Published in final edited form as:
Child Psychiatry Hum Dev. 2014 August ; 45(4): 398–407. doi:10.1007/s10578-013-0410-x.

Somatic Complaints in Anxious Youth

Sarah A. Crawley, Ph.D.[1,2], **Nicole E. Caporino, Ph.D.**[2], **Boris Birmaher, M.D.**[3], **Golda Ginsburg, Ph.D.**[4], **John Piacentini, Ph.D.**[5], **Anne Marie Albano, Ph.D.**[6], **Joel Sherrill, Ph.D.**[7], **Dara Sakolsky, M.D., Ph.D.**[3], **Scott N. Compton, Ph.D.**[8], **Moira Rynn, M.D.**[6], **James McCracken, M.D.**[5], **Elizabeth Gosch, Ph.D.**[9], **Courtney Keeton, Ph.D.**[4], **John March, M.D., M.P.H.**[8], **John T. Walkup, M.D**[10], and **Philip C. Kendall, Ph.D.**[2]

[1]Kennedy Krieger Institute/Johns Hopkins University School of Medicine

[2]Department of Psychology, Temple University

[3]Western Psychiatric Institute and Clinic, University of Pittsburgh Medical Center

[4]Division of Child and Adolescent Psychiatry, The Johns Hopkins University School of Medicine

[5]Semel Institute for Neuroscience and Human Behavior, University of California Los Angeles

[6]Department of Psychiatry, Columbia University Medical Center

[7]Division of Services and Intervention Research, National Institute of Mental Health

[8]Department of Psychiatry and Behavioral Services, Duke University Medical Center

[9]Department of Psychology, Philadelphia College of Osteopathic Medicine

[10]Division of Child and Adolescent Psychiatry, Weill Cornell Medical College

Abstract

This study examined (a) demographic and clinical characteristics associated with physical symptoms in anxiety-disordered youth and (b) the impact of cognitive-behavioral therapy (Coping Cat), medication (sertraline), their combination, and pill placebo on physical symptoms. Youth (*N* = 488, ages 7–17 years) with a principal diagnosis of generalized anxiety disorder, separation anxiety disorder, or social phobia participated as part of a multi-site, randomized controlled trial and received treatment delivered over 12 weeks. Diagnostic status, symptom severity, and impairment were assessed at baseline and week 12. The total number and severity of physical symptoms was associated with age, principal diagnosis, anxiety severity, impairment, and the presence of comorbid internalizing disorders. Common somatic complaints were headaches, stomachaches, head cold or sniffles, sleeplessness, and feeling drowsy or too sleepy. Physical symptoms decreased over the course of treatment, and were unrelated to treatment condition. Clinical implications and directions for future research are discussed. (ClinicalTrials.gov number, NCT00052078)

Correspondence should be addressed to Philip C. Kendall. Weiss Hall, 1701 North 13th Street, Philadelphia, PA 19122. pkendall@temple.edu. Tel: 215-204-1558.

Keywords

children; adolescents; anxiety; treatment

Anxiety disorders occur in approximately 10% of youth [1] and are associated with impairment in family, social, and academic functioning [2, 3]. If left untreated, anxiety disorders run a chronic course [4, 5, 6] and are "gateway" disorders associated with an increased risk for depression, substance use problems, and educational underachievement [7, 8].

Somatic complaints are common among anxiety-disordered youth, with more than 50% reporting at least one somatic complaint [9–11]. These complaints include a range of physical symptoms, such as headaches, stomachaches, muscle tension/pain, difficulty breathing, shaking, pounding or racing heart, sweating, blushing, and fatigue. Physical symptoms play a major role in the classification of anxiety disorders. For example, somatic complaints are required for the diagnosis of panic disorder, generalized anxiety disorder (GAD), and posttraumatic stress disorder, and are among the criteria possible for a diagnosis of separation anxiety disorder (SAD) and acute stress disorder [12]. Somatic complaints are not specific to one anxiety disorder and are common in other mental health disorders with diagnostic criteria that do not include somatic complaints (e.g., major depressive disorder) [11].

Research comparing the rate of somatic complaints across disorders has yielded mixed results. Hofflich et al. [11] found that somatic symptoms are equally common in youth with principal diagnoses of GAD, SAD, and social phobia (SoP) even though somatic symptoms are required for a diagnosis of GAD only. In contrast, Ginsburg et al. [10] found that somatic symptoms were more common in youth with GAD as compared to SoP and SAD. In community samples, somatic complaints are more common among adolescents than younger children [13]. Age differences in somatic complaints have been found in anxious youth as well. For example, Ginsburg et al. [10] reported that older youth (12–17 years) were more likely than younger youth (6–11 years) with anxiety disorders to endorse somatic complaints. Although at least one study did not find age differences in somatic symptoms, this could have been due to a relatively restricted age range (7–14 years) [11].

Somatic complaints have been found to be more common among girls than boys in community samples [13]. However, with the exception of a study that sampled African American adolescents exclusively [14], research has not supported sex differences in the overall number of physical symptoms reported by youth with anxiety disorders [10, 11, 15]. Two studies reported sex differences in the rates with which specific physical symptoms were endorsed [10, 16]. Somatic complaints among youth with anxiety disorders have not been related to race or family income [10, 11, 15]. However, the reported findings were from relatively small samples with limited diversity.

Somatic symptoms in youth with anxiety disorders may be associated with greater psychopathology. Relative to anxiety-disordered children without somatic complaints, children with anxiety disorders and somatic complaints have more severe anxiety and poorer

global functioning [10, 16]. They perform less well academically and are more likely to refuse school [15, 17]. Also, anxiety-disordered youth with somatic symptoms are more likely than their counterparts without somatic symptoms to have comorbid externalizing disorders [11] and depressive symptoms [11, 18]. Finally, among anxiety-disordered adolescents, somatic symptoms are negatively associated with perceived competence across multiple domains [14].

