

Screen-viewing and the home TV environment: The European Youth Heart Study

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ABSTRACT

Objective: Examine if home environmental factors are associated with screen-viewing.

Methods: Data are for 2670, 3rd and 9th grade participants in Denmark, Portugal, Estonia and Norway collected between 1997 and 2000. Outcomes were spending >2 hours after-school watching television (TV) and >1 hour per day playing computer games. Child Autonomy and the home TV environment were exposures.

Results: Each unit increase in Child Autonomy was associated with 9% increase in risk of watching more than 2 hours of TV per day after school and a 19% increase in risk of spending more than an hour per day playing computer games. TV environment was associated with a 31% per unit increase in risk of watching >2 hours of TV after school and 11% increase in risk of spending >1 hour playing computer games.

Conclusions: A family environment in which after-school TV viewing is part of the home culture and homes where children have more autonomy over their own behavior are associated with an increased risk of watching >2 hours of TV per day after school and spending more >1 hour per day playing computer games. The home screen-viewing environment and Child Autonomy may be malleable targets for changing screen-viewing.

Key words: sedentary behavior; obesity; adolescent

INTRODUCTION

Screen-viewing behaviors such as television (TV) watching and playing electronic games have been associated with increased body mass among youth (Jago et al., 2005, Vandewater et al., 2004, Viner & Cole, 2005). As US research has shown that over half of youth's live in homes in which the TV is on most of the time (Rideout et al., 2005) reducing screen-viewing could be an effective means of preventing obesity. To change screen-viewing behaviors we need to identify the factors that influence screen-viewing and then manipulate those variables (Baranowski et al., 1998, Baranowski & Jago, 2005). Ecological models of behavior (Saelens et al., 2003, Sallis & Owen, 1996) suggest that child factors, home environmental factors and the behaviors of other key individuals will influence screen-viewing. In this model home environmental factors would be proximal variables likely to influence screen-viewing while parental behaviors would be more distal factors that capture the underlying home screen-viewing environment. Two proximal factors that have previously been associated with TV viewing among North American youth are the presence of a TV in a child's bedroom (Adachi-Mejia et al., 2007, Dennison et al., 2002) and the number of TV's in the home (Saelens et al., 2002).

British data shows that the majority of children's TV viewing is carried out at or near bedtime (OFCOM, 2004) suggesting that bedtime could be a more distal variable associated with screen-viewing. Prohibition of TV watching during meal times was associated with less TV viewing among primary school students (Salmon et al., 2005) and watching TV with parents was associated with higher TV viewing among adolescents (Hardy et al., 2006), suggesting that the home TV environment could influence youth screen-viewing.

Authoritative parenting style in which a parent sets clear boundaries while being sympathetic to the child has been associated with lower levels of sedentary behavior among US adolescents (Schmitz et al., 2002). Moreover, US research has shown that 53% of 8-18 year olds report that their parents have no rules about TV viewing (Rideout et al., 2005). These findings imply that the extent to which children have autonomy over their own behavior could be associated with screen-viewing.

We do not know the extent to which proximal or distal variables are associated with youth screen-viewing. To identify potentially effective means of changing screen-viewing behaviors this paper examines the extent to which proximal (number of TV's, TV in bedroom) and

distal variables (bedtime, home TV environment and child autonomy) are related to screen-viewing. Moreover, as a TV viewing varies across European countries (Samdal et al., 2007) we used a sample of participants from four European countries and examined if associations differed by country.

METHODS

The data presented here are from the Danish, Portuguese (Madeira), Estonian and Norwegian arms of the European Youth Heart Study (EYHS). The EYHS sampling frame has been reported in detail elsewhere (Riddoch et al., 2005). Briefly, a minimum of 20 schools, stratified by socioeconomic status were recruited in each country between 1997 and 2000. Random samples of 3rd and 9th grade students were recruited in each school. Ethical approval was obtained from local ethics committees and informed consent was obtained for all participants.

