Associations between physical activity, television viewing and postnatal depressive symptoms amongst healthy primiparous mothers

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Associations between physical activity, television viewing and postnatal depressive symptoms amongst healthy primiparous mothers

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**Article info**

**Abstract**

**Background:** Postnatal depression is a serious illness in new mothers. In the general population, physical activity (PA) has been found to reduce the risk of depression, whilst sedentary behaviour (SB; in particular television viewing) has been linked to higher levels of depressive symptoms, yet little is known regarding associations between PA, SB and postnatal depression. This study aimed to investigate associations between PA, television viewing and postnatal depressive symptoms in healthy primiparous mothers.

**Methods:** Cross-sectional survey data were provided by 406 first-time mothers (approximately 3-months postpartum) enrolled in the Melbourne InFANT Extend trial (2012/2013). Women self-reported PA (time spent walking for leisure and transport, and other moderate and vigorous PA), television viewing, and depressive symptoms (CES-D 10). Random intercept linear models examined associations between PA, television viewing and depressive symptoms.

**Results:** In crude models total PA was inversely associated with risk of postnatal depressive symptoms (B = -0.122; 95% CI = -0.24, -0.01). In models adjusted for key sociodemographic and behavioural covariates the association did not remain statistically significant. No other associations between PA, television viewing and postnatal depressive symptoms were evident.

**Conclusions:** Postnatal depressive symptoms may not be related to PA and television viewing in the same way that these behaviours predict depressive symptoms in the general population. Further investigation of the specific domains of PA, as well as different types/contexts of SB and their respective associations with postnatal depressive symptoms is warranted in order to better inform development of targeted interventions aimed at enhancing postnatal mental health.

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It is well-recognised that physical activity plays an important role in enhancing and maintaining women's physical health in the postpartum period (Davenport, Giroux, Sopper, & Mottola, 2011; O’Toole, Sawicki, & Artal, 2003). Currently it is recommended that all adults, including pregnant and postpartum women (without complications) undertake a minimum of 150 min (and up to 300 min) of moderate-intensity physical activity per week for health benefits (Department of Health, 2014). However, a large percentage of adults (43% (Department of Health, 2012)), particularly postpartum women (64% (Albright, Maddock, & Nigg, 2005)) do not achieve these guidelines. In addition to the physical health benefits that physical activity provides (e.g. maintaining healthy weight, reducing the risk of diabetes and cardiovascular disease) (Bauman, 2004), research has shown that physical activity, particularly that which is undertaken in leisure-time, has positive effects on mental health (e.g. reducing the risk of depression) among adults in the general population (Teychenne, Ball, & Salmon, 2008). A small body of evidence has suggested physical activity may also be beneficial for reducing the risk of postnatal depression (Teychenne & York, 2013); however, this research is still in its infancy.

Postnatal depression affects around 13% of new mothers (O’Hara...
& Swain, 1996), although estimates vary between 4 and 73%, dependant on the sample and measure used to assess depression (Leahy-Warren & McCarthy, 2007). Furthermore, incidence rates of postnatal depression have been estimated to be at 14% (Gaynes et al., 2005). Postnatal depression is often associated with decreased enjoyment in interests and activities, social withdrawal, insomnia and poor appetite in new mothers (Lee & Chung, 2007). In some instances it leads to infant-harm thoughts and/or actions (Lee & Chung, 2007). Further, evidence suggests that postnatal depression may impact on infants’/young children’s cognitive (NICHD Early Child Care Research Network., 1999), behavioural (Dawson et al., 2003; Goodman et al., 2011; NICHD Early Child Care Research Network, 1999), and social development (NICHD Early Child Care Research Network, 1999), as well as the child’s mental health (Goodman et al., 2011). Therefore, it is important to identify strategies to reduce new mothers’ risk of this incapacitating illness, which has been associated with a reduced quality of life for both mothers and babies (Lee & Chung, 2007).

