WHICH OLDER WOMEN COULD BENEFIT FROM INTERVENTIONS TO DECREASE SITTING TIME AND INCREASE PHYSICAL ACTIVITY?

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To the Editor: There is increasing evidence that lack of physical activity (PA) and long sitting time are independently associated with poor health.[1,2] Thus, regardless of the health benefits of participation in PA, prolonged sitting is associated with health risks such as metabolic and cardiovascular disease and mortality.[1,2] Reducing sitting time therefore offers a novel intervention opportunity, along with increasing PA, particularly for older people for whom PA may be difficult. To identify older population subgroups that may benefit from interventions to decrease sitting time and increase PA, a study was recently conducted to identify demographic, social, and health-related factors associated with an undesirable pattern of high sitting time and low PA levels in a large cohort of older community-dwelling women. Data were from 6,116 women born between 1921 and 1926 who participated in the Australian Longitudinal Study on Women's Health (www.alswh.org.au).[3] The Ethics Committees of The University of Queensland and the University of Newcastle approved the study. Data were collected in a mail survey in 2002, when the women were aged 76 to 81. Women who were chair-bound, bedridden, or underweight were excluded.

PA was measured using adapted Active Australia survey questions, which assess time spent in the previous week walking briskly and in moderate (MPA) and vigorous (VPA) leisure-time PA. A PA score was calculated by weighting time in each activity by its metabolic equivalent (MET) to account for its respective intensity: (walking * 3.0 METs) + (MPA * 4.0 METs) + (VPA * 7.5 METs). Women also reported the number of hours per weekday and weekend day they typically spent sitting while performing activities such as visiting friends, driving, reading, watching television, and working at a desk or computer. Details about the PA and sitting variables have been reported elsewhere.[4,5] The association between sitting and PA was calculated using Pearson correlations. The associations between possible explanatory factors and sitting and PA separately were initially examined in univariate linear regression models.

Variables found to be significantly associated with at least one outcome were included in multivariable models for weekday sitting, weekend day sitting, and PA. Variables and categories are shown in Table 1. Analyses were done in Stata (Release 10.1; Stata Corp., College Station, TX), with statistical significance at $P \leq .05$. The correlation between sitting time (h/d) and PA (MET.minutes/week) was -0.02 for weekday sitting and -0.03 for weekend day sitting, confirming that PA and sitting are unrelated.

Differences were found in the demographic, social, and health-related factors associated with sitting and PA (Table 1). Some factors were associated with more sitting and less PA (body mass index, chronic conditions, anxiety and depression, caring duties, volunteering (weekday sitting only)); some were associated with more sitting and more PA (being from an English-speaking country other than Australia, more social interaction); some were associated only with more sitting (experiencing dizziness or loss of balance, being single, living in an urban area, having post high school education (weekday sitting only)); and others were associated only with less PA (experiencing stiff or painful joints, experiencing foot problems).

Of the five factors associated with high sitting time and low PA levels, three were health-related (obesity, having ≥ 3 chronic conditions, having more symptoms of anxiety and depression). For example, each additional point on the anxiety and depression scale was associated with an additional 2 minutes of sitting per day and with 21 MET minutes less PA per week (equivalent to 7 minutes of walking). This study expands on previous work showing associations between poor physical and mental health and low PA levels in older people 6–8 by demonstrating that some physical and mental health problems are also associated with high sitting time.

The other two factors associated with high sitting time and low PA were social factors; women without caring duties and women not doing volunteer work sat more and performed less PA than women involved in these activities. In contrast, previous research has identified caring duties as a barrier to PA participation.[9] An explanation could be that the significant caring variable in the current study included caring for grandchildren, which could increase PA by engaging in active play, and for frail older adults.

The results suggest that older women with a high health risk profile (obesity, having ≥ 3 chronic conditions, having more symptoms of anxiety/depression) and social risk profile (no volunteer or caring duties) may particularly benefit from interventions to reduce sitting time and increase PA. In addition, for women who find it difficult to engage in PA, interventions could focus on the substitution of light activities for sitting, which has been associated with better physical health.[10]

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analysis plan. YvG: Conducted the analyses. All authors participated in the interpretation of the data. JvU: Drafted the letter, and all authors were involved in critically revising the letter for important intellectual content. All authors read and approved the final letter. Sponsor's Role: The funding sources had no involvement in the research presented in this paper.

Table 1: Factors Associated with Weekday and Weekend Day Sitting Time and Weekly Physical Activity (Multivariable models, n=6,116)

	Weekday sitting (hrs/day)			**Weekend day sitting (hrs/day)**			**Physical Activity (MET.minutes/week)***		
	Mean	95% CI	*p*	Mean	95% CI	*p*	Mean	95% CI	*p*
Factors associated with more sitting and less PA (compared to reference category)									
BMI									
normal weight	4.8	(4.7 - 4.8)	-	5.1	(5.1 - 5.2)	-	773	(733 - 813)	-
overweight	**5.0**	**(4.9 - 5.1)**	***0.00***	**5.4**	**(5.3 - 5.5)**	***0.00***	712	(661 - 762)	*0.06*
obese	**5.4**	**(5.2 - 5.5)**	***0.00***	**6.0**	**(5.8 - 6.1)**	***0.00***	**542**	**(477 - 606)**	***0.00***
Chronic conditions[§]									
none	4.7	(4.6 - 4.9)	-	5.2	(5.0 - 5.3)	-	860	(781 - 939)	-
1	**5.0**	**(4.9 - 5.1)**	***0.01***	**5.4**	**(5.3 - 5.5)**	***0.04***	780	(728 - 831)	*0.09*
2	4.9	(4.8 - 5.0)	*0.10*	5.3	(5.2 - 5.4)	*0.22*	**681**	**(626 - 736)**	***0.00***
≥3+	**5.1**	**(5.0 - 5.3)**	***0.00***	**5.6**	**(5.4 - 5.7)**	***0.00***	**582**	**(530 - 635)**	***0.00***

