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Media use and associated characteristics in early and late adolescence

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**Media use and associated characteristics
in early and late adolescence**

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ABBREVIATIONS

95%CI – 95% Confidence interval

OR – Odds Ratio

POR – Proportional Odds Ratio

1.ABSTRACT

Since middle of the 20th century, numerous research studies have shown that the media represent an influential element on children and adolescents and have a profound impact on their health. Notwithstanding, with the continuous advancement in technology, it is expected an increasing on the time spent with media.

Adolescence represents a time of critical development at the biologic, behavioural and social levels. During this period, it is expected the increase of adolescents' independence from family and the consolidation of their identity. So, they have more time free from parental control, on a context where rules become more permissive, which open doors for them self-directing their own behaviours. On the other hand, adolescence is also the period during which increases susceptibility to external influences, including peer and media. So, it is important to clarify the potential effect of media exposure in adolescents' behaviours, in order to target specific and early interventions capable of preventing adverse consequences of media usage.

This research aimed to evaluate the association between adolescents' characteristics and television and computer use in early adolescence and to determine the association between this exposure and behavioural characteristics on late adolescence.

This study was developed as part of the EPITeen cohort (Epidemiological Health Investigation of Teenagers in Porto). Eligible participants were urban adolescents that were born in 1990 and were enrolled at public and private schools in Porto. The baseline evaluation was held during the 2003/2004 school year (proportion of participation of 77.5%), when they were 13 years-old. The second evaluation took place in the 2007/2008 school year (17 years-old). At both evaluations, a physical examination was performed and data were collected using self-administered questionnaires comprising demographic, social and behavioural characteristics. The amount of time spent watching television and using computer was evaluated separately for each one and separately for week and weekend days. Based on this information, and for each media, we computed the global daily average time considering the mean of the 5 week days and the 2 weekend days. The total media use per day was calculated through the sum of the time using television and computer.

To analyze media exposure at 13y the sample comprised 1680 adolescents (884 girls and 796 boys). From those adolescents, 1538 were evaluated at the age of 17, but 292 had missing or inconsistent information about time of television and computer use. Therefore, the

final sample for the longitudinal analyses comprises 1246 adolescents (659 girls and 587 boys).

Data were analysed separately for boys and girls. Proportions were compared using the Chi-Square test or Fisher's exact test. To estimate the magnitude of the association between the adolescents' characteristics and each media exposure, odds ratio (OR) or proportional odds ratio (POR) and their 95% confidence intervals (95%CI) were calculated using unconditional logistic regression or ordinal regression, respectively. All models were adjusted for parent's education.

Regarding the adolescents' characteristics associated with television and computer use at 13 years old girls attending private schools had lower odds of being exposed to higher levels of television (POR=0.59; 95%CI 0.43-0.81), as well as those who practiced sports more than once a week (POR=0.73; 95%CI 0.56-0.97). Regarding the computer exposure, girls from private schools were also less likely of using computer (OR=0.55; 95%CI 0.35-0.85). At opposite, those who were depressed had greater odds of using computer for longer (OR=1.71; 95%CI 1.11-2.61). Considering the overall media exposure, the odds of higher exposure was lower in those from private schools (POR=0.53; 95%CI 0.39-0.71) and higher in smokers (POR=1.42; 95%CI 1.06-1.91). In boys, there was a higher probability of watching more television, among those who did not live with both parents (POR=1.61; %CI 1.13-2.28) and among those who smoke (POR=1.49; 95%CI 1.01-2.08). Those attending private schools (POR=0.54; 95%CI 0.37-0.77) and those who sleep more than 9 hours (POR=0.48; 95%CI 0.30-0.78) were less likely to expend more time watching television.

After adjusting for parents education, ordinal and proportional regressions illustrated that adolescents with higher use of television at the age of 13 were also those who presented higher television consumption four years later (in girls, POR=2.25; 95%CI 1.43-3.56; in boys POR=2.00; 95%CI 1.20-3.32). For computer use the same pattern was found, for girls (POR=1.49; 95%CI 1.03-2.18) and for boys (POR=1.68; 95%CI 1.18-2.37). We also found, girls that spent more time using computer at the age of 13 are more likely to have history of school suspension (OR=3.44; 95%CI 1.63-7.23), and boys that used more global daily time media in early adolescence were significantly more prone to smoke on late adolescence (OR=1.61; 95%CI 1.04-2.49).

To conclude, socioeconomic and environmental characteristics are associated with high media use at both ages, showing adolescents from disadvantaged families had higher television and computer use. We also found that high media consumption in early adolescence predicted high media consumption in late adolescence. Additionally, we found that adolescents that spent more time using media in early adolescence were more prone to fail at school and to engage on smoking behaviour in late adolescence.

1.RESUMO

A partir de meados do século XX, numerosos estudos têm mostrado que os media representam um elemento influente sobre crianças e adolescentes e têm um profundo impacto na sua saúde. Não obstante, com o avanço contínuo da tecnologia, espera-se um aumento no tempo gasto com os media.

A adolescência representa um momento de desenvolvimento crítico a nível do comportamento biológico e social, durante o qual se espera um aumento da independência dos adolescentes relativamente à sua família e da consolidação da sua identidade. Nesse sentido, eles vão se encontrando maiores períodos de tempo sem estarem sujeitos ao controlo dos pais, num contexto no qual as regras se vão tornando mais permissivas, o que abre portas para os adolescentes gerirem os seus próprios comportamentos. Por outro lado, a adolescência representa um período no qual aumenta a susceptibilidade às influências externas, incluindo dos pares e dos media. Portanto, é importante esclarecer o efeito potencial da exposição dos media no comportamento dos adolescentes, tendo como fim de linha orientar intervenções específicas e precoces, capazes de prevenir consequências adversas do uso dos media.

O presente trabalho teve como objectivo avaliar a associação entre as características dos adolescentes e o uso da televisão e do computador no início da adolescência, bem como determinar a associação entre essa exposição e as características comportamentais no final da adolescência.

Este estudo foi desenvolvido como parte da coorte EPITeen (Investigação Epidemiológica da Saúde dos adolescentes no Porto). Os participantes elegíveis constituíram-se os adolescentes urbanos que nasceram em 1990 e foram matriculados em escolas públicas e privadas no Porto. A avaliação inicial foi realizada durante o ano lectivo de 2003/2004 (proporção de participação de 77,5%), quando os adolescentes tinham 13 anos de idade. A segunda avaliação ocorreu no ano lectivo de 2007/2008 (com 17 anos de idade). Em ambas as avaliações, um exame físico foi realizado e os dados foram colhidos por meio de questionários auto-administrados compreendendo características demográficas, sociais e comportamentais. A quantidade de tempo gasto a ver televisão e a usar computador foi avaliado separadamente para cada um e, discriminadamente, para os dias da semana e dos fins-de-semana. Com base nessas informações, e para cada tipo de media, calculámos o tempo médio global diário, considerando a média dos 5 dias da semana e os 2 dias de fim-de-semana. O uso global diário dos media foi calculado através da soma do tempo de

utilização da televisão e do computador. Para analisar a exposição aos media aos 13 anos, a amostra foi constituída por 1680 adolescentes (884 raparigas e 796 rapazes). Desses adolescentes, 1.538 foram avaliados aos 17 anos, mas 292 tinham ausência ou inconsistência na informação atinente ao tempo de uso da televisão e do computador. Portanto, a amostra final para as análises longitudinais compreende 1.246 adolescentes (659 raparigas e 587 rapazes).

Os dados foram analisados separadamente para rapazes e raparigas. As proporções foram comparadas através do teste de Qui-Quadrado ou do teste exacto de Fisher. Para estimar a magnitude da associação entre as características dos adolescentes e cada exposição aos media, Odds Ratio (OR) ou Proportional Odds Ratio (POR) e seus intervalos de confiança de 95% (IC 95%) foram calculados através de regressão logística incondicional ou de regressão ordinal, respectivamente. Todos os modelos foram ajustados para a escolaridade dos pais.

Em relação às características dos adolescentes associadas com o uso da televisão e computador, aos 13 anos de idade, as raparigas que frequentavam escolas privadas tiveram menor propensão de serem expostas a níveis mais elevados de televisão (POR=0,59; IC 95% 0,43-0,81), bem como aquelas que praticavam desporto mais do que uma vez por semana (POR=0,73; IC 95% 0,56-0,97). No que concerne ao uso do computador, as raparigas provenientes de escolas particulares também tiveram menor propensão de usar computador (OR=0,55; IC 95% 0,35-0,85). Em detrimento, aquelas que estavam deprimidas apresentaram maior possibilidade de usar computador por mais tempo (OR=1,71; IC 95% 1,11-2,61). Considerando a exposição global diária aos media, a propensão de maior exposição foi menor nas adolescentes provenientes de escolas particulares (POR=0,53; IC 95% 0,39-0,71) e maior naquelas que fumam ou já fumaram (POR=1,42; IC 95% 1,06-1,91). Nos rapazes, houve uma maior propensão de ver mais televisão, entre aqueles que não viviam com ambos os pais (POR=1,61; IC 95% 1,13-2,28) e entre aqueles que fumavam (POR=1,49, IC 95% 1,01-2,08). Os alunos de escolas privadas (POR=0,54; IC 95% 0,37-0,77) e aqueles que dormiam mais de nove horas (POR=0,48; IC 95% 0,30-0,78) foram menos propensos a gastar mais tempo a ver televisão.

Após o ajuste para a escolaridade dos pais, regressões ordinais e proporcionais ilustraram que os adolescentes com maior uso da televisão aos 13 anos também foram os que apresentaram maior consumo de televisão, quatro anos depois (em raparigas, POR=2,25, IC 95% 1,43-3,56; em rapazes, POR=2,00, IC 95% 1,20-3,32). Relativamente ao uso de

computador, o mesmo padrão foi encontrado, para as raparigas (POR=1,49, IC 95% 1,03-2,18) e para os rapazes (POR=1,68, IC 95% 1,18-2,37). Verificámos, também, que as raparigas que passaram mais tempo a usar o computador aos 13 anos são as mais propensas a ter a história de suspensão escolar (OR=3,44, IC 95% 1,63-7,23), e os rapazes que usavam mais tempo diariamente os media no início da adolescência foram significativamente mais propensos a fumar no final adolescência (OR=1,61, IC 95% 1,04-2,49).

Para concluir, as características socioeconómicas e ambientais estão associadas a um uso mais prolongado dos media, em ambos os períodos da adolescência, mostrando que os adolescentes de famílias desfavorecidas reportaram um maior uso de televisão e uso do computador. Verificámos, também, que um uso excessivo dos media no início da adolescência prediz um uso excessivo dos media no final da adolescência. Além disso, observámos que os adolescentes que passaram mais tempo a usar os media no início da adolescência eram mais propensos a ter comportamentos contraproducentes na escola e de fumar.

2.INTRODUCTION

Since the middle of the 20th century, numerous research studies have shown that the media represent an influential element on children and adolescents and have a profound impact on their health (1).

Initially, this research was undertaken to evaluate the potential effects that television had on society. Most of these studies analysed its impact only in a few daily activities. However, recently it were made efforts to reach a more comprehensive knowledge of this phenomena, having emerged evidence that suggests that television displaces time from social and personal care activities, although it is presently under discussion if such occurs, and if so, in what extent (2).

Literature have shown that both traditional media, represented by television, magazines and movies and new media, as internet, cell phones and computer games, can provide pertinent health information and promote social connectedness, through an increase of empathy or of the acceptance of diversity. However, recent evidence is problematizing about media's role on aggressive behaviour, substance abuse, eating disorders and academic difficulties (1, 3). Furthermore, excessive consumption of television has been associated with health outcomes, such as, hypercholesterolemia (4), hypertension (5, 6), increased prevalence of asthma (7), psychological distress (8) and depression (9).

Notwithstanding, with the continuous advancement in technology, it is expected an increasing on the time spent with media use (10). Although already sufficient evidence exists towards the necessity of intervention, too little has been done by parents, health care practitioners, schools, the entertainment industry, or the governments in order to prevent the harmful effects of media and promote the prosocial aspects that it can provide (1). Even so, it is important a better understanding of this issue, clarifying the underlying mechanisms that exist between media and adolescents' health, in order to target specific and early interventions capable of preventing adverse consequences of media usage.

2.1.Considerations about adolescence

Childhood and adolescence are critical periods of development, which can be defined as the process of transitions and reorganizations, occurring at the fastest pace during these life stages, in a process characterized by growth, maturation and change (11).

Adolescence represents a time of critical development, at the biologic, behavioural and social levels. The beginning of adolescence occurs around pubertal onset, implicating changes in hormone levels, substantial physical changes, including rapid physical growth, changes in facial structure and the onset of sexual maturation, as well as the emergence of new drives, motivations and social-affective challenges (12, 13). This reflects social and cognitive modifications, as having more capacity to think abstractly and generalize situations across time, interpersonal transitions, through changing social roles in family and peer relationships, and social-contextual changes, such as the changing of school or of school classes (14).

Adolescents are in a period propitious for the acquisition of the necessary skills to be independent on adulthood (15). So, searching exciting and social experiences, both with peers and romantic partners, improvement of skills and knowledge essential to assume adult social roles, independence from family and consolidation of an individual identity, symbolize core developmental tasks during adolescence, a period of social-reorientation (12).

