Adolescent media use and its association to wellbeing in a Canadian national sample

C. Fitzpatrick, R. Burkhalter, M. Asbridge

ARTICLE INFO

Keywords:
- Media usage
- Academic achievement
- School connectedness
- Physical activity
- Self-esteem
- Bullying
- Fruits and vegetables
- Wellbeing
- Youth

ABSTRACT

Our objective is to describe associations between media usage and multiple wellbeing indicators in a nationally representative sample of Canadian youth (CSTADS 2012–13) enrolled in grades 7 to 12 (N = 41,057). Youth reported media usage (television/movie viewing, videogame playing, and surfing the internet), wellbeing (academic achievement, school connectedness, self-esteem, physical activity, intake of fruits and vegetables, and bullying), and psychological (drug use, drinking, and smoking) and sociodemographic confounds (ethnicity, grade, province, gender). Videogame playing was negatively associated with academic achievement, $b = -0.07$ (99% CI, $-0.08$ to $-0.05$), physical activity, $b = -3.09$, (99% CI, $-3.63$ to $-2.56$), school connectedness, $b = -0.03$ (99% CI, $-0.04$ to $-0.02$), self-esteem, $b = -0.13$ (99% CI, $-0.16$ to $-0.09$), and the consumption of fruits and vegetables $b = -0.07$ (99% CI, $-0.11$ to $-0.03$). Internet usage was negatively related to self-esteem, $b = -0.25$ (99% CI, $-0.28$ to $-0.21$), school connectedness, $b = -0.03$ (99% CI, $-0.03$ to $-0.02$), academic achievement, $b = -0.02$ (99% CI, $-0.03$ to $-0.002$) and physical activity $b = -1.42$ (99% CI, $-1.92$ to $-0.91$). Finally, television exposure was linked with less fruits and vegetable consumption, $b = -0.09$ (99% CI, $-0.12$ to $-0.06$), academic achievement $b = -0.05$ (99% CI, $-0.07$ to $-0.04$), school connectedness $b = -0.02$ (99% CI, $-0.03$ to $-0.01$), self-esteem $b = -0.06$ (99% CI, $-0.11$ to $-0.003$), and physical activity $b = -1.09$ (99% CI, $-1.64$ to $-0.54$). Internet, television/movies, and videogame time also increased the odds of bullying others by 9%, OR = 1.09 (99% CI, 1.01–1.14) 8%, OR = 1.08 (99% CI, 1.01–1.16) and 7%, OR = 1.07 (99% CI, 1.01–1.14) respectively. Overall effect sizes were small yet may represent significant impairment for heavy media users.

Achieving in school, holding a positive view of oneself, maintaining close relationships with others, and adopting healthy lifestyle habits represent important components of youth wellbeing (Patton et al., 2016; Moore et al., 2004; Ryan and Deci, 2001). Together, these elements contribute to a successful transition to adulthood, and forecast the quality of life of the next generation (Schulenberg et al., 2004; Shanahan, 2000). As a result, identifying correlates of poor wellbeing in adolescence, when habits are not yet crystalized, remains important for planning preventive interventions designed to promote healthy and happy populations.

One of the most important historic trends facing youth today is the advent of the ‘digital age’ (UNICEF, 2017). Youth born in the new millennium have unprecedented access to media technology (Bucksch et al., 2016). Parents estimate that their children aged 12 and older spend an average of 7.47 h per day with various types of media. Television remains a popular form of entertainment for adolescents; however, the popularity of ‘interactive media’ in the form of playing games and surfing the internet are on the rise (Rideout, 2015).

Studies have found that adolescent media use is negatively associated with academic performance, prosocial behavior, and healthy lifestyle choices (Anderson et al., 2010; Simonato et al., 2018; Tremblay et al., 2011). Furthermore, some studies have linked media usage to social isolation and poor self-esteem (Sidani et al., 2016; Woods and Scott, 2016). There is also, however, some evidence suggesting positive outcomes of youth media usage, such as reduced risk of depression in frequent video game users (Casiano et al., 2012). Indeed, networked
game playing and access to online resources and communities may provide opportunities for youth to socialize and receive much-needed support and positive reinforcement (Lenhart, 2015).

