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by Stacie Kerr and Mila Kingsbury

Release date: February 15, 2023



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# Online digital media use and adolescent mental health

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**DOI:** <https://www.doi.org/10.25318/82-003-x202300200002-eng>

## ABSTRACT

### Background

Online digital media are a central part of adolescents' lives, providing opportunities for social connection. However, some research has suggested that online digital media use may be negatively associated with mental health. Little population-based research has examined associations between various types of online digital media use and adolescent mental health.

### Data and methods

Data from 13,600 adolescents aged 12 to 17 were drawn from the 2019 Canadian Health Survey on Children and Youth. Adolescents reported on how frequently they used social media, video or instant messaging, and online gaming, as well as their general mental health, eating disorder symptoms and, for those aged 15 to 17, suicidal ideation and attempt. Logistic regression was used to estimate the odds of each outcome from the frequency of each type of digital media use, stratified by sex.

### Results

Associations were noted between the frequency of social media and video and instant messaging use, and general mental health, eating disorder symptoms, and suicidal ideation and attempt. After cybervictimization and sleep adequacy were accounted for, associations with eating disorder symptoms remained significant for girls and boys. Never participating in online gaming was associated with lower odds of lower general mental health and suicidal ideation among girls, but not boys.

### Interpretation

Different types of online digital media use are differentially associated with mental health outcomes, and associations differ between sexes. The associations between social media and video or instant messaging, and mental ill health may be partially explained by the experience of cybervictimization and sleep adequacy. More research on online gaming, particularly among girls, is needed to clarify associations with mental health.

### Keywords

digital media, online, social media, messaging, gaming, mental health, eating disorder symptoms, suicidal ideation, suicide attempt, adolescents

## AUTHORS

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### ***What is already known on this subject?***

- Online digital media use may be negatively associated with the mental health of young people, but evidence has been mixed.
- Many studies measure “screen time,” but different types of digital media use may be differentially associated with mental health.

### ***What does this study add?***

- This study used a nationally representative survey to provide estimates of the frequency of digital media use by Canadian adolescents and several mental health outcomes.
- Frequency of social media use and video or instant messaging was positively associated with eating disorder symptoms among boys and girls.
- Online gaming was not associated with mental health among boys, whereas never participating in online gaming was associated with lower risk of mental ill health among girls.

Digital media are an increasingly central part of adolescents’ lives. As of 2018, nearly all U.S. teens aged 13 to 17 (95%) had access to a smartphone, and 45% reported being online “almost constantly.”<sup>1</sup> In Canada, young people aged 15 to 24 report the highest rates of online media use of any age group—93% regularly use text or instant messaging services, 91% use social media and 68% report playing online games.<sup>2</sup> Some researchers have suggested that online media use may contribute to poor mental health among adolescents;<sup>3</sup> it has been associated with depression, body dissatisfaction,<sup>4</sup> self-harm and suicidality<sup>5</sup> in previous literature. Several reasons for an association between online digital media use and mental ill health have been hypothesized. For example, electronic device use may interfere with adolescents’ sleep, particularly because many teens report sleeping with their smartphones within reach.<sup>6</sup> Alternatively, more time online may be associated with a higher likelihood of online harassment or cybervictimization.<sup>7</sup> However, other researchers have argued that these media may serve a beneficial function, offering convenient ways to form and maintain social relationships despite boundaries, such as physical distance.<sup>8</sup> In reality, the picture is likely to be nuanced—adolescents engage with a wide variety of online digital media, each of which may be related to mental health in a different way.<sup>9</sup> The purpose of the present study was to examine differential associations between different types of online digital media use and mental health among Canadian adolescents. In order to lighten the text without discrimination, please note that throughout the article, the generic masculine will be used.

#### **Text or instant messaging and video messaging**

Text messages, whether through phone services or other apps that enable person-to-person messages, are a common form of communication, particularly among young people.<sup>10</sup> Some research has linked frequent text messaging to higher levels of depression and anxiety among adolescents,<sup>11</sup> whereas other research has not found consistent associations between text messaging and internalizing symptoms, either concurrently or longitudinally.<sup>12</sup> Even less is known about video chatting

services (e.g., FaceTime, Skype) and their association with adolescent mental health. These services offer a convenient way to stay in touch with friends and family at a distance and have become increasingly relevant since the beginning of the COVID-19 pandemic.<sup>13</sup> Some authors have argued that video chatting should be exempted from screen-time guidelines for children, as it may have benefits related to socialization.<sup>14</sup> However, the implications of video chatting for adolescent mental health remain underexplored.

