

A Recipe for Brain Health

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Lifestyle Practices Are Major Contributors to Brain Health



Can we prevent Alzheimer's?



Potential for primary prevention of Alzheimer's disease:
an analysis of population-based data

Sam Norton, Fiona E Matthews, Deborah E Barnes, Kristine Yaffe, Carol Brayne

Lancet Neurol 2014; 13:788-94

30%

~30% of Alzheimer Disease (AD) risk attributed to seven modifiable risk factors – diabetes, midlife hypertension, midlife obesity, physical inactivity, depression, smoking and low education attainment

10%

A 10% reduction in prevalence of each of these risk factors/decade would reduce AD prevalence in 2050 by 8.3% worldwide

20%

A 20% reduction in risk factors would equate to a 15.3% reduction



**Global action
against dementia**

WDC Dementia Risk Reduction Statement

“Regular physical activity and management of cardiovascular risk factors (e.g. diabetes, obesity, smoking, and hypertension) are associated with a reduced risk of cognitive decline and may reduce the risk of dementia.

*Further, a **healthy diet** and lifelong learning/cognitive training may also reduce the risk of cognitive decline.”*

We encourage you all (governments) to take action on dementia risk reduction, by:

- (i) embedding dementia risk reduction/management in to your public health policies and campaigns and your non-communicable disease strategies and action plans, as some countries are already doing; and/or
- (ii) investing in further research in this area, including running population-level intervention studies, to urgently build the evidence base on dementia risk reduction.”

Temporal Trends in the Incidence of Dementia

Reasons For Optimism

Table 2. Temporal Trends in the Incidence of Dementia.*

Subtype	No. of Cases	Total No. of Observation Periods	5-Yr Cumulative Hazard Rate (95% CI)†				5-Yr Hazard Ratio (95% CI)‡				P Value for Trend
			Epoch 1	Epoch 2	Epoch 3	Epoch 4	Epoch 2	Epoch 3	Epoch 4	Trend§	
Overall dementia	371	9015	3.6 (2.9–4.4)	2.8 (2.2–3.5)	2.2 (1.8–2.8)	2.0 (1.5–2.6)	0.78 (0.59–1.04)	0.62 (0.47–0.83)	0.56 (0.41–0.77)	0.80 (0.72–0.90)	<0.001
Alzheimer's disease	264	9015	2.0 (1.5–2.6)	2.0 (1.5–2.6)	1.7 (1.3–2.3)	1.4 (1.0–1.9)	1.00 (0.70–1.43)	0.88 (0.62–1.25)	0.70 (0.48–1.03)	0.88 (0.77–1.00)	0.052
Vascular dementia	84	9014	0.8 (0.6–1.3)	0.8 (0.5–1.2)	0.4 (0.2–0.7)	0.4 (0.2–0.7)	0.89 (0.51–1.56)	0.46 (0.25–0.86)	0.45 (0.23–0.87)	0.71 (0.56–0.90)	0.004

* The baseline examination period was between 1977 and 1983 for the first epoch, between 1986 and 1991 for the second epoch, between 1992 and 1998 for the third epoch, and between 2004 and 2008 for the fourth epoch.

† The 5-year cumulative hazard rates (the cumulative incidence of dementia per 100 persons over a period of 5 years) are adjusted for age and sex.

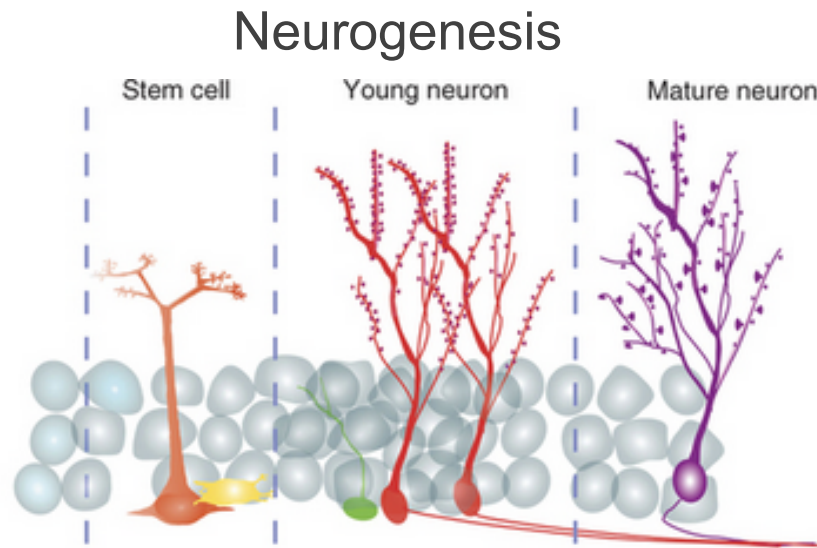
‡ The 5-year hazard ratios (the incidence of dementia during each epoch relative to the incidence during the first epoch) are adjusted for age and sex.

§ We estimated linear trends (the decline per decade in the 5-year incidence of dementia) using the elapsed mean time (in decades) between the first epoch and each consecutive epoch.

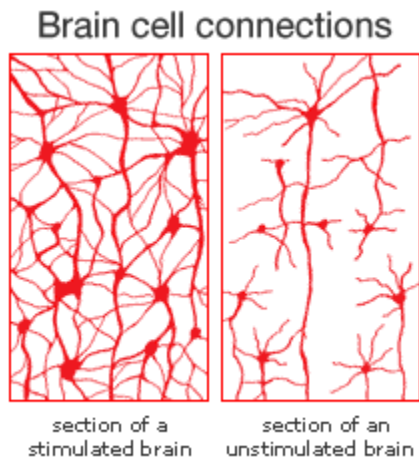
- Among participants in the Framingham Heart Study, the incidence of dementia has declined over the course of three decades
- Increased education and better diagnosis and management of metabolic risk factors likely contributed to the decline
- However, these changes don't completely explain the decreased in dementia incidence

So What Do We Know?

