

Osteoarthritis and Cartilage



The influence of long-term exposure and timing of physical activity on new joint pain and stiffness in mid-age women



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SUMMARY

Objective: To examine the influence of long-term exposure and timing of physical activity (PA) on new joint pain/stiffness in mid-age women.

Methods: Data were from 5105 participants (born 1946–51) in the Australian Longitudinal Study on Women's Health (ALSWH) who completed survey items on PA (1998, 2001 and 2004) and joint pain/stiffness (2007 and 2010). PA was categorized in five levels at each survey and summed into a cumulative PA score (CPA, range 0–12). Associations were analysed using logistic regression, with separate models for the cumulative model (using CPA), the sensitive periods model (i.e., PA measured at each survey in one regression model) and the critical periods model (i.e., separate regression models for PA at each survey).

Results: 951 (18.6%) participants reported new-onset joint pain/stiffness. In the cumulative model, CPA was associated joint pain/stiffness when included as a continuous variable (adjusted odds ratio [OR] = 0.97, 95% confidence interval [CI] = 0.95–0.99), but not when included as a categorical variable. In both the sensitive periods and critical periods models, low to high levels of PA in 2001 and 2004 had stronger inverse associations with joint pain/stiffness than PA levels in 1998. The model fit was better for the sensitive periods than the cumulative or critical periods models.

Conclusions: In mid-age women, PA between the ages 47 and 58 was associated with a lower risk of joint pain/stiffness 9 years later. Associations were stronger for PA in the last 6 years than for earlier PA.

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Introduction

Osteoarthritis (OA) is a highly prevalent and disabling chronic joint disease, which becomes more common with age, and more women than men are affected^{1,2}. The pathologically of clinical OA is characterised by focal areas of damage to the articular cartilage on load-bearing areas, associated with new bone formation at the joint margins (osteophytosis), changes in the subchondral bone, variable degrees of mild synovitis, and thickening of the joint capsule³. While clinical OA is a late-stage condition for which disease-modifying opportunities are limited, OA typically develops over

decades, offering a long window of time to potentially alter its course⁴. For this purpose, insight in pre-OA risk factors for the onset of joint symptoms (e.g., joint pain related to use and short-lasting inactivity stiffness of joints) is important.

Previous research has shown that mechanical overload, obesity and joint injury are important modifiable pre-OA risk factors³. Physical activity (PA) has been found to be associated with an increase in cartilage volume, and decrease in cartilage defects, and less joint space narrowing⁵. These findings suggest that PA is a potential target for interventions to prevent joint problems⁵. However, little is known about the volume and timing of PA that is required to prevent onset of joint symptoms.

The aim in this study was to examine the importance of timing and long-term exposure to PA for the onset of joint pain and stiffness during mid-age in women. Three models were compared: (1) the cumulative model assumes that the effect of PA is additive and that all time points are equally important; (2) the sensitive periods model assumes that the effect of PA is more important at certain

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time points than at other time points, and (3) the critical period assumes that the effect of PA is important at one time point only. To avoid reverse causation, PA at 1998, 2001 and 2004 was associated with new report of joint pain/stiffness in 2007 or 2010. In addition, the role of body mass index (BMI) in this association was examined and appropriate adjustment was made if required.

Method

Participants

Data were from the mid-age cohort (born 1946–1951) of the Australian Longitudinal Study on Women's Health (ALSWH); a prospective study of the health and well-being of three generations of women⁶. As reported elsewhere, samples were randomly drawn from the national Medicare health insurance database, which includes all Australian citizens and permanent residents, with intentional over-representation of women from rural and remote areas^{6,7}. More details about the study can be found at www.alswh.org.au. The study was approved by Ethics Committees of the Universities of Newcastle and Queensland, and informed consent was received from all participants. Baseline surveys were mailed in

1996, with the first follow-up in 1998 and then at three yearly intervals to 2010. Comparison of the baseline sample ($n = 13,715$, response rate 54%) with Australian census data indicated that the sample was representative of Australian women in this age group, but with a somewhat higher representation of partnered women and women with post-school education⁷. As the items for PA differed in the first survey, data from surveys 2 (1998) to 6 (2010) were used for this paper. The response rates for these surveys were 90.0%, 81.9%, 79.5%, 77.6% and 73.0%, respectively. The inclusion and exclusion criteria and reasons for drop-out are presented in Fig. 1.