Despite these relationships, few studies have examined change in the number of somatic complaints following anxiety treatment. Ginsburg et al. [10] reported decreased somatic complaints following fluvoxamine treatment and Storch et al. [16] reported reduced somatic symptoms following CBT for obsessive-compulsive disorder (OCD). Masia-Warner et al. [19] reported reductions in physical symptoms following a CBT protocol modified to target anxiety-related somatic complaints. To date, no studies have compared the effect of CBT and medication, alone and in combination, on the number or severity of physical symptoms.

The current study examined somatic complaints in children and adolescents who received CBT (*Coping Cat*), medication (sertraline; SRT), their combination (CBT + SRT), or pill placebo [20]. We examined baseline levels of somatic complaints in relation to demographic variables (i.e., age; sex; race/ethnicity; socioeconomic status) and presenting characteristics (i.e., principal diagnosis; anxiety severity; functional impairment; comorbidities[1]), and we examined treatment-related change in somatic complaints and associations with improvement in anxiety. The number of general somatic complaints was reported by youth using a symptom checklist whereas the overall severity of anxiety-related somatic complaints was reported by parents and youth, and rated by clinicians based on discussion with parents and children together.

Method

Participants

Participants were 488 youth enrolled in the Child/Adolescent Anxiety Multimodal Study (CAMS [20]), a six-site randomized controlled trial that compared the efficacy of CBT, SRT, their combination, and pill placebo. Participants ranged in age from 7 to 17 years (M = 10.7, SD = 2.8 years) and met criteria for a principal diagnosis of SAD, GAD, and/or SoP based on composite rating from the Anxiety Disorders Interview Schedule for DSM-IV—Child and Parent Versions (ADIS-IV-C/P [21]). Participants responded to announcements in local media and from clinics, schools, primary care offices, mental health centers, churches/temples, and community organizations. Youth with comorbid psychiatric disorders were included in the trial Participants with comorbid, secondary dysthymia were included throughout the trial so long as they were of lesser severity than the target disorder and there was no active suicidality (for methodology details, see Compton et al. [22]).

Approximately 54% of participants were male. The sample was predominantly White (79%), with 9% of participants identifying race as Black, 3% as Asian, 1% as American

[1]Youth with comorbid, secondary depression were initially included in CAMS. However a decision was made to exclude youth with Major Depressive Disorder (MDD) early in the trial.

Indian, <1% as Native Hawaiian/Pacific Islander, and 8% as Other. With regard to ethnicity, 12% of participants self-identified as Hispanic or Latino. The majority of participants (75%) were of middle to high socioeconomic status, as indicated by a score of 40 to 66 on the Hollingshead Four Factor Index of Social Status [23].[2]

Among exclusion criteria were the presence of an unstable medical condition, IQ of less than 80, current school refusal, and failure to respond to two adequate trials of selective serotonin-reuptake inhibitors (SSRIs) or a trial of CBT. Youth were also excluded if their psychiatric condition made participation clinically inappropriate. Clinical characteristics of the sample have been reported in detail by Kendall et al. [24]. The flow of participants through the current study is identical to that reported by Walkup et al. [20].

Measures

Anxiety Disorders Interview Schedule for DSM-IV--Child and Parent Versions (ADIS-IV-C/P)—The ADIS-IV-C/P [21] is a semi-structured interview to diagnose anxiety disorders and common comorbidities in youth. For each disorder, a clinical severity rating (CSR) is assigned using an 8-point scale (with CSRs ≥ 4 indicating a clinical diagnosis). The disorder with the highest CSR is identified as principal. The ADIS-IV-C/P has solid psychometric properties [25, 26]. Based on a review of 10% of videotaped pre- and post-treatment assessments, interrater reliability for diagnostic status (intraclass correlation coefficient) in CAMS ranged from .82 to .88.

Physical Symptoms Checklist (PSC)—The number of physical symptoms was assessed using the PSC [27], a 46-item self-report measure of the extent to which youth are bothered by general health problems over the past week. Items are rated on a Likert scale ranging from 0 (*not at all*) to 3 (*very much*); for this study, item responses were dichotomized to indicate the presence (1, 2, 3) or absence (0) of each symptom and summed. Two gynecological items/symptoms were omitted. In this sample, Cronbach's alpha ranged from .89 to .91.

Pediatric Anxiety Rating Scale (PARS)—The PARS [28] is a clinician-rated measure of the presence and severity of 51 anxiety symptoms in youth. Total scores represent the severity and frequency of anxiety symptoms as well as associated distress, avoidance, and interference during the previous week. For the current study, severity of physical symptoms of anxiety was assessed using an item from the PARS as rated by the parent, child, and clinician. The PARS has acceptable reliability and validity [28, 29]. Inter-rater reliability in CAMS was determined based on a review of 10% of videotaped assessments conducted at pre- and post-treatment (Pearson's $r = .85$).

Children's Global Assessment Scale (CGAS)—The CGAS [30] is a clinician-rated measure of a child's global functioning. The CGAS demonstrates high retest and inter-rater reliability, and discriminates between inpatients and outpatients [30, 31].

[2]Site differences in demographic variables have been discussed by Walkup et al. [20].

Clinical Global Impression Scales (CGI)—The CGI [32] scales provide clinician ratings of global severity (CGI-S) and improvement (CGI-I). The CGI-S ranges from 1 (*not at all ill*) to 7 (*extremely ill*). The CGI-I ranges from 1 (*very much improved*) to 7 (*very much worse*), with scores of 1 (*very much improved*) or 2 (*much improved*) used to designate treatment response. In this study, the CGI-S and CGI-I ratings reflected severity and impairment associated with GAD, SAD, and SoP.

