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ORIGINAL ARTICLE

Association of screen time with subjective health complaints in Iranian school-aged children and adolescents: the CASPIAN-V study

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Abstract

Background Sedentary leisure time might be affecting children's and adolescents' general health. We investigated the association between watching television and computer use in this age group and psychosomatic health complaints.

Methods This study of 14,274 students aged 7–18 years was conducted in Iran between 2014 and 2015, as part of the fifth school-based nationwide health survey named the childhood and adolescence surveillance and prevention of adult non-communicable disease (CASPIAN-V) study. In addition to gathering data on time spent watching television or using a computer per day, we categorized the health complaints into somatic (headache, backache, stomach ache, and feeling dizzy) and psychological (feeling low, feeling nervous, irritability, and difficulty falling asleep) symptoms. Regression models were used to determine the relationships between variables.

Results All psychological health complaints, as well as headaches, were significantly more prevalent in the over-14 age group, both in girls and boys. Lower socioeconomic status, living in families where one or two parents were absent, and living in urban areas were all associated with higher psychosomatic health problems. Also, more time spent watching television was associated with more stomach aches and irritability (OR = 1.12 and 1.14 respectively). More time spent using a computer correlated with a higher prevalence of stomach aches, irritability, feeling nervous, and difficulty falling asleep (OR = 1.15, 1.12, 1.29, and 1.07 respectively).

Conclusion Prolonged time spent on television watching or computer use might be associated with adverse effects on children's and adolescents' psychosomatic health status.

Keywords Child · Adolescent · Screen time · Subjective health complaints · Television

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Introduction

Psychological problems among children and adolescents are negative social issues with the potential for significant harm. These problems are so common that nearly half of all adolescents report suffering from at least one psychological complaint (Husarova et al. 2015). Also, one third of adolescents display symptoms of moderate to severe depression (Kremer et al. 2014), girls more so than boys (Husarova et al. 2015; Kremer et al. 2014). Mental health problems play a significant role in a child's life, and may be linked to social and behavioral problems in adulthood. Knowing the risk factors for psychiatric disorders leads to early prevention and treatment of adverse effects (Mendes et al. 2013). Among many risk factors for such problems, there is evidence of a consistent association between sedentary screen-based activity and mental health issues (Biddle and Asare 2011).

Somatic health complaints have been observed to be increasing among children and adolescents over the years (Dey et al. 2015). Incorrect sitting postures during screen-based activities might adversely affect different parts of the body, mostly the back or neck. Likewise, incorrect spinal posture while sitting is correlated with upper quadrant musculoskeletal pain (Brink and Louw 2013). Stomach ache, headache, and dizziness have also been shown to be more common in children who exceed total screen-time recommendations (Keane et al. 2017), which is nearly half of all children and adolescents (Husarova et al. 2015; Saunders and Vallance 2017). The problem is compounded by the fact that as adolescents get older, the time spent on screen-based activities also increases (Husarova et al. 2015), which can affect children and adolescents in multiple aspects of their lives. For instance, higher screen time is not only correlated with more depressive symptoms (Kremer et al. 2014) and lower health-related quality of life in adolescents (Lacy et al. 2012), but also with higher waist circumference, obesity, and overweight in children (LeBlanc et al. 2015a; Saunders and Vallance 2017). It is also reported that children who participate in more screen-based activities exhibit more unsatisfactory psychosocial behaviors, such as substance abuse or violent behavior, unhealthy eating habits, undesirable school-related outcomes, an obnoxious attitude toward school, and school stress (Hamrik et al. 2015). Violent behaviors such as physical fighting, bullying, and being bullied have been linked to excessive screen activity (Kelishadi et al. 2015).

Watching television and using computers constitute the two significant elements of screen-based activities. Although using computers, either for playing games or searching the internet, is not more common than watching TV, the excessive use of personal computers has been related to more health problems than excessive TV watching (Brindova et al. 2015). A study in 2010 by Marques et al. reported that using computers led to weekly headaches, feeling low, irritability, and nervousness among girls, and weekly irritability among boys (Marques et al. 2015). In another study, of Nordic adolescents, it was the duration rather than the type of screen-based activity that was associated with physical complaints, including headache and backache. The reported correlation was also linear, and did not contain any threshold for time spent on screen and having physical complaints (Torsheim et al. 2010).