Brains Makes New Neurons and New Neural Connections Throughout Life

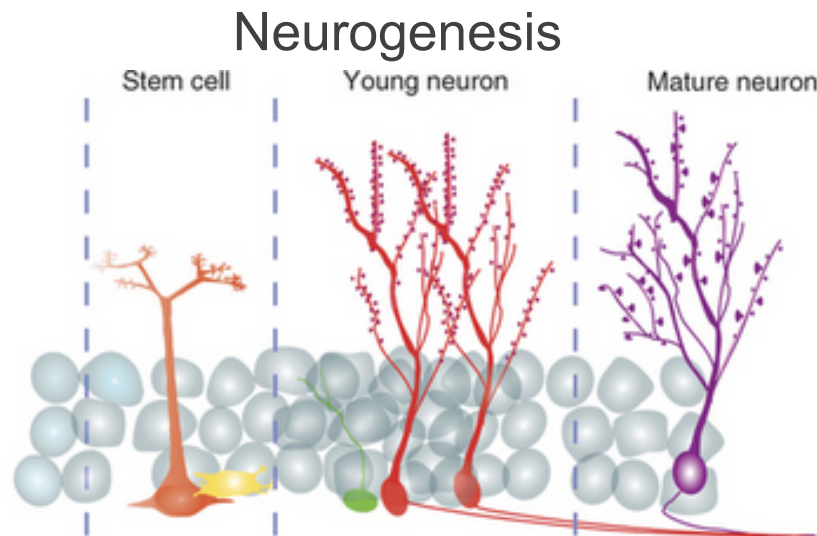


Synaptogenesis

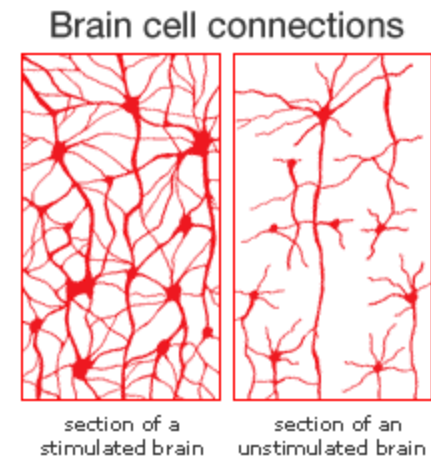


1. Impact of multiple inputs converge on these processes
2. Requires stimulation of common signalling pathways and neurotrophic support
3. Convergence allows for complex interactions amongst inputs

Brains Makes New Neurons and New Neural Connections Throughout Life



Synaptogenesis



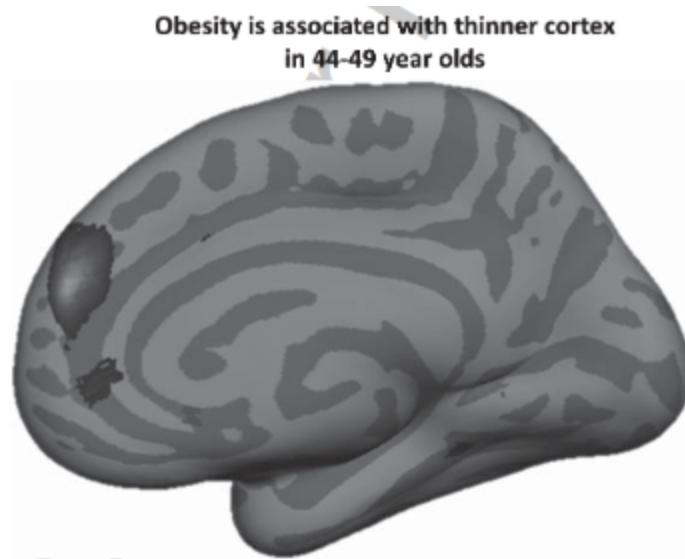
1. Nutrition contributes to an optimal environment to enable these processes to occur
2. Multiple nutrients needed to support these processes, so focus on single nutrient/food unlikely to be successful

Midlife Health is Tremendously Important



Midlife diet and central adiposity increases risk of dementia independent of diabetes and cardiovascular comorbidities. (Whitmer et al, Neurology, 2008; Samieri et al., Ann Intern Med. 2013)

Midlife Obese Individuals Had Thinner Right Frontal Cortices



Cortical thickness differences
between obese and normal weight
individuals aged 44-49

Greater Increase in BMI Over 8 Years Associated with Greater Decrease in Cortical Thickness