Measures

Stature was assessed to the nearest 0.5cm using a Harpenden stadiometer. Weight was assessed to the nearest 0.1kg using a Seca beam scale. The International Obesity Task Force (IOTF) criteria (Cole et al., 2000) were used to classify participants as normal weight or overweight. Parental income was self-reported for each parent and divided into tertiles within each country. All remaining variables were self-reported on a computer-based questionnaire that was produced in English and translated into Danish, Portuguese, Norwegian, Estonian and Russian (approx 20% of Estonians speak Russian) by a professional translation service. Translations were then piloted with 9-10 year old participants in each country and adjusted as necessary.

Outcome variables

TV viewing after school was assessed using a single question which asked participants the number of hours per day spent watching TV after-school (none, <1, 1-2, 2-3, >3). Participants were also asked to report the number of hours per day spent playing computer games (none, <1, 1-2, >2). This approach was utilized as in previous research the assessment of TV viewing via a single question has been shown to correlate ($r = 0.60$) with 10 days of TV diaries among young children (Anderson et al., 1985). Moreover, a recent review reported that the single item approach has the highest validity of current methodologies (Bryant et al., 2007). After-school TV viewing was coded based on the American Academy of Pediatrics guidelines as

less than 2 hours (meeting the guideline) or more than 2 hours (not meeting the guideline) (American Academy of Pediatrics, 1999). Computer hours per day were coded based on the frequency of responses as less than an hour or more than an hour per day.

Exposure variables

Participants reported whether they had a TV in their bedroom and the number of household televisions and what time they usually go to bed on a school day (before 8pm, 8-9pm, 9-10pm and after 10pm). Respondents were asked “how often do you choose what you eat for evening meal” and “how often can you take anything you want to eat from the kitchen” (both never, 1 -2 a week, most days, every day). These two measures provided an indication of the extent to which the child had autonomy over his or her own behavior. We are not aware of any validated measure that provides a direct indication of screen-viewing autonomy, but we hypothesized that these items provided an indication of the extent to which the child is afforded decision making power, a practical surrogate measures of child autonomy. For TV environment participants were also asked “how often do you eat meals while watching TV” (hardly ever, only at weekends, once or twice a week, most days, everyday) and how often is the TV on when you get home from school (hardly ever, 1-2 a week, most days, every day).

Coding of exposure variables

Since the presence of TV's in the bedroom (Dennison et al., 2002) and the number of TV's in the household (Saelens et al., 2002) have been associated with television viewing they were treated as independent exposure variables. As exploratory correlation analyses indicated significant associations among the remaining exposure variables principal component analysis (PCA) with Varimax rotation was conducted in SPSS (Version 12.0) to reduce the items into associated components. This process resulted in two factors; 1) Child Autonomy (33.46% of the variance), which included the participants ability to choose his or her own evening meal, ability to select foods from the kitchen and bedtime; and 2) Home TV Environment (20.94% of the variance) which included whether the TV was on when the child returned home and the frequency of eating meals while watching TV (Table 1). Responses for items included in both factors were summed.

Analysis

One-way analysis of variance and post-hoc Tukey tests were used to examine differences between countries. Frequencies and percents were used to describe dichotomous variables and χ^2 were used to examine differences by country.

A multivariable logistic regression model was run using the xtlogit command in Stata (version 9.0, College Station, TX) with less than or more than 2 hours of After-school TV viewing per day as the outcome variable. Child Autonomy, TV Environment, number of TV's in the home and TV in the child's bedroom were included as exposures. As screen-viewing behaviors have been shown to differ by age, gender, socio-economic status and country (Gordon-Larsen et al., 2000, Rideout et al., 2005, Samdal et al., 2007) the models included grade (reference 3rd), gender (reference female), father's income (reference low income group), mother's income (reference low income group) and country (reference Denmark) as exposures. Obesity status was included in the models because previous work has shown that screen-viewing patterns are associated with body composition (Ekelund et al., 2006). Since participants were recruited from schools the model included school as a random effect and used population averaged robust standard errors. Models were then re-run separately for each country. The entire process was then repeated with less than or more than 1 hour per day of computer use as the outcome. Alpha was set at 0.05.