Procedure

All procedures were approved by the site institutional review board and the NIMH data and safety monitoring board. CAMS used a three-gate entry procedure to ensure a stable anxiety diagnosis (see [20, 22]). Informed consent was obtained from all participants. As detailed in Compton et al. [22], independent evaluators (IEs) were trained to reliability in the administration of clinician-rated measures. The ADIS-C/P and CGI-S were used to determine diagnoses and anxiety severity. The PARS was used to assess overall severity of anxiety-related physical symptoms, as rated by parents, youth, and IEs. Number of physical symptoms was reported by youth using the PSC, which was completed approximately one week before the start of treatment. Youth were randomly assigned to one of the four treatment conditions: CBT, SRT, combination, or placebo. Assessments were repeated within approximately five days of the last session. IEs were blind to treatment condition.

Treatment

Cognitive-behavioral therapy—Youth randomized to CBT received 14, 60-minute sessions delivered over a 12-week period. CBT followed the *Coping Cat* program [33, 34], which teaches youth to recognize and manage anxious arousal. The *Coping Cat* was adapted for the study: six sessions focused on anxiety-management skills and eight sessions on exposure tasks. There were 12 individual child sessions and two parent sessions (without the child present). Adolescents received the *C.A.T. Project* [35], the teen version of the Coping Cat program. CBT was delivered by experienced therapists who were certified in the treatment protocols and received regular onsite and cross-site supervision (see [22, 36]).

Medication—Youth randomized to medication received sertraline (SRT) and eight, 30- to 60-minute medication management sessions. Psychiatrists provided education and guidance in addition to symptom review and medication monitoring. Medication was administered on a fixed-flexible schedule beginning with 25 mg of sertraline per day and titrating up to 200 mg by week 8. Participants were eligible for dose increases through week 8 if they continued to be at least mildly ill and experienced minimal side effects. Pill counts and medication diaries were used to enhance and document adherence to the medication regimen.

Combination—Youth randomized to the combination treatment received both the 14-session CBT protocol and the SRT protocols. Pharmacotherapy and CBT appointments, when possible, were scheduled for the same day and location. Communication between CBT therapists and psychiatrists was facilitated by weekly CAMS meetings.

Placebo—Participants assigned to pill placebo were treated with the medication protocol (same as youth assigned to SRT). Psychiatrists were blind to treatment condition.

Data Analytic Plan

Analyses were conducted using participants who completed all measures of interest, as well as with the intent-to-treat sample. An analysis of variance (ANOVA) was conducted to rule out pretreatment differences in somatic complaints by treatment condition. Correlational analyses and *t*-tests assessed demographic differences in somatic complaints; based on results, age was covaried in further analyses. Analyses of covariance (ANCOVA) examined differences in somatic complaints by principal diagnosis and presence/absence of individual anxiety disorder diagnoses (SAD, GAD, SoP). Correlations evaluated relationships between physical symptoms and anxiety severity, impairment, and treatment-related improvement. Change in physical symptoms from pre- to post-treatment was examined using a paired-samples *t*-test. An ANCOVA examined differences between treatment responders and non-responders in posttreatment number and severity of physical symptoms, controlling for pretreatment symptoms. ANCOVA assessed the relationship between physical symptoms and the presence of comorbid disorders (0, 1, or ≥ 2). An alpha level of .01 was used for all analyses. Cohen's *d* is reported as an index of effect size.

Results

The frequencies with which physical symptoms were endorsed at pretreatment are presented in Table 1. Almost all participants (95%) endorsed at least one physical symptom on the PSC. The most common symptoms reported by youth at pretreatment were headaches (50%), trouble sleeping (48%), stomach pain or aches (47%), head cold or sniffles (40%), restlessness or uncomfortable urge to move (35%), sleeplessness (34%), feeling drowsy or too sleepy (34%), and nightmares or very strange dreams (34%). Means and standard deviations for the number and severity of physical symptoms at pretreatment are presented in Table 2. Child, parent, and clinician ratings of the severity of anxiety-related physical symptoms were highly correlated (Pearson's $r \geq .80$); given that the clinician rating was based on parent and child report, it was used for all subsequent analyses.

Demographic differences in physical symptoms

The number of physical symptoms endorsed by youth at pretreatment was significantly related to age ($r = .17$, $p < .01$), with younger children reporting fewer symptoms than older children. Age was also positively associated with the severity of physical symptoms, based on clinician rating ($r = .17$, $p < .01$). Controlling for age, the number and severity of physical symptoms at pretreatment did not differ by SES, sex, or race/ethnicity. At posttreatment, the number of physical symptoms endorsed by youth was positively associated with age ($r = .17$, $p < .01$), as was the severity of physical symptoms ($r = .28$, $p < .01$). The number and severity of physical symptoms at posttreatment was not related to SES, sex, or race/ethnicity.

Differences in physical symptoms by principal diagnosis

Table 1 presents the frequency of individual physical symptoms by principal diagnosis at pretreatment. When controlling for age, clinician-rated severity of physical symptoms differed significantly based on principal diagnosis, $F(6, 479) = 4.19$, $p < .01$, as did number of symptoms reported, $F(6, 450) = 4.07$, $p < .01$. Means and standard deviations for the number and severity of physical symptoms by principal diagnosis are in Table 3. Analyses were repeated to determine whether having a specific diagnosis of GAD, SAD, or SoP (regardless of whether it was principal) was associated with the report of physical symptoms. Diagnostic group significantly predicted the number of physical symptoms endorsed by youth, $F(4, 453) = 9.23$, $p < .01$. Follow-up analyses revealed that GAD ($t = -3.80$, $p < .01$, $d = -.36$) and SAD ($t = -3.09$, $p < .01$, $d = -.29$) were significantly associated with the number of physical symptoms endorsed by youth while SoP was not ($t = -.26$, $p = .80$). GAD ($t = -4.40$, $p < .01$, $d = -.41$) and SAD ($t = -2.50$, $p = .01$, $d = -.23$) were also significantly associated with clinician-rated severity of physical symptoms while SoP was not ($t = -.43$, $p = .67$).

