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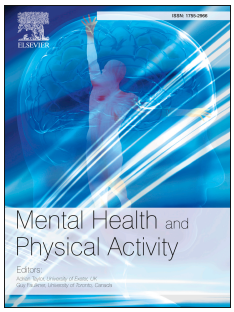

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Amanda L. Rebar, Corneel Vandelanotte, Jannique van Uffelen, Camille Short, Mitch J. Duncan

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Associations of Overall Sitting Time and Sitting Time in Different Contexts with Depression, Anxiety, and Stress Symptoms

Amanda L. Rebar[1] Corneel Vandelanotte [1] Jannique van Uffelen[2]

Camille Short[1] Mitch J. Duncan[1]

Affiliations:
[1] Central Queensland University, School of Human, Health, and Social Sciences, Rockhampton, QLD, Australia

[2] Victoria University, Institute of Sport, Exercise and Active Living, Melbourne, VIC, Australia & The University of Queensland, School of Human Movement Studies, Brisbane, QLD, Australia

Email addresses:
Amanda L. Rebar: a.rebar@cqu.edu.au
Corneel Vandelanotte: c.vandelanotte@cqu.edu.au
Jannique van Uffelen: jannique.vanuffelen@vu.edu.au
Camille Short: c.short@cqu.edu.au
Mitch J. Duncan: m.duncan@cqu.edu.au

Correspondence concerning this article should be addressed to Amanda L. Rebar, School of Human, Health, and Social Sciences, Bldg 18 Rm 1.33, Central Queensland University, Rockhampton, QLD, Australia, 4703. Email: a.rebar@cqu.edu.au.

Running Head: SITTING AND MENTAL HEALTH

Associations of Overall Sitting Time and Sitting Time in Different Contexts with Depression, Anxiety, and Stress Symptoms

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Abstract

Spending a lot of time sitting has been linked to more depressive symptoms and spending a lot of time engaged in screen-based sitting has been linked to greater likelihood of having mental disorders and poorer psychological distress. The purpose of this study was to examine whether overall sitting time and time spent sitting in different contexts was associated with depression, anxiety, or stress symptoms. Sitting time (time spent sitting on typical work- and non-work days while engaged in leisure activities, working, using a computer, watching television, and in transport) and symptom severity of depression, anxiety and stress were self-reported in a cross-sectional online survey in 2012 by Australian adults (*N*=1,104, 55% female, *M* age=58 years). Associations were examined using negative binomial regression analyses accounting for the covariates of physical activity, sex, age, income, education, and presence of chronic conditions. Overall sitting time was significantly associated with more severe depression (*b*=0.01, 95% CI= 0.00 – 0.02) and anxiety (*b*=0.03, 95% CI= 0.02 – 0.04) but not stress (*b*=0.01, 95% CI= -0.00 – 0.02) symptoms. Time spent sitting while at a computer was associated with more severe depression (*b*=0.04, 95% CI= 0.01 – 0.07) and anxiety (*b*=0.03, 95% CI= 0.00 – 0.06) symptoms, and time spent sitting while in transport was associated with more severe anxiety (*b*=0.09, 95% CI= 0.05 – 0.13) and stress (*b*=0.05, 95% CI= 0.02 – 0.08) symptoms. Limiting overall sitting time and time spent sitting while at a computer or in transport could be a potential strategy to improve mental health.

Keywords: Sedentary behaviour, mental health, physical activity, exercise

Associations of Overall Sitting Time and Sitting Time in Different Contexts with Depression, Anxiety, and Stress Symptom Severity

