

# Train Your Brain: An Evidenced-Based and Holistic Approach to Optimal Brain Health

Dr. Rob Winningham  
Western Oregon University



© 2024, Dr. Rob Winningham All Rights Reserved

1

## Today's Presentation

- We will take a very holistic and interconnected approach, discussing a myriad of factors that affect cognition as we age.
- We will discuss numerous and practical ways older adults can maintain their cognitive and social well-being.
- Bottom line is that numerous behavioral and lifestyle interventions seem to have a significant impact on the likelihood of developing dementia.

© 2024, Dr. Rob Winningham All Rights Reserved

2

## Neuropsychology has found that executive functioning is key

- Executive functioning includes:
  - Attention
  - Cognitive inhibition (controlling distractibility)
  - Behavioral (or response) inhibition
  - Problem solving
  - Reasoning
  - Planning
  - Working (or short-term) memory

© 2024, Dr. Rob Winingham All Rights Reserved

3

## What do we know?

- What factors predict better brain health, memory ability or lower chances of developing dementia?

© 2024, Dr. Rob Winingham All Rights Reserved

4

## Many controllable factors impact risks of cognitive impairment

- Physical exercise
- Cognitive stimulation
- Stress and neuroticism
- Sleep
- Social support and engagement
- Diabetes and insulin resistance
- Yoga
- Tai Chi
- High Intensity Interval Training (HIIT)
- Dance
- Dual tasking
- Mindfulness training and Meditation
- Alcohol
- Hearing impairments

© 2024, Dr. Rob Winingham All Rights Reserved

5

## A 2022 Meta-Analysis of 44 Published Studies on the Effects of Online Cognitive Training

- Researchers combined data from 44 studies that used participants with mild cognitive impairment or early stage dementia
- Results showed improvements in executive functioning (attention) and making new memories
- Results also showed reductions in depression
- Programs that lasted for at least 6 weeks had better results

© 2024, Dr. Rob Winingham All Rights Reserved

6

## Article in the Journal *Neurology*

- Wilson et al. found that people who participated in more mentally stimulating activities had a slower rate of decline in memory. Mental activity accounted for nearly **15 percent** of the difference in decline beyond what is explained by brain changes associated with dementia.

© 2024, Dr. Rob Winingham All Rights Reserved

7

## Meta-Analysis in *Neuropsychology*

- Karr et al. conducted a 46 study meta-analysis on the effects of cognitive training and/or physical exercise on cognitive abilities.
  - Both treatment modalities improved executive functioning
  - Reliable effect sizes

© 2024, Dr. Rob Winingham All Rights Reserved

8

## A Multimodal Approach May Be Best

- Nishiguchi et al. reported that a 12-week program that combined physical and cognitive exercise yielded not only improvements in executive functioning performance (e.g., attention) but also led to more efficient brain activity (in the pre-frontal cortex) as measured by fMRI.

© 2024, Dr. Rob Winningham All  
Rights Reserved

9

## Cognitive Stimulation

1	6			5		
			9	1	4	
		4	5	7	3	
			8	7	3	
2	5			9	7	
	8	9	5			
9	4	5	8			
5	7	1				
	2			8	6	

© 2024, Dr. Rob Winningham All  
Rights Reserved

10

2		5			7			6
4			9	6	<b>5</b>		2	
				8			4	5
9	8		<b>5</b>	7	4			
5	7		8	<b>1</b>	2		6	9
			6	3	<b>9</b>		5	7
7	5			2				
	6			5	1			2
3			4			5		8

© 2024, Dr. Rob Winningham All Rights Reserved

11

	1	2	
			4
	3	4	
1	4		

© 2024, Dr. Rob Winningham All Rights Reserved

12

	2		3		6
	6			2	
	5	4	1		
1				6	4
2				4	3
3		6		1	

© 2024, Dr. Rob Winningham All Rights Reserved

13

## Exercise and Cognition

*Walking is the best possible exercise. Habituate yourself to walk very far.* Thomas Jefferson (1743–1826)



© 2024, Dr. Rob Winningham All Rights Reserved

14

## Classic Study

- Colcombe and Kramer reported the results of an 18-study meta-analysis on the effects of exercise on cognition.
  - Age [Older (66-70 or 71-80) > Younger (55-65)]
  - Type of exercise (Aerobic + Strength > Aerobic)
  - Length (6+ months > 5 or less months)

© 2024, Dr. Rob Winningham All Rights Reserved

15

## Exercise and Cognition

- Researchers have since found that physical exercise leads to improvement in executive functioning.
- There are short term benefits (same day and next) and long term benefits that are seen after 6 months.

© 2024, Dr. Rob Winningham All Rights Reserved

16



## What type of exercise is best?

- A mixture of aerobic and strength (or resistance) training seems to be quite effective.



