Title: Physical Activity, Cognitive Functioning, and Amyloid-β In Adults with Down Syndrome

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Introduction: Adults with Down Syndrome (DS) are at high risk for developing Alzheimer's Disease (AD). AD is characterized by the accumulation of extracellular senile plaques, made up of aggregated amyloid-beta (Aβ) protein, and intracellular neurofibrillary tangles, comprised of hyperphosphorylated tau protein. The high risk of AD in DS is attributed to the overproduction of Aβ, due to the triplication of chromosome 21, which contains the gene for the amyloid precursor protein (APP). Nearly all adults with DS evidence the neuropathology of AD, including accumulation of Aβ, by their late forties. There is a critical need to identify interventions that prevent or delay the onset of AD in DS. One intervention target of interest is to promote lifestyle factors that may help delay the onset of AD neuropathology and/or mitigate its effects on cognitive functioning so that adults with DS may live healthier for longer. Physical activity has been proposed to be one of these lifestyle factors. The goal of the current study was to examine the association between physical activity and cognitive functioning and Aβ accumulation using the PET biomarker Pittsburgh component B (PiB) in adults with DS.

Method: Fifty-two adults with DS who were part of the Alzheimer Biomarker Consortium in Down Syndrome (ABC-DS) participated. Participants wore an actigraph accelerometer on their wrist for 7-days. Half were male (n=26) and they ranged in age from 25 to 55 years. Cognitive functioning was assessed via directly-administered measures. Participants underwent MRI and PET scans, during which the standard uptake value ratio (SUVR) of the imaging agent PiB was used to assess Aβ globally across the frontal cortex, anterior cingulate gyrus, parietal cortex, temporal cortex, precuneus, and striatum.

Results: Pearson correlations indicated that spending more daytime in sedentary (average daily percent) was associated with worse executive functioning on the Cat and Dog Stroop task (r = .331, p < .05), visual episodic memory on the Rivermead Memory test (r = -.348, p < .05), visuospatial ability on Block Design (r = -.310, p < .05), and more dementia symptoms on the Down Syndrome Mental Status Exam (r = -.291, p < .05). Spending more daytime in moderate activity was associated with better executive functioning on the Cat and Dog Stroop task (r = -.361, p < .01), visual episodic memory on the Rivermead Memory test (r = .453, p < .01) verbal episodic memory on the Cued Recall tests (r = .317, p < .05), visuospatial ability on Block Design (r = .333, p < .05), motor planning and processing on Purdue Pegboard (r = .458, p < .01), and fewer dementia symptoms (r = .444, p < .01). Several associations remained significant when controlling for chronological and mental age. There was not a significant association between sedentary or moderate daytime activity and PiB SUVR.

Discussion: Our findings suggest that physical activity (low time in sedentary and high time in moderate activity) is associated with better cognitive performance in DS. It is possible that physical activity could have a protective effect against age-related declines in cognitive functioning. We did not find an association between physical activity and PET Aβ. It may be that physical activity does not prevent Aβ from accumulating. However, future analyses are needed to examine potential moderating effects of physical activity on the association between Aβ accumulation and cognitive decline.

References:


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