



Movement as Medicine for the Brain

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DIAGNOSTICS



THERAPEUTICS

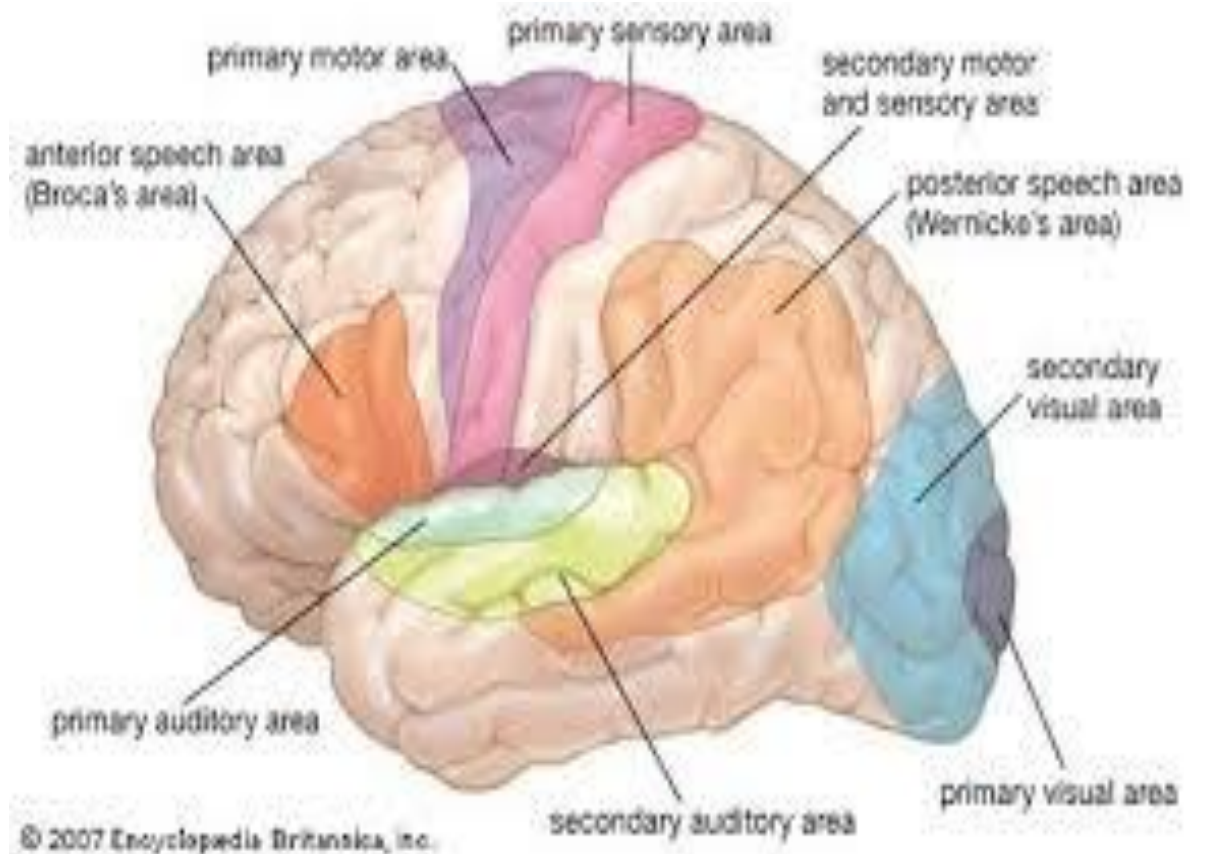


DIGITAL HEALTH

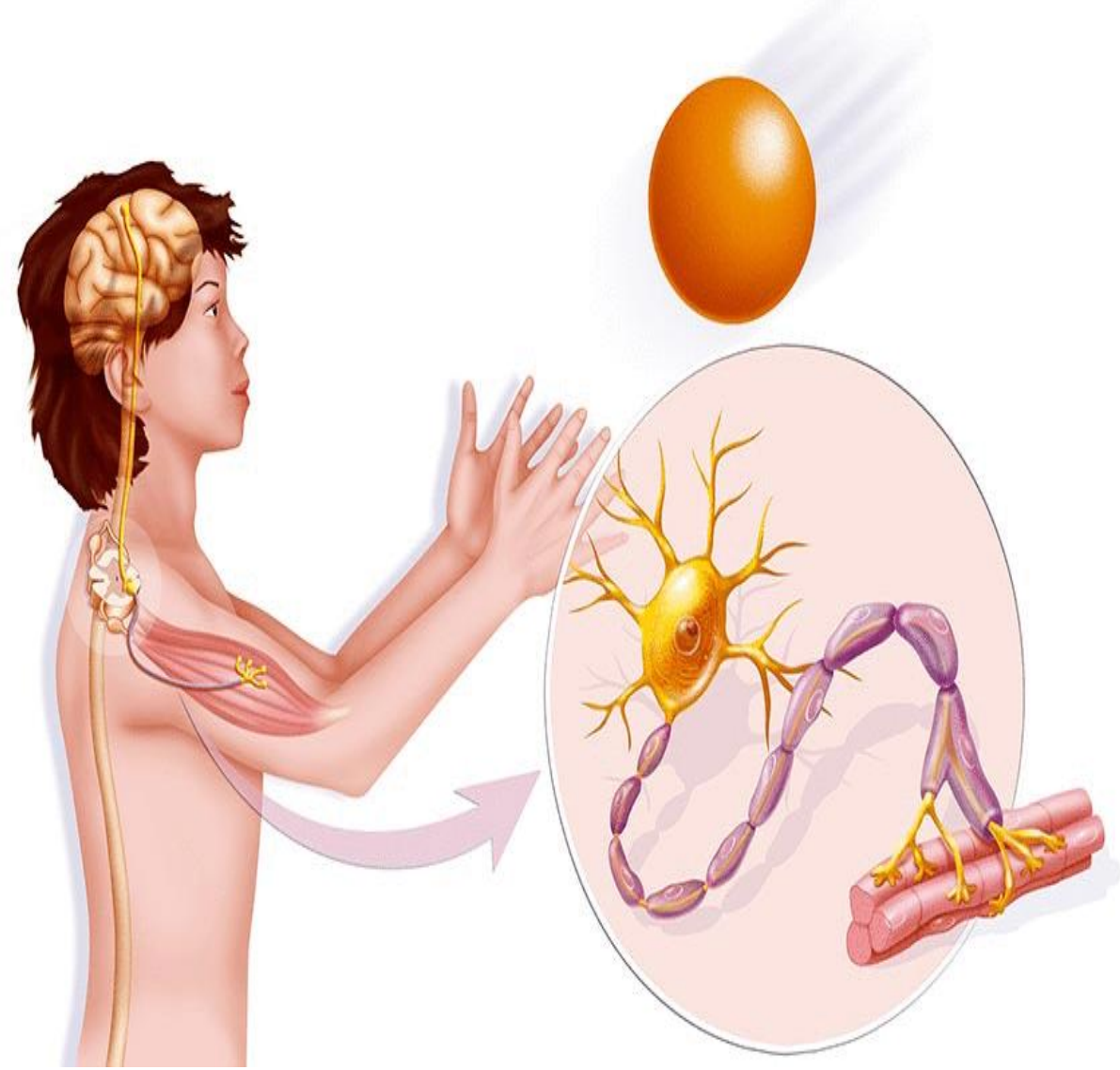
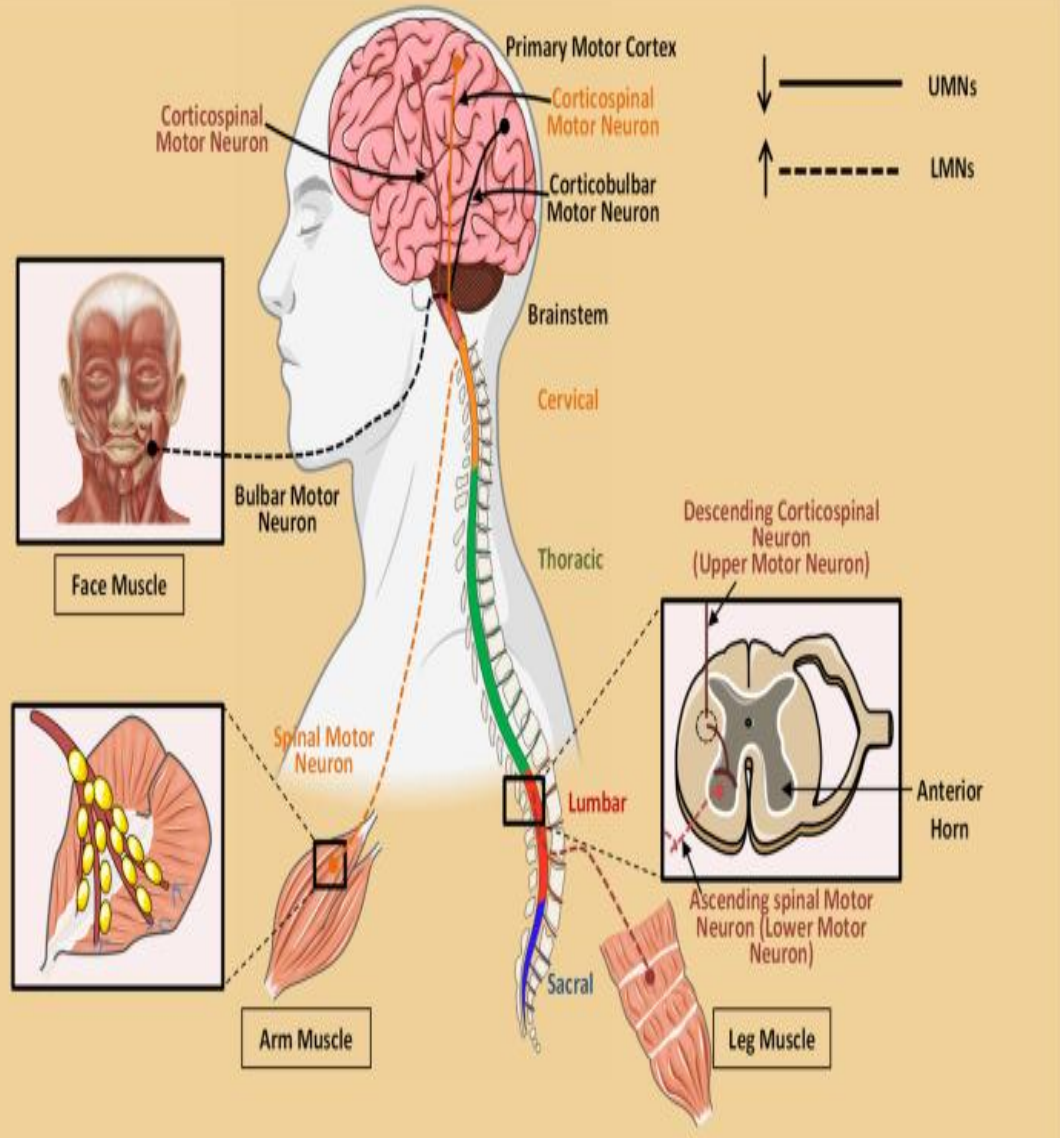
The Human Brain