In the present study we use a nationally representative sample of Canadian youth to describe how different types of media technology (television/movie viewing, videogame playing, and surfing the internet) relate to youth wellbeing. Specifically, we examine how media usage is associated with academic achievement, school connectedness, self-esteem, other-directed bullying behavior, physical activity, and the consumption of fruits and vegetables. We address our objective by adjusting our analyses for the following individual and demographic characteristics: Binge drinking, smoking, cannabis; gender; province of residence; ethnicity, and grade. These individual and demographic variables were selected among those available in our data set because of their theoretical and empirical link to poor academic achievement, mental health, and health-related behavior (Bachman et al., 2011; Bonny et al., 2000; Leech et al., 2014; Miller et al., 2007; Newcomb and Bentler, 1988). Generally, we hypothesize that more time spent using media will be associated with lower levels of adolescent wellbeing. However, we are more speculative regarding associations between media usage and self-esteem, given the existence of mixed empirical evidence.

1. Sample

Data was drawn from the Canadian Student Tobacco, Alcohol and Drugs Survey (CSTADS) (formerly the Youth Smoking Survey (YSS)), a Canadian national classroom-based survey designed to assess adolescent health-related behavior. Additional information on the survey and survey questions can be found in the YSS 2012/2013 user guide (Burkhalter et al., 2013, 2018). The population was stratified by health region smoking rate, and school type before drawing a random sample of schools. The final stratified random sample for the 2012/2013 wave included 47,203 students from public, private, or Catholic schools in all Canadian provinces except for Manitoba, which chose not to participate. For feasibility reasons, schools in Canada’s northern territories were excluded. The Department of Education in each province provided school lists for all participating provinces. In total, 222 school boards were approached. Out of these, 127 (57%) participated. The rate of participation for school boards ranged from 48% in British Columbia to 100% in the Atlantic Provinces. School participation rates ranged from 38% in Ontario to 96% in Newfoundland and Labrador. The overall student participation rate was 72%. For the present study, only students enrolled in grades seven through twelve were included. For the estimation of frequencies and descriptive statistics, the full data set was retained (N = 41,057).

2. Procedure

In each province, a site coordinator oversaw school recruitment and data collection. Site coordinators received a two-day training session held at the University of Waterloo. They also received web-based training sessions and had access to a manual and point person to provide on-going advice and support over the course of the project (Burkhalter et al., 2013). Teachers received detailed instructions on how to administer the questionnaires to ensure that data was collected uniformly. Students completed all the surveys in hardcopy in their classroom within 35 min and did not receive any reward for their participation. The Office of Research Ethics at the University of Waterloo, Health Canada’s Research Ethics Board, and all School board ethics review committees approved this project.

3. Measures

3.1. Predictors: screen time behavior

Students reported the number of hours per day they spent (1): Watching TV shows or videos; (2) Playing video/computer games; and (3) Surfing the internet on a computer (not for homework). For each type of media, answer options included: None; Less than an hour a day; 1 to 2 h a day; More than 2 but less than 5 h a day; and 5 or more hours a day. Responses were converted into scores for each type of media activity. Our approach involved using the midpoint for each response range, with the exception of “5 or more hours a day” where a more conservative score of 5 was used. This resulted in the creation of three continuous variables with hours per day as the unit of measurement.

3.2. Dependent variable

3.2.1. Academic achievement

Students self-reported their grades using the following options: (1) Mostly A’s/above 85%; (2) Mostly A’s and B’s/70–84%; (3) Mostly B’s and C’s/60–69%; (4) Mostly C’s/50–59%; and (5) Mostly letter grades below C’s/below 50%. Response was reverse coded so that higher scores reflected higher achievement.

3.2.2. School connectedness

This variable reflects youth’s sense of closeness to people at school and attachment school environment. This variable was initially developed for the United States National Longitudinal Study of Adolescent Health (Scal et al., 2003). It was computed from the following items: I feel close to people at my school; I feel I am part of my school; I am happy to be at my school; I feel the teachers at my school treat me fairly; I feel safe in my school; and Getting good grades is important to me. Students evaluated each item on a Likert scale from 1 (strongly agree), 2 (agree), 3 (disagree) or 4 (strongly disagree). Responses were reverse coded so that higher scores reflect higher levels of school connectedness, $\alpha = 0.82$.

