Assessment of Somatic Symptoms in British Secondary School Children Using the Children’s Somatization Inventory (CSI)

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Objective To present normative and psychometric data on somatic symptoms using the Children’s Somatization Inventory (CSI) in a nonclinical sample of British young people, and to assess associations with stress and functional impairment. Methods A total of 1,173 students (11- to 16-years old) completed the CSI and self-report psychopathology measures. Results The median CSI total score was 12 (5, 23). Headaches, feeling low in energy, sore muscles, faintness, and nausea were most frequent. Girls scored higher than boys, and respondents aged 13–14 years lower than younger children. The CSI showed good internal consistency and exploratory factor analysis yielded three factors: pain/weakness, gastrointestinal, and pseudo-neurological. A quarter of respondents reported somatic symptoms were made worse by stress. CSI scores were moderately significantly correlated with impairment and emotional symptoms. Conclusions The CSI, complemented by information on functional impairment and stress is an appropriate measure of recent somatic symptoms and somatization risk in young people for use in the UK.

Key words adolescents; children; somatic symptoms; somatization.

Introduction

Somatic symptoms are common in children and adolescents. In the general population, 2–10% of children are documented as having recurrent pains, gastrointestinal symptoms, or described as sickly (Apley, 1975; Goodman & McGrath, 1991; Offord et al., 1987). Symptoms are often medically unexplained and linked to psychological problems (Campos & Fritsch, 1994; Garralda, 1996) and girls tend to report more symptoms than boys, particularly in adolescence (Campos, Jansen-McWilliams, Comer, & Kelleher, 1999; Eminson, Benjamin, Shortall, & Woods, 1996). Even though symptoms are often medically unexplained, they can lead to considerable impairment in the child’s life, affecting development, school and social adjustment (Campos et al., 1999; Konijneman et al., 2005; Roth-Isigkeit, Thyen, Stoven, Schwarzenberger, & Schumucker, 2005).

Frequent somatic complaints tend to be associated with emotional symptoms and constitute the basis for the concept of somatization—when physical symptoms are regarded as an expression of psychological distress—and for DSM-IV’s and ICD-10’s somatoform disorders (American Psychiatric Association, 1994; World Health Organization, 1992). Some somatic symptoms are considered particularly indicative of somatization: the presence of 13 or more of these symptoms was a requirement for DSM-III-R somatization disorder (American Psychiatric Association, 1987); the number of symptoms required was later reduced to eight in DSM-IV. DSM-IV categorizes symptoms into four domains: pain, gastrointestinal, pseudoneurological, and sexual.

Previous studies have reported associations between somatic and emotional symptoms and disorders in children; some have also found links with disruptive behavior disorders, especially in younger boys (Campos et al., 1999; Dhossche, Ferdinand, van der Ende, & Verhulst, 2001; Egger, Costello, Erkanli, Erkanli, & Angold, 1999; Garralda, 1996; Taylor, Szatmari, Boyle, & Offord, 1996). Associations with psychological symptoms are especially marked in subjects with multiple somatic complaints (Escobar, Burnam, Kanno, Forsythe, & Golding, 1987), and in the study of the somatization of distress it is
The Children’s Somatization Inventory (CSI) (Walker & Greene, 1989) has previously been used to assess somatic symptoms in children and adolescents. It has provided normative data for both clinical and nonclinical samples across different countries. Three studies have examined nonclinical samples (Table I). Garber, Walker, and Zeman (1991) assessed somatization in 540 American young people from Grades 2–12 (Garber et al., 1991). The CSI had good internal consistency (α = .92) and the mean somatization score (the sum of “a lot” or a “whole lot” responses to the 26 items in DSM-III-R somatization disorder) for the whole sample was 1.94 (SD 3.05); 15.4% of the children reported four or more symptoms and 1.1% reported 13 or more somatic complaints. Factor analysis yielded four factors: pseudoneurological symptoms, cardiovascular symptoms, gastrointestinal symptoms, and pain/weakness symptoms. The more frequent complaints were headaches, low energy, sore muscles, nausea, or upset stomach. The CSI also showed good construct validity with moderate significant correlations with self-reported anxiety (r = .43), depression (r = .37), and perceived competence (r = −.27). Litcher and colleagues (Litcher et al., 2001) used the CSI with a community sample of 600, 10- to 12-year-olds in the Ukraine. The mean CSI total score was 16.40 (SD 16.11) and the internal consistency was also good (α = .94). They identified four factors which they labeled as Garber et al. (1991) had done, although some of the items loaded differently on the four factors. Again the CSI was moderately correlated with the child reported anxiety, depression, perceived competence, global health and fatigue after school, and with parent rated child health and psychological functioning. In the Netherlands, Meesters et al. (Meesters, Muris, Ghys, Reumerman, & Rooijmans, 2003) assessed somatization in 476 school children aged 10- to 16-years old. Their mean CSI total score was 10.16 (SD 10.36), and there was satisfactory internal consistency (α = .90). A factor analysis yielded three factors: pain/weakness, gastrointestinal, and pseudoneurological. The construct validity of the CSI was established via significant but moderate positive correlations with child and parent reports of psychopathology (anxiety and depression) and personality.

