



Temporal trends in sitting time by domain in a cohort of mid-age Australian men and women

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ABSTRACT

There are few prospective data on temporal trends in overall sitting time for different domains of sitting. This study examined time trends over 6 years in total and domain-specific sitting time in mid-age Australian men and women. Self-report data from 5246 participants in four survey waves (2007, 2009, 2011, 2013) of the HABITAT study in Brisbane, Australia, were analysed. Overall trends in 'high' total sitting time (> 8 h/day sitting) and five domains were examined: a) > 5 h/day for TV; b) > 2 h/day for travel; c) > 2 h/day for home computer use; d) > 2 h/day for leisure; and e) > 6 h/day for work. Sitting to watch TV and sitting at work accounted for more than half of total sitting time. The proportions who reported high sitting for computer use at home increased from 25% in 2007 to 37% in 2013 in men and from 19% to 29% over the same period in women. High TV sitting time was reported by 11.8% of men and 10.2% of women. These estimates increased to 16.5% and 13.2% respectively over the six years. In conclusion, although overall total sitting time remained fairly stable, there were significant increases in sitting time in some domains (home computer use and TV viewing) and in some sub-groups (such as women, and the employed). These increases were countered by declines in work-related sitting due to retirement.

1. Introduction

Evidence suggests that high sitting time (> 8 h/day) is associated with increased risk of all-cause mortality [1]. Although one hour per day of moderate-vigorous physical activity can attenuate or even eliminate the increased risk of all-cause mortality associated with high sitting time, nearly half the population does not achieve that level of physical activity [2]. Furthermore, sitting for long periods (> 5 h/day) to watch TV is associated with increased risk of all cause-mortality, even among those who are highly active [1].

Surveillance of population levels of sitting time has become more widespread in recent years. Data from 54 countries show that nearly 15% of adults spend more than seven hours per day sitting. [3]. Another study, with representative samples from 20 countries, found that adults aged 18–65 with high total sitting time were more likely to be younger and more educated than their counterparts [4]. However, the major limitation of most surveillance efforts to date is the scarcity of data collected at more than one time-point in the same population, which

precludes the evaluation of temporal trends in sitting time.

Temporal trends data from 27 European countries show decreases in the proportion of participants reporting > 4 h/day sitting from both 2002 to 2013 and from 2005 to 2013 [5]. It is unclear whether these decreases apply to all domains of sitting, such as TV viewing, or sitting for travel, work, and leisure. More detailed information about the contexts of high sitting time could inform targeted strategies for behaviour change. The aim of this study therefore, was to examine six-year time trends in total and domain-specific sitting time in mid-age Australian men and women.

2. Methods

2.1. Design and sample

Data were from the HABITAT (How Areas in Brisbane Influence health and AcTivity) study, a longitudinal multi-level cohort study based in Brisbane, Australia. At baseline in 2007 a multi-stage sampling

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Table 1
Descriptive characteristics of the total sample (n = 5246).^a Brisbane, Australia (2007–2013).

Variables	Men (n = 2196)				Women (n = 3050)			
	2007	2009	2011	2013	2007	2009	2011	2013
Age (years) – mean (SD)	51.7 (7.2)	53.7 (7.2)	55.7 (7.1)	57.7 (7.2)	52.1 (7.1)	54.1 (7.1)	56.1 (7.1)	58.2 (7.1)
Age (years) – range	40–65	42–67	44–69	46–71	38–66	40–68	42–70	44–72
Highest completed education (%)								
Bachelor degree or higher	35.7	–	–	–	34.4	–	–	–
Diploma/Associate degree	12.2	–	–	–	11.4	–	–	–
Certificate (trade/business)	21.8	–	–	–	13.9	–	–	–
Year 12 or less	30.2	–	–	–	40.4	–	–	–
Annual gross household income (%) ^b								
AU\$93,600 or more	41.0	43.5	45.7	43.3	32.5	33.3	35.8	34.6
AU\$52,000–93,599/year	33.8	29.6	27.8	27.1	33.4	30.9	28.0	27.8
AU\$20,800–51,999/year	19.8	20.8	20.8	22.4	26.5	25.4	26.9	28.6
< AU\$20,799/year	5.5	6.0	5.7	7.2	7.7	10.4	9.3	9.0
Employment status (%)								
Full-time	72.7	69.5	63.4	56.1	36.8	36.3	34.4	29.6
Part-time	7.0	6.0	6.3	6.8	24.6	22.7	20.7	20.2
Casual	3.9	4.0	4.9	5.2	8.8	9.4	9.6	8.5
Not-working	16.4	20.4	25.4	31.9	29.9	31.6	35.3	41.7
Sitting time variables (min/day)								
Total–mean (SD)	592 (265)	610 (271)	595 (265)	612 (288)	522 (255)	542 (268)	535 (258)	543 (268)
TV–mean (SD)	144 (111)	158 (129)	158 (121)	172 (138)	143 (115)	150 (119)	152 (114)	160 (117)
Travel–mean (SD)	85 (97)	89 (100)	83 (92)	84 (93)	73 (77)	77 (91)	71 (76)	74 (84)
Home Computer–mean (SD)	66 (92)	75 (98)	80 (97)	92 (108)	53 (83)	66 (94)	67 (85)	75 (91)
Leisure–mean (SD)	69 (77)	68 (78)	65 (74)	70 (80)	85 (87)	84 (87)	80 (83)	86 (87)
Work–mean (SD)	228 (185)	221 (186)	209 (198)	194 (200)	167 (171)	165 (171)	164 (186)	147 (187)