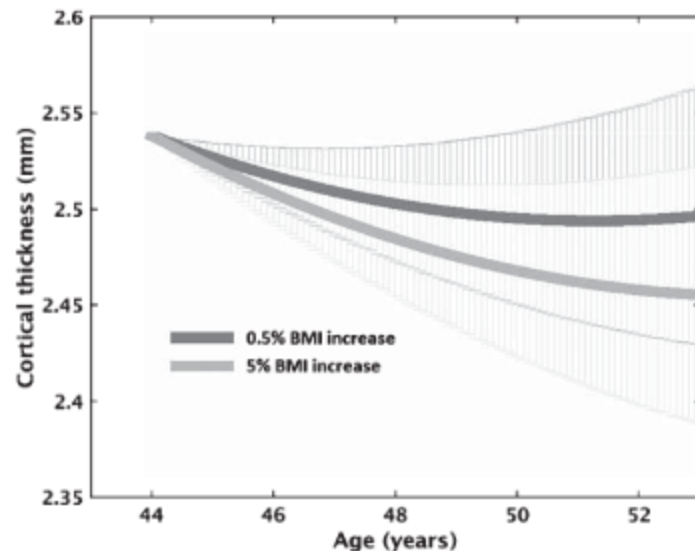
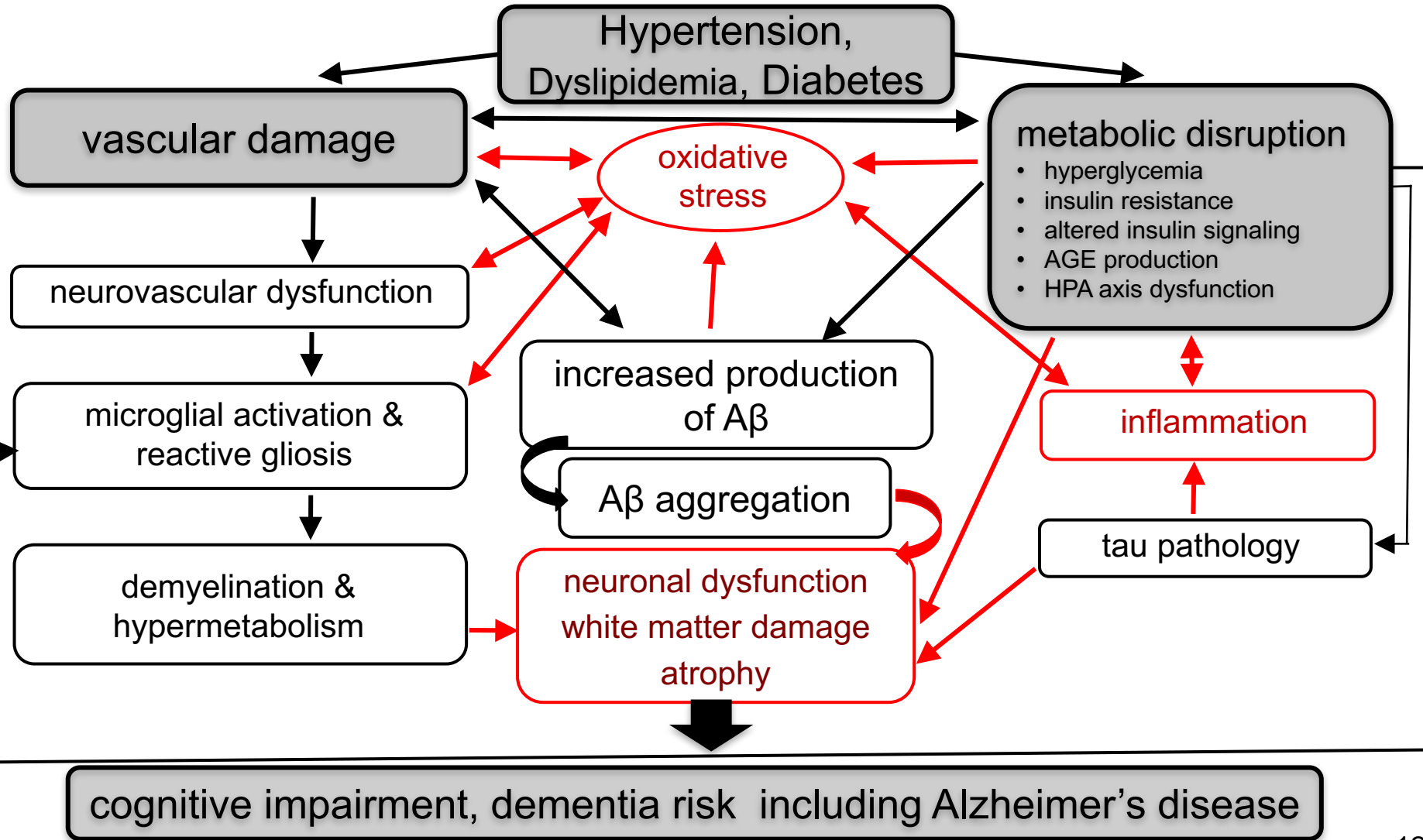


Fig. 4. Schematic of change in cortical thickness in posterior cingulate over 10 years for 0.5% increase in BMI (over 10 years) versus 5% increase. Projection is based on mixed-effect model estimates including the 95% confidence interval for age-related cortical thinning (shaded).

Projected that an individual with 5% increase in BMI over 10 years would have almost twice the cortical thinning in posterior cingulate as an individual with 0.5% BMI increase.

Consequences of Metabolic Disorders



A Really Sobering Concern With The Rise In Childhood Obesity

Obesity and Metabolic Syndrome and Functional and Structural Brain Impairments in Adolescence

Po Lai Yau, Mary Grace Castro, Adrian Tagani, Wai Hon Tsui and Antonio Convit
Pediatrics 2012;130:e856; originally published online September 3, 2012;
DOI: 10.1542/peds.2012-0324



WHAT'S KNOWN ON THIS SUBJECT: Despite the dramatic rise in prevalence of metabolic syndrome (MetS) among children and adolescents, and that MetS is associated with cognitive and brain impairments among adults, no data on the impact of MetS on the brain exist in children.



WHAT THIS STUDY ADDS: It provides the first data on the impact of MetS on brain in adolescence. We show reductions in cognitive function and brain structural integrity in nondiabetic adolescents with MetS, thus suggesting that even pre-clinical metabolic illness may give rise to brain complications.

Poorer Academic Achievement and Smaller Hippocampal Volumes in Adolescents (14-20 yrs) with Metabolic Syndrome

TABLE 2 Cognitive Data

Measures	MetS (<i>n</i> = 49), Mean ± SD	Non-MetS (<i>n</i> = 62), Mean ± SD	Effect Size	<i>P</i>
Intellectual functioning and academic achievement				
Estimated full-scale IQ ^a	102.00 ± 11.63	105.95 ± 12.35	0.17	.09
WRAT reading standard score ^a	106.44 ± 11.57	107.64 ± 10.74	0.02	.83
WRAT spelling standard score ^a	101.22 ± 13.04	105.39 ± 10.94	0.21	.04
WRAT arithmetic standard score	93.02 ± 13.25	102.09 ± 13.04	0.69	.001

