Television viewing habits associated with obesity risk factors: a survey of Melbourne schoolchildren

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ABSTRACT

Objectives: To examine whether children's television viewing may be a useful indicator of risk of obesity-promoting versus healthy eating behaviours, low-level physical activity (PA) and overweight or obesity among children of primary school entry and exit ages.

Design: Cross-sectional study, stratified by area-level socioeconomic status.

Participants and setting: 1560 children (613 aged 5–6 years [50% boys], and 947 aged 10–12 years [46% boys]) from 24 primary schools in Melbourne, Australia, randomly selected proportionate to school size between 1 November 2002 and 30 December 2003 .

Main outcome measures: Parents' reports of the time their child spends watching television, their participation in organised physical activities (PA), and their food intake; each child's measured height and weight and their PA levels as assessed by accelerometry for one week.

Results: After adjusting for the age and sex of child, the parents' level of education, clustering by school, and all other health behaviour variables, children who watched television for > 2 h/day were significantly more likely than children who watched television for ⩽ 2 h/day to: to have one or more serves/day of high energy drinks (adjusted odds ratio [AOR], 2.31; 95% CI, 1.61–3.32), and to have one or more serves/day of savoury snacks (AOR, 1.50; 95% CI, 1.04–2.17). They were also less likely to have two or more serves/day of fruit (AOR, 0.58; 95% CI, 0.46–0.74), or to participate in any organised PA (AOR, 0.52; 95% CI, 0.34–0.80).

Conclusions: Health practitioners in the primary care setting may find that asking whether a child watches television for more than 2 hours daily can be a useful indicator of a child's risk of poor diet and low physical activity level.

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Childhood obesity has reached epidemic proportions.[1] In Australia, a quarter of children are classified as obese.[2] Given the poor outcomes of treatment for obesity, all opportunities for preventing it must be explored. The primary care setting provides an opportunity to target primary and secondary prevention of obesity. However, it appears that general practitioners both under-recognise and under-treat childhood obesity. It has been reported they identify only half the obese children they examine, and are least likely to identify obesity in children under 5 years of age and those with milder degrees of obesity[3,4] — two groups for whom prevention is most likely to be effective. In addition, many parents do not recognise fatness in their own children,[5] or if they do, they believe it to be predetermined and unchangeable.[6] Such reports suggest that it is unlikely that a child's weight will be discussed in the primary care environment.

Thus, it would be useful to have an indicator to help GPs identify risk for both fatness and childhood eating and activity behaviours likely to promote fatness. We examined whether asking parents about their child's television viewing could reveal a child's risk of unhealthy eating, inactivity and obesity.

METHODS

Data were collected between 1 November 2002 and 30 December 2003. Ethical approval was received from Deakin University, the Department of Education and Training Victoria, and the Catholic Education Office.

Public and Catholic primary schools in metropolitan Melbourne with an enrolment of over 200 students were eligible. Each school was classified into one of five quintiles according to the Australian Bureau of Statistics Socioeconomic Index for Areas (SEIFA) Index of Relative Disadvantage.[7] Stratified random sampling was used to select 13 schools from each of the highest, middle and lowest SEIFA quintiles. Children of primary school entry (5–6 years) and exit ages (10–12 years) were recruited from 24 public and Catholic schools in nine high, seven mid and eight low socioeconomic areas.

In total, 1612 children aged 5–6 years and 2085 children aged 10–12 years were provided with information about the study and with consent forms to take home to their parents. Only families who provided active consent were eligible to participate. Reliability of the questionnaire items was assessed with a subsample of 133 parents from the current sample who completed the questionnaire on a second occasion 7–14 days later.

