



Original Investigation | Psychiatry

# Somatic and Posttraumatic Stress Symptoms in Children and Adolescents in France

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## Abstract

**IMPORTANCE** Somatic symptoms are a major concern among the pediatric population because of frequency and burden. The association between adverse childhood experiences and somatic symptoms in adults is well established but less is known concerning somatic symptoms in young people.

**OBJECTIVE** To explore the frequency and intensity of somatic symptoms in children and adolescents exposed to traumatic events.

**DESIGN, SETTING, AND PARTICIPANTS** This cross-sectional study was conducted from January 1 to December 31, 2021, at the Nice Pediatric Psychotrauma Referral Center in Nice, France. Participants included pediatric outpatients, aged 7 to 17 years, who were referred to the center. Statistical analysis was performed in January 2022.

**EXPOSURE** All participants experienced at least 1 traumatic event during life.

**MAIN OUTCOME AND MEASURE** Somatic and posttraumatic stress symptoms were assessed using the Patient Health Questionnaire-13 (PHQ-13) and Child PTSD Checklist (CPC). Posttraumatic stress disorder (PTSD) and non-PTSD groups were defined based on CPC symptoms severity score. In the hypothesized association between somatic symptoms and posttraumatic stress symptoms (PTSS), PTSD and non-PTSD groups were compared, correlations between PTSS and severity of CPC were analyzed, and a regression model was performed.

**RESULTS** There were 363 participants included (mean [SD] age, 13.58 [0.25] years; 174 [47.9%] female, 189 [52.1%] male). Compared with the non-PTSD group, the PTSD group presented with a higher mean (SD) number of somatic symptoms (7.0 [2.5] vs 4.0 [2.5] symptoms;  $t_{360} = 11.7$ ;  $P < .001$ ), and higher mean (SD) intensity (10.4 [4.6] vs 4.8 [3.7] points;  $t_{360} = 12.6$ ;  $P < .001$ ). Most of the explored somatic symptoms positively correlated with the intensity of PTSS and their functional alterations (eg, PTSS intensity correlated with stomach pain symptoms [ $r = .30$ ;  $P < .001$ ]; and with headaches symptoms [ $r = .44$ ;  $P < .001$ ]). In the regression model, the combination of migraines, palpitation, nausea, tiredness, and sleep disorders explained 6.5% of the variance in the PTSD group. ( $F_{1,341} = 22.651$ ;  $P < .001$ ).

**CONCLUSIONS AND RELEVANCE** In this cross-sectional study, somatic symptoms were positively correlated with PTSS both in frequency and intensity among youths. These results suggest that the systematic screening for somatic symptoms in youths with traumatic exposure should be a routine evaluation procedure.

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## Key Points

**Question** Are somatic symptoms associated with traumatic experiences in children and adolescents?

**Findings** In this cross-sectional study of 363 youths aged 7 to 17 years, those with a history of trauma exhibited significantly more frequent and intense somatic symptoms, including migraines, heart rate acceleration, nausea, fatigue, and sleep disorders.

**Meaning** These results suggest that collaboration between pediatricians and mental health professionals is essential for early identification and comprehensive care for children and adolescents with trauma-related somatic symptoms.

## + Supplemental content

Author affiliations and article information are listed at the end of this article.

## Introduction

Somatic symptoms include a variety of bodily complaints, which cause functional impairment and major emotional distress; they may or may not be associated with other diagnosed medical conditions. These include symptoms such as gastrointestinal disorders, body pain (eg, arms, back, and headaches), cardiopulmonary effects (eg, chest pain and dizziness), and fatigue (eg, sleep disturbances and lack of energy).<sup>1</sup> In adults, the overall prevalence of somatic symptoms is estimated at 10% to 25%.<sup>2</sup> These percentages can vary according to the populations studied. For example, studies carried out in emergency departments show that somatic symptoms correspond to at least 33% of consultations in primary care and between 15% and 54% of specialist consultations.<sup>3</sup> These figures are relatively similar to those found in at-risk populations. Thus, in a recent study, Leathers et al<sup>4</sup> found that Latinx immigrants presented moderate somatizations in 37% of their samples. Of interest, research has shown that somatic symptoms in adults are strongly associated with adverse childhood experiences (ACE), such as sexual, physical, or emotional abuse, child neglect, and many others.<sup>5-8</sup> Several studies have examined somatic symptoms using a variety of measures, including self-reported health states,<sup>9,10</sup> data from medical records,<sup>11</sup> and medical observations.<sup>12</sup> In all cases, significant associations were found between childhood trauma and negative effects on physical health.<sup>13</sup> History of ACEs correlates with poor mental and physical health, including the presence of chronic disorders in adults such as asthma, chronic obstructive pulmonary disease, osteoarthritis, metabolic syndrome, and even cancer.<sup>14</sup> The frequency of general somatic symptoms, such as pain, headaches, and stomachaches, differs according to gender.<sup>15</sup> In adults, somatic symptoms appear more frequently in women than in men. These findings seem similar in adolescence but appear to be more heterogeneous in younger children.<sup>16</sup> Indeed, some studies find more somatic symptoms in young girls than in boys,<sup>17</sup> whereas in other studies there were no gender differences.<sup>18</sup>