- The most complex structure in the Universe
- Nourished by four main blood vessels...
- 1.4 kg in weight
- Several hundred billion neurons
- Trillions of nerve – nerve connections or synapses – pruned in infancy / childhood
- Constantly changing
- Determines each individual's experience, reality, and view of the world
- 7 billion + unique brains in the world....



Levels of the Nervous System



Important & Common Neurological Disorders



- Multiple sclerosis
- Epilepsy
- Migraine
- Parkinson's disease
- Traumatic brain injury and concussion
- Dementia
- Peripheral nerve disorders / injuries
- Disorders of muscle

Wellness



- **Wellness is the *active (intentional)* pursuit of activities, choices and lifestyles that lead to a state of holistic health.**

*The Global Wellness Institute**

** (a non-profit based in Florida - <https://globalwellnessinstitute.org>)*



Wellness is Multi-Dimensional



- **Physical:** Nourishing a healthy body through exercise, nutrition, sleep, etc.
- **Mental:** Engaging the world through learning, problem-solving, creativity, etc.
- **Emotional:** Being aware of, accepting and expressing our feelings, and understanding the feelings of others.
- **Spiritual:** Searching for meaning and higher purpose in human existence.
- **Social:** Connecting and engaging with others and our communities in meaningful ways.
- **Environmental:** Fostering positive interrelationships between planetary health and human actions, choices and wellbeing

