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Which population groups are most unaware of CVD risks associated with sitting time?☆

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ABSTRACT

Objective. Prolonged sitting is an emerging risk factor for poor health yet few studies have examined awareness of the risks associated with sitting behaviours. This study identifies the population subgroups with the highest levels of unawareness regarding the cardiovascular disease (CVD) risks associated with sitting behaviours.

Method. Adults ($n = 1256$) living in Queensland, Australia completed a telephone-based survey in 2011, analysis conducted in 2013. The survey assessed participant's socio-demographic characteristics, physical activity, sitting behaviours and awareness of CVD risks associated with three sitting behaviours: 1) sitting for prolonged periods, 2), sitting for prolonged periods whilst also engaging in regular physical activity, and 3) breaking up periods of prolonged sitting with short activity breaks. Population sub-groups with the highest levels of unawareness were identified based on socio-demographic and behavioural characteristics using signal detection analysis.

Results. Unawareness ranged from 23.3% to 67.0%. Age was the most important variable in differentiating awareness levels; younger adults had higher levels of unawareness. Body mass index, physical activity, TV viewing, employment status and time spent at work also identified population sub-groups.

Conclusion. Unawareness of CVD risk for prolonged sitting was moderately high overall. Younger adults had high levels of unawareness on all of the outcomes examined.

Introduction

Sitting is a key component of sedentary behaviour which is defined as any activity that has a metabolic cost less than 1.5 METS (Pate et al., 2008). Accumulating evidence indicates that prolonged sitting time may be associated with several poor health outcomes including cardiovascular disease (CVD) mortality (George et al., 2013; Patel et al., 2010; Pavey et al., 2012; Thorp et al., 2010; van der Ploeg et al., 2012). These associations remain evident following adjustment for a number of socio-demographic factors and health behaviours including physical activity (George et al., 2013; Patel et al., 2010; Pavey et al., 2012; Thorp et al., 2010; van der Ploeg et al., 2012).

While sitting is required to perform some daily tasks and for rest, the adverse health consequences of sitting are driven by the prolonged and uninterrupted nature of sitting performed by many individuals. Sitting is a ubiquitous aspect of modern lifestyle, with many adults spending between 7 and 9 h of their waking day sitting in work, travel or leisure contexts (Thorp et al., 2010; van der Ploeg et al., 2012). In light of this evidence, reducing the amount of prolonged sitting and increasing the amount of movement time are recommended to improve health outcomes (Owen et al., 2008).

One factor influencing an individual's decision to engage with an intervention or change behaviour is to acknowledge that they are at risk or participating in a risky behaviour (Schwarzer, 2008). The association between risk recognition and behaviour change has been documented in relation to numerous health behaviours (Brewer et al., 2007; Carpenter, 2010). Whilst knowledge and awareness of health risks associated with a behaviour are not sufficient to change behaviour alone, they are an important perquisite needed for change (Schwarzer, 2008). Given the evidence of health risks associated with long periods of sitting and its endemic occurrence in everyday activities it is important to identify those population groups who are most unaware of its health risks (Owen et al., 2008; Patel et al., 2010; Pavey et al., 2012; Thorp et al., 2010; van der Ploeg et al., 2012). This is highlighted by qualitative research in office workers that identified that increasing awareness of the health risks associated with sitting may be an important driver for changing sitting behaviours (Gilson et al., 2011).

There is limited evidence of risk awareness related to sitting in the general population and these data are needed to inform future population level interventions directed at reducing sitting. Consequently this

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study aims to identify population subgroups that have the highest levels of unawareness regarding the potential for increased health risk associated with prolonged and uninterrupted sitting.

Methods

Design

Data were obtained from a cross-sectional omnibus telephone survey, the Queensland Social Survey, conducted in July–August 2011 by the Population Research Laboratory of CQUniversity. Participants were adults aged 18 and over residing in the state of Queensland, Australia who were able to be contacted by direct dialled landline telephone. Participants were randomly selected from the electronic white pages (Scott and Happell, 2012). A minimum of five call-back attempts were made to a household if interviewers were unable to contact a participant. No data is available from individuals who declined to participate in the survey. The study was approved by CQUniversity's Human Research Ethics Committee and all participants consented to take part in the survey.

Measures

Participants reported socio-demographic details including age, gender, height, weight, smoking status, employment status, daily time spent at work, years of education completed, gross individual income (AUD/annum) and chronic disease status.

Physical activity was assessed using the Active Australia Questionnaire, a valid and reliable instrument that asks participants to report the frequency and duration of walking for recreation and exercise, walking for transportation, and household (i.e. chores, yard work, gardening) and non-household (i.e. excluding household activities) activities of moderate or vigorous intensity in the last week (Australian Institute of Health and Welfare, 2003; Brown et al., 2004a, 2004b). This study used the format of this instrument that assesses walking for recreation and exercise and transport in two items (Brown et al., 2004a). Time spent in each of these activities (excluding household activities), with vigorous intensity weighted by 2, was summed to determine the total amount of time spent in moderate-to-vigorous intensity physical activity. The total reported frequency of participation in all activities was used to determine the total number of sessions for all reported activities, excluding household activities.