*Stock image purchased by Rob Winningham*

© 2024, Dr. Rob Winningham All Rights Reserved

17

## What type of exercise is best?

- Researchers reported that either once-a-week or twice-a-week resistance training sessions for 12 months led to improvements in older adults' cognition and attention.
  - 11% improvement for once-a-week
  - 13% improvement for twice-a-week

© 2024, Dr. Rob Winningham All Rights Reserved

18

## Strength or Resistance Training

- Then, researchers found that twice a week resistance training in 70 to 80 year old women, with Mild Cognitive Impairment, led to significant improvement in attention and memory ability.

© 2024, Dr. Rob Winingham All Rights Reserved

19

## Options for Resistance Training

- Body weight supported exercise
- Theraband
- Weights
- Water exercises

© 2024, Dr. Rob Winingham All Rights Reserved

20

## Yoga can improve cognition

- In a meta-analysis that combined data from 15 studies assessing the effects of yoga on cognition. The improvements were significant and benefitted executive functioning.

© 2024, Dr. Rob Winningham All Rights Reserved

21

## Why might Yoga help?

- Increased attention and focus
- Reduced stress
- Physical exercise (both resistance and aerobic)

© 2024, Dr. Rob Winningham All Rights Reserved

22

## Tai Chi Can Benefit Mental and Physical Health



Public domain image:  
[https://commons.wikimedia.org/wiki/File:Tai\\_Chi\\_Cannon\\_Beach.jpg](https://commons.wikimedia.org/wiki/File:Tai_Chi_Cannon_Beach.jpg)  
© 2024, Dr. Rob Winningham All Rights Reserved

23

## Tai Chi

- Researchers combined data from 20 studies looking at the effects of Tai Chi on cognition and memory ability in older adults and concluded that Tai Chi has the potential to improve **executive functioning**. Other researchers have shown executive functioning predicts ability to care for oneself and chance of falling.

© 2024, Dr. Rob Winningham All Rights Reserved

24

## Dance

- Dancing has long been associated with cognitive improvements in older adults.
  - Executive functioning
  - Spatial ability
  - Social engagement
  - Often has dual tasking components

© 2024, Dr. Rob Winingham All Rights Reserved

25

## Who benefits the most, in terms of cognition?

- Cognitive training
  - People with mild cognitive impairment and early stage dementia seem to benefit the most. People with more advanced dementia can see improvements to quality of life but probably not cognition.
  - Optimal session length 30-60 minutes, a few times a week, for at least 6 weeks.
  - It is easier to document improvements in older adults relative to middle aged and younger adults.

© 2024, Dr. Rob Winingham All Rights Reserved

26

## Who benefits the most, in terms of cognition?

- Physical activity
  - Older adults tend to have greater improvements in cognition.
  - Resistance training seems to be one of the best physical exercises, in terms of cognition.
  - People with lower baseline physical fitness levels seem to experience the greatest improvements.

© 2024, Dr. Rob Winningham All Rights Reserved

27

## Frequency, Intensity, Time and Type (FITT)

	Aerobic	Strength	Flexibility & Balance
Frequency	≥3 days per week, trend to ≥5 days per week *	≥2 days week	2 to 3 days per week
Intensity	Moderate to vigorous **	50% to 80% of 1RM ****	To point of light to mild tension
Time	≥150 minutes/week (moderate-intensity) ***	5 to 30 repetitions, 3 to 14 seconds/rep, 1 to 3 sets	10 to 40 seconds per stretch or position
Type	Rhythmic, continuous physical activity	Body & external weights; all muscle groups *****	Stretch, balance, yoga, all major muscle groups

From: <http://www.healthedpartners.org/ceu/pa-healthyaging/>

© 2024, Dr. Rob Winningham All Rights Reserved

28

## Why the link between exercise and memory?

Physical activity may improve brain function through:

- Neurogenesis
- Synaptogenesis
- Brain Derived Neurotrophic Factors
- Angiogenesis (creation of new capillaries or blood vessels)
- Reduction in inflammation
- Improved sleep
- Mitigates insulin resistance

© 2024, Dr. Rob Winingham All Rights Reserved

29

## Chronic Pain

- Chronic pain increases the chance of depression, which may be a risk factor for dementia
- Chronic pain increases the chance of sleep problems, which may be a risk factor for dementia
- Activity levels may also be affected by chronic pain

© 2024, Dr. Rob Winingham All Rights Reserved

30

## Alcohol and the Brain

- Antioxidants
- Excessive alcohol consumption over long periods can increase chance of dementia (and a particular type known as Korsakoff's Dementia)
- There is evidence that moderate consumption (1-2 drinks, some days of the week) is associated with lower levels of dementia than non-drinkers, but some studies included people who drank heavily and then stopped as non-drinkers...
- Other lifestyle correlates?