Research has shown that posttraumatic stress disorder (PTSD) is the most common psychiatric disorder occurring after a traumatic event (or after ACEs) in both young people and adults.<sup>19,20</sup> PTSD is a major chronic psychiatric condition formally recognized in 1980.<sup>21</sup> PTSD may occur 1 month after a direct or indirect exposure to a traumatic event, which is defined as a life-threatening condition.<sup>22</sup> In adults, PTSD has an estimated lifetime prevalence between 3.8% and 4.7% in the US<sup>23-25</sup> and between 0.4% and 3.8% in Europe.<sup>26-28</sup> Among children and adolescents, PTSD prevalence is higher, with an estimated risk of developing PTSD after a traumatic event between 20% and 50%.<sup>29-31</sup> PTSD depends on several factors such as age, neurodevelopment, type of traumatic event, degree of exposure, and sex assigned at birth.<sup>30,32-34</sup> Female individuals exhibit more extreme acute reactions to traumatic events than male individuals, and therefore an increased risk of PTSD.<sup>35-37</sup> Rumination thoughts have been cited to explain differences in the frequency of PTSD between female and male individuals.<sup>38</sup> However, other studies found no effect of sex assigned at birth in the development of PTSD.<sup>39,40</sup> With regard to the effect of sex assigned at birth on the increase and maintenance of PTSD symptoms, some studies suggest that these differences begin to appear after the age of 12 years.<sup>41</sup> In particular, children and adolescents experiencing a sexual violence event, hostage situation, or terrorist attack are at risk of PTSD in more than 50% of cases,<sup>30,34,42</sup> whereas the ones experiencing natural disasters are approximately 30%.<sup>43</sup> Moreover, a growing literature is examining age-specific clinical features and the necessity of developing child-focused interventions.<sup>44</sup>

Somatic symptoms are common in children and adolescents with psychiatric disorders.<sup>45</sup> In adults, PTSD is the psychiatric disorder associated with the highest frequency of somatic symptoms.<sup>46</sup> Of interest, among adult survivors of natural disasters, sleep problems and pain (head and back) are described as major concerns.<sup>47,48</sup> However, studies are scarce regarding the pediatric population, in particular concerning somatic symptoms following exposure to disasters triggered by natural hazards. For instance, authors investigating somatic symptoms among pediatric populations, who either witnessed Hurricane Katrina in the US or a 5.8 magnitude earthquake in Japan, did not distinguish between young participants with or without PTSD.<sup>49,50</sup> To our knowledge, only 1 study examined the association between somatic symptoms and PTSD in 3053 school children after a 7.0

magnitude earthquake in Japan.<sup>51</sup> Nevertheless, a limitation of this study was the use of a nonvalidated PTSD tool. Thus, evidence about the association between pediatric PTSD in youths and somatic symptoms is still poorly investigated.

In this context, the primary aim of our study was to explore the frequency and intensity of somatic symptoms in children and adolescents exposed to 1 or more traumatic events as defined by the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5)*,<sup>22</sup> who did or did not develop a PTSD assessed by a validated tool.<sup>52</sup> Secondary objectives were to characterize somatic symptoms associated with PTSD, and to assess the association of the number (single or cumulative) of traumatic events with the severity of the somatic symptomatology.

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## Methods

### Study Design and Setting

This is cross-sectional study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline. Participants were recruited at the Nice Pediatric Psychotrauma Center (NPPC) in southern France. Ethical approval was obtained by the National Ethics Committee NORTHWEST III and registered with ClinicalTrials.gov (NCT03356028). This research is part of a larger study (Program 14-7) looking at the various associations (psychological, cognitive, family) of psychological trauma in a cohort of children. Assessments were conducted after written informed consent from patients or their proxies.