Maintaining Wellness



Plus	Minus
<ul style="list-style-type: none">• Attitude• Intention• Attention• Exercise• Nutrition• Friendships• Social Connectiveness• Meditation and other Eastern practices• Nature• Rest• Novelty	<ul style="list-style-type: none">• Smoking• Illicit drugs• Excess alcohol• Undernutrition• Over-nutrition• Stress• Sleep deprivation• Loneliness• Social isolation

The Brain and Exercise



- Appropriate exercise beneficial for all, those with and without neurological disorders
- Good for the body, good for brain
- “Movement as medicine”
- “Sitting is the new smoking”
- Exercise as “active rest”

Physical Activity and Neuroplasticity



- Neuroplasticity refers to nervous system's ability to adapt structurally and functionally to environmental changes
 - Synaptic plasticity, neurogenesis, and the re-organisation of neural networks
- Physical activity promotes neuroplasticity, enhancing cognition function and neural health
- Increasing research in this area over recent years
- Interest in multimodal interventions in the elderly
- Exercise increases brain volume
- Aerobic exercise can increase hippocampal volume
- Exercise increases BDNF levels and expression, and cerebral blood flow

Types of Exercise



- Aerobic, anaerobic
- Cardio, resistance, combined

- Walking, running
- Swimming
- Cycling
- Tennis
- Gym
- Team sports
- Dancing
- Tai-Chi

- How often should you exercise?



Review



OPEN ACCESS

Physical activity as a protective factor for dementia and Alzheimer's disease: systematic review, meta-analysis and quality assessment of cohort and case-control studies

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Eero Vuoksima ¹ Katja Waller ³

ABSTRACT

Objective Physical activity (PA) is associated with a decreased incidence of dementia, but much of the evidence comes from short follow-ups prone to reverse causation. This meta-analysis investigates the effect of study length on the association.

Design A systematic review and meta-analysis. Pooled effect sizes, dose-response analysis and funnel plots were used to synthesise the results.

Data sources CINAHL (last search 19 October 2021), PsycInfo, Scopus, PubMed, Web of Science (21 October 2021) and SPORTDiscus (26 October 2021).

Eligibility criteria Studies of adults with a prospective

for about 40% of old-age dementias.³ Several pathways through which physical activity (PA) may prevent dementias have been proposed: decreased production of β -amyloid, increased removal of β -amyloid, improved brain vasculature and blood flow, and antioxidative and inflammatory processes in the brain,⁴ as well as indirect pathways through improvements in sleep, mood and other cardiovascular risk factors.

Meta-analyses indicate an association between PA and decreased risk of all-cause dementia,⁵⁻⁷ including in a dose-response manner.⁸ However, many previous meta-analyses lack rigorous quality

Meta-analysis of 58 studies

Physical activity was associated with lower incidence of all-cause dementia and Alzheimer's disease, even at longer follow-up, supporting physical activity as a modifiable protective lifestyle factor.

RR 0.8 (CI 0.77 – 0.84)

Br J Sports Med, June 2022

► Additional supplemental material is published online only. To view, please visit the journal online (<http://dx.doi.org/10.1136/bjsports-2021-104981>).

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Additional Benefits of Exercise



- Exercising outdoors in nature may confer additional brain and mental health benefits
 - “forest bathing”
- Exercise can improve balance and reduce risk of frailty and falls as we age
- The social and “connectedness” aspect of some forms of exercise may also provide protective cognitive benefits

The Default (Mode) Network



- The default mode network (DMN) is a set of brain regions that becomes active when a person is not focused on the outside world, allowing for internally directed thought like daydreaming, self-reflection, and memory recall.
- It is suppressed during tasks requiring external focus and is active during periods of "rest" or quiet wakefulness.
- The DMN is believed to be crucial for processes like remembering the past, imagining the future, and social cognition.