During adolescence brain, cognitive and behavioural mechanisms develop at different rates, concurring to raise problems on control capacities of behaviour and emotion, which contributes to an increasing vulnerability and need of adjustment (12, 16).

Adolescence refers to a specific time course, with no single event marking its onset or end (15). The World Health Organization defines adolescence as the period between 10 and 19 years (17). Many researchers have considered adolescence in three developmental periods, designating early adolescence, normally referring ages 10-13, middle adolescence, 14-17, and late adolescence, 18 until early twenties (18).

Early adolescence is marked by the puberty, which seems to promote emotional arousability, sensation-seeking and reward orientation(19). Considering middle adolescence, it is inherent an increased vulnerability to risk-taking and problems in regulation affect and behaviour. These adolescents are more likely to risk-taking (e.g., risky driving or unprotected sexual activity), whereby they don't tend to ponder the risks and consequences of their behaviour, as well as their actions are largely influenced by their feelings and social influences. In the late adolescence, the maturation of frontal lobes improve the regulatory competence, which is the ability to regulate affect and behaviour according to long-term goals and consequences (16).

The difficulty on regulating emotions and behaviours can explain the *health adolescent paradox*. Although adolescence represents a developmental course of strength and resilience, in which adolescents become stronger, bigger and faster and achieving many

maturational progresses, it is observed an increase of mortality and morbidity rates of around 200%. Such is associated with difficulties in controlling behaviour and emotions, leading to the emergence of risk-behaviours, as homicide, suicide and depression as well as accidents, substance abuse and eating disorders (19).

Concomitantly to their vulnerability, during adolescence, it is expected the increase of their independence from family and the consolidation of their identity. So, they have more time that is uncontrolled by parents, on a context where rules become more permissive, which open doors for them in self-directing their own behaviours (20). Nicknamed already as the *media generation*, adolescents are devoting more than a quarter of each day to mass media (21). Since they have a huge consumption of media, it is fundamental to understand the role of media in adolescents' life.

2.2 Media use in adolescents

One of the markable changes in 20th and 21st centuries has been the dissemination of mass media on the social environment (22). New media technology is suffering a tremendous evolution, engaging more interpersonal strategies on interaction with adolescents (23). The media are powerful (and becoming more) in transmitting attitudes and behaviours to adolescents and has a huge impact on their health (1). So it is crucial understanding what facilitates its' access and what characteristics and outcomes are associated.

2.2.1. Predictors of media use

Exposure to individual media varies in relation to individual, demographic and environmental characteristics (21).

Age represents the most consistent predictor of media usage. As adolescents grow older, the time they spend watching television, using computer and playing video games decreases, while they tend to listen more music (24). However, earlier high users television may be at high risk to maintain this pattern to older ages (25). Gender seem also to be a key factor in which concerns the global media usage, given that boys are more likely to consume more the overall media than girls (24). In the same way, boys use more computer than girls, principally, for playing games. One exception for this pattern is that girls spend more time on

social networks, doing activities such as sending e-mails. Additionally, girls are more likely than boys to listen audio and use print media than boys (21, 24, 25).

Regarding the influence of socioeconomic status in media usage, it seems that adolescents most disadvantaged spend more time with media (26, 27).

The physical and social media environments are strongly associated to media usage. Adolescents who have their own personal media, in their bedrooms or in portable forms, are more likely to use them (21, 26, 28). This large availability of both hardware (number of TV's and computers) and hardware (e.g., number of channels) may partially explain a greater usage of media (25).

On the other hand, adolescents are more likely to watch more television if their families or friends watch television during more time, given that they may model their behaviours (20). Also, the existence of parental control towards media norms within a household, particularly those that apply to television, was associated to lower levels of media usage in homes (27, 29). Additionally, evidence begins to show that family structure may be an important source of influence on the amount of time that adolescents watch television, namely with living with single parents being associated with a higher media use, particularly girls (30).

2.2.2. Prevalence of television and computer use

Media consumption has been increased over the last years, being crucial understanding adequately this phenomena (1, 24, 31).

A systematic review suggests that young people watch more television than they use computer. It was estimated that adolescents watch approximately 2 hours of television per day and spend using computers and video games, 0,5h and 0,75h per day, respectively. Furthermore, a considerable proportion of adolescents are considered high users of television, with 28% watching more than 4 hours per day, the double for the recommended by the American Academy of Pediatrics' guidelines, which recommend that screen time, including TV and computer, in children and adolescents should be limited until 2 h per day (32).

A representative study with American adolescents, found higher prevalence for television and computer consumption in adolescents with 13 years and 18 years (24). According to the

results, early adolescents watch television each day in average 5 hours and use computers during 1 hour and 46 minutes (24). Although on late adolescence the media use tends to decrease, they still exceed the recommended (33), given that they watch television approximately 4 hours and 20 minutes and use computers during 1 hour and half (24).

In the European regions, results from the 2005-2006 Health Behaviour in School-aged Children (HBSC) show that 70% of 13-year-old adolescents reported watching television more than 2 hours daily (31). Particularly, in Portugal, 82% of girls and 76% of boys reported watching more than 2 hours per day (31). Still in Portugal, 36% of adolescents with 13 years use computer for sending e-mails and homework for more than 2 hours, increasing until 47% in adolescents with 15 years-old (similar proportions between sexes) (31). On the other hand, 41 % of early adolescents use computer for playing games more than 2 hours, while 36% of adolescents with 15 years-old use computer for same purposes. In both stages of adolescence, boys clearly use more computer to play games (31).

It should also be noted that time of media consumption varies according to the day of evaluation. Time spent watching television and using computer increases from weekdays to days of weekends (28, 31).

2.2.3. Media use and adolescents' health

Media may have an effect on adolescents by influencing directly their beliefs and behaviors, but also by displacing time they spend doing social and personal care activities (1). Neglecting these activities may decrease the probability of promoting protective practices and experiences on the intellectual, physical and social levels (34-38). The excessive use of computers, including video games, seems to be associated with many of the problems similar to watching television (39).

Recently Thomée and colleagues (40) proposed a model that links media and adverse outcomes. High quantitative use of media covers consequences such as addiction, neglecting individual needs and displacement of personal activities, namely in domains such as physical activity, nutrition, sleep patterns, socialization and physical symptoms. A negative cycle could also be implicated in this process. A high quantitative use may lead to social isolation or addiction, which in turn may increase the media usage (40, 41).

Concerning to the displacement of personal care and activities, it has been proposed that a high media use may substitute time that could be used by adolescents to do other activities, which may have a significant impact at many levels (40, 42).

In this sense, excessive use of media may lead adolescents to neglect their physical status. This may result in adverse outcomes, such as musculoskeletal discomfort and visual problems (43). Prolonged exposure to near objects may induce orbital structure changes, as a consequence of strain of the visual system, causing myopia (43), although recent emergent evidence begins to question about the association between near activities and myopia (44). Computer use is also related to pain and musculoskeletal discomfort in adolescents, principally at low back, neck, shoulders and thoracic spine (43, 45). The association between screen-based exposure and physical complaints seems to be unrelated to the type of screen-based activity, but rather more related to the duration and ergonomic aspects of such activity (46).

During the adolescent development, sleep patterns suffer significant changes. Many adolescents have a perturbed sleep pattern, what may associate to excessive sleepiness, difficulty with mood regulation, impairment at school tasks, accidents and injuries (47). Sleep duration becomes particularly relevant, since in the last 30 years a decrease in sleep duration in the general population was observed (48, 49), and sleep deprivation is a common phenomenon worldwide in modern society generally as a consequence of bedtime restriction (50). During adolescence the decrease in parental control to define bedtime hour, the increase in school requirements and extracurricular activities, promotes a reduction on sleep duration and increases the relevance of this factor as a health determinant. The increase on the availability of late evening activities, many of them related with media use is contributing to this phenomenon. Excessive use of information technology seems to be associated with poorer sleeping patterns, mainly during early adolescence. For boys, this pattern seem to be related to digital games and internet use, and for girls to mobile phone use (51). Other study shown that playing computer games resulted in significant reduced amounts of slow-wave sleep, considerable decreases in verbal memory performance and prolonged sleep-onset latency. Although television seems to not affect sleep patterns, it may reduce sleep duration and efficiency significantly (52). A recent systematic review found that the most consistent association is the effect of excessive media consumption, including television and computer use, on delaying bedtime and shortening the total sleep time, although the underlying mechanisms remain unclear (53).

Over the past years adolescents are spending more time with media and it is being associated with adverse outcomes, such as becoming overweight (54). The association may be explained by the decrease on engaging in protective activities, as well by the promotion of the consumption of high-fat and high-sugar foods (39).

Watching television represents a low energy expenditure activity, similar to sleeping (55). So, the increase on levels of exposure to television viewing may be one of several contributor factors for excess energy intake over long periods (54). Excessive television exposure has been associated to lower levels of physical activity (56) suggesting that screen entertainment in home takes away time for physical activities (57), which may have a negative impact on health since it has been known that higher levels of physical activity improves well-being and decreases the risk of physical and mental disorders (58, 59).

On the other hand, evidence concerning to the displacement of physical activity by computer is controversial (43). For example, a cross-sectional analysis of 1600 five-year Australian children, shown that computer use was related to sedentary activities and less vigorous activity (60). However, a study with 2110 adolescents in Hong Kong found that the use of computer does not compete with the time spent on other social and recreational activities, and neither affects the self-support of computer users, revealing, inclusively, that boys (not girls) practice more physical activities and have higher social support than non-users (61).

However, with the technology advancement, the trends of energy expenditure may alter. Activity-promoting video-games, such as *Wii-Sports*[®] (Nintendo[®]) or dance platforms, increases energy expenditure more than double, comparing to sedentary screen watching (62, 63), which may lessen the adverse effects of its' use.

The effect of media use on socialization has been also a topic of research. The potential social consequences of media use will depend on the activities engaged and varies according to the amount of time of consumption (64). Although much of the time that adolescents spend using computers they are alone, it seems that moderate consumption of computer does not harmfully impact their social skills and activities (64). In fact, online activities may inclusively help to maintain social relationships and adolescents that use often media in social contexts may be protected against social isolation or depression. However, the impact of an excessive use of computer and internet use on adolescents' loneliness and social relationships needs to be studied (64).

Despite using computer seem to have beneficial social consequences (43), evidence begins to show that adolescents who spent more time online, decrease their social involvement and

increase their levels of depression and loneliness, leading to declines in social and psychological well-being. This may be due to the fact that time used spent with media may substitute the time used with social activities. Also, it is suggested that adolescents who search online to know new people, instead of communicating with close friends or family tend to have poorer relationships, establishing less strength connections, than real relationships. These relationships are less likely to endure and cannot replace those activities that adolescents do with real friends. However, if they use media for communicational purposes and substitute poorer quality relationships, for better ones it could be beneficial. More research is needed in this area (64).

2.2.4. Media influence on risk behaviours

Since television, video games, movies, computer networks to cell phones, the media are having a huge impact and a central position on the definition on adolescents values, beliefs and behaviours (22).

Television and computer use have potential benefits and risks. Evidence has shown that television may have prosocial and educational benefits. Adolescents may imitate behaviors as altruism, helping and delay of gratification, when they are exposed to models presenting these behaviors. Furthermore, computer enables greater opportunities of learning, training of fine motor and visual skills and access to an huge spectrum of information (1, 43).

Despite the mentioned benefits, excessive media use may alter youth capacity to maintain adequate interpersonal relationships, interfere with a clear view from the world and promote risk-behaviors (10). In fact, it is known the effect of media in promoting certain behaviours like substance abuse (1, 3, 65). Tobacco and alcohol industries spend multibillion dollars promoting their products, which has a significant impact on adolescents' beliefs, attitudes and consumption of substances (3). In many countries the advertisement of substances, such as tobacco, was forbidden in order to decrease this deleterious influence. However, the new forms of technologies raised, more portable and sophisticated, and additional problems emerged since it is more difficult regulating the contents transmitted.

In this sense, media acts as a source of observational learning by including models which teenagers may seek to follow. In the same way, it is important to salient that exposure to media messages concerning to smoking, supplies direct reinforcement for smoking or not smoking. Thus, attitudes and behaviours may be reinforced by certain images or messages

transmitted on media. Even those who are not searching such lifestyles may be influenced by the permanent presence of substances on media (39). For that reason, antismoking media messages have potential in preventing the consumption of tobacco (66)

Media represent an important vector on adolescents' sexual socialization (3). Exposure to sexual content in the variety of media, namely, music, movies, television, and magazines seem to accelerate adolescents' sexual activity and increase their risk of engaging in early sexual intercourse (67). On the other hand, adolescents that are high computer users seem to have a significant risk of engaging in unprotected sexual activities, as well as a moderate risk seem to exist for those who are excessive television viewers. This enforces that they learn through observational processes, being also influenced by the sexual content transmitted on media (68).

The impact of television and computer games on violence and aggressiveness has been a subject of intensive research. There is consistent evidence for that violent imagery on these media have considerable short-term effects on arousal thoughts, and emotions, increasing the risk of aggressive or fearful behavior in younger children, especially in boys (3). The permanent presence of violent messages may desensitize adolescents to suffering and, in certain cases, may alter adolescents capacity to discern real life from simulation (64). In the long-run, children exposed to violent media may also behave aggressively (22).