Evidence is emerging that more sitting time is associated with depressive symptoms or likelihood of having mental disorders (Arredondo et al., 2013; Balboa-Castillo, León-Muñoz, Graciani, Rodríguez-Artalejo, & Guallar-Castillón, 2011; Hamer, Stamatakis, & Mishra, 2010; Peeters, Burton, & Brown, 2012; Sanchez-Villegas et al., 2008; Teychenne, Ball, & Salmon, 2010a, 2010b; van Uffelen et al., 2013), but no studies have tested how sitting time is related to anxiety or stress symptoms. Anxiety and stress are important aspects of mental health to investigate, given that more than 75% of people report experiencing some stress or anxiety symptoms (Crawford & Henry, 2003), and between 5-10% of the population in developed countries have severe depression, anxiety, and stress-related disorders (Demyttenare et al., 2004). Even mild symptoms of anxiety and stress can be highly debilitating and contribute considerably to burden of disease (S. Cohen & Williamson, 1991; Kalia, 2002; Kiecolt-Glaser, McGuire, Robles, & Glaser, 2002; Pietrzak et al., 2012; Rai et al., 2012), so it is important to determine whether sitting time is linked to anxiety and stress, as well as to depression symptoms.

Teychenne and colleagues (2010b) conducted a review of studies published between 1985 and 2010 and found evidence of a positive association between sitting time and risk of depression in adults. Recent studies have also identified positive associations between sitting time and risk of depression in middle-aged women (Peeters et al., 2012; van Uffelen et al., 2013), disadvantaged women (Teychenne et al., 2010a), and Latinos (Arredondo et al., 2013). These studies suggest that more time spent sitting overall (i.e., across multiple sitting activities) is associated with more severe depressive symptoms; however it remains unclear whether overall sitting time is associated with severity of anxiety or stress symptoms.

A small body of research also suggests that more time spent sitting in front of a screen is associated with poorer mental health, aside from depression symptoms. Three studies found that people who spent more time watching television and/or using the computer had a greater likelihood of having mental disorders (de Wit, van Straten, Lamers, Cuijpers, & Penninx, 2011; Peeters et al., 2012; Sanchez-Villegas et al., 2008), and two studies found that people that spent more time engaging in television, computer, and/or screen-based entertainment behaviours tended to have more psychological distress (Hamer et al., 2010) and worse mental wellbeing (Atkin, Bull, & Biddle, 2012). This previous research is limited in that it remains unclear if the link to mental health is with the overall time spent sitting or the time spent in a specific context (i.e., television-watching, using the computer, screen-based entertainment). To better establish the association between sitting time and mental health, further research is needed to unravel the link between mental health and sitting time in specific contexts (Teychenne et al., 2010b). It may be, for example, that sitting time while engaging in watching television is more strongly linked to poor mental health than time spent sitting while engaging in other activities like reading or visiting with friends. In that case, it would suggest that the relation may partially be the result of cognitive, rather than physical, aspects of the behaviour. Furthermore, knowledge about the association between sitting time in different contexts and poor mental health will help to identify population subgroups in need of interventions and to inform the development of these interventions.

The primary aim of this study was to examine the association between sitting time and depression, anxiety, and stress symptoms in Australian adults. A secondary aim of this study was to investigate the association of time spent sitting in different contexts (i.e., leisure activities, working, using a computer, watching television, in transport) with depression, anxiety, and stress symptom severity. Depression, anxiety, and stress symptoms can systematically differ as a function of a myriad of personal factors including age, sex,

education, and occupation (Bayram & Bilgel, 2008; Crawford & Henry, 2003); other behaviours such as physical activity (Taylor, Sallis, & Needle, 1985); and physical health condition (Moussavi, Chatterji, Verdes, Tandon, Patel, & Ustun, 2007). As such, physical activity, sex, age, income, education, job level, and presence of chronic conditions were accounted for in the analyses.

Methods

Participants and Procedures

This study was conducted as part of the Australian Health and Social Science (AHSS) panel project conducted by the Population Research Laboratory (PRL) at Central Queensland University (Hanley & Mummery, 2009). A random sample of Australian adults were recruited annually from 2009-2012 with computer-assisted telephone interviewing, in which potential respondents from randomly selected households across each Australian state and territory were asked to participate in an online survey with questions about a range of socio-demographic and health-related topics. Those who agreed to participate in the panel were emailed a link to the online survey for this study in August-September 2012. Up to four email reminders were sent to participants who did not start the survey. Of the 3,932 who agreed to participate in the panel, 46.8% (N = 1,843) completed the 2012 survey and responded to questions about their socio-demographics, physical activity, sitting time, and mental health. All study procedures were approved by the local human ethics committee. This response rate is higher than typical for online survey research (Cook, Heath, & Thompson, 2000).