Sedentary behaviours, defined as sitting behaviours that expend approximately 1–1.5 METs (Ainsworth et al., 2000) (e.g. sitting watching television, sitting at the computer or whilst driving), have been shown to comprise an independent risk factor for various chronic physical health conditions, such as cardiovascular disease and type 2 diabetes (Proper, Singh, van Mechelen, & Chinapaw, 2011), in the general population. Further, recent research has suggested the existence of a positive association between sedentary behaviour (in particular television viewing) and risk of depression amongst adults in the general population (Teychenne, Ball, & Salmon, 2010). Only two studies have examined the association between sedentary behaviour and postnatal depression (Herring et al., 2008; Vernon, Young-Hyman, & Looney, 2010), with one of those studies showing a positive relationship in new mothers (Vernon et al., 2010); whilst the other showed no association (Herring et al., 2008).

Given the adverse impact postnatal depression can have on the mother, baby and families of those affected, it is imperative that research identifies modifiable behaviours that might assist in reducing the risk of postnatal depression. Thus, this study aimed to investigate the association between physical activity, television viewing and postnatal depressive symptoms in healthy primiparous mothers. It was hypothesised that physical activity would be inversely associated with postnatal depressive symptoms, whilst television viewing would be positively associated with symptoms.

1. Methods

Analyses were based on self-reported, cross-sectional survey data from the InFANT (Infant Feeding, Activity and Nutrition Trial) Extend study (2012/2013), whereby first-time mothers were recruited from seven local government areas (LGAs) across Melbourne of varying levels of socioeconomic disadvantage. Baseline data, completed when mothers were approximately 3-months postpartum, was used for analyses in this study.

1.1. Participants

Participants were recruited from first-time parents groups across Melbourne neighbourhoods of varying socio-economic position in 2012–2013. A total of nine LGAs were approached for recruitment and seven agreed to participate. The SEIFA index (Australian Bureau of Statistics, 2003) was used to categorise each LGA according to area-level disadvantage (low, medium, high). Group eligibility criteria included a minimum of eight consenting participants within mid and high socioeconomic LGAs or six consenting participants within the lower socioeconomic LGAs (in order to compensate for low response rates of low SEP populations). Participating women needed to be English literate. If parents groups declined to participate, another group was then approached to participate. In total, 531 women from 62 parent groups (28 = low, 20 = medium, 14 = high SEP) were approached and 477 women (90%) agreed to participate.

Of the respondents, 15 women were excluded from the analyses as they were not first-time mothers, six were excluded as they had non-singleton pregnancies and six were excluded as they did not provide detail regarding parity. This exclusion criteria was implemented for the following reasons: 1) The InFANT Extend RCT was an intervention targeting specifically first time mothers and their children and therefore women who were not first time mothers yet attended the first time parent groups were not included in the study analyses; 2) Multiparous women are more likely to experience postpartum depression (Mayberry, Horowitz, & Declercq, 2007) and their physical activity levels are more likely to be significantly compromised (Fell, Joseph, Arnsen, & Dodds, 2009; Ning et al., 2003) compared to primiparous women; 3) Multiparous women are more likely to experience more significant weight gain (Cohen et al., 2009) and complications like preeclampsia (Conrod, Hickok, Zhu, Easterling, & Daling, 1995), and gestational diabetes (Rauh-Hain et al., 2003). Women may each adversely impact on ability to be active (Durham et al., 2011; Hoedjes et al., 2012; Smith, Cheung, Bauman, Zeble, & McLean, 2005). A further two participants were excluded as their survey data were missing. Furthermore, since severely impaired physical health might impact both physical activity and depression and confound associations, participants who reported only poor/fair perceived health (n = 41) or had missing data on that variable (n = 1) were excluded, leaving a total of 406 with data for inclusion in analyses.

1.2. Procedures

The InFANT Extend trial was approved by the Deakin University Human Research Ethics Committee (2011-029) (2007-175) (11/02/ 2011) and the Victorian Government Department of Human Services, Office for Children Research Co-ordinating Committee. After women provided written consent, participants completed questionnaires that were distributed at the recruitment visit.