Although an inadequate media use may associate to all the aforementioned characteristics and outcomes, it is crucial to salient that media users have individual characteristics, and come from an environment that already have influenced them, being exposed to models of healthy and unhealthy behaviour. Those perceptions and experiences will influence what impact the media have on adolescents' health in the future (39).

3.AIMS

1. Evaluate the association between adolescents' characteristics and media consumption in early adolescence.
2. To determine the association between television and computer use on early adolescence and behavioural characteristics on late adolescence.

4.PAPERS

4.1. CHARACTERISTICS ASSOCIATED WITH MEDIA CONSUMPTION IN EARLY ADOLESCENCE

Introduction

The role of exposure to media had been studied since the mid-point of the 20th century, when the television exposure became frequent (1). Given earlier and massive dissemination of television and the emergence of concerns with its' impact, much of the existing research about media exposure focuses primarily on this media (2). In line with the fast advancement in technologies, newer forms of media became ubiquitous more recently on the social environment, such as personal computers and video games, as well as the internet (1). However, these remain less studied than television (3).

Television and computer exposure have potential benefits and risks (4, 5). Studies with children showed a tendency to imitate prosocial behaviours, such as altruism and helping (6). Computer exposure can also supply increased learning opportunities, fast access to high amounts of information, as well as training of fine motor and visual skills (7). On the other hand, high quantitative and negative qualitative media exposure may potentially result in displacement of protective activities on the intellectual, physical and social levels, such as practicing physical activities or having real social interactions that are globally fundamental to an harmonious growing mind and intellect (5, 8-13). Additionally, the exposure to poor models can also promote inadequate behaviours (6). So, higher media use may contribute to higher risk of violent and aggressive behavior, obesity, poor body-concept and self-image, early sexual activity, anxiety, depression, irregular sleep patterns, musculoskeletal and vision problems, social isolation and addictive use (4, 5, 7, 14, 15).

Adolescence is a critical period during which it is expected the acquisition of autonomy and the parents' control declines, allowing an increase in the time available for adolescents to self-manage their activities, including the exposition to television and computer (2). On the other hand, adolescents become more vulnerable to the influences of their external milieu, where peers and media represent important elements. The individual characteristics, as well as the familial and social contexts will influence not only the media exposure time, but also its effect on their current and future health outcomes (2).

It is fundamental to know what characteristics are associated to media consumption, in particular television and computer, with the finality to achieve a better understanding of the potential effect of these exposures, particularly in early adolescence. The aim of this study is to identify the characteristics associated with screen time exposure, on a sample of 13 year-

old adolescents, which may add information in order to optimize and target pertinent interventions.

Methods

Participants

The study was developed as part of the Epidemiological Health Investigation of Teenagers in Porto (EPITeen). Eligible participants were adolescents born in 1990 and enrolled at public and private schools in Porto during the 2003/2004 school year, as previously mentioned (16).

Briefly, we identified 2787 eligible adolescents, and 2160 (1561 public and 509 private school students) agreed to participate and provided information at least for part of the planned assessment. This resulted in 77.5% overall participation, 77.7% in public and 77.0% in private schools, $p=0.709$. The study was approved by the ethics committee of the São João University Hospital. The written informed consent was achieved both from the adolescents and their parents or legal guardians, as long as was assured the data confidentiality and protection through the creation of policies and procedures (17).

For this analysis, 247 adolescents were excluded, given that parents did not return the questionnaires, in which was included information related to time watching television or playing computer. Moreover, 233 adolescents were also excluded by the fact they had missing or inconsistent data regarding these questions among the returned questionnaires. The final sample includes 1680 adolescents, 884 girls and 796 boys.

Those excluded were significantly more male and more frequently attended to public schools, have been retained at school, scored ≥ 13 in the depressive symptoms scale and had the youngest and the least educated parents. No significant differences were found regarding practice of sports, smoking, body mass index, sleep time and presence of any chronic illness.

Data collection

The evaluation included two self-administered questionnaires (one completed at home, another at school) and a physical examination.

The home questionnaire, answered by adolescents and parents, inquired about demographic, social, behavioral and clinical history of the adolescent and the family. As part

of the home questionnaire, the amount of time spent watching television and using computer was evaluated separately for each one and separately for week and weekend days. Based in this information, and for each media, we computed the daily average considering the sum of the 5 week days and the 2 weekend days, divided by 7 days. The total media use per day was calculated through the sum of the daily time using television and computer. Sleep duration was estimated by the difference between self-reported usual bedtimes and wake-up times.

Parental education level was measured as the number of successfully completed years of formal schooling and in the analysis we used the information from the parent with the higher education level. Each school was considered public if it was state administered, or private, when it was not administered by local or national governments. Parental education level and the type of school were used as indicators of socio-economic class. We also gathered information about who adolescents lived with. Due the small number of adolescents living with only one parent or living in another situation, we classified the adolescents in two categories, according to living with both parents: yes or no.

At school, during the research team visit, adolescents answered an additional questionnaire comprising further information on current year school frequency, physical activity, smoking, drinking and depressive symptoms. School retention was based on the difference between the grade expected for the adolescents' age and the actual school year frequented. For tobacco use, adolescents were classified in non-smokers if they had never smoked; and as smokers if they had experimented smoking or if they smoke regardless of the frequency and quantity. We also measured the frequency of physical activity; through self-reported sports activity they were categorized into two categories (less than once a week and once or more a week). As part of this questionnaire the depressive symptomatology was evaluated through the Second Edition of Beck Depression Inventory (BDI-II) (18), previously validated in Portuguese adolescents, with an established cut-off of 13 points to categorize non-depressed and depressed adolescents (19).

During the school visit, anthropometrics were obtained with the subject in light indoor clothes and no shoes. Weight was measured using a digital scale (in kilograms, to the nearest 0.1 kg – Tanita, TBF-300), and height was measured (in centimetres, to the nearest tenth) using a portable stadiometer. Body Mass Index (BMI) was calculated and was classified according to the age- and sex-specific BMI reference percentiles developed by the United States Centers for Disease Control and Prevention (20). Participants were considered overweight if BMI was equal or greater than 85th percentile.

Data Analysis

Data were analysed separately for boys and girls. Proportions were compared using the Chi-Square test or Fisher's exact test. To estimate the magnitude of the association between the adolescents' or parents' characteristics and television (categorized into ≤ 1 hour; >1 & ≤ 2 hours & >2 hours) or total media exposure (categorized into ≤ 2 hours; >2 & ≤ 3 hours & >3 hours), proportional odds ratio (POR) and 95% confidence intervals (%95 CI) were calculated using ordinal regression. Regarding computer utilization (considered into two categories, ≤ 2 hours & >2 hours), we calculated odds ratio (OR) and 95% confidence intervals (%95 CI), using unconditional logistic regression. All models were adjusted for parental education.

Statistical analyses were performed using SPSS[®] version 17.0 for Windows[®].

Results

Considering the daily average of television, the prevalence of adolescents watching more than 2 hours per day was 48.5% in girls and 48.0% in boys. Considering the total time of exposure (both television and computer), 62.7% of girls and 76.9% of boys reported an use higher than 2 hours per day. No significant gender differences were found regarding the time spent watching television. However, boys spend significant more time using computer than girls, especially on weekend (Table 1).

Girls that had parents with less education, who were from a public school, have been retained at school and practiced less frequently sports, reported significantly more time watching television, which was reflected in differences in the total time use. With regard to depressive symptoms, higher use of computer was found among girls that scored ≥ 13 on the BDI-II (Table 2).

Boys that lived with only one of the parents, whose parents were younger and less educated, and that attended to public schools watched significantly more television and played more computer. Additionally, boys that have been retained at school and those that reported lower sleep duration watched significantly more television, reproducing similar results on the total media consumption (Table 3).

In females, concerning the likelihood of change category girls attending private schools had lower odds of being exposed to higher levels of television (POR=0.59; 95%CI 0.43-0.81), as well as those who practiced sports more than once a week (POR=0.73; 95%CI 0.56-0.97). Regarding the computer exposure, girls from private schools were also less likely of using computer (OR=0.55; 95%CI 0.35-0.85). At opposite, those who were depressed had greater odds of using computer for longer (OR=1.71; 95%CI 1.11-2.61). Considering the overall media exposure, the odds of higher exposure was lower in those from private schools (POR=0.53; 95%CI 0.39-0.71) and higher in smokers (POR=1.42; 95%CI 1.06-1.91) (Table 4).

Regarding boys, there was a higher probability of watching more television, among those who did not live with both parents (POR=1.61; 95%CI 1.13-2.28) and among those who smoke (POR=1.49; CI 1.01-2.08). Those attending private schools (POR=0.54; 95%CI 0.37-0.77) and those who sleep more than 9 hours (POR=0.48; 95%CI 0.30-0.78) were less likely to expend more time watching television. Similar associations were found for computer use and the overall media (Table 5).

Discussion

In the present study we show a high prevalence of adolescents using media more than 2 hours per day, the maximum diary recommended for media use (21), which is consistent with other studies (22-24). In line with previous data, adolescents reported spending more time watching television than using computer (5, 23). At weekend the use is considerable higher than at weekdays. This may have relevant implications on the planning of the measurement of media use, given that if the amount of time is questioned as a median time (indistinctly week and weekend days), the exposure time may be underestimate, since adolescent may refer to those days more frequent (days of week).

In accordance with other studies we found no differences by gender regarding time watching television, (5, 23, 25). Notwithstanding to this, gender may be a differentiating factor in media use. Boys are significantly more likely to use computer than girls, resulting in a higher time using media (23, 25, 26). This gender difference may be explained by the fact that computer use in the present study includes playing games, which is an activity more preferred by boys, while girls use computers more attracted by social activities, as sending e-mails and instant messaging (1).

Generally, adolescents that belong to a less favored social class presented higher levels of media consumption (1, 26-28). Similar pattern was found among adolescents with younger and older parents, as well as those that did not live with both parents. Since higher levels of parental education and household income, seem to be associated to the existence of rules governing any kind of media behavior (1). A social environment with more permissive rules, including the absence of clear rules and setting limits on screen time may be a possible explanation for our results regarding parents' characteristics (29). On the other hand, adolescents belonging to higher social classes, may have more opportunities on investing their time on extra-curricular activities, namely practicing sports.

Our study illustrates that higher television and computer use was associated with unhealthy behaviours, including tobacco consumption, less sleep time and sedentarism, in line with previous findings (30). These findings are consistent with notion that adolescents who engage in an unhealthy behavior may be more prone to engage in other unhealthy behaviours (31, 32). Although not evaluated in this study, evidence shows that individuals with high levels of sensation seeking are more likely to consume television and computer games. These individuals are also more prone to engage in activities that could endanger their well-being, such as cigarette smoking, given their pretension to search for intense experiences (1).

We also verified that girls that use more computer presented more depressive symptomatology. This finding was reported by Primack and collaborators particularly in boys, not in girls (33). The lack of association for boys in our study may be due to a low statistical power, given that boys have less depressive symptomatology than girls.

We also found, an association between time watching television and being retained at school. This association may be explained by the displacement of study activities for time spent watching television, leading to a more negative school performance (11, 34). However due to the cross-sectional nature of our study, it is still unclear if this media may be the cause or the consequence of school retention. We cannot also exclude the hypothesis that if this just reflects a socioeconomic environment, which predisposes a worse performance at school.

Notwithstanding the aforementioned results, this raises questions about the role of educational institutions on adolescents' development. It has been described that schools represent a resource to promote the adolescents' health. Also, it has been shown that school achievement is positively linked with health outcomes lifelong (35). A particular challenge for schools is helping adolescents to acquire knowledge and skills about media potential to

influence (positive and negatively) them and the society. According to our results, those who are at risk of greater media consumption, may be those more economically and socially disadvantaged. In this line of thought, school should have the role in building resilience and ensure a curricula that allow all adolescents to achieve the best physical and behavioural development (21, 35, 36).

Respecting to limitations, we reported that questionnaires were filled by adolescents and by their parents at home, which may have caused an underestimation of the amount of media time use, in function of what is socially desirable. On the other hand, we only measured the quantity of media exposure and not its content, which could have provided additional data to a wider consideration of the present study. Other important limitation was related with cross-sectional nature of our study which prevents to identify the temporal relation between some associations, for instance, between media exposure time and sports activities.

Despite these limitations, the study has the benefit of discriminating the media use by week and weekend days, which is important, because its determinants may differ considerably, requiring different forms of consideration and intervention. On the other hand, it also merits to be noted that our study considers only adolescents of 13 years, on a representative sample of students at this age, enabling a more homogeneous group, on a stage of life cycle that is marked by constant change and transition. Furthermore, since school attendance is compulsory at this age in Portugal our sample is representative of adolescents at this age.

Conclusion

More than half of those young adolescents reported using television and computer for more than 2 hours per day, with a high exposure in boys, especially on weekend. Besides the association with less healthier behaviours, we also found a higher consumption among adolescents socially disadvantaged (lower social class and less structured families), which may increase their permeability to a negative influence of the media.