Measures

Depression, anxiety, and stress symptom severity. Depression, anxiety, and stress symptom severity was assessed with the 21-item Depression, Anxiety, and Stress Scale (Henry & Crawford, 2005), which is a quantitative measure of distress symptom severity and is not a measure of clinical diagnosis. Participants reported how much each statement applied

to them over the past week using the response scale ranging from 0 (*did not apply to me at all*) to 3 (*applied to me very much, or most of the time*). The depression, anxiety, and stress symptom severity scores were calculated as the sum of responses for the 7-item subscales: depression (e.g., "I felt that I had nothing to look forward to"), anxiety (e.g., "I felt scared without any good reason"), and stress (e.g., "I found it hard to wind down"). Each of the three scores could range from 0 – 21 with higher scores indicating more severe symptoms. These scales have demonstrated acceptable validity and reliability in community samples of adults (Antony, Bieling, Cox, Enns, & Swinson, 1998; Lovibond & Lovibond, 1995) and had acceptable inter-item reliability in the present study (depression $\alpha = .91$, anxiety $\alpha = .77$, stress $\alpha = .88$).

Sitting time. Sitting time was assessed using the 10-item Workforce Sitting Questionnaire (Chau, van der Ploeg, Dunn, Kurko, & Bauman, 2011). Participants who reported that they were employed at the time of the survey reported how much time they spent sitting on a typical work day and a typical non-work day while engaged in leisure activities, working, using a computer, watching television, and in transport during the past week. If participants were not working at the time of the survey (n = 726, 39.4% of total sample), they reported time spent sitting while engaged in these activities on a typical day during the past week. For employed participants, time spent sitting was averaged across their work day and non-work day responses. Sitting time scores were calculated as average hours spent sitting daily in each sitting context and overall (Chau et al., 2011). This measure has previously been shown to have acceptable test-retest reliability (ICCs=0.46 – 0.90) and criterion validity against accelerometry (r=0.22 – 0.46) (Chau et al., 2011).

Other personal and behavioural factors. Participants self-reported their sex, age, income, education, job level, and presence of chronic conditions. There were 16 categories for income ranging from $0 to $260,000 annually (with an additional option for 'I don't

know' which was treated as missing data), 11 categories for education ranging from no schooling to postgraduate tertiary studies (including Masters, PhD), and 13 categories for job level including manager/administrator, professional, and labourer/related worker. Presence of chronic conditions was scored as a binary code (0 = no, 1 = yes) based on a series of yes/no responses to having been told by a doctor or other medical professional that they had one of 24 chronic conditions such as coronary heart disease, hypertension, cancer, and irritable bowel syndrome.

Physical activity was assessed using the duration items of the validated Active Australia Survey (Australian Institute of Health and Welfare, 2003; Brown, Burton, Marshall, & Miller, 2008). Participants reported the total time they spent walking, and in moderate and vigorous physical activity for bouts of ten minutes or more during the previous week. Physical activity was calculated as the sum of the reported minutes spent in the three activities with minutes of vigorous physical activity weighted by 2 to account for the additional energy expenditure of these activities (Ainsworth et al., 2000). To control for over-reporting, time spent in activities was truncated to 14 hours and total activity time was truncated to 28 hours before calculating the physical activity variable, as is standard for this measure (Australian Institute of Health and Welfare, 2003).

Data Analyses

The depression, anxiety, and stress variables took on the properties of a Poisson distribution, so medians and quartiles were reported for descriptive purposes as means and standard deviations can be heavily biased by skew and lead to misleading conclusions (e.g., Carlucci & Wright, 2012). Negative binomial models (Hilbe, 2011) were used to test the research questions because a priori analyses showed that these models had significantly better fit than the Poisson regression models. Prior to testing the models, sample medians were imputed for missing data (sitting time: n = 103, 6%; age, sex, education, & job level: n = 188,

10%; income: *n* = 427, 23%; physical activity: *n* = 20, 1%); although post-hoc analyses revealed that the findings were the same when complete-case analyses were used. Inclusion of the job level factor variables resulted in multicollinearity, so these variables were not included in the analyses. Sensitivity analyses confirmed that the relations of depression, anxiety, or stress symptoms to overall sitting time and context-specific sitting time did not differ between employed and unemployed participants (*p*'s: .07 – .99).