Leisure-time physical activity is low in Iranian children and adolescents, and screen use time (mostly watching TV) is approximately double the recommendation (Hovsepian et al. 2016; Jari et al. 2014). However, information about the impact of screen-based sedentary activities on child and adolescent health problems in Iran is lacking. To the best of our knowledge, this is the first study to investigate the associations of screen activity with subjective health complaints in a nationally representative sample of Iranian children and adolescents.

Methods and materials

This multicentric national study of 14,274 students aged 7–18 years was conducted in Iran between 2014 and 2015, as part of the fifth school-based nationwide health survey named the childhood and adolescence surveillance and prevention of adult non-communicable disease (CASPIAN-V) study. The Research and Ethics Council of Isfahan University of Medical Sciences approved the study (Project Number: 194049). The protocol description has been described in detail elsewhere (Kelishadi et al. 2013).

A total of 14,400 students aged 7–18 were selected from urban and rural areas in 30 provinces using a multistage, stratified cluster sampling method. After the protocol of the study and its objectives had been explained to students, their informed written and verbal consent was obtained.

Demographic characteristics such as the gender of participants, their socioeconomic status (SES), and living area were collected from questionnaires. Children were also asked to report their family structure as two parents, one parent, or other. Students were categorized into four age groups, namely under 10 years, 10–11 years, 12–14 years and older than 14 years. To assess leisure-time behaviors, the daily time that individuals spent using a personal computer, playing electronic games, or watching television was queried and recorded as hours per day (Kelishadi et al. 2013). To evaluate subjective health complaints, children reported how often they experienced somatic (headache, backache, stomach ache, feeling dizzy) and psychological (feeling low, feeling nervous, irritability, and difficulty falling asleep) symptoms. There were five possible responses to each health complaint: (1) at least once a day, (2) more than once a week, (3) once a week, (4) once a month, and (5) rarely or never, which were then divided into two larger categories: (1) less than once a week or (2) more

than once a week. Participants who reported two or more complaints as occurring once a week or more were considered to have multiple complaints (Keane et al. 2017).

Statistical analysis

In this study, the STATA statistical package (Stata Software, release 11, StataCorp LP. Package, College Station, TX, USA) was used for statistical analysis. *P* values < 0.05 were considered as significant. Data were reported as numbers (percentages) for categorical variables and means (standard deviations) for continuous variables. Odds ratios (OR) and prevalence were calculated with 95% confidence intervals (95% CI). The association between health complaints, personal computer use, and watching television was evaluated by logistic regression analyses in two different models. In model I, the correlation was assessed without adjustment, while in model II it was adjusted for gender, age group, SES, family structure, and living area.

Results

Table 1 presents the demographic characteristics of the students by gender. It shows that 7046 (49.4%) girls and 7228 (50.6%) boys participated in this study. The means for computer use and television watching in students were 0.57 h and 1.97 h per day respectively. There was no significant difference between computer use and gender (*P* value = 0.31). No significant difference was documented for demographic characteristics in boys and girls except age groups. The prevalence of health complaints by gender is shown in Fig. 1, from which it can be seen that both psychological and somatic health complaints were higher in girls than boys. Irritability and feeling nervous were the most common health complaints (37% and 33% respectively), while the least frequent complaints were feeling dizzy (8%) and feeling low (12%). About 44% of girls and 39% of boys experienced multiple health complaints. Table 2 shows the association between health complaints in students and demographic characteristics in girls and boys. All psychological symptoms were associated with age in both genders. Among somatic symptoms, headache and backache in girls, and headache, backache, and feeling dizzy in boys, were associated with age group. The number of complaints increased with age. All the psychological symptoms (except for feeling low) and none of the somatic symptoms were associated with SES in girls, while in boys only the psychological complaints of difficulty falling asleep and irritability and the somatic complaint of feeling dizzy were associated with this demographic characteristic. Girls and boys who lived in urban areas reported more experiences of feeling all psychological symptoms. All reports of somatic symptoms (except stomach ache) in girls and of having backache in boys were statistically higher in urban students than rural students. Family structure was associated with headaches in both genders, and with feeling low in girls and irritability in boys. Age group, SES, and living area also correlated with a risk of reporting two or more complaints once a week or more in both

