



COVID-19-related anxiety and trauma symptoms predict decreases in body image satisfaction in children

Philip Aucoin¹ · Olivia Gardam¹ · Elizabeth St. John¹ · Laila Kokenberg-Gallant¹ · Sophie Corbeil¹ · Jonathan Smith² · Fanny-Alexandra Guimond¹

Accepted: 11 April 2022

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Abstract

The present study investigated short-term longitudinal effects of COVID-19-related trauma and separation, social, and generalized anxiety symptoms on children's body image satisfaction. Participants were 247 Canadian children (121 boys, 123 girls) aged between 7 and 12 years ($M=9.04$). Two cohorts of parents were recruited to complete a questionnaire at two time points on their children's body image satisfaction and COVID-19-related trauma and anxiety symptoms. The first cohort ($n=136$ children) was recruited in Summer 2020 and the second cohort ($n=111$ children) was recruited in Winter 2021. For each cohort, follow-up surveys were completed approximately five months later, therefore covering an entire year with both cohorts. Multilevel regression analyses showed that children's trauma and anxiety at Time 1 predicted significant decreases in body image satisfaction at Time 2. Older children were especially at risk of decreased body image satisfaction as a result of their COVID-19-related trauma, social anxiety and generalized anxiety symptoms. Younger girls were susceptible to decreased body image satisfaction as a result of their separation anxiety symptoms. Given that children's body image dissatisfaction is a precursor to the development of eating disorders, these findings shed light on potential targets for early intervention with children who are at-risk of developing such difficulties.

Keywords Body image satisfaction · Children · Anxiety · Trauma · COVID-19 pandemic

The coronavirus disease (COVID-19) pandemic has upended the ways in which people live their lives. In many countries, the physical health risks have led to the implementation of strict social restrictions to limit transmission of the virus. In Canada, states of emergency have been declared intermittently since the pandemic began in early 2020, resulting in mass school closures, reductions in gathering limits, and stay-at-home orders. Though these restrictions have been shown to prevent viral transmission, emerging evidence suggests that they have also had adverse effects on the mental health of children. Indeed, youth have reported increased

symptoms of anxiety (i.e., separation, social and generalized anxiety) and trauma throughout the pandemic [1–4].

Youth who report higher levels of trauma and anxiety tend to also struggle with body image dissatisfaction [5, 6], which can be broadly defined as negative thoughts and feelings about one's body [7]. Though prevalence rates vary widely for younger children, it is estimated that 24–46% of adolescent girls and 12–26% of adolescent boys report being dissatisfied with their appearance [8–10]. Given the increase in anxiety and trauma symptoms, it should come as no surprise that the pandemic has also been marked by an increase in body image dissatisfaction in adults and youth [11, 12]. Despite these links between anxiety, trauma, and body dissatisfaction, we still have a limited understanding of how the COVID-19 pandemic contributed to these problems.

Our understanding of the mechanisms behind these associations also remains limited but recent evidence suggests that trauma symptoms may indirectly influence body image dissatisfaction through subsequent emotional dysregulation and dissociation [13]. For instance, after experiencing a traumatic event, dissociation can emerge as a method of

✉ Fanny-Alexandra Guimond
fguimond@uottawa.ca

¹ School of Psychology, Faculty of Social Sciences, University of Ottawa, 136 Jean-Jacques Lussier, Vanier Hall, K1N 6N5 Ottawa, Ontario, Canada

² Department of Education, Sherbrooke University, Sherbrooke, Quebec, Canada

coping with overwhelming negative emotions [14]. This may present as mindless eating, in which individuals eat to numb their emotional distress. Over time, this can lead to deteriorations in physical health (e.g., rapid weight gain) and trigger increases in body image dissatisfaction. Moreover, anxiety can manifest in many ways in youth and various types of anxiety disorders may influence body image dissatisfaction differently. For instance, *social anxiety* is thought to influence body image dissatisfaction through a decreased sense of self-worth and heightened expectations of rejection by others [15]. On the other hand, *separation anxiety* may lead to increased body image dissatisfaction via poor attachment-related experiences that result in poor subjective evaluations of one's physical appearance [16]. *Generalized anxiety*, on its part, represents excessive worry and may lead individuals to rely more on the acceptance of others and to be more sensitive to unrealistic societal standards of health and weight [17]. To date, two cross-sectional studies have reported that greater COVID-19-related anxiety was associated with greater body image dissatisfaction in adults [18, 19]. However, it is unclear whether children's body image dissatisfaction was impacted by COVID-19-related anxiety and trauma symptoms.

This literature gap is concerning, especially given the marked increase in *youth* eating disorder symptoms throughout the pandemic [20]. Indeed, body image dissatisfaction happens to be one of the strongest predictors of eating disorders [21]. Though eating disorders are most likely to be diagnosed in late adolescence and early adulthood, it is theorized that the critical period for healthy body image development is during childhood [22]. Therefore, it is especially important to investigate the effects that the pandemic may be having on youth body image. Are these increases in body image dissatisfaction among youth only temporary? Or are COVID-19-related trauma and anxiety having lasting effects on the body image of school-aged children? And how are different types of anxiety affecting body image dissatisfaction in children? With these questions in mind, it is crucial to explore the progression of body image dissatisfaction in these age groups to identify the children who are most at risk of developing eating disorders—especially given the global pandemic and its related consequences.

