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Original article

Predictors and Health Consequences of Screen-Time Change During Adolescence—1993 Pelotas (Brazil) Birth Cohort Study

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A B S T R A C T

Purpose: To investigate screen-time change from early to mid adolescence, its predictors, and its influence on body fat, blood pressure, and leisure-time physical activity.
Methods: We used data from a longitudinal prospective study, conducted among participants of the 1993 Pelotas (Brazil) Birth Cohort Study. At baseline, adolescents were, on average, 11 years old. They were later visited at age 15 years. Screen time was self-reported, accounting for the time spent watching television, playing video games, and using the computer. Several predictors were examined. The effect of screen-time change on some health outcomes was also analyzed.
Results: Screen time increased on average 60 min/d from 11 to 15 years of age, for the 4,218 adolescents studied. The groups that presented the highest increases in screen time were male, wealthiest, those whose mothers had higher education, and adolescents with a history of school failure. There were positive associations between screen-time change and body mass index, skinfold thickness, waist circumference, and leisure-time physical activity at 15 years of age.
Conclusions: Screen time increased from early to mid adolescence. This increment was higher among boys and the wealthiest adolescents. Increases in screen time affected body composition, with negative implications on adiposity.

IMPLICATIONS AND CONTRIBUTION

Screen time increased from early to mid adolescence. This rise was higher among boys and the wealthiest adolescents. Increases in screen time affected body composition, with negative implications on adiposity.

Despite the recent accumulated evidence about the increase in overall screen time among adolescents [1,2], little is known about the patterns of change of this behavior throughout adolescence and its health consequences. Studies discussing the tracking of screen time during adolescence to adulthood revealed possible stability [3] or a decline in time spent on these activities [4]. On the other hand, the claim that these behaviors have an independent effect on health is still emerging [5,6]. It is suggested that too much screen time is associated with adverse health behaviors and sociocognitive outcomes in young people [7]. However, answers to some questions are still needed, such as What factors influence the tracking of screen time during adolescence?; What are the health consequences it generates? and Which are the groups most at risk?

Researchers have evaluated the predictive strength of some variables on screen time. The results revealed a positive association between screen time and gender (male), body mass index (BMI), and depression, and an association with non-Caucasian, socioeconomic status, and parental education [8]. However, when only prospective studies are considered, there is insufficient evidence on the determinants of sedentary behavior, including screen time during adolescence [9].

Unlike physical activity, research studies about the determinants of sedentary behavior in children and adolescents are

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scarce, and there is a consensus among researchers that there is an insufficient accumulation of information [8,9]. Few studies have been conducted in this field; there is a wide variation in the types of sedentary behaviors studied and the limited amount of predictor variables analyzed. In this scenario, it seems necessary to understand the demographic, biological, psychological, behavioral, social, and environmental predictors of screen time.

Identifying the predictors of screen time is also justified by the growing concern that this time may bring detrimental consequences to health. In fact, in the past 10 years, there has been a rapid increase of evidence that sustains this hypothesis, demonstrating a positive association between sedentary behavior, specifically screen time, with all-cause mortality [10] and increased cardiometabolic risk [11].

Therefore, the purpose of this study was to analyze the change in screen time of adolescents from 11 to 15 years of age, its predictors, and its influence on body fat, blood pressure, and leisure-time physical activity in a birth cohort in Southern Brazil.

Methods

Study design and population

We used data from a longitudinal prospective study conducted among participants of the 1993 Pelotas (Brazil) Birth Cohort Study. This cohort included all children born in the calendar year of 1993 (N = 5,249) in Pelotas, a city in Southern Brazil with a population of 320,000. In 2004, when they were on average 11 years old (mean = 11.3; standard deviation [SD] = .3), all participants were searched for follow-up, and 4,452 members (87.5%) of the original cohort were traced. In 2008, when they were on average 15 years old (mean = 14.7; SD = .3), all individuals were sought again, and 4,325 were followed up (85.2%). Overall, 4,118 adolescents (81.2% of original cohort) had complete information regarding sedentary behavior for both waves (11 and 15 years). There was no difference in terms of sedentary behavior levels (min/d) between those who were interviewed in both periods and those who were not located in the last survey in 2008. Moreover, the profile of individuals included in this study and the original cohort was similar in terms of socioeconomic, demographic, and anthropometric variables.