The first model tested the relation between overall sitting time with depression, anxiety, and stress symptoms, while accounting for the covariates of physical activity, sex, age, income, education, and presence of chronic conditions. The second model tested the independent relations of context-specific sitting time with depression, anxiety, and stress symptoms, while accounting for the same covariates. Because all the components used to calculate overall sitting time were included in this model, significant main effects can be interpreted as the unique contribution to the relation between sitting time and depression, anxiety, or stress symptoms accounting for the effect of the other components of overall sitting time (Miles & Shevlin, 2001).

For all models, Variance of Inflation Factor (VIF) was used to test severity of multicollinearity, with values of 10.0 or greater indicative of high risk of multicollinearity. The results of negative binomial regression (e.g., coefficients, incident rate ratios) are difficult to interpret when the dependent variable is continuous, as is the case in these models; therefore predicted values for a person with less than typical (M – 1 SD), typical (M), and more than typical (M + 1 SD) sitting time values were used as an indication for effect size. Additionally, relative weights were used to calculate the percentage of the total variability explained by the full model attributable to each independent variable (Nimon & Oswald, 2013). Analyses were conducted with the MASS, car, and stats packages in R version 2.15

(Fox & Weisberg, 2010; R Core Team, 2013; Venables & Ripley, 2002).[20-22] Significance values were set at $p < .05$.

Results

Descriptive statistics for the sample are reported in Table 1. The majority of participants spent between 6.42 and 11.75 hours sitting daily (50%), were female (55%), earned between AUD $41,600 and $130,000 (51%), had at least a year 12 equivalent education (97%), and had 1 or more chronic conditions (67%). Overall sitting time was positively associated with symptom severity of depression and anxiety, but not stress, after accounting for the effects of the other personal and behavioural factors (see Table 2). The models had low risk of multicollinearity (VIFs = 1.02 – 1.36). On the scale from 0-21 with higher score indicative of more severe symptoms, the predicted depression symptom scores for people that sat for 3.97 hours/day (M – 1 SD), 9.97 hours/day (M), and 15.97 hours/day (M + 1 SD) (after accounting for the other model covariates) were 2.78, 2.98, and 3.20, respectively and their predicted anxiety symptom scores were 1.32, 1.62, and 1.98, respectively (see Figure 1). For the depression symptoms model, sitting time accounted for 5% of the variability; whereas sex accounted for 4%, age for 24%, income for 22%, education for 1%, presence of chronic conditions for 14%, and physical activity for 29%. For the anxiety model, sitting time accounted for 27% of the variability; whereas sex accounted for < 1%, age for 11%, income for 25%, education for 1%, presence of chronic conditions for 22%, and physical activity for 14%.

Associations between sitting time during leisure, at work, in transport, while working on a computer and watching television with depression, anxiety, and stress symptom severity are reported in Table 3. Sitting time while using a computer was positively associated with depression (12% of total variability explained) and anxiety symptoms (7% of total variability explained), and time spent sitting while in transport was positively associated with anxiety

(20% of total variability explained) and stress symptoms (8% of total variability explained), after accounting for the other model covariates. These models had low risk of multicollinearity (VIFs = 1.03 – 1.45).

Discussion

The aims of this study were to examine whether overall sitting time and time spent sitting in different contexts was associated with depression, anxiety, and stress symptom severity. It was found that people who spent more time sitting overall had more severe depression and anxiety symptoms than people who sat less, but overall sitting time was not found to be associated with severity of stress symptoms. Additionally, people who spent more time while at a computer had more severe depression and anxiety symptoms than those who sat at a computer less and people who spent more time sitting while in transport had more severe anxiety and stress symptoms than those who sat in transport less.

