

Alzheimer's and Exercise

Stanford ADRC

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Participant Appreciation Celebration
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LIFE & ARTS

YOUR HEALTH | SUMATHI REDDY

Linking Diet, Exercise and Alzheimer's

IN HIS 40S and a self-described fitness nut, Stephen Chambers doesn't seem like someone who would be worrying about Alzheimer's.

But when his father was diagnosed with the disease about five years ago, he went to the Alzheimer's Prevention Clinic in New York to see what he could do.

Though he had no noticeable memory issues, cognitive testing showed less than ideal levels in certain areas. His neurologist told him there were a number of lifestyle changes that might help his cognition and possibly reduce the risk of developing Alzheimer's disease.

Mr. Chambers, a 48-year-old physical therapist in Jersey City, N.J., modified his sleep, diet and exercise routines. Eighteen months later, his performance on a battery of cognitive tests improved, particularly in areas like processing speed and executive function, such as decision-making and planning.

"I feel a certain sense of comfort in knowing that there are factors that I can control that can contribute to the decreased risk of me getting Alzheimer's," says Mr. Chambers.

Mr. Chambers is among 154 pa-



BRYAN ANSELM FOR THE WALL STREET JOURNAL

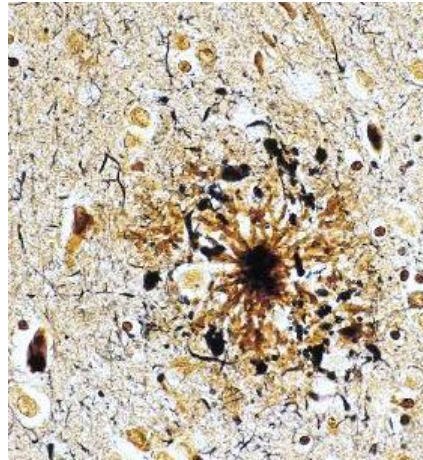
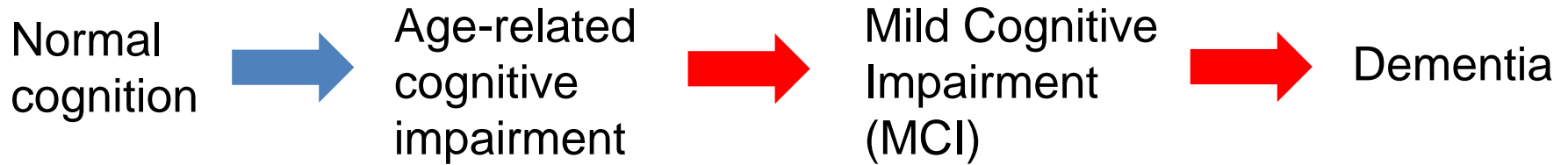
says Dr. Sabbagh of the study. "That is where the trend is going."

Ronald Petersen, director of the Mayo Clinic Alzheimer's Disease Research Center in Rochester, Minn., called the study encouraging but cautioned that lifestyle changes aren't a magic bullet. "Does that mean we're going to prevent Alzheimer's disease?" he says. "No." But measures that might help delay the onset are significant. "If we can postpone the onset or slow the progression of cognitive impairment and Alzheimer's disease, that's very important," he says.

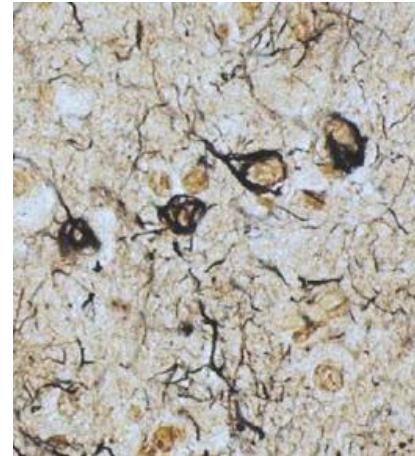
Mr. Chambers says he now eats blueberries or strawberries, which are high in antioxidants, at least two to three times a week. He eats more of certain kinds of fish to get more Omega-3 fatty acids, which can decrease inflammation and improve cardiovascular and brain health. And he adds powdered cocoa flavonols to his morning coffee because studies show they can combat insulin resistance and promote cognitive function.

He also listens to more music, particularly classical music, and tweaked his workouts to include more high-intensity interval train-

Alzheimer's risk increases with aging



Amyloid plaques



Tau tangles

- **Alzheimer's disease**
- Vascular dementia
- Lewy body dementia

Exercise dramatically reduces Alzheimer's disease incidence



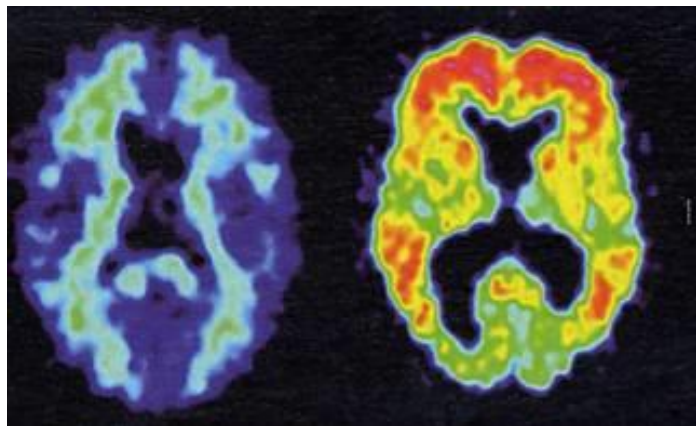
Exercise – how much? 30 min/day 5d/week - moderate levels



