

“Exerkines”, Motion, and Mental Might: A Review of how Exercise Powers the Brain

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BACKGROUND / OBJECTIVES

- On average, people in Western countries today live significantly longer than their parents and grandparents. (Ref. 1-3)
- Extensive research demonstrates that regular physical activity significantly improves cardiovascular and metabolic health. (Ref. 4)
- Exercise is also the most effective intervention currently known to enhance cognitive function and reduce the risk and impact of dementia. (Ref. 9,15,16)
- Exerkines” are a broad class of molecules released into circulation by muscles in response to exercise and include: (Ref. 7,11,12,14)
 - myokines, peptides, metabolites, and certain circulating microRNAs whose expression is altered by exercise
- This review aims to present evidence from pre-clinical studies, meta-analyses, and randomized controlled trials to support the hypothesis that exercise—and exercise-induced exerkines—have beneficial impacts on cognition and brain health and reduce risk of dementia.

RESULTS

Molecular Mechanisms: Exerkines

- Exercise stimulates the release of “exerkines” including myokines (e.g., irisin, cathepsin B, clusterin), metabolites (e.g., lactate), and circulating microRNAs whose expression is altered by exercise.(Ref. 7,11,12,14)
- Some exerkines enter the brain and upregulate the neurotrophic factor called brain-derived neurotrophic factor (BDNF), which can promote hippocampal neurogenesis and the growth and maturation of new functional neurons from stem cells. (Ref. 13)
- Exercise reduces neuroinflammation and modulates epigenetic regulation via microRNAs.(Ref. 14)

Exercise and Brain Structure

- Both aerobic and resistance training have been dose-dependently associated with positive structural changes in the brain, such as increased hippocampal volume. (Ref. 8,10)

Cognitive Function and Dementia Risk

- Regular exercise improves cognitive functioning and is linked to reduced dementia risk.
- A meta-analysis of data from studies with 160,000 participants found that regular exercisers had a 45% lower risk of developing dementia compared to non-exercisers.(Ref. 9,15,16)

Clinical Evidence

- The EXERT trial demonstrated that moderate-intensity aerobic exercise stabilized cognition over 12 months in individuals with mild cognitive impairment (Ref.17)
- Comparative analysis with matched Alzheimer’s Disease Neuroimaging Initiative 1 (ADNI-1) controls confirmed protection from cognitive decline.(Ref.18)

CONCLUSIONS

- Exercise dose-dependently triggers the release of exerkines, which support brain health by mechanisms including the upregulation of neurotrophic factors and downstream promotion of neurogenesis as well as the reduction of neuroinflammation. (Ref. 6-8,11-14)
- Regular physical activity preserves cognitive function and significantly reduces the risk of dementia, as demonstrated by large-scale meta-analyses and clinical trials. (Ref. 9-12,15-18)
- Exercise is a potent, accessible, and non-pharmacological intervention for maintaining brain health and reducing dementia risk across the lifespan. (Ref. 4,6,9,15,17)

References

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