3.2.3. Self-esteem

This variable was assessed using the following items derived from the Rosenberg Self-Esteem Scale (Rosenberg, 1965): In general, I like the way I am; When I do something, I do it well; and I like the way I look. Each item was rated using a 5-point Likert scale with options: 0 (false); 1 (mostly false); 2 (neutral); 3 (mostly true); and 4 (true). Scores represent sums ranging from 0 to 12, with higher scores reflecting higher self-esteem, $\alpha = 0.77$.

3.2.4. Bullying

Involvement in victimization as a bully was assessed from the following questions. In the last 30 days, in what ways did you bully other students? Participants chose from the following response options: (1) I did not bully other students in the last 30 days; (2) Physical attacks (e.g., beat up, pushed, or kicked them); (3) Verbal attacks (e.g., teased, threatened, or spread rumors about them); (4) Cyber-attacks (e.g., sent mean text messages or spread rumors about them on the internet); and (5) Stole from them or damaged their things. Participants were instructed to select all that applied. Given the low base rate of bullying behavior we computed a dichotomous variable scored as 0 (no bullying) or 1 (any bullying). Those who did not answer any of the five options were considered missing, $\alpha = 0.65$.

3.2.5. Physical activity

Youth participation in moderate to vigorous physical activity completed during the past weekdays and weekend days was assessed by asking respondents about the number of minutes they engaged in physical activity that made them “sweat and to breathe harder or ‘be out of breath’”. Participants were instructed to include physical
education class. After computing a total number of minutes per week for each participant, total scores were divided by 7 to provide daily estimates, α = 0.92.

Consumption of fruit and vegetables was assessed using the following question: On a usual day, how many servings of fruits and/or vegetables do you eat? Participants were specifically instructed to include fresh, frozen, canned, and cooked items like apples, bananas, carrots, salads and 100% juices and to exclude chips, French fries or other fried potatoes. Participants provided their answers using the following options: 0 servings; 1–2 servings; 3–4 servings; 5 servings; 6 servings; 7 servings; and 8 or more servings. Midpoint values were used to transform the ranges into continuous scores, with the exception of 8 or more servings which was scored as 8, to provide more conservative estimates.

3.3. Control measures

Risk factors for poor academic, mental health, and health-related behavior were included in the analysis. Demographic variables were province of residence, sex, high school grade (from grade 7 to grade 12), and ethnicity (coded as White, Black, Asian, Aboriginal, Latin-Hispanic, Other, or Multiethnic). Finally, three substance use behaviors were assessed as proxies for individual risk. Alcohol consumption was measured by whether the respondent had 5 or more drinks of alcohol in the past 12 months, with answers coded as 1 = yes and 0 = no use. Smoking status was dichotomized as 0 = nonsmoker and 1 for current or former smokers having consumed 100 or more cigarettes in their life. Finally, participants also reported whether they had used cannabis in the past 12 months, with answers coded as 1 = yes and 0 = no use.

3.4. Data analytic strategy

We begin by conducting descriptive statistics including frequencies and means with 99% confidence intervals. Next, we conduct a series of linear regression models to estimate associations between screen time behaviors (TV/video, videogame, and internet usage) and continuous outcomes. Associations between the main predictors and bullying were conducted with Stata 14.2. To reduce sampling bias and bias due to non-response, analyses were weighted using the complex survey commands to account for the clustered nature of the data. Survey weights were calculated in two steps. First, a weight was calculated to account for school selection within each health region smoking rate and school level strata, in each province. A second weight was computed to account for student nonresponse. The product of both weights was calibrated according to the demographics (sex and grade) of each province (Burkhalter et al., 2013, 2018).

4. Results

Tables 1 and 2 present descriptive statistics for categorical and continuous variables respectively. Our sample was equally divided among genders (51.4% males) and was predominantly White, with the largest proportion of youth living in the province of Ontario (45.7%). Youth spent on average 1.9 h a day surfing the internet, 1.7 h watching television or movies, and 1.3 h playing videogames. Across mediums, youth consumed a total of average of 4.9 h of media per day, which exceeds daily recommendations of 2 h or less per day.