Assessments were conducted by child psychologists or child psychiatrists specializing in trauma with (1) the child or adolescent and (2) the parent(s). The study was systematically proposed to all outpatients consulting at NPPC during a 12-month period from January to December 2021. The NPPC is a specialized outpatient facility dedicated to comprehensively manage and study psychotraumatic conditions among the pediatric population. The NPPC is constituted by a multidisciplinary team including proficiently trained professionals in pediatric psychotrauma and from diverse fields, such as pediatric medicine, child and adolescent psychiatry, psychology, neuropsychology, pediatric nursing, and occupational therapy, among others. The NPPC offers a spectrum of services encompassing thorough assessments and evidence-based therapeutic interventions and conducts clinical research to improve the understanding and treatment of pediatric PTSD.<sup>53</sup>

### Participants

Participants included female and male youths, aged between 7 and 17 years, who were exposed to at least 1 traumatic event as defined by the *DSM-5-TR*<sup>22</sup> 1 month or more prior to the assessment. Gender identity was not assessed. Exclusion criterion was the absence of French language fluency.

CPC uses the *DSM-5* diagnostic criteria to define exposure to a traumatic event. Potentially traumatic events, which include confrontation with death or the threat of death, serious injury or sexual violence, were assessed in the following ways by (1) being directly exposed to 1 or more traumatic events, (2) directly witnessing 1 or more traumatic events, or (3) learning that 1 or more traumatic events have happened to a close family member or friend. In cases of death or threat of death of a family member or friend, the event must have been violent or accidental. The traumatic events defined in the *DSM-5* have been classified into 12 groups (Child PTSD Checklist [CPC] Part 1): (1) crash with automobile, plane, or boat; (2) animal attack; (3) man-made disasters; (4) natural disasters; (5) hospitalization or invasive medical procedures; (6) physical abuse; (7) sexual abuse, assault, or rape; (8) accidental burning; (9) near drowning; (10) witnessing another person's assault; (11) kidnapping; or (12) other. The other category included events such as bullying, the sudden death of a parent, migratory journeys, or certain accidents in everyday life (accidental injury in the home, or a traffic accident not involving a car).

In 2021, the NPPC's active list included 643 patients per year. Applying the inclusion criteria, 232 patients were excluded (age criterion: 157 patients; not fluent in French: 75 patients). The study was therefore proposed to 411 youths (refusal rate: 12%).

## Variables

For the PHQ-13, the variables of interest were the intensity of somatic symptoms (overall score) and the number of somatic symptoms that bothered the child a little or a lot. For the CPC, the variables of interest were concerning traumatic events: the total number of events was counted, enabling us to divide our sample into single vs cumulative (at least 2 different events) exposure groups. The intensity of PTSD symptoms and the intensity of functional impairment were also recorded, enabling us to divide our sample into 2 groups: PTSD vs non-PTSD.

## Measurements

### PHQ-13 Questionnaire

The PHQ-13 is a 13-item somatic symptoms severity scale questionnaire.<sup>54</sup> The items evaluated are (1) stomach pain; (2) back pain; (3) arm, leg, or joint pain; (4) headaches; (5) dizziness; (6) feeling your heart pound or race; (7) shortness of breath; (8) constipation, loose bowels, or diarrhea; (9) nausea, gas, or indigestion; (10) fatigue or low energy; (11) trouble sleeping; (12) chest pain; and (13) fainting spells.

The PHQ-13 questionnaire serves as a continuous measure of somatic symptoms during the period of the previous 7 days. The 13 questions are constructed on a 3-point Likert scale; 0 means no symptom, whereas 1 (bothered a little) and 2 (bothered a lot) mean the presence of a symptom. Cutoffs for the PHQ-13 are 5 points (mild symptom level), 10 points (moderate symptom level), and 15 points (severe symptom level). The PHQ-13 is the pediatric questionnaire derived from the adult version PHQ-15 (the 2 adult items regarding menstruation and sexual intercourse are excluded). The PHQ-13 questionnaire is completed by the child and takes approximately 10 minutes to complete. It was first used for children diagnosed with PTSD after the Lushan earthquake.<sup>34</sup> In adults, the PHQ-15 is a well-validated tool which has shown positive correlation with PTSD severity.<sup>37</sup> The PHQ-15 is equal or superior to other brief measures for assessing somatic symptoms and screening for somatoform disorders.<sup>55</sup>