© 2024, Dr. Rob Winingham All Rights Reserved

31

## Nutrition

- *Food for thought: An apple a day keeps the doctor away (and maybe dementia too)*
- Over 20% of the calories you consume go to fueling your ~3 pound brain!

© 2024, Dr. Rob Winingham All Rights Reserved

32



## Bad Fat: Good Fat Ratios

- The average person in North America has a bad fat (omega 6 and 9) to good fat (omega 3) ratio of approximately 10:1, and nutrition experts recommend having a 4:1 ratio.
- This is problematic because fatty lipids are absolutely necessary for proper functioning of our cells, particularly our neurons.
- Moreover, our bodies may not be able to efficiently utilize as much of the good fat it consumes if there are also high levels of bad fat in our diet.

© 2024, Dr. Rob Winningham All Rights Reserved

33

## Research

- Research has found a positive correlation between Omega-3 fatty acids levels (e.g., DHA) and cognitive functioning in older adults.
- Individuals with dementia often have lower levels of DHA than non-demented controls.
- The more fish people eat, the less likely they are to show signs of Alzheimer's Disease.

© 2024, Dr. Rob Winningham All Rights Reserved

34

## Fish Oil Tablets

- 1200 mg
  - ~280mg of DHA
  - ~280mg of EPA
- Don't take more than one capsule unless recommended by your medical provider
- Avoid taking with with blood thinners
- Refrigerate fish oil tablets

© 2024, Dr. Rob Winningham All Rights Reserved

35

## What if you don't like seafood?

- We can get DHA, the type of Omega 3 fatty acid found in fish, in marine algae. It is often sold as a vegan omega-3 supplement.

© 2024, Dr. Rob Winningham All Rights Reserved

36

## A Large Study Measuring Fish Consumption and Dementia

Albanese et al., studied 15,000 people in Latin America and Asia found that those who ate fish nearly every day were 20% less likely to get dementia as compared to those who ate it only a few times a week. Those that ate fish a few times per week were 20% less likely to get dementia than those who rarely ate fish.

© 2024, Dr. Rob Winningham All Rights Reserved

37

## Can Omega-3 supplements improve cognition in older adults?

- The results have been mixed on some other populations but when researchers added omega 3 supplements for several years, it was associated with improved executive functioning, if the participants had low omega 3 levels before the study, relative to a control group.

© 2024, Dr. Rob Winningham All Rights Reserved

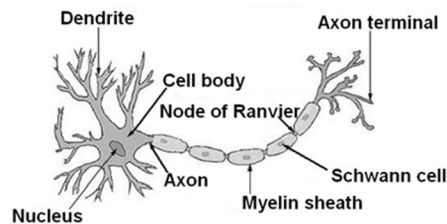
38

# Myelination

- It may be that myelination of the axon is affected by our dietary intake of fat.

- Processing speed
- Demyelination with aging, Multiple Sclerosis
- Myelination during development

Structure of a Typical Neuron



Public domain image from:  
<https://commons.wikimedia.org/wiki/Neuron#/media/File:Neuron.jpg>

© 2024, Dr. Rob Winningham All Rights Reserved

39

# Diabetes and Cognition

- Diabetes leads to much faster cognitive decline and dramatically increased risk of developing dementia.
- Even pre-diabetes or insulin resistance has been shown to impair attention and concentration, which can affect many aspects of cognition and function.
- Clearly, physical exercise plays a key role in preventing and controlling diabetes and its effects.

© 2024, Dr. Rob Winningham All Rights Reserved

40

## Diabetes and Cognition

- Older adults with type 2 diabetes who experience cognitive deficits have a much harder time managing their diabetes.
- Cognitive assessment of older adults with diabetes is important.
- Treatment of diabetes with metformin has been shown to slow cognitive decline and decrease the chance of developing dementia.

© 2024, Dr. Rob Winningham All Rights Reserved

41

## Summary

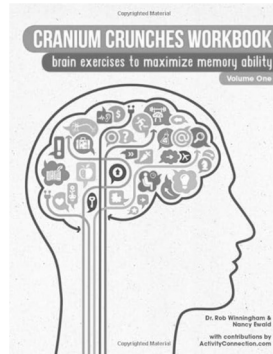
- Participation in cognitively stimulating activities is associated with decreased likelihood of developing dementia.
- Cognitively stimulating activities may delay the need for more intensive care.
- Proper food, exercise and social engagement are all good for your brain and memory.

© 2024, Dr. Rob Winningham All Rights Reserved

42

## Contact Information

- Email:  
[rob.Winningham@gmail.com](mailto:rob.Winningham@gmail.com)



© 2024, Dr. Rob Winningham All  
Rights Reserved