



# Canadian Adolescents' Internalized Symptoms in Pandemic Times: Association with Sociodemographic Characteristics, Confinement Habits, and Support

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## Abstract

Adolescence is a time of increased risk for developing symptoms of anxiety and depression, especially for girls. The stress and social isolation experienced during confinement add new threats to already vulnerable adolescents' daily lives. This study is aimed at determining which sociodemographic characteristics (age, family composition, achievement), confinement habits (schedule, new hobby, sleep duration, cellphone and computer use, sports, schoolwork), and sources of support (parents and teachers) are associated with more or less internalized symptoms in Canadian adolescents. Differences between boys and girls are also investigated. Between April 8 and 30 (2020) and through an online survey, 895 Canadian adolescents (74% girls) aged between 12 and 17 years ( $M = 14.7$ ) were recruited. Path analysis was performed to identify significant associations between sociodemographic characteristics, confinement habits, support variables, and internalized symptoms. Independent samples t-tests and invariance tests were conducted to compare boys and girls. Results suggest that certain confinement habits (time spent using cellphones, doing sports and schoolwork, finding a new hobby) and support variables (parents working outside the home) were significantly and negatively associated with internalized symptoms. Regarding the sex differences, girls used their cellphones more and invariance test results showed that all associations between predictors and symptoms were statistically similar for boys and girls. This study's results help understand better adolescents' experience in confinement. It sheds light on the habits likely to characterize those who are less at risk of experiencing distress, making it possible to better support adolescents during this challenging period.

**Keywords** Adolescents · COVID-19 · Confinement · Anxiety · Depression

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## Adolescents: a Population Strongly Affected by the Lockdown

Like everywhere in the world, the COVID-19 pandemic is affecting Canada, resulting in drastic confinement measures and a complete change in the psychosocial environment. Suddenly on March 15 and for an indefinite period of time, teenagers in Quebec (Canada) had their studies interrupted, were isolated from their friends, and deprived of their leisure and sports activities, just like 90% of children and teenagers in the world [1]. The confinement may have represented an opportunity for some adolescents to benefit from family time, but the disadvantages may outweigh these benefits.

Although adolescents seem to be physically less affected with COVID-19 as compared to adults, the psychological impacts they suffer are potentially more severe than those observed in the adult population for several reasons [2, 3]. First, adolescents are generally more at risk of experiencing anxiety and depressive symptoms, mainly due to the onset of puberty and the hormones, especially in girls [4, 5]. Second, the lockdown resulted in the deprivation of adolescent socialization contexts, school closure, and limited access to their friends at an age where peer interaction is a central aspect of development [6]. Adolescence is also characterized by identity exploration, increased autonomy from parents, and the initiation of romantic relationships [7]. Although the family still represents an essential developmental context for teenagers, detachment from parents represents a significant milestone for adolescents who are biologically and psychologically driven to be with peers [8]. Nevertheless, it is undoubtedly social isolation, a risk factor for many mental disorders, that mostly affected young people during the lockdown, mainly because they found themselves in a stressful situation and could not benefit from their friends' social support [9, 10]. On top of that, school closure that was associated with a lack of activity and structure, problematic dietary and sleeping habits, and disappointment in some teenagers who saw their graduation canceled, was likely to be associated with a higher increase in anxiety and depression symptoms [11–13].

Data collected from adolescents since the start of the COVID-19 pandemic tend to confirm their significant rates of depression and anxiety symptoms. Indeed, Chinese and Indian studies showed that the prevalence of anxiety symptoms (including post-traumatic stress disorder (PTSD) symptoms) varied between 8 and 37% during confinement and that of depressive symptoms between 12 and 44% [3, 14–16]. An Indian study further showed that confined adolescents experience significantly more worries, helplessness, and fear than non-confined adolescents [17].