### Child PTSD Checklist (CPC)

The CPC questionnaire evaluates the severity of posttraumatic stress symptoms (PTSS) in children aged 7 to 17 years<sup>52</sup> and has been recently validated in French.<sup>56</sup> The CPC is divided into 3 parts: the first part assesses the occurrence of 12 types of traumatic events during the child's lifetime (previously described). In the second part, the intensity of 21 possible posttraumatic symptoms (according to the identified traumatic event in part 1) is assessed during a 2-week period using a Likert scale (score of 0 [not at all] to 4 [everyday]). In the third part, functional impairment in relation to part 2 is assessed using 6 Likert-scale questions. The questionnaire can be administered to any child over 7 years of age who has experienced a potentially traumatic event at least 1 month prior to completing it. The CPC questionnaire is completed by the child and takes around 30 minutes to complete. The total score of PTSS intensity ranges from 0 to 84, with a probable diagnosis cutoff of 20. Functional impairment score ranges from 0 to 24, with a probable diagnosis cutoff of 4.<sup>56</sup>

## Bias

Questionnaires were completed by the children in the presence of the research team. For the somatic symptoms questionnaire (PHQ-13), a semistructured interview consisting of 3 questions was used to elicit whether the child had been ill or not during the week before the assessment (Have you been ill? Did you miss school because of that? Did you see a physician for this?). If the child missed classes or consulted a physician, the study visit was rescheduled. For the CPC, the main bias is related to difficulties in understanding instructions or questions. These could be reformulated by the psychologist or child psychiatrist.

## Study Size

The number of participants required was estimated on the assumption that the mean (SD) somatic symptom intensity would be 5.0 (5.0) in the non-PTSD group and 10.0 (5.0) in the PTSD group. With a first-species risk of 5.0%, a second-species risk of 5.0%, and a 2-tailed test, it was calculated that 26 patients would be needed in each group, giving a total of 52 patients. However, the study was offered to all eligible NPPC patients, without stopping at the calculation of the sample size.

## Quantitative Variables

The number of somatic symptoms (which ranges between 0 and 13) and their intensity (score between 0 and 26) were extracted from the PHQ-13. The presence of a somatic symptom referred to 1 or 2 based on the child's answer, and the absence of a symptom referred to a value of 0.

The CPC provided the intensity of PTSS (score between 0 and 80) and the intensity of functional impairment (score between 0 and 24). Probable PTSD and non-PTSD groups were defined based on CPC symptoms cutoff severity scores (PTSD group had CPC total severity score  $\geq 20$  and functional impairment  $\geq 4$ ; non-PTSD group had CPC total severity score  $\leq 19$  and functional impairment  $\leq 3$ ). Single (1) and cumulative (more than 1) traumatic events groups were defined based on CPC traumatic events classification.

## Statistical Analysis

All analyses were performed with Statistica version 13.3 (TIBCO Software Inc) in January 2022. Statistical significance was set at a 2-tailed  $P < .05$ . Sociodemographic data (age, sex, and number of visits prior to inclusion) were extracted from local Lisia software, which collects computerized medical records of the NPPC. Continuous variables were reported as means and SDs, and categorical variables as frequencies and relative percentages. Missing data were less than 1%.

To compare continuous sociodemographic data according to the presence of PTSD in children, 1-way analysis of variance was performed. Correlations between somatic symptoms (according to PHQ-13), sociodemographic, and traumatic events were performed using Pearson correlation coefficients. Student  $t$  tests were performed to compare somatic symptoms between PTSD and non-PTSD groups, as well as between single and cumulative traumatic events groups.

To investigate whether somatic symptoms (PHQ-13 scores) were significantly associated with the participants' severity of PTSS (CPC-child symptoms score), multiple regression analysis was used. The regression model included the different somatic symptoms with age and sex as moderating factors.

## Results

### Participants

Among 363 youths included in the study, 174 (47.9%) were female and 189 (52.1%) were male. Ages ranged from 7 to 17 years, and the mean (SD) age was 13.58 (0.25) years.

### Descriptive Data

Sociodemographic characteristics are described in **Table 1**. Of the 363 youths who experienced a potentially traumatic event, 288 (79.3%) were directly exposed, 36 (9.9%) were indirectly exposed, and 39 (10.7%) witnessed a potentially traumatic event. According to the CPC, 144 youths (39.7%) were diagnosed with PTSD.

The frequency of somatic symptoms (PHQ-13) is shown in **Figure 1**. The frequency of each somatic symptom was higher in the PTSD group.

**Figure 2** shows the distribution of traumatic experiences (according to the first part of the CPC). In our sample, man-made disaster (terrorist attack on July 14, 2016;  $n = 200$  [55.1%]), witnessing assault ( $n = 109$  [30.0%]), and hospitalization ( $n = 94$  [25.9%]) were the most common traumatic events experienced.