Relationship of physical symptoms to impairment

Global functioning, as measured using the CGAS, was negatively associated with the pretreatment number of physical symptoms endorsed by youth ($r = -.13$, $p < .01$) and clinician-rated severity of physical symptoms ($r = -.34$, $p < .01$).

Change in physical symptoms by treatment condition

At baseline, there were no differences by treatment condition in the number or severity of somatic complaints when controlling for age. The number of physical symptoms reported by youth decreased significantly from pre- to post-treatment, $t(390) = 13.15$, $p < .01$, $d = 1.33$, as did clinician-rated severity of physical symptoms, $t(437) = 20.01$, $p < .01$, $d = 1.91$.

The number of physical symptoms reported by youth at posttreatment was not related to treatment condition when controlling for age and pretreatment number of physical symptoms (Table 4). Planned contrasts did not reveal significant differences in the number and severity of physical symptoms between participants who received medication and those who did not (youth-reported number of symptoms, $t(413) = -.18$, $p = .86$; clinician-rated severity, $t(434) = 2.06$, $p = .04$), and between participants who received CBT and those who did not (youth-reported number of physical symptoms, $t(413) = -.35$, $p = .73$; clinician-rated severity, $t(434) = 2.06$, $p = .56$).[3]

Relationship of physical symptoms to anxiety severity and improvement

The pretreatment number of physical symptoms endorsed by youth was positively associated with pretreatment anxiety severity, as measured by the CGI-S ($r = .19$, $p < .01$), but was unrelated to posttreatment anxiety severity ($r = .03$, $p = .57$) and improvement, as measured by the CGI-I ($r = .01$, $p = .96$). Pretreatment severity of physical symptoms, as rated by clinicians, was positively associated with anxiety severity at pretreatment ($r = .46$, $p < .01$)

[3]Findings did not differ when analyses were conducted using the intent-to-treat sample with last observation carried forward versus participants with complete data at baseline and week 12.

and posttreatment (r = .15, p < .01), but was unrelated to improvement in anxiety (r = .07, p = .14). Posttreatment number of physical symptoms endorsed by youth was positively associated with pretreatment anxiety severity (r = .20, p < .01) and posttreatment anxiety severity (r = .24, p < .01), and was related to CGI-I ratings reflecting less improvement in anxiety (r = .16, p < .01). Posttreatment severity of physical symptoms, as rated by clinicians, was also positively associated with pretreatment anxiety severity (r = .21, p < .01) and posttreatment anxiety severity (r = .53, p < .01), and was related to CGI-I ratings reflecting less improvement in anxiety (r = .48, p < .01).

Analyses were conducted to determine if the posttreatment number and severity of physical symptoms were related to treatment response (i.e., CGI-I ratings of *much improved* or *very much improved)*. Controlling for baseline symptoms, treatment responders reported fewer physical symptoms, $F(1, 414) = 6.89$, p < .01, d = .26, and less severe clinician-rated physical symptoms, $F(1, 435) = 77.58$, p < .01, d = .84, than non-responders.[3]

Relationship of physical symptoms to presence of comorbid disorders

Controlling for age, neither the number nor the severity of physical symptoms reported by participants differed by the presence/number of pretreatment comorbid diagnoses. When internalizing and externalizing comorbidities were examined separately, there were significant pretreatment differences in the number and severity of physical symptoms based on the presence/number (0, 1, ≥ 2) of comorbid internalizing disorders (youth-reported number of physical symptoms, $F(2, 454) = 4.54$, p = .01; clinician-rated severity of physical symptoms, $F(2, 483) = 4.54$, p = .01). Planned contrasts revealed that participants without comorbid internalizing disorders had fewer and less severe physical symptoms than participants with one or more comorbid internalizing disorders (youth-reported number of physical symptoms, $t(454) = 2.95$, p < .01, d = .28; clinician-rated severity of physical symptoms, $t(483) = 2.98$, p < .01, d = .27). There were no significant differences in the number or severity of physical symptoms between participants with one comorbid internalizing disorder and those with two or more comorbid internalizing disorders. At pretreatment, there were no significant differences between participants with/without comorbid externalizing disorders on the number or severity of physical symptoms endorsed.

Controlling for age, the number of physical symptoms endorsed by youth at posttreatment differed based on the presence/number of comorbid diagnoses, $F(2, 413) = 4.96$, p < .01. Planned contrasts revealed that participants with no comorbid disorders endorsed significantly fewer physical symptoms at posttreatment than participants with one or more disorders, $t(413) = -2.87$, p < .01, d = −.28. Participants with one comorbid disorder did not differ from participants with two or more comorbid disorders, $t(413) = -.24$, p = .81, suggesting that the number of physical symptoms is related to the presence but not the number of comorbid disorders. Clinician-rated severity of physical symptoms did not differ based on presence/number of comorbid diagnoses.

When comorbid internalizing and externalizing disorders were examined separately, the presence/number of comorbid internalizing disorders (0, 1, ≥ 2) was significantly associated with clinician-rated severity of physical symptoms, $F(2, 434) = 8.05$, p < .01, but not youth-reported number of physical symptoms, $F(2, 413) = 3.94$, p = .02, at posttreatment. Planned

contrasts showed that clinician-rated severity of physical symptoms was significantly greater for participants with at least one comorbid internalizing disorder, $t(434) = 3.89$, $p < .01$, $d = .37$, but did not differ between participants with one versus two or more comorbid internalizing diagnoses. At posttreatment, there were no group differences in the number or severity of physical symptoms based on the presence/number of comorbid externalizing disorders.