SD = standard deviation; – : Data for highest completed education were not collected in 2009, 2011, 2013.

^a Including only participants who completed every survey.

^b AU\$ 1.00 = US\$ 0.91 at 30th Jun 2013.

and recruitment protocol was used to identify a stratified random sample of 16,128 eligible people aged 40–65 years, from across 200 local areas with contrasting levels of neighbourhood socioeconomic status. A mail-survey was administered at baseline and at subsequent follow-ups in 2009, 2011 and 2013. The study protocols received ethical clearance from the Queensland University of Technology Human Research Ethics Committee (Ref. Nos. 3967H & 1300000161). More details of the methods have been reported previously [6,7].

2.2. Sitting time

At all surveys, participants were asked to report time (hours/minutes) spent sitting on a usual week day and a usual weekend day in each of five domains: (a) watching television (including DVDs, videos, video games); (b) sitting while in transportation; (c) using a computer at home; (d) in overall leisure time (excluding television time and using a computer at home); and (e) sitting at work (for those who were in paid employment at the time of each survey). These measures have acceptable reliability and validity among mid-age Australian adults [8]. For this study, data relating to sitting time on a usual week day was analysed. Total sitting time was calculated by summing the time reported in each specific-domain (TV, transportation, computer at home, overall leisure time and work). For total sitting time, those participants who were not in paid employment were assigned a score of zero for sitting at work. High total sitting time was defined as > 8 h/day for total; > 5 h/day for TV; > 2 h/day for travel; > 2 h/day for home computer use; > 2 h/day for leisure (not considering TV viewing and computer use); and > 6 h/day for work. The thresholds for classification of high total sitting and high TV time were based on a recent meta-analysis, which showed higher risk of all-cause mortality among adults who reported more than eight hours per day in sitting and more than five hours per day watching TV [1]. For travel, home computer, leisure and work-based domains, ‘high’ sitting time was based on sample distributions; these cut-offs approximately represented the top quartile of

sitting time in these domains.

2.3. Covariates

Additional questions were used to assess participants’ socio-demographic characteristics including gender, highest level of education completed, gross annual household income, and employment status. Age was derived from date of birth data obtained at the time of sampling. Table 1 shows how each of these variables were operationalised for analysis.

2.4. Statistical analyses

Descriptive statistics were used to describe total sitting time [mean and standard deviation (SD)], sitting time in each domain as a proportion of total sitting time, and the prevalence and 95% confidence intervals (95%CI) of ‘high’ sitting time (overall and in each domain). To estimate the 95%CIs, robust standard errors were calculated by taking into account the clustering that resulted from the two-staged sampling design. The statistical significance of changes between years was calculated by Poisson regression, with the sitting time variable as the outcome of interest and the year of survey as the exposure. Analyses were conducted separately for men and women as previous research with this sample has shown gender differences in sitting time [9], and for participants who were employed/not employed, to evaluate the time trends of total sitting time and of sitting in each domain. Both unadjusted and adjusted (for age and socioeconomic position, SEP) estimates are presented. All analyses were performed using Stata version 12.1 (StataCorp, College Station, Texas, USA).

3. Results

Of the 16,128 potential respondents, 11,035 (2007), 7867 (2009), 6901 (2011) and 6520 (2013) returned the survey at each wave. The

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