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Adolescent social media use and its association with relationships and connections: Canadian Health Behaviour in School-aged Children, 2017/2018

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ABSTRACT

Background

The development of healthy relationships and connections is of fundamental importance to adolescent well-being. The use of social media plays a vital role in the lives of young Canadians, yet the association between different types of social media use and the quality of relationships and connections remains unknown, and most existing analyses on this topic are based on modest and non-representative samples.

Data and methods

Using 2017/2018 reports from the nationally representative Health Behaviour in School-aged Children study (n=17,149; ages 11 to 15 years), the strength, consistency and statistical significance of associations was examined between intensive (frequent use to connect with other people) and problematic (use that depicts addictive qualities) social media use and available measures of adolescent relationships and connections.

Results

Overall, intensive use (online communication with others almost all of the time) and problematic use (potential addiction to social media) were more common in girls than boys (38% of girls versus 30% of boys and 7.7% of girls versus 5.2% of boys, respectively), with prevalence levels that rose with age. Intensive use was associated with more positive social relationships with friends, especially among girls (relative risk [RR] = 1.40 [95% confidence interval (CI) 1.28 - 1.54]), while problematic use was consistently and negatively associated with strong relationships and connections in all groups in the study. Notably, problematic use was negatively associated with strong family relationships in boys (RR = 0.58 [95% CI 0.42 to 0.79]) and girls (RR=0.48 [95% CI 0.36 to 0.63]).

Discussion

Intensive use of social media has the potential to strengthen relationships and connections in adolescents. However, when social media use becomes addictive or “problematic,” it is highly correlated with weaker relationships and a sense of social disconnection. Public health initiatives related to social media use should consider how different types of social media use have the potential to impact on different aspects of health.

Keywords

Social media use, Health Behaviour in School-aged Children, adolescents, Canada, relationships

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What is already known on this subject?

- Relationships and connections are important determinants of health in adolescents.
- This national analysis explores the association of different types of social media use with adolescent relationships and connections.

What does this study add?

- Intensive (frequent) social media use was associated with positive social relationships with friends, whereas problematic (addictive) social media use was associated with negative aspects of relationships and connections.
- These findings suggest that public health interventions related to social media should consider how different types of social media use have the potential to impact different aspects of health.

Strong, positive relationships are critical to the healthy development of adolescents in their transition to adulthood. Positive relationships buffer against negative social influences, foster the formation of identity, support the development of social skills and self-esteem, and assist young people in establishing autonomy.¹ Qualities of healthy and unhealthy adolescent relationships can be measured in diverse manners. Sometimes they are measured in terms of the extent of the connections young people have with the people surrounding them and their environment, whether these connections are to oneself, others, nature and the land, or the transcendent.² Alternatively, they can be measured in terms of the strengths of the social supports to which young people have access, including those emergent from family, peer groups, schools and the broader community.³ Despite how they are conceived and what aspects of development they support, positive and healthy relationships during adolescence act as positive assets leading to better self-reported health, higher life satisfaction and fewer health complaints.² Supportive relationships are also strongly protective against the effects of structural inequalities in determinants of health, such as poverty and other forms of deprivation.^{1,3}

Social media use (SMU), which is defined here as the active use of electronic media on social network and instant messenger sites to communicate with other people, has become a ubiquitous part of the daily lives of most young people. In 2017, 85% of Ontario students in grades 7 to 12 reported daily SMU, with 20% reporting more than five hours of use per day, an increase from 16% in 2015 and 11% in 2013.⁴ The widespread daily use of social media among young people has also been observed nationally⁵ and internationally.⁶ Engagement in social media can provide a means for young people to connect to others and to foster and maintain relationships.⁷ For example, SMU can enhance communication with family and friends, improve collaboration with classmates, and provide access to essential social support networks.⁷

While SMU can be a means to foster positive relationships, there is evidence to suggest that it can also contribute to negative emotional feelings, such as those related to

disconnection, loneliness and perceived social exclusion.^{8,9} Further, online interactions were associated with greater tendencies to compare oneself with others and intense feelings of “missing out” in comparison with in-person interactions.¹⁰ The sense of loneliness induced by overuse of social media has been conceived as part of an etiological pathway that eventually leads to negative mental health effects, including decreased life satisfaction.¹¹ This is a particularly salient issue in times of forced isolation, such as has been hypothesized¹² but not confirmed, around the world during the COVID-19 pandemic.

