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Prospective associations between sedentary behaviour and risk of depression in socio-economically disadvantaged women

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ABSTRACT

Objective. Although recent cross-sectional research has suggested a positive association between sedentary behaviour and risk of depression, the direction of associations is unclear. This study aimed to investigate prospective associations between sedentary behaviour and risk of depression in both directions in socio-economically disadvantaged women.

Methods. 1511 women, aged 18–45, completed self-report validated measures of sedentary behaviour (TV viewing, computer use, overall sitting time and screen time) as well as depressive symptoms (CES-D-10) in 2007/08 (T1) and 2010/11 (T2). Linear regression analyses examined associations between sedentary behaviours at T1 and depressive symptoms at T2, and multinomial logistic regression analyses examined associations between depressive symptoms at T1 and sedentary behaviours at T2.

Results. Although prospective analyses indicated no association between T1 sedentary behaviours and depressive symptoms at T2, results showed that depressive symptoms at T1 were associated with higher levels of TV viewing (adjusted odds ratio: 1.032, 95% CI: 1.00, 1.07) at T2.

Conclusions. Women's sedentary behaviour may not predict subsequent depressive symptoms; however, women's risk of depression may be predictive of engaging in greater amounts of TV viewing. Confirmation of these findings using further prospective and intervention study designs is required.

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Introduction

A growing body of prospective research suggests that engaging in sedentary behaviour (i.e. sitting behaviours performed at or just above 1.5 METS (Sedentary Behaviour Research Network, 2012) is linked to poor health, including being at greater risk of type 2 diabetes and premature mortality (Proper et al., 2011), and these associations are independent of physical activity. More recently, research has investigated the association between sedentary behaviour and mental health outcomes, in particular the risk of depression (Teychenne et al., 2010b). Although sedentary behaviour (most notably screen-based entertainment) has been on balance linked to an increased risk of depression (Teychenne et al., 2010b), the majority of existing research is of cross-sectional nature and therefore the direction of relationships is yet to be determined. Currently, just three prospective studies have examined the link between sedentary behaviour and depression risk (Lucas et al., 2011; Sanchez-Villegas et al., 2008; van Uffelen et al., 2013). Of those studies, two showed that engaging in higher levels of sedentary behaviour (specifically television viewing and computer use) predicted greater depression risk at follow-up (Lucas et al., 2011; Sanchez-Villegas et al.,

2008), whilst van Uffelen et al. (2013) showed no prospective associations between sedentary behaviour and depressive symptoms.

It is anticipated that depression will be the second leading cause of disease globally by 2030 (Mathers and Loncar, 2006), and therefore it is important to identify behavioural risk factors linked to the illness in order to inform prevention and management strategies. Additionally, research focussing on population groups most at risk of depression including women and socio-economically disadvantaged groups (Lorant et al., 2003; Wilhelm et al., 2003) is needed. We have previously reported on cross-sectional associations in this sample, finding that computer use, screen time (i.e. computer and television time) and overall time spent sitting were positively associated with risk of depression (Teychenne et al., 2010a). However, the direction of associations between sedentary behaviour and risk of depression is unclear. The current study extends these cross-sectional findings as it aimed to investigate the prospective associations between sedentary behaviour and risk of depression in both directions amongst women living in socio-economically disadvantaged neighbourhoods. To date, only one prospective study has investigated the relationship between sedentary behaviour and risk of depression in both directions (van Uffelen et al., 2013), yet this study's sample consisted only of women within a small age range (50–55 years). Further, no prospective studies have investigated these associations in socio-economically disadvantaged women, a group that is both at high risk of depression and sedentary behaviour.

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In the current study it was hypothesised that prospective associations would be found in both directions, indicating a bi-directional relationship between depression risk and engagement in sedentary behaviours.

Methods

Analyses were undertaken on prospective survey data collected in 2007/08 (T1) and 2010/2011 (T2) from the Resilience for Eating and Activity Despite Inequality (READI) Study. Methods have been described elsewhere (Ball et al., 2013) and are summarised below. Data used in the present analyses were provided by 1511 women (aged between 18 and 45) living in socio-economically disadvantaged areas of Victoria, Australia.

Participants

Participants were recruited randomly from 80 Victorian neighbourhoods (40 rural and 40 urban) of low socio-economic position (SEP), based on scoring in the bottom tertile on the Australian Bureau of Statistics Socioeconomic Index for Areas Index of Relative Socio-Economic Disadvantage (Australian Bureau of Statistics, 2006). The electoral roll was used to randomly choose approximately 150 women (aged 18 to 45 years) from each of the 80 suburbs.

At T1, surveys were mailed to 11,940 women, and a total of 4934 women returned a completed survey, representing a response rate of 45%. Of the respondents, 571 women were excluded due to residing in 'non-READI' neighbourhoods, nine women were excluded due to falling outside the valid age range (or had data missing on this variable) and three women were excluded as the survey was not completed by the woman it was addressed to. Two women later withdrew from the study. This left a total of 4349 women included at T1. At T2, 1913 women returned a completed survey (44% of the T1 sample). After excluding 402 women with missing data on predictor, outcome and confounding variables and/or reporting currently being pregnant, this left 1511 women with data for inclusion in analyses.