The Present Study

As emerging evidence suggests that the link between children's anxiety and trauma symptoms and body image dissatisfaction applies directly to the COVID-19 pandemic, the present study had three main objectives. The first objective was to determine whether COVID-19-related trauma and separation, social, and generalized anxiety symptoms

were associated with body image dissatisfaction in school-aged children, while controlling for child body mass index (BMI). Based on prior research on adults, we hypothesized that children with greater anxiety and trauma symptoms during the COVID-19 pandemic would also have increased body image dissatisfaction, above and beyond their BMI. The second objective was to examine whether separation, social, and generalized anxiety, as well as trauma symptoms predicted changes in body image dissatisfaction over time. Specifically, we hypothesized that greater anxiety and trauma symptoms would predict increases over time in body image dissatisfaction, above and beyond child BMI.

The final objective was to examine whether age and gender would moderate these associations. Prior research suggests that girls are more likely to experience both body image dissatisfaction and anxiety symptoms than boys [23, 24]. Therefore, we expected girls to show stronger associations between their anxiety symptoms and body image dissatisfaction. Regarding trauma symptoms, there is evidence suggesting that girls show more trauma symptoms than boys following a crisis event [25]. Therefore, we also hypothesized that girls would show stronger associations between body image dissatisfaction and trauma symptoms. Finally, because body image concerns tend to increase in older age groups [26], we hypothesized that older children would show stronger associations between anxiety and trauma symptoms and body image dissatisfaction, with the exception of separation anxiety, which occurs more often in younger children.

Method

Participants

The study was conducted over the course of one year with two separate cohorts of parents who responded to surveys on behalf of their children. The first cohort of participants ($n=136$ children) was recruited in Summer 2020 and the second cohort of participants ($n=111$ children) was recruited in Winter 2021. For each cohort, follow-up surveys were completed approximately five months later. This timeline was chosen in order to capture data across roughly an entire year of living with the COVID-19 pandemic. It is worth noting that the lockdown measures experienced by these participants varied consistently throughout data collection, along with COVID-19 case numbers. With that said, each time point was characterized by states of emergency, stay-at-home orders, severe gathering restrictions (i.e., as low as 5–10 people indoors), and intermittent school and business closures.

Independent samples *t*-tests indicated that the two cohorts did not differ in terms of child age, $t(240) = -0.35$, $p = .73$, body image satisfaction at Time 1, $t(238) = -0.16$, $p = .87$, and at Time 2, $t(132) = -0.37$, $p = .71$, social anxiety symptoms, $t(238) = -0.36$, $p = .50$, separation anxiety symptoms, $t(238) = -0.67$, $p = .50$, and trauma symptoms, $t(238) = -0.90$, $p = .37$. However, the two cohorts differed significantly in terms of generalized anxiety symptoms, such that the first cohort reported fewer generalized anxiety symptoms ($M = 5.12$, $SD = 2.31$) than the second cohort ($M = 5.91$, $SD = 1.85$; $t(238) = -2.90$, $p = .004$). These findings justified combining both cohorts into one sample, with the exception of generalized anxiety symptoms which were investigated separately per cohort. Therefore, at Time 1, the total sample comprised 247 Canadian children (boys = 49%; girls = 49.8%, unspecified = 1.2%) aged between 7 and 12 years old ($M_{\text{age}} = 9.04$ years) from 177 families. Of this total, 104 families completed the survey at Time 2 (134 children; 45.9% boys, 54.1% girls; $M_{\text{age}} = 8.7$ years). Of the 177 families, 46.3% of the sample lived in the province of Ontario and 43.5% in the province of Quebec. The remaining families were from other Canadian provinces and territories (5.1%) or did not indicate their province of residence (5.1%). Most respondents were biological mothers (86.4%) or biological fathers (11.9%), and most children lived with the parent respondent on a full-time basis (84.7%), whereas 15.3% of the sample lived in shared custody. Most parents reported a household income above the median of CAD 68,000 (56.6%). Additional sociodemographic characteristics of the parents and children are presented in Table 1.

Procedure and ethical considerations

This study was approved by the University of Ottawa Office of Research Ethics and Integrity (#H-05-20-5756). Parents completed the questionnaires regarding their children's and their own mental health during the COVID-19 pandemic at two time points. Informed written consent was appropriately obtained before completion of the online survey at both time points. Recruitment took place on social media platforms (e.g., Facebook), in Canadian journal ads, and through email threads. All instruments were administered in either English or French, depending on the preference of the parent. On average, participants completed the online surveys in less than 25 min. Participants who completed the study at both time points received a \$5 gift card to a library store.