#### **Social media**

Social media, including social networking and media-sharing platforms like Facebook, Instagram and TikTok, represent popular forms of digital media and an important context for adolescents’ social lives. Findings regarding the impact of social media on youth outcomes are mixed. Some research suggests that time spent on social media is associated with negative mood states and depressive symptoms.<sup>7,15,16</sup> Furthermore, social media with features such as curated, idealized images (e.g., highly edited or “filtered” photographs) and quantifiable feedback (e.g., “likes”) may contribute to adolescents’ body image concerns, particularly among girls.<sup>17,18</sup> However, other studies have found no such associations,<sup>19</sup> or have noted associations with indicators of positive mental health and life satisfaction.<sup>20</sup>

#### **Video games**

Researchers and parents have long been concerned about the potential negative effects of playing video games, particularly with respect to aggression. At the beginning of the 21st century, a great deal of academic concern emerged surrounding Internet gaming, and gaming addiction in particular.<sup>21</sup> Internet gaming disorder was added to the Diagnostic and Statistical Manual of Mental Disorders-V in 2013, and prevalence has been estimated to be between 1% and 5% among adolescents in international research.<sup>22</sup> Some cross-sectional research has linked heavy use of online gaming with suicide attempt,<sup>23</sup> and a recent case series linked Internet gaming disorder with eating disorder, framing

both as maladaptive coping mechanisms used to avoid emotional distress.<sup>24</sup> Engagement with appearance-focused games, in particular, has been suggested to confer risk for eating disorder via adolescents' body dissatisfaction and internalization of the thin ideal.<sup>25</sup>

On the other hand, some longitudinal research suggests that claims regarding the negative effects of video games may be exaggerated, and that outside of addiction, playing video games does not increase risk of aggressive behaviour<sup>26</sup> or emotional problems.<sup>27</sup> In fact, some research suggests that video games may promote positive mental health among children and adolescents because they provide an avenue for stress reduction and relaxation, as well as opportunities for problem-solving and mastery of game-specific skills.<sup>28</sup>

### The present study

Overall, there is reason to believe that these different forms of online digital media may be differentially related to adolescent mental health. Moreover, sex differences are important to examine, as boys and girls may use digital media differently. For example, boys tend to spend an hour more per day engaged in screen time than girls<sup>29</sup> and are more likely to spend this time playing online games, whereas girls report more social media use.<sup>30</sup> Some evidence also suggests that the implications of digital media use may differ between boys and girls,<sup>18,30</sup> with some authors suggesting that these differences may account for inconsistency in previous literature on media use and mental health.<sup>7,30</sup> For example, one recent study reported that associations between heavy online digital media use and indicators of psychological well-being are stronger among girls than boys.<sup>30</sup> Finally, accounting for explanatory factors (e.g., cybervictimization and sleep) may help clarify the mechanisms behind previously reported associations between online digital media use and mental health.

### Objectives

The purpose of the present study was to leverage nationally representative data to (1) examine associations between different types of online digital media use and adolescent mental health, including eating disorder symptoms and suicidality; (2) test whether these associations hold after adjustment for explanatory factors (i.e., cybervictimization and sleep); and (3) examine sex differences in these associations. These findings may serve to inform the development of prevention and intervention strategies aimed at improving adolescent mental health in a digital world.

## Data and methods

### Data source

This study uses data from the 2019 Canadian Health Survey on Children and Youth (CHSCY), a cross-sectional survey on the physical and mental health of children and youth in Canada. The survey covered the population aged 1 to 17, excluding those

living in foster homes, institutions or Indigenous settlements. Data were collected between February 11, 2019, and August 2, 2019.

The person most knowledgeable about the selected adolescent (in 96% of cases this was a birth parent, hereafter referred to as a parent) reported on family demographics via questionnaire (online or by computer-assisted telephone interview). Adolescents aged 12 to 17 also completed a self-report questionnaire, which included questions on online digital media use, cybervictimization, sleep and mental health. The current study was limited to those aged 12 to 17 years because media use was assessed only within this age group.

The response rate for adolescents aged 12 to 17 was 41%, resulting in an analytical sample size of 13,602 (49% female). For analyses on suicidality, the sample was limited to 6,915 adolescents aged 15 to 17 (49% female) because survey items assessing suicidal ideation and attempt were administered only to those within this age group.

### Measures

#### Online digital media use

Adolescents reported on their digital media use, including video or instant messaging, social media, and gaming. Adolescents were asked how often they go online for these three activities and provided responses based on a six-point scale: "never," "less than weekly," "weekly," "once a day," "several times a day" and "constantly." Responses for social media and video or instant messaging were collapsed into three categories: "once a day or less," "several times a day" and "constantly." Adolescents reported less frequent use of online gaming than other digital media; therefore, responses were categorized differently: "never," "occasionally" and "once a day or more."

#### Mental health outcomes

Four mental health outcomes were considered: general mental health, eating disorder symptoms, suicidal ideation and suicide attempt. Adolescents were asked, "In general, how is your mental health?" A binary variable was created, comparing higher mental health (responses "good," "very good" or "excellent") with lower mental health (responses "fair" or "poor").

Eating disorder symptoms were assessed via three questions adapted from the Eating Attitudes Test – 26 Item (EAT-26). Adolescents reported how often in the past 12 months they had (1) "been preoccupied with a desire to be thinner," (2) "vomited to lose weight" and (3) "changed [their] eating habits in order to manage [their] weight." Responses were rated on a five-point scale from "never" to "daily." In accordance with the EAT-26 interpretation guide,<sup>31</sup> respondents were considered to have elevated eating disorder symptoms if they reported either of the first two symptoms "daily" or "weekly," or indicated that they had vomited to lose weight at any point during the past 12 months.

