Journal of Public Health | Vol. 33, No. 3, pp. 392–402 | doi:10.1093/pubmed/fdq087 | Advance Access Publication 3 November 2010

Sociodemographic and home environment predictors of screen viewing among Spanish school children†

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ABSTRACT

Background Higher screen-viewing levels increase the risk of obesity. Understanding the correlates of screen viewing is an important first step in designing interventions but there is lack of information on the correlates among Spanish children. This study examined associations among environmental, sociocultural, age variables and screen viewing among Spanish children.

Methods Children completed a questionnaire about time spent in screen viewing. BMI was assessed and children were classified into obesity groups using International Obesity Task Force cut-off points. Parents completed a questionnaire about sociodemographic, environmental and sociocultural variables.

Results Participants were 247 primary and 256 secondary school-aged children and their parents. Time spent in screen viewing increased with age. Males spent more time than females in screen viewing. Greater access to bedroom media sources was associated with higher screen viewing. Younger children from single-parent households and older children having a younger parent, siblings and a father who was not working were higher screen-viewers on weekends and weekdays, respectively. For older children parental TV viewing time appeared to be a significant correlate, while parental rules was a determinant predictor for younger children on weekdays.

Conclusions Environmental and sociocultural factors influence the time children spend in screen viewing. Parents play a central role in child's screen viewing; therefore, interventions that target environmental and family TV viewing practices are likely to be effective.

Keywords children, obesity and health promotion

Introduction

The prevalence of overweight and obesity among children and adolescents has increased in many European countries.[1,2] A number of studies have reported that high levels of screen viewing increase the risk of obesity.[3–6] Moreover, a small number of interventions that have focussed on reducing screen viewing have yielded reductions in adiposity.[7–9] The American Academy of Paediatrics (AAP) suggest that parents should limit their child's total media time (i.e. television and electronic games) to no more than 1–2 h per day.[10] As evidence indicates that many children exceed this threshold,[11] there is a need to develop interventions to reduce screen viewing. The mediating variable model[12] suggests that changes in screen-viewing behaviours will be achieved by understanding the mediators and moderators of behaviours. Thus, in order to reduce screen viewing, we need to understand the correlates of screen viewing and how they may differ by participant characteristics. Although sociodemographic variables of screen viewing have been more routinely assessed in the literature, few studies have examined modifiable environmental and sociocultural variables. This absence is important because it has also been suggested that there is a need to identify and focus interventions on strong and consistent modifiable correlates.[12]

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Middle childhood and early adolescence period (ages 5–13) are transition periods of interest when social skills such as learning to make choices[13] are developed and long-term pathways of behaviours are established.[14,15] A peak in television (TV) usage emerges between 9 and 12 years of age[16] and patterns of screen viewing from this age track into later life.[15] Thus, if the correlates that influence screen viewing for school-aged children are known more sophisticated interventions can be developed.

Research on media technology in Spain has highlighted that children's media viewing time has increased in recent years.[17,18] Data from the Spanish National Health Survey showed that 53.2% of Spanish adolescents aged 10–14 years old watched more than 2 h of TV per day with this figure increasing to 70.9% for weekend days.[18] There is lack of information on the correlates of screen viewing among Spanish school-aged children. To the best of our knowledge, there is no Spanish study that compares correlates of screen viewing in primary and secondary school-aged children. This paper aims to: (i) describe patterns of screen viewing (TV watching, computer and console playing and overall screen viewing); and (ii) to identify sociodemographic, environmental and sociocultural correlates of screen viewing in a sample of primary and secondary Spanish school-aged children.

Methods

Sample and procedures

The schools were recruited to approximate the economic diversity of the local area based on an assessment of the economic activity that includes assessment of employment, establishments, business density and commercial establishments in Bilbao (Biscay, Spain).[19] The economic activity rates for the areas where schools were located were obtained. Although this approach only provides information on the school and not where the children live it was intended to provide a reasonable range of participants from different economic neighbourhoods within the city. We invited 19 public schools (six from the highest, eight from the middle and five from the lowest economic activity level) to participate but three (one from each economic activity level) declined to participate. From the 16 schools which participated, six had only primary school-aged children (two from the highest, two from the lowest and two from the middle economic activity level), six only secondary school-aged children (two from the highest, three from the lowest and one from the middle economic activity level) and four both primary and secondary school-aged children (three from the middle and one from the highest economic activity level). This study was carried out between November 2009 and January 2010. It was approved by the University of the Basque Country Ethics Committee and written informed parental consent was obtained for all participants.

Measures

Children completed a self-administered questionnaire at school that assessed their TV viewing, computer games-playing and console games-playing hours for an average weekday and average weekend day. Six-point ordinal response scales were used with options of 'none', '1–2 h', '2–3 h', '3–4 h, '4–5 h' and 'more than 5 h'. Children were assisted with the completion of the questionnaire by teachers and the first author. Daily TV viewing time and daily computer games-playing and console games-playing time were summed to create an overall screen-viewing variable. In addition, children were classified as not meeting TV and electronic media use guidelines for a usual weekday and for a usual weekend day in accordance with suggested screen-viewing guidelines by the AAP ($\geq$2 h/day).[10] They were also asked about the presence of a TV, computer or console in their bedroom (yes/no). The questions were based on a published scale that has been shown to have good reliability.[20] Children's height and weight were assessed using a Seca portable scale and stadiometer. Body mass index (BMI) was calculated [weight (kg)/height(m^2)] and the International Obesity Task Force (IOTF) cut-off points were used to classify participants as normal weight, overweight and obese.[21]