Varying associations between adolescent well-being and SMU have been demonstrated cross-nationally.¹³ The strength of such associations depends in part on the SMU and the social norms surrounding its use. To illustrate, intense SMU—SMU that is highly frequent throughout the day—has been associated with greater life satisfaction, more family support and fewer psychological complaints in countries where the prevalence of intense SMU was higher than average.¹³ In contrast, problematic SMU—addiction-like SMU that impairs functioning¹⁴—was consistently associated with lower levels of well-being compared with non-problematic SMU in those same countries.¹³ Longitudinal research confirms the temporal direction of such relationships; problematic SMU symptoms were associated with decreased mental health over time, while intensive SMU was not consistently associated with mental health in any direction.¹⁴

Healthy relationships and connections are a fundamental determinant of health.^{2,15} While relationships and connections among adolescents occur more and more often via electronic media,⁴ evidence is limited about how the qualities of adolescent relationships are affected by the varying impacts of SMU and how these in turn affect mental health status. This is complicated by the paradoxical finding that SMU sometimes strengthens relationships while also fostering feelings of social disconnection.^{8,9,16} The latter findings have been attributed to the negative qualities of problematic SMU and their impact on relationships in a smaller proportion of adolescents.^{13,17} However, less is known about the potential effects of intensive SMU, which is far more common in adolescent populations.⁶

Given the high prevalence of intensive SMU,⁶ and that both types of SMU could be increasing, understanding the potential influences of each type of SMU on healthy relationships and connections is especially warranted.

More theoretically, different SMU behaviours may be contributing to adolescent health and well-being in different manners. Illustratively, past longitudinal studies affirm that intensive SMU and problematic SMU are likely very different behaviours with divergent consequences.¹⁴ In national and cross-national analyses, neither intensive use¹³ nor time spent using social media¹⁸ were associated with mental health problems, whereas problematic use was associated with decreased mental health over time.¹⁹ Lower levels of social support and weaker connections are among many of the reported negative outcomes associated with problematic use, including lower school achievement,²⁰ lower life satisfaction,¹³ social isolation,²¹ depressive symptoms,^{22,23} anxiety, lower self-esteem and poorer sleep,^{24,25} disordered eating,²⁶ and body image dissatisfaction.²⁷ These findings suggest that from clinical and public health perspectives, it is important to understand the mechanisms by which such associations occur and to recognize that the pathways that connect SMU with health outcomes are complex and vary with respect to the types of social media in which adolescents engage. Further study of these pathways is clearly warranted.

To address such gaps in knowledge, the potential influence of intensive and problematic SMU on the self-perceived qualities of relationships (with family members, friends, teachers and classmates) and connections (to self, others, nature and the transcendent) was examined using Canadian data collected in 2017/2018.

Data and methods

Data source

Data for this study were from the 2017/2018 cycle of the Health Behaviour in School-aged children (HBSC) study, a World Health Organization collaborative, cross-national research study conducted every four years.⁶ For the Canadian component of this cycle of the HBSC, nationally representative data were collected from students in grades 6 to 10 between January and May 2018 using questionnaires that students completed individually in classroom settings during one class session (approximately 45 to 70 minutes).⁵ A total of 21,541 students from 287 schools completed the survey. In this study, participants with complete data on age and gender, and at least one of the two core SMU scales (n=18,886), were included. Participants younger than 11 years or older than 15 years (n=1,546) were excluded, as the sampling protocol was specially designed to be nationally representative of students between 11 and 15 years old. A total of 255 participants responded “Neither term describes me” when asked “Are you male or female?” When further disaggregated by the variables of interest, the resulting sample sizes were smaller than the

minimum cell sizes required to maintain confidentiality requirements. As such, these participants were also excluded from the analysis. The remaining 17,085 participants were included in the study (Table 1).