Discussion

Consistent with previous reports [11, 16], over 95% of anxiety-disordered youth endorsed at least one somatic symptom. The number and severity of physical symptoms decreased over the course of treatment. Treatment type (i.e., CBT; SRT; CBT + SRT; pill placebo) did not differentially affect change in the number or severity of physical symptoms reported. Improvement in anxiety symptoms, regardless of treatment, was negatively associated with number and severity of physical symptoms at posttreatment. Treatment responders reported fewer physical symptoms and less severe clinician-rated physical symptoms than non-responders.

When controlling for age, there were no significant differences in the number or severity of physical symptoms across conditions at posttreatment. It is surprising that participants who received active treatment did not have fewer and less severe physical symptoms than participants in the placebo condition. Prior studies that reported reductions in physical symptoms following CBT [16, 19] but did not include placebo groups may have found symptom change partially due to the passage of time, maturation, or repeated assessment. Although Ginsburg et al. [10] found that pharmacological treatment was superior to placebo for reducing physical symptoms of anxiety, the duration of the trial was shorter than CAMS (8 weeks versus 12 weeks). It may be that active treatment reduces the number and severity of some physical symptoms but, with increased knowledge and awareness, increases participants' reports of others. Because CBT teaches participants to identify physical symptoms as signals to engage in coping, it's possible that CBT results in self-monitoring and reporting of these somatic signals (symptoms). In the case of SSRI's, increased reporting of physical symptoms due to side effects (e.g., gastrointestinal symptoms, nausea, insomnia) [37] might balance out anxiety symptom reduction.

Consistent with prior research [10, 14, 16], the number and severity of physical symptoms were positively associated with anxiety severity and impairment. It may be the case that more severe anxiety leads to hyperawareness of physical symptoms, which triggers increases in physical symptoms that signal anxiety, such as rapid heart rate. Or, it may be that there is a relationship between physical symptoms and anxiety severity because physical symptoms are characteristic of anxiety disorders such that youth with more severe disorders report more severe physical symptoms.

Youth with GAD and SAD reported greater numbers of and more severe physical symptoms than youth with SoP. Previous studies examining the relationship between diagnosis and somatic symptoms yielded mixed findings [10, 11, 15]. Inconsistencies across studies could be attributed to measurement issues; the PSC is more comprehensive than measures of

physical complaints used in previous studies and includes items that are not part of the diagnostic criteria for anxiety disorders. Also, diagnostic criteria for both GAD and SAD include the presence of physical symptoms while the criteria for SoP do not. In other words, it is possible that the presence of somatic complaints in these samples is related more to screening and diagnosis than to meaningful differences across these groups. Alternatively, GAD and SAD may involve more physiological reactivity than does SoP. Future research is needed to clarify reasons for the differential distribution of somatic complaints across diagnostic groups. For example, studies that involve presenting children with mildly anxiety-provoking situations and examining differences in physiological reactivity across diagnostic groups could address this question.

As in prior studies [11, 18], the presence of comorbid internalizing disorders (but not externalizing disorders) was related to the severity of somatic complaints at pre- and post-treatment. These findings are consistent with those of Hofflich et al. [11], in which children with comorbid anxiety and depression reported more frequent somatic symptoms than children with anxiety alone or children with anxiety and externalizing symptoms. Internalizing disorders, including mood and anxiety disorders, are characterized by the presence of physical symptoms including insomnia, restlessness, and fatigue, while the diagnostic criteria for externalizing disorders do not include physical symptoms.

With regard to demographic variables, age was associated with number and severity of physical symptoms before and after treatment. This finding is in line with previous research that used samples spanning childhood and adolescence [10, 13]. The finding that age was related to physical symptoms suggests that either youth become more aware their physical symptoms and more likely to communicate about them with age, or youth actively experience more physical symptoms with age.

There were no sex differences in the number of somatic symptoms reported. This finding is consistent with diagnosed cases [10, 11], though inconsistent with community samples [13, 14]. Given that parents seek treatment for their children only when symptoms negatively impact functioning, it may be that girls in community samples report somatic complaints more frequently than boys but that for a subset of girls, somatic symptoms do not impact their general functioning.

Limitations

Potential limitations merit mention. First, the PARS and the PSC each assess physical symptoms experienced over the past week and may not reflect persistent symptoms. Further, the PSC does not allow for anxiety-related somatic complaints to be teased apart from symptoms associated with illness or medication side effects. Although the PARS is specific to anxiety, it may not be easy for parents and youth to determine the source of physical symptoms. Second, this sample excluded youth with a principal diagnosis of MDD. Research is needed to examine relationships between physical and psychological symptoms as well as treatment effects in youth with co-principal anxiety and depressive disorders. Third, the CBT and combination treatment conditions were not blinded; treatment expectancies may have influenced reports. Fourth, the extent to which IEs considered change in physical symptoms while assigning CGI-I ratings cannot be determined.

Improvement in somatic complaints may have influenced assessment of treatment response. Finally, findings may not generalize to non-treatment-seeking samples, as there have been reports of differences in somatic symptoms between community and diagnosed samples [9–11, 13, 14].

Summary

As in prior studies [10, 11], somatic complaints were common among youth diagnosed with an anxiety disorder; almost all participants endorsed as least one physical symptoms. The total number and severity of pretreatment physical symptoms was associated with age (but not sex, race/ethnicity, or SES), principal diagnosis, anxiety severity, impairment, and the presence of comorbid internalizing (but not externalizing) disorders. Somatic complaints decreased over 12 weeks of CBT (Coping Cat), medication (sertraline), their combination, or pill placebo. Findings suggest that an evaluation for anxiety disorders is warranted when youth present with frequent somatic complaints (e.g., headaches, stomachaches, difficulty sleeping, drowsiness, and sniffles) and that promoting awareness of physical symptoms of anxiety may facilitate accurate identification. Treatment of anxiety is critical given impairments in functioning [2, 3, 38, 39]. The current study suggests that treatment reduces reports of physical symptoms, more so for treatment responders, but the type of treatment does not differentially affect the number and severity of physical symptoms experienced by youth.

