



## Original research

## Physical activity, leisure-time screen use and depression among children and young adolescents



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## ABSTRACT

**Objectives:** Adolescent mental disorders remain a relatively neglected area of research, despite evidence that these conditions affect youth disproportionately. We examined associations between physical activity, leisure-time screen use and depressive symptoms among Australian children and adolescents.

**Design:** Large cross-sectional observational study.

**Methods:** Self-reported physical activity and leisure-time screen behaviours, and depressive symptoms using the Short Mood and Feeling Questionnaire were assessed in 8256 students aged 10–16 years (mean age = 11.5 years, SD = 0.8).

**Results:** Thirty three percent of the sample reported moderate to high depressive symptoms, with rates higher among females (OR = 1.18; 95% CI: 1.02, 1.36;  $p = 0.001$ ). Increased opportunities to be active at school outside class (OR = 0.70; 0.58, 0.85;  $p < 0.001$ ), being active in physical education classes (OR = 0.77; 0.69, 0.86;  $p < 0.001$ ), greater involvement in sports teams at school (OR = 0.77; 0.67, 0.88;  $p < 0.001$ ) and outside of school (OR = 0.84; 0.73, 0.96;  $p = 0.01$ ) were all independently associated with lower odds for depressive symptoms. Meeting recommended guidelines for physical activity (OR = 0.62; 0.44, 0.88;  $p = 0.007$ ) and, for 12–14 year olds, leisure-time screen use (OR = 0.77; 0.59, 0.99;  $p = 0.04$ ) were also independently associated with lower odds for depressive symptoms.

**Conclusions:** Higher levels of physical activity among children and young adolescents, and lower levels of leisure-time screen use among young adolescents, are associated with lower depressive symptoms. Longitudinal studies are needed to understand the causal relationships between these variables.

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## 1. Introduction

The association between physical activity and depressive symptoms in adults is well established.<sup>1</sup> Although there are fewer studies in children and adolescents, they have generally shown lower depressive symptoms and internalising symptoms as well as greater well-being in those who are physically active.<sup>2,3</sup> Conversely a low level of vigorous exercise in boys and girls has been reported to be independently associated with depressive symptoms.<sup>4</sup> One prospective study of 11–14 year old adolescents in the United Kingdom, reported an increase in physical activity of

approximately 1 h per week was associated with an 8% decrease in the odds of depressive symptoms in both boys and girls.<sup>5</sup> Associations between lower psychological wellbeing, lower physical activity levels and increased use of television in adolescents aged 13–16 years have been reported.<sup>6</sup> Other longitudinal findings have shown that among boys higher levels of time spent in sedentary activities predicted higher levels of depressive symptoms.<sup>4</sup>

Few studies have examined these associations among Australian samples of children and young adolescents, with little known about the possible protective effect on depressive symptoms through being both physically active and having low leisure-time screen use. The 2007 Australian Children's Nutrition and Physical Activity Survey found only 69% of the 9–16 year olds surveyed met recommended physical activity guidelines of at least 60 min of moderate to vigorous physical activity (MVPA) daily<sup>7</sup> on most of the days

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surveyed<sup>8</sup> and just 33% met the recommendations for leisure-time screen use<sup>8</sup> of not more than 2 h per day.<sup>7</sup> Median leisure-time screen use of nearly 4 h per day for young people (aged 10–13 years) in Australia has been reported.<sup>9</sup>

There is evidence that regular physical activity can offer some protective effect for the onset of depression. This relationship appears bidirectional, at least for girls, as having depressive symptoms is associated with the number of physical activities in which adolescent girls participate.<sup>10</sup> The observed decline in physical activity during adolescence, particularly for females<sup>11</sup> may contribute to the higher rates of depression in girls.<sup>10,12</sup>

There is a growing view that sedentary behaviours such as watching television may have an effect on mood independent of physical activity. Frequent or high use of television predicts later lower self-esteem and other negative health outcomes in adolescents.<sup>13,14</sup> Television viewing time and physical activity are independently associated with psychological distress in younger children (aged 4–12 years), and greater television time and low physical activity levels have been shown to interact to increase psychological distress.<sup>15</sup> These factors appear to operate independently and synergistically to increase risk.<sup>15</sup> However, one recent Australian study found no cross-sectional or longitudinal associations between MVPA, vigorous physical activity, organised sport, sedentary time and symptoms of depression among boys or girls.<sup>16</sup>

This study cross-sectionally examined (i) associations between physical activity, leisure-time screen use and self-reported depressive symptoms (adjusting for covariates including location and area-level SES), and (ii) the interactive effect of being physically active and having low leisure-time screen use on depressive symptoms, among a large sample of Australian children and young adolescents.