~40% reduced risk

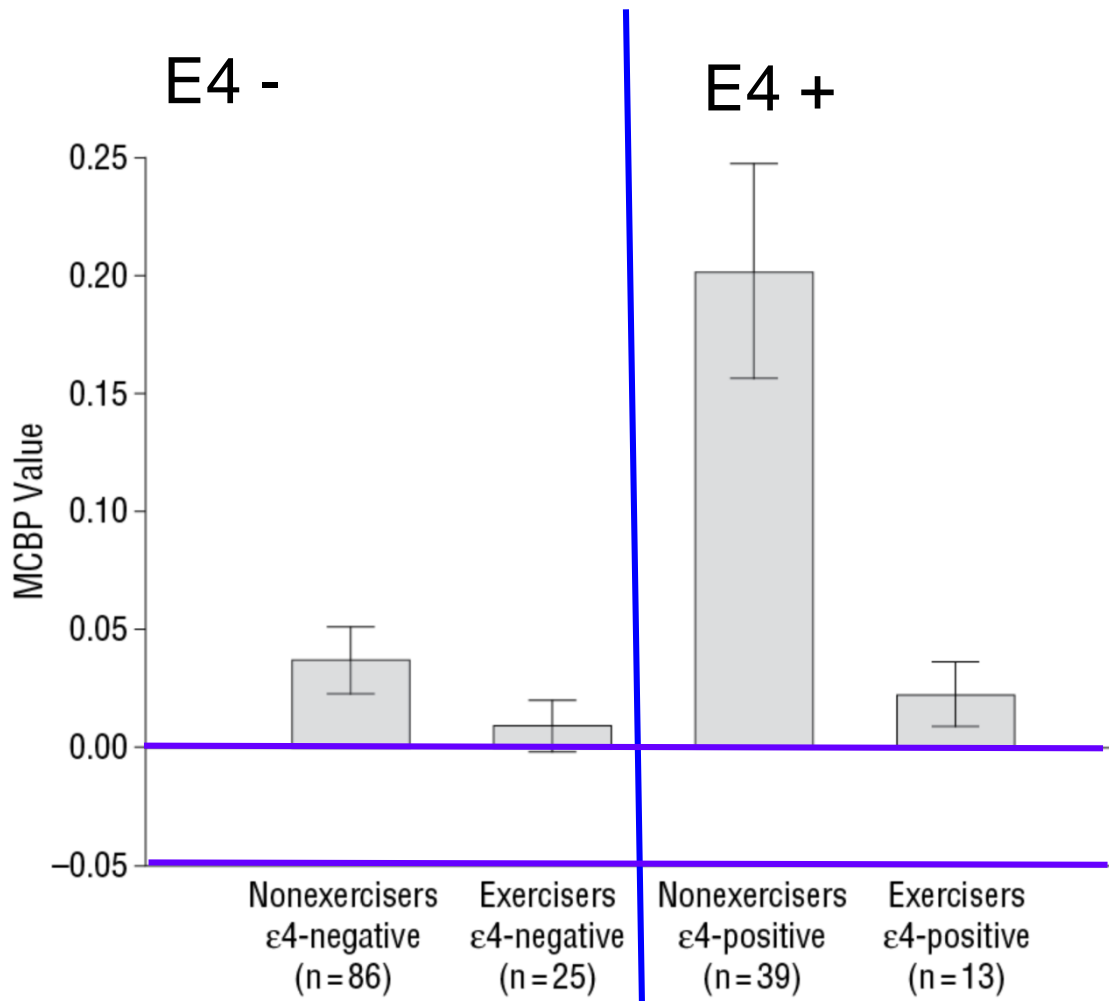
Gomes-Osman et al *Neurology* 2018
Guure et al *BioMed Res Int* 2017
WHO guidelines 2019
Jia et al *BMC Geriatrics* 2019

