



# Screen-based sedentary behaviour and psychosocial well-being in childhood: Cross-sectional and longitudinal associations



Mark S. Allen <sup>a,\*</sup>, Stewart A. Vella <sup>b</sup>

<sup>a</sup> School of Psychology, Faculty of Social Sciences, University of Wollongong, Northfields Avenue, Wollongong 2522, NSW, Australia

<sup>b</sup> Early Start Research Institute, Faculty of Social Sciences, University of Wollongong, Northfields Avenue, Wollongong 2522, NSW, Australia

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## ABSTRACT

**Objective:** Sedentary behaviour is an important contributor to the development of non-communicable diseases worldwide. Less is known about the relationship between screen-based sedentary behaviour and child mental health problems. This study explores cross-sectional and longitudinal associations between screen time (electronic gaming and television viewing) and psychosocial well-being in early and late childhood.

**Method:** Two independent samples of Australian children were used to explore associations. Data were collected from the parents of 3956 young children (age 6) and 3862 older children (age 10) at baseline with a two year follow-up.

**Results:** After controlling for demographic and socioeconomic factors (e.g., sex, household income), we found that screen time was negatively associated with prosocial behaviour, and positively associated with hyperactivity, peer problems and conduct problems in both samples. We also found that high screen time related to the development of emotional symptoms in young children, and to the development of hyperactivity and conduct problems in older children, over two years. Important moderators were household income, parental education level, and neighbourhood socioeconomic position.

**Conclusion:** These findings indicate that screen-based sedentary behaviour is related to the development of psychosocial difficulties in early and late childhood.

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## 1. Introduction

Child mental health problems are becoming increasingly common in developed and developing nations. For example, epidemiological studies have reported that one in five children (Costello, Mustillo, Erkanli, Keeler, & Angold, 2003) and one in five adolescents (Costello, Copeland, & Angold, 2011) suffer from some sort of psychiatric disorder – the most frequently reported being oppositional-defiant disorder, conduct disorder, attention-deficit-hyperactivity disorder, and emotional disorders such as depression and panic disorder (Ford, Goodman, & Meltzer, 2003; Kessler et al., 2005). A number of individual and environmental inputs have been identified as important for child psychosocial well-being. In particular, sedentary behaviour has been found to relate to an increased occurrence of interpersonal, affective and conduct problems in childhood and adolescence (for reviews, see Costigan,

Barnett, Plotnikoff, & Lubans, 2013; Hinkley et al., 2014; Suchert, Hanewinkel, & Isensee, 2015; Tremblay et al., 2011). The current study explores the contribution of screen-based sedentary behaviour (television viewing and electronic gaming) to the development of emotional, hyperactivity and conduct problems in two cohorts of Australian children.

Sedentary behaviour is independent to physical activity and is defined as “any waking behaviour characterized by an energy expenditure of  $\leq 1.5$  METs [metabolic equivalent of task] while in a sitting or reclining posture” (Sedentary Behaviour Research Network, 2012, p. 540). Screen-based activities such as television viewing and seated electronic gaming are consistent with this definition of sedentary behaviour (Mansoubi et al., 2015). Children and adolescents in western societies spend the majority of their free-time (6–8 h per day) in sedentary pursuits such as television viewing or video gaming (Rideout, Foehr, & Roberts, 2010) and there is now considerable evidence that excessive sedentary behaviour is associated with negative health outcomes. For example, children that spend a greater amount of time in sedentary pursuits show a higher prevalence of obesity, higher blood pressure

\* Corresponding author.

E-mail address: [mark\\_allen@uow.edu.au](mailto:mark_allen@uow.edu.au) (M.S. Allen).

and total cholesterol, poorer attachment to parents and peers, more negative eating habits, and poorer cognitive development and academic achievement (de Rezende, Lopes, Rey-López, Matsudo, & do Carmo Luiz, 2014; Salmon, Tremblay, Marshall, & Hume, 2011; Tremblay et al., 2011).

There are reasons to consider that screen-based sedentary behaviour will contribute to the development of mental health problems in childhood. One hypothesis – that is less well supported (Page, Cooper, Griew, & Jago, 2010) – is that time spent in sedentary behaviours takes time away from healthy behaviours such as sport and physical activity that are known to contribute to positive mental health (Ahn & Fedewa, 2011). An alternative explanation is that screen-based sedentary behaviour might lead to increased social isolation and withdrawal that contribute to the development of social and emotional problems (Kraut et al., 1998). The content of screen-based activities might also be important. Television and internet viewing provide children and adolescents the opportunity to compare themselves with others – both in terms of physical appearance and talents (Suchert et al., 2015) – and such idealisation might lead to heightened social pressure and emotional problems. Children who engage in a high amount of screen time might also be subjected to a greater amount of screen violence that is associated with the development of emotional and conduct problems (see Greitemeyer & Mügge, 2014; Nikkelen, Valkenburg, Huizinga, & Bushman, 2014; Pearce & Field, 2015). Neurocognitive changes that accompany screen-based activities (Kühn, Gleich, Lorenz, Lindenberger, & Gallinat, 2014) might also explain observed associations between screen time and childhood attentional problems (see Jolin & Weller, 2011).

