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Abstract

Objective: To explore longitudinal and cross-sectional correlates of sport participation and screen time in a nationally representative sample of Australian children. **Methods:** The sample included 3956 child participants taken from the Longitudinal Study of Australian Children. Data were collected in 2004 (age range. = 4-5. years) and 2012 (age range = 12-13. years) and included parental estimates of sport participation and total screen time (electronic gaming and television viewing) in addition to demographic, socioeconomic and environmental factors. **Results:** Sport participation and total screen time were inversely correlated (r=- .10). Child demographics (sex, pubertal status, general health, and body mass index [BMI]), socioeconomic (neighborhood socioeconomic position, household income, parental education, and parental BMI) and environmental (neighborhood belonging, neighborhood safety, and neighborhood facilities) factors were related to both outcomes - in most cases a positive [negative] correlation with sport participation yielded a corresponding negative [positive] correlation with total screen time. **Conclusion:** Our findings show that demographic, socioeconomic and environmental factors measured at age 4 predict sport participation and screen time at age 12, and that the correlates of childhood sport participation and childhood sedentary behavior may be more similar than previously estimated.

Keywords

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Brief Original Report

Are the correlates of sport participation similar to those of screen time?

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ABSTRACT

Objective. To explore longitudinal and cross-sectional correlates of sport participation and screen time in a nationally representative sample of Australian children. *Methods.* The sample included 3956 child participants taken from the Longitudinal Study of Australian Children. Data were collected in 2004 (age range = 4–5 years) and 2012 (age range = 12–13 years) and included parental estimates of sport participation and total screen time (electronic gaming and television viewing) in addition to demographic, socioeconomic and environmental factors. *Results.* Sport participation and total screen time were inversely correlated ($r = -.10$). Child demographics (sex, pubertal status, general health, and body mass index [BMI]), socioeconomic (neighborhood socioeconomic position, household income, parental education, and parental BMI) and environmental (neighborhood belonging, neighborhood safety, and neighborhood facilities) factors were related to both outcomes — in most cases a positive [negative] correlation with sport participation yielded a corresponding negative [positive] correlation with total screen time. *Conclusion.* Our findings show that demographic, socioeconomic and environmental factors measured at age 4 predict sport participation and screen time at age 12, and that the correlates of childhood sport participation and childhood sedentary behavior may be more similar than previously estimated.

Introduction

An active lifestyle has considerable health benefits for children and adolescents (Biddle and Asare, 2011; Janssen and LeBlanc, 2010). It is therefore unsurprising that researchers are targeting the identification of factors associated with participation in regular physical activity.

Studies have found that a combination of individual, interpersonal, environmental, national and global factors relate to childhood physical activity (Bauman et al., 2012; Vella et al., 2014). Because physical activity and sedentary behavior are relatively uncorrelated (Pearson et al., 2014) researchers are also targeting the identification of factors that correlate with childhood sedentary behavior, with a particular focus on television viewing and electronic gaming. A number of potential correlates have been identified (Hinkley et al., 2010; Salmon et al., 2011) and initial findings indicate that the correlates of sedentary behavior seem to differ from the correlates of sport and physical activity (Van der Horst et al., 2007). Here, we explore the relative contributions of demographic, socioeconomic and environmental factors to childhood sport participation and total screen time. Moreover, we explore longitudinal (measured at age 4) and cross-sectional (measured at age 12) correlates of sport participation and screen time during the important transition from childhood to adolescence.

Method

Sample

Data were taken from the Longitudinal Study of Australian Children (LSAC) Kindergarten (K) cohort at wave 1 (2004) and wave 5 (2012). LSAC is a nationally representative sample of Australian children that aims to investigate children's social, economic and cultural environments as they relate to child adjustment and wellbeing (for details, see Gray and Smart, 2009). At wave 1 (2004) 4983 children (aged 4–5 years) were sampled (a response rate of 50%) and by wave 5 (2012) 3956 children remained (age range = 12–13 years), representing an attrition rate of 20.6%.