Sociodemographics: Parents reported their age, sex, country of birth, language usually spoken at home, marital status, and education level. Education (some secondary school or less; completed secondary school/trade/technical certificate; or university qualification) was used as the indicator of socioeconomic status (SES), as earlier studies have shown television viewing varies by parents' educational attainment.[8]

Television viewing: Parents reported television viewing by children on a usual school day and a usual weekend day. They were asked to circle the number (ranging from 0 hours to 6 or more hours, in half-hour segments) that best represented their child's usual viewing time. Usual daily television viewing was calculated (reliability: intraclass correlation [ICC], 0.78; 95% CI, 0.69–0.84; $P < 0.001$) and was dichotomised into ⩽ 2 h/day or > 2 h/day. Two hours per day was chosen as the cutpoint to reflect the Royal

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Australasian College of Physicians policy on children's television viewing[9] and new national recommendations.[10]

Food intake: Parents reported their child's food intake in the previous week using a Food Frequency Questionnaire (FFQ). Literature supports the accuracy of parent reports of usual food intakes, except for vegetables (fair to good agreement on the number of food items eaten),[11] and for child dietary fat intake ($r = 0.54$).[12] The FFQ included 83 food and drink items that were identified from National Nutrition Survey (NNS) data as important contributors to energy and fat intakes (and thus the energy density of the diet) for the target age groups.[13] In addition, all fruits and vegetables (low-energy-density foods) included in the NNS were included in the FFQ. Parents were asked "How often did your child eat/drink this food/beverage over the last week?". There were eight response categories ranging from "4 or more times a day" to "not eaten". Data for individual foods were summed to calculate the frequency of consumption of: "takeaway-style foods" (eg, pasties, meat pies, sausage rolls, pizza); "high-energy fluids" (eg, fruit juice drinks, cordial, soft drinks), "sweet snacks" (eg, sweet biscuits, cake, confectionary), "savoury snacks" (eg, flavoured savoury biscuits, peanuts, potato crisps, extruded snacks); and "fruits" and "vegetables".

Organised physical activity: Parents reported their child's frequency of participation in organised physical activity in the previous week from a list of six common activities (swimming, dancing/callisthenics, gymnastics, football, tennis, and junior athletics),[14] and could report up to two other activities. To measure total frequency of participation in organised activity per week, the frequency of participation was summed across all activities (reliability: intra-class correlation (ICC), 0.61; 95% CI, 0.43–0.73; $P < 0.001$). This variable was dichotomised into none or some organised physical activity in the previous week.

Objectively assessed activity: Children's physical activity was assessed by means of an accelerometer (Actigraph Model AM7164-2.2C, Manufacturing Technology Inc [MTI], Fort Walton, Fla, USA). Except for during water-based activities, each child wore the accelerometer around the waist for 7 days during waking hours. The first and last incomplete days of monitoring were discarded, and only children who wore the accelerometer for a minimum of 4 days were included.[15] Days in which total accelerometer counts were less than 10 000 were excluded as it was considered the monitor was not worn for the entire day, and counts greater than 20 000 000 were also considered invalid.

To estimate the time per day spent in physical activity of moderate-intensity (3.0–5.9 metabolic equivalents of rest [METs]) and vigorous-intensity (6.0+ METs), age-specific movement count thresholds[16] were applied to the accelerometer data. Time per day in moderate-to-vigorous-intensity physical activity (MVPA) was derived by summing these values. Total time per day in MVPA was dichotomised into ≤ 2 h/day or > 2 h/day as it was hypothesised that TV viewing (dichotomised in the same way) displaces physical activity.

Height and weight: These were measured with digital scales (weight to the nearest 0.1 kg) and a portable stadiometer (height to the nearest 0.1 cm) while children were not wearing shoes. The body mass index (BMI) of each child was calculated, and internationally accepted age-specific and sex-specific cut-points were used to categorise children as overweight or obese.[17]

Statistical analyses

Analyses were performed with StataSE (version 8.0; Stata Corporation, College Station, Tex, USA). Descriptive analyses were used to characterise the parents who responded to the survey, the children's television viewing, food intake, organised physical activity, and MVPA. Differences in these behaviours by child's age and sex were analysed using Pearson's χ^2 tests. Interactions between child's sex and age and television viewing with the eating behaviours, physical activity, and weight status were analysed. Bivariate logistic regression analyses (adjusting for child's sex and age, and clustering by school) were performed to examine whether watching television for more than 2 hours per day was associated with obesity-promoting or "healthy" eating behaviours, spending less than 2 hours per day in MVPA, participating in no organised physical activity, and overweight or obesity. Multiple logistic regression models adjusting for child's sex, age, parental education and all other health variables (eating behaviours, MVPA, organised physical activity, and overweight or obesity) were performed to examine associations between watching television for more than 2 hours daily and each of these health variables.