Parents completed a self-administered questionnaire reporting standard sociodemographic (gender, children and parental age, parental education, family structure, presence of siblings and employment), environmental (number of household TV sets) and sociocultural information (daily parental TV viewing time and presence of TV and computer playing time rules). Parents reported their weight and height. BMI was calculated and they were classified in accordance with IOTF BMI cut-off points (underweight: $<$18.5, normal range: 18.5–24.99, overweight: 25–29.99 and obese: $\geq$30).[22] All items were Spanish translations of widely used English language scales that have been shown to have good internal consistency and validity.[23,24]

Analysis

Participants' characteristics were compared using independent sample *t*-tests for continuous variables and chi-square statistics for categorical variables. Associations were assessed separately by age, gender and for a usual weekday and a usual weekend day. A logistic regression model with whether

participants exceed the AAP guideline (≥2 h/day of watching TV) as the outcome was estimated with environmental (household TV set and presence of TV, computer and console in child's bedroom), sociocultural (parental TV viewing, and parental rules for TV and computer playing) and sociodemographic variables (parental age, family structure, presence of siblings, mother employment and father employment) as variable exposures. The model was adjusted for child's BMI group, parental BMI group and parental education, which were treated as confounders with all variables entered into the model in one step. The process was then repeated with ≥2 h/day engaged in overall screen viewing (i.e. TV and electronic games use combined with entertainment media) as the outcome. Robust standard errors were used to take account of the clustering of participants in schools. Alpha was set at <0.05. All analyses were performed using STATA (version 11.0, 2009; Stata Corporation, College Station, TX, USA).

Results

Descriptive data

Analyses included volunteers from 10, fifth year primary schools (10–11 years old) and 10, first year secondary schools (12–13 years old) groups. Three hundred and ninety-seven primary school-aged children were invited to participate and 247 agreed (response rate 65.1%), while 457 secondary school-aged children were invited and 256 participated (response rate 57.9%). Five hundred and nine parents (247 from the primary group and 262 from the secondary group) completed the questionnaire. Six secondary school-aged children were absent on the day of data collection due to illness.

Participant and parent characteristics are summarized by age and by gender within age group in Table 1. There were no differences in parental age between the two groups but parents of the primary school group were more educated than those of the secondary school group ($P = 0.01$). The children in the secondary school group had more TV sets in their homes ($P = 0.01$) and they also had more TV sets in their bedroom (34.6%) than the children in the primary school group (20.2%) ($P < 0.01$). The number of parents who spent ≥2 h/day watching TV was higher in the secondary school group (29.5%) than in the primary school group (21.6%) ($P = 0.04$). The number of single parents was higher in the secondary school group than in the primary school group ($P = 0.04$). There were no differences between genders within each age group, except that more males in the secondary school group than females had a console in their bedroom ($P < 0.01$)

Screen-viewing time

Child's TV viewing, computer games-playing, console games-playing and overall screen viewing are shown by age group and gender for a usual weekday and for a usual weekend day in Table 2. For all children more time was spent engaged in screen-viewing behaviours on weekend days than on weekdays (all $P < 0.01$). When children's screen-viewing behaviours were analysed separately by day of the week, more older children spent ≥2 h/day engaged in all analysed screen-viewing behaviours in comparison to younger children on a weekday and on a weekend day.

A greater proportion of males in primary ($P < 0.01$) and in secondary schools ($P = 0.02$) spent ≥2 h/day in overall screen viewing on a weekday. For a weekend day, only primary school-aged males ($P < 0.01$) spent ≥2 h/day in overall screen viewing than primary school-aged females. More primary school-aged males ($P < 0.01$) exceeded TV viewing guidelines than primary school-aged females on a weekday. More males reported spending ≥2 h/day engaged in console games than females.

Relationships between screen-viewing behaviours and variables

Table 3 presents logistic regression models (odds ratios and 95% confidence intervals) for analysed environmental, sociocultural and sociodemographic variables by age group, by gender within age group and by day of the week for watching TV ≥2 h/day. Statistically significant predictors for younger females exceeding TV guidelines on a weekday were having ≥2 TV sets in the household [OR: 3.20 (1.15–8.90), $P < 0.05$] and not having parental rules regarding computer playing [OR: 0.19 (0.05–0.72), $P < 0.05$]. Not having parental screen-viewing rules [for TV viewing OR: 0.07 (0.01–0.42), $P < 0.01$ and for computer playing OR: 0.19 (0.04–0.82), $P < 0.05$], and living in single-parent households [OR: 0.47 (0.24–0.92), $P < 0.05$] were also predictors for young males exceeding TV guidelines on a weekday and on a weekend day, respectively. For older females, the presence of TV [OR: 0.25 (0.09–0.68), $P < 0.01$] and console in the bedroom [OR: 0.14 (0.04–0.50), $P < 0.01$], having a parent <40 years of age [OR: 0.09 (0.03–0.23), $P < 0.01$] and having siblings [OR: 2.76 (1.67–4.57), $P < 0.01$] were significant correlates for spending ≥2 h/day watching TV on a weekday. On a weekend day, having two or more TV sets in the household [OR: 1.94 (1.06–3.56), $P < 0.05$] and not having parental TV rules [OR: 0.16 (0.03–0.87), $P < 0.05$] were also associated in this subgroup. Higher parental TV viewing [for a weekday OR: 4.22 (1.95–9.12), $P < 0.01$; and for a weekend day OR: 10.5 (2.74–40.8), $P < 0.01$] was