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Table 1 – Adolescents' television, computer and total media consumption, according to sex

N (%)	Sex		p-value
	Female	Male	
Television use (hours)			
Weekdays (/day)			
≤1	268 (30.3)	263 (33.0)	0.499
>1 and ≤2	297 (33.6)	247 (31.0)	
>2 and ≤3	140 (15.8)	134 (16.8)	
>3	179 (20.2)	152 (19.1)	
Weekend (/day)			
≤1	68 (7.7)	58 (7.3)	0.712
>1 and ≤2	111 (12.6)	114 (14.3)	
>2 and ≤3	142 (16.1)	132 (16.6)	
>3	563 (53.4)	492 (61.8)	
Global daily average			
≤1	141 (16.0)	134 (16.8)	0.968
>1 and ≤2	314 (35.5)	280 (35.2)	
>2 and ≤3	216 (24.4)	194 (24.4)	
>3	213 (24.1)	188 (23.6)	
Computer use (hours)			
Weekdays (/day)			
≤1	754 (85.3)	548 (68.8)	<0.001
>1 and ≤2	81 (9.2)	143 (18.0)	
>2 and ≤3	31 (3.5)	47 (5.9)	
>3	18 (2.0)	58 (7.3)	
Weekend (/day)			
≤1	620 (70.1)	208 (26.1)	<0.001
>1 and ≤2	137 (15.5)	194 (24.4)	
>2 and ≤3	51 (5.8)	125 (15.7)	
>3	76 (8.6)	269 (33.8)	
Global daily average			
≤1	724 (81.9)	418 (52.5)	<0.001
>1 and ≤2	107 (12.1)	240 (30.2)	
>2 and ≤3	31 (3.5)	73 (9.2)	
>3	22 (2.5)	65 (8.2)	
Global daily average of total media use (television and computer) (hours)			
≤1	85 (9.6)	21 (2.6)	<0.001
>1 and ≤2	245 (27.7)	163 (20.5)	
>2 and ≤3	210 (23.8)	210 (26.4)	
>3	344 (38.9)	402 (50.5)	

Table 2 – Daily mean of television, computer and total media use, according to parents' and adolescents' characteristics, in girls

n (%)	Television use (hours/day)				P-value	Computer games use (hours/day)			P-value	Total media use (hours/day)			P-value
	≤1	>1 and ≤2	>2 and ≤3	>3		≤1	>1 and ≤2	>2		≤2	>2 and ≤3	>3	
Living with both parents													
No	26 (12.8)	72 (35.5)	50 (24.6)	55 (27.1)	0.495	173 (85.2)	19 (9.4)	11 (5.4)	0.424	36 (17.7)	79 (38.9)	88 (43.3)	0.222
Yes	104 (16.3)	232 (36.3)	157 (24.6)	146 (22.8)		521 (81.5)	81 (12.7)	37 (5.8)		140 (21.9)	262 (41.0)	237 (37.1)	
Parents' age (years)													
30-40	17 (13.0)	46 (35.1)	30 (22.9)	38 (29.0)	0.633	103 (78.6)	18 (13.7)	10 (7.6)	0.525	19 (14.5)	51 (38.9)	61 (46.6)	0.162
40-50	65 (15.5)	158 (37.7)	97 (23.2)	99 (23.6)		348 (83.1)	47 (11.2)	24 (5.7)		100 (23.9)	158 (37.7)	161 (38.4)	
>50	29 (17.2)	52 (30.8)	45 (26.6)	43 (25.4)		146 (86.4)	15 (8.9)	8 (4.7)		33 (19.5)	70 (41.4)	66 (39.1)	
Parental education (years)													
≤6	26 (10.3)	83 (32.9)	62 (24.6)	81 (32.1)	<0.001	228 (92.3)	10 (4.0)	9 (3.6)	0.485	34 (14.4)	96 (40.7)	106 (44.9)	<0.001
7-12	59 (14.2)	148 (35.6)	104 (25.0)	105 (25.2)		388 (94.4)	14 (3.4)	9 (2.2)		73 (18.3)	161 (40.4)	165 (41.4)	
>12	55 (24.2)	90 (39.6)	48 (21.1)	34 (15.0)		212 (95.9)	6 (2.7)	3 (1.4)		74 (34.1)	82 (37.8)	61 (28.1)	
Type of school													
Public	80 (12.5)	216 (33.7)	171 (26.7)	174 (27.1)	<0.001	511 (79.7)	85 (13.3)	45 (7.0)	0.018	97 (15.1)	266 (41.5)	278 (43.4)	<0.001
Private	61 (25.1)	98 (40.3)	45 (18.5)	39 (16.0)		213 (87.7)	22 (9.1)	8 (3.3)		91 (37.4)	86 (35.4)	66 (27.2)	
School retention													
Retained	22 (12.4)	49 (27.7)	54 (30.5)	52 (29.4)	0.010	141 (79.7)	21 (11.9)	15 (8.5)	0.304	25 (14.1)	71 (40.1)	81 (45.8)	0.021
Non-retained	117 (16.6)	265 (37.6)	162 (23.0)	161 (22.8)		581 (82.4)	86 (12.2)	38 (5.4)		161 (22.8)	281 (39.9)	263 (37.3)	
Sleep duration													
≤ 8h	16 (13.6)	39 (33.1)	28 (23.7)	35 (29.7)	0.620	93 (78.8)	19 (16.1)	6 (5.1)	0.679	23 (19.5)	42 (35.6)	53 (44.9)	0.663
8h01 – 9h00	74 (17.7)	145 (34.6)	105 (25.1)	95 (22.7)		344 (82.1)	50 (11.9)	25 (6.0)		87 (20.8)	173 (41.3)	159 (37.9)	
>9h	50 (14.5)	130 (37.7)	82 (23.8)	83 (24.1)		285 (82.6)	38 (11.0)	22 (6.4)		77 (22.3)	136 (39.4)	132 (38.3)	
Ever smoke													
No	98 (16.0)	222 (36.3)	156 (25.5)	135 (25.5)	0.199	509 (83.3)	69 (11.3)	33 (5.4)	0.483	136 (22.3)	252 (41.2)	223 (36.5)	0.055
Yes	29 (13.1)	79 (35.6)	50 (22.5)	64 (28.8)		177 (79.7)	31 (14.0)	14 (6.3)		36 (16.2)	87 (39.2)	99 (44.6)	
Frequency of sports activity													
< 1/week	65 (14.1)	149 (32.3)	119 (25.8)	129 (27.9)	0.004	383 (82.9)	53 (11.5)	26 (5.6)	0.953	85 (18.4)	185 (40.0)	192 (41.6)	0.051
≥ 1/week	64 (17.1)	153 (40.9)	87 (23.3)	70 (18.7)		307 (82.1)	45 (12.0)	22 (5.9)		90 (24.1)	155 (41.4)	129 (34.5)	
BMI* (Kg/m2)													
Non-overweight	43 (10.1)	140 (32.8)	115 (26.9)	129 (30.2)	0.218	341 (79.9)	56 (13.1)	30 (7.0)	0.684	67 (15.7)	162 (37.9)	198 (46.4)	0.446
Overweight	12 (7.6)	57 (36.1)	52 (32.9)	37 (23.4)		128 (81.0)	22 (13.9)	8 (5.1)		28 (17.7)	66 (41.8)	64 (40.5)	
Depressive symptomatology[‡]													
Non-depressed	103 (15.0)	253 (36.9)	167 (24.4)	162 (23.6)	0.575	576 (84.1)	73 (10.7)	36 (5.3)	0.031	143 (20.9)	286 (41.8)	256 (37.4)	0.314
Depressed	28 (18.5)	48 (31.8)	39 (25.8)	36 (23.8)		114 (75.5)	27 (17.9)	10 (6.6)		34 (22.5)	53 (35.1)	64 (42.4)	

* Body mass index. Non-overweight if BMI < 85th percentile; overweight if BMI ≥ 85th percentile, Kuczmarski, et al., 2002);

‡ Non-depressed if score <13 and depressed if score ≥ 13 depressive symptoms on Beck Depression Inventory, Second Edition.

Table 3 – Daily mean of television, computer and total media use per day, according to parents' and adolescents' characteristics, in boys

n (%)	Television use (hours/day)				P-value	Computer games use (hours/day)			P-value	Total media use (hours/day)			P-value
	≤1	>1 and ≤2	>2 and ≤3	>3		≤1	>1 and ≤2	>2		≤2	>2 and ≤3	>3	
Living with both parents													
No	16 (11.3)	45 (31.7)	34 (23.9)	47 (33.1)	0.016	63 (44.4)	42 (29.6)	37 (26.1)	0.007	10 (7.0)	47 (33.1)	85 (59.9)	0.073
Yes	108 (17.8)	221 (36.3)	149 (24.5)	130 (21.4)		329 (54.1)	186 (30.6)	93 (15.3)		61 (10.0)	247 (40.6)	300 (49.3)	
Parents' age (years)													
30-40	7 (6.5)	36 (33.3)	33 (30.6)	32 (29.6)	0.014	50 (46.3)	37 (34.3)	21 (19.4)	0.156	5 (4.6)	32 (29.6)	71 (65.7)	0.001
40-50	84 (20.4)	148 (36.0)	89 (21.7)	90 (21.9)		229 (55.7)	119 (29.0)	63 (15.3)		50 (12.2)	174 (42.3)	187 (45.5)	
>50	25 (15.1)	56 (33.7)	42 (25.3)	43 (25.9)		79 (47.6)	50 (30.1)	37 (22.3)		10 (6.0)	65 (39.2)	91 (54.8)	
Parental education (years)													
≤6	15 (7.9)	53 (27.9)	62 (32.6)	60 (31.6)	<0.001	144 (78.7)	22 (12.0)	17 (9.3)	0.004	6 (3.4)	55 (30.9)	117 (65.7)	<0.001
7-12	48 (12.6)	137 (36.1)	93 (24.5)	102 (26.8)		308 (79.6)	36 (9.3)	43 (11.1)		34 (9.1)	142 (38.2)	196 (52.7)	
>12	68 (31.5)	84 (38.9)	40 (18.5)	24 (11.1)		195 (89.0)	18 (8.2)	6 (2.7)		35 (16.4)	105 (49.1)	74 (34.6)	
Type of school													
Public	80 (13.3)	198 (33.0)	161 (26.0)	161 (26.0)	<0.001	302 (50.3)	181 (30.2)	117 (19.5)	0.012	45 (7.5)	223 (37.2)	332 (55.3)	<0.001
Private	54 (40.3)	82 (29.3)	33 (16.8)	27 (13.8)		116 (59.2)	59 (30.1)	21 (10.7)		33 (16.8)	93 (47.4)	70 (35.7)	
School retention													
Retained	18 (9.5)	62 (22.2)	57 (29.5)	53 (28.5)	0.004	93 (48.9)	58 (30.5)	39 (20.5)	0.339	9 (4.7)	71 (37.4)	110 (57.9)	0.010
Non-retained	114 (19.0)	217 (36.2)	136 (22.7)	133 (22.2)		321 (53.5)	182 (30.3)	97 (16.2)		67 (11.2)	243 (40.5)	290 (48.3)	
Sleep Duration													
≤ 8h	9 (11.5)	19 (22.4)	23 (29.5)	27 (34.6)	0.020	33 (42.3)	27 (34.6)	18 (23.1)	0.189	4 (5.1)	24 (30.8)	50 (64.1)	0.011
8h01 – 9h00	58 (15.8)	129 (35.1)	85 (23.2)	95 (34.6)		187 (51.0)	114 (31.1)	66 (18.0)		37 (10.1)	134 (36.5)	196 (53.4)	
>9h	67 (19.1)	132 (37.6)	86 (24.5)	66 (18.8)		198 (56.4)	99 (28.2)	54 (15.4)		37 (10.5)	158 (45.0)	156 (44.4)	
Ever smoke													
No	104 (17.5)	215 (36.2)	145 (24.4)	130 (21.9)	0.164	320 (53.9)	179 (30.1)	95 (16.0)	0.094	60 (10.1)	240 (40.4)	294 (49.5)	0.102
Yes	20 (14.9)	39 (29.1)	35 (26.1)	40 (29.9)		61 (45.5)	42 (31.3)	31 (23.1)		11 (8.2)	43 (32.1)	80 (59.7)	
Frequency of sports activity													
< 1/week	34 (17.3)	71 (36.2)	44 (22.4)	47 (24.0)	0.916	99 (50.5)	66 (33.7)	31 (15.8)	0.386	19 (9.7)	75 (38.3)	102 (52.0)	0.928
≥ 1/week	90 (16.7)	189 (35.0)	135 (25.0)	126 (23.3)		289 (53.5)	154 (28.5)	97 (18.0)		52 (9.6)	215 (39.8)	273 (50.6)	
BMI* (Kg/m2)													
Non-overweight	43 (11.2)	130 (33.8)	99 (25.7)	113 (29.4)	0.643	204 (53.0)	105 (27.3)	76 (19.7)	0.443	24 (6.2)	141 (36.6)	220 (57.1)	0.909
Overweight	12 (8.8)	43 (31.6)	42 (30.9)	39 (28.7)		70 (51.5)	44 (32.4)	22 (16.2)		9 (6.6)	47 (34.6)	80 (58.8)	
Depressive symptomatology†													
Non-depressed	114 (16.5)	248 (36.0)	168 (24.4)	159 (23.1)	0.890	360 (52.2)	216 (31.3)	113 (16.4)	0.107	67 (9.7)	275 (39.9)	347 (50.4)	0.119
Depressed	8 (18.2)	14 (31.8)	10 (22.7)	12 (27.3)		23 (52.3)	9 (20.5)	12 (27.3)		2 (4.5)	13 (29.5)	29 (65.9)	

* Body mass index. Non-overweight if BMI < 85th percentile; overweight if BMI ≥ 85th percentile (Kuczmarski, et al., 2002).