RESULTS

The sample consisted of 1560 children and their primary carers, and response rates were 38% for younger children and 46% for older children (low-SES schools, 24% response rate; mid-SES, 31% response rate; high-SES, 42% response rate). There were 613 children aged 5–6 years (50% boys; mean age, 5.9 years; 95% CI, 5.8–5.9 years) and 947 children aged 10–12 years (46% boys; mean age, 11.2 years, 95% CI, 11.2–11.3 years). The mean age of the primary carers was 38.6 years (95% CI, 38.3–38.9 years; the median age in Victoria in 2004 was 37 years[18]), and 86% of primary carers were women. About 87% of families spoke English at home and 64% of parents were born in Australia (in 2002, 77% of the population was born in Australia[19]). Eighty-five per cent of primary carers were married or in a de facto relationship (nationally, almost 80% of children up to 14 years lived in a family with two adults[20]); 22% of primary carers had less than 12 years education, 42% had completed high school or a trade, and 36% had attended university.

Among 5–6-year-olds, 23% of boys and 23% of girls were overweight or obese. Among 10–12-year-olds, 32% of boys and 32% girls were overweight or obese. There were significant differences in weight status by age group among boys ($P < 0.01$) and among girls ($P < 0.05$). Australian statistics for 1995 show that 15% of boys and 22% of girls aged 5–9 years, and 22% of boys and 22% of girls aged 10–14 years were overweight or obese.[20] Therefore, our sample contained a higher proportion of overweight or obese children than existing population estimates.[2]

Box 1 summarises the children's food consumption, physical activity, and television viewing, and differences by age and sex. There were no significant interactions between age and sex and television viewing for each of the health variables. Box 2 presents regression models with unadjusted and adjusted odds ratios for the nine separate outcome variables. The adjusted analyses show that children who watched television for more than 2 hours daily were more likely to consume an unhealthy diet and less likely to eat fruit, and were less likely to participate in any organised physical activity.

DISCUSSION

Our findings suggest that asking a simple question about a child's television viewing is

1 Children's obesity-promoting and "healthy" food frequency, physical activity, and television viewing

	Boys				Girls			
	5–6 year olds		10–12 year olds		5–6 year olds		10–12 year olds	
	%	*n*	%	*n*	%	*n*	%	*n*
Obesity-promoting food frequency								
Takeaway food (any/day)	75	302	79	434	72	308	78	513
High energy drinks (⩾ 1 serve/day)	81	305	82	434	74	308	80	513
Sweet snacks (⩾ 1 serve/day)	86	305	88	432	87	308	90	513
Savoury snacks (1 serve/day)	45†	305	40	434	37†¶	308	46¶	513
"Healthy" food frequency								
Fruit (⩾ 2 serves/day)	60	302	55	420	66	305	61	501
Vegetables (⩾ 2 serves/day)	59	304‡	64	428	71	306‡	68	506
Physical activity								
MVPA accelerometer (⩾ 2 h/day)*	97**	260	63**§	365	96**	263	41**§	443
Organised physical activity (any/week)	76**	305	89**†	434	71	308	84†	513
Television viewing (> 2 h/day)	71††	295	80††	425	66**	304	84**	497