### A Unique Confinement Context for Each Adolescent

Researchers worldwide highlight the significant heterogeneity in the ways individuals experienced confinement, mainly according to their sex and living conditions during the lockdown. Some studies in Asia suggest that a higher prevalence of psychological distress was present in adolescent girls during the COVID-19 pandemic, compared to normal times [3]. School closures have also contributed to widen social inequalities and increase discrepancies in education and health [18, 19]. Indeed, by being confined at home, adolescents no longer had the opportunity to evolve within the school environment, which in normal times ensures a relative reduction of these disparities. The adolescents' habits and the support they received during lockdown were also likely to be heterogeneous. For instance, some youths experienced confinement in more comfortable and healthy conditions than others,

which may have impacted their mental health. Existing studies all support the assertion that confinement is associated with distress in teenagers, but whether or not this association is a matter of adolescents habits during confinement such as their sleep duration, screen time, daily schedule, physical activity, and time devoted to schoolwork, which represent positive development indicators among adolescents, remains unclear [20]. Some adolescents who were less anxious about homeschooling may also have taken advantage of confinement to try new activities, which can be a source of positive youth development and mental health, while others who generally performed lower, may have felt distressed at being left on their own for their learning. Finally, the support that adolescents received from parents or teachers also varied significantly depending on whether their parents worked outside or not, or depending on the school procedures to contact and support their students. Yet, whether and how these factors were associated with adolescent mental health is unknown. Thus, they ought to be addressed as a way of understanding adolescent psychological distress and well-being during confinement.

The present study thus aims to identify the sociodemographic characteristics (age, family composition, achievement), confinement habits (i.e., schedule, new hobby, sleep duration, cellphone and computer use, sport, schoolwork time), and sources of support (from parents and teachers) associated with anxious (somatic, generalized, traumatic) and depressive symptoms (somatic, affective) in adolescents during confinement. Given the significant gender differences in the prevalence of adolescents' psychological distress, this study will also compare boys' and girls' confinement habits and their associations with symptoms.

## Methodology

### Study Design and Participants

Between April 8 and April 30, 2020, Quebec adolescents aged between 12 and 17 were invited to answer anonymously to an online survey on their well-being during confinement. Initially, the invitation to participate was posted on social media. Next, partners from several schools and social service organizations promoted the study by sending emails to parents. After providing parental consent, participants were invited to complete the questionnaire at the time of their choice. A total of 895 adolescents completed the questionnaire ( $M$  age = 14.7,  $SD$  = 1.7). The sample is characterized by a significant disproportion between boys and girls (74%). The majority of participants were born in Canada (97%) from parents born in Canada (59%), and lived with both parents (59%). With regard to the parents' professional situation, 42% of adolescents had at least one of their parents who worked outside the home during confinement, and 10% had two parents who worked outside. More than half of adolescents (57%) reported being in contact with their teachers, and 26% reported receiving support from their parents to do their schoolwork.

### Measures

**Outcomes Variables** A French validated version of the Center for Epidemiologic Studies Depression Scale (CES-D) was used to measure the presence and the severity of depressive symptoms. Three different aspects of depression were assessed: *Depressed affect* (7 items; e.g., *I felt sad*) ( $\alpha$  = 0.94), *Somatic complaints* (7 items; e.g., *My sleep was restless*)

( $\alpha=0.85$ ), and *Positive affect* (reversed) (4 items; e.g., *I enjoyed life*) ( $\alpha=0.84$ ). Adolescents reported the presence of these symptoms from the beginning of confinement using a 6-point Likert scale (1 = *never*, to 6 = *most of the time*).

Anxiety symptoms were reported with three scales from the validated French version of The Screen for Child Anxiety Related Disorders-Revised (SCARED-R) [21–23]: *Generalized Anxiety Disorder Symptoms* (7 items; e.g., *I worry about the future*) ( $\alpha=0.85$ ), *Significant somatic symptoms* (7 items; e.g., *When frightened, I feel like throwing up*) ( $\alpha=0.84$ ), and *Traumatic stress disorder symptoms* (4 items; e.g., *I try not to think about a very aversive event I once experienced*) ( $\alpha=0.84$ ). Teenagers were asked to rate how frequently they experienced each symptom from the beginning of confinement using a 3-point Likert scale (0 = *almost never*, to 2 = *often*).

**Independent Variables** Sociodemographic variables were self-reported by adolescents: Sex (0 = *male*; 1 = *female*), age (12 to 17 years old), family composition (0 = *nuclear family*; 1 = *other*), and presence of siblings (0 = *single kid*; 1 = *sibling(s)*).