1.3. Measures

1.3.1. Predictor variables

1.3.1.1. Physical activity. Physical activity was assessed using the Active Australia Survey (Australian Institute of Health and Welfare, 2003), a reliable and valid self-report measure of physical activity in adults (Brown, Bauman, Timperio, Salmon, & Trost, 2002). Women estimated the duration of time (i.e. number of times and total hours and minutes) they spent in the last week 1) walking for exercise and to get from place to place (i.e. leisure-time and transport-related physical activity), 2) undertaking other moderate-intensity physical activity (excluding domestic chores/gardening), and 3) undertaking vigorous-intensity physical activity (excluding domestic chores/gardening). Total physical activity time (min/week) was calculated by summing the total time spent walking, time spent in moderate and in vigorous physical activity.

1.3.1.2. Television viewing. Television viewing was assessed using a reliable and valid self-report measure (Salmon, Owen, Crawford, Bauman, & Sallis, 2003). Women estimated the number of hours and minutes they spent sitting down and watching television and DVD’s/videos on a usual weekday, as well as weekend day, and the weekly total was then calculated by multiplying the weekday duration by five then adding this to the weekend day duration.
which was multiplied by two).

1.3.2. Outcome variable

Depressive symptoms were measured using the 10-item version of the Centre for Epidemiologic Studies Depression Scale (CES-D) (Radloff, 1977), which has been shown to have good internal reliability in postpartum women (Beeghly et al., 2003). This measure includes questions that relate to symptoms of depression that may have been experienced in the past week, and respondents rate themselves on a 4-point severity scale (ranging from ‘rarely/none of the time’ to ‘all of the time’). Responses were summed and analysed as a continuous variable. Scores range from 0 to 30, with higher scores indicating a higher presence of depressive symptoms.

1.4. Covariates

Maternal dietary intake over the preceding 12 months was assessed using the Cancer Council of Australia’s Dietary Questionnaire for Epidemiological Studies (DQES version 3.1) 137-item Food Frequency Questionnaire (Cancer Council of Victoria, 2014) and adherence to the 2013 Australian Dietary Guidelines was subsequently assessed using the Dietary Guideline Index (McNaughton, Bail, Crawford, & Mishra, 2008) as a measure of diet quality. Furthermore, self-reported highest education level (categorised as did not complete high school; completed year high school or equivalent/trade/apprenticeship/certificate/diploma; completed tertiary education), body mass index (BMI; height and weight measured by trained researchers), country of birth, age, marital status, obesity, age at child birth, sex, and marital status were modelled. Maternal dietary intake over the preceding 12 months was assessed using the Cancer Council of Australia’s Dietary Questionnaire for Epidemiological Studies (DQES version 3.1) 137-item Food Frequency Questionnaire (Cancer Council of Victoria, 2014) and adherence to the 2013 Australian Dietary Guidelines was subsequently assessed using the Dietary Guideline Index (McNaughton, Bail, Crawford, & Mishra, 2008) as a measure of diet quality. Furthermore, self-reported highest education level (categorised as did not complete high school; completed year high school or equivalent/trade/apprenticeship/certificate/diploma; completed tertiary education), body mass index (BMI; height and weight measured by trained researchers), country of birth, age, marital status, obesity, age at child birth, sex, and marital status were modelled. Maternal dietary intake over the preceding 12 months was assessed using the Cancer Council of Australia’s Dietary Questionnaire for Epidemiological Studies (DQES version 3.1) 137-item Food Frequency Questionnaire (Cancer Council of Victoria, 2014) and adherence to the 2013 Australian Dietary Guidelines was subsequently assessed using the Dietary Guideline Index (McNaughton, Bail, Crawford, & Mishra, 2008) as a measure of diet quality. Furthermore, self-reported highest education level (categorised as did not complete high school; completed year high school or equivalent/trade/apprenticeship/certificate/diploma; completed tertiary education), body mass index (BMI; height and weight measured by trained researchers), country of birth, age, marital status, obesity, age at child birth, sex, and marital status were modelled.

1.5. Missing data

Cases were excluded where they did not contain complete independent or dependant variables for the specific analyses of interest. Variables with missing data included; Television viewing (n = 1), walking (n = 1), moderate-intensity physical activity (n = 2), total physical activity (n = 3), depressive symptoms (n = 5), education (n = 1), body mass index (n = 28), baby sleep time (n = 6), and diet quality (n = 11).