Participation was voluntary and anonymous. Consent was provided by school boards, schools, parents or guardians and participants. Ethics approval was obtained from research ethics boards at Health Canada, the Public Health Agency of Canada and Queen’s University.

Social media use

Intensive SMU was based on the self-reported frequency of use. Using four items adapted from the EU Kids Online Survey,²⁸ participants were asked how often they have online contact with close friend(s), friends from a larger friend group, friends that they got to know through the Internet but didn’t know before, and people other than friends (e.g., parents, siblings, classmates or teachers). The five response options included “never or almost never,” to “almost all the time throughout the day.” Following precedent,^{6,13} participants who responded “almost all the time throughout the day” on at least one item were classified as reporting intensive SMU, and the remainder were classified as reporting non-intensive SMU.

Indicators of problematic SMU were based on self-reported symptoms of addiction to social media, including preoccupation, tolerance, withdrawal, persistence, displacement, interpersonal problems, deception, escape and conflict.⁶ Using the nine-item Social Media Disorder Scale,²⁹ adapted then psychometrically tested from a scale indicative of gambling addiction,³⁰ participants were asked (yes or no) whether, in the past year, they “regularly could not think of anything else but social media,” “regularly felt dissatisfied because they wanted to spend more time on social media,” “often felt bad when they could not use social media,” “failed to spend less time on social media,” “regularly neglected other activities because of social media,” “regularly had arguments with others because of their social media use,” “regularly lied to parents or friends about their time spent on social media,” “often used social media to escape from negative feelings,” and “had serious conflicts with parents or siblings because of their social media use.” Following precedent,^{17,31,32} participants who answered positively to at least six items were classified as reporting problematic SMU and the remainder were classified as non-problematic social media users. Previous research suggests that the Social Media Disorder Scale, a psychometrically sound and valid instrument used across multiple countries, has structural validity, internal consistency (Cronbach’s alpha > .76), test-retest reliability (Pearson correlation = .50, p < .001), good convergent validity^{29,31,32} and is correlated but distinct from intensive SMU.³²

Table 1
Selected characteristics of the sample, Canada, 2018

	Sample size	Percent
Age (years)		
11	1,867	10.9
12	3,559	20.8
13	3,898	22.7
14	4,269	24.9
15	3,556	20.7
Gender		
Male	7,854	45.8
Female	9,295	54.2
Ethnicity		
White	12,010	71
Black	714	4.2
East Indian and South Asian	568	3.4
East and Southeast Asian	527	3.1
Indigenous	494	2.9
Arab and West Asian	306	1.8
Latin American	243	1.4
Other (including mixed race)	2,060	12.2
Missing	230	...
Family Structure		
Mother and father	12,649	75.3
Mother only	2,264	13.5
Mother and partner	936	5.6
Father only	425	2.5
Father and partner	213	1.3
Other	316	1.9
Missing	346	...
Family Affluence Scale III		
0 to 6	4,879	30.3
7 to 10	7,443	46.1
11 to 13	3,808	23.6
Missing	1,018	...
Urban / Rural Status		
Rural (< 1,000)	162	0.9
Small centre (1,000 to 29,999)	7,546	44
Medium centre (30,000 to 99,999)	3,223	18.8
Large urban centre (≥ 100,000)	6,219	36.3

... not applicable

Note: All values are weighted.**Source:** Health Behaviour in School-aged Children, Canada, 2018.

Relationships

Measures describing the qualities of relationships were based on indicators of social support from family members, friends, teachers and classmates. Relationships with family were measured using four items: “My family really tries to help me,” “I get the emotional help and support I need from my family,” “I can talk about my problems with my family,” and “My family is willing to help me make decisions.” Relationships with friends were measured using four items: “My friends really try to help me,” “I can count on my friends when things go wrong,” “I can share both my happy feelings and my sad feelings with my friends,” and “I can talk about my problems with my friends.” Relationships with teachers were measured using three

items: “I feel that my teachers accept me as I am,” “I feel that my teachers care about me as a person,” and “I feel a lot of trust in my teachers.” Relationships with classmates were measured using three items: “The students in my class(es) enjoy being together,” “Most of the students in my class(es) are kind and helpful,” and “Other students accept me as I am.” Participants were asked to indicate how much they agree with the items on a scale of 1 (very strongly disagree) to 7 (very strongly agree) for family and peer support, and on a scale of 1 (strongly agree) to 5 (strongly disagree) for teacher and classmate support. Based on precedent, the scores were summed into scaled indicators³³ and categorized into tertiles, with the top third indicating high levels of social support.