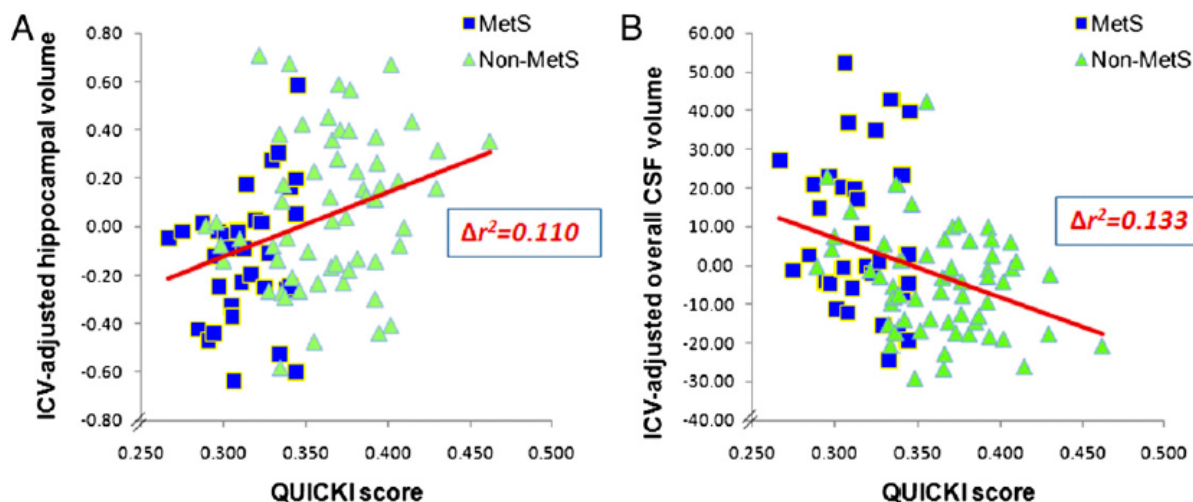


FIGURE 3

Lower QUICKI scores (more IR) were associated with smaller ICV-adjusted hippocampal volumes (*n* = 91) (A) and larger ICV-adjusted overall CSF volumes (*n* = 92) (B).

Can The Glass Be Half Full?



What About The Mediterranean Diet?

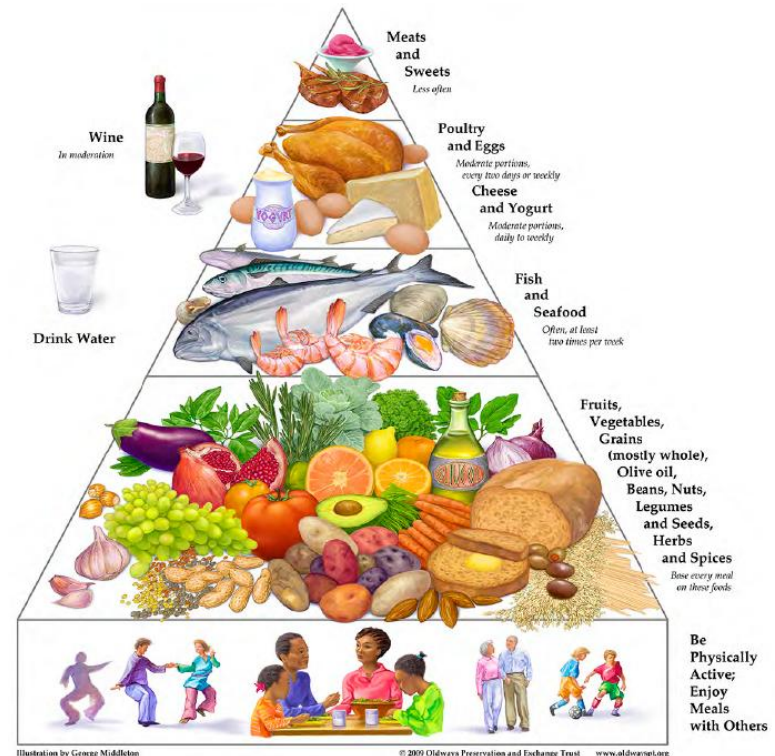
27%

Lower risk of mild
cognitive
impairment

36%

Lower risk of Alzheimer
Disease

Benefits observed in
Europeans
and North Americans



Mediterranean Diet and Biologic Factors

Greater Adherence to Mediterranean Diet Associates With:

- Larger brain volumes (low meat eaters only)
{Titova et al, Exp Gerontol., 2013. 48:1443-1448}
- Less damage to brain blood vessels and surrounding tissues; especially with monounsaturated fat
{Gardener et al, Arch Neurol, 2012. 69:251-256}
- Lower levels of oxidation and inflammation
{Konstantinidou et al, Mol Nutr Food Res, 2013. 57:772-783}

Primary Prevention of Heart Disease With a Mediterranean Diet (PREDIMED)

- participants at high cardiovascular risk, but with no CVD at enrollment
- 7447 persons (**aged 55 to 80 years**) assigned to a low fat diet, Med diet with olive oil, or Med diet with nuts
- Trial stopped after median follow-up of 4.8 yrs

Hazard Ratios for Med Diet vs Low Fat Diet

	Med Diet	Low Fat	P
Major Cardiovascular event ¹	0.71 (0.56–0.90)	1 (ref)	0.005
Stroke ²	0.61 (0.44–0.86)	1 (ref)	0.005

¹Primary end point – adjusted model;

²Secondary end point

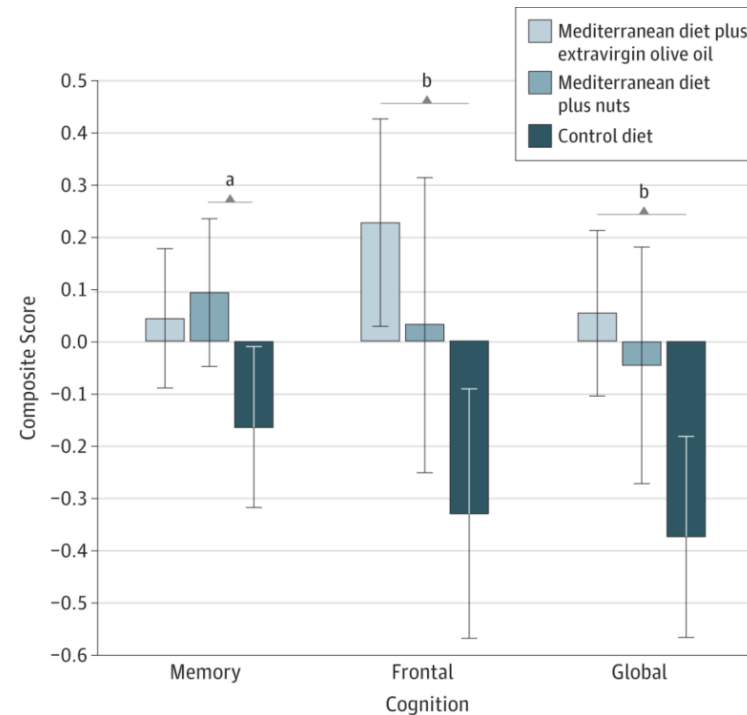
Impact of Mediterranean Diet on Cognitive Function (PREDIMED Study)