## 2. Methods

Data was derived from the Healthy Neighbourhoods Study, a cross-sectional survey examining the health and wellbeing of young people in 30 communities across three states of Australia. The communities were defined as Statistical Local Areas (SLA's) with at least 17,000 residents, according to the Australian Bureau of Statistics (ABS) census boundaries. SLA's within the metropolitan areas of Melbourne, Perth and Brisbane were classified as urban and those outside the metropolitan areas as regional. Quartiles of the index of relative socioeconomic disadvantage from the ABS Socio Economic Indices for Areas (SEIFA)<sup>17</sup> were used to classify community SES; a low score identified the most disadvantaged (quartile 1) and a high score the most advantaged (quartile 4) areas. After stratification by SES and rurality, communities were randomly selected from each stratum. The final sample included 8 communities in Queensland, 8 in Western Australia, and 14 in Victoria. Within each community, a random sample of schools with students at year 6 level and all schools with students at year 8 level were invited to participate. Schools from the Catholic, independent and government sectors were represented across each state. Overall 86% ( $n = 483$ ) of schools responded to the invitation and 53% agreed to take part. The final number of schools surveyed was 164 and 82 in year 6 and 8 respectively. There was no difference in school participation rate by sector or state. Parent information packs with consent forms were sent home with all students enrolled in year 6 or year 8 at participating schools. Of the 15,666 consent forms distributed, 9830 (63%) were returned and 885 (9%) refused consent. Absenteeism was 7% on the day of survey and participation rates were similar across the three states. The final sample for this study consisted of 8256 year 6 and 8 students aged 10–16 years.

Students were surveyed via an online self-report instrument that was adapted and expanded from the Communities That Care

Youth Survey, which has shown good reliability and validity in large samples.<sup>18,19</sup> Participants reported physical activity behaviour and perceived opportunities to be physically active according to 11 items. Items from validated instruments were used to capture information about: the number of days attended physical education classes ('In an average week when you are at school, on how many days do you go to PE classes?'; 1=0 days; 6=5 days)<sup>20</sup>; frequency of being very active during physical education classes ('In the last school week, during your PE classes, how often were you very active [playing hard, running, jumping, throwing, dancing]?'; 1=I do not do physical education; 5=always); the number of days very active after school ('In the last school week on how many days after school [e.g. end of school until bed-time] did you do sports, dance, or play games in which you were very active?'; 1=0; 6=5 days); the number of times very active during the last weekend ('On the last weekend, how many times did you do sports, dance, or play games in which you were very active?'; 1=0; 6=5 or more)<sup>21</sup>; involvement in sports clubs, organisations or other activities at school ('How many times in the past year [12 months] have you been involved in sports, clubs, organisations or other activities at school?') and outside of school ('How many times in the past year [12 months] have you been involved in sports, clubs, organisations or other activities outside of school?'; 1=never; 5=10 or more times); opportunities to get involved in sports, clubs, organisations or other activities at school ('There are lots of chances for students in my school to get involved in sports, clubs, organisations, or other school activities outside of class'; 1=YES!, 4=NO!)<sup>18</sup>; frequency of involvement in sports teams at school ('During the past 12 months, on how many sports teams did you play at school?'); and outside of school ('During the past 12 months, on how many sports teams did you play outside of school?'; 1=none; 6=5 or more)<sup>22</sup>; activity over the past 7 days ('Over the past 7 days, on how many days were you physically active for a total of at least 60 min per day [don't include your physical education or gym classes]?') and in a normal week ('Over a normal week, on how many days were you physically active for a total of at least 60 min per day [don't include your physical education or gym classes]?'; 1=0 days; 8=7 days).<sup>23</sup> Participants also reported on the time they spent watching television and on a computer or playing video games for leisure separately for week ('On school days for how many hours do you usually watch TV?', 'On school days for how many hours do you usually spend on a computer or playing video games such as gamecube, xbox, PS2, PSP, GBA etc.?'; 1=none; 6=more than 6 h) and weekend days ('On weekend days for how many hours do you usually watch TV?', 'On weekend days for how many hours do you usually spend on a computer or playing video games such as gamecube, xbox, PS2, PSP, GBA etc.?'; 1=none; 6=more than 6 h).<sup>24</sup>

Depressive symptoms were assessed using the Short Mood and Feelings Questionnaire,<sup>25</sup> which measures depressive mood and feelings, and other symptoms associated with depression such as negative affect. The instrument comprises 13 items (e.g., 'I felt miserable or unhappy') rated using a three-point scale (0=not true; 1=sometimes true; 2=true); has high internal consistency and correlates with other well-validated instruments such as the Children's Depression Inventory and the Diagnostic Interview Schedule for Children depression scale.<sup>25</sup> Within the survey participants were asked how important they considered the questions to be to them and how honest they were in filling out the survey. Their honesty was also tested by asking them if they had consumed a fictitious drug ('In the past month have you ever used phenoxydine [pox, PX, breeze]?'; 1=never; 5=10 or more times). Those reporting that they were dishonest or that they used the fictitious drug ( $n=92$ ) were excluded from the analyses.

The surveys were administered by trained research staff in classrooms during a 45–60 min period. Instructions on survey completion were provided in the introductory page of the survey

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