Table 1 Sociodemographic Characteristics of the Sample

Characteristic	<i>N</i>	%
Child Gender		
Female	123	49.8%
Male	121	49%
No answer	3	1.2%
Child Age (years)		
7	68	27.5%
8	45	18.2%
9	35	14.2%
10	33	13.4%
11	30	12.1%
12	31	12.6%
No answer	5	2%
Child Ethnicity		
White	195	78.9%
Mixed Race	20	8.1%
Asian	12	4.8%
Black	6	2.4%
Latino/a	5	2.0%
Other	9	3.6%
Marital Status		
Married	94	53.1%
Common-law	47	26.6%
Divorced	16	9%
Single	10	5.6%
No answer	10	5.7%
Annual Income (CAD)		
Over 120,000	51	28.9%
80,000-119,999	49	27.7%
60,000-79,000	18	10.2%
40,000-59,999	10	5.6%
Less than 39,000	12	6.8%
No answer	26	14.7%
Level of Education		
College diploma	49	27.7%
Bachelor's degree	49	27.7%
Master's degree	29	16.4%
Doctoral degree	15	8.5%
High school diploma	14	7.9%
University certificate	9	5.1%
Elementary school	2	1.1%
No answer	10	5.7%

Measures

Body image satisfaction

At both time points, children's body image satisfaction was measured using five items ("This child likes his or her body", "This child would like to be thinner", "This child talks about his or her weight", "This child feels good about the way he or she looks" and "This child wishes that he or she was better looking") of the parent questionnaire [27]. Parents rated each item on a 4-point scale ranging from 1 (*never*)

to 4 (*always*). Some items were reverse coded and the total items were averaged to yield a global body image satisfaction score at Time 1 ($M=1.57$, $SD=0.52$, $\alpha=0.80$) and at Time 2 ($M=1.57$, $SD=0.57$, $\alpha=0.86$).

Generalized anxiety symptoms

Children's generalized anxiety symptoms were measured using the four-item generalized anxiety subscale ("This child worries about things", "This child worries that something awful will happen to someone in our family", "This child worries that something bad will happen to him/her", and "This child can't seem to get bad or silly thoughts out of his/her head") of the parent-reported Spence Child's Anxiety Scale, Short Version (SCAS-S) [28]. Parents rated each item on a 4-point scale ranging from 1 (*never*) to 4 (*always*). The items were summed to yield a global generalized anxiety symptoms score at Time 1 ($M=5.48$, $SD=2.14$, $\alpha=0.78$).

Separation anxiety symptoms

Children's separation anxiety symptoms were measured using the three-item separation anxiety subscale ("This child would be afraid of being on his/her own at home", "This child worries about being away from me" and "This child would feel scared if he/she had to stay away from home overnight") of the parent-reported SCAS-S [28]. Parents rated each item on a 4-point scale ranging from 1 (*never*) to 4 (*always*). The items were summed to yield a global separation anxiety symptoms score at Time 1 ($M=5.82$, $SD=2.10$, $\alpha=0.65$).

Social anxiety symptoms

Children's social anxiety symptoms were measured using the three-item social anxiety subscale ("This child is scared when he/she has to take a test", "This child worries that he/she will do badly at school" and "This child feels afraid that he/she will make a fool of him/herself in front of people") of the parent-reported SCAS-S [28]. Parents rated each item on a 4-point scale ranging from 1 (*never*) to 4 (*always*). The items were summed to yield a global separation anxiety symptoms score at Time 1 ($M=6.08$, $SD=1.87$, $\alpha=0.66$).

Trauma symptoms

Children's trauma symptoms were measured using eight items deemed observable by parents from the Children's Revised Impact of Event Scale (CRIES) [29]. For example, parents were asked if, since the COVID-19 pandemic

lockdown, they noticed the child would "startle more easily or feel more nervous than he/she did before" and "get alert and watchful even when there is no obvious need to be". The items were rated on a 4-point scale ranging from 1 (*never*) to 4 (*always*) and were summed to yield a global trauma symptoms score at Time 1 ($M=13.25$, $SD=3.54$, $\alpha=0.74$).

Plan of analysis

Analyses were conducted using the Statistical Package for the Social Sciences (SPSS), version 28. As preliminary analyses, multilevel regression analyses were conducted using generalized estimating equations (GEE) to assess bivariate associations between study variables. GEE analyses were used because some parents responded on behalf of more than one child ($n=71$), thus violating the assumption of data independence (i.e., siblings are similar to one another) needed to conduct classical analyses such as correlations. GEE analyses confirm that the standard errors are not underestimated and that parameter estimates are not overestimated, as would be the case if using classical analyses (e.g., linear regression) with nested data. GEE models therefore permit to correct the standard errors and the parameter estimates by accounting for the nested nature of the data [30].

The main analyses also consisted of multilevel regression analyses using GEE. The first set of analyses examined the concurrent associations between children's different types of anxiety (i.e., generalized, separation, and social) and trauma symptoms and their body image satisfaction at Time 1. The first model tested was an unconditional model (i.e., without any predictor), which provided preliminary information about the model fit. In the second model, sociodemographic and control variables (i.e., gender, age, ethnicity, and BMI) were added to predict child body image satisfaction at Time 1. In the third model, main predictors (i.e., child generalized, separation and social anxiety, and trauma symptoms) were added to predict child body image satisfaction at Time 1. In the fourth models, two two-way interaction terms between child gender and age and each predictor (i.e., child generalized, separation and social anxiety, and trauma symptoms) were added to test the moderating effect of child gender and age in the association between children's anxiety or trauma symptoms and child body image satisfaction at Time 1 (e.g., "child generalized anxiety * gender" and "child generalized anxiety * age"). In the fifth models, three-way interaction terms were added separately to assess the moderating effect of gender and age in the associations between child anxiety or trauma symptoms and body image dissatisfaction at Time 1 (e.g., child generalized anxiety * age * gender).