Connections

Using a modified version^{34,35} of an international spiritual health scale that describes “the connections in life that make us human,”³⁶ measures of the quality of connections were based on the reported importance of fostering connections within oneself, such as a sense of purpose, meaning or joy in life, connections to other people, nature and the land, and a higher spiritual (potentially transcendent) power. Participants were asked to rank the importance of statements on a scale from 1 (not important at all) to 5 (very important). Connections to self were measured using two items: “Life has a meaning or purpose” and “Experience the joy in life.” Connections to others were measured using three items: “Be kind to other people,” “Be forgiving of others,” and “Show respect for other people.” Connections to nature were measured using two items: “Feeling connected to nature or wilderness” and “Care for the natural world.” Connections to the transcendent were measured using three items: “Meditate or pray,” “Feel a connection to a higher spiritual power,” and “Feel a sense of belonging to something greater than yourself.” For each domain, scores that averaged four or more across items were classified as high levels of connection. Previous research demonstrated strong structural validity and internal consistency (ranging from Cronbach’s alpha > .7 to > .8 within each of the four domains) across nine countries,³⁵ and equally strong relationships with mental health outcomes across each of the four domains.³⁶

Demographics

Age was calculated based on the date of survey administration and participant responses to “What month were you born?” and “What year were you born?” Gender identity was measured by asking participants “Are you male or female?” (male, female or neither term describes me). Ethnicity was measured with the following item: “People living in Canada come from many different cultural and racial backgrounds. How do you describe yourself?” Response options included White, Chinese, South Asian, Black, Filipino, Latin American, Southeast Asian, Arab, Métis, Inuit, First Nations, Japanese, Korean, West Asian and Other—Please Specify. Family structure, which was based on

who lived in the home where participants live all or most of the time, was classified as “Mother and father,” “Mother only,” “Mother and partner,” “Father only,” “Father and partner” or “Other.” Family affluence was used as a measure of socioeconomic status and measured using the HBSC Family Affluence Scale,³⁷ a six-item measure of material assets in the home that included the number of cars, having one’s own bedroom, the number of computers in the home, the number of bathrooms, family holidays taken in the past year, and having a dishwasher. Urban or rural status was determined using Statistics Canada’s Population Centre and Rural Area Classification 2016³⁸ to classify the communities where students attended school into four groups ranging from “rural” to “large urban centre.”

Statistical Analysis

First, the sample was described by sociodemographic characteristics. Second, the prevalence of engagement in intensive then problematic SMU among boys and girls stratified by age (11 to 15 years) was described. The 95% confidence intervals (CI) for these estimates accounted for the clustered nature of the Canadian HBSC sample, with students nested within schools.⁵ P-values describing the statistical significance of any gender differences and the trends in proportions by age were generated via binomial regression models that included schools as random effects to account for clustering. The prevalence of the eight study outcomes (high perceived levels of social support in four relational contexts and self-reports that connections are important in each of the four domains) was described by age and gender. Third, multivariable binomial regressions (which are suitable for the data and enable the direct estimation of relative risks) were used to model the associations of intense SMU then problematic SMU with each of the eight outcomes. Models were adjusted for potential confounding factors, including age, family affluence and family structure. Models examining the potential associations of intensive SMU were adjusted for problematic SMU, and vice versa. Findings are presented as relative risks (RR) and 95% CIs, adjusted for clustering. All estimates were calculated to be nationally representative using survey weights, reflecting student

Table 2
Prevalence of intense and problematic social media use by age and gender, Canada, 2018