† Non-depressed if score <13 and depressed if score ≥ 13 depressive symptoms on Beck Depression Inventory, Second Edition.

Table 4 – Associations between adolescents' characteristics and global daily mean of television, computer and total media use, in girls

	Daily mean of television use [‡]		Daily mean of computer use [‡]		Daily mean of total media use [‡]	
	Crude POR (95%)	Adjusted POR (95%) [‡]	Crude OR (95%)	Adjusted OR (95%) [‡]	Crude POR (95%)	Adjusted POR (95%) [‡]
Living with both parents						
Yes	1	1	1	1	1	1
No	1.21 (0.90-1.63)	1.13 (0.84-1.54)	0.77 (0.50-1.18)	0.76 (0.49-1.18)	1.20 (0.89-1.61)	1.12 (0.83-1.51)
Parents' age (years)						
30-40	1	1	1	1	1	1
40-50	0.79 (0.55-1.14)	1.06 (0.72-1.57)	0.75 (0.46-1.22)	0.81 (0.48-1.34)	0.69 (0.47-0.99)	0.88 (0.60-1.30)
>50	0.94 (0.61-1.44)	1.15 (0.73-1.80)	0.58 (0.32-1.06)	0.62 (0.33-1.14)	0.76 (0.50-0.86)	0.90 (0.58-1.40)
Type of school						
Public	1	1	1	1	1	1
Private	0.47 (0.35-0.63)	0.59 (0.43-0.81)	0.55 (0.36-0.85)	0.55 (0.35-0.85)	0.43 (0.33-0.58)	0.53 (0.39-0.71)
School retention						
Non-retained	1	1	1	1	1	1
Retained	1.61 (1.19-2.19)	1.16 (0.83-1.62)	0.84 (0.55-1.27)	0.85 (0.55-1.31)	1.57 (1.15-2.14)	1.15 (0.82-1.61)
Sleep duration						
≤ 8h	1	1	1	1	1	1
8h01 – 9h00	0.76 (0.52-1.11)	0.78 (0.52-1.16)	0.81 (0.49-1.35)	0.80 (0.48-1.34)	0.80 (0.55-1.16)	0.78 (0.53-1.16)
>9h	0.78 (0.53-1.15)	0.73 (0.49-1.10)	0.78 (0.47-1.32)	0.76 (0.45-1.28)	0.82 (0.56-1.21)	0.76 (0.51-1.14)
Ever smoke						
No	1	1	1	1	1	1
Yes	1.25 (0.93-1.67)	1.26 (0.94-1.70)	1.27 (0.86-1.87)	1.27 (0.86-1.87)	1.39 (1.04-1.85)	1.42 (1.06-1.91)
Frequency of sports activity						
< 1/week	1	1	1	1	1	1
≥ 1/week	0.62 (0.47-0.80)	0.73 (0.56-0.97)	1.06 (0.74-1.51)	1.11 (0.77-1.60)	0.76 (0.59-0.98)	0.87 (0.67-1.14)
BMI* (Kg/m²)						
Non-overweight	1	1	1	1	1	1
Overweight	0.86 (0.62-1.21)	0.91 (0.64-1.28)	0.93 (0.59-1.48)	0.94 (0.59-1.50)	0.90 (0.64-1.27)	0.94 (0.66-1.33)
Depressive symptomatology[‡]						
Non-depressed	-	-	1	1	-	-
Depressed	-	-	1.72 (1.12-2.62)	1.71 (1.11-2.61)	-	-

[‡] Television use categorized into ≤ 1 hour; >1 & ≤ 2 hours & > 2 hours; computer use categorized into two categories, ≤ 2 hours & > 2 hours; and total media use categorized into ≤ 2 hours; >2 & ≤3 hours and > 3 hours.

[‡] Adjusted for parents' education

* Body mass index. Non-overweight if BMI < 85th percentile; overweight if BMI ≥ 85th percentile (Kuczmarski, et al., 2002).

[‡] Non-depressed if score <13 and depressed if score ≥ 13 in the Beck Depression Inventory, Second Edition.

Table 4 – Associations between adolescents' characteristics and global daily mean of television, computer and total media use, in boys

	Daily mean of television use [‡]		Daily mean of computer use [‡]		Daily mean of total media use [‡]	
	Crude POR (95%)	Adjusted POR (95%) [#]	Crude OR (95%)	Adjusted OR (95%) [#]	Crude POR (95%)	Adjusted POR (95%) [#]
Living with both parents						
Yes	1	1	1	1	1	1
No	1.66 (1.18-2.34)	1.61 (1.13-2.28)	1.48 (1.02-2.14)	1.46 (1.01-2.11)	1.45 (1.02-2.07)	1.38 (0.96-1.99)
Parents' age (years)						
30-40	1	1	1	1	1	1
40-50	0.57 (0.38-0.84)	0.75 (0.49-1.13)	0.69 (0.45-1.05)	0.76 (0.49-1.19)	0.43 (0.28-0.66)	0.56 (0.36-0.88)
>50	0.75 (0.48-1.18)	0.89 (0.55-1.42)	0.95 (0.58-1.54)	1.01 (0.62-1.67)	0.64 (0.39-1.04)	0.75 (0.45-1.26)
Type of school						
Public	1	1	1	1	1	1
Private	0.39 (0.28-0.55)	0.54 (0.37-0.77)	0.70 (0.50-0.97)	0.72 (0.52-1.01)	0.45 (0.33-0.61)	0.61 (0.44-0.84)
School retention						
Non-retained	1	1	1	1	1	1
Retained	1.56 (1.15-2.12)	0.90 (0.64-1.26)	0.83 (0.60-1.16)	0.88 (0.63-1.24)	1.49 (1.09-2.05)	1.05 (0.75-1.49)
Sleep Duration						
≤ 8h	1	1	1	1	1	1
8h01 – 9h00	0.59 (0.37-0.92)	0.74 (0.46-1.19)	0.71 (0.43-1.16)	0.69 (0.42-1.14)	0.62 (0.38-1.02)	0.78 (0.47-1.29)
>9h	0.44 (0.28-0.70)	0.48 (0.30-0.78)	0.57 (0.35-0.93)	0.55 (0.33-0.91)	0.46 (0.28-0.75)	0.53 (0.32-0.89)
Ever smoke						
No	1	1	1	1	1	1
Yes	1.49 (1.05-2.12)	1.45 (1.01-2.08)	1.40 (0.96-2.04)	1.44 (0.98-2.11)	1.49 (1.04-2.16)	1.49 (1.02-2.20)
Frequency of sports activity						
< 1/week	1	1	1	1	1	1
≥ 1/week	1.04 (0.76-1.42)	1.30 (0.94-1.81)	0.89 (0.64-1.23)	0.92 (0.66-1.28)	1.00 (0.73-1.36)	1.23 (0.86-1.70)
BMI* (Kg/m2)						
Non-overweight	1	1	1	1	1	1
Overweight	1.10 (0.77-1.58)	1.14 (0.79-1.66)	1.06 (0.72-1.57)	1.07 (0.72-1.58)	1.03 (0.70-1.50)	1.06 (0.72-1.58)
Depressive symptomatology[‡]						
Non-depressed	1	1	1	1	1	1
Depressed	1.15 (0.65-2.05)	1.17 (0.64-2.14)	1.00 (0.54-1.84)	1.02 (0.55-1.89)	1.71 (0.92-3.16)	1.56 (0.82-2.97)

[‡] Television use categorized into ≤ 1 hour; >1 & ≤ 2 hours & > 2 hours; computer use categorized into two categories, ≤ 2 hours & > 2 hours; and total media use categorized into ≤ 2 hours; >2 & ≤3 hours and > 3 hours.

[#] Adjusted for parents' education

* Body mass index. Non-overweight if BMI < 85th percentile; overweight if BMI ≥ 85th percentile (Kuczmarski, et al., 2002).

[‡] Non-depressed if score <13 and depressed if score ≥ 13 in the Beck Depression Inventory, Second Edition.

4.2. MASS MEDIA USE AND ADOLESCENTS' BEHAVIOUR: A LONGITUDINAL STUDY

Introduction

Media use is extremely frequent among adolescents (1). Although media may provide beneficial prosocial models and it may be capable of promoting healthy behaviours, this potentiality has been underestimated by health and education professionals (2). Although it has been difficult to precise the exact quantity of media use at which it may become prejudicial, increasing concern emerges regarding the adverse effects on health related to high media use. Therefore, media may displace activities, resulting in irregular sleep patterns, social isolation, academic difficulties, poor fitness and overweight, and model behaviours through the exposure to prejudicial media contents and advertising, contributing to poor dietary habits, violent behaviour and substance abuse (2-4). It has also been proposed that high media use may be a component of a lifestyle that may be influenced or influence the likelihood of engaging on the aforementioned behaviours, which may have common determinants (5, 6).

However, there are few longitudinal studies reporting the long-term effects of early high media use on late adolescence. This fact deserves particular attention, since early adolescents begin to make lifestyle choices and their patterns of behaviour are being formed (7). This period will have a profound influence on their current and future health, given that behaviours started early tend to maintain through their life (7). In this sense, it is fundamental a better understanding about if high media use represents an unhealthy choice, capable of being associated with later adverse outcomes. To explore this issue, we examined the longitudinal association between television and computer use in 13-year-old adolescents and their socioeconomic and behavioural characteristics four years later.

Methods

The study population consisted of urban adolescents, members of the Epidemiological Health Investigation of Teenagers in Porto (EPITeen). As previously reported (8), the cohort assembled adolescents that were born in 1990 and were enrolled at public and private schools in Porto during the 2003/2004 school year. The evaluation included self-administered questionnaires and a physical examination performed at school, by a team of experienced nurses, nutritionists and physicians. The second evaluation took

place in the 2007/2008 school year and adolescents were evaluated following the same procedures and standardized questionnaires as it happened at baseline evaluation.

At baseline (when the participants were 13 years), 2160 adolescents agreed to participate and provided information at least for part of the planned assessment, resulting in a participation of 77.5%. Among the 2160 baseline participants, 1716 (79.4%) participated in the second evaluation of the cohort.

From the 2160 participants evaluated at 13 years, 247 adolescents were excluded, given that parents did not return the questionnaires, in which was included information related to time watching television or playing computer. Moreover, 233 adolescents were also excluded by the fact they had missing or inconsistent data regarding to these questions among the returned questionnaires. So, at 13 years we had data for 1680 adolescents. From those adolescents, 1538 were evaluated at age 17, but 292 had missing or inconsistent information about time of television and computer use. Therefore, the final sample comprises 1246 adolescents, 659 girls and 587 boys.

Compared with those included in this analysis, adolescents not included had parents less educated and a higher proportion have been retained at school. No significant differences were found regarding sex, practice of sports, parents' age or number of friends.

Data collection

The amount of time spent watching television and using computer was evaluated separately for each one and separately for week and weekend days. Based in this information, and for each media, we computed the global daily average time considering the mean of the 5 week days and the 2 weekend days. The total media use per day was calculated through the sum of the time using television and computer.

Parental education level was measured as the number of successfully completed years of formal schooling and in the analysis we used the information from the parent with the higher education level. Parental education level was used as indicators of socio-economic class. We also gathered information about if adolescents lived with both parents, classified in two categories: yes or no. Parents' age was also inquired and categorized into ≤ 40 years; 41 - 50 years and ≥ 50 years.

Concerning school retention, it was asked to adolescents if they had ever been retained at school. Adolescents were also asked if they ever had been suspended from school (yes or no).

For tobacco use, adolescents were classified as non-smokers if they had never smoked; and as smokers if they had experimented smoking or if they smoke regardless of the frequency and quantity. Adolescents were also asked if they have ever drunk alcoholic beverages. We also measured physical activity, considering self-reported sports activity, categorized into two categories (yes or no). Sleep duration was estimated by the difference between self-reported usual bedtimes and wake-up times.

The depressive symptomatology was evaluated through the Second Edition of Beck Depression Inventory (BDI-II) (9), previously validated in Portuguese adolescents, with an established cut-off of 13 points to categorize non-depressed and depressed adolescents (10).

Other adolescents' characteristics were included in the self-reported questionnaires, namely if they had television in their bedrooms; if they used to fall asleep with television turned on; and if they habitually played games at night (all variables categorized into yes or no). Furthermore, it was asked to adolescents to report how many close friends they had (1, 2 and 3 or more) and classified number of friends into less than 3 friends and 3 or more friends.

Anthropometrics were obtained with the subject in light indoor clothes and no shoes. Weight was measured using a digital scale (in kilograms, to the nearest 0.1 kg – Tanita), and height was measured (in centimetres, to the nearest tenth) using a portable stadiometer. Body Mass Index (BMI) was calculated and was classified according to the age- and sex-specific BMI reference percentiles developed by the United States Centers for Disease Control and Prevention (11). Participants were considered overweight if BMI was equal or greater than 85th percentile.

Data Analysis

Data were analysed separately for boys and girls. Proportions were compared using the Chi-Square test or Fisher's exact test. For these analysis, daily mean television and computer use were categorized into ≤ 1 hour; > 1 & ≤ 2 hours; and ≥ 2 hours.