- participants at high vascular risk
- 522 persons (**age 74.6 ± 5.7 years**) consuming low fat diet, Med diet with olive oil, or Med diet with nuts
- After 6.5 years of nutritional intervention

	Med + EVOO	Med + Nuts	Low Fat
MMSE	28.00 (27.72 to 28.29)	27.96 (27.64 to 28.29)	27.40 (26.99 to 27.81)
CDT	5.45 (5.25 to 5.65)	5.27 (5.01 to 5.52)	4.95 (4.67 to 5.24)

Both Med diet different from low fat with adjusted analyses
No baseline measures

Consumption of a Mediterranean Diet Plus Nuts Prevented 4 yr Decline In Global Cognitive Function in a Subsample of 334 Participants – PREDIMED Trial



Additional olive oil and mixed nuts (almonds, hazelnuts and walnuts) chosen because of their lipid profile and high concentration of polyphenolic compounds



Brain Health &
Wellness

Is The Mediterranean Diet the Holy Grail?

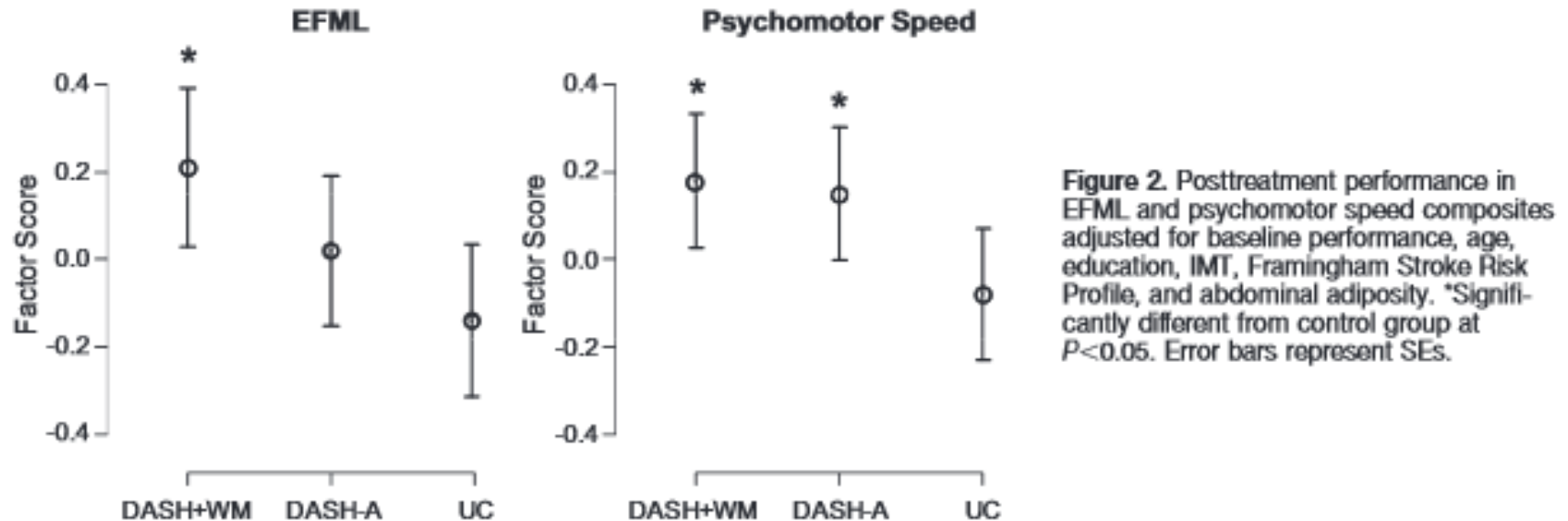
No!!!

Eating a Mediterranean style diet does not mean concentrating on Italian, Greek or Spanish food – it refers to any diet rich in :

- ☐ Fruits, Vegetables
- ☐ Whole grains and cereals
- ☐ Beans/pulses
- ☐ Fish
- ☐ Low in saturated fats and highly processed foods

There are many ways to achieve a healthy diet – the Mediterranean diet is just one example.

DASH Diet and Exercise



- ❑ Only the DASH diet plus exercise group (DASH+WM) showed improvements in executive function-memory-learning
 - comparable to a 14.6-year improvement in predicted age for Trail Making Test B-A performance and a 6.1-year improvement for Stroop Interference Test
- ❑ Both the DASH diet alone and the DASH diet plus exercise groups showed improvements in psychomotor speed.
 - Comparable to an ~ 9 year improvement in controlled detection speed
- ❑ Participants in the DASH+WM group with greater intima-medial thickness and higher systolic blood pressure showed greater EFML gains

We Need To Return To The Simple Message

Manage your body weight, cholesterol and blood pressure and reduce your diabetes risk

Eat your fruits and veggies

Choose whole grain alternatives and include more grains and beans/pulses in your diet

Consume fish regularly

Avoid highly processed foods and those with 'empty calories'

Which Foods Help the Brain?



**BRAIN HEALTH
FOOD GUIDE**



An Evidence-Based
Approach to Healthy Eating
for the Aging Brain



Simple diet changes have a powerful effect on brain health

The Brain Health Food Guide is for adults who want to retain cognitive function and brain health as they age. The guide is based on studies on adults aged 50+ who changed their diet and found these beneficial effects:

- After four months of eating well, they performed as if they were nine years younger on tests of reading and writing speed¹
- After four years of eating well, they did not experience any memory loss²

Dietary patterns similar to the Brain Health Food Guide are associated with:

- 36 percent lower risk of developing Alzheimer's disease³
- 27 percent lower risk of developing mild cognitive impairment or pre-dementia³

With a nutritious variety of vegetables, fruit, whole grains, beans, fish, nuts and low-fat dairy products, the Brain Health Food Guide offers the same eating plan that's recommended to prevent or treat heart disease, diabetes, high cholesterol, high blood pressure and other conditions too.

Consult with your health care provider to adapt these basic recommendations to meet your specific needs.