Table 1 Demographic characteristics of students by gender: the CASPIAN-V study

		Total	Girls *n* = 7046 (49.36%) *n* (%)	Boys *n* = 7228 (50.64%) *n* (%)	*P* value
Age group (in years)	Under 10	3405 (23.85)	1820 (25.83)	1585 (21.93)	< 0.001
	10–11	2724 (19.08)	1274 (18.08)	1450 (20.06)	
	12–14	4305 (30.16)	2156 (30.60)	2149 (29.73)	
	Older than 14	3840 (26.90)	1796 (25.49)	2044 (28.28)	
Socioeconomic status	Low	4562 (33.45)	2234 (33.33)	2325 (33.58)	0.08
	Moderate	4521 (33.15)	2172 (32.40)	2343 (33.84)	
	High	4555 (33.40)	2297 (34.27)	2255 (32.57)	
Family structure	Two parents	13,341 (93.39)	6578 (93.36)	6751 (93.40)	0.79
	One parent	660 (4.62)	322 (4.57)	338 (4.68)	
	Other	285 (1.99)	146 (2.07)	139 (1.92)	
Living area	Urban	10,194 (71.42)	5044 (71.59)	5150 (71.25)	0.66
	Rural	4080 (28.58)	2002 (28.41)	2078 (28.75)	
Screen-time activity		Mean (SD) Total	Girls	Boys	
TV watching (h/d)		1.97 (1.01)	1.96 (1.01)	1.98 (1.02)	0.51
Computer use (h/d)		0.57 (0.81)	0.56 (0.79)	0.58 (0.82)	0.31

CASPIAN-V childhood and adolescence surveillance and prevention of adult noncommunicable disease-V, *N* number, *SD* ntandard deviation, *TV* television, *h/d* hours per day