Mean (SD) PTSS intensity was rated at 41.8 (13.5) points with a cutoff of 20 for the PTSD group, with mean (SD) functional impairment at 10.6 (5.2) points with a cutoff of 4. The non-PTSD-group had a mean (SD) CPC score intensity of 11.3 (9.7) points and a mean (SD) functional impairment of 2 (3) points.

**PTSD and Somatic Symptoms**

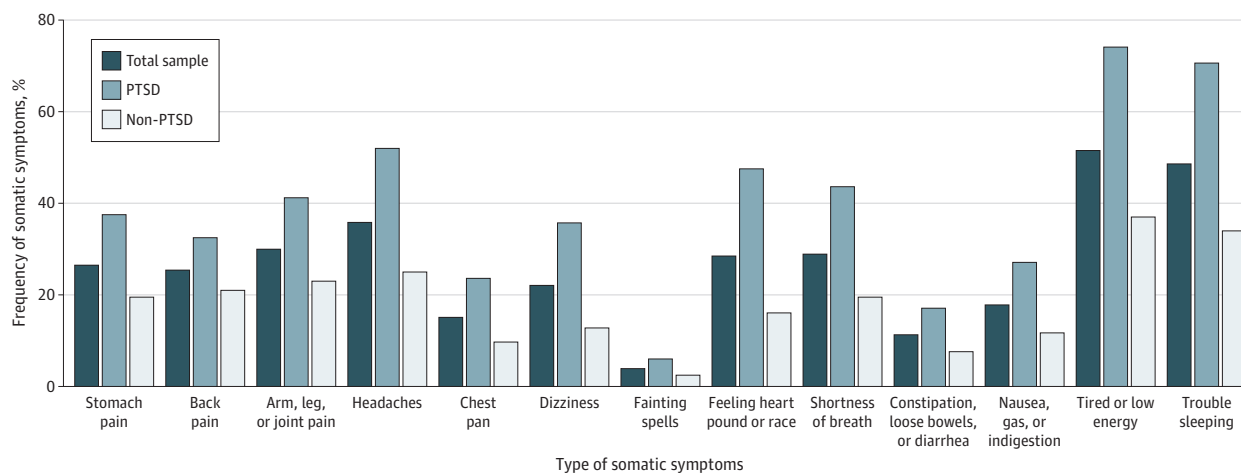
The mean (SD) intensity of somatic symptoms differed significantly between the PTSD and the non-PTSD groups (PTSD: 10.4 [4.6] vs non-PTSD: 4.8 [3.7] points;  $t_{360} = 12.6$ ;  $P < .001$ ). The mean (SD) number of somatic symptoms assessed by PHQ-13 was also higher in the PTSD group (PTSD: 7.0 [2.5] symptoms vs non-PTSD: 4.0 [2.5] symptoms;  $t_{360} = 11.7$ ;  $P < .001$ ). As shown in **Table 2**, most of the explored somatic symptoms (PHQ-13) positively correlated with the intensity of PTSS and functional impairments. For example, PTSS intensity correlated with stomach pain symptoms ( $r = .30$ ;  $P < .001$ ) and with headaches symptoms ( $r = .44$ ;  $P < .001$ ).

**Table 1. Sample Sociodemographic Characteristics (N = 363)**

Variables	No. (%)			P value
	Total sample	Non-PTSD	PTSD	
Participants	363 (100.0)	219 (60.3)	144 (39.7)	.02
Sex				
Female	174 (47.9)	93 (42.5)	81 (56.2)	.02
Male	189 (52.1)	126 (57.5)	63 (43.8)	
Traumatic events				
Single	131 (36.1)	96 (43.8)	35 (24.3)	<.001
Cumulative	232 (63.9)	123 (56.2)	109 (75.7)	
Somatic symptoms				
Absent	139 (38.3)	123 (56.2)	16 (11.1)	<.001
Mild	118 (32.5)	72 (32.9)	46 (31.9)	
Moderate	73 (20.1)	19 (8.7)	54 (37.5)	
Severe	33 (9.1)	5 (2.2)	28 (19.5)	
Age, mean (SD), y	13.7 (0.3)	13.2 (0.3)	14.4 (0.3)	<.001
No. of visits in lifetime, mean (SD)	15.5 (19.6)	13.8 (16.6)	18.11 (23.3)	.04
PHQ-13, mean (SD), symptoms	7.0 (5)	4.8 (3.8)	10.4 (4.6)	<.001
CPC, mean (SD), points	23.4 (18.8)	11.3 (9.7)	41.8 (13.5)	<.001

Abbreviations: CPC, Child PTSD Checklist; PHQ-13, Patient Health Questionnaire-13; PTSD, posttraumatic stress syndrome.