The effect size of the relation between sitting time and depression symptoms was small, relative to the other personal and behavioural factors included in the model; however sitting time was more strongly related to anxiety symptoms than all other tested factors, including physical activity. The effects of physical activity on depression symptoms are estimated to be larger than the effects of physical activity on anxiety symptoms (Rethorst, Wipfli, & Landers, 2009; Wipfli, Rethorst, & Landers, 2008). It may be that limiting sitting time has the reverse consequences on mental health, being more beneficial for reducing anxiety rather than depression symptoms.

The results of this study correspond with previous research identifying links between overall sitting time and depression symptoms (Arredondo et al., 2013; Peeters et al., 2012; Teychenne et al., 2010a, 2010b; van Uffelen et al., 2013), and extend this body of research by also examining the association of sitting time with anxiety and stress symptoms. That overall sitting time was found to be significantly associated with depression and anxiety but not

stress symptom severity suggests that the link between sitting time and mental health may be restricted to relatively enduring negative affective symptoms (i.e., depression and anxiety), and may not generalize to states of nervous arousal and tension (i.e., stress) (Antony et al., 1998). It is also noteworthy that, independent from the effects of sitting time, physical activity was associated with mental health symptoms in the current study. These findings contribute to evidence that sitting time and physical activity impact health outcomes in different ways (Owen, Healy, Matthews, & Dunstan, 2010).

Previous research suggests that more time spent in front of screens (Atkin et al., 2012; de Wit et al., 2011; Hamer et al., 2010; Sanchez-Villegas et al., 2008) and longer commuting time (Stutzer & Frey, 2008) is associated with poorer mental health in adults. The results of the current study suggest that depressive symptoms experienced in these settings may be linked to the context rather than the amount of time spent sitting (in the context). It may be, for example, that standing on a bus while commuting or using a standing desk while at a computer for a long time would also be linked to poor mental health; although, recent evidence has shown that using a sit-stand workstation can lead to reduced sitting time and improved mood (Pronk, Katz, Lowry, & Payfer, 2012).

Time spent sitting while watching television was tested separately from time spent sitting while using a computer in the present study, and only time spent while using a computer was found to be associated with poor mental health. Previous research has also linked computer use to poor mental health (Huang, 2010); however this evidence is mixed (Dickinson & Gregor, 2006; White et al., 1999) and the effects are likely dependent on several factors such as age (Chen & Persson, 2002) and the computer-based activities (e.g., social networking vs work email) (Gordon, Juang, & Syed, 2007; Morgan & Cotten, 2003). De Wit and colleagues (2011) tested the effects of computer use and watching television independently and found that computer use was associated with higher risk of depressive

disorders, whilst television watching was associated with higher risk of anxiety disorders. The present results add to the accumulating research demonstrating that the association between time spent in front of a screen and mental health is multifaceted. The complex relation between screen time and mental health further highlights the importance of disentangling the consequences of the behaviour of sitting from the consequences of the sitting contexts to better understand the impacts on mental health outcomes.

Limitations & Conclusions

Previous research suggests that the positive associations between sitting time and depression symptoms found in cross-sectional studies may not be present in prospective (van Uffelen et al., 2013) or intervention studies (Teychenne et al., 2010b). The findings of this cross-sectional study should not be used as an indicator of causality (L. Cohen, Manion, & Morrison, 2011) or of clinical significance (Jacobson & Truax, 1991); instead, these findings should act as a precursor for future prospective and experimental designs testing the longitudinal associations between sitting time and mental health, the direction of the associations, as well as the effects of limiting sitting time on mental health. It is important to test whether sitting time relates prospectively to depression, anxiety, and stress symptom severity, experimentally-manipulated changes in sitting time lead to clinically-relevant changes in these mental health symptoms, and to clarify the underlying mechanisms of these associations. It is important to test the plausible alternative possibility that poor mental health causes one to sit more often. It may be that people with poorer mental health may sit more as a result of physical comorbidities, fatigue, hopelessness, distress, fear, lack of motivation, or social isolation (Clark & Watson, 1991; Moussavi et al., 2007; Sareen, Cox, Clara, & Asmundson, 2005).