Table 1 General characteristics of children and family by age group and by gender within age group

	Primary school children			*Secondary school children*			
	Female	*Male*	P_a*	*Female*	*Male*	P_a*	P_a**
Age (mean ± SD)	10.09 ± 0.8	10.08 ± 0.6	0.9	12.27 ± 0.5	12.30 ± 0.5	0.6	0.00
Parental age (mean ± SD)	43.7 ± 4.4	43.47 ± 3.9	0.6	44.35 ± 6.3	44.35 ± 5.3	1.0	0.1
	Female	*Male*	P_b*	*Female*	*Male*	P_b*	P_b**
Gender *n* (%)	132 (53.4)	115 (46.6)		120 (46.9)	136 (53.1)		0.1
Parental education							
Secondary school	25 (18.9)	21 (18.3)	0.7	44 (36.7)	32 (23.5)	0.07	0.01
High school	32 (24.2)	33 (28.7)		26 (21.6)	34 (25)		
University	75 (56.8)	61 (53)		50 (41.6)	70 (51.5)		
Children BMI group							
Non-overweight/obese	96 (72.7)	80 (70.2)	0.5	75 (63)	93 (68.4)	0.3	0.2
Overweight	32 (24.2)	27 (23.7)		38 (31.9)	40 (29.4)		
Obese	4 (3)	7 (6.1)		6 (5)	3 (2.2)		
Parental BMI group							
Underweight	1 (0.8)	2 (1.9)	0.9	1 (0.9)	3 (2.5)	0.2	0.3
Norm weight	85 (67.5)	71 (67)		66 (57.4)	73 (60.8)		
Overweight	32 (25.4)	26 (24.5)		35 (30.4)	38 (31.7)		
Obese	8 (6.3)	7 (6.6)		13 (11.3)	6 (5)		
House TV set							
1	37 (28)	26 (22.6)	0.6	19 (15.8)	20 (14.7)	0.7	0.01
≥2	52 (39.4)	49 (42.6)		54 (45)	56 (41.2)		
≥3	43 (32.6)	40 (34.8)		47 (39.2)	60 (44.1)		
TV set bedroom							
Yes	29 (22.3)	20 (17.7)	0.3	35 (29.2)	53 (39.6)	0.08	0.00
No	101 (77.7)	93 (82.3)		85 (70.8)	81 (60.4)		
Computer bedroom							
Yes	48 (37.2)	43 (38.1)	0.8	52 (43.3)	56 (41.8)	0.8	0.2
No	81 (62.8)	70 (61.9)		68 (56.7)	78 (58.2)		
Console bedroom							
Yes	55 (42.6)	57 (50.4)	0.2	32 (26.9)	65 (48.9)	0.00	0.08
No	74 (57.4)	56 (49.6)		87 (73.1)	68 (51.1)		
Parental TV viewing							
<2 h/day	99 (77.3)	86 (79.6)	0.6	82 (70.1)	88 (71)	0.8	0.04
≥2 h/day	29 (22.7)	22 (20.4)		35 (29.9)	36 (29)		
Parental TV rules							
Yes	119 (92.2)	97 (91.5)	0.8	103 (89.6)	111 (91.7)	0.5	0.6
No	10 (7.8)	9 (8.5)		12 (10.4)	10 (8.3)		
Parental computer rules							
Yes	120 (93.8)	101 (95.3)	0.6	108 (93.1)	115 (93.5)	0.9	0.6
No	8 (6.2)	5 (4.7)		8 (6.9)	8 (6.5)		
Family structure							
Single parent	16 (12.5)	15 (14.3)	0.6	24 (20.9)	24 (19.5)	0.7	0.04
Two parents	112 (87.5)	90 (85.7)		91 (79.1)	99 (80.5)		
Presence of siblings							
Yes	100 (76.9)	78 (72.9)	0.4	56 (47.5)	54 (43.5)	0.5	0.00
No	30 (23.1)	29 (27.1)		62 (52.5)	70 (56.5)		
Mother employment							
Non-working	26 (20.5)	24 (23.1)	0.6	30 (26.8)	34 (28.6)	0.7	0.1
Working	101 (79.5)	80 (76.9)		82 (73.2)	85 (71.4)		

Continued

Table 1 Continued

	Primary school children			*Secondary school children*			
	Female	*Male*	P_b*	*Female*	*Male*	P_b*	P_b**
Father employment							
Non-working	7 (6.2)	6 (6.5)	0.9	8 (8.5)	7 (6.9)	0.6	0.6
Working	106 (93.8)	86 (93.5)		86 (91.5)	95 (93.1)		

P_a *: by sex within age group *t*-test, P_a **: by age group *t*-test, P_b **: by sex within age group chi-square test, P_b **: by age group chi-square test.