4.1. Regression results

Tables 3 presents unstandardized regression coefficients for continuous outcomes. Only respondents with complete data on all covariates and each of the outcomes were retained for the regression analysis, resulting in a different sample size for each outcome. Of all three types of media activities, videogame playing had the strongest negative association with academic achievement, $b = -0.07$ (99% CI between $-0.08$ and $-0.05$) and physical activity, $b = -3.09$, (99% CI between $-3.63$ and $-2.56$). Each hour of videogame playing was also associated with significant scale decreases in school connectedness, $b = -0.03$ (99% CI between $-0.04$ and $-0.02$), self-esteem, $b = -0.13$ (99% CI between $-0.16$ and 0.09), and the consumption of fruits and vegetables $b = -0.07$ (99% CI between $-0.11$ and $-0.03$). Internet usage was the strongest negative correlate of self-esteem, $b = -0.25$ (99% CI between $-0.28$ and $-0.21$) and made a similar contribution to school connectedness, $b = -0.03$ (99% CI between $-0.03$ and $-0.02$) as did videogame playing. Internet use also made small significant negative contributions to academic achievement,
Table 3
Unstandardized regression coefficients and 99% confidence intervals depicting associations between daily hours of media usage and adolescent health and wellbeing outcomes.

|                          | Academic achievement | School connectedness | Self-esteem | Physical activity (minutes/day) | Fruits and vegetables |
|--------------------------|----------------------|----------------------|-------------|---------------------------------|-----------------------|
| N                        | 35,534               | 36,157               | 36,324      | 35,985                          | 35,913                |
| TV/movies                | −0.05 (−0.07−0.04)***| −0.02 (−0.03−0.01)**| −0.06 (−0.11−0.03)*| −1.09 (−1.64−0.54)***| −0.09 (−0.12−0.06)***|
| Videogames               | −0.07 (−0.08−0.05)***| −0.03 (−0.04−0.02)**| −0.13 (−0.16−0.09)***| −0.90 (−3.63−2.56)***| −0.07 (−0.11−0.03)***|
| Internet                 | −0.02 (−0.03−0.02)*  | −0.03 (−0.03−0.02)**| −0.25 (−0.28−0.21)***| −1.42 (−1.92−0.61)***| −0.03 (−0.06−0.01)***|
| Sex                      | Male                 | Female               | Male        | Female                          |                       |
|                          | 1.00                 | 0.10                 | 1.00        | 1.00                            |                       |
|                          | −0.12 (−0.16−0.08)***| 0.08 (0.05−0.11)***  | 1.22 (1.11−1.34)***| 15.28 (13.12−17.45)***| 0.01 (−0.10−0.11)    |
|                          |                      |                      | 0.11        | 0.10                            | 0.02                 |

Note. Media usage variables are measured in hours per day. Sex is coded as 1 = male, 0 = female. Models are adjusted for grade, ethnicity, province, binge drinking, smoking, and cannabis use. * denotes p < .01; ** denotes p < .001 and *** denotes p < .0001.

5. Discussion

To our knowledge, this is the first study to describe associations between different types of media use and multifaceted wellbeing indicators in a large representative sample. After adjusting for individual and sociodemographic covariates, all three types of media usage were negatively related with wellbeing variables. Videogame usage was the strongest negative correlate of academic achievement and physical activity and made smaller contributions to self-esteem and the consumption of fruits and vegetables. Internet usage made the strongest negative contribution to self-esteem and smaller contributions to physical activity and academic achievement. Both internet and videogame use made equally small contributions to school connectedness and bullying. Television use generally made the smallest negative contributions to all outcomes, apart from fruits and vegetables consumption where it made the strongest negative contribution.

The present result is consistent with recent work showing a positive correlation between videogame playing and BMI in boys and between television viewing and MVPA in adolescent girls (O’Brien et al., 2018). Our results are also in-line with a recent investigation of screen time and lifestyle habits in early adolescence revealing that screen time intake at age 13 was concurrently associated with unhealthy eating habits, BMI, and student engagement (Simonato et al., 2018). Our findings on the association between screen time and bullying also replicate findings with Dutch youth (Busch et al., 2013), and are consistent with findings from an investigation of Canadian youth linking both school connectedness and being a bully to increased screen time (Katapally et al., 2018).

The effect sizes in our study varied and were most meaningful for associations between media usage and academic achievement and self-esteem and were smallest for the consumption of fruits and vegetables. Our linear analyses also suggest the most clinically important effects are likely to appear for youth engaged in heavy media usage (4–5 h per day) rather than for those engaged in moderate use (2 h or less per day). Although our observed effect sizes were small, they may still be meaningful when projected on a population-level. Adolescent academic success, self-esteem, bullying, and physical activity habits each contribute to important adult outcomes including earnings, psycho-pathology, involvement in criminal activity, and lifelong health and morbidity (Copeland et al., 2013; Freudenberg and Ruglis, 2007; Hallal et al., 2018).