Exercise decreases amyloid accumulation and overcomes ApoE4 genetic risk

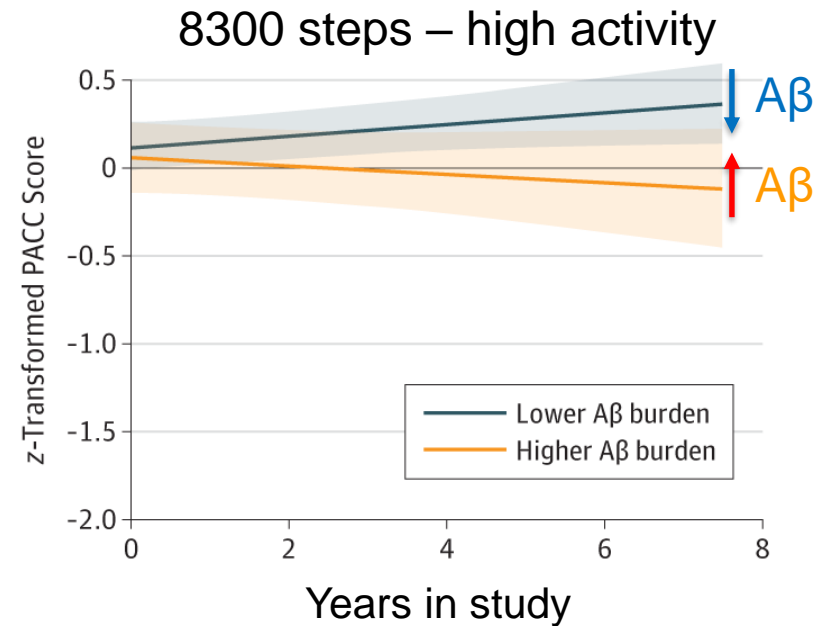
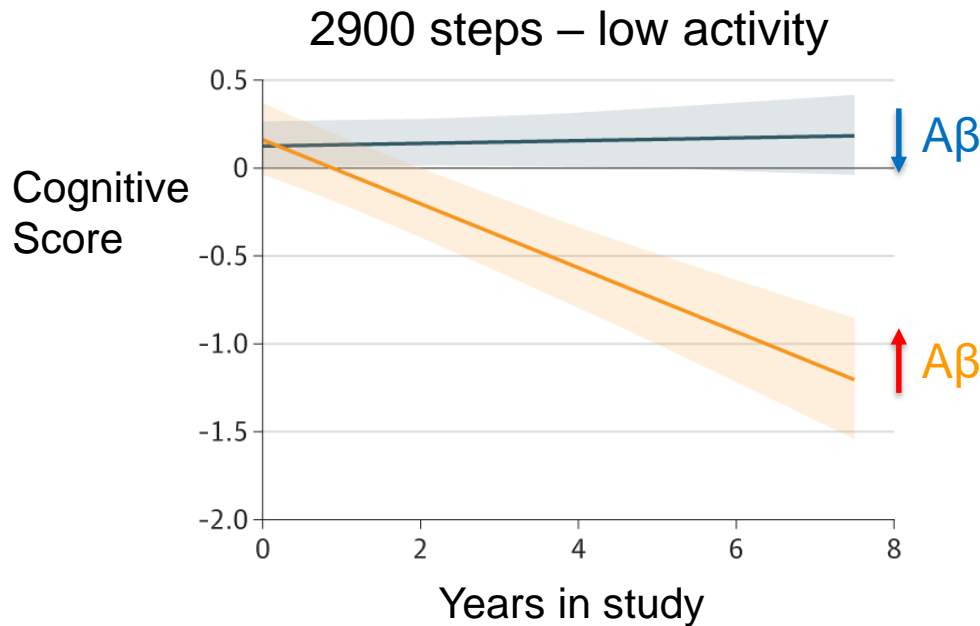
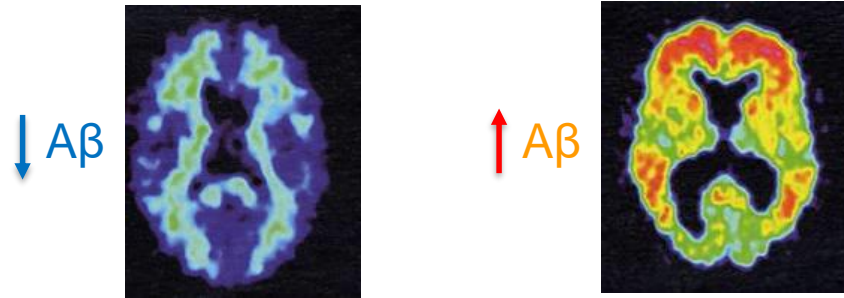


45-88 yo normals – parent-AD
± exercise past 10 years

30 min mod exercise 5d/wk



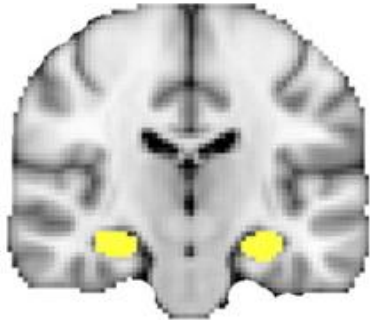
High physical activity – resilience to amyloid