	Intense social media use								P-value ¹	Problematic social media use								P-value ¹
	Boys ²				Girls ²					Boys				Girls ²				
	Sample size	Percent yes	95% confidence interval		Sample size	Percent yes	95% confidence interval			Sample size	Percent yes	95% confidence interval		Sample size	Percent yes	95% confidence interval		
Total	7,808	30	29.0	31.0	9,271	38	37.0	39.0	<.01	7,461	5.2	4.7	5.7	8,823	7.7	7.1	8.2	<.01
Age (years)																		
11	823	21	18.2	23.7	1,028	22.6	20.0	25.1	0.62	774	5.1	3.6	6.7	929	4.1	2.8	5.4	0.6
12	1,670	23.5	21.4	25.5	1,869	32.4	30.3	34.6	<.01	1,547	4.1	3.1	5.1	1,741	4.7	3.7	5.7	0.53
13	1,755	29.7	27.5	31.8	2,133	37.1	35.1	39.2	<.01	1,682	4.7	3.7	5.7	2,041	8.5	7.3	9.8	<.01
14	1,960	33.6	31.5	35.7	2,301	44.1	42.1	46.1	<.01	1,909	6.6	5.5	7.8	2,208	8.5	7.4	9.7	0.14
15	1,601	37.5	35.2	39.9	1,940	45.4	43.2	47.6	0.01	1,549	5.1	4	6.2	1,904	10.3	8.9	11.6	<.01

¹ The p-value comparing social media use in boys and girls was obtained from a regression model adjusting for clustering by school.

² Significant trend by age (p < 0.01).

Note: All values are weighted.

Source: Health Behaviour in School-aged Children, Canada, 2018.

enrollment in the grade levels in the age ranges targeted by the HBSC study, by province and territory. With a sample size of 17,149, the study was powered to detect very modest increases in RR (1.1 or greater), with 80% power (alpha = 0.02; two-sided) within each gender stratum.

Results

Table 1 describes the sociodemographic distribution of the sample. There were more girls than boys, and the median age was 13 years. Most participants reported being White. Three-quarters of participants reported a family structure involving both a mother and a father, and the sample was drawn from a range of community sizes from rural to large urban centres.

The prevalence of intensive then problematic SMU is described in Table 2. Overall, girls (38%) reported intensive SMU more often than boys (30%), and the prevalence increased with increasing age in girls and boys. The group reporting the highest prevalence of intensive SMU was 15-year-old girls (45.4%), while 11-year-old boys (21.0%) reported the lowest prevalence. Overall, problematic SMU was less common among boys (5.2%) than girls (7.7%). With age came a statistically significant increase in reported problematic SMU among girls ($p < 0.01$) but not among boys. At 10.3%, 15-year-old girls reported the highest levels of problematic SMU.

When examining associations between intensive SMU and measures of connections and relationships, the strongest associations were observed between intensive SMU and high levels of perceived support from friends in boys and girls (Table 3). Among boys, intensive SMU was further associated with connections with the transcendent, and, after adjusting for problematic SMU, a significant association with higher levels of family support was observed. Among girls, a modest association with high support from classmates was observed.

Associations between problematic SMU and connections and relationships were generally stronger. This is more consistent and in the opposite direction to intense SMU. Problematic SMU was associated with lower levels of social support across all sources (family, friends, teachers and classmates) and lower levels of connection (to others, self and nature), except for connections with the transcendent where no association was observed (Table 4). These associations held even after adjusting for intense SMU.

Discussion

In this novel national analysis of Canadian adolescents, strong associations between intensive SMU (online contact with others almost all the time throughout the day) and higher levels of perceived social support from friends were identified in boys and girls, and weaker or no associations were observed with other measures of relationships and connections. Conversely, problematic SMU (symptoms of addiction) was consistently and strongly associated with lower levels of social support from families, teachers and classmates and lower levels of connections to one's self, others and nature.