**Table 1**  
**Online digital media use, mental health outcomes and covariates by sex, adolescents aged 12 to 17 years, Canada, 2019**

Characteristics	Girls			Boys			p-value
	Percent	95% confidence interval		Percent	95% confidence interval		
		from	to		from	to	
<b>Social networking</b>							
Once a day or less	30.1	28.6	31.5	46.7	45.2	48.2	<.0001
Several times a day	50.2	48.6	51.8	41.5	40.0	43.0	...
Constantly	19.7	18.5	21.0	11.8	10.8	12.7	...
<b>Video/instant messaging</b>							
Once a day or less	40.7	39.1	42.3	56.5	55.0	58.0	<.0001
Several times a day	40.6	39.1	42.1	31.9	30.4	33.3	...
Constantly	18.7	17.4	19.9	11.6	10.7	12.6	...
<b>Online gaming</b>							
Never	66.9	65.3	68.5	21.8	20.4	23.1	<.0001
Less than weekly	14.0	12.8	15.1	10.5	9.6	11.5	...
Weekly	7.0	6.2	7.9	16.2	15.0	17.4	...
Once a day	6.0	5.3	6.8	20.5	19.2	21.7	...
Several times a day	4.2	3.6	4.8	20.9	19.6	22.1	...
Constantly	1.9	1.5	2.3	10.2	9.2	11.1	...
<b>General mental health</b>							
Excellent, very good or good	83.0	81.8	84.4	93.0	92.2	93.7	<.0001
Fair or poor	17.0	15.9	18.3	7.0	6.3	7.8	...
<b>Presence of eating disorder risk</b>							
No	70.9	69.5	72.4	84.5	83.5	85.6	<.0001
Yes	29.1	27.6	30.5	15.5	14.4	16.5	...
<b>Suicidal ideation in the past 12 months</b>							
No	82.0	80.3	83.6	89.9	88.6	91.3	<.0001
Yes	18.0	16.4	19.7	10.1	8.7	11.4	...
<b>Suicide attempt in lifetime</b>							
No	91.1	89.8	92.4	95.4	94.5	96.4	<.0001
Yes	8.9	7.6	10.2	4.6	3.6	5.5	...
<b>Indigenous identity of adolescent</b>							
Indigenous	4.8	4.1	5.4	4.8	4.1	5.4	0.970
Not Indigenous	95.2	94.6	95.9	95.2	94.6	95.9	...
<b>Household income</b>							
Below LIM threshold	28.3	26.9	29.7	27.2	25.8	28.6	0.100
Above LIM threshold	71.7	70.3	73.1	72.8	71.4	74.2	...
<b>Parent's education</b>							
High school diploma or less	22.7	21.4	24.1	20.8	19.6	22.1	0.110
Certificate or diploma below the bachelor's level	38.9	37.4	40.5	40.1	38.5	41.7	...
Bachelor's degree or above	38.3	36.8	39.8	39.1	37.6	40.5	...
<b>Family immigrant status</b>							
One or more family members born outside Canada	43.1	41.5	44.6	43.0	41.5	44.5	0.970
No family members born outside Canada	56.9	55.4	58.5	57.0	55.5	58.5	...
<b>Parent's marital status</b>							
Not married or living common law	20.7	19.4	21.9	19.7	18.4	21.0	0.310
Married or living common law	79.3	78.1	80.6	80.3	79.0	81.6	...
<b>Population group</b>							
Racialized group	31.5	30.1	32.9	30.5	29.1	31.8	0.300
Not a racialized group	68.5	67.1	69.9	69.5	68.2	70.9	...
<b>Area of residence</b>							
Rural area	17.4	16.3	18.5	18.6	17.5	19.8	0.130
Urban area	82.6	81.5	83.7	81.4	80.2	82.5	...
<b>Experienced cybervictimization</b>							
No	87.6	86.6	88.6	87.6	86.6	88.6	0.940
Yes	12.4	11.4	13.4	12.4	11.4	13.4	...
<b>Met sleep guidelines</b>							
No	35.6	34.0	37.1	32.3	30.9	33.7	0.002
Yes	64.4	62.9	66.0	67.7	66.3	69.1	...

... not applicable

**Notes:** LIM stands for low-income measure. A p-value lower than 0.05 indicates that the distribution for boys is significantly different from the distribution for girls.

**Source:** Statistics Canada, Canadian Health Survey on Children and Youth, 2019.

Adolescents aged 15 to 17 additionally reported on suicidal ideation and attempt by answering “yes” or “no” to the following questions: “In the past 12 months, did you ever seriously consider attempting suicide or taking your own life?” and “Have you ever attempted suicide or tried taking your own life?”