Regarding to daily mean of total media use, it was categorized into ≤ 2 hour; > 2 & ≤ 3 hours; and ≥ 3 hours

To estimate the magnitude of the association between the adolescents' characteristics and daily mean television use (categorized into < 1 hour; ≥ 1 & < 2 hours and ≥ 2 hours), daily mean computer use (considered into two categories, < 2 hours and ≥ 2 hours) and daily mean total media exposure (categorized ≤ 2 hours; > 2 & ≤ 3 hours and > 3 hours), odds ratio (OR) and 95% confidence intervals (95% CI) were calculated using unconditional logistic regression. For variables with more than 2 categories, proportional odds ratio (POR) and 95% CI were calculated using ordinal regression. All models were adjusted for parent's education.

Statistical analyses were performed using SPSS[®] version 17.0 for Windows[®].

Results

For both sexes who consumed more television at 13 years significantly consumed more television at age 17 years, reproducing similar results on the total media use. Those with higher computer use at 13 years also had higher computer use at 17 years, but significantly only in boys (Table 1).

Girls that consumed more television at age 13 years have parents with less education, and, at 17 years old, reported more frequently to have television in their bedroom, fall asleep with television turned on and practice less sports activity. Similar findings were found considering total media time use (Table 2.A. and 2.B.).

Boys that watched more television when they were younger (13 years) reported more frequently to live with only one of the parents and had parents less educated. Additionally, they also reported more frequently history of school retention and to have television in the bedroom at 17 years. Those who spent more time using computer when they had 13 years smoked significantly more and played more games at night at 17 years old. Similar results were found for total media use (Table 3.A. and 3.B.).

In girls, after adjusting for parents education, those who watched more than 2 hours of television at age 13 presented higher probability of having a television in the bedroom (OR=1.79; 95%CI 1.10-2.89), falling asleep with television turned on (OR=1.78; 95%CI 1.00-3.16) and watching more television (POR=2.25; 95%CI 1.43-3.56) at 17 years.

Those who played more computer at 13 years, have also higher likelihood of spending more time playing computer (POR=1.49; 95%CI 1.03-2.18). Those girls also had a higher odds of playing games at night (OR=2.58; 95%CI 1.16-5.74) and to have television in the bedroom (OR=2.49; 95%CI 1.51-4.11). Considering the total time of media use, those who consumed more than 3 hours per day at age 13, were more prone to have a television in their bedroom (OR=2.23; 95%CI 1.50-3.31) and to present higher total media use (POR=1.75; 95%CI 1.19-2.56) (Table 4).

After adjusting for parents education, boys who watched more than 2 hours of television at age 13, have higher probability of watching more television at age 17 (POR=2.00; 95%CI 1.20-3.32). Those who played computer more than 2 hours at 13 years had higher odds of having television in their bedrooms (OR=1.92; 95%CI 1.30-2.83), playing games at night (OR=2.16; 95%CI 1.54-3.03) and playing computer at age 17 years (POR= 1.68; 95%CI 1.18-2.37). Those who used total media for more than 3 hours at 13 years, were more prone to smoke (OR=1.61; 95%CI 1.04-2.49) and playing games at night (OR=1.96; 95%CI 1.26-3.06) (Table 5).

Discussion

Our study shows that the high early media use may be a predictor of high media use in late adolescence. We also found that girls that spent more time using the total media at early adolescence were more prone to be suspended from school. In general, no association was found between time spent with media and future engagement in non-healthy behaviours, however, boys who spent more than 3 hours using media at age 13 years, are more prone to smoke at age 17 years.

The high association between the media use at age 13 and 17 years may be partially explained by the fact that adolescents establish their patterns of behaviour early and tend to maintain them along the time, especially when they begin to be more autonomous about the lifestyle choices they make, as it occurs in late adolescence (7). Our results show that high media use is associated with socioeconomic and environmental factors, which may also partly explain the maintenance of high media use between early and late adolescence.

Socioeconomic status plays an important role in media use, since those who were more exposed belong more frequently to disadvantaged families (12-15). This may be

related with a lower likelihood of supervising adolescents' behaviours, including media use, among this group. Furthermore, adolescents that come from these families may have fewer opportunities to structure their free time with alternative activities. So, youth tend to live in the same familial environment during their adolescence, which may maintain the media use among those who were already high users.

The household environment seem also to be linked with media use, namely, the presence of television in the bedroom, as suggested by previous studies (16, 17). The accessibility to personal media may facilitate and promote media use, given that adolescents may have more control on the use of their own time, especially in later stages, when they engage in more independent activities. However, it is unclear if they had already a greater availability of media (television in their bedrooms and/or personal computer) since early adolescence, which remained to late adolescence, or if this may be a consequence (adolescents who were greater consumers may have influenced the decision of having television in their bedrooms or computers that allow them playing games at night).

Media use may be a marker for some unknown determinant of long-term health. On the other hand, may be a part of a cluster of unhealthy behaviours, in which the engagement in an unhealthy behaviour may increase the probability to engage in another (6, 18-20). Although for most of behaviours an association with high media use was not found, our study shows that boys who used media during more time at age 13, were more prone to smoke in late adolescence (20). Although the underlying mechanisms are unclear why this association was found specifically for boys, it may be possible that media have a role as a socializing influence on adolescent smoking. Boys may have preference for certain media contents (referring to television and computer), which may predispose them more to influences that promote tobacco consumption.

We also found that heavier media use is associated with school suspension in girls. This may be due to the fact that time destined to study may have been replaced by using computer. However we cannot exclude the hypothesis that, despite the adjustment for parental education (a marker of social class), is the result of being inserted in a family environment less conducive to good school results.

Concerning limitations, our study only measured the amount of media use and not its content. We also report that questionnaires at 13 years were filled by adolescents and by their parents at home, which may have caused an underestimation of the amount of media time use, by what is socially desirable. However, it should be emphasized that

our study considers adolescents in a representative sample of students at 13 years, who were followed until age 17 years, enabling a more homogeneous group which was evaluated on key stages of development.

Conclusion

High media use in early adolescence predicts high media use in late adolescence. Adolescents who are from disadvantaged families are more likely to consume media, emphasizing the importance of socioeconomic and environmental factors. Furthermore, we also found that adolescents that spent more time using media at early adolescence were more prone to fail at school and to engage on smoking behaviour.

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Table 1 – Adolescents' television, computer and total media use per day in adolescents in 17-year-old adolescents, according to their use at 13 years

n (%)	Television use at 13y (hours/day)			P-value	Computer use at 13y (hours/ day)			P-value	Total media use at 13y (hours/day)			P-value
	≤1	>1 but ≤2	>2		≤1	>1 and ≤2	>2		≤2	>2 but ≤3	>3	
Girls												
Watching television at 17y												
≤1	19 (25.3)	32 (42.7)	24 (32.0)	≤0.001	60 (80.0)	13 (17.3)	2 (2.7)	0.452	40 (53.3)	12 (16.0)	23 (30.7)	0.003
>1 and ≤2	29 (17.6)	78 (47.3)	58 (35.2)		139 (84.2)	17 (10.3)	9 (5.5)		75 (45.5)	40 (24.2)	50 (30.3)	
>2	57 (13.6)	138 (32.9)	224 (53.5)		346 (82.6)	48 (11.5)	25 (6.0)		141 (33.7)	107 (25.5)	171 (40.8)	
Playing computer at 17y												
≤1	47 (15.4)	125 (41.0)	133 (43.6)	0.528	265 (86.9)	28 (9.2)	12 (3.9)	0.088	134 (43.9)	72 (23.6)	99 (32.5)	0.056
>1 and ≤2	27 (17.4)	55 (35.5)	73 (47.1)		120 (77.4)	25 (16.1)	10 (6.5)		59 (38.1)	33 (21.3)	63 (40.6)	
>2	31 (15.6)	68 (34.2)	100 (50.3)		160 (80.4)	25 (12.6)	14 (7.0)		63 (31.7)	54 (27.1)	82 (41.2)	
Overall media use at 17y												
≤2	19 (20.0)	40 (42.1)	36 (37.9)	0.038	81 (85.3)	12 (12.6)	2 (2.1)	0.522	48 (50.5)	18 (18.9)	29 (30.5)	0.013
>2 and ≤3	17 (15.3)	52 (46.8)	42 (37.8)		94 (84.7)	12 (10.8)	5 (4.5)		49 (44.1)	31 (27.9)	31 (27.9)	
>3	69 (15.2)	156 (34.4)	228 (50.3)		370 (81.7)	54 (11.9)	29 (6.4)		159 (35.1)	110 (24.3)	184 (40.6)	
Boys												
Watching television at 17y												
≤1	20 (32.3)	22 (35.5)	20 (32.3)	=0.001	36 (58.1)	19 (30.6)	7 (11.3)	0.715	19 (30.6)	19 (30.6)	24 (38.7)	0.040
>1 and ≤2	33 (22.3)	58 (39.2)	57 (38.5)		82 (55.4)	43 (29.1)	23 (15.5)		46 (31.1)	39 (26.4)	63 (42.6)	
>2	51 (13.5)	136 (36.1)	190 (50.4)		195 (51.7)	115 (30.5)	67 (17.8)		77 (20.4)	102 (27.1)	198 (52.5)	
Playing computer at 17y												
≤1	28 (22.8)	48 (39.0)	47 (38.2)	0.112	85 (69.1)	24 (19.5)	14 (11.4)	0.002	44 (35.8)	34 (27.6)	45 (36.6)	0.002
>1 and ≤2	29 (19.5)	58 (38.9)	62 (41.6)		79 (53.0)	45 (30.2)	25 (16.8)		39 (26.2)	41 (27.5)	69 (46.3)	
>2	47 (14.9)	110 (34.9)	158 (50.2)		149 (47.3)	108 (34.3)	58 (18.4)		59 (18.7)	85 (27.0)	171 (54.3)	
Overall media at 17y												
≤2	10 (26.3)	15 (39.5)	13 (34.2)	0.056	26 (68.4)	8 (21.1)	4 (10.5)	0.280	13 (34.2)	10 (26.3)	15 (39.5)	0.021
>2 and ≤3	17 (23.3)	32 (43.8)	24 (32.9)		41 (56.2)	23 (31.5)	9 (12.3)		24 (32.9)	25 (34.2)	24 (32.9)	
>3	77 (16.2)	169 (35.5)	230 (48.3)		246 (51.7)	146 (30.7)	84 (17.6)		105 (22.1)	125 (26.3)	246 (51.7)	

Table 2.A. –Daily mean television, computer and total media use in girls of 13 years, according to parents' and their characteristics at age 17 years

n (%)	Television use at 13y (hours/day)			P-value	Computer use at 13y (hours/day)			P-value	Total media use at 13y (hours/day)			P-value
	≤1	>1 and ≤2	>2		≤1	>1 and ≤2	>2		≤2	>2 and ≤3	>3	
Living with both parents at 17y												
No	19 (11.8)	59 (36.6)	83 (51.6)	0.144	139 (86.3)	16 (9.9)	6 (3.7)	0.261	58 (36.0)	37 (23.0)	66 (41.0)	0.450
Yes	81 (17.2)	183 (38.9)	207 (43.9)		381 (80.9)	60 (12.7)	30 (6.4)		188 (39.9)	116 (24.6)	167 (35.5)	
Parents' age at 17y												
30-40	20 (15.4)	43 (33.1)	67 (51.5)	0.463	102 (78.5)	19 (14.6)	9 (6.9)	0.260	42 (32.3)	41 (31.5)	47 (36.2)	0.065
40-50	43 (17.7)	98 (40.3)	102 (42.0)		202 (83.1)	26 (10.7)	15 (6.2)		102 (42.0)	56 (23.0)	85 (35.0)	
>50	17 (14.3)	46 (38.7)	56 (47.1)		106 (89.1)	8 (6.7)	5 (4.2)		53 (44.5)	20 (16.8)	46 (38.7)	
Parents' education at 17y												
≤6	14 (8.9)	53 (33.8)	90 (57.3)	<0.001	126 (80.3)	19 (12.1)	12 (7.6)	0.756	46 (29.3)	41 (26.1)	70 (44.6)	0.001
7-9	13 (10.8)	39 (32.5)	68 (56.7)		101 (84.2)	13 (10.8)	6 (5.0)		36 (30.0)	30 (25.0)	54 (45.0)	
10-12	30 (16.8)	73 (40.8)	76 (42.5)		145 (81.0)	25 (14.0)	9 (5.0)		73 (40.8)	40 (22.3)	66 (36.9)	
>12	48 (23.6)	83 (40.9)	72 (35.5)		173 (85.2)	21 (10.3)	9 (4.4)		101 (49.8)	48 (23.6)	54 (26.6)	
Presence of television in the bedroom at 17y												
No	50 (20.9)	104 (43.5)	85 (35.6)	<0.001	215 (90.0)	17 (7.1)	7 (2.9)	0.001	120 (50.2)	58 (24.3)	61 (25.5)	<0.001
Yes	55 (13.2)	141 (33.8)	221 (53.0)		327 (78.4)	61 (14.6)	29 (7.0)		134 (32.1)	100 (24.0)	183 (43.9)	
Falling asleep with the television on at 17y												
No	86 (17.9)	186 (38.7)	209 (43.5)	0.006	404 (84.0)	55 (11.4)	22 (4.6)	0.170	200 (41.6)	114 (23.7)	167 (34.7)	0.026
Yes	18 (10.7)	55 (32.5)	96 (56.8)		134 (79.3)	21 (12.4)	14 (8.3)		51 (30.2)	44 (26.0)	74 (43.8)	
Playing game at night at 17y												
No	100 (16.0)	238 (38.1)	287 (45.9)	0.395	522 (83.5)	69 (11.0)	34 (5.4)	0.086	246 (39.4)	151 (24.2)	228 (36.5)	0.362
Yes	4 (13.8)	8 (27.6)	17 (58.6)		19 (65.5)	8 (27.6)	2 (6.9)		8 (27.6)	7 (24.1)	14 (48.3)	