Table 2 Time spend in screen-viewing behaviours by age group, by gender within age group and by day of the week

	Primary school children			*Secondary school children*			
	Female	*Male*	*P**	*Female*	*Male*	*P**	*P***
Weekday *n* (%)							
TV viewing							
<2 h/day	109 (83.2)	76 (67.9)	0.00	81 (67.5)	88 (64.7)	0.6	0.01
≥2 h/day	22 (16.8)	36 (32.1)		39 (32.5)	48 (35.3)		
Computer playing							
<2 h/day	120 (93)	112 (98.2)	0.05	103 (85.8)	116 (85.3)	0.9	0.00
≥2 h/day	9 (7)	2 (1.8)		17 (14.2)	20 (14.7)		
Console playing							
<2 h/day	122 (93.1)	101 (87.8)	0.1	109 (90.8)	105 (77.2)	0.00	0.01
≥2 h/day	9 (6.9)	14 (12.2)		11 (9.2)	31 (22.8)		
Overall media use							
<2 h/day	100 (75.8)	66 (57.4)	0.00	63 (52.5)	52 (38.2)	0.02	0.00
≥2 h/day	32 (24.2)	49 (42.6)		57 (47.5)	84 (61.8)		
Weekend day *n* (%)							
TV viewing							
<2 h/day	68 (54)	51 (44.7)	0.1	36 (30.2)	46 (34.3)	0.4	0.00
≥2 h/day	58 (46)	63 (55.2)		83 (69.8)	88 (65.7)		
Computer playing							
<2 h/day	114 (87.7)	101 (87.8)	0.9	72 (60.5)	85 (63)	0.6	0.00
≥2 h/day	16 (12.3)	14 (12.2)		47 (39.5)	50 (37)		
Console playing							
<2 h/day	118 (91.5)	83 (72.2)	0.00	99 (82.5)	80 (59.3)	0.00	0.00
≥2 h/day	11 (8.5)	32 (27.8)		21 (17.5)	55 (40.7)		
Overall media use							
<2 h/day	58 (46)	31 (27.2)	0.00	17 (14.2)	17 (12.7)	0.7	0.00
≥2 h/day	68 (54)	83 (72.8)		103 (85.8)	117 (87.3)		

*P**: by sex within age group chi-square test and *P***: by age group chi-square test.

associated with secondary school-aged males watching TV ≥2 h/day. Not having parental TV rules [OR: 0.28 (0.08–0.88), $P < 0.05$] and having a father that was not working [OR: 0.13 (0.03–0.51), $P < 0.01$] were also associated with an increased of exceeding TV guidelines on a weekday for older males.

The logistic regression models for whether participants exceeded the 2 h per day of overall screen viewing (i.e. TV and electronic games use combined with entertainment media) are presented in Table 4. Living in a single-parent household [OR: 0.26 (0.12–0.53), $P < 0.01$] and not having parental TV rules [OR: 0.12 (0.02–0.67), $P < 0.05$] were

Table 3 Logistic regression model analysis (odds ratios and 95% confidence intervals) for analysed environmental, sociocultural and sociodemographic variables by age group, by gender within age group and by day of the week for watching TV ≥2 h/day

	TV viewing															
	Primary school children								*Secondary school children*							
	Female				*Male*				*Female*				*Male*			
	Weekday		*Weekend day*		*Weekday*		*Weekend day*		*Weekday*		*Weekend day*		*Weekday*		*Weekend day*	
	OR	*(95% CI)*	*OR*	*(95% CI)*	*OR*	*(95% CI)*	*OR*	*(95% CI)*	*OR*	*(95% CI)*	*OR*	*(95% CI)*	*OR*	*(95% CI)*	*OR*	*(95% CI)*
Household TV set																
≥2	3.20	1.15–8.90*	1.51	0.44–5.09	1.01	0.40–2.54	1.10	0.49–2.47	6.17	0.85–44.3	1.94	1.06–3.56*	1.18	0.47–2.95	1.88	0.33–10.7
≥3	1.07	0.25–4.46	1.10	0.25–4.72	2.36	0.67–8.26	2.69	0.91–7.94	3.82	0.43–33.5	1.73	0.62–4.84	0.86	0.25–2.89	1.52	0.24–9.37
TV bedroom	0.85	0.25–2.89	2.08	0.64–6.74	0.46	0.11–1.94	0.88	0.24–3.15	0.25	0.09–0.68**	1.32	0.43–4.03	0.78	0.24–2.54	0.73	0.24–2.17
Computer bedroom	0.85	0.39–1.84	1.09	0.31–3.87	0.77	0.26–2.28	1.28	0.53–3.07	1.25	0.54–2.84	1.22	0.67–2.22	1.57	0.81–3.07	0.89	0.37–2.14
Console bedroom	0.46	0.20–2.06	1.40	0.71–2.76	0.34	0.10–1.12	1.12	0.44–2.81	0.14	0.04–0.50**	0.37	0.08–1.76	1.38	0.72–2.67	1.12	0.55–2.26
Parental TV viewing	1.59	0.27–9.37	0.97	0.34–2.80	0.32	0.05–1.91	2.32	0.83–6.53	3.11	0.88–10.9	1.73	0.79–3.81	4.22	1.95–9.12**	10.5	2.74–40.8**
Parental rules TV	0.35	0.08–1.46	0.94	0.31–2.83	0.07	0.01–0.42**	0.57	0.12–2.61	0.59	0.17–2.01	0.16	0.03–0.87*	0.28	0.08–0.88*	0.47	0.11–2.03
Parental rules computer playing	0.19	0.05–0.72*	0.93	0.32–2.67	0.19	0.04–0.82*	1.17	0.22–6.26	1.37	0.22–8.57	0.75	0.19–2.86	0.28	0.04–1.92	0.32	0.03–2.87
Parental age	0.43	0.08–2.07	0.28	0.07–1.10	0.99	0.33–2.90	1.10	0.42–2.88	0.09	0.03–0.23**	0.60	0.16–2.23	0.39	0.15–1.00	0.50	0.16–1.56
Family structure	0.89	0.09–7.96	0.42	0.16–1.12	0.42	0.09–1.97	0.47	0.24–0.92*	0.31	0.09–1.01	0.61	0.18–1.99	0.51	0.24–1.08	0.87	0.28–2.70
Presence of siblings	1.50	0.62–3.63	0.56	0.25–1.25	0.72	0.26–2.02	0.94	0.43–2.05	2.76	1.67–4.57**	1.14	0.62–2.11	0.66	0.35–1.24	0.47	0.19–1.14
Mother employment	0.75	0.31–1.81	0.67	0.23–1.95	1.72	0.62–4.77	0.62	0.17–2.18	0.65	0.26–1.58	0.68	0.22–2.06	0.69	0.32–1.51	1.45	0.54–3.84
Father employment	0.43	0.09–1.91	3.81	0.39–36.5	1.46	0.50–4.27	1.86	0.18–18.6	1.61	0.27–9.55	1.22	0.29–5.16	0.13	0.03–0.51**	0.27	0.03–2.51