**Covariates**

Several demographic characteristics were considered as covariates in the analyses: adolescents’ age, sex at birth (male or female), gender identity (cisgender, transgender or gender diverse; based on self-reported gender [male, female or other] and sex at birth), Indigenous identity, membership in racialized population groups (yes or no),<sup>32</sup> household income (above or below the low-income measure threshold for their household size),<sup>33</sup> parent’s education (high school diploma or less, certificate or diploma below the bachelor’s level, or bachelor’s degree or above), family immigrant status (adolescent, parent or parent’s spouse was born outside Canada), parent married or living common law (yes or no), and residence in an urban or rural area.<sup>34</sup>

In addition, cybervictimization and sleep adequacy were considered as explanatory variables. Adolescents reported on their experience of cybervictimization in the past 12 months using three items: (1) “someone posted hurtful information about you on the Internet,” (2) “someone threatened or insulted you through email, instant messaging, text messaging or an

online game,” and (3) “someone purposefully excluded you from an online community.”<sup>35</sup> Response options ranged from 0 (“never”) to 4 (“daily”) and were summed to create a total score ranging from 0 to 12. Those in the top 15% of cybervictimization scores (i.e., scores of 2 or higher) were considered to have experienced cybervictimization. Adolescents’ adherence to sleep guidelines (yes or no, based on Canadian 24-Hour Movement Guidelines for Children and Youth)<sup>36</sup> was calculated based on adolescents’ age and reports of average nighttime sleep duration.<sup>34</sup>

**Statistical analyses**

Descriptive analyses were conducted to obtain sample characteristics and estimate the number and percentage of adolescents reporting different mental health outcomes and frequencies of digital media use.

A series of logistic regression analyses were conducted, predicting mental health outcomes from online digital media use frequencies, stratified by sex. For each outcome, three models were produced: the crude model, a model adjusting for demographic covariates, and a third model that included cybervictimization and sleep.

All analyses were weighted using bootstrap weights and survey weights developed for the CHSCY. Survey weights account for potential bias introduced because of non-response and ensure that the sample is representative of Canadians aged 1 to 17. The bootstrap method with 1,000 resamples was used to calculate

**Table 2**  
**Logistic regression analysis predicting lower general mental health, elevated eating disorder symptoms, suicidal ideation and suicide attempt from frequency of social media use, girls aged 12 to 17 years, Canada, 2019**

Frequency of social media use	Lower general mental health			Elevated eating disorder symptoms			Suicidal ideation			Suicide attempt		
	Adjusted odds ratio	95% confidence interval		Adjusted odds ratio	95% confidence interval		Adjusted odds ratio	95% confidence interval		Adjusted odds ratio	95% confidence interval	
		from	to		from	to		from	to		from	to
<b>Model 1</b>												
Once a day or less	0.53 *	0.43	0.66	0.57 *	0.48	0.68	0.93	0.67	1.30	1.19	0.79	1.78
Several times a day <sup>†</sup>	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Constantly	1.43 *	1.17	1.74	1.47 *	1.23	1.75	1.38 *	1.06	1.80	1.39	0.97	2.01
<b>Model 2<sup>‡</sup></b>												
Once a day or less	0.72 *	0.56	0.91	0.75 *	0.62	0.89	0.89	0.63	1.25	1.21	0.80	1.85
Several times a day <sup>†</sup>	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Constantly	1.35 *	1.10	1.67	1.39 *	1.16	1.67	1.44 *	1.09	1.91	1.44	0.99	2.10
<b>Model 3<sup>§</sup></b>												
Once a day or less	0.77	0.60	1.00	0.78 *	0.64	0.94	0.95	0.65	1.37	1.40	0.89	2.19
Several times a day <sup>†</sup>	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Constantly	1.13	0.90	1.42	1.25 *	1.04	1.52	1.23	0.91	1.68	1.30	0.88	1.93
Cybervictimization	2.87 *	2.28	3.62	2.02 *	1.65	2.49	3.86 *	2.82	5.27	3.73 *	2.10	6.63
Met sleep guidelines	0.51 *	0.42	0.62	0.63 *	0.54	0.73	0.45 *	0.34	0.58	0.65 *	0.43	0.98

... not applicable

\* significantly different from reference category (p < 0.05)

<sup>†</sup> reference category

<sup>‡</sup> model adjusted for child age, rural residence, population group, Indigenous identity, gender identity, parental marital status, family low income, family immigrant status and parental education

<sup>§</sup> model additionally adjusted for cybervictimization and sleep adequacy

Source: Statistics Canada, Canadian Health Survey on Children and Youth, 2019.

variance estimates, including 95% confidence intervals (CIs). Cases with missing data (< 3% on any variable) were deleted from analysis. All estimates met quality guidelines for the CHSCY.<sup>37</sup>

## Results

### Frequency of online digital media use

The frequency of online digital media use by adolescents and mental health outcomes are presented in Table 1. More than half of Canadians aged 12 to 17 engaged in social media (61%) and video or instant messaging (51%) several times a day or more. By comparison, less than one-fifth of respondents (19%) played video games online at the same frequency. Sex differences in adolescents’ participation in online activities were identified, with girls using social media and video or instant messaging more frequently than boys, while boys participated in online gaming more frequently than girls (Table 1).

### Associations with mental health outcomes

#### Girls

In crude models, greater frequency of social media use was associated with lower general mental health and higher risk of elevated eating disorder symptoms and suicidal ideation; these associations remained significant after adjustment for

sociodemographic covariates (Table 2). After the experience of cybervictimization and sleep were adjusted for, associations with general mental health and suicidal ideation were non-significant, but associations with eating disorder symptoms remained significant. Compared with using social media several times a day, using social media once a day or less was associated with lower risk of elevated eating disorder symptoms (odds ratio [OR]: 0.78; 95% CI: 0.64, 0.94), whereas using social media “constantly” was associated with greater risk (OR: 1.25; 95% CI: 1.04, 1.52).