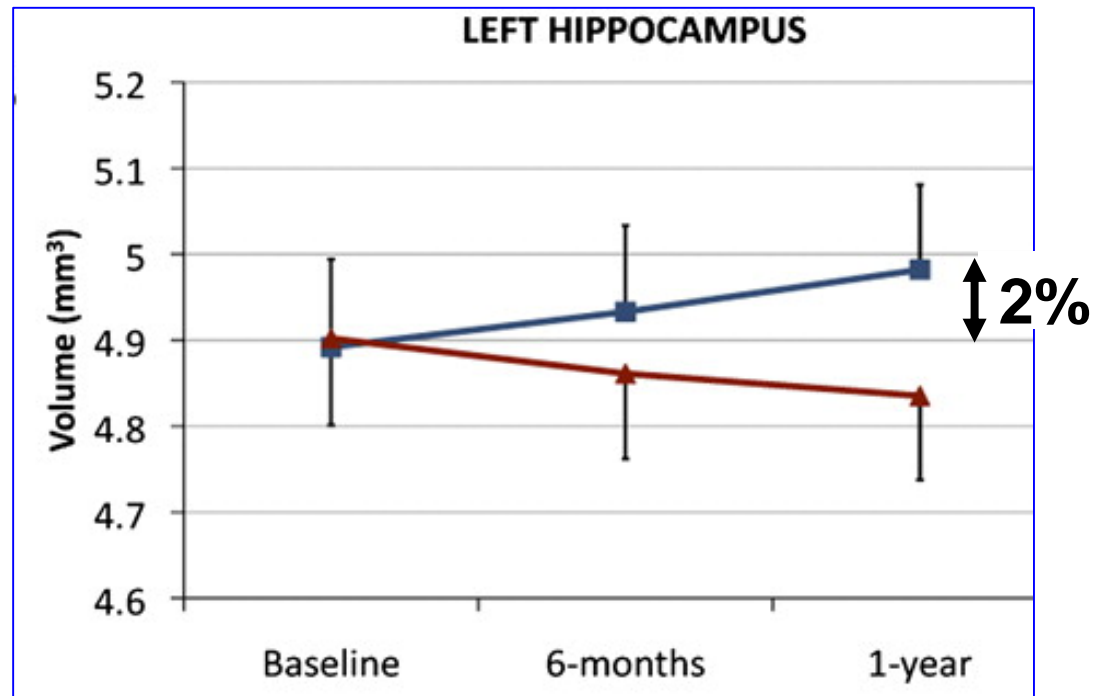
Walking reverses of Hippocampal Age-related Atrophy!



10 → 40 min/day walk 1 year



hippocampus
1-2%/yr atrophy

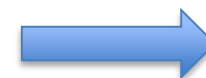
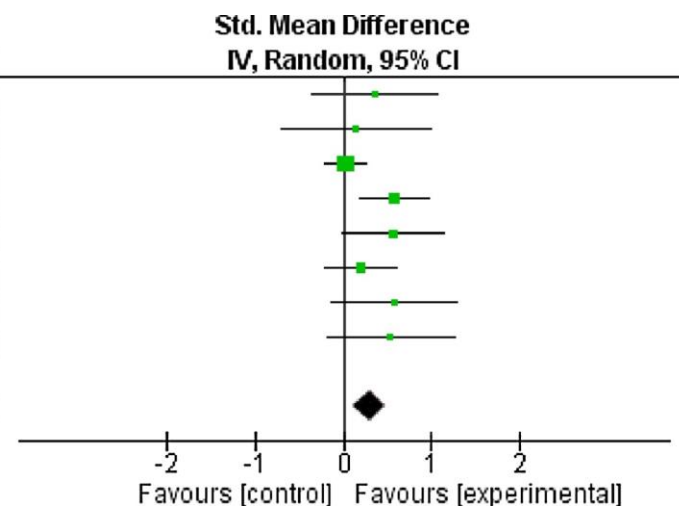


Exercise effects on cognition in MCI

Meta-analysis:

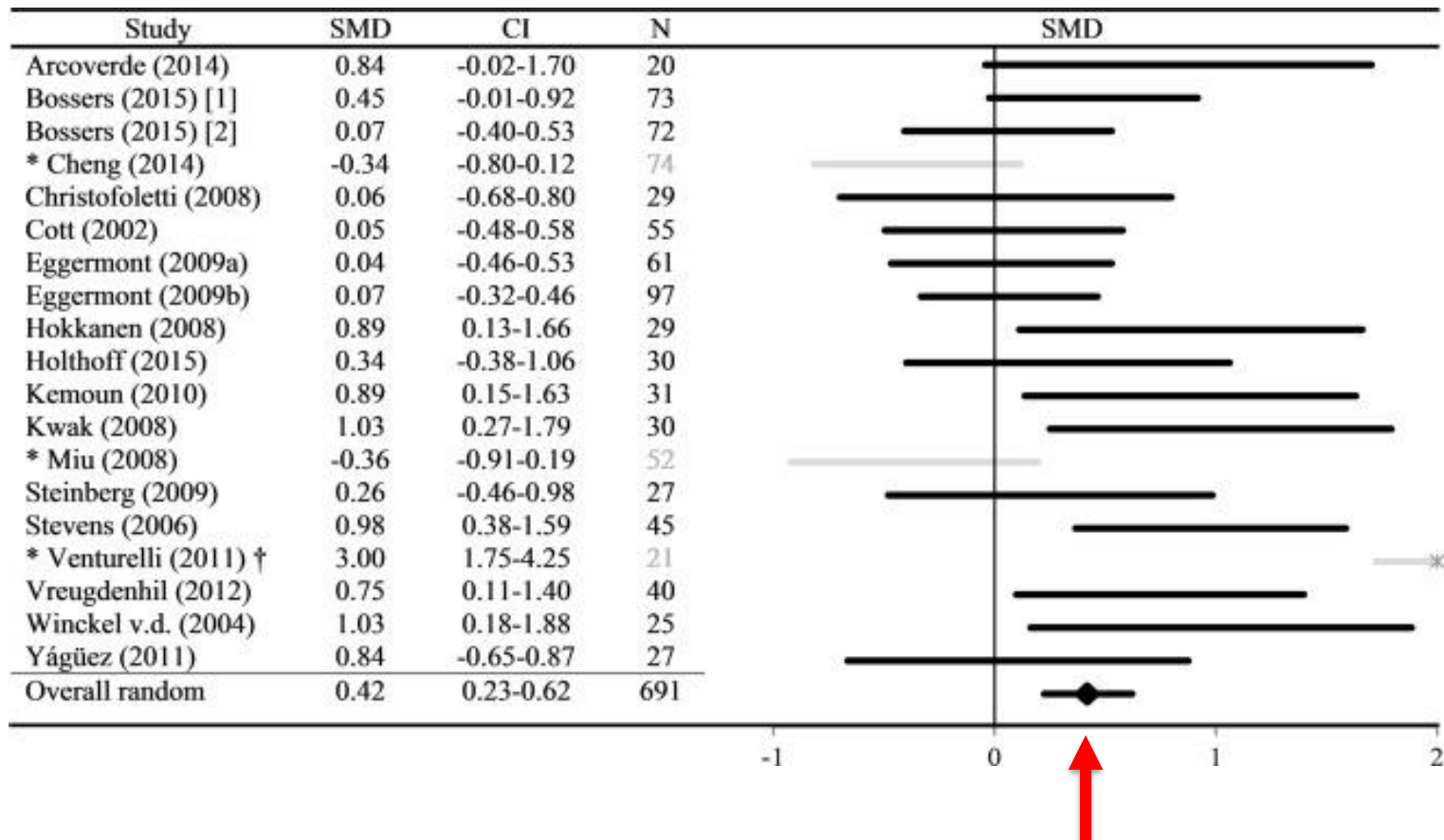
Study or Subgroup	Experimental			Control			Weight	Std. Mean Difference	
	Mean	SD	Total	Mean	SD	Total		IV, Random, 95% CI	IV, Random, 95% CI
Busse 2008	6.3	8.9	14	3.2	8.1	17	6.5%	0.36	[-0.36, 1.07]
Hong 2017	1	3.27	10	0.42	4.45	12	4.8%	0.14	[-0.70, 0.98]
Lam 2015	3.3	3.3	147	3.2	3.3	131	32.9%	0.03	[-0.21, 0.27]
Lautenschlager 2008	0.87	3.44	48	-1.29	3.95	52	16.9%	0.58	[0.18, 0.98]
Singh 2014	2.73	3.13	22	0.95	3.05	27	9.5%	0.57	[-0.01, 1.14]
Suzuki 2013	0.2	2.42	47	-0.3	2.59	45	16.4%	0.20	[-0.21, 0.61]
Varela 40% 2011	1.09	6.5	17	-2.27	4.7	15	6.6%	0.57	[-0.14, 1.28]
varela 60% 2011	0.42	5	16	-2.27	4.7	15	6.4%	0.54	[-0.18, 1.26]
Total (95% CI)			321			314	100.0%	0.30	[0.10, 0.49]

Heterogeneity: $\tau^2 = 0.01$; $\chi^2 = 8.70$, $df = 7$ ($P = 0.28$); $I^2 = 20\%$
 Test for overall effect: $Z = 3.03$ ($P = 0.002$)