In order to illustrate significant interaction effects, we followed the procedure recommended by Holmbeck [31], in which the statistically significant associations between a predictor (i.e., generalized, separation and social anxiety, or trauma symptoms at Time 1) and the dependent variable (i.e., child body image satisfaction at Time 1 or at Time 2) were examined when the moderator was at 1 standard deviation above the mean and when the moderator was at 1 standard deviation below the mean.

The second set of analyses examined the longitudinal associations between children's different types of anxiety (i.e., generalized, separation, and social) and trauma symptoms at Time 1 and their body image satisfaction at Time 2. Therefore, it replicated the same models as the first set of analyses with the addition of the control variable "child body image satisfaction at Time 1" and the modification of the dependent variable (i.e., child body image satisfaction at Time 2 and not at Time 1).

Supplemental analyses were conducted in which concurrent and longitudinal associations between children's generalized anxiety symptoms and body image satisfaction were investigated separately per cohort since mean-level differences were present between the first and the second cohort of participants. Each model was compared to the preceding one to evaluate whether the inclusion of additional predictors provided a better fit to the data. Goodness of fit was

evaluated based on the Quasi-likelihood under independence model criterion (QIC). While this fit index does not allow formal model comparisons, it can be used as a guideline for model selection, with lower values indicating a better overall model fit [32].

All variables except child gender were z-standardized prior to conducting analyses to facilitate interpretation of effect sizes. An average of 4.8% (range = 2.8–15.8%) of the data were missing for the variables included in the study at Time 1 ($n=247$). Less than 1% of the data were missing for the variable (i.e., body image satisfaction) included in the study at Time 2 ($n=134$). Little's Test of Missing Completely at Random (MCAR) indicated that the data at Time 1 and Time 2 were missing completely at random, $\chi^2(264)=278.35$, $p=.26$. In order to address the possibility that certain demographic characteristics were associated with participant attrition, we conducted independent samples *t*-tests to compare sample characteristics between participants who completed both surveys (Time 1 and Time 2) and those who only completed the survey at Time 1. Demographic characteristics (i.e., annual income, age, ethnicity, marital status) did not differ between the groups, with the exception of parent education. Indeed, parents who completed surveys at both time points were more educated than those who only completed the survey at Time 1, $t(168) = -2.12$, $p=.02$. Missing data at the item level were imputed

Table 2 Multilevel Regression Beta Coefficients Between Study Variables

Variable	1	2	3	4	5	6	7	8	9	M (SE)
1. Gender	–	–0.06 [–0.16, 0.05]	–0.03 [–0.11, 0.05]	–0.04 [–0.13, 0.05]	–0.02 [–0.11, 0.06]	0.04 [–0.06, 0.13]	0.08 [–0.01, 0.17]	0.07 [–0.02, 0.15]	0.05 [–0.05, 0.15]	–
2. Age	–	0.17** [0.07, 0.28]	–0.20** [–0.32, –0.08]	–0.23** [–0.35, –0.11]	–0.05 [–0.18, 0.08]	0.05 [–0.09, 0.18]	–0.20* [–0.36, –0.05]	0.01 [–0.14, 0.16]	9.02 (1.76)	
3. BMI T1	–	–0.52** [–0.66, –0.37]	–0.51** [–0.72, –0.29]	0.16 [–0.08, 0.39]	0.30* [0.07, 0.53]	–0.06 [–0.23, 0.12]	0.22 [–0.02, 0.47]	18.35 (4.21)		
4. Body Image T1	–	0.79** [0.64, 0.93]	–0.43** [–0.60, –0.26]	–0.51** [–0.70, –0.32]	–0.04 [–0.19, 0.12]	–0.43** [–0.60, –0.25]	1.56 (0.52)			
5. Body Image T2	–	–0.22* [–0.43, –0.02]	–0.39** [–0.58, –0.20]	0.03 [–0.13, 0.18]	–0.40** [–0.58, –0.21]	1.57 (0.57)				
6. Generalized Anxiety T1	–	0.43** [0.30, 0.55]	0.38** [0.26, 0.51]	0.37** [0.23, 0.51]	5.48 (2.15)					
7. Social Anxiety T1	–	0.29** [0.15, 0.42]	0.48** [0.37, 0.60]	6.09 (1.87)						
8. Separation Anxiety T1	–	0.25** [0.11, 0.39]	5.82 (2.11)							
9. Trauma T1	–	13.25 (3.55)								