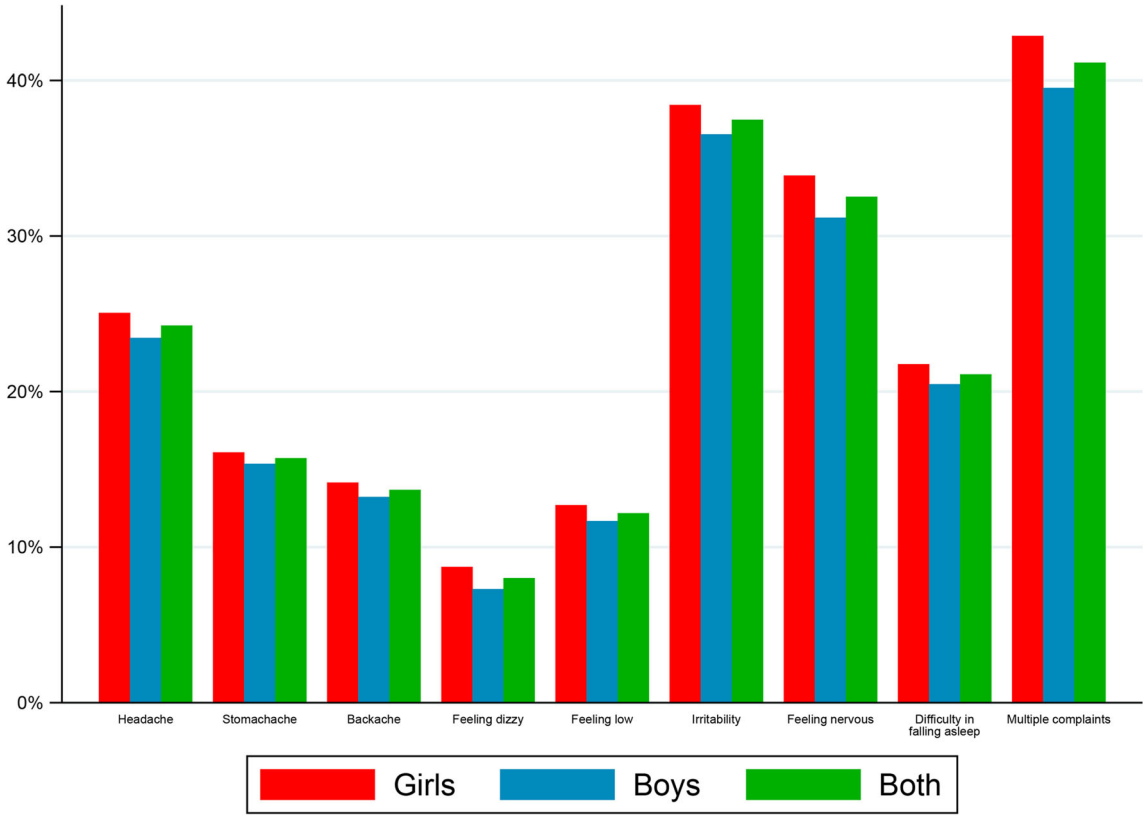

Fig. 1 Prevalence of health complaints by gender in Iranian children and adolescents: the CASPIAN-V study

girls and boys. Table 3 shows the association of reporting subjective health complaints with computer use and television watching, presented as OR and 95% CI in two models: crude (model 1) and adjusted for gender, age group, SES, family structure, and living area (model 2). There was a definite association between using personal computers and backache in model 1 (OR: 1.10, 95% CI: 1.02–1.18), but it became non-significant after adjustment for confounders (model 2) (OR: 1.06, 95% CI: 0.99–1.14). However, students who spent more time using the computer were more likely to experience stomach ache, irritability, nervousness, and difficulty falling asleep according to both crude and adjusted ORs. The results showed that 1 h spent on personal computers increased the risk of stomach ache by 1.15 times (OR: 1.15, 95% CI: 1.07–1.23), irritability by 1.12 times (OR: 1.12, 95% CI: 1.07–1.17), feeling nervous by 1.29 times (OR: 1.29, 95% CI: 1.24–1.35), and risk of difficulty falling asleep by 1.07 times (OR: 1.07, 95% CI: 1.037–1.10) after adjustment for confounders (model 2). There was no association between computer use/watching television and multiple health complaints in this study.

Discussion

Our study of a large national sample of students revealed a positive correlation between screen-based activities and multiple health complaints. More prolonged time spent watching television was associated with a higher prevalence of stomach ache and irritability, a relationship which was significant after adjustment for age, gender, SES, family structure, and living area. Longer hours spent using computers correlated with a higher frequency of stomach ache, irritability, feeling nervous, and difficulty falling asleep.

Although the time spent on any screen-based activity may differ in various communities, it has been found that children generally dedicate more time to watching television than using computers (Fakhouri et al. 2013; Lauricella et al. 2015), with boys participating in more screen-time activities than girls, and being more likely to break the recommended limits set out in guidelines (Goon et al. 2016; LeBlanc et al. 2015b). This contradicts our study, which found no difference in screen time between boys and girls.

Our results show that all somatic and psychological health complaints (including multiple health complaints) except stomach ache and feeling dizzy are more prevalent in girls above the age of 14. These outcomes are similar for boys, with multiple health complaints and all subjective health complaints except stomach ache being higher in those older than 14 years. Our findings corroborate the previous study mentioned above, in which subjective health complaints were more common in youth over 14 years of age (Keane et al. 2017). We also found a higher prevalence of health complaints

Table 2 Association of demographic characteristics with health complaints by gender: the CASPIAN-V study