Joint pain/stiffness

At each survey, participants were asked to indicate the frequency of experiencing joint pain and stiffness in the last 12 months. Response options were never, rarely, sometimes, and often. Onset of joint pain/stiffness was defined as reporting having joint pain/stiffness often at surveys 5 (2007) or 6 (2010). As described above, participants who reported having joint pain/stiffness often at earlier surveys were excluded from the analyses. Unfortunately, no details were available on which joint or the intensity of the pain/stiffness.

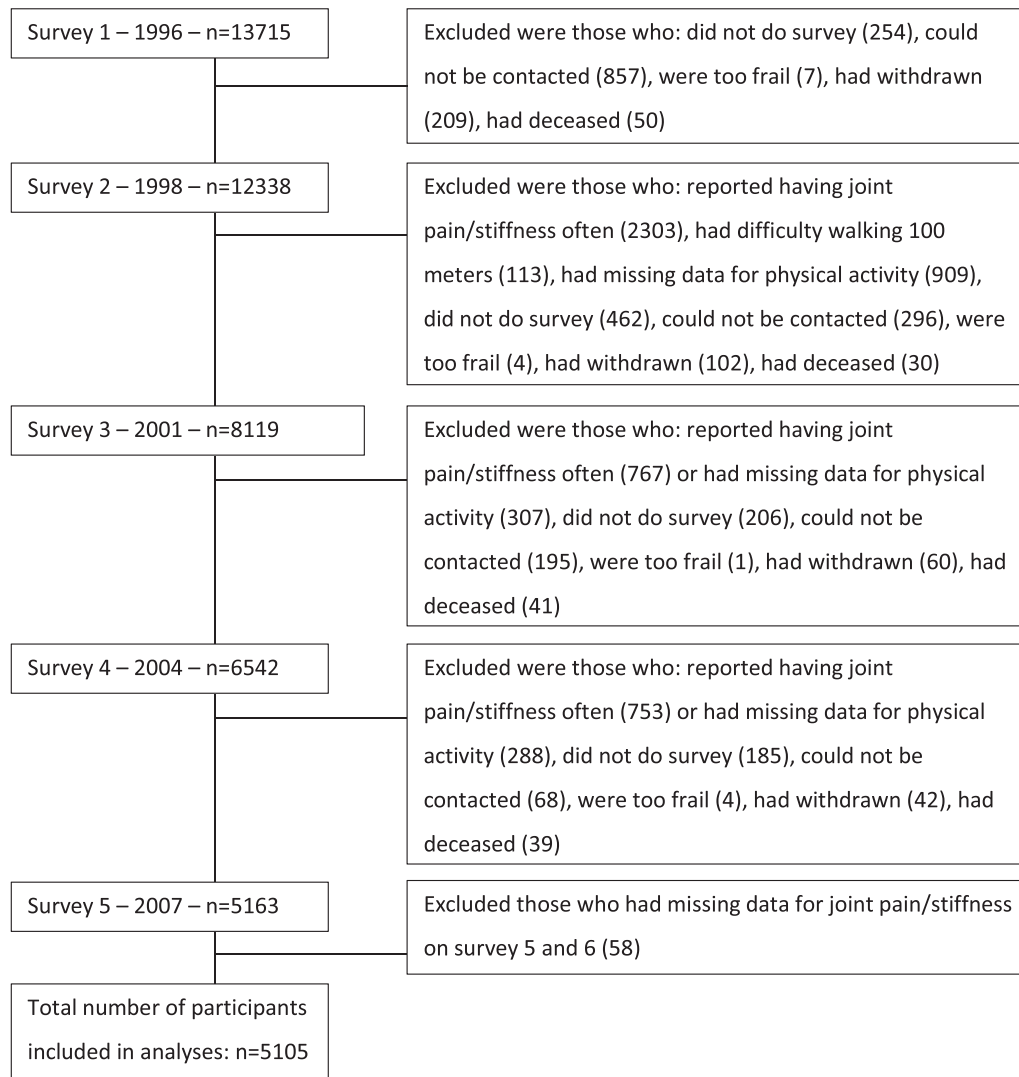


Fig. 1. Flow chart of participants in the ALSWH included in the current analyses. Participants were included if they returned survey 2 (1998) and excluded if they (1) reported limitations walking 100 m at survey 2; (2) reported joint pain/stiffness at surveys 2, 3 or 4; (3) had missing data for or PA at surveys 2, 3 or 4; and (4) had missing data for joint pain/stiffness at survey 5 or 6.

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