Note. $N=247$ children from 177 families. 95% Confidence intervals are presented in brackets. Gender was coded *boys* = 0, *girls* = 1. Body image items were rated from 1 (*never*) to 4 (*always*) and were averaged. Generalized, social, and separation anxiety and trauma items were rated on a scale from 1 (*never*) to 4 (*always*) and were summed. * $p < .05$, ** $p < .01$, two-tailed

Table 3 Concurrent Associations Between Children's Anxiety and Trauma and Body Image Satisfaction at Time 1

Model	Variable	B	SE	QIC
Unconditional model				241.19
Model 2	Gender	0.25* [0.01, 0.50]	0.12	168.48
	Age	-0.25*** [-0.38, -0.11]	0.07	
	Ethnicity	0.00 [-0.03, 0.03]	0.02	
	BMI T1	-0.09*** [-0.13, -0.06]	0.02	
Model 3	Separation Anxiety T1	-0.03 [-0.15, 0.09]	0.06	144.08
	Social Anxiety T1	-0.22*** [-0.35, -0.09]	0.07	
	Generalized Anxiety T1	-0.19* [-0.34, -0.05]	0.07	
	Trauma T1	-0.07 [-0.20, 0.06]	0.07	
Model 4a	Separation Anxiety *	-0.18 [-0.39, 0.04]	0.11	143.40
	Gender			
	Separation Anxiety *	-0.12* [-0.23, -0.01]	0.06	
	Age			
4b	Social Anxiety * Gender	0.00 [-0.20, 0.21]	0.10	146.37
	Social Anxiety * Age	-0.12* [-0.25, 0.00]	0.06	
4c	Generalized Anxiety *	-0.13 [-0.35, 0.09]	0.11	145.75
	Gender			
	Generalized Anxiety * Age	-0.09 [-0.20, 0.02]	0.06	
4d	Trauma * Gender	-0.06 [-0.31, 0.19]	0.13	152.23
	Trauma * Age	-0.04 [-0.19, 0.11]	0.07	
Model 5a	Age * Gender	-0.18 [-0.44, 0.07]	0.13	145.49
	Separation Anxiety *	0.07 [-0.18, 0.31]	0.12	
	Gender * Age			
5b	Age * Gender	-0.13 [-0.37, 0.11]	0.13	148.16
	Social Anxiety * Gender * Age	0.26 [-0.02, 0.53]	0.14	
5c	Age * Gender	-0.11 [-0.36, 0.14]	0.13	149.10
	Generalized Anxiety * Gender * Age	-0.02 [-0.27, 0.24]	0.13	
5d	Age * Gender	-0.09 [-0.34, 0.16]	0.13	152.23
	Trauma * Gender * Age	0.16 [-0.14, 0.46]	0.15	

Note. $N=247$. 95% Confidence intervals are presented in brackets. QIC=Quasi-likelihood under independence model criterion. Gender was coded *boys*=0, *girls*=1. Anxiety and trauma symptoms and body image satisfaction were rated on a scale from 1 (*never*) to 4 (*always*). * $p < .05$, ** $p < .01$

using the Estimation Maximization algorithm with 25 iterations.

Results

Preliminary analyses

The multilevel regression coefficients between study variables are presented in Table 2. Based on parent reports, there was a significant association between children's age and BMI, separation anxiety, and body image satisfaction at both time points. Older children were taller and heavier, more dissatisfied by their body, and less anxious about potential separation with their parents than younger children. There was a significant association between BMI and body image (at both time points) and social anxiety. Bigger children were more likely to be dissatisfied with their body and to be socially anxious than smaller children. Body image at Time 1 was strongly associated with body image at Time 2, showing that body image dissatisfaction remained relatively stable over time. Body image satisfaction at both time points was negatively associated with generalized anxiety, social anxiety, and trauma. Hence, children dissatisfied with their body image were more likely to be suffering from trauma and generalized and social anxiety symptoms than children who liked their appearance. Finally, trauma and generalized, social, and separation anxiety were all correlated at Time 1. Anxious children were more likely than others to display different types of anxiety as well as trauma symptoms.

Main analyses

Concurrent Associations between Anxiety/Trauma and body image satisfaction at Time 1

As can be seen in Table 3, the first step was the unconditional model (i.e., without any predictor) to provide a model fit index (QIC = 241.19). In the second model, parent reports indicated that child gender ($b = 0.25$, $SE = 0.12$, $p = .04$), age ($b = -0.25$, $SE = 0.07$, $p < .001$) and BMI ($b = -0.09$, $SE = 0.02$, $p < .001$) were significantly associated with body image satisfaction at Time 1, whereas child ethnicity was not ($b = 0.00$, $SE = 0.02$, $p = .99$). Hence, girls, older and heavier children were less likely to be satisfied with their body than boys, younger and thinner children. Inclusion of these predictors resulted in a better model fit compared to the previous model, as the model fit index decreased (QIC = 168.48). In the third model, parent reports indicated that child generalized anxiety ($b = -0.19$, $SE = 0.07$, $p = .01$) and social anxiety ($b = -0.22$, $SE = 0.07$, $p < .001$) symptoms were associated with body image satisfaction