Acknowledgments

This research was supported by grants (U01 MH064089, to Dr. Walkup; U01 MH64092, to Dr. Albano; U01 MH64003, to Dr. Birmaher; U01 MH63747, to Dr. Kendall, U01 MH64107, to Dr. March; U01 MH64088, to Dr. Piacentini; and U01 MH064003, to Dr. Compton) from the National Institute of Mental Health. Sertraline and matching placebo were supplied free of charge by Pfizer. Views expressed within this article represent those of the authors and are not intended to represent the position of NIMH, NIH, or DHHS.

References

1. Costello EJ, Mustillo S, Erkanli A, Keeler G, Angold A. Prevalence and development of psychiatric disorders in childhood and adolescence. Arch Gen Psychiatry. 2003; 60(8):837–844. [PubMed: 12912767]
2. Ezpeleta L, Keeler G, Erkanli A, Costello EJ, Angold A. Epidemiology of psychiatric disability in childhood and adolescence. J Child Psychol & Psychiatry. 2001; 42(7):901–914. [PubMed: 11693585]
3. Van Ameringen M, Mancini C, Farvolden P. The impact of anxiety disorders on educational achievement. J Anxiety Disord. 2003; 17(5):561–571. [PubMed: 12941366]
4. Bittner A, Egger HL, Erkanli A, Jane costello E, Foley DL, Angold A. What do childhood anxiety disorders predict? J Child Psychol Psychiatry. 2007; 48(12):1174–1183. [PubMed: 18093022]
5. Costello, EJ.; Angold, A., editors. Epidemiology. Guilford; New York, NY: 1995.
6. Ferdinand RF, Verhurlst FC. Psychopathology from adolescence into young adulthood: an 8-year follow-up study. Am J Psychiatry. 1995; 152:1586–1594. [PubMed: 7485620]
7. Swendsen J, Conway KP, Degenhardt L, Glantz M, Jin R, Merikangas KR, et al. Mental disorders as risk factors for substance use, abuse and dependence: results from the 10-year follow-up of the National Comorbidity Survey. Addiction. 2010; 105(6):1117–1128. [PubMed: 20331554]
8. Woodward LJ, Fergusson DM. Life course outcomes of young people with anxiety disorders in adolescence. J Am Acad Child Adolesc Psychiatry. 2001; 40(9):1086–1093. [PubMed: 11556633]

9. Beidel DC, Christ MAG, Long PJ. Somatic complaints in anxious children. J Abnorm Child Psychol. 1991; 19:659–670. [PubMed: 1791272]
10. Ginsburg GS, Riddle MA, Davies M. Somatic symptoms in children and adolescents with anxiety disorders. J Am Acad Child Adolesc Psychiatry. 2006; 45(10):1179–1187. [PubMed: 17003663]
11. Hofflich SA, Hughes AA, Kendall PC. Somatic complaints and childhood anxiety disorders. Int J Clin Health Psychol. 2006; 6:229–242.
12. American Psychiatric Association. Diagnostic and statistical manual of mental disorders: DSM-IV-TR. 4. Author; Washington, DC: 1994.
13. Garber J, Walker LS, Zeman J. Somatization symptoms in a community sample of children and adolescents: further validation of the Children's Somatization Inventory. Psychol Assess. 1991; 3(4):588–595.
14. Kingery JN, Ginsburg GS, Alfano CA. Somatic symptoms and anxiety among African American adolescents. J Black Psychol. 2007; 33(4):363–378.
15. Last CG. Somatic complaints in anxiety disordered children. J Anxiety Disord. 1991; 5(2):125–138.
16. Storch EA, Merlo LJ, Keeley ML, Grabill K, Milsom VA, Geffken GR, et al. Somatic symptoms in children and adolescents with obsessive-compulsive disorder: associations with clinical characteristics and cognitive-behavioral therapy response. Behav Cogn Psychother. 2008; 36(03): 283–297.
17. Hughes AA, Lourea-Waddell B, Kendall PC. Somatic complaints in children with anxiety disorders and their unique prediction of poorer academic performance. Child Psychiatry Hum Dev. 2008; 39(2):211–220. [PubMed: 17786552]
18. Bernstein GA, Massie ED, Thuras PD, Perwien AR, Borchardt CM, Crosby RD. Somatic symptoms in anxious-depressed school refusers. J Am Acad Child Adolesc Psychiatry. 1997; 36(5):661–668. [PubMed: 9136501]
19. Masia-Warner C, Colognori D, Kim RE, Reigada LC, Klein RG, Browner-Elhanan KJ, et al. Cognitive-behavioral treatment of persistent functional somatic complaints and pediatric anxiety: an initial controlled trial. Depress Anxiety. 2011; 28(7):551–559. [PubMed: 21681863]
20. Walkup JT, Albano AM, Piacentini J, Birmaher B, Compton SN, Sherrill JT, et al. Cognitive behavioral therapy, sertraline, or a combination in childhood anxiety. N Engl J Med. 2008; 359(26):2753–2766. [PubMed: 18974308]
21. Silverman, WK.; Albano, AM. The Anxiety Disorders Interview Schedule for DSM-IV-Child and Parent Versions. Graywind Publications; San Antonio, TX: 1996.
22. Compton SN, Walkup JT, Albano AM, et al. Child/Adolescent Anxiety Multimodal Study (CAMS): rationale, design, and methods. Child Adolesc Psychiatry Ment Health. 4(1):1–15. [PubMed: 20051130]
23. Hollingshead AB. Unpublished manuscript. Department of Sociology, Yale University; 1975. Four factor index of social status.
24. Kendall PC, Compton SN, Walkup JT, Birmaher B, Albano AM, Sherrill J, et al. Clinical characteristics of anxiety disordered youth. J Anxiety Disord. 2010; 24(3):360–365. [PubMed: 20206470]
25. Silverman WK, Nelles WB. The Anxiety Disorders Interview Schedule for Children. J Am Acad Child Adolesc Psychiatry. 1988; 27(6):772–8. [PubMed: 3198566]
26. Silverman WK, Eisen AR. Age differences in the reliability of parent and child reports of child anxious symptomatology using a structured interview. J Am Acad Child Adolesc Psychiatry. 1992; 31(1):117–124. [PubMed: 1537762]
27. Emslie G, Kratochvil C, Vitiello B, Silva S, Mayes T, McNulty S, et al. Treatment for Adolescents with Depression Study (TADS): safety results. J Am Acad Child Adolesc Psychiatry. 2006; 45(12):1440–1455. [PubMed: 17135989]
28. Research Units on Pediatric Psychopharmacology Anxiety Study. The Pediatric Anxiety Rating Scale (PARS): development and psychometric properties. J Am Acad Child Adolesc Psychiatry. 2002; 41:1061–1069. [PubMed: 12218427]
29. Ginsburg GS, Keeton CP, Drazdowski TK, Riddle MA. The utility of clinicians ratings of anxiety using the Pediatric Anxiety Rating Scale (PARS). Child Youth Care Forum. 2011; 40(2):93–105.