Measures

Sport participation

The primary parent reported whether the child had participated in team [individual] sport during the previous week (responses were: yes/no). For 'yes' responses, parents reported the number of days that week the child had participated in team [individual] sport (1 – 7) and the average number of hours the child had participated in team [individual] sport on those days. Responses could be: 1 (up to 1 h a day), 2 (more than 1 but less than 2 h a day) or 3 (more than 2 h a day). We computed an average weekly estimate of child physical activity by combining scores from team and individual sport participation and

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multiplying hours by number of days. For parents that reported 'no' for individual and team sport participation, the child was scored as 0 h sport participation for the previous week.

Screen time

The primary parent reported the number of minutes the child spends watching television and playing electronic games on an average weekday and on an average weekend day. These values were weighted (weekday × 5, and weekend day × 2) to calculate an estimate of minutes spent television viewing and electronic gaming in an average week. We calculated a composite score for the two sedentary activities (total screen time).

Additional variables

The primary parent provided information on child sex, indigenous status, main language spoken at home and pubertal status. Pubertal status was measured (at wave 5 only) using the mean of four (girls) and five (boys) items adapted from the pubertal development scale for parental report (Petersen et al., 1988). A child general health rating was also provided by the primary parent using a single item measure rating from 1 (excellent) to 5 (very poor). The child and primary parent had their height and weight measured by a trained professional and these were used to calculate body mass index (BMI; kg/m^2). The primary parent also provided their home postcode, household income (in AUD per week), number of people in the house, and self-reported education and physical activity. Self-reported education ranged from 1 (year 9 or below) to 11 (postgraduate degree) and physical activity was the number of days each week the parent participates in at least 30 min of moderate or vigorous physical activity. Family income was standardized to the household size by dividing estimates by the square root of the number of people in the house (Australian Bureau of Statistics, 2005).

Using participants' postcode, an estimate of neighborhood socioeconomic position (NSP) was determined according to the Index of Relative Socio-Economic Disadvantage (Australian Bureau of Statistics, 2008) and neighborhood remoteness was estimated using the Australian Standard Geographical Classification (Australian Bureau of Statistics, 2003). The primary parent completed single item measures of neighborhood facilities: "there are good parks, playgrounds and play spaces in this neighborhood", and public transport: "there is access to close, affordable, regular public transport in this neighborhood" — items scored from 1 (strongly agree) to 4 (strongly disagree). A single item: "this is a safe neighborhood" and the mean of three items (e.g., "you feel a strong sense of identity with your neighborhood") were used to assess neighborhood safety and neighborhood belonging, respectively — items scored from 1 (strongly agree) to 5 (strongly disagree).

Results

Of the total sample, 60 participants (1.5%) had missing data for sport participation and 98 participants (2.5%) had missing data for total screen time. Our analyses show that the correlates of sport participation are similar to the correlates of total screen time (see Tables 1 & 2). In most cases, a positive [negative] correlation with sport participation yielded a corresponding negative [positive] correlation with total screen time (viz., child health status, parental education, NSP, household income, parental BMI, neighborhood belonging, neighborhood safety, and neighborhood facilities). The exceptions were child sex, pubertal status and primary language that related to the two outcome variables in the same direction. Boys recorded greater time in organized sport ($t = 11.88$, $p < .01$) and total screen time ($t = 6.87$, $p < .01$) than girls, and children in non-English speaking families recorded less time in organized sport ($t = 4.02$, $p < .01$) and total screen time ($t = 2.90$, $p < .01$)

Table 1
Means, standard deviations, bivariate correlations, and multiple regressions of Time 1 (2004) demographic, socioeconomic and environmental variables on Time 2 (2012) sport participation and total screen time.