at Time 1. Children with higher levels of generalized and social anxiety were less likely to be satisfied by their body. Child separation anxiety ($b = -0.03$, $SE = 0.06$, $p = .65$) and trauma ($b = -0.07$, $SE = 0.07$, $p = .30$) symptoms were not significant predictors of body image satisfaction. Inclusion of these predictors resulted in a better model fit compared to the previous model (QIC = 144.08). In the fourth models, the two-way interaction effect of "separation anxiety * age" was significantly associated with child body image satisfaction at Time 1 ($b = -0.12$, $SE = 0.06$, $p = .03$; QIC = 143.40). Probing of this interaction effect revealed that higher levels of separation anxiety were more strongly associated with lower levels of body image satisfaction in older children ($b = -0.39$, $SE = 0.10$, $p < .001$) than in younger ones ($b = -0.16$, $SE = 0.07$, $p = .04$). In the fifth models, the three-way interaction effects were not significantly associated with child body image satisfaction.

Longitudinal Associations between Anxiety/Trauma at Time 1 and Body Image Satisfaction at Time 2

As can be seen in Table 4, the first step was the unconditional model to provide a model fit index (QIC = 135.44). In the second model, parent reports of child body image satisfaction at Time 1 significantly predicted child body image satisfaction at Time 2 ($b = 0.66$, $SE = 0.07$, $p < .001$), whereas child's gender ($b = 0.02$, $SE = 0.12$, $p = .84$), age ($b = -0.12$, $SE = 0.09$, $p = .17$), ethnicity ($b = -0.03$, $SE = 0.02$, $p = .06$), and BMI at Time 1 ($b = -0.02$, $SE = 0.02$, $p = .25$) were not. Hence, higher levels of child body image satisfaction at Time 1 predicted higher levels of such satisfaction at Time 2. Inclusion of these predictors resulted in a better model fit compared to the previous model, as the model fit index decreased (QIC = 62.49). In the third model, parent reports of child generalized anxiety ($b = 0.12$, $SE = 0.09$, $p = .18$), separation anxiety ($b = -0.05$, $SE = 0.05$, $p = .29$), social anxiety ($b = -0.03$, $SE = 0.07$, $p = .70$), and trauma ($b = -0.16$, $SE = 0.09$, $p = .06$) symptoms at Time 1 did not predict child body image satisfaction at Time 2. Inclusion of these predictors did not result in a better model fit compared to the previous model (QIC = 70.47). In the fourth models, the two-way interaction effect of "social anxiety * age" significantly predicted child body image satisfaction at Time 2 ($b = -0.21$, $SE = 0.08$, $p = .01$; QIC = 68.81). Probing of this interaction effect revealed that higher levels of social anxiety at Time 1 predicted lower levels of body image satisfaction at Time 2 in older children ($b = -0.31$, $SE = 0.12$, $p = .01$) but not in younger children ($b = 0.10$, $SE = 0.10$, $p = .33$). The two-way interaction effect of "trauma * age" also significantly predicted child body image satisfaction at Time 2 ($b = -0.31$, $SE = 0.08$, $p < .001$; QIC = 65.53). Indeed, higher levels of trauma symptoms at Time 1 predicted lower levels of body

Table 4 Longitudinal Associations Between Children's Anxiety and Trauma at Time 1 and Body Image Satisfaction at Time 2

Model	Variables	B	SE	QIC
Unconditional model				135.44
Model 2	Gender	0.02 [-0.21, 0.26]	0.12	62.49
	Age	-0.12 [-0.30, 0.05]	0.09	
	Ethnicity	-0.03 [-0.07, 0.00]	0.02	
	BMI T1	-0.02 [-0.05, 0.01]	0.02	
	Body Image T1	0.66** [0.52, 0.81]	0.07	
Model 3	Separation Anxiety T1	0.05 [-0.04, 0.14]	0.05	68.50
	Social Anxiety T1	-0.03 [-0.17, 0.11]	0.07	
	Generalized Anxiety T1	0.12 [-0.05, 0.29]	0.09	
	Trauma T1	-0.16 [-0.33, 0.01]	0.09	
Model 4a	Separation Anxiety * Gender	-0.11 [-0.31, 0.10]	0.10	70.47
	Separation Anxiety * Age	-0.08 [-0.20, 0.03]	0.06	
4b	Social Anxiety * Gender	0.03 [-0.16, 0.21]	0.09	68.81
	Social Anxiety * Age	-0.21** [-0.36, -0.06]	0.08	
4c	Generalized Anxiety * Gender	-0.01 [-0.26, 0.24]	0.13	72.02
	Generalized Anxiety * Age	-0.13 [-0.27, 0.01]	0.07	
4d	Trauma * Gender	-0.04 [-0.26, 0.18]	0.11	65.53
	Trauma * Age	-0.31*** [-0.47, -0.15]	0.08	
Model 5a	Age * Gender	-0.14 [-0.43, 0.14]	0.15	71.73
	Separation Anxiety * Gender * Age	-0.25* [-0.50, -0.01]	0.13	
5b	Age * Gender	-0.09 [-0.34, 0.15]	0.13	72.16
	Social Anxiety * Gender * Age	0.01 [-0.27, 0.28]	0.14	
5c	Age * Gender	-0.03 [-0.29, 0.23]	0.13	76.54
	Generalized Anxiety * Gender * Age	-0.07 [-0.38, 0.24]	0.16	
5d	Age * Gender	-0.08 [-0.31, 0.15]	0.12	68.44
	Trauma * Gender * Age	0.17 [-0.11, 0.45]	0.14	

