

Supplementary Methods

Statistical Estimation of Relative Risk for Dementia Across Physical Activity Levels

To estimate the relative risk (RR) of dementia for individuals engaging in any physical activity, reported as MET-minutes/week, compared to individuals engaging in zero MET-min/week, we derived a composite RR using data from a previously published meta-analysis.¹ Using the PlotDigitizer web application (<https://plotdigitizer.com/app>), we extracted the RR for each point of interest. Considering 2 hours per week of vigorous physical activity (7.5 METs according to the 2024 Adult Compendium of Physical Activities²):

1. RR of dementia for 900 vs 203.64 MET-min/week (reference value in the meta-analysis) = 0.78 (95% CI: 0.73, 0.85)
2. RR of dementia for zero vs 203.64 MET-min/week = 1.10 (95% CI: 1.07–1.14)

Because both comparisons share a common referent group (203.64 MET-min/week), we calculated the RR for 916.36 vs zero MET-min/week by taking the ratio of the two RRs:

$$RR_{900 \text{ vs } 0} = \frac{RR_{900 \text{ vs } 203.64}}{RR_{0 \text{ vs } 203.64}} = 0.72$$

To estimate the 95%CI for this derived RR, we employed the logarithmic method, which assumes that the natural logarithm of the RR follows an approximately normal distribution. First, we calculated the standard errors (SE) of the log-transformed RRs based on the provided CIs:

$$SE_{900} = \frac{\ln(0.85) - \ln(0.78)}{2 * 1.96} \quad SE_0 = \frac{\ln(1.14) - \ln(1.10)}{2 * 1.96}$$

We then computed the standard error for the log of the derived RR by summing the variances (squared SEs), assuming independence of the two estimates:

$$SE = \sqrt{SE_{900}^2 + SE_0^2}$$

The log-transformed RR and its 95%CI were then:

$$\log RR = \ln(RR_{900 \text{ vs } 203.64}) - \ln(RR_{0 \text{ vs } 203.64})$$

Back-transforming these limits to the RR scale:

$$\ln(CI) = \ln(RR) \pm (SE * 1.96)$$

References

1. Iso-Markku P, Kujala UM, Knittle K, Polet J, Vuoksima E, Waller K. 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. *Br J Sports Med*. 2022;56:701-9.
2. Brazil. Ipeadata [Internet]. [cited 2025 Aug 31 2025]. <http://www.ipeadata.gov.br/Default.aspx>