Eating for brain health is all about...

- Embracing balance, moderation and variety (see back for guide)
- Focusing on an overall pattern of healthy eating, not one one specific "superfood" for brain health
- Making sure you eat until you are "just" full and not stuffed
- Enjoying lots of vegetables and fruit
- Eating raw leafy vegetables daily, including lettuce, kale and spinach
- Eating fish, beans, and nuts several times a week
- Including better fats in the diet, from olive oil, nuts and fish
- Limiting red and processed meat
- Selecting low-fat dairy products, such as milk and yogurt
- Choosing whole grain over refined grains and white bread

Resources

Recipes & Healthy Eating
Dietitians of Canada
www.cdn.dietitians.ca

Heart & Stroke Foundation
www.heartandstroke.com

Canadian Diabetes Association
www.diabetes.ca/diabetes-and-you/recipes

EatRight Ontario
www.eatrightontario.ca

HealthLink BC
www.healthlinkbc.ca/healthyliving

Preventing Dementia
Alzheimer Society of Canada
www.alzheimer.ca/en/uk/your-wellbeing/preventing-dementia/brain-boosters



- **Choose colour.** Include colourful fruits and vegetables in each meal
- **Grill, steam and bake** foods instead of deep frying
- **Stock your kitchen** with a variety of dried or canned beans, frozen or canned fish, frozen vegetables and fruits
- **Add legumes** to soups, stews and stir-fries
- **Snack smart.** Reach for nuts, fresh fruit, cut up vegetables and low fat yogurt
- **Keep hydrated.** Drink water or unsweetened beverages

Developed by: Dr. Matthew Parnell
in collaboration with members of the Canadian Consortium on Neurodegeneration in Aging:
Team 8: Nutrition, Exercise and Lifestyle

Team 8 Member Organizations:
Baycrest Health Sciences, Concordia University, Institut Universitaire de Gériatrie de Montréal, Centre de recherche du Centre hospitalier de l'Université de Montréal, McGill University, Rotman Research Institute, Ryerson University, Sunnybrook Health Sciences Centre, Toronto Rehab/UMH Cardiovascular Rehabilitation Program, Université de Montréal, Université de Sherbrooke, University Health Network, Toronto, University of British Columbia, University of Ottawa, University of Toronto, Waterloo University

Supporting Evidence:
1. Smith PJ, Kumari M, Jayaraman S, et al. Effects of the dietary approaches to stop hypertension diet, exercise, and calorie restriction on neurocognition in overweight adults with high blood pressure. *Hypertension*. 2015;65(1):1101-1108.
2. Valls-Pedrer C, Barba-Vila A, Sala-i-Mel A, et al. Mediterranean diet and age-related cognitive decline: a randomized trial. *JAMA Internal Medicine*. 2015;175(7):1054-1062.
3. Singh R, Parnell AP, Malik VA, et al. Association of Mediterranean diet with risk of cognitive impairment and Alzheimer's disease: a systematic review and meta-analysis. *J Alzheimer's Dis*. 2014; 38:271-282.





Foods to Include	Servings	Serving Size
Vegetables Total	5 or more times a day	1/2 cup except 1 cup for Raw Leafy Greens
Of this, be sure to include: Raw Leafy Greens (e.g. lettuce, spinach, mixed greens, kale, cabbage)	1 time a day	
Cruciferous Vegetables (e.g. broccoli, cauliflower, Brussels sprouts, kale, cabbage, bok choy)	3 times a week	
Fruit Total	4 or more times a day	1 medium or 1/2 cup
Of this, be sure to include: Berries (fresh or frozen)	3 times a week	
Unsalted Nuts or All-natural Nut Butters Total (e.g. almond butter, peanut butter)	1 time a day	1/4 cup nuts or 2 tbsp nut butter
Of this, be sure to include: Walnuts	4 or more times a week	
Beans or Legumes (e.g. chickpeas, kidney beans, lentils, navy beans)	2 or more times a week	1/2 cup
Fish or Seafood Total (not battered or fried)	3 times a week	3-4oz
Of this, be sure to include: Fatty fish (e.g. salmon, trout, sardines)	1 or more times a week	

- Choose whole grains (e.g. oats, brown rice, brown pasta, 100% whole wheat or whole grain breads, quinoa, bulgur, barley, whole grain pasta and breads) instead of refined grains (e.g. white rice, white pasta, white bread)
- Use low-fat milk (skim or 1%), yogurt (0-2%), and cheese (about 22%)
- Use extra-virgin olive oil as your main culinary oil for cooking, salad dressings, and added to bread and foods



Foods to Limit	Servings	Serving Size
Any Meat and Poultry Total No more than 1 meal per day should include meat or poultry Of this, be sure to limit: Red and processed meats (e.g. beef, pork, lamb, liver, sausages, hot dogs, jerky, cold cuts, pepperoni)	1 or less per day less than 1 per week	3-4oz
Butter, cream, or high fat dairy spreads (e.g. sour cream, cream cheese)	less than 1 per week	1tsp butter 1tbsp cream
White breads (e.g. bread, rolls, bagels, pita, tortilla)	1 or less per week	1 slice bread 1/2 bagel
Pre - packaged foods and meals (e.g. canned soup, instant noodles, frozen appetizers, and entrees) Potato chips, fries, pretzels, or other salty snacks or fried food Store-bought dairy desserts (e.g. ice cream, frozen yogurt, pudding, custard) Baked goods (especially store bought) (e.g. cookies, muffins, scones, croissants, donuts, cakes, pies) Candy and chocolate Pop, sweetened fruit juice or any other sugary drink		