The adolescents' academic achievement was assessed using two items, one relating to language and the other to mathematics (e.g., "thinking about your grades in math, how do you rank compared to other students?") to which participant responded using a five-point Likert scale (1 = *I am among the least performing*, to 5 = *I am among the most performing*). This type of measurement has been shown in a large-scale study to be just as sensitive as individual performance tests [24].

Questions developed for this study (see Table 1 for details) were used to assess confinement habits (schedule, new hobby, sleeping duration, cell phone and computer use, physical activity, schoolwork) and sources of support (parents and teachers).

## Statistical Analyses

First, descriptive statistics and bivariate correlations were performed between variables. Second, independent sample T-tests were performed to compare boys and girls with respect to their mean differences in symptoms of psychological distress and time spent doing activities, using SPSS 27. We also calculated the independent samples effect sizes to assess the magnitude of the difference in means between the groups using Cohen's *d* [25]. An effect size of 0.2 is small, 0.5 moderate, and 0.8 large. Third, using Mplus 8.4 and the maximum likelihood estimation with robust standard errors method (MLR), we performed multiple regression to assess the associations between sociodemographic characteristics, confinement habits, support and adolescents' internalized symptoms. Together with Mplus' Full Information Maximum Likelihood, this procedure allowed handling missing data. There were between 0.0% and 1.7% of missing values in our sample, which globally corresponds to 0.5% on all 18 variables. All predictors were entered simultaneously into the model to account for covariance between them. Model fit was assessed using the chi-square statistic ( $\chi^2$ ), the Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI), and the Tucker-Lewis Index (TLI). RMSEA values smaller than 0.08 and 0.06 respectively suggest adequate and excellent model fit. Values above 0.90 and 0.95 for the CFI and TLI respectively indicate adequate and excellent model fit [26, 27]. Fourth, the predictive equivalence of the regression paths was assessed between boys and girls. To do so, we compared the same predictive model with no additional constraints between genders to a second model in which regression slopes were constrained to equality between

**Table 1** Questions assessing adolescents' confinement habits and sources of support

Variable	Question	Variable codification
<b>Confinement habits</b>		
Sleep duration	“During confinement, around what time do you go to bed?”; “During confinement, around what time do you wake up?”	<i>n</i> hours of sleep
Screen time	“On average, in a day of confinement, how much time do you spend: on your cell phone? On the computer?”	<i>n</i> hours of cell phone/computer use
Sport time	“On average, in a day of confinement, how much time do you spend doing physical activities (walking, biking, going outside)?”	<i>n</i> hours of physical activity
Schoolwork time	“On average, in a day of confinement, how much time do you spend doing school work or educational activities?”	<i>n</i> hours of school work
Following a schedule	“Do you follow a schedule during confinement?”	0 = no 1 = yes
New hobby	“Are you doing any new activities (that you did not do before confinement)?”	0 = the participant did not mention a new activity; 1 = the participant mentioned at least one new activity
<b>Support</b>		
Parents working outside	“During confinement, does your father/mother work outside the house?”	0 = at least one parent does not work outside the home; 1 = one parent work outside the home; 2 = two parents work outside the home
Parent support	“During confinement, my parents help me with school work	“0 = no; 1 = yes
Teacher support	“During confinement, I am in contact with my teacher(s)	“0 = no; 1 = yes

genders. A model is considered invariant if the RMSEA does not increase by more than 0.015 and the CFI and TLI do not decrease by more than 0.010 [28, 29]. A model was considered invariant if the RMSEA did not increase by more than 0.015, the CFI did not decrease by more than 0.010 and the TLI did not decrease by more than 0.010.

## Results

No strong correlation was observed between the predictors, indicating a low risk of multicollinearity in the model (Table 2). Descriptive statistics are presented for each group (Table 3). The results of the T-tests (Table 4) indicated that compared to boys, girls reported higher levels of anxiety (somatic, generalized, and traumatic) and depressive symptoms (somatic and affect) during confinement. The magnitude of these differences is moderate. Boys and girls reported similar levels of positive affect. Girls also reported using their cellphones more often, but boys used computers more often, these differences are moderate and small, respectively. Boys and girls did not differ in their sleep duration, schoolwork, and sport habits.