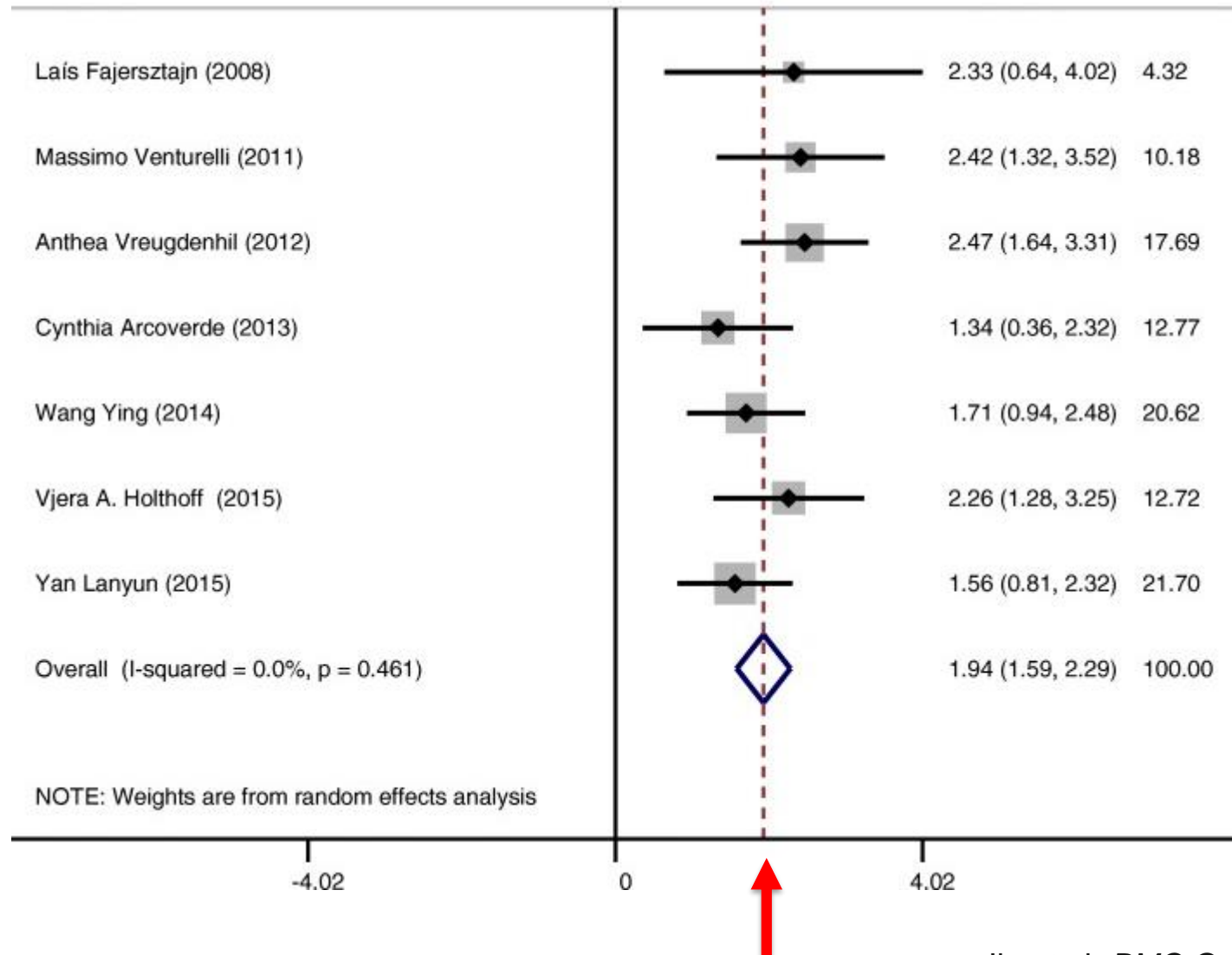


Physical activity effects on cognitive measures in dementia: RCT meta-analysis

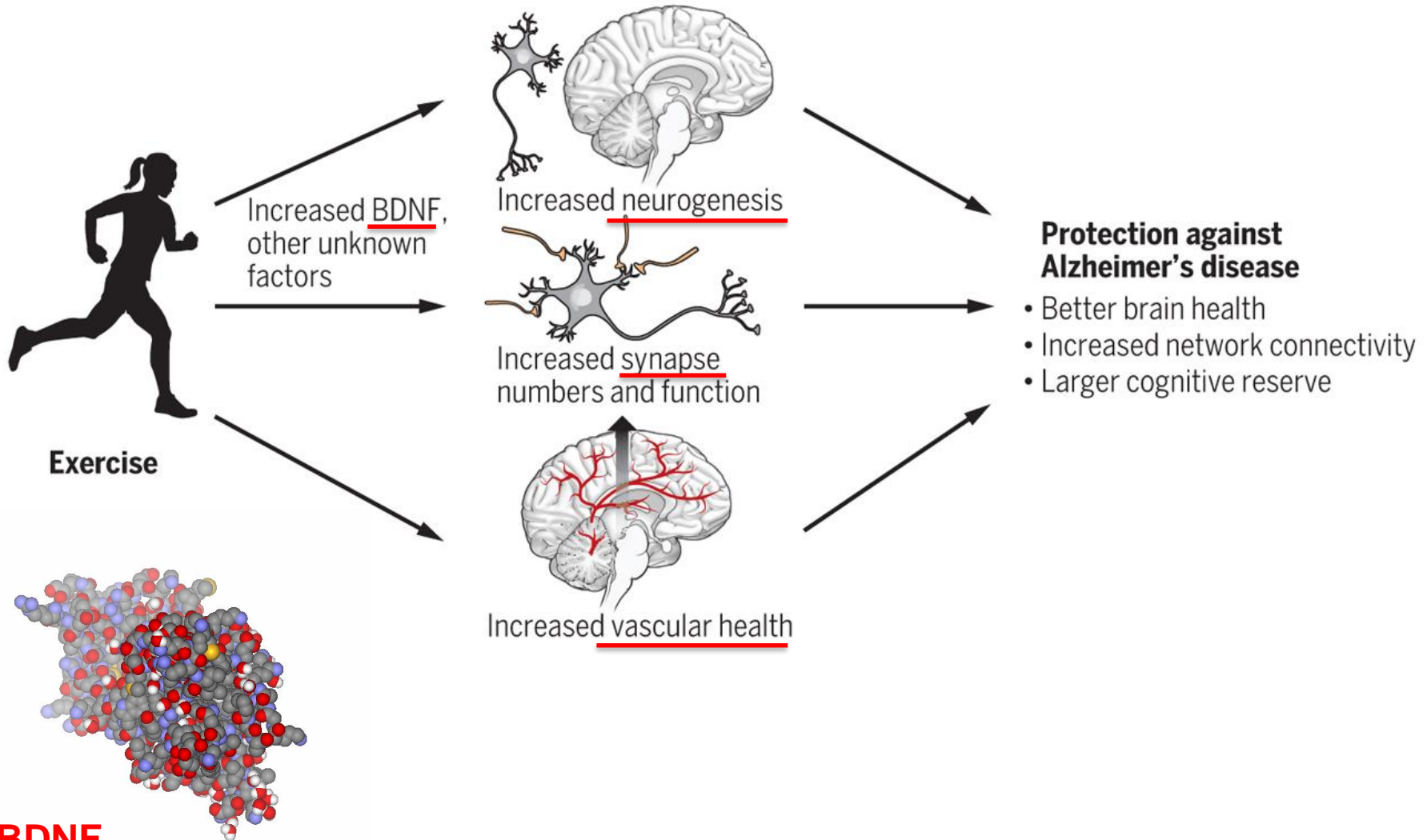
Mean: 183 min/week, aerobic vs social activity (AD + non-AD)



Physical activity effects on cognitive measures in dementia: RCT meta-analysis