That A Single Nutrient Provides a 'Quick Fix' To A Complex Problem

Identify Bioactive Component of Food



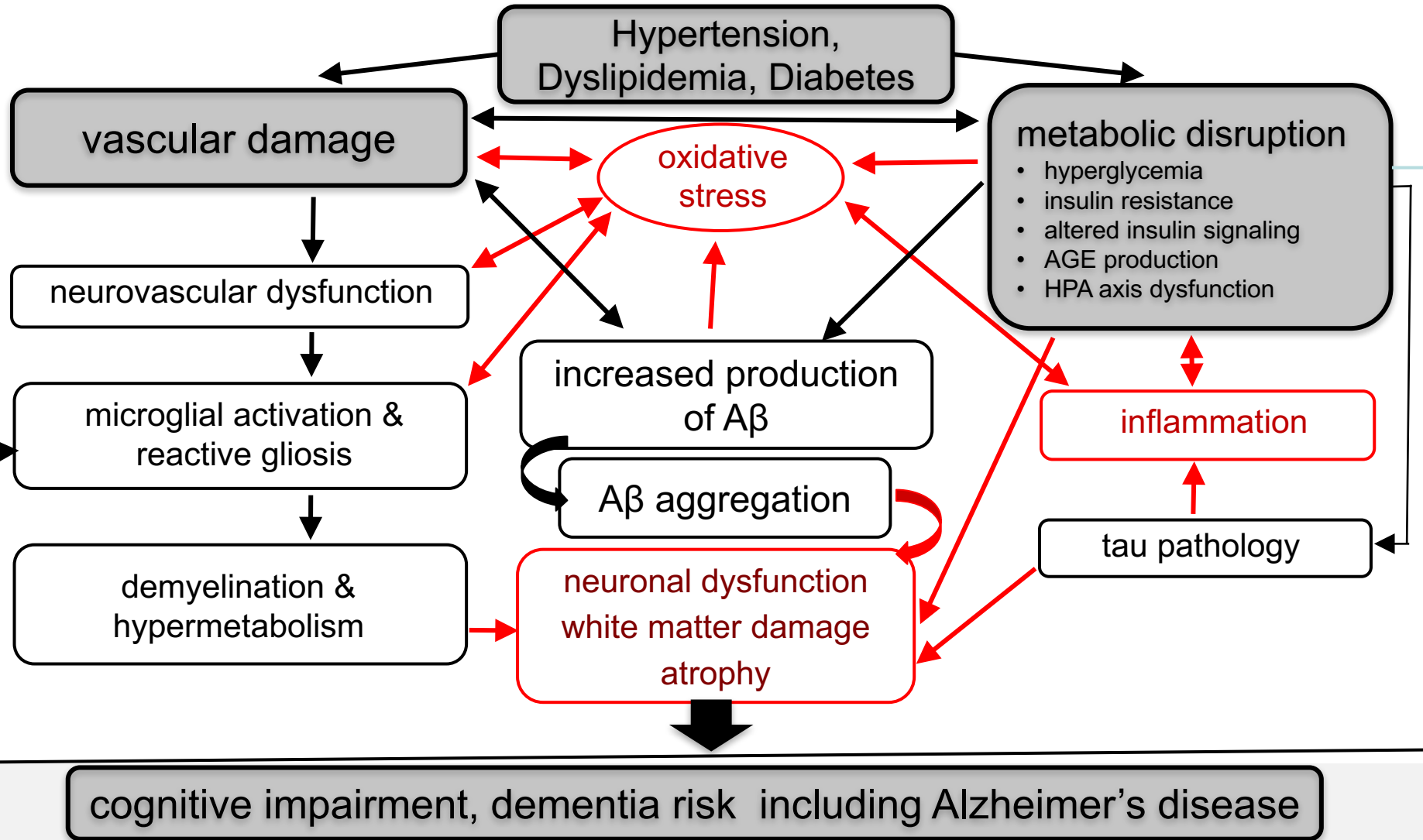
Market Bioactive Component



Inform Public Health Policy



A Single Nutrient Or Food Can't Overcome Multiple Insults



Is there evidence for 'Super-foods' and brain health?



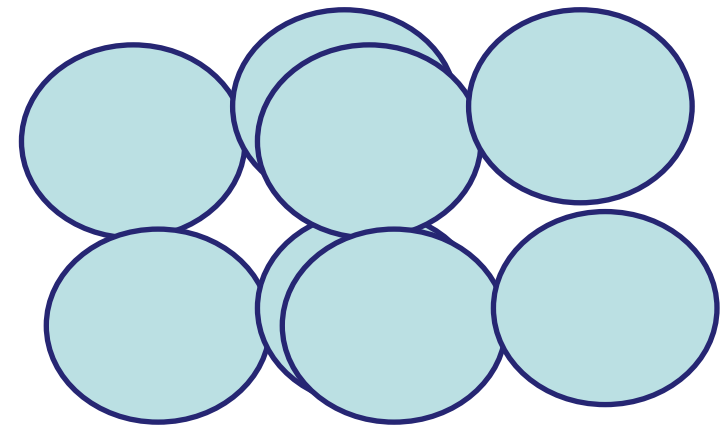
NO!!!

- ❖ No evidence at the food group level
- ❖ Variety is more important to ensure broad exposure to healthy nutrients and food components
- ❖ Exception is fatty fish (salmon, sardines, mackerel) or other sources of omega-3 fats
- ❖ No evidence that any single food can cause dementia

Use Spices to Increase Intake of Fruit and Vegetables Not To Enhance Antioxidant or Polyphenol Intake