The idea that SMU may strengthen relationships while paradoxically fostering feelings of social disconnection is not new.^{16,39} The study contributes to this evidence base by demonstrating that different types of SMU (intensive and problematic) contribute to different relational experiences in variable ways. The findings suggest that intensive SMU is not necessarily associated with weaker relationships and connections and, in some cases, may even contribute to strengthening them, whereas problematic use may contribute to feelings of disconnection. As relationships and connections are known determinants of health and well-being in youth and adult populations,^{2,3,40} the findings illuminate one pathway whereby

Table 3
Relative risk of outcomes associated with intense social media use (yes versus no), Canada, 2018

Outcomes	Boys						Girls					
	Model 1			Model 2			Model 1			Model 2		
	Relative risk	95% confidence interval		Relative risk	95% confidence interval		Relative risk	95% confidence interval		Relative risk	95% confidence interval	
		from	to		from	to		from	to		from	to
Connections, important												
Others	1.01	0.97	1.05	1.01	0.97	1.06	1.00	0.98	1.03	1.01	0.98	1.03
Self	1.01	0.98	1.05	1.02	0.98	1.05	1.01	0.98	1.04	1.02	0.99	1.05
Nature	1.03	0.97	1.10	1.04	0.98	1.11	0.96	0.92	1.01	0.98	0.94	1.02
Transcendent	1.26	1.14	1.38	1.28	1.15	1.42	1.04	0.94	1.15	1.05	0.96	1.16
Social supports, high												
Family support	1.10	1.00	1.22	1.12	1.01	1.23	1.04	0.94	1.15	1.07	0.97	1.18
Teacher support	0.96	0.86	1.08	0.98	0.87	1.11	1.07	0.97	1.17	1.08	0.99	1.20
Classmate support	1.05	0.97	1.13	1.06	0.99	1.15	1.09	1.01	1.17	1.11	1.02	1.20
Friend support	1.56	1.36	1.78	1.55	1.36	1.78	1.41	1.28	1.54	1.40	1.28	1.54

Notes: All values are weighted and adjusted for clustering by school and adjusted for problematic social media use. Model 1 is adjusted for age, family affluence and family structure. Model 2 is also adjusted for problematic social media use.

Source: Health Behaviour in School-Aged Children, Canada, 2018.

Table 4
Relative risk of outcomes associated with problematic social media use (yes versus no), Canada, 2018

Outcomes	Boys						Girls					
	Model 1			Model 2			Model 1			Model 2		
	Relative risk	95% confidence interval		Relative risk	95% confidence interval		Relative risk	95% confidence interval		Relative risk	95% confidence interval	
		from	to		from	to		from	to		from	to
Connections, important												
Others	0.86	0.76	0.97	0.85	0.75	0.97	0.92	0.86	0.99	0.92	0.86	0.99
Self	0.84	0.76	0.94	0.84	0.76	0.93	0.87	0.81	0.93	0.87	0.81	0.93
Nature	0.82	0.72	0.95	0.82	0.71	0.94	0.82	0.74	0.91	0.83	0.74	0.92
Transcendent	1.00	0.78	1.27	0.99	0.78	1.25	1.15	0.98	1.35	1.14	0.97	1.34
Social supports, high												
Family support	0.59	0.44	0.81	0.58	0.42	0.79	0.48	0.36	0.64	0.48	0.36	0.63
Teacher support	0.75	0.58	0.97	0.76	0.59	0.98	0.56	0.44	0.73	0.56	0.43	0.72
Classmate support	0.76	0.63	0.90	0.74	0.62	0.89	0.77	0.64	0.93	0.75	0.62	0.91
Friend support	0.85	0.62	1.16	0.84	0.61	1.14	0.87	0.70	1.07	0.82	0.66	1.01

Notes: All values are weighted and adjusted for clustering by school and adjusted for intense social media use. Model 1 is adjusted for age, family affluence and family structure. Model 2 is also adjusted for intense social media use.

Source: Health Behaviour in School-aged Children, Canada, 2018.

SMU may be positively and negatively contributing to adolescent well-being.