The effect sizes of the present study were relatively small, but it is important to take into account that the models were adjusted for multiple other personal and behavioural

factors. The inclusion of a large number of covariates helps to reduce the likelihood that the tested relations are the result of alternative explanations; however it can lead to underestimations of effect size magnitude (Courville & Thompson, 2001). It is of note that even after accounting for these factors, sitting time was found to be associated with depression and anxiety symptoms.

This study was conducted on a convenience sample of highly functioning Australian adults with overall sitting times similar to, or slightly more than, objectively monitored sedentary time of other adult normative populations (Healy et al., 2008; Matthews et al., 2008). Additionally, the sample was an overrepresentation of older people based on the entire eligible population (all adults in Australia). Further research is needed to determine if these associations generalize to more heterogeneous populations. Although appropriate for population-based studies (Bauman, Phongsavan, Schoeppe, & Owen, 2006), self-report measures have limitations. There may be biases in how people report their behaviour, so future research is needed that utilizes objective behavioural measures of sitting time to use, ideally in concordance with context-specific self-reported details of the sitting behaviour. Additionally, although the response rate for this study was higher than typical for online survey research (Cook et al., 2000), it cannot be ruled out that there were systematic differences between responders and non-responders of the survey that may have impacted the findings.

In conclusion, advancements in research addressing the mental health consequences of sitting behaviour are important so that this health behaviour is not overlooked in mental health interventions or public health promotion efforts. This study adds to our understanding of the relation between sitting time and mental health by demonstrating that sitting behaviour is linked with poor mental health, and that a lot of time spent sitting whilst in transport or at a computer may be particularly linked to poor mental health. Experimental and longitudinal

research tracking how changes in sitting time impact changes in mental health will be instrumental for determining whether intervening with sitting time may be an effective method for improving mental health and reducing the societal burden of depression, anxiety, or stress symptoms (S. Cohen & Williamson, 1991; Kalia, 2002; Kiecolt-Glaser, McGuire, Robles, & Glaser, 2002).

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Figure Captions

Figure 1. The significant associations of overall sitting time with depression and anxiety symptoms after adjusting for other personal and behavioural factors

Table 1.

Descriptive Statistics of Study Sample

Continuous Study Variable	Median	*25% – 75%*
Depression Symptoms	2.00	0.00 – 4.00
Anxiety Symptoms	1.00	0.00 – 2.00
Stress Symptoms	3.00	1.00 – 6.00
Overall Sitting Time, hrs/day	8.75	6.42 – 11.75
Leisure Sitting, hrs/day	1.00	0.50 – 2.00
Work Sitting, hrs/day	2.00	0.00 – 4.00
Computer Sitting, hrs/day	1.50	0.75 – 2.50
Television Sitting, hrs/day	2.50	1.50 – 3.50
Transport Sitting, hrs/day	0.75	0.33 – 1.50
Physical Activity, hrs/day	0.57	0.21 – 1.29
Age (yrs)	58	48 – 66
Categorical Study Variables	*n*	%
Sex		
Male	746	45%
Female	909	55%
Income (quartiles)		
< $41,599	375	26%
$41,600 - $77,999	371	26%
$78,000 - $129,999	349	25%
> $130,000	321	23%
Education (quartiles)		
≤ Year 12 equivalent and Technical studies	660	40%
Tertiary Studies, Diploma, Advanced Degree	289	17%
Tertiary Studies, Bachelor Degree	351	21%
Tertiary Studies, Graduate Diploma, Postgraduate including Masters, PhD	355	21%
Presence of Chronic Conditions		
None	595	33%
1 or more	1211	67%

Table 2.