Household TV set (ref. 1); TV bedroom (ref. yes); computer bedroom (ref. yes); console bedroom (ref. yes); parental TV viewing (ref. <2 h/day); parental TV rules (ref. no); parental age (ref. ≤40 years old); family structure (ref. single parents); presence of siblings (ref. no); mother employment (ref. non-working); father employment (ref. non-working). Model adjusted for parental BMI group, children BMI group and parental education and clustering by school. *$P < 0.05$, **$P < 0.01$.

associated with not meeting overall screen-viewing guidelines for young females on a weekend day and young males on a weekday, respectively. For older females, having a TV [OR: 0.32 (0.10–0.97), $P < 0.05$] and a console in the bedroom [OR: 0.26 (0.08–0.84), $P < 0.05$], living in higher parental TV viewing households [OR: 2.74 (1.06–7.10), $P < 0.05$] and having a parent <40 years of age [OR: 0.11 (0.02–0.51), $P < 0.01$] were associated with spending ≥2 h/day engaged in overall screen-viewing time on a weekday. For older males, parental TV viewing was associated with exceeding overall recommended screen-viewing guidelines [weekday OR: 5.89 (1.15–30.1), $P < 0.05$; and weekend day OR: 6.83 (1.02–45.4), $P < 0.05$]. Having a parent <40 years of age [OR: 0.15 (0.03–0.64), $P < 0.05$] and a father who was not working [OR: 0.15 (0.02–0.88), $P < 0.05$] were also associated with not meeting overall recommended screen-viewing guidelines in this subgroup on a weekday.

Discussion

Main findings of this study

In this sample of Spanish youth, 32.8% of primary and 55.1% of secondary school-aged children exceeded the AAP total screen-viewing time recommendation on weekdays. On weekend days these figures were higher with 62.9% in primary and 86.6% in secondary school-aged children exceeding the guidelines. There were also gender differences in TV viewing and console games-playing. Males watched more TV than females, although it was only in primary school-aged children and on weekdays. Males also spent more time playing games-consoles than females. Overall, males engaged more time than females in all screen-viewing behaviours.

Older children with greater access to media sources in their bedrooms spent more time engaged in screen-viewing behaviours. The higher levels of TV and screen viewing by older children could be at least partially explained by increased access to media equipment as our results showed that they had more TV sets in their bedrooms than younger children and that having a TV and a console in the bedroom were significant factors for not meeting screen-viewing guidelines on weekdays.

Familial screen-viewing factors such as parental TV viewing and rules were correlates of screen viewing, although influences differed depending on children's age and day of the week. For older children, parental TV viewing time appeared to be associated with children's TV viewing on weekdays and weekend days, while parental rules was associated among younger children on weekend days. Some family factors are also likely to be key predictors of youth screen viewing. Younger children living in single-parent households were more likely to exceeded recommended screen-viewing guidelines on weekend days, while older children with a younger parent, with siblings and having a father that was not working were more likely to exceeded recommended screen-viewing guidelines on weekdays.

What is already known on this topic

Previous research has established that adolescents spend more time in screen-based activities than their younger counterparts[25–32] and that TV usage peak emerges between 9 and 12 years of age.[16] Several studies have also described that adolescents spent more time in screen-viewing behaviours on weekend days than on weekdays.[18,25,26–28,33–35] Two reviews of correlates of screen viewing and TV viewing in youth have reported no gender differences in TV viewing,[16,34] while males spent more time engaged in console games-playing than females.[16,25,29,35–37] Several studies have also reported that youth in single-parent families consistently watch more TV than those from two-parent families[34,38] and that TV viewing appears unrelated to being an only child.[34,39]

In relation to environmental and sociocultural variables, the presence of a TV in the bedroom has been suggested to be an important correlate of TV viewing in youth.[34] Several studies have described a positive association between young people and parental TV viewing habits.[33,34,39,40] The home media environment including rules[41–43] and whether TV is left on in home[44,45] has been also associated with children's screen viewing.