30. Shaffer D. A Children's Global Assessment Scale (CGAS). Arch Gen Psychiatry. 1983; 40(11): 1228–1231. [PubMed: 6639293]

31. Bird HR. Further measures of the psychometric properties of the Children's Global Assessment Scale. Arch Gen Psychiatry. 1987; 44(9):821–824. [PubMed: 3632256]

32. Guy, W. ECDEU Assessment Manual for Psychopharmacology, revised. National Institute of Mental Health; Rockville, MD: 1976.

33. Kendall, PC.; Hedtke, K. Cognitive-behavioral therapy for anxious children: therapist manual. 3. Workbook Publishing; Ardmore, PA: 2006a.

34. Kendall, PC.; Hedtke, K. Coping Cat workbook. 2. Workbook Publishing; Ardmore, PA: 2006b.

35. Kendall, PC.; Choudhury, M.; Hudson, J.; Webb, A. The CAT Project workbook for the cognitive-behavioral treatment of anxious adolescents. Workbook Publishing; Ardmore, PA: 2002.

36. Podell JL, Kendall PC, Gosch EA, Compton SN, March JS, Albano AM, Piacentini JC. Therapist factors and outcomes in CBT for anxiety in youth. Professional Psychology: Research and Practice. 2013; 44(2):89.

37. Safer DJ, Zito JM. Treatment-emergent adverse effects from selective serotonin reuptake inhibitors by age group: children versus adolescents. J Child Adolesc Psychopharmacol. 2006; 16:159–69. [PubMed: 16553536]

38. Ialongo N, Edelsohn G, Werthamer-Larsson L, Crockett L, Kellam S. The significance of self-reported anxious symptoms in first grade children: prediction to anxious symptoms and adaptive functioning in fifth grade. J Child Psychol Psychiatry. 1995; 36(3):427–437. [PubMed: 7782406]

39. Strauss CC, Frame CL, Forehand R. Psychosocial impairment associated with anxiety in children. J Clin Child Psychol. 1987; 16(3):235–239.

Table 1

Frequency of Physical Symptoms by Principal Diagnosis at Pretreatment

Pretreatment Symptom	Principal Diagnosis							
	SAD (*n* = 16)	SoP (*n* = 55)	GAD (*n* = 33)	SAD SoP (*n* = 33)	SAD GAD (*n* = 39)	SoP GAD (*n* = 137)	SAD SoP GAD (*n* = 175)	Total (*N* = 488)
Sleep disturbance								
Trouble sleeping	37.5%	32.5%	45.5%	44.7%	60.4%	48.3%	50.3%	48.0%
Restless or uncomfortable urge to move	37.5	17.5	27.3	23.7	35.4	33.1	45.3	35.1
Feeling drowsy or too sleepy	25.0	55.0	39.4	31.6	47.9	58.1	50.6	33.6
Sleeplessness	12.5	22.5	36.4	27.0	29.2	32.0	42.2	33.6
Nightmares or very strange dreams	6.2	15.0	36.4	21.6	37.5	35.1	40.4	33.5
Upper respiratory								
Head cold or sniffles	50.0	40.0	25.0	34.2	41.7	39.2	44.7	40.4
Allergies	6.2	17.5	42.4	23.7	31.2	35.6	37.9	33.0
Sore throat	12.5	12.5	30.3	28.9	35.4	23.6	30.0	26.5
Dry mouth	6.2	12.5	15.2	18.4	27.1	21.6	31.2	23.4
Coughing or wheezing	25.0	12.5	15.2	16.2	37.5	28.4	29.4	26.3
Fever	0.0	12.5	15.2	10.5	2.1	8.1	14.9	10.5
Pain								
Headache	33.3%	32.5%	39.4%	39.5%	58.3%	54.5%	55.3%	50.4%
Stomach pain or ache	50.0	30.0	45.5	47.4	58.3	43.9	51.6	47.3
Muscle aches or cramps	25.0	25.0	18.2	18.9	25.0	30.4	27.3	26.5
Joint pain	12.5	12.8	15.2	7.9	22.9	16.2	14.9	15.3
Panic/cardiac								
Racing or pounding heart	18.8	22.5	18.2	13.2	33.3	26.4	23.0	23.8
Chest pain	12.5	17.5	12.1	15.8	22.9	20.3	23.6	20.2
Dizziness/faintness	6.2	17.5	12.1	7.9	12.5	21.5	54.5	19.0
Tremor, trembling, or shakiness	12.5	17.5	9.1	8.1	25.0	18.9	22.4	18.8
Excessive sweating	6.2	20.0	9.1	18.9	16.7	13.5	17.4	15.5
Difficulty breathing	6.2	7.5	15.2	10.8	18.8	15.5	15.5	14.5
Heart skips beats	12.5	10.0	3.0	10.5	20.8	8.1	12.4	11.0
Numbness or tingling in arms or legs	12.5	7.5	6.1	8.1	18.8	9.5	18.0	12.8