Greater frequency of video or instant messaging was associated with lower general mental health and higher risk of elevated eating disorder symptoms and suicidal ideation in crude models (Table 3); associations remained significant when demographic covariates were included in the models. However, after the experience of cybervictimization and sleep were adjusted for, only the association with eating disorder symptoms was significant: using video or instant messaging once a day or less was associated with reduced risk of elevated symptoms (OR: 0.77; 95% CI: 0.65, 0.91), compared with messaging several times a day.

Finally, compared with gaming occasionally, “never” participating in online gaming was associated with reduced risk of poorer general mental health, suicidal ideation and suicide attempt, and gaming once a day or more was associated with reduced risk of elevated eating disorder symptoms (Table 4). With the exception of the association with suicide attempt, these

**Table 3**  
**Logistic regression analysis predicting lower general mental health, elevated eating disorder symptoms, suicidal ideation and suicide attempt from frequency of video/instant messaging, girls aged 12 to 17 years, Canada, 2019**

Frequency of video/ instant messaging	Lower general mental health			Elevated eating disorder symptoms			Suicidal ideation			Suicide attempt		
	Adjusted odds ratio	95% confidence interval		Adjusted odds ratio	95% confidence interval		Adjusted odds ratio	95% confidence interval		Adjusted odds ratio	95% confidence interval	
		from	to		from	to		from	to		from	to
<b>Model 1</b>												
Once a day or less	0.75 *	0.62	0.90	0.60 *	0.51	0.70	1.05	0.79	1.40	0.74	0.50	1.08
Several times a day <sup>†</sup>	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Constantly	1.45 *	1.17	1.81	1.28 *	1.07	1.54	1.40 *	1.06	1.85	1.17	0.79	1.72
<b>Model 2<sup>‡</sup></b>												
Once a day or less	0.95	0.77	1.17	0.73 *	0.62	0.87	1.02	0.75	1.37	0.70	0.47	1.04
Several times a day <sup>†</sup>	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Constantly	1.27 *	1.01	1.60	1.17	0.97	1.41	1.39 *	1.03	1.87	1.15	0.76	1.75
<b>Model 3<sup>§</sup></b>												
Once a day or less	1.03	0.83	1.28	0.77 *	0.65	0.91	1.09	0.80	1.50	0.77	0.50	1.17
Several times a day <sup>†</sup>	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Constantly	1.05	0.82	1.36	1.06	0.87	1.30	1.15	0.84	1.59	0.94	0.60	1.46
Cybervictimization	2.98 *	2.36	3.77	2.05 *	1.66	2.53	3.91 *	2.87	5.34	4.02 *	2.79	5.79
Met sleep guidelines	0.51 *	0.42	0.62	0.62 *	0.53	0.72	0.44 *	0.34	0.57	0.64 *	0.46	0.89

... not applicable

\* significantly different from reference category (p < 0.05)

<sup>†</sup> reference category

<sup>‡</sup> model adjusted for child age, rural residence, population group, Indigenous identity, gender identity, parental marital status, family low income, family immigrant status and parental education

<sup>§</sup> model additionally adjusted for cybervictimization and sleep adequacy

Source: Statistics Canada, Canadian Health Survey on Children and Youth, 2019.



associations remained significant after adjustment for sociodemographic covariates, cybervictimization and sleep. In the fully adjusted model, “never” gaming was associated with reduced risk of lower general mental health (OR: 0.64; 95% CI: 0.51, 0.81) and suicidal ideation (OR: 0.58; 95% CI: 0.42, 0.81), and gaming once a day or more was associated with reduced risk of elevated eating disorder symptoms (OR: 0.68; 95% CI: 0.52, 0.90).

**Boys**

Greater frequency of social media use was associated with higher risk of eating disorder symptoms, and this association remained significant after adjusting for sociodemographic covariates (Table 5). After cybervictimization and sleep were adjusted for, using social media once a day or less was associated with lower risk of elevated eating disorder symptoms (OR: 0.74; 95% CI: 0.59, 0.91) compared with using social media several times a day.

Greater frequency of video or instant messaging was associated with lower general mental health and higher risk of elevated eating disorder symptoms and suicide attempt; associations with eating disorder symptoms and suicide attempt remained significant after adjusting for sociodemographic covariates (Table 6). After cybervictimization and sleep were adjusted for, using video or instant messaging “constantly” was associated

with a greater risk of elevated eating disorder symptoms (OR: 1.49; 95% CI: 1.13, 1.96).

Online gaming was not significantly associated with mental health outcomes in crude or adjusted models (Table 7).

**Discussion**

In this large, nationally representative sample of Canadian adolescents aged 12 to 17, this study finds associations between the frequency of various forms of online media use and several indicators of mental health. Notably, greater frequency of instant or video messaging and social media use was associated with elevated eating disorder symptoms, and online gaming was associated with lower general mental health and suicidal ideation among girls.

