Changes in physical activity behavior and risk of falls over 8 years follow-up: English Longitudinal Study of Ageing

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To the Editor

Data suggests that population levels of physical activity (PA) are low.[1] High levels of PA across the life span and in later life have been shown to be associated with greater life expectancy.[2-4] A contributing component to greater life expectancy in the physically active may be owing to a reduction in falls.

Falls are the major cause of injury-related fatalities in the elderly population.[5] Structured strength and balance training programmes have been widely used in the falls prevention field,[6] although the role of free-living PA has had limited attention.[7,8] Exercise training studies are often limited by short-term follow up (e.g., 6 – 18 months), thus we know little about the effects of long-term free-living PA adherence on risk of falls. There are presently no data examining associations between long-term changes in free-living PA and risk of falls, which was the aim of our study.

The English Longitudinal Study of Ageing (ELSA)[9] conducted interviews at baseline (wave 1; 2002-03) in 11,391 individuals (5186 men, 6205 women); Participants were re-assessed every 2 years thereafter. Participants gave full informed written consent to participate in the study and ethical approval was obtained from the London Multi-centre Research Ethics Committee. Self-reported PA, previously validated,[10] included questions on the frequency of participation in vigorous, moderate, and light physical activities. At follow-up (8 years later at wave 5; 2010-11) participants were asked "if they had fallen down in the past 12 months", and if so "whether injured seriously enough (from the fall) to need medical treatment." The outcome was categorised into three groups, comprising "no fall", "non-serious fall", "fall requiring medical treatment (injurious fall)". Multinomial logistic regression was employed to examine the association between PA and falls risk at follow-up.

Covariates included age, sex, cigarette smoking, alcohol intake, body mass index, depressive symptoms, activity limiting illness, and wealth. All analyses were conducted using SPSS version 22.

At baseline 9,720 participants had complete data although loss to follow-up (n=1,848 died; n=3,186 missing data at follow up) resulted in a final analytic sample of n=4,686 (age 63.2± 8.3 yrs; 44.1% men). At 8 yr follow-up 8.2% of the sample reported an injurious fall that required medical treatment. Participants reporting falls were older, less likely to be male, physically inactive, report activity limiting illnesses, obese, and less affluent (Table e1). In multivariate models there was no association between PA and risk of a non-injurious fall (Table e2). Participation in moderate PA at baseline was related to lower risk of an injurious fall in comparison to vigorous PA (Table e2). Over a 4-year follow-up period (from wave 1 to 3) the majority of participants had not changed their original activity status from the initial baseline examination (Table e3 provides a comparison of baseline characteristics). In participants that were inactive at baseline but active at 4 year follow-up (n=403) there was no greater risk of any type of fall at 8 year follow-up (Table). Participants that had remained physically inactive throughout (n=401) were at higher risk of an injurious fall (OR=1.49; 95% CI 1.04, 2.13) compared with participants that had remained active.

Our data demonstrate persistent PA over 4 years was related to lower risk of falls compared to inactivity; inactive participants that became physically active were not at any greater risk of falls. The strength of this study is the large representative sample of older adults, repeated measures of PA, and the longitudinal study design. However, the falls ascertainment was collected by retrospective recall over the past 12 months that may have

introduced recall bias. In conclusion, once inactive older adults' balance and lower limb function has improved and falls risk reduced, increasing habitual PA may reduce risk for subsequent falls.

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Table. Multinomial logistic regression on longitudinal association between 4 year change in physical activity (wave 1 to 3) and falls risk (at wave 5) (n=4,686)

Physical activity change over 4 years	Cases/N	*Non-Injurious fall*	
		Model 1[a] OR (95 % CI)	Model 2[b] OR (95% CI)
Remain active†	675/3349	1.0 (Ref)	1.0 (Ref)
Became active	84/403	1.04 (0.81, 1.35)	0.93 (0.71, 1.21)
Became inactive	125/533	1.18 (0.94, 1.48)	1.04 (0.82, 1.31)
Remain inactive	110/401	1.56 (1.22, 1.99)	1.18 (0.90, 1.54)
		Injurious Fall	
	Cases/N	Model 1 OR (95 % CI)	Model 2 OR (95% CI)
Remain active	232/3349	1.0 (Ref)	1.0 (Ref)
Became active	38/403	1.27 (0.88, 1.84)	1.11 (0.76, 1.52)
Became inactive	53/533	1.26 (0.91, 1.74)	1.10 (0.79, 1.55)
Remain inactive	58/401	1.94 (1.39, 2.70)	1.49 (1.04, 2.13)

†Remain active defined as maintaining at least moderate activity once a week over 4 years

Odds ratios (OR) are relative to no fall. CI= confidence interval; n= number

a Model 1 adjusted for age and sex

b Model 2 adjusted for age, sex, smoking (current, previous or non-smoker), alcohol (daily, at least weekly, rarely, never), depressive symptoms (a score >3 on the 8-item Centre of Epidemiological Studies Depression scale), activity limiting illness, body mass index, wealth (calculated as net of debt including total value of participant's home (excluding mortgage), financial assets, business assets, and physical wealth).