What this study adds

This study makes an important contribution to the limited research that has examined correlates of screen viewing among Spanish children. We focused on environmental and sociocultural variables as a way to identify modifiable correlates that might help to develop future effective interventions. Overall our results support previous findings on screen-viewing correlates, although they may operate at different time during childhood and associations may also differ depending on the day of the week. However, in contrast with previous review studies[16,34] males in this study spent more time in TV viewing than females. Older children had more media devices in their bedrooms and they also spent more time in screen viewing. This might be at least partially explained because as they get older they might have

Table 4 Logistic regression model analysis (odds ratios and 95% confidence intervals) for analysed environmental, sociocultural and sociodemographic variables by age group, by gender within age group and by day of the week for spending ≥2 h/day in overall screen viewing

	Overall screen viewing															
	Primary school children								*Secondary school children*							
	Female				*Male*				*Female*				*Male*			
	Weekday		*Weekend day*		*Weekday*		*Weekend day*		*Weekday*		*Weekend day*		*Weekday*		*Weekend day*	
	OR	*(95% CI)*	*OR*	*(95% CI)*	*OR*	*(95% CI)*	*OR*	*(95% CI)*	*OR*	*(95% CI)*	*OR*	*(95% CI)*	*OR*	*(95% CI)*	*OR*	*(95% CI)*
Household TV set																
≥2	2.34	0.56–9.79	1.18	0.35–3.89	1.27	0.63–2.58	0.75	0.27–2.08	3.99	0.75–20.9	1.89	0.96–3.70	1.34	0.64–2.79	5.85	0.99–34.5
≥3	2.06	0.45–9.26	1.11	0.32–3.82	1.52	0.40–5.76	1.33	0.26–6.69	3.62	0.81–16.1	1.38	0.61–3.10	1.68	0.66–4.27	7.72	0.87–68.5
TV bedroom	1.08	0.38–3.05	2.43	0.86–6.84	0.44	0.08–2.20	0.71	0.10–5.05	0.32	0.10–0.97*	0.87	0.24–3.15	0.40	0.15–1.03	1.09	0.38–3.05
Computer bedroom	0.97	0.41–2.30	1.00	0.29–3.41	0.56	0.18–1.72	0.43	0.17–1.04	0.94	0.34–2.61	1.20	0.53–2.70	1.30	0.55–3.05	0.53	0.25–1.09
Console bedroom	0.60	0.19–1.89	1.08	0.47–2.49	0.51	0.21–1.23	0.56	0.29–1.08	0.26	0.08–0.84*	0.84	0.11–6.23	0.60	0.34–1.05	1.44	0.43–4.84
Parental TV viewing	1.90	0.39–9.05	1.60	0.44–5.77	0.95	0.37–2.46	1.59	0.32–7.73	2.74	1.06–7.10*	0.67	0.27–1.63	5.89	1.15–30.1*	6.83	1.02–45.4*
Parental rules TV	0.45	0.07–2.62	1.35	0.41–4.45	0.12	0.02–0.67*	0.91	0.20–4.04	0.52	0.22–1.20	Omitted		0.34	0.07–1.56	1.84	0.29–11.5
Parental rules computer playing	0.31	0.04–2.08	1.48	0.47–4.59	0.84	0.12–5.95	0.99	0.10–9.79	2.49	0.29–20.8	0.86	0.12–5.88	0.59	0.08–3.99	Omitted	
Parental age	0.34	0.07–1.53	0.34	0.08–1.38	0.42	0.15–1.15	1.21	0.37–4.01	0.11	0.02–0.51**	0.45	0.11–1.79	0.15	0.03–0.64*	1.24	0.32–4.74
Family structure	0.42	0.08–2.05	0.26	0.12–0.53**	0.62	0.13–2.93	0.54	0.17–1.71	0.42	0.16–1.13	Omitted		0.97	0.35–2.64	1.06	0.17–6.35
Presence of siblings	1.40	0.45–4.36	0.73	0.33–1.60	1.38	0.39–4.87	0.87	0.39–1.97	1.22	0.52–2.88	1.27	0.39–4.16	0.92	0.46–1.85	1.20	0.49–2.89
Mother employment	1.33	0.40–4.41	0.53	0.21–1.29	0.98	0.40–2.41	0.49	0.12–1.93	0.67	0.28–1.58	0.61	0.12–3.18	1.89	0.52–6.81	1.25	0.25–6.13
Father employment	0.32	0.06–1.68	1.14	0.19–6.87	0.87	0.21–3.52	5.90	0.49–70.4	2.67	0.42–16.9	1.33	0.24–7.36	0.15	0.02–0.88*	Omitted	

Household TV set (ref. 1); TV bedroom (ref. yes); computer bedroom (ref. yes); console bedroom (ref. yes); parental TV viewing (ref. <2 h/day); parental TV rules (ref. no); parental age (ref. ≤40 years old); family structure (ref. single parents); presence of siblings (ref. no); mother employment (ref. non-working); father employment (ref. non-working). Model adjusted for parental BMI group, children BMI group and parental education and clustering by school. *$P < 0.05$, **$P < 0.01$.

greater access and spend more time engaged in independent activities in their bedrooms.

Weekday and weekend TV and screen viewing are separate behaviours, so the variables associations would not be expected to be the same. Family characteristics (parental age and employment) were significant variables for not meeting screen-viewing guidelines on weekdays for older children, while time rules and family structure were significant variables for not meeting screen-viewing guidelines on weekdays and weekend days, respectively, for younger children. Changes in time and family structures might have a stronger effect on younger children as consistent time schedules and habits help them to form a healthy lifestyle.