Employed participants were asked to estimate how much time in total they spent sitting on an average working day using a single item. This item has been used in previous studies (Duncan et al., 2010; Mummery et al., 2005), and similar items have demonstrated excellent test retest reliability (Duncan et al., 2013). Duration of TV viewing in the previous week was assessed using a single item as a marker of sedentary behaviour in leisure time (Davies et al., 2012).

Based on previously developed items (Badland and Duncan, 2009), three items assessing perceived CVD risk associated with sitting were developed specifically for the current study. The three items were: 1. "Sitting for long periods of time increases my risk of cardiovascular disease;" 2. "Even if I do regular physical activity, like brisk walking or exercise for 30 minutes most days of the week, sitting for long periods of time increases my risk of cardiovascular disease;" and 3. "When sitting for long periods of time, taking short breaks by standing or slowly moving around for a minute or two to break up my sitting is a good way to reduce my risk of cardiovascular disease." Participants rated their level of agreement for these items on a five point scale ranging from 'Strongly Agree' to 'Strongly Disagree'. Respondents could also choose a "don't know" response option. Individuals who agreed or strongly agreed with each item were classified as being aware of the risks associated with sitting; all other responses to each item were classified as being unaware of the risks. Being classified as unaware was the outcome of interest in the current study. A fourth outcome variable, individuals who were classified as unaware on at least one of the three risk awareness items, was created to provide an indicator of overall awareness.

Analyses

Signal Detection Analysis was used to identify the specific population subgroups that were unaware of the health risks posed by sitting behaviour (King et al., 2010; Vandelanotte et al., 2011). Signal Detection Analysis uses recursive partitioning in an iterative process to identify the optimal point in a predictor variable that classifies specific population subgroups who are at higher or lower risk of having the outcome (Kiernan et al., 2001). This process means that different cut points in a particular variable may be identified in analyses examining separate outcomes. Compared to logistic regression analysis which is commonly used to examine associations between predictor variables and the outcome, Signal Detection Analysis offers several advantages including being less sensitive to multicolinearity of predictor variables, systematically examining interactions between variables without needing to be specified *a priori* and the ability to control the false positive rate (Kiernan et al., 2001). A comparison of Signal Detection Analysis and logistic regression to identify subgroups can be found elsewhere (Kiernan et al., 2001). The subgroup partitioning process was set to maximize both sensitivity and specificity (50%) and used a *p*-value of 0.01 when identifying subgroups. Identification of population subgroups was conducted using a separate Signal Detection Model for each of the four outcomes using ROC 5.0 software (http://www.stanford.edu/~yesavage/ROC.html). Missing data was identified as missing as per the requirements of the software to avoid it being identified as a potential cut point in the analysis. Analysis was conducted in 2013.

The thirteen predictor variables used in analysis were gender, age, employment status (employed; not employed), gross individual income (<$600/week; ≥$600/week), smoking status (current smoker, non-smoker), chronic disease status (present; absent), years of education, body mass index (BMI), daily time spent at work, daily duration of occupational sitting, weekly min of TV viewing, weekly minutes of physical activity and weekly sessions of physical activity. Individuals who reported not being employed were classified as having zero minutes of daily time spent at work and zero minutes of occupational sitting. Variables not specified as dichotomies were included in analyses as continuous measures. These predictor variables were selected as they may be useful in identifying sub-groups who can be targeted in future interventions.

Results

A total of 4009 people were invited to take part in the survey and a total of 1265 completed the survey; the response rate was 32%. The two most common reasons for not completing the survey were refusal to take part ($n = 2309$) and unable to be contacted ($n = 276$). Table 1 provides an overview of participant characteristics in the total sample and characteristics of those who were aware and unaware for each outcome variable. The proportion of the sample who were unaware of the risks associated with sitting for long periods, were unaware of the risk associated with sitting for long periods of time, even when they engaged in at least 30 minutes of moderate to vigorous intensity physical activity on a daily basis and were unaware that taking short breaks in sitting could reduce risk was 23.3%, 58.3% and 27.5% and respectively. Sixty-seven percent of participants were unaware of the risks associated with at least one of the sitting behaviours. The average age of the sample was 53.3 (SD = 16.0 years), the majority were employed, reported earning over $600/week and did not report the presence of a diagnosed chronic disease. For items 2, 3 and 4 participants who were unaware of the risks associated with sitting were significantly younger compared to those who were aware of the risks associated with sitting (Table 1).

Specific variable thresholds identifying population sub-groups can be found in Figs. 1–4. For all analyses, age was the variable that most efficiently separated groups on levels of unawareness (Figs. 1–4). Following age, min of TV viewing, BMI, time spent engaged in physical activity and time spent at work were the variables that most efficiently separated sub-groups. Variables that further identified sub-groups with the lowest and highest levels of unawareness were BMI, smoking status, min of TV viewing, age, min and sessions of physical activity and employment status.

Fig. 1 shows that overall 23.3% of the sample was unaware of the risks associated with long periods of sitting. The sub-group with the highest level of unawareness were those aged <37 years who watched ≥900 min of TV in the previous week (46.2%). The sub-group with the lowest level of unawareness were those aged ≥37 years, who watched ≥300 min of TV in the previous week and who were non-smokers (18.5%).

Overall the level of unawareness regarding the risks associated with sitting even when engaging in physical activity was 58.4% (Fig. 2). The sub-group with the highest level of unawareness were those aged