Table 2.B. –Daily mean television, computer and total media use in girls of 13 years, according to their characteristics at age 17 years

n (%)	Television use at 13y (hours/day)			P-value	Computer use at 13y (hours/day)			P-value	Total media use at 13y (hours/day)			P-value
	≤1	>1 and ≤2	>2		≤1	>1 and ≤2	>2		≤2	>2 and ≤3	>3	
Sleep Duration at 17y												
≤7h	33 (14.7)	87 (38.7)	105 (46.7)	0.739	183 (81.3)	31 (13.8)	11 (4.9)	0.406	89 (36.9)	49 (21.8)	87 (38.7)	0.659
7h01 – 8h00	47 (18.8)	85 (34.0)	118 (47.2)		212 (84.8)	22 (8.8)	16 (6.4)		96 (38.4)	68 (27.2)	86 (34.4)	
>8h	25 (13.6)	76 (41.3)	83 (45.1)		150 (81.5)	25 (13.6)	9 (4.9)		71 (38.6)	42 (22.8)	71 (38.6)	
Smoke at 17y												
No	64 (17.1)	141 (37.6)	170 (45.3)	0.567	312 (83.2)	42 (11.2)	21 (5.6)	0.831	147 (39.2)	94 (25.1)	134 (35.7)	0.682
Yes	40 (14.1)	107 (37.8)	136 (48.1)		232 (82.0)	36 (12.7)	15 (5.3)		108 (38.2)	65 (23.0)	110 (38.9)	
Drinking Alcohol at 17y												
No	21 (21.0)	28 (28.0)	51 (51.0)	0.069	82 (82.0)	9 (9.0)	9 (9.0)	0.173	33 (33.0)	27 (27.0)	40 (40.0)	0.423
Yes	84 (15.0)	220 (39.4)	255 (45.6)		463 (82.8)	69 (12.3)	27 (4.8)		223 (39.9)	132 (23.6)	204 (36.5)	
Number of friends at 17y												
< 3	17 (13.0)	51 (38.9)	63 (48.1)	0.643	112 (85.5)	15 (11.5)	4 (3.1)	0.400	56 (42.7)	23 (17.6)	52 (39.7)	0.134
≥ 3	85 (16.3)	195 (37.4)	241 (46.3)		427 (82.0)	63 (12.1)	61 (6.0)		196 (37.6)	135 (25.9)	190 (36.5)	
BMI* (Kg/m2) at 17y												
Non- overweight	93 (16.8)	212 (38.2)	250 (45.0)	0.167	462 (83.2)	63 (11.4)	30 (5.4)	0.906	220 (39.6)	132 (23.8)	203 (36.6)	0.693
Overweight	10 (10.3)	35 (36.1)	52 (53.6)		79 (81.4)	12 (12.4)	6 (6.2)		34 (35.1)	25 (25.8)	38 (39.2)	
BDI[†] at 17y												
Non- depressed	68 (14.0)	183 (37.7)	235 (48.4)	0.029	405 (83.3)	57 (11.7)	24 (4.9)	0.924	179 (36.8)	120 (24.7)	187 (38.5)	0.146
Depressed	23 (24.7)	33 (35.5)	37 (39.8)		77 (82.8)	12 (12.9)	4 (4.3)		44 (47.3)	21 (22.6)	28 (30.1)	
History of school suspension at 17y												
No	285 (45.9)	238 (38.3)	98 (15.8)	0.261	31 (5.0)	69 (11.1)	521 (83.9)	0.002	223 (35.9)	154 (24.8)	244 (39.3)	0.091
Yes	19 (57.6)	8 (24.2)	6 (18.2)		5 (15.2)	8 (24.2)	20 (60.6)		18 (54.5)	5 (15.2)	10 (30.3)	
Ever been school retained at 17y												
No	76 (16.6)	182 (39.7)	201 (43.8)	0.168	384 (83.7)	53 (11.5)	22 (4.8)	0.428	191 (41.6)	106 (23.1)	162 (35.3)	0.115
Yes	29 (14.7)	66 (33.5)	102 (51.8)		158 (80.2)	25 (12.7)	14 (7.1)		65 (33.0)	51 (25.9)	81 (41.1)	

* Body mass index. Non- overweight if BMI < 85th percentile; overweight if BMI ≥ 85th percentile (Kuczmarski, et al., 2002).

[†] Beck Depression Inventory, Second Edition. Classified into depressed if total score ≥ 13 depressive symptoms.

Table 3.A. –Daily mean television, computer and total media use in boys of 13 years, according to parents' and their characteristics at age 17 years

n (%)	Television use at 13y (hours/day)			P-value	Computer use at 13y (hours/ day)			P-value	Total media use at 13y (hours/day)			P-value
	≤1	>1 and ≤2	>2		≤1	>1 and ≤2	>2		≤2	>2 and ≤3	>3	
Living with both parents at 17y												
No	14 (11.4)	45 (36.6)	64 (52.0)	0.071	59 (48.0)	36 (29.3)	28 (22.8)	0.121	25 (20.3)	31 (25.2)	67 (54.5)	0.299
Yes	89 (19.9)	162 (36.2)	196 (43.8)		247 (55.3)	132 (29.5)	68 (15.2)		115 (25.7)	122 (27.3)	210 (47.0)	
Parents' age at 17y												
30-40	14 (14.7)	40 (42.1)	41 (43.2)	0.127	51 (53.7)	31 (32.6)	13 (13.7)	0.853	26 (27.4)	28 (29.5)	41 (43.2)	0.372
40-50	37 (17.0)	79 (36.2)	102 (46.8)		120 (55.0)	68 (31.2)	30 (13.8)		52 (23.9)	58 (26.6)	108 (49.5)	
>50	27 (21.6)	57 (45.6)	41 (32.8)		68 (54.4)	35 (28.0)	22 (17.6)		35 (28.0)	42 (33.6)	48 (38.4)	
Parents' education at 17y												
≤6	3 (2.9)	30 (29.1)	70 (68.0)	<0.001	48 (46.6)	26 (25.2)	29 (28.2)	0.003	12 (11.7)	18 (17.5)	73 (70.9)	<0.001
7-9	12 (11.2)	31 (29.0)	64 (59.8)		48 (44.9)	38 (35.5)	21 (19.6)		16 (15.0)	27 (25.2)	64 (59.8)	
10-12	27 (15.3)	72 (40.9)	77 (43.8)		105 (59.7)	47 (26.7)	24 (13.6)		42 (23.9)	55 (31.3)	79 (44.9)	
>12	62 (30.8)	83 (41.3)	56 (27.9)		112 (55.7)	66 (32.8)	23 (11.4)		72 (35.8)	60 (29.9)	69 (34.3)	
Presence of television in the bedroom at 17y												
No	43 (23.9)	70 (38.9)	67 (37.2)	0.007	116 (64.4)	43 (23.9)	21 (11.7)	0.001	61 (33.9)	48 (26.7)	71 (39.4)	0.001
Yes	60 (14.9)	145 (36.0)	198 (49.1)		195 (48.4)	133 (33.0)	75 (18.6)		80 (19.9)	112 (27.8)	211 (52.4)	
Falling asleep with the television on at 17y												
No	88 (19.6)	164 (36.5)	197 (43.9)	0.119	242 (53.9)	135 (30.1)	72 (16.0)	0.738	116 (25.8)	119 (26.5)	214 (47.7)	0.281
Yes	16 (12.2)	48 (36.6)	67 (51.1)		66 (50.4)	41 (31.3)	24 (18.3)		25 (19.1)	37 (28.2)	69 (52.7)	
Playing game at night at 17y												
No	66 (19.2)	127 (37.0)	150 (43.7)	0.451	211 (61.5)	89 (25.9)	43 (12.5)	<0.001	101 (29.4)	91 (26.5)	151 (44.0)	0.004
Yes	38 (15.8)	87 (36.1)	116 (48.1)		101 (41.9)	87 (36.1)	53 (22.0)		41 (17.0)	69 (28.6)	131 (54.4)	

Table 3.B. –Daily mean television, computer and total media use in boys of 13 years, according to their characteristics at age 17 years

n (%)	Television use at 13y (hours/day)			P-value	Computer use at 13y (hours/ day)			P-value	Total media use at 13y (hours/day)			P-value
	≤1	>1 and ≤2	>2		≤1	>1 and ≤2	>2		≤2	>2 and ≤3	>3	
Sleep Duration at 17y												
≤7h	31 (15.3)	79 (39.1)	92 (45.5)	0.739	108 (53.5)	58 (28.7)	36 (17.8)	0.940	49 (24.3)	53 (26.2)	100 (49.5)	0.566
7h01 – 8h00	47 (20.3)	82 (35.3)	103 (44.4)		127 (54.7)	70 (30.2)	35 (15.1)		60 (25.9)	58 (25.0)	114 (49.1)	
>8h	26 (17.7)	53 (36.1)	68 (46.3)		77 (52.4)	46 (31.3)	24 (16.3)		33 (22.4)	48 (32.7)	66 (44.9)	
Smoke at 17y												
No	65 (18.4)	139 (39.4)	149 (42.2)	0.171	197 (55.8)	108 (30.6)	48 (13.6)	0.072	95 (26.9)	98 (27.8)	160 (45.3)	0.115
Yes	39 (16.8)	77 (33.2)	116 (50.0)		116 (50.0)	68 (29.3)	48 (20.7)		47 (20.3)	62 (26.7)	123 (53.0)	
Drinking Alcohol at 17y												
No	13 (14.9)	31 (35.6)	43 (49.1)	0.668	41 (47.1)	28 (32.2)	18 (20.7)	0.381	22 (25.3)	23 (26.4)	42 (48.3)	0.968
Yes	91 (18.3)	183 (36.7)	224 (45.0)		271 (54.4)	148 (29.7)	79 (15.9)		120 (24.1)	136 (27.3)	242 (48.6)	
Number of friends at 17y												
< 3	17 (16.3)	33 (34.4)	46 (47.9)	0.884	50 (52.1)	31 (32.3)	15 (15.6)	0.865	21 (21.9)	26 (27.1)	49 (51.0)	0.841
≥ 3	85 (17.7)	177 (36.9)	218 (45.4)		258 (53.8)	142 (29.6)	80 (16.7)		118 (24.6)	129 (26.9)	233 (48.5)	
BMI* (Kg/m2) at 17y												
Non-overweight	80 (17.5)	166 (36.3)	211 (46.2)	0.822	239 (52.3)	140 (30.6)	78 (17.1)	0.568	103 (22.5)	121 (26.5)	233 (51.0)	0.071
Overweight	24 (19.2)	47 (37.6)	54 (43.2)		71 (56.8)	37 (29.6)	17 (13.6)		38 (30.4)	37 (29.6)	50 (40.0)	
BDI[†] at 17y												
Non-depressed	74 (15.9)	174 (37.3)	218 (46.8)	0.506	253 (54.3)	131 (28.1)	82 (17.6)	0.074	110 (23.6)	125 (26.8)	231 (49.6)	0.607
Depressed	7 (22.6)	9 (29.0)	15 (48.4)		15 (48.4)	14 (45.4)	2 (6.5)		9 (29.0)	6 (19.4)	16 (51.6)	
History of school suspension at 17y												
No	236 (45.5)	190 (36.6)	93 (17.9)	0.837	84 (16.2)	159 (30.6)	276 (53.2)	0.905	253 (48.7)	139 (26.8)	127 (24.5)	0.561
Yes	25 (43.9)	23 (40.4)	9 (15.8)		9 (15.8)	16 (28.1)	32 (56.1)		26 (45.6)	19 (33.3)	12 (21.1)	
Ever been school retained at 17y												
No	79 (21.1)	144 (38.4)	152 (40.5)	0.001	199 (53.1)	122 (32.5)	54 (14.4)	0.223	99 (26.4)	113 (30.1)	163 (43.5)	0.003
Yes	24 (11.4)	72 (34.3)	114 (54.3)		113 (53.8)	54 (25.7)	43 (20.5)		43 (20.5)	45 (21.4)	122 (58.1)	

* Body mass index. Non-overweight if BMI < 85th percentile; overweight if BMI ≥ 85th percentile (Kuczmarski, et al., 2002).

[†] Beck Depression Inventory, Second Edition. Classified into depressed if total score ≥ 13 depressive symptoms.

