# Device-measured physical activity and the risk of tendinopathy: a prospective UK Biobank cohort study

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INTRODUCTION: The role of physical activity in the development and course of tendinopathy remains controversial. Therefore, this study aims to investigate the association between daily physical activity and the risk of tendinopathy.

METHODS: We conducted a 1-year landmark analysis using data from the prospective UK Biobank cohort (Application Number 185061). Eligible participants were adults who provided valid data from a wrist-worn accelerometer over a seven-day period between June 2013 and January 2016 and had no prior diagnosis of tendinopathy. The primary exposure, moderate-to-vigorous physical activity (MVPA, measured in minutes/week), was quantified using wrist accelerometry, along with the secondary exposure, light-intensity physical activity (LPA, hours/week) and total physical activity volume (total PA, mg/week). The primary outcome was the incidence of tendinopathy identified via the International Classification of Diseases, Ninth and Tenth (ICD-9/10) diagnostic codes. We calculated hazard ratios (HRs) with 95% confidence intervals (CIs) using multivariable Cox proportional hazards models, adjusting for confounders identified through a directed acyclic graph.

RESULTS SECTION: Among 90,035 participants (mean [SD] age 62.35 [7.7] years; 56.4% women; 92.3% Caucasian), 999 incident tendinopathy events occurred over a median follow-up of 7.96 years. Compared to the lowest quartile, the highest quartile of MVPA was associated with a significantly reduced risk (HR, 0.78; 95% CI, 0.64 to 0.96; P = 0.017), whereas the highest quartile of LPA (HR=1.31, 95% CI [1.03, 1.66], p=0.026) and median quartile of total PA (HR=1.35, 95% CI [1.12, 1.63], p=0.002) was associated with the upregulated risk, after adjusting for the minimal sufficient adjustment set. These findings for MVPA were consistent in different subgroups and sensitivity analyses (using primary care records and World Health Organization guideline categories [<150, 150–300, and >300 minutes/week]).

DISCUSSION: In this large prospective cohort, higher volumes of MVPA were associated with lower tendinopathy risk, whereas greater LPA was associated with higher risk. These intensity-specific patterns remained robust across sensitivity analyses, suggesting that the pattern of physical activity accumulation may be more consequential for tendon health than total volume alone. Limitations include: potential outcome misclassification due to reliance on ICD codes; use of a single, 7-day accelerometry assessment, which may not capture long-term behavioral changes or lower-limb specific loading; and limited generalizability beyond an older, predominantly Caucasian cohort. Nevertheless, our findings support an intensity-dependent relationship where MVPA exerts protective effects while prolonged LPA is associated with adverse outcomes. This highlights the importance of shifting time from LPA to MVPA and interrupting prolonged low-load activities as a potential preventative strategy.

SIGNIFICANCE/CLINICAL RELEVANCE: This study identifies modifiable, intensity-specific physical activity patterns associated with tendinopathy risk, providing actionable targets for counseling (increase MVPA; interrupt or limit prolonged LPA) and scalable monitoring via wearables. By addressing a common, disabling condition with a high public-health burden, these results have immediate relevance for preventive strategies in clinical care and workplace health programs.

ACKNOWLEDGEMENTS: We extend our heartfelt gratitude to the participants of the UK Biobank.

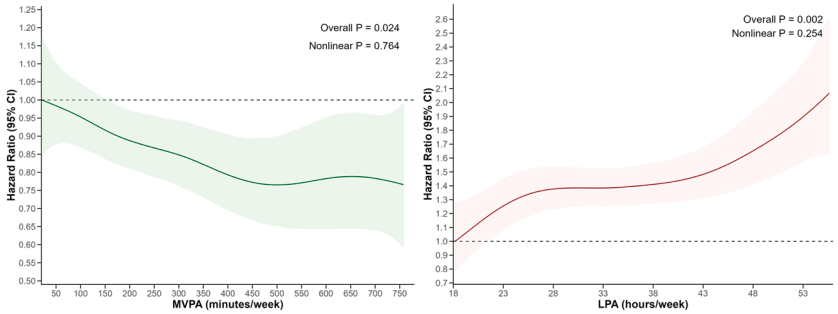


**Figure 1.** Associations between device-measured physical activity and risk of incident tendinopathy were tested using penalized cubic splines

**Table 1.** Primary analysis of device-measured physical activity (quartiles) and risk of incident tendinopathy.

| | HR | 95% CI | p-value |
|---|---|---|---|
| **MVPA (primary exposure)** | | | |
| Q1 (Lowest) | — | — | |
| Q2 | 0.92 | 0.77, 1.09 | 0.347 |
| Q3 | 0.89 | 0.74, 1.07 | 0.220 |
| Q4 (Highest) | **0.78** | **0.64, 0.96** | **0.017** |
| LPA | | | |
| Q1 (Lowest) | — | — | |
| Q2 | 1.11 | 0.92, 1.35 | 0.277 |
| Q3 | 1.15 | 0.93, 1.41 | 0.193 |
| Q4 (Highest) | **1.31** | **1.03, 1.66** | **0.026** |

HR = Hazard Ratio, CI = Confidence Interval. Model was adjusted for age at accelerometer assessment, sex, ethnicity, education, employment, BMI, low grip strength, alcohol intake, smoking, sedentary behavior, and health diet score