Brain Health and Dementia Prevention with the Cogtrastim Model

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Age-Friendly Healthcare in a COVID-19 World
September 25, 2020
Dementia prevention via brain health

Overview

• Why brain health?
• Is it possible to prevent dementia?
• The evidence on risk factors
• Interventions
• Cogtrastim model for patient brain health program planning
Treatments

Dev Mehta,¹ Robert Jackson,² Gaurav Paul,³ Jiong Shi,² and Marwan Sabbagh²
Another promising Alzheimer's drug trial ends in failure: 'This one hurts'

By Sandee LaMotte, CNN
Amyloid-β

Changes in processing this protein are key in the pathology of Alzheimer’s disease and related to cognitive function in persons without a clinical diagnosis of dementia.
More Alzheimer's drug trial failures: are researchers on the wrong track?

by Dennis Thompson, Healthday Reporter

(HealthDay)—Amyloid beta has long been a prime suspect in Alzheimer’s disease, since abnormal levels of the protein form disruptive plaques between patients' brain cells.
After amyloid failures, it’s time to take a new tack for treating Alzheimer’s

By RAYMOND J. TESI / APRIL 30, 2019
Prevention

Preventing Cognitive Decline and Dementia: A Way Forward

Committee on Preventing Dementia and Cognitive Impairment
Alan I. Leshner, Story Landis, Clare Stroud, and Autumn Downey, Editors
Board on Health Sciences Policy
Health and Medicine Division

National Academy of Sciences, June, 2017

Also see: Interventions to prevent age-related cognitive decline, mild cognitive impairment, and clinical Alzheimer-type dementia. Agency for Health Research and Quality, Comparative Effectiveness Report Number 188, March 2017.
Prevention

Nearly Half of Dementia Cases Could Be Prevented or Delayed

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Dementia prevention, intervention, and care: 2020 report of the Lancet Commission

Gill Livingston, Jonathan Huntley, Andrew Sommerlad, David Ames, Clive Ballard, Sube Banerjee, Carol Brayne, Alistair Burns, Jiska Cohen-Mansfield, Claudia Cooper, Sergi G Costaferda, Arnit Dias, Nick Fox, Laura N Gitlin, Robert Howard, Helen C Kales, Mika Kivimäki, Eric B Larson, Adesola Oggunniyi, Vasiliki Orgeta, Karen Ritchie, Kenneth Rockwood, Elizabeth L Sampson, Quincy Samus, Lon S Schneider, Geir Selbæk, Linda Teri, Naheed Mukadam

Executive summary
The number of older people, including those living with dementia, is rising, as younger age mortality declines. However, the age-specific incidence of dementia has fallen in many countries, probably because of improvements in education, nutrition, health care, and lifestyle changes. against dementia. Using hearing aids appears to reduce the excess risk from hearing loss. Sustained exercise in midlife, and possibly later life, protects from dementia, perhaps through decreasing obesity, diabetes, and cardiovascular risk. Depression might be a risk for dementia, but in later life dementia might cause

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Division of Psychiatry
(Prof G Livingston MD, J Huntley PhD, A Sommerlad PhD)
Prevention

Modifying 12 risk factors might prevent or delay up to 40% of dementias:

- Prevent/treat diabetes
- Treat hypertension
- Prevent head injury
- Stop smoking
- Reduce air pollution
- Reduce midlife obesity
- Exercise
- Reduce occurrence of depression
- Avoid excessive alcohol
- Treat hearing impairment
- Social interaction
- Attain high level of education
Potential cost savings

Preventing dementia via brain health

Prevention

“Brain maintenance” is the primary factor in successful cognitive aging.

Genes and lifestyle are key.

Interventions can promote brain structure and function with increasing age.

What interventions?
Exercise
Meta-analysis of effects

Exercise training increases size of hippocampus and improves memory


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Exercise

Diet
Mediterranean diet

- The Mediterranean diet emphasizes olive oil, fish, cheese and yogurt, as well as fresh fruits and vegetables
- Beans, legumes, and nuts are important
- Whole grain breads and pastas
Mediterranean diet

**Effects**

“Among older adults, [Mediterranean diet] adherence was associated with less brain atrophy, with an effect similar to 5 years of aging.”


“Closer adherence to the traditional MD is highly likely to protect against cognitive decline …”


“The results reinforce the notion that Mediterranean diet components might counteract age-related cognitive decline.”

Sleep
Sleep

Effects

Poor sleep linked to increased dementia risk

Slow wave sleep disruption increases cerebrospinal fluid amyloid-β levels.
Brain. 2017 Aug; 140(8): 2104–2111

Slow wave sleep is a promising intervention target for Alzheimer’s Disease
Brain fluid flow switches direction in deep sleep

Fultz et al. show that retrograde brain fluid waves follow the fluctuations in neural activity and brain blood volume in slow-wave sleep (SWS).

1. The choroid plexus of the lateral ventricle and the third and fourth ventricles filter blood plasma to produce cerebrospinal fluid (CSF).

2. CSF circulates around the brain and exits through arachnoid granulations into venous blood vessels.

3. Small volumes of CSF enter the paravascular space around penetrating arterioles, where it mixes with interstitial fluid during SWS.

4. Fultz et al. found that retrograde CSF flow waves in the fourth ventricle during SWS are coupled to slow-wave neural activity and a slow oscillation in brain blood flow.

Søren Grubb, and Martin Lauritzen Science 2019;366:572-573
Neuroinflammation
Depression and Risk for Alzheimer Disease

**Conclusions:** A history of depression may confer an increased risk for later developing AD. This relation may reflect an independent risk factor for the disease.

*Arch Gen Psychiatry. 2006;63:530-538*
Neuroinflammation

Cognitive aging and what we can do about it.

Causes

• Stress
• Increasing age
• Inactivity
• Poor sleep
• Adiposity (fat)
• Infections
An antidepressant affects amyloid-β

Interventions

Escitalopram decreases amyloid-β

Neurology. First published September 10, 2020, DOI: https://doi.org/10.1212/WNL.0000000000010725

Life moves pretty fast. If you don’t stop and look around once in awhile, you could miss it.

--Ferris Bueller
Risk of developing mild cognitive impairment

Mentally Stimulating Activities

- Reading books
- Crafts
- Social activities
- Games
- Using a computer

Risk of developing mild cognitive impairment

Number of Mentally Stimulating Activities

Risk of developing mild cognitive impairment

Cognitive Training

Cognitive training

- Advanced Cognitive Training for Independent and Vital Elderly (ACTIVE) study
- Six sites
- 2,832 participants
- National Institute on Aging
- Four groups: (1) memory, (2) reasoning, (3) speed of processing, and (4) control
- 10 sessions over 6 weeks
- Intervention for speed of processing
  - Useful Field of View
Speed of Processing