	Mean	SD	Bivariate correlations (r)		Multiple regression (SP)		Multiple regression (ST)	
			SP	ST	b (s.e.)	β	b (s.e.)	β
Sport participation (SP)	3.41	4.18	–	–	–	–	–	–
Screen time (ST)	3.33	1.93	−.10***	–	–	–	–	–
Demographic variables								
Sex	48.9 (% female)		–	–	−.79 (.18)	−.09***	−.73 (.07)	−.21***
Indigenous status	2.9 (% aboriginal)		–	–	−.20 (.63)	−.01	−.65 (.26)	−.05*
Language spoken at home	89.8 (% English)		–	–	.65 (.32)	.04*	.15 (.13)	.02
Child BMI	16.31	1.63	.00	.02	.04 (.06)	.01	.00 (.02)	.00
General health	2.34	0.88	−.09***	.07***	−.26 (.11)	−.05*	.05 (.05)	.03
Socioeconomic variables								
Parental education	7.18	2.12	.13***	−.15***	.10 (.05)	.05*	−.11 (.02)	−.13***
NSP	1012.53	58.21	.12***	−.12***	.00 (.00)	.03	−.00 (.00)	−.05*
No. of people in household	4.47	1.16	−.00	−.03*	−.04 (.09)	−.01	−.07 (.04)	−.04
Household income	705.51	433.31	.14***	−.11***	.00 (.00)	.10***	.00 (.00)	−.04
Parental BMI	25.32	5.14	−.07***	.10***	−.04 (.02)	−.04	.02 (.01)	.07**
Parental physical activity	2.65	1.90	.05**	.01	.09 (.05)	.04	.01 (.02)	.01
Environmental variables								
Neighborhood remoteness	0.82	1.21	−.04*	.01	−.07 (.08)	−.02	−.01 (.03)	−.01
Neighborhood belonging	2.29	0.65	−.10***	.04*	−.15 (.15)	−.02	−.01 (.06)	−.00
Neighborhood safety	1.75	0.63	−.08***	.04*	−.34 (.15)	−.05*	.09 (.06)	.03
Neighborhood facilities	1.97	0.83	−.07***	.04*	−.22 (.12)	−.04	.06 (.05)	.03
Public transport availability	2.14	0.94	−.03	−.02	.10 (.10)	.02	−.10 (.04)	−.05*
R^2					.06***		.09***	

Note: SP = sport participation (hours per week), ST = screen time (hours per day). For regression analyses, all independent variables were entered into the regression equation simultaneously and collinearity diagnostics were within acceptable ranges (VIF's < 2.00). NSP = Neighborhood socioeconomic position. BMI = body mass index (weight in kg/[height in meters]∗2). Sex was coded as 1 (male) or 2 (female), indigenous status was coded as 1 (aboriginal) or 2 (non-aboriginal), and main language spoken at home was coded as 1 (English) or 2 (non-English). Aboriginal % includes indigenous people of the Torres Strait Islands. 1722 children (43.5%) were excluded from the sport participation regression, and 1745 children (44.1%) were excluded from the screen time regression, owing to missing data on one or more predictor variables. Excluded participants had a greater child BMI ($t = 2.23$, $p < .05$), a higher negative health rating ($t = 2.02$, $p < .05$), a lower parental education ($t = 6.31$, $p < .01$), a lower household income ($t = 3.39$, $p < .01$), a lower NSP ($t = 2.95$, $p < .01$), a less safe neighborhood ($t = 4.22$, $p < .01$) and a lower index of neighborhood belonging ($t = 4.22$, $p < .01$).
*$p < .05$, **$p < .01$, ***$p < .001$.

Table 2
Means, standard deviations, bivariate correlations, and multiple regressions of Time 2 (2012) demographic, socioeconomic and environmental variables on Time 2 (2012) sport participation and total screen time.

	Mean	SD	Bivariate correlations (r)		Multiple regression (SP)		Multiple regression (ST)	
			SP	ST	b (s.e.)	β	b (s.e.)	β
Sport participation (SP)	3.41	4.18	–	–	–	–	–	–
Screen time (ST)	3.33	1.93	−.10***	–	–	–	–	–
Demographic variables								
Sex	48.9 (% female)		–	–	−.99 (.20)	−.12***	−.87 (.09)	−.23***
Indigenous status	2.9 (% aboriginal)		–	–	.39 (.54)	.01	.10 (.24)	.01
Language spoken at home	91.7 (% English)		–	–	.74 (.31)	.05*	.40 (.14)	.06**
Pubertal status	2.31	0.69	−.10***	−.07***	−.10 (.15)	−.02	.12 (.07)	.04
Child BMI	20.48	3.89	−.09***	.07***	−.04 (.02)	−.04	.02 (.01)	.05*
General health	2.37	0.92	−.10***	.09***	−.28 (.10)	−.06**	.02 (.04)	.01
Socioeconomic variables								
Parental education	8.20	1.61	.12***	−.14***	.14 (.06)	.06*	−.13 (.03)	−.11***
NSP	1011.32	67.42	.15***	−.11***	.00 (.00)	.06**	−.00 (.00)	−.04
No. of people in household	4.58	1.31	.00	−.05**	.07 (.07)	.02	−.07 (.03)	−.04*
Household income	1123.14	859.18	.14***	−.11***	.00 (.00)	.07**	.00 (.00)	−.06**
Parental BMI	27.01	6.10	−.07***	.13***	−.01 (.02)	−.01	.02 (.01)	.06**
Parental physical activity	2.99	2.01	.04*	−.04*	−.01 (.04)	−.00	−.04 (.02)	−.04
Environmental variables								
Neighborhood remoteness	0.73	1.03	−.05**	.00	−.07 (.10)	−.02	−.13 (.04)	−.07**
Neighborhood belonging	2.09	0.65	−.11***	.05**	−.27 (.15)	−.04	.09 (.07)	.03
Neighborhood safety	3.69	1.44	−.04**	.03*	.04 (.12)	.01	.02 (.03)	.02
Neighborhood facilities	1.99	1.00	−.09***	.07***	−.05 (.11)	−.01	.01 (.05)	.00
Public transport availability	2.31	1.26	−.05**	−.01	−.01 (.08)	−.00	−.02 (.04)	−.02
R^2					.06***		.09***	