Average follow-up duration was 3.4 years (SD = .2), ranging from 2.8 to 4.0 years. Detailed information about the cohort methodology and previous follow-ups is published elsewhere [12]. The study protocol was approved by the Ethics Committee of the Medical School from the Federal University of Pelotas, and the parents or guardians of all participants signed a written informed consent.

Logistics and instrument

Each data collection period (2004 and 2008) lasted approximately 8 months. The first one was carried out from July 2004 to March 2005, whereas the second wave extended from January to August 2008. The methodology used in both surveys was the same. Data were collected through face-to-face home interviews by trained interviewers. A standardized and pretested questionnaire was used. One questionnaire was administered to mothers (or guardians) and another, with different questions, to the adolescents. Measurements of weight, height, and subscapular and triceps skinfold were collected in both waves. Skinfolds were measured using a Cescorf scientific caliper (Cescorf, Porto Alegre, Brazil) following the recommendations of Lohman et al [13]. Weight and height were obtained using a SECA digital scale (SECA, Birmingham, UK) with 100-g precision and an aluminum stadiometer with 1-mm precision, respectively. When adolescents were 15 years old, they had their waist circumference and blood pressure measured twice by trained technicians. Blood pressure was measured by a wrist digital (OMRON HEM 629, Beijing, China), and a correction equation was used [14].

For quality control purposes, 30% of the participants were reinterviewed by two study supervisors (10% in person and 20% by telephone calls) using a short questionnaire. Additionally, all questionnaires were checked for completeness and consistency by study supervisors.

Screen time

Screen time was collected through face-to-face interviews with the adolescents. The instrument included questions on whether the adolescent watched television (TV), played video games, and used the computer. The translated questions were (1) "How much time do you watch TV?"; (2) "How much time do you play video game?"; (3) "How much time do you use the computer?". Interviewers were trained to identify possible overlap (e.g., if the same time is reported in both situations) and ask the respondent to choose the appropriate answer in such cases.

The mean time spent in front of each of these electronic media (in a typical week) was noted separately for weekdays and weekends. The outcomes were constructed by adding the weighted mean screen time (TV + video game + computer), assigning the weight 5 to weekdays, 2 to weekends, and dividing the result by 7 to obtain the mean time in minutes per day. Screen-time change between 11 and 15 years of age was calculated by subtracting the time (min/d) at age 15 years by the respective time at age 11 years.

Predictors

The variables included as possible predictors of screen-time change were sex; self-reported skin color (white, mixed, black); socioeconomic level at baseline, generated by principal component analysis of 19 assets index in the household [12] and categorized into tertiles (poorest, intermediate, wealthiest); maternal schooling (0–4, 5–8, 9–11, ≥12 years), adolescent failure in school (no, yes); amount of time spent outdoors in comparison with peers, self-reported by the adolescent at baseline (mostly indoors, mostly outdoors); perception of fear of living in the neighborhood at baseline (no, yes); relationship with parents (fair, excellent); BMI status at age 11 years, based on objective measurement of weight and height, and classified according to the cut-off points proposed by the World Health Organization [15] (underweight or normal, overweight, obese); leisure-time physical activity status at age 11 years, self-reported and categorized according to the cut-off point of 420 min/wk [16]; fat consumption based on the Block questionnaire [17]; and biological maturation at age 15 years, self-reported based on Tanner's stages [18] (least developed, stages 1, 2, and 3, and most developed, stages 4 and 5).

Outcomes

We studied the effect of screen-time change on several outcomes at age 15 years: BMI (kg/m^2), sum of subscapular and tricip-