Taken together, there is reason to consider that excessive screen-based sedentary behaviour might contribute to the onset of psychosocial difficulties in childhood. This association has been explored in a large number of studies spanning various developmental stages. Of relevance to the current research, a recent systematic review of school-aged children synthesised data from 91 studies exploring sedentary behaviour and indicators of mental health (Suchert et al., 2015). The main conclusion was that associations between screen-based sedentary behaviour and mental health indicators were indeterminate. Nevertheless, consistent positive correlations emerged for screen time and hyperactivity/attention problems, and for screen time and internalising problems. The systematic review demonstrated that most studies had been cross-sectional in nature and had rarely explored potential moderating variables. The authors recommended additional prospective longitudinal studies (to assist in identifying causation) and the inclusion of additional moderator analyses.

Mental disorders are becoming increasingly prevalent among children and adolescents (Costello et al., 2011) and often persist into adulthood (Kessler et al., 2005). Identifying factors that contribute to the development of psychosocial ill- and well-being in childhood therefore has considerable relevance to public health. We use a prospective longitudinal design to uncover potential associations between screen-based sedentary behaviour and parent-reported symptoms of psychosocial difficulties in two cohorts of children – a younger sample (age 6) and an older sample (age 10). We hypothesised that screen time would be negatively associated with prosocial behaviour, and positively associated with hyperactivity, emotional symptoms, peer problems and conduct problems. We further hypothesised that screen time would be negatively associated with the development of prosocial behaviour, and positively associated with the development of hyperactivity, emotional symptoms, peer problems and conduct problems over two years. Moderator analyses were exploratory and no specific hypotheses were generated. Potential moderators explored were child sex, biological maturation (pubertal status), child general

health, and variables connected to socioeconomic status (parental education, household income and neighbourhood socioeconomic position).

## 2. Method

### 2.1. Sample

Data from wave 4 (2010) and wave 5 (2012) of the longitudinal study of Australian children (LSAC) were used in this investigation. LSAC began in 2004 with two cohorts: families with 4–5 year old children (the K cohort) and families with 0–1 year old infants (the B cohort). The sample was selected from Medicare Australia's enrolment database to be representative of Australian children. Using 311 postcodes, the population was ordered by date of birth and then a random start and skip was applied to select children, providing an equal chance of inclusion (about one in 25). Families of 18,800 selected children received letters of invitation to take part in the study with a 54% response rate (non-English speaking families were underrepresented among respondents). LSAC data are collected by trained professionals in the form of self-report questionnaires and face-to-face interviews with children, their parents and their teachers. In this investigation we use data collected from the child's primary parent (98.6% of respondents in the B cohort, and 97.1% in the K cohort, were the child's mother). We refer to data collected in 2010 as Time 1 (Children in the B cohort were age 6, and children in the K cohort were age 10) and data collected in 2012 as Time 2 (Children in the B cohort were age 8, and children in the K cohort were age 12). LSAC received ethical approval from the Australian Institute of Family Studies Ethics Committee.

In the B cohort, 4242 children were sampled at Time 1, of which 286 (6.5%) did not return at Time 2. Attrition analyses revealed that children with incomplete data had higher levels of hyperactivity,  $t(4202) = 2.81, p < .01, d = 0.17$ , emotional symptoms,  $t(4202) = 3.34, p < .01, d = 0.18$ , peer problems,  $t(4202) = 4.86, p < .01, d = 0.29$ , and conduct problems,  $t(4202) = 3.02, p < .01, d = 0.17$ . Those with incomplete data also had a lower household income,  $t(3797) = 4.70, p < .01, d = 0.34$ , neighbourhood socioeconomic position,  $t(4231) = 4.67, p < .01, d = 0.27$ , and higher levels of electronic gaming time,  $t(4228) = 3.61, p < .01, d = 0.19$ . In the K cohort, 4169 children were sampled at Time 1, of which 307 (7.2%) did not return at Time 2. Attrition analyses revealed that children with incomplete data had a lower pubertal status,  $t(4256) = 13.70, p < .01, d = 0.57$ , a lower household income,  $t(3605) = 2.60, p < .01, d = 0.16$ , and a lower neighbourhood socioeconomic position,  $t(4161) = 3.25, p < .01, d = 0.19$ . Characteristics of the final samples are reported in Table 1.

### 2.2. Measures

#### 2.2.1. Psychosocial well-being

The strengths and difficulties questionnaire (SDQ; Goodman, 1997) is a brief behaviour measure that covers common forms of child ill- and well-being including emotional, hyperactivity and conduct problems. The SDQ is often used in child psychiatric epidemiological research (Stone, Otten, Engels, Vermulst, & Janssens, 2010) and consists of 25 questions that correspond to five major behavioural components: prosocial behaviour (e.g., "is kind to younger children"), hyperactivity (e.g., "easily distracted"), emotional symptoms (e.g., "often seems worried"), peer problems (e.g., "tends to play alone"), and conduct problems (e.g., "steals from home"). Items were scored from 1 (*not true*) through 2 (*somewhat true*) to 3 (*certainly true*). In the current investigation the questionnaire was completed by the child's primary parent. The SDQ has demonstrated acceptable construct validity (Van Roy,

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