**Figure 1. Somatic Symptoms in the General Sample and According to PTSD and Non-PTSD Groups**



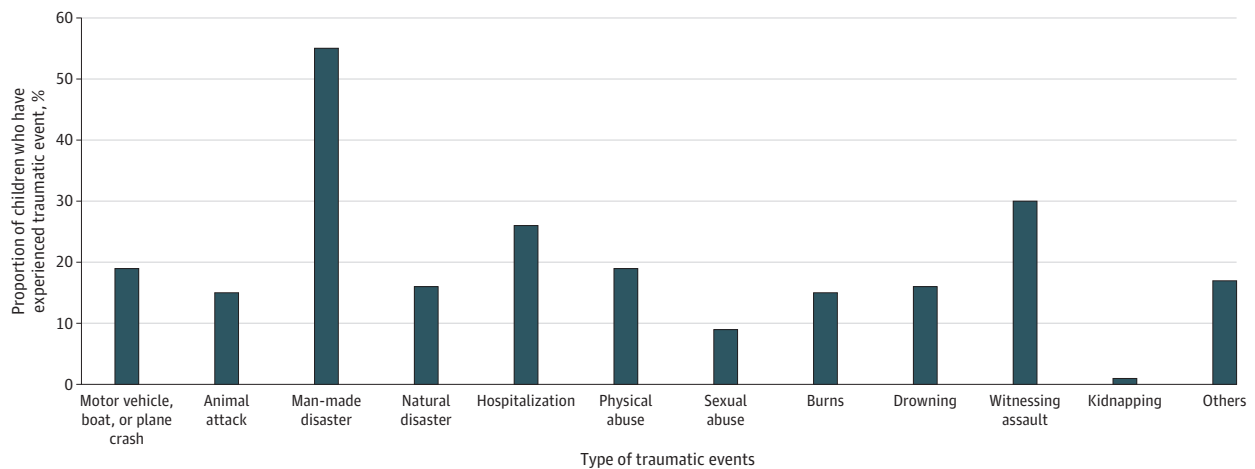
PTSD indicates posttraumatic stress syndrome.

### Cumulative Traumatic Events and Somatic Symptoms

Mean scores of somatic symptoms assessed by PHQ-13 are presented in **Table 3**, according to whether the traumatic experience was single or cumulative. Among 232 youths with cumulative trauma, 82 (35.3%) had 2 traumatic experiences, 69 (29.7%) had 3, and 81 (35.0%) had 4 or more. The cumulative traumatic events group differed significantly from the single traumatic experience group in terms of both the mean (SD) intensity score (7.8 [5.1] vs 5.7 [4.3] points;  $t_{349} = 3.92$ ;  $P < .001$ ) and the mean (SD) number of somatic symptoms (PTSD: 5.5 [3.0] vs 4.3 [2.8] symptoms;  $t_{349} = 3.5$ ;  $P < .001$ ).

In the multiple regression model, we included only somatic symptoms that were significantly different between PTSD groups (eTable in [Supplement 1](#)). The results of the regression indicated that the model explained 6.5% of the variance of PTSS severity score ( $F_{1,341} = 22.651$ ;  $P < .001$ ).

Figure 2. Frequency of Traumatic Experiences



The total percentages are higher than 100% because some children may experience more than 1 trauma.

Table 2. Correlation Matrix for Symptom Intensity and Functional Impairment Among Somatic Symptoms, Age, Sex, and PTSD

Somatic symptoms	Age		Sex (boy = 0; girl = 1)		PTSD intensity		Functional impairments	
	r	P value	r	P value	r	P value	r	P value
Stomach pain	0.10	.08	0.20	<.001	0.30	<.001	0.27	<.001
Back pain	0.15	.004	0.95	.08	0.24	<.001	0.24	<.001
Arm, leg, or joint pain	-0.03	.55	-0.06	.29	0.24	<.001	0.20	<.001
Headaches	0.15	.006	0.17	.001	0.44	<.001	0.38	<.001
Chest pain	0.07	.21	0.10	.08	0.30	<.001	0.32	<.001
Dizziness	0.16	.003	0.10	.05	0.41	<.001	0.32	<.001
Fainting spells	0.04	.46	0.09	.08	0.18	.001	0.16	.003
Feeling heart pound or race	0.16	.002	0.19	<.001	0.51	<.001	0.45	<.001
Shortness of breath	0.12	.03	0.14	.007	0.41	<.001	0.34	<.001
Constipation, loose bowels, or diarrhea	0.03	.62	-0.03	.62	0.17	.002	0.13	.02
Nausea, gas, or indigestion	0.01	.88	0.04	.47	0.32	<.001	0.29	<.001
Tired or low energy	0.21	<.001	0.17	.002	0.51	<.001	0.47	<.001
Trouble sleeping	0.07	.19	0.17	.002	0.52	<.001	0.43	<.001