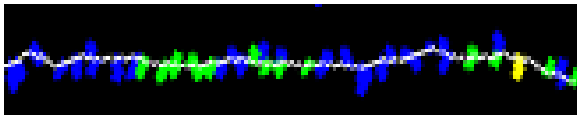
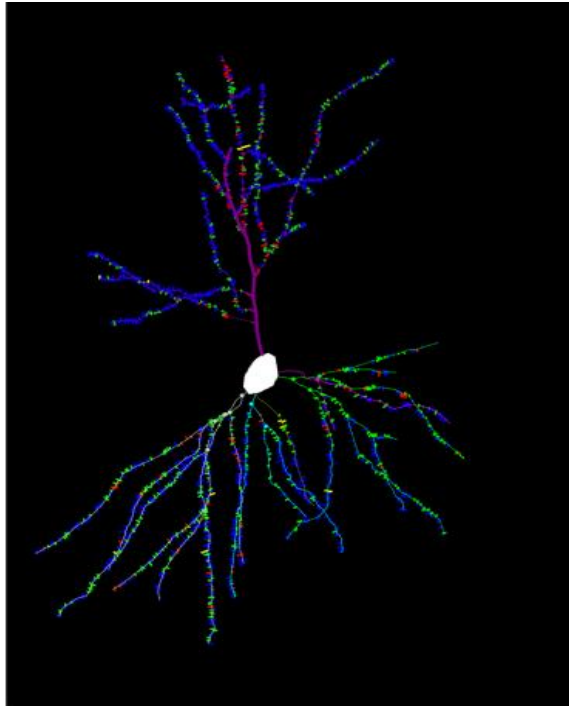
How does exercise protect against Alzheimer's?



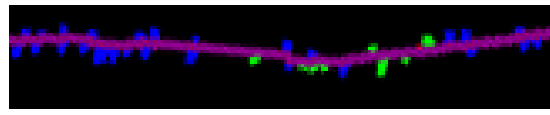
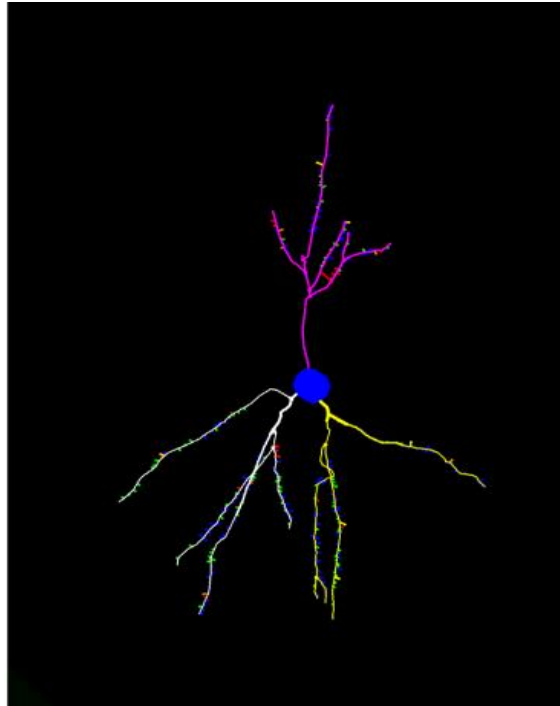
BDNF
(brain-derived neurotrophic factor)