1.6. Statistical analysis

Analyses were performed using STATA version 12. Univariate analyses examined the distributions of physical activity (i.e. walking, moderate-intensity, and vigorous-intensity and total physical activity), television viewing, demographic variables, and depressive symptoms. The distributions of each variable were tested for normality and consequently three variables (television viewing, walking time and total physical activity) were transformed as necessary to meet model assumptions (using square root transformations). Random intercept linear models, with mothers’ group as the level-2 identifier, examined crude associations between each of the physical activity (walking, moderate-intensity, vigorous-intensity, and total physical activity) and television viewing predictors, and depressive symptoms. Further models were tested for each predictor, with adjustment for potential confounders education, BMI, country of birth, age, marital status, baby sleeping time (sleep quality), and diet quality.

2. Results

The socio-demographic characteristics of participants and their mean physical activity and television viewing time is presented in Table 1. The mean age of participants was 32 (SD = 4.25). About half the women were classified as overweight/obese (49%) and most were married or in a defacto relationship (96%). More than half of women had completed a tertiary degree (60%) and the majority were born in Australia (76%). Table 2 presents the associations (crude and adjusted) between television viewing, physical activity and postnatal depressive symptoms. In crude models total physical activity was inversely associated with postnatal depressive symptoms (B = −0.122; 95% CI = −0.24, -0.01). However, in the adjusted model the association did not remain statistically significant. No other associations between physical activity, television viewing and postnatal depressive symptoms were evident.

3. Discussion

This paper aimed to investigate the association between physical activity, television viewing and postnatal depressive symptoms among healthy primiparous mothers. Given that the small body of research which has investigated the relationship between physical activity and risk of postnatal depression has on balance suggested an inverse association (Teychenne & York, 2013), it was hypothesised that physical activity would be inversely associated with postnatal depressive symptoms.

Table 1

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight status (BMI)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not overweight (&lt;25)</td>
<td>192</td>
<td>51</td>
</tr>
<tr>
<td>Overweight (25–29.9)</td>
<td>113</td>
<td>30</td>
</tr>
<tr>
<td>Obese (≥30)</td>
<td>73</td>
<td>19</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married/defacto</td>
<td>390</td>
<td>96</td>
</tr>
<tr>
<td>Separated/divorced/widowed</td>
<td>6</td>
<td>1.5</td>
</tr>
<tr>
<td>Never married</td>
<td>10</td>
<td>2.5</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not complete high school</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td>Completed high school/trade certificate/diploma</td>
<td>149</td>
<td>37</td>
</tr>
<tr>
<td>Completed tertiary education</td>
<td>243</td>
<td>60</td>
</tr>
<tr>
<td>Country of birth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>310</td>
<td>76</td>
</tr>
<tr>
<td>Other</td>
<td>96</td>
<td>24</td>
</tr>
</tbody>
</table>

Table 2

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>N</th>
<th>95% CI</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Television viewing</td>
<td>25.2 h/week</td>
<td>2.95</td>
<td></td>
</tr>
<tr>
<td>Walking</td>
<td>4.3 h/week</td>
<td>3.24</td>
<td></td>
</tr>
<tr>
<td>Moderate physical activity</td>
<td>0.61 h/week</td>
<td>1.33</td>
<td></td>
</tr>
<tr>
<td>Vigorous physical activity</td>
<td>1.08 h/week</td>
<td>1.88</td>
<td></td>
</tr>
<tr>
<td>Total physical activity</td>
<td>5.98 h/week</td>
<td>4.63</td>
<td></td>
</tr>
</tbody>
</table>