RESULTS

Child Autonomy was significantly higher in Norway and the number of TV sets in the home was higher in Denmark (Table 2). The prevalence of overweight was highest in Portugal (20.8%). Portugal also had the highest prevalence of participants who spent more than an hour per day playing computer games (29.7%).

Logistic regression models predicting whether participant's watched 2 or more hours of TV after school are shown in Table 3. For all participants, each unit increase in child autonomy (range from 3 – 12) was associated with a 9% (i.e. odds ratio = 1.09) increase in the likelihood of watching more than 2 hours of TV after school. (As Child Autonomy scores ranged from 3 to 12 each unit increased provided a linear indication of the extent to which participants were afforded decision making power by his or her parents). Similarly, each unit increase in TV Environment was associated with 31% increase in the likelihood of watching more than 2 hours of TV after school. (TV environment scores ranged from 2 to 9 and each unit increase provided a linear indication of the extent to which the TV was dominant within

the home). Overweight participants were 40% more likely to watch more than 2 hours of TV after-school than non-overweight children.

Among Danish participants Child Autonomy (21%), Home TV Environment (22%) and overweight status (91%) were associated with an increased likelihood of watching more than 2 hours of TV after school. For Portuguese participants, each unit increase in TV environment was associated with a 25% increase in the risk of watching more than 2 hours of TV after school. For Estonians each unit increase in TV environment was associated with a 27% increase in risk of watching more than 2 hours of TV while each TV was associated with a 42% increase. Among Norwegians each unit increase in child autonomy (21%) and TV environment (60%) increased the likelihood of participants watching more than 2 hours of TV per day.

Each unit increase in Child Autonomy (19%) and Home TV Environment (11%) was associated with an increased risk of spending more than an hour per day playing computer games (Table 4). Males were 4.2 times more likely than females and the Portuguese were 61% more likely than the Danes to spend an hour per day playing computer games.

Among Danish youth each unit increase in Child Autonomy (29%) and the Home TV Environment (18%) was associated with an increase in risk of spending more than an hour per day playing computer games. Portuguese males were over 3 times more likely to spend an hour per day or more playing computer games than females with this figure being over 7 times for Norwegian children. Among Norwegian youths each unit in child autonomy was associated with a 16% increase in the likelihood of spending more than an hour per day playing computer games. Among Estonians each unit increase in Child Autonomy was associated with a 27% increase in risk of spending more than an hour per day playing computer games with a 23% increase in risk for each TV environment unit increase and a 30% increase for the number of TV's in the home. Estonian males were 3.6 times more likely to play computer games for an hour per day and students with a mother in the middle income tertile were 37% less likely than the lowest maternal income group to play computer games for an hour per day.

DISCUSSION

Youth's who live in homes in which the TV plays an important role (i.e. it is on when the children get home and meals are eaten in front of the TV) are more likely to watch more than 2 hours of TV after school and spend more than an hour per day playing computer games. Changing screen-viewing behaviors of the entire family is likely to be important for changing youth screen-viewing and strategies such as family turn-off weeks and family TV budgets might enhance screen-viewing interventions.

Higher child autonomy was associated with an increased risk of watching more than 2 hours of TV per day after school in Denmark and Norway and was also associated with an increased risk of playing computer games for more than an hour per day, except in Portugal. Unstudied factors such as the number of TV channels available and physical activity opportunities could also be important influences on screen-viewing. Nevertheless, the data presented here imply that more work is needed to examine how child autonomy is associated with screen-viewing and whether changing child autonomy affects screen-viewing.

Over 30% of participants watched more than 2 hours of TV per day after school and over 22% spent more than an hour per day playing computer games thereby indicating a need to change both behaviors. These figures are considerably less than recent Australian research where it was reported that 61% of boys and 57% of girls watched more than 2 hours of TV per day (Salmon et al., 2005) and US data which has reported that 41% of 9 year old girls watched more than 2 hours of TV per day (Davison et al., 2005). The analyses presented here also showed that screen-viewing behaviors differed by country and therefore it will be important to fully understand the determinants within each country and develop country specific strategies to change screen-viewing behaviors.

