General

Association of Step Volume and Intensity With All-Cause Mortality in Older Women.


Summary:
A goal of 10,000 steps/day is commonly believed by the public to be necessary for health, but this number has limited scientific basis. Additionally, it is unknown whether greater stepping intensity is associated with health benefits, independent of steps taken per day.

Objective:
To examine associations of number of steps per day and stepping intensity with all-cause mortality.

Design, Setting, and Participants:
This prospective cohort study included 18289 women from the USA Women's Health Study, who agreed to participate by wearing an accelerometer during waking hours for seven days between 2011 and 2015. A total of 17708 women wore and returned their devices; data were downloaded successfully from 17466 devices. Of these women, 16741 were compliant wearers (≥10 h/d of wear on ≥4 days) and included in the analyses, which took place between 2018 and 2019.

Exposures:
Steps per day and several measures of stepping intensity (i.e., peak one-minute cadence; peak 30-minute cadence; maximum five-minute cadence; time spent at a stepping rate of ≥40 steps/min, reflecting purposeful steps).

Main Outcomes and Measures:
All-cause mortality.

Results:
Of the 16741 women who met inclusion criteria, the mean (SD) age was 72.0 (5.7) years. Mean step count was 5499 per day, with 51.4%, 45.5%, and 3.1% of time spent at 0, 1 to 39 (incidental steps), and 40 steps/min or greater (purposeful steps), respectively. During a mean follow-up of 4.3 years, 504 women died. Median steps per day across low-to-high quartiles of distribution were 2718, 4363, 5905, and 8442, respectively. The corresponding quartile hazard ratios (HRs) associated with mortality and adjusted for potential confounders were 1.00 (reference), 0.59 (95% CI, 0.47-0.75), 0.54 (95% CI, 0.41-0.72), and 0.42 (95% CI, 0.30-0.60), respectively (P < .01). In spline analysis, HRs were observed to decline progressively with higher mean steps per day until approximately 7500 steps/d, after which they levelled. For measures of stepping intensity, higher intensities were associated with significantly lower mortality rates; however, after adjusting for steps per day, all associations were attenuated, and most were no longer significant (highest vs lowest quartile for peak one-minute cadence, HR = 0.87 [95% CI, 0.68-1.11]; peak 30-minute cadence, HR = 0.86 [95% CI, 0.65-1.13]; maximum five-minute cadence, HR = 0.80 [95% CI, 0.62-1.05]; and time spent at a stepping rate of ≥40 steps/min, HR = 1.27 [95% CI, 0.96-1.68]; P > .05).

Conclusions and Relevance:
Among older women, as few as approximately 4400 steps/d was significantly related to lower mortality rates compared with approximately 2700 steps/d. With more steps per day, mortality rates progressively decreased before levelling at approximately 7500 steps/d. Stepping intensity was not clearly related to lower mortality rates after accounting for total steps per day.