		Somatic health complaints			
		Headache *n* = 3447	Stomach ache *n* = 2229	Backache *n* = 1918	Feeling dizzy *n* = 1123
Girls					
Age group (in years)	Under 10	21.85 (19.75–24.10)	15.72 (13.96–16.67)	11.93 (6.63–14.68)	7.93 (5.27–11.75)
	10–11	24.23 (22.00–26.61)	14.94 (13.23–16.83)	13.50 (11.60–15.65)	8.89 (6.25–12.48)
	12–14	25.20 (22.90–27.64)	17.68 (15.90–19.63)	15.80 (13.30–17.05)	\8.62 (6.59–11.20)
	Older than 14	28.65 (25.57–31.94)	15.31 (13.67–17.10)	15.76 (13.66–18.11)	9.53 (6.63–13.50)
	P value	**< 0.001**	0.10	**< 0.001**	0.40
Socio-economic status	Low	25.93 (24.00–27.97)	16.61 (15.07–18.28)	13.55 (11.61–15.74)	9.70 (7.33–12.74)
	Moderate	22.92 (21.32–24.59)	14.50 (12.97–16.17)	14.61 (12.94–16.46)	8.22 (5.60–11.94)
	High	24.58 (23.01–26.23)	16.53 (15.05–18.14)	13.63 (12.12–15.31)	8.17 (6.11–10.85)
	P value	0.07	0.09	0.53	0.12
Family structure	Two parents	24.74 (23.56–25.95)	16.11 (15.22–17.04)	14.17 (12.88–15.58)	8.71 (6.64–11.35)
	One parent	24.92 (19.22–31.65)	15.31 (11.60–19.95)	12.58 (9.00–17.31)	7.21 (3.40–14.46)
	Other	39.04 (33.45–44.93)	16.19 (9.99–25.18)	16.78 (11.56–23.72)	12.59 (7.97–19.32)
	P value	**< 0.001**	0.93	0.48	0.17
Living area	Urban	25.84 (24.41–27.32)	16.18 (15.03–17.40)	14.90 (13.31–16.63)	9.14 (6.45–12.79)
	Rural	23.04 (20.89–25.33)	15.81 (14.25–17.51)	12.29 (10.47–14.38)	7.68 (5.69–10.29)
	P value	**0.01**	0.71	**0.01**	0.05
Boys					
Age group (in yrs.)	Under 10	19.89 (17.62–22.36)	14.95 (12.93–17.22)	10.64 (8.63–13.05)	5.60 (4.19–7.43)
	10–11	22.04 (19.78–24.48)	14.09 (12.40–15.96)	11.87 (10.05–13.96)	5.53 (4.37–6.98)
	12–14	25.02 (23.09–27.05)	16.59 (14.68–18.69)	13.29 (12.00–14.71)	7.38 (5.98–9.08)
	Older than 14	25.49 (23.16–27.97)	15.22 (13.68–16.91)	16.11 (14.09–18.35)	9.75 (7.46–12.66)
	P value	**< 0.001**	0.21	**< 0.001**	**< 0.001**
Socio-economic status	Low	24.06 (22.20–26.02)	16.68 (14.84–18.70)	12.14 (10.65–13.82)	8.42 (6.80–10.39)
	Moderate	22.09 (20.55–23.72)	14.68 (13.35–16.10)	14.32 (12.99–15.76)	6.20 (5.10–7.52)
	High	23.15 (21.44–24.97)	14.76 (13.09–16.60)	12.60 (11.19–14.16)	7.64 (5.76–10.07)
	P value	0.28	0.10	0.07	**0.01**
Family structure	Two parents	23.30 (22.27–24.35)	15.28 (14.30–16.32)	13.13 (12.22–14.10)	7.28 (5.98–8.84)
	One parent	21.00 (16.97–25.71)	17.61 (13.60–22.49)	12.65 (9.54–16.58)	6.59 (4.13–10.34)
	Other	36.30 (27.16–46.54)	12.59 (9.16–17.06)	19.26 (12.82–27.89)	9.70 (5.75–15.91)
	P value	**< 0.001**	0.34	0.11	0.50
Living area	Urban	23.89 (22.76–25.05)	15.41 (14.26–16.63)	13.81 (12.69–15.01)	7.58 (6.13–9.34)
	Rural	22.30 (20.53–24.18)	15.17 (13.52–16.97)	11.79 (10.16–13.65)	6.56 (5.39–7.97)
	P value	0.15	0.80	**0.02**	0.14

	Psychological health complaints				Multiple complaints *n* = 5875
	Feeling low *n* = 1710	Irritability *n* = 5275	Feeling nervous *n* = 4582	Difficulty falling asleep *n* = 2967	
Girls					
Age group (in years)	10.61 (8.74–12.81)	33.96 (30.57–37.53)	29.86 (26.60–33.34)	19.72 (16.05–23.99)	37.85 (33.64–42.27)
	10.45 (8.95–12.15)	32.64 (29.56–35.89)	29.89 (26.73–33.25)	20.64 (17.29–24.44)	38.38 (34.77–42.13)