Danish participants in the highest tertile of paternal income were 48% less likely to watch more than 2 hours of TV per day after school while Danish participants in the highest tertile of maternal income were 48% less likely to spend an hour per day playing computer games. Among Estonians, participants in the middle maternal income group were 37% less likely to spend more than an hour per day playing computer games but these income differences were not evident elsewhere. Possible explanations for the differences could be because more affluent parents have more income to pay for other activities such as physical activity participation in sport clubs or could be because children with higher income mothers are in organized day care that provides more activity and less screen-viewing for youths.

Understanding these differences and why they were not evident among the Portuguese or Norwegian participants will aid the development of new, more effective strategies to change screen-viewing behaviors.

Limitations

The data reported here are self-reported and could be susceptible to socially desirable responses. The child autonomy measure does not directly assess screen-viewing autonomy as it is based on diet related autonomy and therefore needs to be considered as a surrogate measure of child autonomy. Finally, the data are cross-sectional and it is not possible to delineate the direction of causality in the associations.

CONCLUSIONS

The data presented in this paper show that among children and adolescents from four European nations higher levels of child autonomy over their own behavior and residing in a home in which after-school TV viewing is part of the home culture is associated with an increased risk of watching more than 2 hours of TV per day after school and spending more than an hour per day playing computer games. Developing strategies that engage the entire family to change these variables will likely be important for reducing the amount of time spent engaged in screen-viewing.

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TABLES

Table 1: Principal Component Analysis (PCA) derived factors from European Youth Heart Study self-report data (1997-2000)

Variable	Child autonomy	TV Environment
How often do you choose what you want to eat for your evening meal?	.488	.379
How often can you take anything you want to eat from the kitchen?	.765	.225
What time do you usually go to bed on a school day?	.791	-.150
How often is the TV on when you get home?	-.102	.822
How often do you eat meals while watching TV?	.215	.567
Variance Explained (Total = 51.7%)	33.46%	20.94%

Table 2: Means and frequencies of variables for all subjects and separately by country in the European Youth Heart Study (1997-2000)

	All (n = 2670)	Denmark (n = 887)	Portugal (n =466)	Estonia (n =774)	Norway (n = 544)	F
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
Child autonomy	8.09 (2.07)	6.92 (1.88)	8.26 (1.88)	8.77 (1.93)	8.86 (1.89)	F = 176.27, p <0.001 ^{a, b, c, d, e}
TV environment	4.88 (1.74)	4.62 (1.67)	4.62 (1.66)	5.68 (1.67)	4.59 (1.65)	F = 85.40, p < 0.001 ^{b, d, f}
# TV sets	2.80 (0.629)	2.98 (0.59)	2.89 (0.58)	2.87 (.57)	2.87 (0.58)	F = 117.17, p = <0.001 ^{a, b, c, d, f}
	N (%)	N(%)	N (%)	N (%)	N (%)	χ^2 (df = 3)
Female	1364 (51.1%)	460 (51.9%)	225 (48.4%)	420 (54.3%)	259 (47.6%)	7.33, p = 0.062
Male	1306 (48.9%)	427 (48.1%)	240 (51.6%)	354 (45.7%)	285 (52.4%)	
Normal weight	2320 (86.9%)	765 (86.2%)	368 (79.1%)	698 (90.2%)	489 (89.9%)	51.60, p <0.001
Overweight (IOTF)	350 (13.1%)	122 (13.8%)	97 (20.8%)	76 (9.8%)	55 (10.1%)	
3 rd Grade	1388 (52.0%)	528 (59.5%)	175 (37.6%)	394 (50.9%)	291 (53.5%)	59.43, p<0.001
9 th Grade	1282 (48.0%)	359 (40.5%)	290 (62.4%)	380 (49.1%)	253 (46.5%)	
No TV in Bedroom	1581 (59.2%)	362 (40.8%)	280 (60.2%)	571 (73.8%)	368 (67.6%)	208.51, p <0.001
TV in bedroom	1089 (40.8%)	525 (59.2%)	185 (39.8%)	176 (22.7%)	176 (32.4%)	
< 2 hrs TV after school	1852 (69.4%)	720 (81.2%)	290 (62.4%)	443 (57.2%)	399 (85.8%)	126.56, p <0.001
≥ 2 hrs TV after school	818 (30.6%)	167 (18.8%)	175 (37.6%)	331 (42.8%)	145 (31.2%)	
< 1 hr Computer	2071 (77.6%)	722 (81.4%)	327 (70.3%)	624 (80.6%)	398 (73.2%)	31.72, p<0.001
≥ 1 hr Computer	599 (22.4%)	165 (18.6%)	138 (29.7%)	146 (18.9%)	146 (26.8%)	