Note. $N=134$. 95% Confidence intervals are presented in brackets. QIC=Quasi-likelihood under independence model criterion. Gender was coded *boys*=0, *girls*=1. Anxiety and trauma symptoms and body image satisfaction were rated on a scale from 1 (*never*) to 4 (*always*). * $p < .05$, ** $p < .01$.

image satisfaction at Time 2 in older children ($b = -0.40$, $SE = 0.12$, $p < .001$) but not in younger ones ($b = -0.03$, $SE = 0.08$, $p = .71$).

In the fifth models, the three-way interaction effect of "separation anxiety * age * gender" at Time 1 significantly predicted child body image satisfaction at Time 2 ($b = -0.25$, $SE = 0.13$, $p = .04$; QIC = 71.73). Probing of this

interaction effect revealed that higher levels of separation anxiety at Time 1 predicted lower levels body image satisfaction in younger girls at Time 2 ($b = -0.48$, $SE = 0.17$, $p = .004$) but not in younger boys ($b = -0.09$, $SE = 0.13$, $p = .51$) nor in older children (boys: $b = -0.05$, $SE = 0.14$, $p = .73$; girls: $b = 0.06$, $SE = 0.11$, $p = .56$).

Supplemental analyses

Since generalized anxiety levels differed between both cohorts of participants, the analyses were re-run separately per cohort. The same pattern of results emerged as seen in the first set of analyses. Indeed, higher levels of generalized anxiety symptoms were associated with lower body image satisfaction at Time 1 in the first ($b = -0.17$, $SE = 0.08$, $p = .03$) and in the second cohort ($b = -0.36$, $SE = 0.13$, $p = .01$). The same pattern of results also emerged in the second set of analyses, with the exception of the two-way interaction effect of “generalized anxiety * age” at Time 1, which significantly predicted child body image satisfaction at Time 2 in the second cohort ($b = -0.26$, $SE = 0.11$, $p = .02$; $QIC = 43.86$). Probing of this interaction effect revealed that higher levels of generalized anxiety symptoms at Time 1 predicted lower levels of body image satisfaction at Time 2 in older children ($b = -0.26$, $SE = 0.12$, $p = .04$) but not in younger ones ($b = 0.26$, $SE = 0.18$, $p = .15$). This interaction effect was not significant for the first cohort of participants ($b = -0.10$, $SE = 0.10$, $p = .32$; $QIC = 49.22$).

Discussion

This study sought to investigate the concurrent and longitudinal associations between COVID-19-related trauma and separation, social and generalized anxiety symptoms, and body image dissatisfaction in school-aged children. In addition, this study examined the moderating effect of age and gender on these associations.

Our findings indicated that girls, older children, and heavier children reported greater body image dissatisfaction. This is in line with prior research documenting that girls are more likely to struggle with body image dissatisfaction than boys [23], that body image dissatisfaction is more common in older children than younger ones [26], and that weight issues increase the likelihood of body image dissatisfaction [33]. Moreover, children with greater generalized, separation, and social anxiety symptoms reported greater body image dissatisfaction, which was in line with our hypothesis. These results are also in line with two recent studies on the impact of COVID-19-related anxiety on adults’ body image dissatisfaction [18, 19] and support the notion that these links extend to children as well.

In the case of social anxiety, the concurrent and longitudinal associations with body image dissatisfaction were especially strong for older children. Social anxiety typically presents as a marked fear of situations in which children may be scrutinized by others. Often, this anxiety centers around the quality of academic performance or school in general [34], which may have been especially fragile in our participants given the shift towards virtual schooling during the COVID-19 pandemic. Moreover, youth who worry about how they are appraised by their peers may begin to place unrealistic expectations on themselves regarding their physical appearance in addition to these performance-related factors. The fact that this association is stronger in older children is unsurprising, as social pressure to “fit in” tends to increase as children get older [35]. This increased pressure may lead to more anxiety in social situations, and subsequent dissatisfaction with one’s appearance and whether it meets the standards held by one’s peers.

Our findings also indicated that children with higher levels of generalized anxiety symptoms were more likely to have greater body image dissatisfaction over time, but only in older children in our second cohort of participants. This difference in findings between cohorts may point towards a general worsening of anxiety over the course of the COVID-19 pandemic. In Canada, where our data were collected, a state of emergency was in effect during data collection for both cohorts. It is possible that this extended period of heightened social restrictions (i.e., stay-at-home orders, social distancing, mask mandate, etc.) had cumulative effects on generalized anxiety symptoms specifically. Moreover, the majority of participants in our second cohort were recruited from the province of Quebec, which had an especially high number of COVID-19 cases around the time we collected our data. These positive cases could explain increased generalized anxiety symptoms in the population, as it is characterized by a heightened tendency to worry about a number of events or activities. Specifically, the long-term nature of the pandemic may have led children to worry more about their health as well as the health of their relatives, which is another common feature of generalized anxiety disorder [36]. Regardless of the exact mechanism behind this rise in generalized anxiety symptoms, this heightened sense of worry may be directed towards one’s body, and thus feed into poorer body image satisfaction. The fact that these associations were stronger for older children also supports the notion that generalized anxiety and body image dissatisfaction increase as children age [26].