The first path analysis model performed with all parameters allowed to vary between boys and girls presented excellent fit indices ( $\chi^2=0.711$  (df=0);  $p<0.000$ ; RMSEA=0.000; CFI=0.991; TLI=1.000). The second model, which aimed to assess predictive equivalence between genders, had a significant decrease in model fit ( $\chi^2=112.978$  (df=105)  $p=0.280$ ; RMSEA=0.013; CFI=0.903; TLI=0.806). Thus, we tested a third model in which regression paths were progressively freed between genders to identify those that were not invariant. Freeing one path resulted in an excellent fit ( $\chi^2=101.376$  (df=104);  $p=0.555$ ; RMSEA=0.000; CFI=1.000; TLI=1.064). The association between sleep hours and somatic anxiety was found to differ between boys and girls. However, the association was not significant in both groups, although it varied in direction and magnitude (boys:  $b=12.028$  (s.e.=6.424),  $p=0.061$ ,  $\beta=0.192$ ; girls:  $b=-2.895$  (s.e.=2.369),  $p=0.222$ ,  $\beta=-0.057$ ).

Regarding sociodemographic characteristics, being in an intact family was associated with higher levels of traumatic anxiety symptoms (Table 5). All other sociodemographic variables were not significantly associated with anxious and depressive symptoms. In terms of confinement habits, more time spent on the cellphone was associated with lower levels of traumatic anxiety, more time spent playing sports was associated with lower levels of positive affect (reversed), more time spent doing schoolwork was associated with lower levels of somatic depression and depressive affect, and finding a new hobby as associated with lower levels of somatic depression. Having a schedule, sleep duration, and time spent on the computer were not associated with anxiety and depression symptoms. Regarding the support variables, adolescents who have parents working outside the home reported lower levels of depressive affects.

## Discussion

This study's main objective was to describe the associations between variables accounting for the heterogeneity in the adolescents' confinement experience with their anxiety and depression symptoms. A complementary objective of the study was to identify differences between boys and girls. Some sociodemographic characteristics (family status),

**Table 2** Correlations (*n* = 895)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
1. SA	-																					
2. GA	.59***	-																				
3. TA	.56***	.50***	-																			
4. SD	.58***	.52***	.49***	-																		
5. DA	.64***	.61***	.57***	.75***	-																	
6. PD	.44***	.52***	.40***	.58***	.66***	-																
7. Age	.19***	.27***	.17***	.26***	.21***	.21***	-															
8. Family	-.11**	-.10*	-.09**	-.10**	-.09**	-.06	-.08*	-														
9. Siblings	-.04	-.04	-.04	-.05	-.04	-.00	-.04	.18***	-													
10. Achv. (lang.)	.01	-.03	-.04	-.01	.01	-.12***	-.01	.05	.02	-												
11. Achv. (math)	-.14***	-.15***	-.18***	-.12***	-.13***	-.15***	-.11***	.12***	.07*	.25***	-											
12. Schedule	-.00	-.02	-.03	-.12***	-.07*	-.14***	-.13***	.13***	.07*	.05	.07*	-										
13. Sleep	-.09**	-.11***	-.03	-.17***	-.15***	-.15***	-.21***	.09**	-.01	.00	.04	.06	-									
14. Cell-phone	.22***	.25***	.19***	.34***	.31***	.31***	.25***	-.12	-.00	-.06	-.15***	-.22***	-.21***	-								
15. Computer	.04	-.03	.06	.05	.06	.09**	.02	-.01	-.02	.02	.05	.01	-.06	-.01	-							
16. Sport	-.03	.01	-.05	-.09**	-.03	-.07*	-.04	.05	.03	-.01	-.05	.05	-.04	-.09**	-.11***	-						
17. School-work	-.01	.03	.01	-.06*	-.04	-.01	-.12***	.11**	.02	.02	.06*	.36***	.01	-.20***	.10**	.01	-					
18. Hobby	.02	.07*	.06*	.02	.02	-.06	-.00	.02	.06	.12***	.01	.08**	-.01	-.05	-.05	.03	-.02	-				
19. Parent outside	.00	.05	-.02	-.02	-.01	.00	.04	-.01	.01	-.01	.06	-.02	-.02	.09**	-.04	.01	-.02	-.01	-			
20. Parent support	-.09**	-.08*	-.08**	-.16***	-.16***	-.17***	-.32***	.06*	.02	-.12***	-.02	.19***	.12***	-.21***	-.07*	.04	.13***	.02	-.05	-		
21. Teach. contact	.02	.09**	.01	-.03	-.00	-.08*	-.04	.06	.03	.10**	.07*	.22***	.02	-.13***	.04	.02	.28***	.09**	-.00	.13***	-	
Min-Max	0-2	0-2	0-2	0-3	0-3	0-3	0-3	0-1	0-1	1-5	1-5	0-1	2-15	0-22	0-20	0-20	0-20	0-1	0-2	0-1	0-1	0-1