* 229 children were excluded on the basis of accelerometer counts, leaving 1331 children for this analysis. † $P < 0.05$, ‡ $P < 0.01$, § $P < 0.001$, significant difference by sex within age group. ¶ $P < 0.05$, ** $P < 0.001$, †† $P < 0.01$, significant difference by age group within sex.
MVPA = moderate to vigorous-intensity physical activity. ◆

likely to reveal associations with unhealthy eating practices and reduced activity patterns. It is frequently argued that television viewing displaces physical activity,[1] and that those who watch television for extended periods are likely to be less active than those who watch little television. While evidence on this "displacement hypothesis" is mixed,[21] we found an inverse relationship between television viewing and frequency of organised physical activity and a non-significant inverse association with objectively assessed physical activity. Some of these associations may be explained by the age of the child. Although fewer younger children participated in organised physical activity than older children, they were more active overall, and there was no significant interaction between age group and television viewing by participation in organised activity. From a practitioner's perspective these findings are important when considered together with recent evidence that a short counselling session in a primary care setting can influence the time children spend watching television time and their physical activity.[22]

Our findings are generally consistent with previous studies which have shown increased viewing time to be associated with increased soft-drink consumption,[23] and reduced consumption of fruits and vegetables.[24] While these relationships might be explained by the clustering of behaviours, they may also reflect the well documented relationships between television viewing, exposure to food advertising, increased requests for advertised foods,[25] and preferences for the advertised items.[26] It may also be that fruits and vegetables are not consumed because they are not advertised during children's viewing time,[27] or that advertised foods displace them. Further, television viewing provides a context that encourages frequent snacking or overeating.[28] Our findings suggest that the development of targeted strategies to reduce unhealthy snacking during television viewing may be important for the prevention of overweight and obesity among children.

Potential limitations of our study include the cross-sectional nature of the data, where

2 Unadjusted and adjusted odds ratios of obesity-promoting and "healthy" food frequency, physical activity, and weight status for those watching television for more than 2 hours daily*

	Odds ratios (95% CI)	
Dependent variables†	Unadjusted‡	Adjusted§
Obesity-promoting food frequency		
Takeaway food/day (any)	1.70 (1.27–2.29)¶	1.39 (0.98–1.97)
High energy drinks (⩾ 1 serve/day)	2.69 (1.94–3.72)¶	2.31 (1.61–3.32)¶
Sweet snacks (⩾ 1 serve/day)	1.66 (1.12–2.47)**	1.49 (0.90–2.47)
Savoury snacks (⩾ 1 serve/day)	1.78 (1.29–2.47)¶	1.50 (1.04–2.17)**
"Healthy" food frequency		
Fruit (⩾ 2 serve/day)	0.61 (0.48–0.77)¶	0.58 (0.46–0.74)¶
Vegetables (⩾ 2 serve/day)	0.72 (0.58–0.91)¶	0.87 (0.62–1.21)
Physical activity		
MVPA (> 120 min/day)	0.67 (0.46–0.97)**	0.75 (0.50–1.13)
Organised physical activity/wk (none)	0.48 (0.31–0.74)††	0.52 (0.34–0.80)††
Weight status (overweight/obese)	1.42 (1.03–1.96)**	1.37 (0.94–2.00)

* Compared with those watching television for ⩽ 2 hours daily. † Each eating and physical activity behaviour and weight status treated as the dependent variable in separate logistic regression models. ‡ Adjusted for age and sex of child, and clustering by school. § Adjusted for age and sex of child, parental education, clustering by school, and all other variables in each model. ¶ $P < 0.001$. ** $P < 0.05$. †† $P < 0.01$.
MVPA = moderate to vigorous-intensity physical activity. ◆

we cannot infer causality, the fact that we relied on parents' reporting of children's diet and organised physical activity, and the low response rate, which may limit the generalisability of findings. Self-selection bias may result in a healthier and more active sample compared with the general population; therefore, any relationships identified in our study may be underestimating the true level of association.

Strengths of our study included the large and heterogenous sample across socioeconomic strata, the fact that levels of overweight and obesity in our sample were comparable to projected population estimates,[20] and BMI and MVPA were objectively assessed.

Television viewing time appears to be an important indicator of a range of lifestyle behaviours likely to promote fatness over time. Further research examining the validity of the television viewing measure in the primary care setting and the feasibility of its use by GPs is required.

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COMPETING INTERESTS

None identified.

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