“The Brain at Rest”

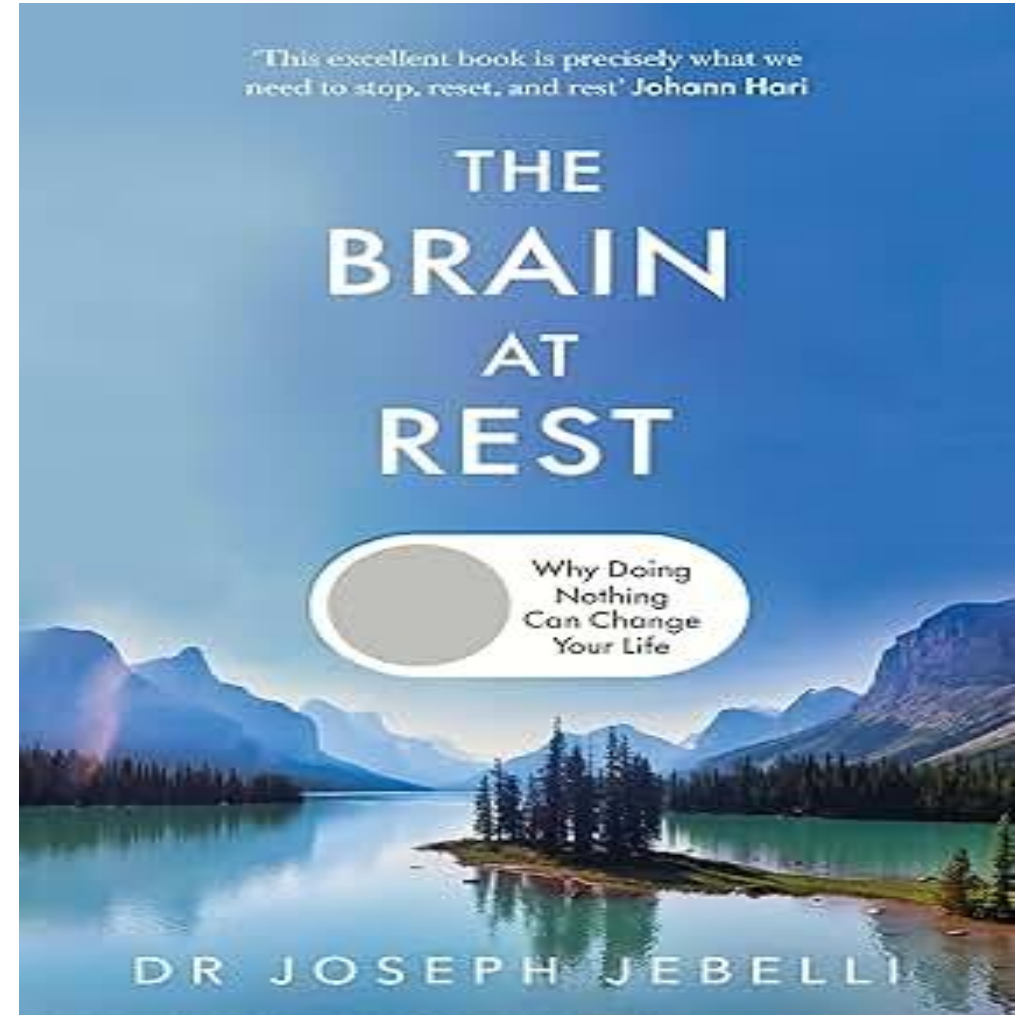


Rest

Mind-wandering

Active Rest (exercise)

Play



12 Modifiable Risk Factors and Dementia Risk



- Hypertension
- Obesity
- Smoking
- Diabetes
- Excessive alcohol use
- Low education

- ***Physical inactivity***
- Depression
- Low social contact
- Hearing loss
- Traumatic brain injury
- Air pollution

Lisko I et al, JIM, 2021

Some Practical Tips



- Do what is feasible in your unique situation
- Seek advice from your GP and neurologist
- Build in to your weekly schedule
- Mix it up
- Once a week won't do it
- But don't overdo either – pace oneself
- Rest, sleep, nutrition, hydration, mental health
- May need to avoid direct contact sport where there is an increased risk of (repetitive) head injury