Abbreviation: PTSD, posttraumatic stress disorder.

## Discussion

This cross-sectional study found that the presence of somatic symptoms was positively correlated with the presence of traumatic stress symptoms in a large population of children and adolescents who experienced at least 1 DSM-5–defined traumatic event.<sup>22</sup> In our study sample, we found that somatic symptoms were more prevalent and more intense among participants who were diagnosed with PTSD. Somatic symptoms (such as abdominal pain, headache, and pain in the limbs) are common complaints among the pediatric population. Nevertheless, youths who have been traumatized potentially show these symptoms with a higher frequency and intensity than seen among studies in youths who are not traumatized.<sup>57</sup> Moreover, somatic symptoms can significantly interfere with quality of life, individual functioning, and school attendance,<sup>58</sup> leading to adverse health effects even in adolescence.<sup>59</sup>

In the case of traumatic exposure, physical response occurs as a continuum, ranging from a physiological response (low number and intensity of symptoms) to a pathological response (huge number and intensity of somatic symptoms). At a pathophysiological level, this is understandable when considering current models of the autonomic nervous system dysregulation, fully evident in people experiencing PTSD.<sup>60</sup>

In one of the largest studies investigating somatic symptoms in an adult military sample (n = 14 445), more than half of the participants with PTSD (59.6%) met the criteria for somatoform disorder, whereas 26.5% of the subsyndromal-PTSD group and only 2.7% of the non-PTSD group were diagnosed with the same comorbidity.<sup>61</sup> As aforementioned, studies about the pediatric population are scarce, and they principally assess somatic symptoms after an exposure to the natural disaster (eg, Hurricane Katrina), without distinguishing between youths with or without PTSD,<sup>50</sup> or adopting nonvalidated tools (eg, 5.8 magnitude earthquake in Japan).<sup>51</sup> In their work on the pediatric sample involving the 5.8 magnitude earthquake in Japan, Zhang et al<sup>51</sup> found that the most frequent somatic symptoms in the PTSD group were sleep disorders (83.2%), followed by feeling tired or having low energy (74.4%), stomachache (63.2%), dizziness (58.1%), and headache (57.7%). Their results appear similar to ours, potentially indicating that somatic disorders are similar whatever the traumatic exposure (wide range of traumatic events vs single event [eg, earthquake in Japan]).

The frequency of the following somatic symptoms, such as headaches, fatigue, and sleep disorders, correlates with sex, with a higher frequency in female individuals. These results are consistent with the literature on both adolescent and adult women.<sup>62,63</sup> According to the literature, somatic symptoms frequency appears to be equal between females and males until puberty, when female patients appear to have higher rates of somatic symptoms. One hypothesis is that male adolescents tend to exhibit more externalizing behaviors than their female peers, who use more

Table 3. Somatic Symptoms According to Cumulative Traumatic Events

Somatic symptoms	Mean (SD)		t value	P value
	Single trauma	Cumulative trauma		
Stomach pain	0.4 (0.6)	0.6 (0.7)	2.10	.03
Back pain	0.4 (0.7)	0.6 (0.7)	1.55	.12
Arm, leg, or joint pain	0.5 (0.7)	0.7 (0.7)	1.73	.08
Headaches	0.6 (0.7)	0.8 (0.8)	2.23	.02
Chest pain	0.2 (0.5)	0.3 (0.6)	2.02	.04
Dizziness	0.3 (0.6)	0.5 (0.7)	2.62	.009
Fainting spells	0.1 (0.3)	0.1 (0.4)	1.26	.20
Accelerated heart rate	0.4 (0.6)	0.7 (0.8)	3.25	.001
Shortness of breath	0.5 (0.8)	0.6 (0.8)	1.14	.25
Constipation, loose bowels, or diarrhea	0.2 (0.4)	0.3 (0.6)	1.19	.23
Nausea, gas, or indigestion	0.3 (0.6)	0.4 (0.7)	0.43	.66
Fatigue	0.9 (0.7)	1.1 (0.9)	2.44	.01
Sleep disorders	0.7 (0.8)	1.1 (0.8)	3.75	<.001