BMI, Body Mass Index; CES-D 10, Centre for Epidemiologic Studies Depression Scale. Scores range from 0 to 30, with higher scores reflecting higher levels of depressive symptoms. DGI, dietary guideline index. Scores range from 0 to 110, with higher scores reflecting greater diet quality.
postnatal depressive symptoms. However, the current study found no association between physical activity and postnatal depressive symptoms, regardless of the intensity of physical activity examined. These findings are consistent with those of Boury, Larkin, and Krummel (2004) who found no association between physical activity (assessed across domains) and postnatal depressive symptoms in women. Of the previous studies that have found an inverse relationship between postpartum physical activity and depressive symptoms (n = 10) (Armstrong & Edwards, 2003, 2004; Craike, Coleman, & MacMahon, 2010; Da Costa et al., 2009; Haas et al., 2005; Heh, Huang, Ho, Fu, & Wang, 2008; Herring et al., 2008; Koltyn & Schultz, 1997; Norman, Sherburn, Osbourne, & Galea, 2010; Vernon et al., 2010), all but one (Vernon et al., 2010) assessed leisure-time physical activity, suggesting that physical activity undertaken for leisure may be associated with lower risk of postnatal depression. However, since the measure used in the current study combined leisure and transport-related physical activity, domain-specific associations between physical activity and postnatal depressive symptoms could not be disentangled, which may partly explain non-significant findings. Thus there is a need for future studies to examine the link between specific domains of physical activity (i.e. separately for leisure, transport, work and domestic) and postnatal depressive symptoms.

It has been suggested that postnatal depression may be triggered by biological factors such as family history (and past history) of depression (Alasoom & Koura, 2014), as well as a number of other factors including: sleep disturbances/poor sleep quality (Okun et al., 2011), stressful life events (Katon et al., 2014), inability to cope, feeling incompetent, loss of identity and social isolation (Letourneau et al., 2012). Although not dissimilar to potential causes of depression in the general population (Lopezri, Hood, & Drummond, 2013), these major contributing factors are often heightened during the postpartum period. Therefore, the ability to overcome these factors (e.g. poor sleep quality, stress, loss of identity etc.) through the use of physical activity as a treatment/mangement option for postpartum women, could potentially be compromised. Further studies investigating the associations between physical activity and postnatal depression and potential underlying mechanisms is warranted.

Given much of the existing evidence regarding the association between sedentary behaviour (in particular television viewing) and risk of postnatal depression has pointed towards a positive association in the general population (Teychenne et al., 2008), it was hypothesised in the current study that television viewing would be positively associated with postnatal depressive symptoms. However, results showed no association between television viewing and postnatal depressive symptoms, which is consistent with findings from one previous longitudinal study that assessed the link between television/video viewing and risk of depression (Herring et al., 2008). Together, this may suggest that the relationship between television viewing and depression is different for postpartum women compared to the general population. New mothers may use television viewing as a form of relaxation and time to “escape”, in which case television viewing may not be detrimental to mental health. This notion is supported by previous research amongst socioeconomically disadvantaged women (with depressive symptoms) that found women would use television viewing as a coping strategy to “switch off” (Teychenne, Ball, & Salmon, 2011).

Since the current study used television viewing as a proxy measure of sedentary behaviour, it is unknown whether analyses of other sedentary behaviours (e.g. sitting at the computer, sitting using a smartphone/tablet, overall sitting time) would have yielded different results. Just one other study (Vernon et al., 2010) has previously assessed the relationship between sedentary behaviour (overall sitting time) and postnatal depressive symptoms, and found a positive association (i.e. higher levels of sitting were associated with higher levels of depressive symptoms). It would be assumed that overall sitting time amongst postpartum women would be high, given the long periods women spend feeding their newborns and therefore it is important that studies distinguish the type and context of sedentary behaviour in order to better understand the relationship with postnatal mental health. Examining available literature on other postnatal mental health/well-being indicators, one study amongst new mothers (0–18 months postpartum) showed that time spent at the computer “mummy blogging” was indirectly linked to maternal well-being through enhancing perceived connectedness and social support (McDaniel, Coyne, & Holmes, 2012). In contrast, a study amongst new parents (9-months postpartum) found that the frequency of visits to social networking (Facebook) accounts was associated with higher levels of parental stress in mothers (Bartholomew, Schoppe-Sullivan, Glassman, KampDush, & Sullivan, 2012). These findings suggest that the relationship between sedentary behaviour such as computer/tablet/smartphone use and postnatal mental health is complex and context-dependent, and requires further research to confirm findings.