The findings resonate with theoretical models that suggest that high levels of engagement or habitual SMU (i.e., intensive use) do not necessarily result in negative health outcomes.⁴¹ In contrast, social theorists propose that problematic SMU emerges when an individual views social media as an important mechanism to relieve stress, loneliness or depression.⁴² Such theories suggest that the causal pathway that links SMU, relationships and connections, and mental health is complex and likely bidirectional. The use of social media provides continuous rewards, e.g., self-efficacy and satisfaction and perceived social acceptance,⁴³ and this leads to more and more use and, eventually, problems, such as reduced engagement and relational conflicts. These problems then exacerbate negative feelings, creating a cyclical pattern of using SMU to feel better.⁴² Further, problematic SMU has many addictive properties as evidenced by the indicators used in its assessment.^{13,29} Biopsychosocial frameworks, where a combination of biological, psychosocial and social factors contribute to the development of problematic SMU may also be applicable.^{44,45}

The strengths of this study warrant comment. This analysis considered reports from a large, national sample of adolescents. While the prevalence of specific indicators may not be representative because of sampling error, one can argue that relationships between variables contained in our sample should be highly representative of the experiences of Canadian adolescents. Second, this study used previously validated instructions to measure SMU, relationships and connections across multiple domains, adding to the robustness of the findings. Third, the estimation controlled for many important potential confounders and effect modification by gender, further strengthening the findings. However, all studies have limitations and the current one is no exception. The cross-sectional design limits causal inference in terms of the temporality of model findings, and reverse causation is possible.

It is also possible that a common factor may have impacted on SMU and these measures of relationships and connections. Further, the data were self-reported and therefore prone to social desirability biases,⁴⁶ leading to an underestimation of the prevalence of intensive and problematic SMU and the rated strengths of the relationships and connections, subsequently reducing the strength of the observed associations. The available measure of intensive SMU focused on communication with friends in three of four items, providing an alternative explanation as to why it was primarily associated with friend and classmate social support. The intensive SMU measure included active (e.g., communicating with others) and not passive (e.g., reading, looking at or watching social media content) use and is a measure of the frequency of electronic media communication with others and not of the time spent using social media. Different measures of SMU that include such passive use may have different associations with relationships and connections. And finally, while the etiological analysis focused mainly on the size and consistency of the effects observed across multiple indicators, and not on the statistical significance per se, some Type I errors remain a possibility.

Observation of consistent associations between problematic SMU and lower levels of relationship support and weaker feelings of connection suggest that preventing and reducing addiction to SMU rather than focusing on reducing the frequency or time spent using social media by adolescents may be a better approach. Conversely, preventing and addressing problematic SMU among the adolescent population by targeting social relationships and connections may also be warranted. Studies of the upstream determinants and deeper etiology of SMU behaviours, including the role of personality types in leading to intensive and problematic behaviours⁴⁷ are warranted. While these findings were discovered for all adolescents, to a degree, they appear to be particularly germane to the experiences of girls, suggesting the need to target clinical and public health efforts as a priority. Because adult monitoring

and goal setting of adolescent activity online has not been shown to be an effective long-term strategy for supporting young people in healthy engagement with social media and other wired technologies, it may be more effective in the long term to empower young people to develop the skills they need to engage with social media in healthy ways on their own, without adult interventions and rules.^{48, 49} SMU requires young people to navigate a complex landscape; health promotion initiatives that help young people understand the different uses and consequences of intensive versus problematic SMU may help young people negotiate their SMU with new insights and self-regulation.⁵⁰

In conclusion, this national study shows that intensive SMU has the potential to strengthen relationships and connections in adolescents, while more problematic forms contribute to feelings of social disconnection. With the advent of the COVID-19 pandemic and related physical distancing measures, such as

online schooling, the prevalence of SMU has likely increased among adolescents with some of its positive and negative consequences potentially amplified. Further research is required to inform public health initiatives to promote healthy SMU and prevent problematic use. This includes gaining an understanding of the transition from non-problematic to problematic use, whether problematic use is associated with certain types of use (e.g., active versus passive use and patterns of use), and whether some adolescents are more susceptible to becoming problematic users than others. Increased understanding of how young people use social media in healthy ways will also provide important insights moving forward.

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