µg or mg of polyphenols



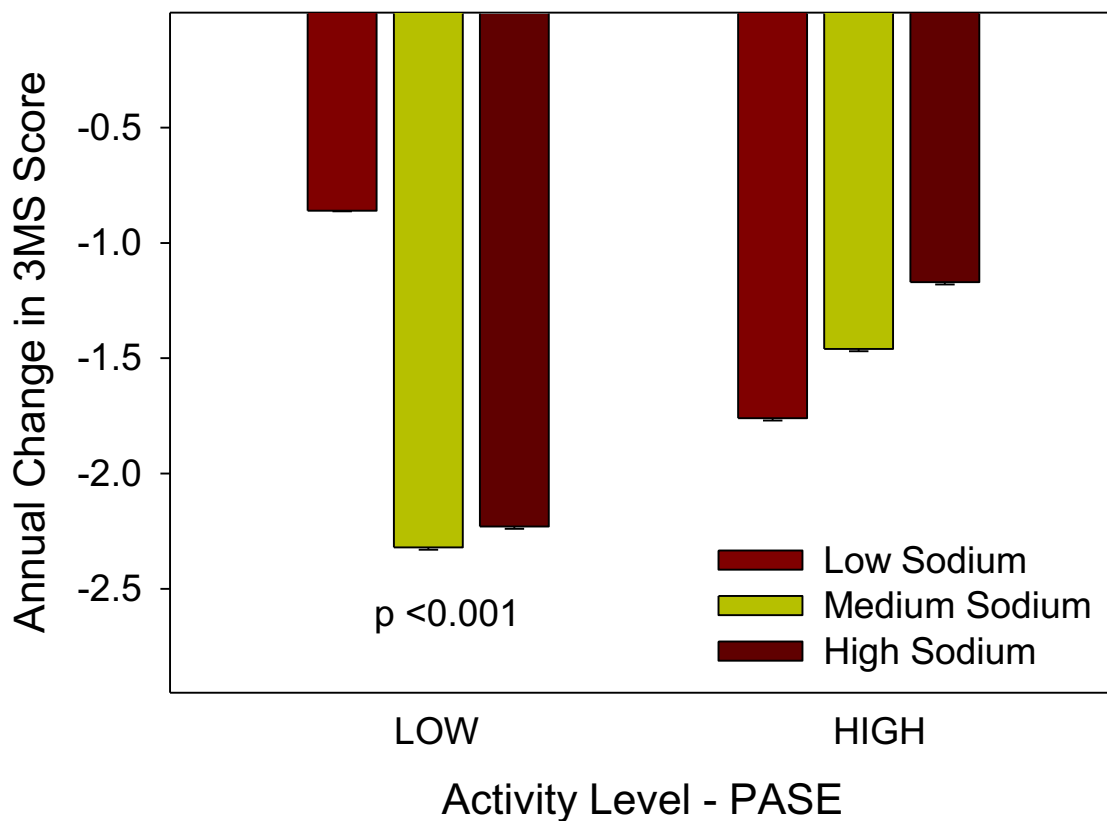
g of polyphenols



Lifestyle Factors Interact With One Another

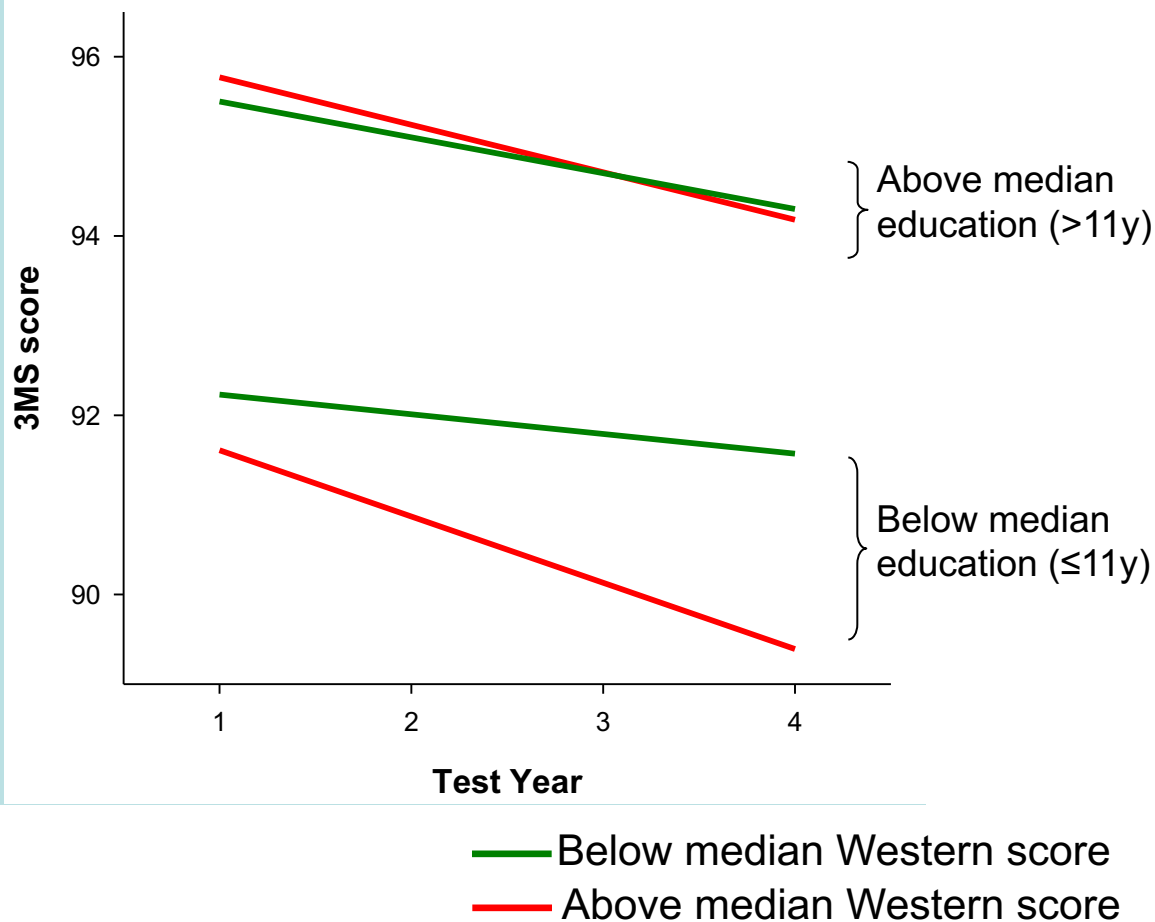
- Diet is important
- But, so are other aspects of your lifestyle

Adverse Effects of High Sodium Intake More Apparent in Older Adults With Low Activity



Adverse effect of poor sodium intakes even when we took into account blood pressure and use of blood pressure lowering medications

Western dietary pattern related to worse performance in less educated older adults



Conclusions

- Diet is an important contributor to brain health
- Multiple nutrients are involved, so the global diet is more important than individual foods or nutrients
- Multiple factors work cooperatively with one another to enhance cognitive capacity and focus needs to be on total lifestyle and not its individual components
- Obesity-associated disorders are major contributors to brain injury and poor cognitive function

THANK YOU!

RESEARCH PARTICIPANTS!!!

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David Jenkins

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NOW THAT WAS A
MOUTHFUL!

THANK YOU