Pretreatment Symptom	Principal Diagnosis							
	SAD (*n* = 16)	SoP (*n* = 55)	GAD (*n* = 33)	SAD SoP (*n* = 33)	SAD GAD (*n* = 39)	SoP GAD (*n* = 137)	SAD SoP GAD (*n* = 175)	Total (*N* = 488)
Can't hear well	0.0%	5.0%	3.0%	2.7%	4.2%	9.5%	13.1%	8.5%
Elimination/gastric								
Nausea/vomiting	25.0	10.0	15.2	15.8	29.2	16.2	29.2	21.5
Feeling bloated or gassy	0.0	10.3	15.2	5.3	18.8	21.6	14.9	15.7
Constipation	0.0	2.5	9.1	5.3	14.6	13.2	11.5	14.3
Frequent urination	0.0	5.0	9.1	13.5	12.5	12.8	18.0	13.3
Diarrhea	6.2	7.5	17.2	7.9	12.5	10.1	15.5	12.2
Heartburn	0.0	5.0	6.1	7.9	8.3	12.2	11.2	9.7
Pain with urination	0.0	2.5	3.0	2.6	12.5	3.4	5.0	4.5
Skin								
Dry skin	12.5	22.5	12.1	34.2	41.7	29.5	29.8	28.9
Acne	18.8	37.5	27.3	18.4	16.7	24.2	17.5	21.9
Skin rash	0.0	7.5	6.1	15.8	12.5	12.8	16.8	13.0
Hives	6.2	2.5	3.0	2.6	6.2	0.7	3.7	2.9
Other								
Feeling flushed or warm	18.8%	17.5%	21.2%	10.5%	25.0%	27.5%	32.9%	26.2%
Feeling cold or chilled	12.5	22.5	18.2	15.8	22.9	28.2	28.6	25.2
Agitation/disinhibition	18.8	17.9	25.8	5.3	29.2	24.5	25.8	23.2
Ringing in ears	0.0	15.0	24.2	7.9	16.7	18.8	23.6	18.8
Easy bruising	6.2	7.5	15.2	21.1	16.7	13.6	19.4	15.8
Cold or canker sores	10.0	9.1	0.0	22.2	13.3	15.7	3.6	10.6
Dental problems	0.0	5.0	9.1	10.8	10.4	10.1	9.4	9.1
Hair loss or brittle hair	0.0	7.5	3.0	0.0	4.2	5.4	36.4	4.6
Swelling, water retention	0.0	5.1	3.0	2.6	2.1	2.7	5.6	3.7

Table 2

Pre- and Post-treatment Means and Standard Deviations for Number and Severity of Physical Symptoms (N = 488)

	Pretreatment		Posttreatment	
	M	*SD*	*M*	*SD*
PSC number of physical symptoms	9.22	7.25	4.98	5.69
PARS clinician-rated severity	2.35	1.41	0.91	1.20
PARS child-reported severity	2.21	1.50	0.82	1.19
PARS parent-reported severity	2.29	1.48	0.82	1.21

Note. PSC = Physical Symptoms Checklist, PARS = Pediatric Anxiety Rating Scale (0–5)

Table 3

Pretreatment Means and Standard Deviations for the Number and Severity of Physical Symptoms by Principal Diagnosis

		Number		Severity	
	n	***M***	***SD***	***M***	***SD***
SAD	16	5.47	4.16	1.73	1.62
SoP	55	7.03	6.70	1.77	1.40
GAD	33	7.97	5.81	2.30	1.47
SAD SoP	33	7.06	6.18	1.83	1.32
SAD GAD	39	10.46	7.50	2.46	1.22
GAD SoP	137	9.50	6.70	2.48	1.41
SAD SoP GAD	175	10.33	1.62	2.54	1.37

Note. 0 = no symptoms, 1 = minimal, 2 = mild, 3 = moderate, 4 = severe, 5 = extreme. Number of physical symptoms was assessed using the Physical Symptoms Checklist. Severity of physical symptoms was rated by clinicians using the Pediatric Anxiety Rating Scale.

Table 4

Posttreatment Means and Standard Deviations for Number and Severity of Physical Symptoms by Treatment Condition

	COMBO (*n* = 140)	SRT (*n* = 133)	CBT (*n* = 139)	Placebo (*n* = 76)	*F*	*p*
PSC number of physical symptoms	5.16 (5.66)	5.04 (5.69)	4.35 (5.39)	5.31 (5.65)	.30	.83
PARS clinician-rated severity	0.75 (1.10)	0.82 (1.15)	1.04 (1.32)	0.98 (1.27)	2.05	.11
PARS child-reported severity	0.68 (1.11)	0.72 (1.10)	0.96 (1.34)	0.68 (1.10)	4.65	.18
PARS parent-reported severity	0.73 (1.34)	0.64 (1.12)	0.94 (1.33)	0.94 (1.35)	1.90	.13

Note. PSC = Physical Symptoms Checklist, PARS = Pediatric Anxiety Rating Scale (0–5)