Procedures

The READI study was approved by the Deakin University Human Research Ethics Committee. Participants were sent a pre-survey letter in the mail, informing them that they had been selected to take part in a study on women's health and surveys were posted one week later. Following the Dilman protocol (Dillman, 1978), non-respondents received a mailed reminder two weeks later and a second reminder with replacement survey another two weeks later. Women received small incentives (e.g. tea bags, $1 scratch lottery tickets) with their initial survey pack. Respondents provided written consent within their returned surveys. Women who had agreed to be re-contacted were sent a follow-up survey three years later.

Measures

Sedentary behaviour measures

Sedentary behaviour was measured at T1 and T2 using four measures: time spent sitting at a computer, time spent sitting watching television, screen time (television viewing and computer use), and overall time spent sitting. Time spent sitting watching television and sitting using the computer were examined separately using reliable and valid measures (Salmon et al., 2003). Participants estimated the number of hours and minutes they spent undertaking those activities on a usual weekday, as well as a weekend day, and weekly totals were calculated by multiplying the duration of sitting on weekdays by five then adding this to the weekend days' total duration (which was multiplied by two). Weekly screen time was assessed by summing the reported weekly duration of time spent sitting watching television and using the computer. Overall sitting in the past week was assessed using the International Physical Activity Questionnaire (IPAQ-L), a well-validated seven-day recall of physical activity and sedentary behaviour (Craig et al., 2003). Participants estimated the number of hours and minutes spent sitting on a usual weekday, as well as a usual weekend day, and weekly totals were calculated as above. Each sedentary behaviour variable was converted into minutes per day and then categorised into approximate tertiles.

Depressive symptoms measure

Depressive symptoms at T1 and T2 were assessed using the 10-item version of the Centre for Epidemiologic Studies Depression Scale (CES-D), a well-validated measure of depression risk (Andersen et al., 1994; Radloff, 1977).

This screening tool includes questions that relate to various symptoms of depression that may have been experienced in the past week, which indicate poor mental health, and respondents rate themselves on a 4-point severity scale. Responses were summed and analysed as a continuous variable.

Covariates

Covariates from T1 were selected based on prior literature and then included if bivariately associated with depressive symptoms in the current data set. On this basis, self-reported age, education, body mass index (BMI), marital status, employment status, children living at home, and physical health (whether they had a serious illness, long-term injury or disability that prevented them from being physically active) were included in analyses as potential confounding factors.

Statistical analyses

As the depressive symptom scores were normally distributed, linear models were used when this was the outcome of interest. The sedentary behaviour measures were, however, negatively skewed and were therefore categorised into approximate tertiles for analyses in which they were the dependent variable. Descriptive univariate analyses were used to examine the distributions of socio-demographic characteristics at T1, and sedentary behaviour and depressive symptoms at T1 and T2. Linear regression models were used to test longitudinal associations between sedentary behaviours at T1 and depressive symptoms at T2, adjusting for levels of depression symptoms at T1. Multinomial logistic regression analyses examined longitudinal association between depressive symptoms at T1 and sedentary behaviours at T2, adjusting for levels of sedentary behaviour at T1. For all longitudinal analyses, crude and adjusted (controlling for sociodemographic covariates) models were tested. All models adjusted for clustering by women's suburb of residence. Analyses were performed using STATA version 12.0.

Results

Table 1 presents the socio-demographic characteristics among participants at baseline. The mean age of participants at baseline was 36 (SD = 7.68). At T1, a total of 480 women (32%) were classified as being at risk of depression (i.e. CES-D-10 score ≥10). At T2, a total of 510 women (34%) were classified as being at risk of depression (CES-D-10 score ≥10), which included 299 women also classified as at-risk at T1, and 211 women who scored below the risk threshold at T1. About half of the sample (54.3%, n = 820) were not classified as being at risk of depression at either time point, while a further 181 women had been classified as being at risk at T1, but were no longer at risk at T2. A higher proportion of those excluded (i.e. with missing data) from analyses reported low levels of sitting at T2 (37%) compared to those included (27.5%, p = 0.017), were more likely to be obese (24.7%) compared to those included (20%, p < 0.0005), and were more likely to have an illness/injury (12.3%) compared to those included (10.9%, p < 0.0005). A higher proportion of those included in analyses reported being older (i.e. >40 years; 38.6%) compared to those excluded (23.4%, p < 0.0005) and were more likely to be employed full-time (38.7%), compared to those who were excluded (31.1%, p = 0.021). No other differences in key variables were seen between groups (e.g. depressive symptoms, T1 sedentary behaviours, T2 television viewing, computer use and screen time, education, marital status, children living at home).

Table 2 shows associations between sedentary behaviours at T1 and depressive symptoms at T2. None of the sedentary behaviours were longitudinally associated with depressive symptoms. Associations between depressive symptoms at T1 and sedentary behaviour at T2 are presented in Table 3. In crude models (adjusted for T1 sedentary behaviours only), baseline depressive symptoms were associated with greater odds of engaging in medium (≥120 min/day) or high (≥240 min/day) levels of television viewing, and high (≥360 min/day) levels of screen time at follow-up. In adjusted analyses (controlling for T1 sedentary behaviours and sociodemographic covariates), however, only the association between depressive symptoms and greater odds of high levels of television viewing remained statistically significant. For example, every 10 point