Table 2 (continued)

	Psychological health complaints				Multiple complaints $n = 5875$
	Feeling low $n = 1710$	Irritability $n = 5275$	Feeling nervous $n = 4582$	Difficulty falling asleep $n = 2967$	
	13.84 (12.45–15.36)	41.79 (38.83–44.82)	36.13 (33.20–39.17)	22.16 (19.81–24.71)	44.94 (41.55–48.39)
	15.02 (12.98–17.32)	42.99 (38.47–47.64)	38.02 (34.76–41.39)	24.12 (20.82–27.76)	48.55 (44.17–52.96)
	< 0.001	**< 0.001**	**< 0.001**	**0.01**	**< 0.001**
Socio-economic status	11.98 (10.28–13.91)	39.01 (35.63–42.49)	31.26 (29.36–33.22)	24.53 (22.04–27.20)	44.22 (41.65–46.84)
	13.23 (11.59–15.05)	35.46 (33.01–37.99)	35.94 (33.25–38.73)	18.85 (15.91–22.20)	40.33 (37.56–43.16)
	13.19 (11.75–14.78)	39.86 (37.08–42.70)	33.86 (31.70–36.09)	21.39 (18.59–24.49)	42.75 (39.66–45.90)
	0.37	**0.01**	**0.01**	**< 0.001**	**0.03**
Family structure	12.91 (11.80–14.10)	38.34 (36.19–40.55)	33.95 (32.41–35.53)	21.80 (19.63–24.14)	42.98 (40.76–45.21)
	5.99 (4.06–8.76)	38.05 (32.21–44.26)	29.78 (24.24–35.98)	19.81 (15.10–25.54)	37.88 (32.21–43.91)
	18.18 (12.88–25.03)	42.66 (35.16–50.51)	39.16 (32.16–42.63)	24.11 (16.64–33.60)	47.94 (40.10–55.89)
	< 0.001	0.57	0.12	0.56	0.09
Living area	13.61 (12.32–15.01)	39.73 (37.26–42.25)	35.38 (33.63–37.17)	23.21 (20.30–26.40)	44.53 (41.67–47.42)
	10.42 (8.77–12.33)	35.15 (31.99–38.44)	30.07 (27.08–33.25)	18.11 (15.68–20.93)	38.61 (35.44–41.88)
	< 0.001	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.001**
Boys					
Age group (in yrs.)	10.28 (8.37–12.56)	33.65 (29.92–37.60)	26.97 (23.58–30.65)	18.87 (16.43–21.58)	34.76 (31.14–38.57)
	10.67 (8.86–12.79)	35.63 (31.54–39.94)	27.61 (24.36–31.12)	17.31 (15.01–19.88)	36.55 (33.08–40.16)
	10.74 (9.33–12.33)	36.50 (34.31–38.76)	32.83 (30.35–35.41)	20.86 (18.94–22.92)	40.76 (38.31–43.26)
	14.44 (12.57–16.54)	39.40 (36.68–42.19)	35.21 (32.59–37.93)	23.54 (20.80–26.51)	43.98 (40.59–47.43)
	< 0.001	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.001**
Socio-economic status	11.57 (10.21–13.08)	36.85 (34.53–39.23)	30.26 (27.99–32.64)	22.10 (19.97–24.39)	40.43 (37.93–42.98)
	11.48 (10.03–13.11)	32.45 (29.62–35.41)	32.16 (29.49–34.94)	18.04 (16.20–20.03)	37.13 (34.50–39.84)
	12.22 (10.96–13.60)	39.92 (37.56–42.33)	31.15 (28.95–33.44)	20.75 (18.19–23.56)	40.35 (37.96–42.79)
	0.70	**< 0.001**	0.38	**< 0.001**	**0.03**
Family structure	11.69 (10.79–12.66)	36.18 (34.39–38.01)	31.24 (29.65–32.88)	20.54 (19.01–22.16)	39.47 (37.68–41.29)
	10.30 (7.36–14.24)	38.74 (33.93–43.77)	28.23 (23.51–33.48)	19.33 (14.78–24.88)	39.34 (33.19–45.86)
	14.07 (9.17–20.99)	48.15 (42.39–53.95)	35.07 (27.78–43.14)	20 (14.04–27.66)	41.73 (34.82–48.98)
	0.51	**0.01**	0.32	0.86	0.86
Living area	12.56 (11.42–13.79)	37.59 (35.66–39.55)	32.30 (30.49–34.15)	21.12 (19.34–23.03)	40.54 (38.34–42.79)
	9.49 (7.76–11.56)	33.90 (30.50–37.48)	28.40 (24.76–32.34)	18.86 (16.64–21.30)	36.96 (33.88–40.15)
	< 0.001	**< 0.001**	**< 0.001**	**0.03**	**0.01**