F = One-way ANOVA with country as a factor χ^2 = Chi-square test of differences by country

^a = Tukey p <0.05 Denmark vs. Portugal

^b = Tukey p <0.05 Denmark vs. Estonia ^c = Tukey p <0.05 Denmark vs. Norway

^d = Tukey p <0.05 Portugal vs. Estonia ^e = Tukey p <0.05 Portugal vs. Norway

Table 3: Logistic regression predicting 2 or more hour of TV after-school by child autonomy and the home TV environment among European Youth: The European Youth Heart Study (1997-2000)*

ALL N = 2670				
	OR	95% CI		
Child autonomy	1.09	1.03 – 1.17		
TV Environment	1.31	1.23 – 1.39		
# TV sets in Home	1.10	0.89 – 1.34		
TV in bedroom	1.15	0.89 – 1.48		
Overweight (ref normal)	1.40	1.17 – 1.76		
Grade (ref 3 rd)	1.11	1.06 – 1.14		
Gender (ref Female)	1.18	0.93 – 1.35		
Fathers Income – Medium (ref low)	0.94	0.77 – 1.15		
Fathers Income –High (ref low)	0.69	0.50 – 0.94		
Mother’s Income – Medium (ref low)	0.95	0.78 – 1.14		
Mother’s Income – High (ref low)	0.87	0.68 – 1.12		
Portugal (ref Denmark)	1.94	1.40 – 2.70		
Estonia (ref Denmark)	2.18	1.58 – 3.03		
Norway (ref Denmark)	1.65	1.16 – 2.34		
	Denmark N = 887		Portugal – N = 465	
	OR	95% CI	OR	95% CI
Child autonomy	1.21	1.02 – 1.44	1.07	0.93 – 1.22
TV Environment	1.22	1.07 – 1.38	1.25	1.13 – 1.38
# TV sets in Home	0.86	0.59 – 1.25	0.85	0.60 – 1.20
TV in bedroom	1.09	0.58 – 2.07	1.44	0.95 – 2.18
Overweight (ref normal)	1.91	1.23 – 2.97	1.28	0.86 – 1.89
Grade (ref 3 rd)	1.05	0.95 – 1.16	1.10	1.00 – 1.19
Gender (ref Female)	1.19	0.83 – 1.71	1.05	0.68 – 1.60
Fathers Income – Medium (ref low)	0.82	0.56 – 1.19	1.18	0.56 – 2.22
Fathers Income –High (ref low)	0.52	0.28 – 0.95	0.64	0.23 – 1.77
Mother’s Income – Medium (ref low)	0.99	0.72 – 1.40	0.94	0.56 – 1.57
Mother’s Income – High (ref low)	0.74	0.38 – 1.45	1.32	0.63 – 2.76
	Estonia – N = 774		Norway N = 544	
	OR	95% CI	OR	95% CI
Child autonomy	1.03	0.92 – 1.15	1.21	1.05 – 1.40
TV Environment	1.27	1.14 – 1.41	1.60	1.36 – 1.88
# TV sets in Home	1.42	1.01 – 1.99	1.17	0.63 – 2.17
TV in bedroom	1.12	0.69 – 1.81	1.16	0.76 – 1.78
Overweight (ref normal)	1.14	0.77 – 1.67	1.37	0.75 – 2.52
Grade (ref 3 rd)	1.13	1.07 – 1.20	1.07	0.99 – 1.15
Gender (ref Female)	0.95	0.71 – 1.28	1.37	0.84 – 2.22
Fathers Income – Medium (ref low)	0.92	0.73 – 1.18	0.89	0.34 – 2.30
Fathers Income –High (ref low)	1.07	0.57 – 2.02	0.65	0.22 – 1.92
Mother’s Income – Medium (ref low)	1.05	0.82 – 1.36	0.54	0.26 – 1.13
Mother’s Income – High (ref low)	0.96	0.69 – 1.34	0.56	0.31 – 1.03