Interestingly, children’s trauma symptoms did not have a concurrent effect, but *did* have a longitudinal effect on body image dissatisfaction. This may suggest that trauma symptoms have a delayed effect on children’s body image, whereas anxiety has more immediate effects. In fact, given

that global disasters are commonly associated with elevated posttraumatic stress disorder symptoms [37], some have predicted that posttraumatic stress disorder will be the “second tsunami” of the pandemic [38]. With that said, it is worth noting that this increase in trauma symptomology is not necessarily directly related to COVID-19. Indeed, it appears that simply being exposed to the pandemic and its associated social restrictions are aggravating otherwise unrelated trauma symptoms in the general population [4]. This is in line with the stress sensitization hypothesis [39], which suggests that those who are predisposed to developing psychopathology should be especially sensitive to the psychological consequences of a global health crisis.

Children’s separation anxiety also significantly predicted lasting decreases in body image satisfaction, though this was only the case in *younger* girls. This maps on well to prior research indicating that younger children, especially girls, are more likely to experience separation anxiety [40] and that girls are more likely than boys to experience body image dissatisfaction [23]. Moreover, given that one of the key features of separation anxiety is fear of being abandoned by caregivers and worrying about the wellbeing or death of attachment figures, the health risks of the COVID-19 pandemic likely contributed to the emergence of separation anxiety symptoms.

Taken together, our findings suggest that older children seem to be more sensitive to the lasting effects of COVID-19 generalized and social anxiety symptoms and trauma (as a delayed effect) on their body image satisfaction, whereas younger girls are especially sensitive to separation anxiety symptoms. Although these findings are novel and offer a unique view of how youth psychopathology is being affected by the COVID-19 pandemic, there are several limitations to consider in our study. First, we do not have access to pre-pandemic data as a baseline measure, which impeded us from establishing causal associations between our variables. Second, our measure of body image satisfaction primarily focused on the body itself, rather than on phenotypic characteristics (e.g., eye color, nose shape, hair) or body composition (e.g., muscle tone). Given that these dimensions are relevant to the construct of body image [7], future studies should address these features when measuring body image satisfaction. Furthermore, we relied solely on parent reports for our data collection. Our findings would be more convincing had we collected data from additional sources (e.g., children, peers) and reduced the risk of measurement error. Third, because of our sample’s demographics, we were also unable to compare ethnic/racial groups differences as we did not have enough diversity in our participants. Future research should investigate how different diversity factors might impact the associations between trauma, anxiety, and body image satisfaction in children. Fourth, we experienced

a somewhat high attrition rate (26%) between Time 1 and Time 2, potentially due to the timing and the pandemic-related stressors at the time of the follow-up. However, our attrition rates were consistent between cohorts.

Lastly, our study only examined a short window within the COVID-19 pandemic period. While this provided us with a better understanding of the short-term effects of COVID-19 trauma and anxiety, it would have been beneficial to examine our participants over an even longer period. It would be especially interesting to follow participants after COVID-19 has been declared eradicated, in order to observe whether the effects of trauma and anxiety on body dissatisfaction will persist. This study is therefore a start to understanding whether COVID-19-related mental health symptoms may have long-term impacts on youth body image dissatisfaction.

Summary

Heightened symptoms of trauma and anxiety have been documented in children throughout the COVID-19 pandemic [2]. Some recent cross-sectional evidence suggests that these symptoms lead to poor body image satisfaction in adults [18]. Therefore, this short-term longitudinal study examined how COVID-19-related symptoms of trauma and anxiety (i.e., generalized, separation, and social) impacted children’s body image satisfaction over time. Our findings suggest that older children were especially prone to decreases in their body image satisfaction as a result of their COVID-19-related trauma, social anxiety, and generalized anxiety symptoms. Alternatively, younger girls were especially susceptible to decreases in body image satisfaction as a result of their separation anxiety symptoms during the pandemic. These are novel findings as, to date, they were only found in cross-sectional studies on adults and with general COVID-19-related anxiety [18, 19]. This study is also clinically relevant since early body image dissatisfaction is a strong precursor of the development of eating disorders, a psychopathology that increased dramatically in youth during the COVID-19 pandemic [20, 21]. The findings therefore shed light on potential targets for early intervention with children who are at-risk of developing such difficulties, especially during stressful time.

Acknowledgements The authors would like to thank the participating families.

Declarations

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. The authors have no relevant financial or non-financial

interests to disclose. This study was approved by the University of Ottawa Office of Research Ethics and Integrity (#H-05-20-5756). The study was conducted according to the ethical principles specified in guidelines established by the American Psychological Association. Signed informed consent was required for participation.

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