Association of Overall Sitting Time, and Adjusting Factors, with Depression, Anxiety, and Stress Symptom Severity

	Depression		Anxiety		Stress	
	Coefficient	*95% CI*	Coefficient	*95% CI*	Coefficient	*95% CI*
Intercept	2.00*	1.67 – 2.34	1.06*	0.72 – 1.40	2.22*	1.96 – 2.48
Sitting Time	0.01*	0.00 – 0.02	0.03*	0.02 – 0.04	0.01	-0.00 – 0.02
Physical Activity	-0.23*	-0.29 – -0.16	-0.16*	-0.22 – -0.09	-0.11*	-0.17 – -0.06
Sex	0.19*	0.07 – 0.31	-0.06	-0.19 – 0.07	0.01	-0.09 – 0.10
Age	-0.02*	-0.02 – -0.01	-0.01*	-0.02 – -0.01	-0.02*	-0.02 – -0.01
Income						
$41,600 - $77,999	-0.15	-0.31 – 0.01	-0.16	-0.32 – 0.01	-0.12	-0.25 – 0.00
$78,000 - $129,999	-0.36*	-0.53 – -0.19	-0.35*	-0.53 – -0.17	-0.20*	-0.33 – -0.06
> $130,000	-0.40*	-0.58 – -0.22	-0.48*	-0.67 – -0.29	-0.19*	-0.33 – -0.05
Education						
Tertiary Studies, Diploma, Advanced Degree	0.07	-0.10 – 0.24	-0.12	-0.30 – 0.06	-0.06	-0.19 – 0.08
Tertiary Studies, Bachelor Degree	-0.17	-0.33 – 0.01	-0.16	-0.33 – 0.01	-0.10	-0.22 – 0.03
Tertiary Studies, Graduate Diploma, Postgraduate including Masters, PhD	0.01	-0.15 – 0.18	-0.00	-0.17 – 0.17	0.04	-0.08 – 0.17
Presence of Chronic Conditions	0.30*	0.17 – 0.44	0.41*	0.26 – 0.55	0.22*	0.12 – 0.33
Residual Deviance	2009.48	—	1909.92	—	2154.42	—
Dispersion (θ)	0.85	*SE* = 0.04	0.93	*SE* = 0.05	1.48	*SE* = 0.08

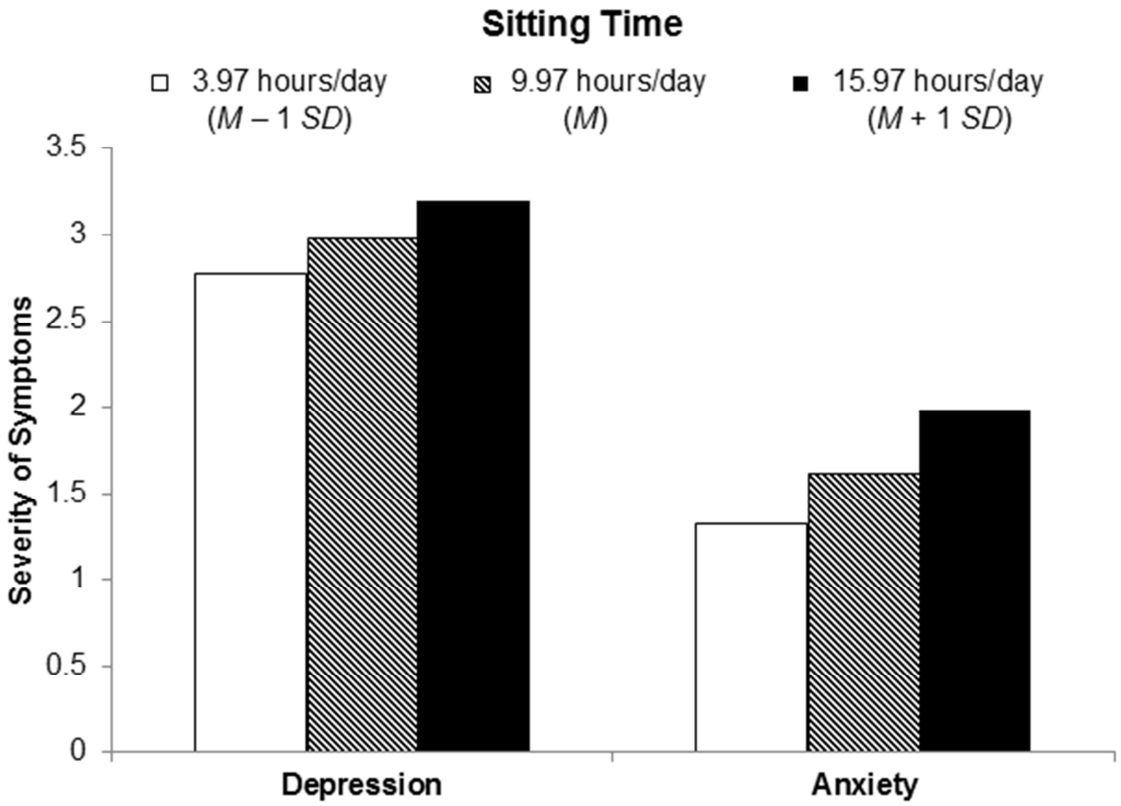
Note. Negative binomial regression, N = 1,843. Reference categories: Sex: female, Income: < $41,599, Education: ≤ Year 12 equivalent and Technical studies, Presence of Chronic Conditions: none. * $p < .05$