**Table 2** (continued)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
M	.51	.94	.66	.98	.95	1.25	14.73	-	-	3.60	3.63	-	-10.03	3.99	1.48	1.42	1.65	-	.61	-	-
S.D.	.50	.57	.64	.77	.96	.91	1.69	-	-	.98	1.15	-	-1.43	3.20	2.30	1.33	.69	-	.66	-	-

SA somatic (anxiety), GA generalized (anxiety), TA traumatic (anxiety), SD somatic (depression), DA depressive affect (depression), PD positive affect (depression) (reversed)  
 Values significant at the  $p < .05$  level are marked in boldface



**Table 3** Descriptive statistics

	Boys ( <i>n</i> = 235)	Girls ( <i>n</i> = 660)
Sociodemographic characteristics		
Age (M(S.D.))	14.4 (1.6)	14.8 (1.7)
Family composition		
Living with both parents	60%	58%
Having siblings	81%	81%
Achievement (M(S.D.))		
Maths	3.78 (1.14)	3.40 (1.03)
Language	3.58 (1.14)	3.68 (.95)
Confinement habits		
Following a schedule during confinement	59%	59%
Having a new hobby during confinement	62%	76%
Support		
Parents work situation		
Parents at home	50%	48%
Having one parent working outside home	39%	43%
Having two parents working outside home	11%	9%
Parents are helping with schoolwork	34%	23%
Having contacts with teacher(s)	52%	58%

confinement habits (new hobby, using cellphones, doing sports, and time spent doing schoolwork), and support variables (parents working outside the home) were significantly associated with anxiety and/or depressive symptoms. However, although girls reported significantly higher levels of anxiety and depressive symptoms in confinement than boys did, as in normal time when there is no pandemic [30, 31], the associations between the predictors and the symptoms remained the same for boys and girls.

### Sociodemographic Characteristics and Internalized Symptoms

Youth who lived with both of their parents reported higher levels of traumatic anxiety. This result is surprising as the financial stability resulting from living with both parents could have helped alleviate stress in this time of economic instability for many families [32]. However, a study conducted among American adults shows that they have experienced conflict escalations in their romantic partnerships during confinement [33]. Therefore, this surprising association could be explained by the fact that youth living with two parents may have been more exposed to marital conflict, a significant stressor for adolescents that can generate anxiety [34]. Further studies will be needed to understand better the impact of family dynamics on adolescents' mental health in confinement.