Table 4
Odds ratios and 99% confidence intervals depicting associations between daily hours of media usage and adolescent self-reported bullying of others.

|                          | N = 36,012 |
|--------------------------|------------|
|                          | Odds ratio |
|                          |            |
| TV/movies (hours per day)| 1.08 (1.01−1.16)* |
| Videogames (hours per day)| 1.07 (1.01−1.14)* |
| Internet (hours per day)  | 1.09 (1.04−1.14)*** |
| Sex (female = 1, male = 2)|           |
| Female = 1               | 1.00       |
| Male = 2                 | 1.38 (1.09−1.76)*** |
| R-square                 | 0.04       |

Note. The model is adjusted for grade, ethnicity, province, binge drinking, smoking, and cannabis use. * denotes p < .01; ** denotes p < .001 and *** denotes p < .0001.
et al., 2006; Trzesniewski et al., 2006). As a result, even small reductions in media usage may translate into important public health savings from a cost-benefit perspective.

Associations between screen time and youth wellbeing are likely to partially result from ‘time displacement’, whereby screens take time away from important activities such as sleep, homework, exercising, or spending time with friends. The experience of social isolation, which is likely to accompany heavy media usage, can then lead to further cognitive, emotional, and physical disruptions (Hall-Lande et al., 2007; Leigh-Hunt et al., 2017). Such isolation and disengagement from peers may then pave the way for antisocial behaviors such as bullying (Spriggs et al., 2007).

The content and quality of the media youth engage with is also likely to matter.

For one, violent content is prevalent and easily accessible to youth and can facilitate the activation of aggressive behavioral scripts, which could then increase the risk of bullying others (American Academy of Pediatrics, 2016; Bailey et al., 2010). Additionally, exposure to advertisements is likely to influence dietary choices (Wiecha et al., 2006). Furthermore, advertisements that contribute to objectification or repeated negative social comparisons could also influence youth feelings of self-esteem (Dakanalis et al., 2014; Vogel et al., 2014).

The cross-sectional design of our study is an important limitation. For one, reverse causality is possible, in that youth experiencing poorer wellbeing might have decided to engage in more screen time. Alternatively, media usage may represent a marker of some other underlying individual disposition (i.e., poor health) that is itself related to youth wellbeing. In order to reduce this possibility, we attempted to statistically control for individual dispositions towards unhealthy behavior by including reports of substance use. Nevertheless, research has provided strong evidence that screen time represents a small causal risk factor for behavioral and cognitive outcomes (Plante and Anderson, 2017). Our findings and observed effect sizes are consistent with this research.

The present study also draws on several strengths. First, we assess naturally occurring media usage behaviors in a nationally-representative sample of youth, which increases the ecological validity of our findings. Furthermore, using the CSTADS data, it was possible to examine multiple outcomes of media usage simultaneously, which also allows us to better estimate the potential cumulative risks associated with heavy media usage.

Increasingly parents, teachers, and policy makers are expressing concerns over the potential consequences of heavy media usage on youth wellbeing. Using a large representative sample of Canadian youth, we found evidence that heavy media usage is negatively related to adolescent health and productivity. Although small, the cumulative significant effect of media usage across development and across multiple spheres of functioning may indicate a considerable health burden for adolescents. Regardless of whether the association is causal, our results therefore suggest that heavy media usage by youth represent an at-risk group that should be targeted through preventive efforts aimed at promoting population health.

Conflict of interest

The authors have no conflict of interest to report.

Acknowledgements

These analyses were supported by the Canadian Cancer Society grant #2017-704507, through the Propel Centre for Population Health Impact. Data used for this research were taken from Health Canada’s Canadian Student Tobacco, Alcohol and Drugs Survey (CSTADS; formerly the Youth Smoking Survey), which is conducted for Health Canada by the Propel Centre for Population Health Impact at the University of Waterloo. Health Canada has not reviewed, approved, nor endorsed this research. Any views expressed or conclusions drawn herein do not necessarily represent those of Health Canada. Additional information about the survey can be found at cstads.ca

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