Note: SP = sport participation (hours per week), ST = screen time (hours per day). For regression analyses, all independent variables were entered into the regression equation simultaneously and collinearity diagnostics were within acceptable ranges (VIF's < 2.00). NSP = Neighborhood socioeconomic position. BMI = body mass index (weight in kg/[height in meters]∗2). Sex was coded as 1 (male) or 2 (female), indigenous status was coded as 1 (aboriginal) or 2 (non-aboriginal), and main language spoken at home was coded as 1 (English) or 2 (non-English). Aboriginal % includes indigenous people of the Torres Strait Islands. 1492 children (37.7%) were excluded from the sport participation regression, and 1511 children (38.2%) were excluded from the screen time regression, owing to missing data on one or more predictor variables. Excluded participants had a greater child BMI ($t = 3.48$, $p < .01$), a higher negative health rating ($t = 3.54$, $p < .01$), a greater number of people in the household ($t = 6.49$, $p < .01$), a lower parental education ($t = 2.54$, $p < .05$), a lower household income ($t = 6.85$, $p < .01$), a lower NSP ($t = 5.69$, $p < .01$), and a lower index of neighborhood belonging ($t = 3.84$, $p < .01$).
*$p < .05$, **$p < .01$, ***$p < .001$.

than children in English speaking families. Linear regression models show that demographic, socioeconomic and environmental factors explained 6% and 9% of the variance in sport participation and total screen time, respectively. With the exception of child sex, the largest standardized regression coefficients emerged for socioeconomic factors.

Discussion

This study shows that demographic, socioeconomic and environmental factors are important correlates of children's time in organized sport and total screen time viewing. Effect sizes for longitudinal associations were comparable to cross-sectional associations. Important differences were child BMI (age 4 estimates were unrelated to both outcome measures) and pubertal status (included as a correlate at age 12). Overall, the data demonstrate that the two outcome variables have similar socioeconomic and environmental correlates. Thus, as far as demographic, socioeconomic and environmental factors are concerned, the correlates of sport participation and the correlates of total screen time appear more similar than they do dissimilar.

Limitations include the correlational nature of the study and the exclusive focus on socioeconomic and environmental factors. Other potential limitations include the use ofparent report measures that are open to response bias (see Ekelund et al., 2011) and the grouping together of various modes of physical activity (see Bocarro et al., 2014). We recommend additional studies that target other potential correlates – including biological and psychosocial factors (see Bauman et al., 2012) – to help disentangle the factors that best predict physical activity from those that best predict sedentary behaviors. In particular, experimental studies are needed to ascertain whether changing socioeconomic and environmental factors has repercussions for childhood activity levels. A better understanding of the correlates of physical activity and sedentary behavior in childhood can support the development of practical interventions targeting a more physically active lifestyle in a population consistently found to have rapidly declining activity levels.

Conclusion

Our findings show that demographic, socioeconomic and environmental measures taken at age 4 predict time in organized sport and screen time viewing at age 12, and that the correlates of childhood sport participation and childhood sedentary behavior may be more similar than previously estimated.

Conflicts of interest

The authors declare that there are no conflicts of interests.

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