**Table 4** Means, standard deviations, and independent sample comparisons for boys and girls)

	<i>Boys (B)</i> ( <i>n</i> = 235)		<i>Girls (G)</i> ( <i>n</i> = 660)		<i>Independent samples t-test</i>			
	<i>M</i>	<i>S.D</i>	<i>M</i>	<i>S.D</i>	<i>t</i>	<i>p</i>	<i>Group comparisons</i>	<i>Cohen's d</i>
<b>Internalized symptoms</b>								
Somatic anxiety	<b>.248</b>	<b>.344</b>	<b>.600</b>	<b>.508</b>	<b>12.818</b>	<b>.000</b>	<b>B &lt; G</b>	<b>.750</b>
Generalized anxiety	<b>.626</b>	<b>.489</b>	<b>1.059</b>	<b>.555</b>	<b>12.247</b>	<b>.001</b>	<b>B &lt; G</b>	<b>.804</b>
Traumatic anxiety	<b>.382</b>	<b>.496</b>	<b>.742</b>	<b>.651</b>	<b>9.552</b>	<b>.000</b>	<b>B &lt; G</b>	<b>.587</b>
Somatic depression	<b>.636</b>	<b>.664</b>	<b>1.086</b>	<b>.766</b>	<b>9.327</b>	<b>.002</b>	<b>B &lt; G</b>	<b>.608</b>
Depressive affect	<b>.423</b>	<b>.678</b>	<b>1.120</b>	<b>.974</b>	<b>13.036</b>	<b>.000</b>	<b>B &lt; G</b>	<b>.771</b>
Positive affect ( <i>r</i> )	.942	.869	1.35	.897	6.707	.085	<i>n.s</i>	.460
<b>Confinement habits</b>								
Sleep duration	10.029	1.536	10.026	1.391	-.027	.133	<i>n.s</i>	-.002
Cellphone	<b>2.699</b>	<b>2.706</b>	<b>4.464</b>	<b>3.241</b>	<b>8.846</b>	<b>.000</b>	<b>B &lt; G</b>	<b>.568</b>
Computer	<b>1.655</b>	<b>2.473</b>	<b>1.420</b>	<b>2.233</b>	<b>-1.400</b>	<b>.006</b>	<b>B &gt; G</b>	<b>-.102</b>
Schoolwork	1.601	1.797	1.669	1.652	.582	.890	<i>n.s</i>	.041
Sport	1.427	1.238	1.417	1.361	-.098	.278	<i>n.s</i>	-.007

### Adolescents' Habits During Confinement and Internalized Symptoms

Time spent using their cellphone was associated with a lower level of psychological distress symptoms in adolescents. Specifically, there was a lower prevalence of intrusive thoughts about a negative event. Again, this result is surprising because some studies showed that those who report more considerable daily screen time during lockdown experienced poorer well-being [14]. Adolescents often use their cellphones to consult social media. Yet, high exposure to social media has been particularly singled out because it increases sensitivity to social comparison and peer judgment and could directly contribute to the onset or worsening of anxiety and depressive symptoms [35, 36]. Nevertheless, social media are very useful amid physical distancing to maintain a social connection, access information and resources related to COVID-19, allow teenagers to continue developing their identity by providing a territory of autonomous exploration outside adult supervision, and seek help for those who find themselves in an unsafe family environment. Girls also reported their cellphone usage as being significantly higher during confinement (on average 4.5 h) compared to boys (on average 2.7 h) and the effect size of this difference was medium. The fact that girls in confinement used their cellphones more than boys did possibly reflects their higher propensity to favor social support as a coping strategy. It is crucial to keep in mind that during the lockdown, the cellphone was the only way for teenagers to reach their friends who are their primary source of social support [9, 10]. It would be essential to focus on adolescents' behaviors online, that is, how they use their cellphone and with whom they interact, in order to have a better understanding of this complex variable.

Teenagers who spent more time exercising reported more positive affects, like feeling happy, valued, and confident about the future, which is not surprising given the similar results from studies on adult and adolescents populations in confinement [37, 37]. Teenagers who experienced depression symptoms were perhaps less likely to engage in physical