Consistent with well-known sex differences in prevalence of mental disorder,<sup>38</sup> girls were more likely than boys to report lower general mental health, eating disorder symptoms, suicidal ideation and suicide attempt. With respect to online activities, girls reported a higher frequency of social media use and video or instant messaging, while boys were more likely to engage in online gaming, also consistent with previous literature.<sup>30</sup>

**Table 4**  
**Logistic regression analyses predicting lower general mental health, elevated eating disorder symptoms, suicidal ideation and suicide attempt from frequency of online gaming, girls aged 12 to 17 years, Canada, 2019**

Frequency of online gaming	Lower general mental health			Elevated eating disorder symptoms			Suicidal ideation			Suicide attempt		
	Adjusted odds ratio	95% confidence interval		Adjusted odds ratio	95% confidence interval		Adjusted odds ratio	95% confidence interval		Adjusted odds ratio	95% confidence interval	
		from	to		from	to		from	to		from	to
<b>Model 1</b>												
Never	0.66 *	0.54	0.81	0.94	0.79	1.12	0.55 *	0.41	0.73	0.62 *	0.43	0.89
Occasionally <sup>†</sup>	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Once a day or more	0.83	0.63	1.10	0.70 *	0.55	0.90	0.69	0.45	1.06	0.75	0.43	1.29
<b>Model 2<sup>‡</sup></b>												
Never	0.63 *	0.50	0.79	0.84	0.70	1.01	0.57 *	0.42	0.72	0.64 *	0.44	0.94
Occasionally <sup>†</sup>	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Once a day or more	0.93	0.69	1.27	0.68 *	0.52	0.88	0.70	0.44	1.12	0.75	0.42	1.35
<b>Model 3<sup>§</sup></b>												
Never	0.64 *	0.51	0.81	0.87	0.72	1.06	0.58 *	0.42	0.81	0.74	0.48	1.12
Occasionally <sup>†</sup>	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Once a day or more	0.92	0.67	1.26	0.68 *	0.52	0.90	0.75	0.45	1.23	0.85	0.45	1.58
Cybervictimization	2.96 *	2.35	3.73	2.15 *	1.74	2.65	3.94 *	2.90	5.36	4.09 *	2.84	5.90
Met sleep guidelines	0.51 *	0.42	0.61	0.62 *	0.53	0.72	0.43 *	0.33	0.56	0.64 *	0.46	0.89

... not applicable

\* significantly different from reference category (p < 0.05)

<sup>†</sup> reference category

<sup>‡</sup> model adjusted for child age, rural residence, population group, Indigenous identity, gender identity, parental marital status, family low income, family immigrant status and parental education

<sup>§</sup> model additionally adjusted for cybervictimization and sleep adequacy

Source: Statistics Canada, Canadian Health Survey on Children and Youth, 2019.

**Table 5**  
**Logistic regression analysis predicting lower general mental health, elevated eating disorder symptoms, suicidal ideation and suicide attempt from frequency of social media use, boys aged 12 to 17 years, Canada, 2019**

Frequency of social media use	Lower general mental health			Elevated eating disorder symptoms			Suicidal ideation			Suicide attempt		
	Adjusted odds ratio	95% confidence interval		Adjusted odds ratio	95% confidence interval		Adjusted odds ratio	95% confidence interval		Adjusted odds ratio	95% confidence interval	
		from	to		from	to		from	to		from	to
<b>Model 1</b>												
Once a day or less	0.84	0.66	1.07	0.68 *	0.56	0.82	1.16	0.84	1.61	1.14	0.69	1.89
Several times a day <sup>†</sup>	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Constantly	1.20	0.97	1.48	1.39 *	1.09	1.77	1.09	0.72	1.63	1.26	0.74	2.17
<b>Model 2<sup>‡</sup></b>												
Once a day or less	1.17	0.89	1.52	0.71 *	0.58	0.87	1.21	0.86	1.70	1.14	0.67	1.95
Several times a day <sup>†</sup>	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Constantly	1.33	0.94	1.89	1.30 *	1.00	1.67	1.03	0.67	1.57	1.14	0.64	...
<b>Model 3<sup>§</sup></b>												
Once a day or less	1.21	0.91	1.60	0.74 *	0.59	0.91	1.26	0.85	1.82	1.15	0.62	2.13
Several times a day <sup>†</sup>	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Constantly	1.19	0.82	1.71	1.20	0.92	1.56	0.92	0.59	1.43	1.07	0.60	1.91
Cybervictimization	3.20 *	2.39	4.27	1.96 *	1.54	2.50	3.85 *	2.65	5.61	4.80 *	2.97	7.78
Met sleep guidelines	0.56 *	0.44	0.73	0.65 *	0.54	0.78	0.55 *	0.40	0.76	0.78	0.48	1.28

... not applicable

\* significantly different from reference category (p < 0.05)

† reference category

‡ model adjusted for child age, rural residence, population group, Indigenous identity, gender identity, parental marital status, family low income, family immigrant status and

§ model additionally adjusted for cybervictimization and sleep adequacy

Source: Statistics Canada, Canadian Health Survey on Children and Youth, 2019.