symptoms of anxiety/depression: GADS score												
Constant	3.8	(3.4	4.2)	*0.00*	3.8	(3.4	4.3)	*0.00*	477	(291	662)	*0.00*
Coefficient	**0.03**	**(0.01**	**0.04)**	***0.00***	**0.03**	**(0.02**	**0.05)**	***0.00***	**-21**	**(-29**	**-13)**	***0.00***
Caring												
not providing care	5.0	(5.0	5.1)	-	5.5	(5.4	5.6)	-	678	(635	721)	-
caring for grandchild or frail adult	**4.9**	**(4.8**	**5.0)**	***0.02***	5.4	(5.3	5.5)	*0.16*	731	(688	775)	*0.09*
caring for grandchild and frail adult	**4.7**	**(4.5**	**4.9)**	***0.00***	**5.0**	**(4.8**	**5.2)**	***0.00***	**833**	**(750**	**916)**	***0.00***
Volunteering												
no	5.0	(4.9	5.1)	-	5.4	(5.3	5.5)	-	685	(644	726)	-
yes	**4.9**	**(4.8**	**5.0)**	***0.02***	5.3	(5.2	5.4)	*0.47*	**757**	**(713**	**800)**	***0.02***

Factors associated with more sitting and more PA (compared to reference category)															
Country of birth															
Australia	4.9	(4.8	-	4.9)	-	5.3	(5.2	-	5.3)	-	689	(657	-	721)	-
other English speaking	**5.4**	**(5.2**	**-**	**5.5)**	***0.00***	**5.9**	**(5.7**	**-**	**6.1)**	***0.00***	**825**	**(740**	**-**	**911)**	***0.00***
non-English speaking	4.9	(4.7	-	5.1)	*0.47*	5.5	(5.2	-	5.7)	*0.08*	**801**	**(696**	**-**	**906)**	***0.04***
Social interaction: DSSI score															
Constant	3.8	(3.4	-	4.2)	*0.00*	3.8	(3.4	-	4.3)	*0.00*	477	(291	-	662)	*0.00*
Coefficient	**0.10**	**(0.06**	**-**	**0.14)**	***0.00***	**0.13**	**(0.08**	**-**	**0.17)**	***0.00***	**57**	**(38**	**-**	**76)**	***0.00***
Factors associated with sitting only															
Dizziness/loss of balance															
no	4.9	(4.9	-	5.0)	-	5.3	(5.3	-	5.4)	-	717	(688	-	746)	-

yes	**5.3**	**(5.0**	**-**	**5.6)**	***0.02***	**5.8**	**(5.5**	**-**	**6.1)**	***0.01***	756	(627	-	886)	*0.56*
Marital status															
single†	5.1	(5.1	-	5.2)	-	5.5	(5.4	-	5.6)	-	724	(685	-	762)	-
married/partnered	**4.7**	**(4.6**	**-**	**4.8)**	***0.00***	**5.2**	**(5.1**	**-**	**5.3)**	**0.00**	714	(668	-	759)	0.75
Area of residence															
urban	5.1	(5.0	-	5.1)	-	5.5	(5.4	-	5.6)	-	751	(707	-	795)	-
large town	4.9	(4.7	-	5.1)	*0.11*	5.4	(5.2	-	5.6)	*0.48*	662	(583	-	741)	*0.06*
Education															
junior high school certificate or less	4.9	(4.8	-	5.0)	-	5.3	(5.3	-	5.4)	-	701	(668	-	735)	-
high school or leaving certificate	5.0	(4.9	-	5.2)	*0.10*	5.5	(5.3	-	5.7)	*0.11*	772	(686	-	858)	*0.13*
trade, certificate, or diploma	**5.2**	**(4.9**	**-**	**5.5)**	***0.04***	5.3	(5.2	-	5.5)	*0.91*	741	(654	-	828)	*0.41*
university degree	**5.1**	**(4.9**	**-**	**5.2)**	***0.04***	5.4	(5.1	-	5.7)	*0.81*	775	(634	-	917)	*0.32*
Factors associated with physical activity only															

Stiff/painful joints															
no	4.9	(4.8	-	5.0)	-	5.3	(5.3	-	5.4)	-	742	(708	-	775)	-
yes	5.0	(4.9	-	5.2)	*0.11*	5.4	(5.3	-	5.6)	*0.18*	**656**	**(605**	**-**	**708)**	***0.01***
Problems with one or both feet															
no	4.9	(4.9	-	5.0)	-	5.4	(5.3	-	5.4)	-	740	(708	-	772)	-
yes	5.0	(4.9	-	5.2)	*0.38*	5.4	(5.3	-	5.6)	*0.43*	**608**	**(547**	**-**	**668)**	***0.00***

* Means and 95% CIs for physical activity are bootstrapped estimates given the non-normality of the data; † single/separated/divorced/widow; § From a list of health conditions, including diabetes, cancer, and heart disease, reported as diagnosed by a doctor, or treated for, in the previous 3 years; DSSI = Duke Social Support Index, range 4-12 points, higher score indicates more interaction; GADS = Goldberg Anxiety and Depression Scale, range 0-18 points, higher score indicates more symptoms; MET = metabolic equivalent; **boldface** indicates significant difference compared with the reference category for that variable; underlined = reference category.

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