books Mailroom clerk (n = 1) Sorts and delivers mail, makes up gift packages Sheltered Workshop (n = 27) Sorting, assembly, shredding, cleaning, packaging Store Clerk (n = 1)Stocking and shelving items Fast Food Worker (n = 4)Cleans, stocks, clears dishes



Piro-Gambetti, Schworer et al. 2023



Employment Activities

N = 87 Adults with Down syndrome (25-56 yrs)

Do Co	oes Employment ognitive decline? 		t Protect	Protect Agains		Cycle 2	
			Memory Cha		ge in Dementia Symptoms		
		Cued Recall Total	Cued Recall Intrusions	DSMSE	DLD Sum of Social	DLD Sum of Cognitive	
	Data Complexity	r=007 p=.953	r=026 p=.836	r=.080 p=.518	r=100 p=.419	r=117 p=.345	
	People Complexity	r=.023 p=.853	r=075 p=.545	r=.237 p=.053	r=262 p=.032	r=228 p=.064	
	Things Complexity	r=.280 p=.022	r=214 p=.082	r=.263 p=.032	r=242 p=.049	r=137 p=.271	

N = 87; Partial correlations controlling for age, intellectual disability level & hours spent in employment per week

Are Leisure Activities Related to the Timing of Alzheimer's Disease in Down syndrome?



- Emailing
- Blogging

Mihaila et al., (2017, 2019)



Implications

- Employment complexity and leisure are modifiable aspects of lifestyle shown to alter the risk of Alzheimer's disease and aging-related cognitive decline outside of Down syndrome (Andel et al., 2005; Kröger et al., 2008; Smart et al., 2014).
- Adults with Down syndrome who were involved in more complex employment in terms of *People* and *Things* evidenced less cognitive decline across 16-20 months than did adults with DS involved in no employment activities or less complex activities.
- Leisure activity -- especially cognitively stimulating and social activities -- related to less decline in memory across 3 yrs even in the face of early AD pathology
- Efforts to alter social policy and design interventions that increase employment and leisure could potentially contribute to healthy cognitive aging for adults with DS.

Physical Activity and Cognitive Performance







Fleming et al., 2020

* P <.05; **P<.01. Partial r models controlled for age and premorbid ID level

Physical Activity and White Matter Impairment

Sedenta (% per	ary day)	Mod (% pe	erate er day)
r	Partial r	r	Partial r
-0.182	-0.387*	0.407*	0.342
-0.183	-0.387*	0.385*	0.339
-0.158	-0.419*	0.356*	0.284
0.073	0.400*	-0.347	-0.326
	Sedenta (% per r -0.182 -0.183 -0.183 0.073	Sedentary (% per day) r Partial r -0.182-0.387* -0.183-0.387* -0.158-0.419*	Sedentary (% per day) Mod (% per (% per r r Partial r r -0.182-0.387* 0.407* -0.183-0.387* 0.385* -0.158-0.419* 0.356* 0.073 0.400* -0.347

Partial rs control for age and premorbid ID. * P<.05

Fleming et al., 2020



Middle longitudinal fasciculus

Inferior longitudinal fasciculus

Arcuate fasciculus (AF) SLF-tp Uncinate fasciculus (UF)

Stay Active

- Adults with Down syndrome engaged in more physical activity, and who are less sedentary, have better cognitive performance and higher white matter integrity
- Social policy and interventions aimed at being active may have the potential to promote healthy cognitive and brain aging



<u>Stomach Twist:</u> Stretches the neck, chest, shoulders, and back. Opens up the hips and improves posture



Leg/Knee Lifts: Activates quadriceps, hamstrings, calves, glutes, and hip flexors

<u>Cat/Cow:</u> Increases the flexibility of the neck, shoulders, and spine







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Resources for Alzheimer's Disease in People with Down syndrome

<u>https://ndss.org/resources?topical=49</u>

• NDSS (National Down syndrome Society) has a variety of resources about aging including a practical guidebook for caregivers and an informational resource on Alzheimer's Disease and Down syndrome. The caregiver guide in particular has lots of practical tips for helping with different challenges associated with Alzheimer's Disease.

• <u>https://adscresources.advocatehealth.com/aging-and-alzheimers-disease-in-adults-with-down-syndrome-webinar-recording-11102020/</u>

• This webinar provides information about Down syndrome and Alzheimer's disease. Recommendations for managing these issues once they have arisen begins at (26:03).

<u>https://adscresources.advocatehealth.com/assets/1/13/Orientation_Book.pdf?60</u>

• This template shows you how to create an orientation book, which can be helpful for anyone with dementia, but particularly for individuals with Down syndrome. This can help them remember important people and places in order to make everyday life less stressful for them.

<u>https://www.amazon.com/Down-Syndrome-Dementia-Students-</u>

Practice/dp/178963167X/ref=sr_1_7?crid=1HLL6ZEHPS7MX&keywords=alzheimer%27s+disease+and+down+syndrome&qid=1665 521444&qu=eyJxc2MiOilwLjAwliwicXNhljoiMC4wMClsInFzcCl6ljAuMDAifQ%3D%3D&refinements=p_n_conditiontype%3A1294423O11&rnid=1294421011&s=books&sprefix=alzheimer%27s+disease+and+down+syndrome%2Caps%2C113&sr= 1-7

• "Down syndrome and Dementia: A Guide for Family Members, Social and Health Care Staff and Students (Sharing Good Practice)" by Bob Dawson is a quick read but covers a great deal of information. Chapters include tips on communication and managing different specific challenging behaviors.