### Social media and video or instant messaging

For adolescents in this sample, a positive relationship between the frequency of social media use and video or instant messaging and self-rated general mental health, eating disorder symptoms, suicidal ideation and suicide attempt was seen. Those engaging the least were at the lowest risk, and those engaging “constantly” (about 15% of adolescents) were at the greatest risk. However, after cybervictimization and sleep adequacy were adjusted for, these associations were largely attenuated.

Researchers have hypothesized many reasons for reported associations between the use of online digital media and mental health. One hypothesis is that greater frequency of engagement with such media increases the likelihood that adolescents will experience cybervictimization, which in turn is detrimental to mental health. One Canadian study using data from the Ontario Student Drug Use and Health Survey found that the experience of cybervictimization mediated the links between social media use and mental health problems, including psychological distress, suicidal ideation and suicide attempt.<sup>39</sup> Sleep adequacy represents another potential explanatory factor in the association between online digital media use and mental health: greater time spent on social media has been associated with shorter sleep duration<sup>40</sup> and lower sleep quality,<sup>7</sup> and poor sleep

has been shown to mediate the association between social media use and depressive symptoms.<sup>7</sup> The results of this study are consistent with the notion that cybervictimization and sleep adequacy are significant factors that may explain previously noted associations between adolescents’ social media use and mental ill health, and they suggest that similar mechanisms may be at play with respect to video or instant messaging.

Notably, associations between social media use, video or instant messaging and eating disorder symptoms remained significant even after accounting for cybervictimization and sleep. Among both girls and boys, frequency of use of these media was associated with eating disorder symptoms in a dose–response manner—those with the lowest engagement were at lowest risk, whereas those who engaged most often with these media were at highest risk. A pattern of sex differences in these associations was noted: among girls, social media use was more robustly associated with eating disorder symptoms, while among boys, stronger associations were noted with video or instant messaging. These findings are in line with some research suggesting that girls may be more prone to social comparison on social media, comparing themselves with highly curated and filtered versions of reality.<sup>41</sup> Girls may also be more sensitive to the peer feedback provided via “likes” and comments,<sup>17</sup> which may be damaging to self-esteem and body image.<sup>41,42</sup> Although eating disorders are relatively less common among boys than

**Table 6**  
**Logistic regression analysis predicting lower general mental health, elevated eating disorder symptoms, suicidal ideation and suicide attempt from frequency of video/instant messaging, boys aged 12 to 17 years, Canada, 2019**

Frequency of video/ instant messaging	Lower general mental health			Elevated eating disorder symptoms			Suicidal ideation			Suicide attempt		
	Adjusted odds ratio	95% confidence interval		Adjusted odds ratio	95% confidence interval		Adjusted odds ratio	95% confidence interval		Adjusted odds ratio	95% confidence interval	
		from	to		from	to		from	to		from	to
<b>Model 1</b>												
Once a day or less	0.81	0.62	1.06	0.87	0.72	1.05	1.04	0.75	1.45	1.34	0.82	2.20
Several times a day <sup>†</sup>	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Constantly	1.51 *	1.08	2.10	1.65 *	1.27	2.14	1.30	0.87	1.92	1.94 *	1.16	3.25
<b>Model 2<sup>‡</sup></b>												
Once a day or less	1.09	0.82	1.46	0.91	0.74	1.12	1.10	0.78	1.54	1.36	0.80	2.30
Several times a day <sup>†</sup>	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Constantly	1.39	0.99	1.96	1.56 *	1.19	2.05	1.31	0.88	1.96	1.80 *	1.05	3.11
<b>Model 3<sup>§</sup></b>												
Once a day or less	1.09	0.81	1.47	0.97	0.78	1.20	1.16	0.81	1.66	1.33	0.75	2.36
Several times a day <sup>†</sup>	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Constantly	1.21	0.84	1.75	1.49 *	1.13	1.96	1.16	0.75	1.78	1.71	0.99	2.97
Cybervictimization	3.15 *	2.36	4.22	2.00 *	1.35	2.97	3.74 *	2.56	5.45	4.71 *	2.91	7.63
Met sleep guidelines	0.57 *	0.44	0.74	0.63 *	0.51	0.78	0.56 *	0.41	0.78	0.81	0.49	1.33

... not applicable

\* significantly different from reference category (p < 0.05)

<sup>†</sup> reference category

<sup>‡</sup> model adjusted for child age, rural residence, population group, Indigenous identity, gender identity, parental marital status, family low income, family immigrant status and parental education

<sup>§</sup> model additionally adjusted for cybervictimization and sleep adequacy

Source: Statistics Canada, Canadian Health Survey on Children and Youth, 2019.

girls, a non-negligible percentage of boys in the sample (15%) were identified as showing elevated symptoms of eating disorder. In previous literature, appearance-focused social media use (e.g., sending pictures) has been associated with eating disorder symptoms among both boys and girls.<sup>43</sup> Many adolescents take and send pictures of themselves using messaging apps like Snapchat, which allow users to filter and edit their images.<sup>44</sup> Use of this type of messaging app may lead to a heightened focus on appearance, and comparison with highly filtered images of oneself and others may exacerbate body image concerns.<sup>44,45</sup> Moreover, the design of most video-messaging apps presents users with their own video feed, resulting in constant appearance-related feedback, which may increase appearance-related anxiety.<sup>46</sup>

### Online gaming

Significant sex differences with respect to online gaming were noted. The frequency of gaming was not significantly associated with any of the outcomes among boys; however, girls who reported “never” gaming were at lower risk of poorer general mental health and suicidal ideation, compared with those who reported gaming only occasionally. Somewhat counterintuitively, playing online games once a day or more was associated with lower risk of elevated eating disorder symptoms. One possibility is that engagement in online gaming may displace time spent on more appearance-focused media.