Parental TV viewing for older children was associated with child TV viewing in this study. Parents' lifestyles might have a strong influence on their children's lifestyles from early stages. These influences might be more notable as children age and parental rules become more relaxed as they have more opportunities to make their own choices. It has been reported that parents tend to increase co-viewing as children move into early adolescence, while less time is spent together in other social contexts (eating together, going out, etc.).[46] In this context, co-viewing can be considered as a familial social activity that may serve as a means of bonding between young adolescents and parents.[39] When combined with our data, these results might suggest that parents influence their child's screen viewing via role modelling and therefore interventions that target child and parent TV viewing together may be useful.

Sociodemographic correlates might highlight key groups that could be the target for future interventions, while environmental and sociocultural correlates might reflect potential mediators and targets for future interventions that should be developed to change these variables. However, more research is needed to both corroborate these findings and to better understand correlates' influences by children's characteristics and time periods.

Limitations of this study

The strengths of this study include heterogeneity across different socioeconomic strata and the examination of a great variety of different screen-viewing behaviours and variables included. Previous studies of electronic media use have focused mostly on the description of sociodemographic characteristics and on TV viewing as a highly prevalent sedentary behaviour. This study included the analysis of sociocultural and environmental factors and captured the diversity of screen-viewing behaviours. This study has some limitations. The cross-sectional nature of this study makes it unable to infer causality. We know that the use of self-reported questionnaires can be problematic, particularly among children. Finally, this sample comprised children living in a single city and this might result in limited generalizability of the results, even if they were from different socioeconomic strata.

Conclusions

There are important associations between environmental and sociocultural factors and screen-viewing behaviours, although they may operate at different time during childhood. Parents are a key influence on children's screen-viewing behaviours and therefore interventions that target environmental and family TV viewing practices are likely to be effective.

Contributors

The authors developed the hypothesis, analysed the data, developed statistical analyses and interpreted the data. The authors contributed to various drafts and approved the final draft.

Ethics approval

This study was approved by the University of the Basque Country Ethics Committee.

Funding

This work is research arising from a Career Development Fellowship (to Dr. Jago) supported by the National Institute for Health Research. The views expressed in this publication are those of the authors and not necessarily those of the National Health Service, the National Institute for Health Research or the Department of Health.

References

1 Ebbeling CB, Pawlak DB, Ludwig DS. Childhood obesity: public-health crisis, common sense cure. *Lancet* 2002;**360**:473–82.

2 Lobstein T, Frelut ML. Prevalence of overweight among children in Europe. *Obes Rev* 2003;**4**:195–200.

3 Proctor MH, Moore LL, Gao D *et al.* Television viewing and change in body fat from preschool to early adolescence: the Framingham children's study. *Int J Obes Relat Metab Disord* 2003;**27**:827–33.

4 Jago R, Baranowski T, Baranowski JC *et al*. BMI from 3–6 y of age is predicted by TV viewing and physical activity, not diet. *Int J Obes* 2005;**29**:557–64.

5 Viner RM, Cole TJ. Television viewing in early childhood predicts adult Body Mass Index. *J Pediatr* 2005;**147**:429–35.

6 Hancox RJ, Poulton R. Watching television is associated with childhood obesity: but is it clinically important? *Int J Obes* 2006;**30**:171–5.

7 Gortmaker SL, Peterson K, Wiecha J *et al*. Reducing obesity via a school-based interdisciplinary intervention among youth: Planet Health. *Arch Pediatr Adolesc Med* 1999;**153**:409–18.

8 Robinson TN. Reducing children's television viewing to prevent obesity: a randomized controlled trial. *JAMA* 1999;**282**: 1561–7.

9 Epstein LH, Roemmich JN, Robinson JL *et al*. A randomized trial of the effects of reducing television viewing and computer use on body mass index in young children. *Arch Pediatr Adolesc Med* 2008;**162**:239–45.

10 American Academy of Pediatrics. Committee on public education. Children, adolescents, and television. *Pediatrics* 2001;**107**: 423–6.

11 Currie C, Gabhainn SN, Godeau E *et al*. Inequalities in young people's health: health behaviour in school-aged children (HBSC) study; international report from the 2005/2006 survey. World Health Organization, Regional Office for Europe, 2008. Health Policy for Children and Adolescents. Report No. 5.

12 Baranowski T, Anderson C, Carmack C. Mediating variable framework in physical activity interventions. How are we doing? How might we do better? *Am J Prev Med* 1998;**15**:266–97.

13 Shiner R, Caspi A. Personality differences in childhood and adolescence: measurement, development, and consequences. *J Child Psychol Psychiatry* 2003;**44**:2–32.

14 Malina RM. Tracking of physical activity across the lifespan. *Res Digest* 2001;**3**:1–8.

15 Janz KF, Burns TL, Levy SM. Tracking activity and sedentary behaviours in childhood. The Iowa Bone Development Study. *Am J Prev Med* 2005;**29**:171–8.

16 Marshall SJ, Gorely T, Biddle SJ. Descriptive epidemiology of screen-based media use in youth: a review and critique. *J Adolesc* 2006;**29**:333–49.

17 Instituto Nacional de Estadística. Encuesta Nacional de Salud (2003). http://www.ine.es/jaxi/menu.do?type=pcaxis&path=/t15/p419/p02/a2003/&file=pcaxis (26 April 2005, date last accessed).

