

Association of Daily Step Count and Multiple Sclerosis: An Accelerometer-Based Prospective Cohort Study

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Purpose: To date, no study has examined the dose–response association between daily step count and the incidence of Multiple Sclerosis (MS), and no specific step-based guidelines exist for MS prevention. This study aimed to investigate the association between accelerometer-derived daily step count and MS incidence in a large population-based cohort from the United Kingdom (UK).

Methods: We used data from the UK Biobank cohort, including participants aged 40–79 years at baseline (2013–2015) who agreed to wear a wrist-worn triaxial accelerometer (*Axivity AX3*) for seven days. Daily step counts were estimated using the Verisense step-count algorithm implemented via the GGIR R-package. Incident MS cases were ascertained based on primary care and hospital inpatient data, as well as self-reported data. Cox proportional hazards models, with age as the timescale, were used to examine the association between step count and MS risk, adjusting for potential confounders. Daily step counts were analysed as a continuous variable (per 1,000 steps/day), in categories (<7,000; 7,000–10,000; $\geq 10,000$), and using restricted cubic splines to assess potential non-linearity.

Results: Among 96,253 participants (mean age = 62.4 ± 7.8 years), 67 developed MS over a mean follow-up of 8.1 (± 1.0) years. Participants recorded an average of 10,937 ($\pm 3,427$) steps/day. A linear association was observed between daily steps and MS incidence (hazard ratio (HR) per 1,000 steps/day = 0.92; 95% confidence interval (CI) = 0.85, 0.99; $p = 0.029$). Participants in the highest category had a 62% lower incidence of MS compared to those in the lowest (HR = 0.38; 95% CI = 0.19, 0.74; $p = 0.004$). While the inclusion of splines did not statistically improve the model fit (p -non-linearity = 0.097), a plateau in the dose–response curve was observed around 12,000 steps/day when using three knots.

Conclusion: In this large prospective cohort study, higher daily step counts were associated with a reduced incidence of MS. The dose–response relationship also suggests that even a modest increase in daily activity (1,000 steps) may confer substantial benefits among individuals with less than 10,000 steps/day. These findings support the integration of step-based physical activity targets into public health strategies for MS prevention. Future guidelines may build upon this evidence to develop practical, step-oriented recommendations aimed at promoting neurological health.

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