However, more research into the mechanisms linking online game play to psychosocial outcomes among girls is warranted.

### Limitations and future directions

The present study was limited to measures of the frequency of use of online media, which may not reflect the amount of time spent engaged with these media. Moreover, many authors have argued that a focus on frequency or time lacks nuance, and that it is important to consider the content of adolescents’ media use, as well as individual vulnerability factors.<sup>5,47,48</sup> For example, using social media to connect and make plans with friends has been found to be protective against suicidality, whereas using social media to post content publicly has been associated with greater suicidality risk.<sup>5</sup> In terms of individual differences, associations between social media use and poor mental health tend to be more pronounced among adolescents who are more prone to social comparison on social media.<sup>5,49</sup> Future research should also consider additional contextual factors that may influence associations between online digital media use and mental health, such as in-person time with family and friends.<sup>50</sup>

As this study was cross-sectional in nature, temporality in the associations between online digital media use and mental ill health could not be assessed. For example, it is possible that adolescents with worse mental health may engage more often with digital media as a form of avoidance coping.

**Table 7**  
**Logistic regression analyses predicting lower general mental health, elevated eating disorder symptoms, suicidal ideation and suicide attempt from frequency of online gaming, boys aged 12 to 17 years, Canada, 2019**

Frequency of online gaming	Lower general mental health			Elevated eating disorder symptoms			Suicidal ideation			Suicide attempt		
	Adjusted odds ratio	95% confidence interval		Adjusted odds ratio	95% confidence interval		Adjusted odds ratio	95% confidence interval		Adjusted odds ratio	95% confidence interval	
		from	to		from	to		from	to		from	to
<b>Model 1</b>												
Never	0.83	0.57	1.19	0.96	0.75	1.23	0.99	0.65	1.50	0.90	0.45	1.79
Occasionally <sup>†</sup>	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Once a day or more	1.09	0.83	1.42	0.96	0.79	1.18	1.23	0.88	1.72	1.61	0.89	2.93
<b>Model 2<sup>‡</sup></b>												
Never	0.71	0.48	1.03	0.93	0.73	1.20	0.93	0.61	1.42	0.92	0.45	1.88
Occasionally <sup>†</sup>	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Once a day or more	1.05	0.80	1.39	0.97	0.79	1.20	1.19	0.85	1.68	1.52	0.82	2.81
<b>Model 3<sup>§</sup></b>												
Never	0.74	0.50	1.09	0.94	0.72	1.22	1.00	0.65	1.56	0.94	0.45	1.99
Occasionally <sup>†</sup>	1.00	...	...	1.00	...	...	1.00	...	...	1.00	...	...
Once a day or more	0.89	0.67	1.18	0.90	0.73	1.12	1.02	0.71	1.47	1.26	0.65	2.44
Cybervictimization	3.15 *	2.37	4.20	2.03 *	1.60	2.59	3.70 *	2.55	5.36	4.61 *	2.80	7.60
Met sleep guidelines	0.56 *	0.44	0.73	0.63 *	0.53	0.76	0.56 *	0.40	0.77	0.80	0.49	1.30

... not applicable

\* significantly different from reference category (p < 0.05)

<sup>†</sup> reference category

<sup>‡</sup> model adjusted for child age, rural residence, population group, Indigenous identity, gender identity, parental marital status, family low income, family immigrant status and parental education

<sup>§</sup> model additionally adjusted for cybervictimization and sleep adequacy

Source: Statistics Canada, Canadian Health Survey on Children and Youth, 2019.

The findings of this study are largely generalizable to the Canadian population aged 12 to 17. However, data on suicidal ideation and suicide attempt were collected only from adolescents aged 15 to 17, limiting the generalizability of these findings. Future research investigating these associations in younger children and adolescents is warranted, as online digital media use begins much earlier than 15 years of age.

The data for the present study were collected in 2019, limiting the generalizability of the findings to a post-COVID-19 context. Pandemic-related physical distancing requirements have led to a rise in the amount of time youth are spending online, particularly on social media and messaging services.<sup>51</sup> The relationships between online media use and mental health may change as adolescents use online media at different frequencies and for different purposes in a post-COVID-19 world.

## Conclusion

In a large, nationally representative sample of adolescents aged 12 to 17, associations between the frequency of social media use and instant or video messaging and several indicators of mental ill health were noted. However, once sleep adequacy and cybervictimization were taken into account, only associations with eating disorder symptoms were significant. Online gaming was associated with mental health among girls, but not boys.

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