Developing drugs to reverse degeneration

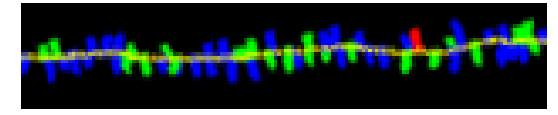
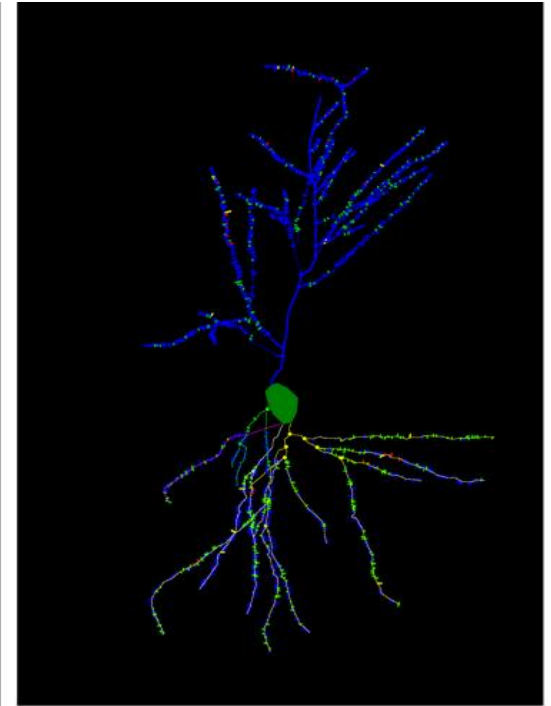
Normal mouse

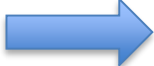


AD mouse

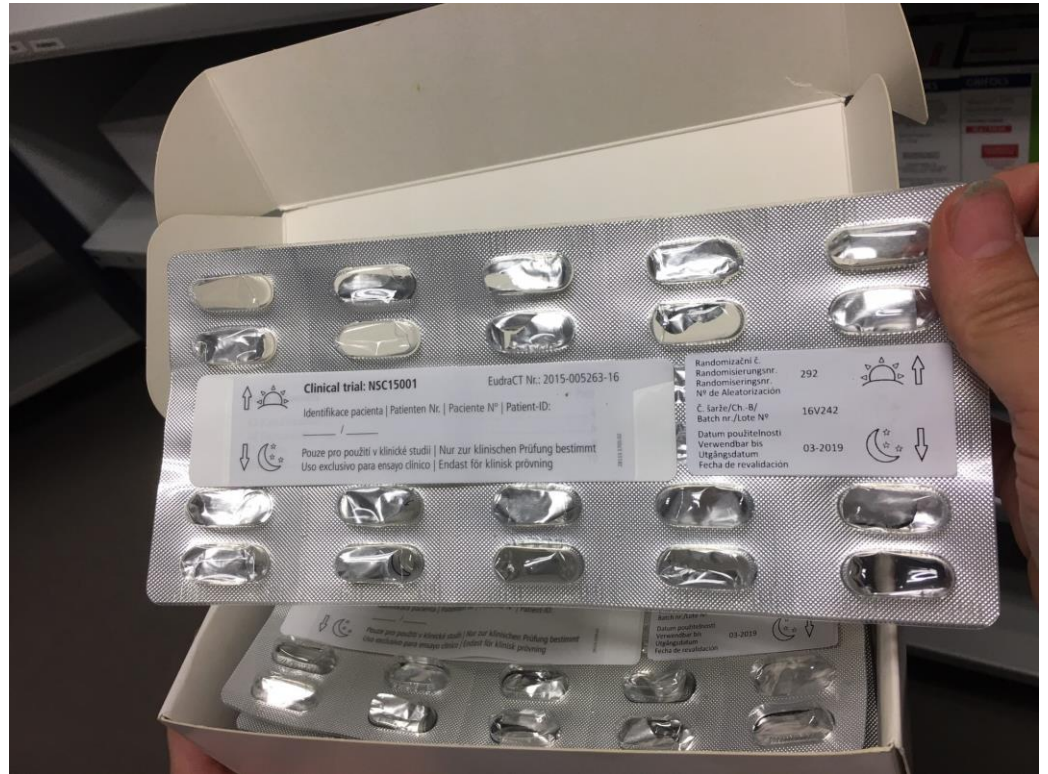


AD mouse + drug



mouse  human

From mice to people



Basic science and clinical care at Stanford



Stanford Neuroscience Institute 2020



Stanford Neuroscience Health Center 2016



Adult Hospital November 2019



Packard Children's Hospital 2018