Of interest in the current study was that sleep quality was by far the strongest covariate included in analyses, being strongly correlated with both physical activity (p = <0.001) and depressive symptoms (p = <0.001). Although not a key focus of the paper, this finding may suggest that future interventions aimed at improving mental health of postpartum women through the promotion of physical activity may need to consider including strategies for improving or coping with poor sleep quality. Such strategies may include providing tips via online forums, websites or brochures about optimising mothers sleep particularly during the early postpartum stages (e.g. sleeping when your child sleeps [during the day and night], calling on social support/help [paid or unpaid], and highlighting the benefits of physical activity for increasing energy levels and improving sleep in new mothers). Poor sleep quality has been previously linked to low levels of physical activity (Cramp & Bray, 2011) and higher risk of postnatal depression (Huang, Carter, & Guo, 2004). Further investigation, such as mediating analyses to examine the impact of sleep quality on the relationship

Table 2
Random intercept linear analyses examining associations between television viewing, physical activity and postnatal depressive symptoms.

<table>
<thead>
<tr>
<th>Behaviour</th>
<th>Crude models</th>
<th>Adjusted modelsa</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>95% CI</td>
<td>P Value</td>
</tr>
<tr>
<td>Television viewing</td>
<td>−0.013</td>
<td>−0.11, 0.09</td>
</tr>
<tr>
<td>Walking</td>
<td>−0.104</td>
<td>−0.21, 0.00</td>
</tr>
<tr>
<td>Moderate physical activity</td>
<td>−0.001</td>
<td>−0.003, 0.001</td>
</tr>
<tr>
<td>Vigorous physical activity</td>
<td>−0.001</td>
<td>−0.002, 0.001</td>
</tr>
<tr>
<td>Total physical activity</td>
<td>−0.122</td>
<td>−0.24, −0.01</td>
</tr>
</tbody>
</table>

Boldface indicates statistical significance (p < 0.05).

a Additionally adjusted for age, education, country of birth, body mass index (BMI), marital status, baby sleep time (hours per/night), and diet quality.
between physical activity and postnatal depressive symptoms may be useful for informing the development of targeted multi-component intervention strategies for enhancing new mothers’ mental health.

Limitations of this research should be acknowledged. Firstly, self-report measures were used for assessing both predictor and outcome variables and therefore risk reporting bias and recall difficulties. Although the physical activity measure used was valid and reliable (Brown et al., 2002), behaviours were assessed only for the ‘past week’ which may not capture ‘usual’ physical activity levels, particularly in the early postpartum stage where women are establishing new routines (Demissie et al., 2011). Secondly, the cross-sectional study design did not allow for direction of relationships or causality to be determined. Women were assessed at 3-months postpartum, which may have been too early for women to have re-established physical activity routines. Assessment at multiple time-points (i.e. 3-, 6-, 12-months postpartum) would provide more comprehensive information regarding postpartum physical activity levels. Thirdly, participants reported lower levels of depressive symptoms compared to those found in a large meta-analysis examining rates of postnatal depression (O’Hara & Swain, 1996). For example, only 7% of women in our study scored ≥10 on the CES-D 10 (Radloff, 1977) which indicates being at risk of depression, which is about half of the prevalence found by O’Hara and Swain (13%) (1996). Further, there were no extreme scores on the depression scale in the present study, indicating that most of the sample had relatively good mental health. This is not surprising given the recruitment method (via first-time mothers groups). Only about two-thirds of women attend their mothers’ group sessions (KPMG, 2006; Scott, Brady, & Glynn, 2001), and speculatively those with poor mental health (e.g. major depression) may be less likely to attend. Moreover, anti-depressant medication use was not assessed in this study and therefore analyses were unable to control for this potentially confounding factor. Finally, the sample was limited to primiparous mothers who considered themselves in good general health and therefore results may not be generalised to multiparous mothers or mothers with poor general health.

Strengths of the study include the high response rate (90%) which increases the generalizability of results. Further, the large sample allowed analyses to control for a number of important confounding factors including sleep quality, which few previous studies examining the physical activity-postnatal depression relationship have done.

In conclusion, findings of this study suggest that postnatal depressive symptoms may not be related to physical activity and television viewing in the same way that these behaviours predict depressive symptoms in the general population. Further investigation of the specific domains of physical activity, as well as different types/contexts of sedentary behaviour and their respective associations with postnatal depressive symptoms is warranted in order to better inform development of targeted interventions aimed at enhancing postnatal mental health.

Competing interests

The authors declare that they have no competing interests.

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