Data presented as percentages (95% CI)

Significant *p* values shown in bold

CASPIAN-V childhood and adolescence surveillance and prevention of adult noncommunicable disease-V, *n* number

Table 3 Association of screen-time activities with health complaints in regression analyses: the CASPIAN-V study

	Somatic health complaints				Psychological health complaints				Multiple complaints
	Headache	Stomach-ache	Backache	Feeling dizzy	Feeling low	Irritability	Feeling nervous	Difficulty falling asleep	
TV watching (h/d)									
Model 1	0.88 (0.83–0.92)[a]	1.11 (1.07–1.14)[a]	0.75 (0.70–0.81)[a]	0.85 (0.79–0.92)[a]	0.67 (0.59–0.75)[a]	1.12 (1.08–1.16)[a]	0.92 (0.88–0.96)[a]	0.74 (0.61–0.89)[a]	0.99 (0.96–1.03)
Model 2	0.88 (0.84–0.93)[a]	1.12 (1.08–1.16)[a]	0.74 (0.68–0.79)[a]	0.87 (0.81–0.93)[a]	0.65 (0.58–0.74)[a]	1.14 (1.09–1.18)[a]	0.92 (0.88–0.96)[a]	0.71 (0.59–0.86)[a]	1.00 (0.97–1.04)
Computer use (h/d)									
Model 1	1.04 (0.99–1.09)	1.12 (1.05–1.20)[a]	1.10 (1.02–1.18)[a]	0.81 (0.64–1.02)	1.00 (0.92–1.09)	1.14 (1.08–1.20)[a]	1.31 (1.26–1.36)[a]	1.07 (1.03–1.10)[a]	1.08 (1–1.15)
Model 2	1.02 (0.98–1.08)	1.15 (1.07–1.23)[a]	1.06 (0.99–1.14)	0.81 (0.65–1.01)	0.96 (0.87–1.05)	1.12 (1.07–1.17)[a]	1.29 (1.24–1.35)[a]	1.07 (1.03–1.10)[a]	1.06 (0.99–1.13)

Data reported as OR (95% CI)

Model 1: Crude model

Model 2: Adjusted for gender, age group, socioeconomic status, family structure, living area

CASPIAN-V childhood and adolescence surveillance and prevention of adult noncommunicable disease-V, *n* number, *TV* television, *h/d* hours per day, *OR* odds ratio, *CI* confidence interval

[a] Statistically significant

among girls, in accordance with many other studies (Husarova et al. 2015; Jorn et al. 2002; Nuutinen et al. 2014; Ottová-Jordan et al. 2015). One study of Norwegian students from 2002 suggested that these gender differences may be due to varying perceptions of symptoms between girls and boys, with more internalizing of symptoms among girls causing more health complaints, and social factors prompting boys not to admit to or report health complaints (Jorn et al. 2002).

Family structure and economic level are significant influencing factors on children's health. In our results, children from moderate socioeconomic backgrounds were less likely to feel irritable, have difficulty falling asleep, and suffer from multiple health complaints. However, they felt nervousness more than their counterparts in low or high economic level families. Parenting and family structure also affect screen use in children. Children who live with either just their mother or just their father are more likely to watch television more than 2 h per day than children living with both parents (Veldhuis et al. 2014). Moreover, the risk of reporting subjective health complaints is elevated in single-adult households, including living with one parent or one grandparent (Carlerby et al. 2011). This is in agreement with our findings, which showed a significant increase in headaches for both girls and boys who lived with neither of their parents in comparison with one-parent families, and a slightly higher risk in single-parent families in comparison with two-parent families.