Table 4 – Associations between media use in girls of 13 years and their characteristics at age 17 years

n (%)	Television use at 13y (hours/day) [‡]			Computer use at 13y (hours/day) [‡]			Total media use at 13y (hours/day) [‡]		
	≤1	>1 and ≤2	>2	≤1	>2	≤2	>2 and ≤3	>3	
Watching television [‡]	1	1,11 (0,71-1,72)	2,25 (1,43-3,56)	1	0,97 (0,64-1,46)	1	1,70 (1,13-2,56)	1,79 (1,25-2,59)	
Playing computer [‡]	1	0,85 (0,55-1,31)	1,13 (0,74-1,72)	1	1,49 (1,03-2,18)	1	1,46 (1,01-2,12)	1,63 (1,16-2,27)	
Overall media [‡]	1	0,90 (0,56-1,43)	1,43 (0,89-2,32)	1	1,25 (0,79-1,93)	1	1,39 (0,91-2,12)	1,75 (1,19-2,56)	
Presence of television in the bedroom*	1	1,05 (0,65-1,70)	1,79 (1,10-2,89)	1	2,49 (1,51-4,11)	1	1,37 (0,90-2,10)	2,23 (1,50-3,31)	
Falling asleep with the television on*	1	1,26 (0,69-2,30)	1,78 (1,00-3,16)	1	1,33 (0,84-2,09)	1	1,38 (0,86-2,21)	1,48 (0,97-2,26)	
Playing games at night*	1	0,71 (0,21-2,45)	1,10 (0,35-3,44)	1	2,58 (1,16-5,74)	1	1,25 (0,44-3,56)	1,54 (0,62-3,79)	
Living with both parents*	1	0,76 (0,43-1,36)	0,65 (0,37-1,14)	1	1,52 (0,91-2,52)	1	0,98 (0,61-1,58)	1,19 (0,78-1,80)	
BMI** (Kg/m2)	1	1,41 (0,67-2,99)	1,64 (0,79-3,39)	1	1,11 (0,63-1,94)	1	1,13 (0,64-1,99)	1,06 (0,63-1,76)	
BDI* [‡]	1	0,54 (0,29-0,99)	0,48 (0,26-0,87)	1	1,05 (0,58-1,90)	1	0,72 (0,41-1,28)	0,62 (0,37-1,05)	
Sleep Duration [‡]	1	0,92 (0,59-1,43)	1,12 (0,71-1,73)	1	0,98 (0,68-1,42)	1	1,09 (0,76-1,58)	1,05 (0,76-1,46)	
Smoke*	1	1,24 (0,77-1,98)	1,31 (0,82-2,08)	1	1,10 (0,73-1,66)	1	0,94 (0,63-1,41)	1,13 (0,79-1,63)	
Drinking Alcohol*	1	2,16 (1,15-4,06)	1,51 (0,84-2,71)	1	0,96 (0,55-1,68)	1	0,78 (0,45-1,36)	0,85 (0,51-1,41)	
Sport Activity*	1	0,98 (0,60-1,59)	0,77 (0,48-1,25)	1	0,69 (0,44-1,07)	1	0,72 (0,47-1,10)	0,76 (0,52-1,11)	
Number of friends*	1	0,83 (0,45-1,52)	0,90 (0,49-1,65)	1	1,33 (0,78-2,28)	1	1,83 (1,07-3,14)	1,19 (0,77-1,85)	
Ever been school retained*	1	0,71 (0,41-1,25)	0,79 (0,46-1,36)	1	1,23 (0,77-1,95)	1	1,15 (0,72-1,85)	1,05 (0,69-1,60)	
History of school suspension*	1	0,46 (0,15-1,38)	0,76 (0,26-2,03)	1	3,44 (1,63-7,23)	1	0,67 (0,22-2,02)	1,58 (0,70-3,57)	

[‡] Television use categorized into ≤ 1 hour; >1 & ≤ 2 hours & > 2 hours; computer use categorized into two categories, ≤ 2 hours & > 2 hours; and total media use categorized into ≤ 2 hours; >2 & ≤3 hours and > 3 hours.

* Odds ratio performed

[‡] Proportional Odds Ratio performed

* Body mass index. Non-overweight if BMI < 85th percentile; overweight if BMI ≥ 85th percentile (Kuczmarski, et al., 2002).

* Non-depressed if score <13 and depressed if score ≥ 13 in the Beck Depression Inventory, Second Edition.

Table 5 – Associations between media use in boys of 13 years and their characteristics at age 17 years

n (%)	Television use at 13y (hours/day) [‡]			Computer use at 13y (hours/day) [‡]		Total media use at 13y (hours/day) [‡]		
	≤1	>1 and ≤2	>2	≤1	>2	≤2	>2 and ≤3	>3
Watching television [‡]	1	1,53 (0,91-2,50)	2,00 (1,20-3,32)	1	1,03 (0,70-1,51)	1	1,18 (0,70-1,94)	1,44 (0,90-2,27)
Playing computer [‡]	1	1,12 (0,67-1,83)	1,58 (0,95-2,58)	1	1,68 (1,18-2,37)	1	1,49 (0,92-2,37)	2,06 (1,34-3,15)
Overall media [‡]	1	0,99 (0,51-1,81)	1,49 (0,23-2,80)	1	1,22 (0,75-1,96)	1	1,05 (0,55-1,87)	1,61 (0,90-2,80)
Presence of television in the bedroom*	1	1,10 (0,66-1,85)	1,14 (0,67-1,94)	1	1,92 (1,30-2,83)	1	1,55 (0,94-2,56)	1,52 (0,95-2,42)
Falling asleep with the television on*	1	1,33 (0,70-2,52)	1,29 (0,68-2,43)	1	1,07 (0,72-1,60)	1	1,26 (0,73-2,31)	1,13 (0,66-1,93)
Playing game at night*	1	1,11 (0,68-1,81)	1,15 (0,70-1,89)	1	2,16 (1,54-3,03)	1	1,82 (1,12-2,94)	1,96 (1,26-3,06)
Living with both parents*	1	0,53 (0,28-1,03)	0,44 (0,23-0,84)	1	0,75 (0,50-1,12)	1	1,20 (0,67-2,16)	1,53 (0,90-2,60)
BMI** (Kg/m2)	1	0,73 (0,39-1,31)	0,56 (0,27-1,05)	1	0,87 (0,56-0,86)	1	0,99 (0,56-1,68)	0,84 (0,48-1,40)
BDI* [‡]	1	0,90 (0,51-1,59)	0,81 (0,46-1,44)	1	0,86 (0,57-1,28)	1	0,80 (0,47-1,35)	0,55 (0,34-0,92)
Sleep Duration [‡]	1	0,55 (0,20-1,56)	0,74 (0,27-2,02)	1	1,28 (0,62-2,67)	1	0,59 (0,20-1,73)	0,87 (0,36-2,10)
Smoke*	1	0,78 (0,45-1,29)	0,38 (0,57-1,59)	1	0,92 (0,65-1,29)	1	1,14 (0,70-1,81)	0,99 (0,63-1,53)
Drinking Alcohol*	1	0,95 (0,58-1,56)	1,37 (0,83-2,23)	1	1,25 (0,90-1,75)	1	1,31 (0,81-2,10)	1,61 (1,04-2,49)
Sport Activity*	1	0,98 (0,48-1,99)	1,03 (0,51-2,09)	1	0,80 (0,50-1,26)	1	1,20 (0,63-2,28)	1,38 (0,77-2,49)
Number of friends	1	0,67 (0,37-1,19)	0,71 (0,40-1,27)	1	0,85 (0,59-1,23)	1	0,66 (0,39-1,12)	0,80 (0,49-1,32)
Ever been school retained*	1	1,09 (0,60-1,97)	1,11 (0,62-1,99)	1	0,81 (0,55-1,18)	1	0,69 (0,40-1,19)	0,96 (0,59-1,56)
History of school suspension*	1	1,17 (0,52-2,67)	0,94 (0,41-2,19)	1	0,85 (0,49-1,49)	1	1,39 (0,65-2,99)	0,97 (0,46-2,04)

[‡] Television use categorized into ≤ 1 hour; >1 & ≤ 2 hours & > 2 hours; computer use categorized into two categories, ≤ 2 hours & > 2 hours; and total media use categorized into ≤ 2 hours; >2 & ≤3 hours and > 3 hours.

* Odds ratio performed

[‡] Proportional Odds Ratio performed

* Body mass index. Non-overweight if BMI < 85th percentile; overweight if BMI ≥ 85th percentile (Kuczmarski, et al., 2002).

* Non-depressed if score <13 and depressed if score ≥ 13 in the Beck Depression Inventory, Second Edition.

5.DISCUSSION

The present study, showed a high prevalence of early adolescents using media (33) more than 2 hours per day, the maximum diary recommended for media usage by the American Academy of Pediatrics (33) which is consistent with other studies (25, 69, 70). These adolescents tend to consume more media when they have 17 years old, which enforces that high early media usage emerges as a potential predictor of high media consumption on late adolescence. Teenagers begin to form their behaviour in early adolescence and tend to keep them throughout their development (71). Accordingly, the amount and how they use media is another behaviour that can be established early. If in early adolescence, youth have the possibility to choose the time of use of media (when they are still very dependent on the control of parents), may be capable of maintaining the same patterns of use, especially as they become more autonomous.

Our transversal and longitudinal analyses found that adolescents who belong to a less favored socioeconomic class present higher level of media consumption (21, 26, 72, 73). These results may be related with both economic restrictions and environmental characteristics that favoured the use of media, namely television. At an economical point of view, adolescents who belong to higher social classes, may have more opportunities to invest their time on other kind of extra-curricular activities, namely practicing sports, which may explain why they have lower levels of media usage. Parallel with the importance of the socioeconomic milieu, the physical environment also influences media consumption, such as the parents' media use or the interest for other activities, which was not evaluate in our study. Furthermore, a social environment with more permissive rules, including the absence of clear rules and setting limits on screen time, which may be more frequent among less favored socioeconomic groups (21), may be a possible explanation (29). Easy accessibility to television and computer may be a source of encouraging or facilitating its consumption. Our results from the longitudinal study reinforce this association, since the presence of television in the bedroom is associated with higher likelihood of using media. This association could mean that adolescents who were greater consumers influenced the decision of having television in their bedrooms or computers that allow them playing games at night. However, although our longitudinal approach, we are unable to exclude a possible inverse relation, once we did not have data about the availability of media at 13 years old (television in their bedrooms and/or personal computer). Additionally, this study illustrates that higher television and computer use on early adolescence may be associated with unhealthy behaviours, including tobacco consumption, less sleep time

and sedentary lifestyles, in early adolescence and also later in life. These findings are consistent with the notion that adolescents who engage in an unhealthy behaviour may be more prone to engage in other unhealthy behaviours (74, 75). It is also possible that media may influence directly the adolescents' attitudes, beliefs and behaviours, by exposing them to deleterious models, which can trigger the initiation to tobacco consumption and enforce that behaviour through the adolescence.

We verified that girls of 13 years that use more computer presented more depressive symptomatology. This finding was reported particularly in boys, not in girls (9). It may be explainable by an impairment of sleep patterns caused by excessive use of computer, which in turn may associate to depressive symptomatology (52). In boys this association was not found, but it may be due to the fact that boys included in the study presented lower levels of depressive symptoms.

It was also found an association between more time watching television and being retained at school. This association may be explained by the displacement of study activities for time spent watching television, leading to a more negative school performance (34, 76). At a longitudinal perspective, we did not find this specific association, but girls who consume more media at age 13 years old have higher likelihood of having a history of school suspension at the age of 17.

Although proven the beneficial prosocial capabilities of media (1, 3), this finding has been underestimated by health and education professionals. This raises questions about the role of educational institutions on adolescents' development. It has been described that schools represent a resource to promote the adolescents' health. Also, it has been shown that school achievement is positively linked with health outcomes lifelong (77). So, it is crucial to implement educational strategies capable of improving the adolescents' ability to limit the amount of media consumption, as well as stimulate their critical-thinking, essential to select and learn correct information towards healthy behaviours.

Regarding limitations, our study measured the amount of media usage, but not its content. Media use is complex to measure precisely, which inclusively can be an activity that may be combined with the use of other type media. For computer use, it is not specifically known in which activities adolescents are more likely to engage. Computer supply multiple activities, including entertainment, working, playing games, going to social networks or other online activities. The amount of time and the type of activity may expose adolescents to different messages or influences. On the other

hand, television is also an extensive source of contents. Given the variety of channels and programs, multiple models may influence adolescents positive or negatively. Accordingly, this could added pertinent information related to the purposes of adolescents in using the media and what may have influenced them. It can be also stated that global media exposure was a form of obtaining information regarding the time adolescents devote globally to media per day (reporting to computer and television). However, it exists other several types of media as cell phones, video games, movies and mp3 readers, as well as other portables devices, which, although were not focus of our study, may influence the characteristics studied in the present work. Additionally, questionnaires at 13 years were filled by adolescents and by their parents at home, which may have caused an underestimation of the amount of media time usage, by what is socially desirable.

However, it should be noted that television and computer use were clearly distinguished according to days of week and of weekend. This may be particularly important, given it allows a better understanding of this phenomenon. In this sense, it was shown that media use is different across the week, requiring different forms of intervention. Furthermore, our study considers adolescents on a representative sample of students at 13 years, who were followed until age 17 years enabling a more harmonized group, which was evaluated on crucial stages of adolescence.

6.CONCLUSION

More than half of early adolescents reported using television and computer for more than 2 hours per day. Television use was similar in both gender but boys reported higher computer use, especially on weekend.

High media consumption in early adolescence predicted high media consumption on late adolescence.

Socioeconomically disadvantaged environments were, transversal and longitudinally, associated with high media use, namely television.

Adolescents who spent more time using media at early adolescence were more prone to sleep less hours per night, practice less physical activity, consume tobacco and have depressive symptomatology. This high exposure at the age of 13 was associated with high probability to fail at school and to engage on smoking behaviour at 17 years.

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