**Table 5** Path analysis and invariance testing results (*n* = 895)

	Somatic anxiety			Generalized anxiety			Traumatic anxiety			Somatic depression			Depressive affect			Positive affect (reversed)		
	b	s.e.	$\beta$	b	s.e.	$\beta$	b	s.e.	$\beta$	b	s.e.	$\beta$	b	s.e.	$\beta$	b	s.e.	$\beta$
<b>Sociodemographic characteristics</b>																		
Age	-1.337	1.724	-0.18	1.585	3.011	.014	6.182	4.212	.052	1.820	4.707	.015	-8.039	4.888	-0.059	.263	5.069	.002
Family (0 = non-intact)	-0.804	6.898	-0.003	-8.936	9.597	-0.23	<b>34.107</b>	<b>14.124*</b>	<b>.085</b>	26.102	15.859	.064	-11.294	16.069	-0.025	13.247	17.028	.028
Siblings (0 = no)	11.265	7.002	.038	1.785	12.323	.004	-1.791	16.612	-0.04	-8.668	19.339	-0.18	21.703	17.973	.040	3.368	18.517	.053
Achiev.Lang	2.149	4.357	.019	.153	5.677	.001	1.647	7.052	.057	-11.472	8.141	-0.60	-1.903	8.355	-0.009	2.087	9.098	.009
Achiev.Math	-4.982	3.370	-0.048	-2.524	4.244	-0.16	-12.128	6.255	-0.71	-6.679	7.591	-0.39	-3.361	6.898	-0.17	6.861	7.743	.034
<b>Confinement habits</b>																		
Schedrule (0 = no)	-4.462	6.335	-0.18	-5.491	11.301	-0.15	-14.395	14.913	-0.36	13.692	16.255	.034	24.261	16.315	.054	2.672	17.782	.006
Sleep	-.094	1.899	-.002	.509	2.309	.005	.662	3.362	.006	-1.972	4.484	-0.19	-3.769	4.041	-0.033	1.427	5.369	.012
Cellphone	-284	.449	-0.020	-972	.844	-0.045	<b>-2.454</b>	<b>.809*</b>	<b>-1.08</b>	.154	1.597	.007	-.779	.873	-0.030	2.134	1.647	.080
Computer	-439	.591	-0.012	.273	.857	.005	-.470	1.220	-0.08	-3.447	1.788	-0.58	-4.32	1.668	-0.007	.818	1.647	.012
Sport	-1.767	1.503	-0.024	-6.99	1.969	-0.06	3.439	4.171	.029	-1.937	3.627	-0.16	.308	3.762	.002	<b>-1.389</b>	<b>3.943***</b>	<b>-.074</b>
Schoolwork	-691	2.932	-0.004	-7.323	5.291	-0.26	2.609	9.663	.009	<b>-19.902</b>	<b>9.290*</b>	<b>-0.66</b>	<b>-24.292</b>	<b>9.464***</b>	<b>-0.72</b>	-11.695	14.626	-.033
New hobby (0 = no)	-1.524	7.611	-0.006	-6.234	1.506	-0.17	-1.091	14.248	-0.03	<b>-36.027</b>	<b>17.305*</b>	<b>-0.90</b>	27.603	16.393	.062	-4.359	17.950	-.009
<b>Support</b>																		
Parents work outside	-1.761	4.391	-0.10	-4.217	7.745	-0.15	1.249	1.625	.035	15.666	11.376	.054	<b>-24.735</b>	<b>11.068*</b>	<b>-0.75</b>	7.709	12.704	.023
Parental support (0 = no)	-4.987	7.218	-0.020	-6.369	1.191	-0.17	15.159	15.745	.037	-18.667	17.820	-0.46	2.535	18.425	.006	-1.253	18.981	-.003
Teacher support (0 = no)	-2.778	6.887	-0.012	6.024	9.988	.016	-2.754	14.356	-0.53	22.908	16.614	.058	4.662	17.061	.010	1.662	17.408	.004

b: Unstandardized regression coefficient; s.e. Standard error of the coefficient;  $\beta$  Standardized regression coefficient. Paths displayed in boldface are significant at  $p < .05$ . Italicized path was not invariant between boys and girls  
 \* $p < .05$ ; \*\* $p < .01$

activity because they lacked energy [38]. It is, therefore, essential to pay attention to sports as a protective factor for mental health in the context adolescence and confinement, two conditions that tend to increase sedentary lifestyle [39, 40]. Adolescents who spent more time doing schoolwork reported less difficulty sleeping, concentrating, appetite changes, and were feeling less depressed, lonely, or worthless. These results are similar to those of a Canadian study on teenagers. It is possible that maintaining a commitment to school despite the school closure, gave a certain normalcy in the daily life of these adolescents and occupied their minds constructively, thus avoiding boredom and ruminations. Moreover, adolescents who adopted a new hobby while in confinement experienced fewer somatic depressive symptoms such as lack of appetite, liveliness, difficulty sleeping, or concentrating. This result is congruent with the conclusions of a review of various studies conducted with children and adolescents which suggests that taking up creative activities help to manage mental health [41]. Trying a new hobby could be a coping strategy that the teenagers would have deployed to alleviate their stress and strengthen their self-esteem by developing new skills during the lockdown [42]. It is also possible that adolescents who experienced elevated somatic symptoms were simply not mentally and physically available to take an interest in new activities, although the period of confinement was an opportunity to do so given the increase in free time they suddenly had [43].