Our study also revealed the dramatically high influence of living area on the psychological well-being of children. Children in urban areas have more frequent psychological symptoms than their counterparts in rural areas. Similar findings were also reported in a study of Swedish students in which boys in urban areas suffered more subjective health complaints than boys living in rural areas (Carlerby et al. 2011). Moreover, children who were residents of urban areas used computer and video games more than rural residents, but did not watch more television. The reason for this discrepancy may be due to the same accessibility of television in both rural and urban homes (Andrade Neto et al. 2014).

Some studies mentioned in a review article in 2013 investigated the association between the use of screen-based devices and musculoskeletal pain. All of them suggested a positive connection, and described musculoskeletal pain as being more related to the duration of the activity than the type (Costigan et al. 2013). Furthermore, in a study of 4462 Portuguese students, spending more hours on the computer was associated with having more headaches in girls. However, this correlation was not reported among boys (Marques et al. 2015). Another study in Japan involving elementary school children showed that those who used computers for more than 1 h a day experienced higher frequencies of dizziness, headache, and abdominal pain. The same was not true for television, however. The underlying mechanism for this discrepancy between television and computer has not yet

been well studied (Nakamura et al. 2012). In our study regarding somatic health complaints, stomach ache was statistically related to more hours of computer use per day. Unlike previous studies, we did not find any significant relation to other somatic health complaints including backache, headache and feeling dizzy, even after adjustments for gender, age group, SES, family structure, and living area.

Numerous studies in Canada (Maras et al. 2015), the United States (Primack et al. 2009), China (Cao et al. 2011), Norway (Sund et al. 2011), and Australia (Kremer et al. 2014) are in agreement that depressive symptoms are higher in children who watch television and play computer games excessively. Feeling low and irritability have noticeably correlated with more hours of computer use, but not with TV watching (Marques et al. 2015). Although, in contrast to previous studies, we did not find a relationship between feeling low and screen time, we were able to confirm that irritability in both genders had a meaningful association with more screen-time activities, including both television and computer use.

We also found that feeling nervous had the most significant relationship to longer hours of computer use among the subjective health complaints. These findings are in line with a study by Marques et al. in 2015, in which they reported positive associations between time spent on computers and feeling nervous among girls, although this did not extend to watching television (Marques et al. 2015). Brindova et al. suggested that there is a relation between feeling nervous with both watching television and using computers. This correlation was dramatically higher in children who used computers more than 3 h per day (Brindova et al. 2015).

Sleep problems are also associated with screen-time activities, mainly if they are frequently used just before bed time. One review from 2014 reported that 90% of articles showed a negative association between screen time and sleep. For instance, all the studies mentioned that adolescents who spent more time on computer use went to bed later than their counterparts; 75% found they suffered from more daytime tiredness, and 40% experienced sleep-onset latency (Hale and Guan 2015). These findings are in ageement with our outcomes showing that higher computer use was associated with increased difficulty falling asleep.

Strengths and limitations

Our study focused on different aspects of associations between psychosomatic health problems and screen time among a large sample of children and adolescents. Limitations include not evaluating the correlation between demographic characteristics and screen time. Also, the causality effect of the factors in this research could not be studied because of its cross-sectional design. In addition, smart cellphones or tablets were not considered as part of screen time. Another limitation was that the questionnaires were filled out by young students who may not have estimated the number of hours they spent on screen accurately. Also, psychological symptoms may not be perceived equally in all individuals.

Conclusions

Prolonged time spent on television watching or computer use might be associated with adverse effects on children's and adolescents' psychosomatic health status. Because of the long-lasting impact of health problems which appear in childhood and the frequency of psychosomatic health issues among children and youth, reduction of screen time should be taken into consideration by parents and health policymakers alike.

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Author's contribution RF contributed in the conception of the work, manuscript preparation, manuscript revision, and final approval of the manuscript, and agreed to be accountable for all aspects of the work.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

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