Table 3.

Association of Context-Specific Sitting Time, and Adjusting Factors, with Depression, Anxiety, and Stress Symptom Severity.

	Depression		Anxiety		Stress	
	Coefficient	*95% CI*	Coefficient	*95% CI*	Coefficient	*95% CI*
Intercept	2.04*	1.71 – 2.39	1.09*	0.75 – 1.43	2.21*	1.94 – 2.47
Leisure Sitting	-0.00	-0.04 – 0.03	0.01	-0.02 – 0.05	-0.00	-0.03 – 0.03
Work Sitting	-0.01	-0.03 – 0.02	0.02	-0.00 – 0.05	0.02	-0.00 – 0.04
Computer Sitting	0.04*	0.01 – 0.07	0.03*	0.00 – 0.06	0.00	-0.02 – 0.03
Television Sitting	0.00	-0.03 – 0.03	0.00	-0.03 – 0.03	-0.02	-0.04 – 0.00
Transport Sitting	0.03	-0.01 – 0.07	0.09*	0.05 – 0.13	0.05*	0.02 – 0.08
Physical Activity	-0.23*	-0.29 – -0.16	-0.17*	-0.24 – -0.10	-0.12*	-0.17 – -0.07
Sex	0.18*	0.06 – 0.30	-0.06	-0.19 – 0.06	0.01	-0.09 – 0.10
Age	-0.02*	-0.02 – -0.01	-0.01*	-0.02 – -0.01	-0.01*	-0.02 – -0.01
Income						
$41,600 - $77,999	-0.14	-0.30 – 0.02	-0.16	-0.33 – 0.00	-0.13*	-0.25 – -0.00
$78,000 - $129,999	-0.34*	-0.51 – -0.17	-0.34*	-0.52 – -0.17	-0.21*	-0.34 – -0.07
> $130,000	-0.37*	-0.55 – -0.18	-0.49*	-0.68 – -0.30	-0.21*	-0.35 – -0.07
Education						
Tertiary Studies, Diploma, Advanced Degree	0.06	-0.10 – 0.24	-0.13	-0.31 – 0.05	-0.05	-0.19 – 0.08
Tertiary Studies, Bachelor Degree	-0.17*	-0.33 – -0.01	-0.17	-0.34 – 0.00	-0.11	-0.24 – 0.02
Tertiary Studies, Graduate Diploma, Postgraduate including Masters, PhD	0.01	-0.16 – 0.17	-0.03	-0.20 – 0.15	0.02	-0.11 – 0.14
Presence of Chronic Conditions	0.29*	0.15 – 0.42	0.40*	0.26 – 0.55	0.23*	0.12 – 0.33
Residual Deviance	2009.32	__	1910.18	__	2155.02	__
Dispersion (θ)	0.85	*SE* = 0.04	0.94	*SE* = 0.06	1.50	*SE* = 0.07

Note. Negative binomial regression, N = 1,843. Reference categories: Sex: female, Income: < $41,599, Education: ≤ Year 12 equivalent and Technical studies, Presence of Chronic Conditions: none. * $p < .05$



- Negative binomial regression was used to test sitting time – mental health relations
- Sitting time was significantly associated with more severe depression symptoms
- Time spent sitting at a computer was associated with depression and anxiety symptoms
- Time spent sitting in transport was associated with anxiety and stress symptoms