internalizing or ruminative coping styles.<sup>64,65</sup> Noticeably, women are at greater risk of exposure to acts of violence,<sup>16,66</sup> which leads to higher rates of PTSD, as well as somatic symptoms such as headaches, chronic pain, sleep disorders, and gastrointestinal symptoms.<sup>67</sup> One of the limitations, though, regularly cited in studies of somatic symptoms in medical settings is the overrepresentation of women, with nearly 75% of patient samples being women.<sup>68-71</sup> This bias is not present in our cohort (47.9% female, 52.1% male), yet a substantial number of somatic symptoms appear to be more prevalent in female individuals.

To the best of our knowledge, our study is the first to find that cumulative traumatic events are associated with a higher number and a greater intensity of several somatic symptoms, including sleep disturbances, dizziness, increased heart rate, and several pain types (headaches, stomachaches, and chest pain). Our results are supported by the growing literature on ACEs, which indicates an increase in somatic symptoms among individuals with multiple ACEs. Regarding children's and adolescents' health after a traumatic experience, scientific literature indicates that they are at increased risk for cardiovascular problems, cancer, osteoarthritis, and metabolic disorders in adulthood.<sup>72,73</sup> An association between the presence of traumatic events in childhood and systemic increased inflammation has been also reported.<sup>74</sup> Finally, the regression model of the present study showed that the combination of migraines, heart rate acceleration, nausea, tiredness, and sleep disorders explained 6.5% of the variance of the PTSD symptomatology in our sample.

Research has highlighted that somatic symptoms following traumatic experiences might be associated with multiple medical visits, check-ups, or drug treatments.<sup>75,76</sup> They can also affect children's social and leisure activities as well as sleep quality.<sup>77</sup> In addition, secondary medical procedures are sometimes anxiety-inducing and might have a further negative effects on children's and adolescents' school functioning, increasing stress and absenteeism.<sup>78</sup> Thus, systematic assessments of traumatic experience in youths with unexplained and/or multiple somatic symptoms may be a useful routine screening procedure in primary pediatric care. Of note, when multiple somatic symptoms such as accelerated heart rate, headaches, and nausea occur in concomitance with trouble sleeping, a PTSD diagnosis should be investigated. A better and earlier detection of pediatric PTSD might lead to timely specialized diagnosis and effective therapeutic management of these patients.

### Limitations

This study has limitations. The first is regarding the heterogeneity of the sample regarding age and traumatic experiences. However, we chose to systematically include all participants during a 12-month period. In a similar manner, the mean number of visits prior to inclusion (15.5) emphasizes that a substantial part of included patients were undergoing specialized psychotrauma management and should not be considered as a naturalistic or general population sample. This means that our results should not be generalized to the entire youth population, but only to individuals who have experienced traumatic events. Not including children without reported traumatic experience could also be considered a limitation.

Another limitation is due to the diagnosis only confirmed by the CPC without the systematic use of standardized clinical interviews. However, an elevated mean score on the CPC is in favor of a more severe disorder; the mean severity was 41.8 in the PTSD group vs 11.3 in the non-PTSD group (cutoff 20) and the mean functional impairment was 10.6 vs 2.0 (cutoff 4).

Another limitation of the study is that somatic symptoms could not be assessed prior to traumatic exposure. However, the presence of somatic symptoms only following trauma exposure, as well as the absence of temporary conditions (eg, virus, treatment, unusual physical activity) has been verified by the examiner during the assessment.

## Conclusions

In this cross-sectional study, we found that children who have experienced at least 1 *DSM-5*-defined trauma have a high prevalence of somatic symptoms, and those experiencing PTSD even more so. The interplay between exposure to a traumatic event, emotional distress, and somatic symptoms should encourage the various professionals involved to work together to identify children and adolescents in distress. Thus, the systematic screening for somatic symptoms in youths with traumatic exposure should be a routine evaluation procedure. This study highlights the importance of involving mental health professionals in the assessment and treatment of children with somatic and posttraumatic stress symptoms.

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### ARTICLE INFORMATION

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#### SUPPLEMENT 1.

eTable. Regression Coefficients Predicting Traumatic Symptoms

#### SUPPLEMENT 2.

Data Sharing Statement