* All models control for the clustering of participants within schools and use robust standard errors

OR = Odds ratio

95% CI = 95% Confidence Intervals

Table 4: Logistic regression predicting an hour a day playing computer games by child autonomy and the home TV environment among European Youth: The European Youth Heart Study (1997-2000)*

	All N = 2670			
ALL N = 2670	OR	95% CI		
Child autonomy	1.19	1.11 – 1.28		
TV Environment	1.11	1.06 – 1.18		
# TV sets in Home	1.17	0.99 – 1.40		
TV in bedroom	1.02	0.82 – 1.28		
Overweight (ref normal)	1.30	0.99 – 1.70		
Grade (ref 3 rd)	0.94	0.89 – 0.99		
Gender (ref Female)	4.23	3.23 – 5.53		
Fathers Income – Medium (ref low)	1.22	0.95 – 1.56		
Fathers Income –High (ref low)	1.24	0.90 – 1.71		
Mother’s Income – Medium (ref low)	0.85	0.66 – 1.10		
Mother’s Income – High (ref low)	1.01	0.74 – 1.38		
Portugal (ref Denmark)	1.61	1.07 – 2.41		
Estonia (ref Denmark)	0.77	0.53 – 1.11		
Norway (ref Denmark)	1.06	0.73 – 1.54		
	Denmark N = 887		Portugal – N = 465	
	OR	95% CI	OR	95% CI
Child autonomy	1.29	1.10 – 1.50	1.07	0.94 – 1.23
TV Environment	1.18	1.06 – 1.31	0.99	0.88 – 1.12
# TV sets in Home	1.12	0.80 – 1.56	1.48	0.96 – 2.27
TV in bedroom	0.81	0.57 – 1.15	1.09	0.71 – 1.67
Overweight (ref normal)	1.69	1.20 – 2.38	0.97	0.52 – 1.79
Grade (ref 3 rd)	0.97	0.87 – 1.08	1.00	0.94 – 1.08
Gender (ref Female)	4.62	2.94 – 7.28	3.09	1.86 – 5.14
Fathers Income – Medium (ref low)	1.08	0.66 – 1.75	1.29	0.74 – 2.22
Fathers Income –High (ref low)	1.11	0.65 – 1.87	2.49	0.97 – 6.42
Mother’s Income – Medium (ref low)	0.89	0.60 – 1.34	1.24	0.64 – 2.40
Mother’s Income – High (ref low)	0.52	0.32 – 0.83	0.91	0.33 – 2.55
	Estonia – N = 774		Norway N = 544	
	OR	95% CI	OR	95% CI
Child autonomy	1.27	1.10 – 1.47	1.16	1.02 – 1.31
TV Environment	1.23	1.10 – 1.37	1.11	0.97 – 1.28
# TV sets in Home	1.30	1.03 – 1.62	0.88	0.59 – 1.31
TV in bedroom	1.19	0.76 – 1.87	0.94	0.53 – 1.65
Overweight (ref normal)	1.09	0.67 – 1.78	1.28	0.60 – 2.74
Grade (ref 3 rd)	0.83	0.75 – 0.92	0.97	0.87 – 1.09
Gender (ref Female)	3.56	2.18 – 5.82	7.10	3.37 – 14.90
Fathers Income – Medium (ref low)	1.19	0.81 – 1.74	2.29	0.72 – 7.30
Fathers Income –High (ref low)	1.25	0.65 – 2.43	1.98	0.62 – 6.35
Mother’s Income – Medium (ref low)	0.63	0.41 – 0.96	1.04	0.55 – 1.94
Mother’s Income – High (ref low)	1.12	0.49 – 2.53	1.51	0.85 – 2.67

* All models control for the clustering of participants within schools and use robust standard errors

OR = Odds ratio

95% CI = 95% Confidence Intervals