### Support and Internalized Symptoms

Surprisingly, teenagers whose parents worked outside the home reported less depressive affect, thus feeling less sad and depressed. However, one might think that teenagers whose two parents work outside would had more difficulty in confinement since they may have been left without supervision and support. It is therefore conceivable the fact that parents worked out of home, as they did in normal times, contributed to the feeling of normalcy in the situation, may have limited family conflicts, and financial strains [44].

Several sociodemographic characteristics were not associated with any symptoms of anxiety or depression. This is the case for age, which is somewhat surprising as some studies have shown that being older represents a risk factor for adolescents' psychological distress, in confinement as in normal times particularly as it relates to depressive symptoms [14]. It is possible that, because the model we tested in the present study considered the relative contribution of all other predictors, which was not the case in other studies, it highlighted the predominance of the variables that have turned out to be associated with symptoms.

### Strengths and Limitations

This study, among the first to examine the variables associated with the mental health of adolescents in confinement, has several strengths. It is based on a sample of considerable size and documents a critical moment in the pandemic events. The fact that the analyzes were carried out according to the subtypes of anxiety and depressive symptoms provides more specific avenues for the intervention. The analyzes used to assess the differences between boys and girls were highly rigorous. However, this study has certain limitations. First, it was based on a cross-sectional design, which prohibits any conclusion of causal relationships. Another consequence resulting from this design is that pre-existing mental health diagnoses were not monitored, which would have been relevant since some studies have identified it is an aggravating factor of psychological distress in confinement. Also,

public health guidelines made it impossible to apply a sampling method at this time. The possibility of selection bias within our sample should be considered given that we relied on voluntary recruitment and solicited a portion of the sample through social media and email. To better understand the significance of the results, it would have been desirable to consider families' socio-economical status, especially in the context of the pandemic where inequalities are increased. Still, it is unfortunately difficult to do so from data reported by adolescents. Finally, it is legitimate to question the accuracy of the self-reported data that accounts for the time spent on daily activities since it can be difficult for adolescents to estimate the amount of time spent doing an activity. Also, the teacher and parent support variables were very limited. Ideally, the support would have directly, qualitatively, and more precisely measured.

## Conclusion

This study provided a portrait of the characteristics and habits of adolescents in confinement associated with their symptoms of anxiety and depression. Adolescents who spent more time doing schoolwork, sports, and used their cellphones, had fewer symptoms during confinement. This is also the case for those who discovered a new hobby and whose parents were working outside the home. How sociodemographic characteristics, confinement habits, and support were associated with symptoms was similar for boys and girls. Yet, to disentangle the direction of these associations, it becomes essential for future studies to rely on longitudinal designs and populational data. However, this study allows researchers and clinicians to better understand how adolescents experience confinement. In the eventuality of re-confinement, this study will help guide actions to support boys' and girls' mental health and provide concrete avenues for intervention.

**Abbreviations** COVID-19: Coronavirus Disease 2019; CES-D: Center for Epidemiologic Studies Depression Scale; CFI: Comparative Fit Index; DA: Depressive affect; GA: Generalized anxiety; MLR: Robust standard errors method; PD: Positive affect (depression); PTSD: Post traumatic stress disorder; RMSEA: Root Mean Square Error of Approximation; SA: Somatic anxiety; SCARED-R: The Screen for Child Anxiety Related Disorders-Revised; SD: Somatic (depression); SPSS: Statistical Package for Social Science; TA: Traumatic anxiety; TLI: Tucker-Lewis Index

**Author Contributions** First author analyzed and interpreted the data and leded the redaction of the article.

Second author contributed to the study design and redaction of the article.

Third contributed to the study design and redaction of the article.

Fourth contributed to the redaction of the article.

Fifth analyzed and interpreted the data and contributed to the redaction of the article.

All authors read and approved the final manuscript.

The first draft of the manuscript was written by First author and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

**Data Availability** The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

## Declarations

**Ethics Approval and Consent to Participate** This study was approved by the Research Ethical Committee of Université du Québec en Outaouais (UQO). All the participants provided a written parental consent.

**Consent for Publication** Consent for publication was included in the parental consent form..

**Conflict of Interest** The authors declare that they have no conflict of interest.

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