18 Instituto Nacional de Estadística. Encuesta Nacional de Salud (2006). http://www.ine.es/jaxi/menu.do?type=pcaxis&path=/t15/p419/a2006/p03/&file=pcaxis (13 March 2008, date last accessed).

19 Ayuntamiento de Bilbao. Lan Ekintza. Observatorio socioeconómico. http://www.bilbao.net/lanekintza/observatorio (2009, date last accessed).

20 Anderson DR, Field DE, Collins PA *et al*. Estimates of young children's time with television: a methodological comparison of parent reports with time-lapse video home observation. *Child Dev* 1985;**56**:1345–57.

21 Cole TJ, Bellizzi MC, Flegal KM *et al*. Establishing a standard definition for child overweight and obesity worldwide: international survey. *BMJ* 2000;**320**:1240–3.

22 World Health Organization. Obesity: preventing and managing the global epidemic. Report of a WHO Consultation, 2000. WHO Technical Report Series. Report No: 894.

23 Jago R, Page A, Froberg K *et al*. Screen-viewing and the home TV environment: the European Youth Heart Study. *Prev Med* 2008;**47**:525–9.

24 Jago R, Fox KR, Page AS *et al*. Development of scales to assess children's perceptions of friend and parental influences on physical activity. *Int J Behav Nutr Phys Act* 2009;**6**:67.

25 Wright JC, Huston AC, Vandewater EA *et al*. American children's use of electronic media in 1997: a national survey. *J Appl Dev Psychol* 2001;**22**:31–47.

26 Saelens BE, Sallis JF, Nader PR *et al*. Home environmental influences on children's television watching from early to middle childhood. *J Dev Behav Pediatr* 2002;**23**:127–32.

27 Wake M, Hesketh K, Waters E. Television, computer use and body mass index in Australian primary school children. *J Paediatr Child Health* 2003;**39**:130–4.

28 Tirado Altamirano F, Barbancho Cisneros FJ, Hernandez LM *et al*. Repercusión de los hábitos televisivos sobre la actividad física y el rendimiento escolar de los niños. *Rev Cubana Enfermer* 2004;**20**:2.

29 Vandewater EA, Shim M, Caplovitz AG. Linking obesity and activity level with children's television and video game use. *J Adolesc* 2004;**27**:71–85.

30 Hesketh K, Ball K, Crawford D *et al*. Mediators of the relationship between maternal education and children's TV viewing. *Am J Prev Med* 2007;**33**:41–7.

31 Lioret S, Maire B, Volatier JL *et al*. Child overweight in France and its relationship with physical activity, sedentary behaviour and socioeconomic status. *Eur J Clin Nutr* 2007;**61**: 509–16.

32 Lioret S, Touvier M, Dubuisson C *et al*. Trends in child overweight rates and energy intake in France from 1999 to 2007: relationships with socioeconomic status. *Obesity* 2009;**17**:1092–100.

33 Verma S, Larson RW. Television in Indian adolescents' lives: a member of the family. *J Youth Adolesc* 2002;**31**:177–83.

34 Gorely T, Marshall SJ, Biddle SJ. Couch kids: correlates of TV viewing among youth. *Int J Behav Med* 2004;**11**:152–63.

35 Bercedo A, Redondo C, Pelayo R *et al*. Mass media consumption in adolescence. *An Pediatr* 2005;**63**:516–25.

36 Utter J, Neumark-Sztainer D, Jeffery R *et al*. Couch potatoes or French fries: are sedentary behaviours associated with body mass index, physical activity, and dietary behaviorss among adolescents? *J Am Diet Assoc* 2003;**103**:1298–305.

37 Colwell J, Kato M. Video game play in British and Japanese adolescents. *Simul Gaming* 2005;**36**:518–30.

38 Bagley S, Salmon J, Crawford D. Family structure and children's television viewing and physical activity. *Med Sci Sports Exerc* 2006;**38**:910–8.

39 Hardy LL, Baur LA, Garnett SP *et al*. Family and home correlates of television viewing in 12–13 year old adolescents: the Nepean Study. *Int J Behav Nutr Phys Act* 2006;**24**:1–9.

40 Barradas DT, Fulton JE, Blanck HM *et al*. Parental influences on youth television viewing. *J Pediatr* 2007;**151**: 369–73.

41 Krosnick JA, Anand SN, Hartl SP. Psychosocial predictors of heavy television viewing among preadolescents and adolescents. *Basic Appl Soc Psych* 2003;**25**:87–110.

42 Salmon J, Timperio A, Telford A *et al*. Association of family environment with children's television viewing and with low level of physical activity. *Obes Res* 2005;**13**:1939–51.

43 Davison KK, Francis LA, Birch LL. Links between parents' and girls' television viewing behaviors: a longitudinal examination. *J Pediatr* 2005;**147**:436–42.

44 Songül Yalçin S, Tugrul B, Naçar N *et al*. Factors that affect television viewing time in preschool and primary schoolchildren. *Pediatr Int* 2002;**44**:622–7.

45 Spurrier NJ, Magarey AA, Golley R *et al*. Relationships between the home environment and physical activity and dietary patterns of preschool children: a cross-sectional study. *Int J Behav Nutr Phys Act* 2008;**5**:31.

46 Dubas JS, Gerris JR. Longitudinal changes in the time parents spend in activities with their adolescent children as a function of child age, pubertal status, and gender. *J Fam Psychol* 2002;**16**:415–27.