In Britain, the CSI has only been used with clinical samples. It has identified high levels of symptoms in young people attending primary health care and in those with somatoform disorders such as chronic fatigue syndrome (Garralda, Rangel, Levin, Roberts, & Ukoumunne, 1999; Kramer & Garralda, 1998; Yates, Kramer, & Garralda, 2004). However, the number of symptoms reported by Kramer and Garralda (1998) in psychologically healthy young people attending primary care was lower than reported by Garber et al. (1991) in an American general population sample, indicating a need to gather general population data in the UK.

The CSI does not assess impairment (of leisure, social activity, or school attendance) or perceived links between somatic symptoms and stress, which are central to the concept of somatization. These links are endorsed by a number of young people with functional somatic symptoms (Beck, 2008) and may be mediated by unhelpful coping strategies (Walker, Freeman Baber, Garber, & Smith, 2008). Kramer and Garralda (1998) added a section to the CSI on these topics and found that a substantial percentage of primary care attendees, especially those with comorbid psychiatric disorders, reported both impairment and links with stress.

To the best of our knowledge, this is the first time that impairment and perceptions of stress have been studied in the general population in the context of CSI identified somatic symptoms. The current study has several aims; first, to gather normative CSI data for British nonclinical adolescents; second, to describe the psychometric properties of the CSI including its factor structure; third, to examine construct and discriminant validity (through associations with self-reported emotional and behavioral symptoms); and finally, to explore the links between somatic symptoms, functional impairment, and the effect of stress using the scale developed by Kramer and Garralda (1998).

**Methods**

**Participants**

Participants were pupils (N=1,251) attending a co-educational secondary school serving a metropolitan area in south east England during March 2004. This comprised young people aged 11- to 16- and three
17-year-olds, with a mean age of 13.5 (SD 1.5) A total of 1,173 pupils (94% of the school population) completed the questionnaires: 22 during the pilot study, 1,132 on the index day, and 19/41 absentees subsequently; 56 declined to participate and 22 were absent on both data collection days. The genders were equally represented (girls 51% and boys 49%), and the majority (91%) self-reported a White British ethnicity.

**Measures**

Self-reported demographic information (age, gender, ethnicity, family composition, and parental occupation) were recorded on a record form designed for this study. The occupation of the family’s primary financial provider was subsequently coded by the researchers according to the Office of National Statistics’ Standard Occupational Classification (Office of National Statistics, 2000).

The CSI (Walker & Greene, 1989), is a self-report questionnaire comprising 35 items requiring individuals to report the extent to which they experienced each symptom in the previous two weeks (0 = not at all, 1 = a little, 2 = somewhat, 3 = a lot, 4 = a whole lot). Two scores are derived: the CSI total score (maximum 140) is the sum of all items reflecting both the range and intensity of experienced symptoms. The somatization score (maximum 26) is the sum of “a lot” or a “whole lot” responses to the 26 items in DSM-III-R somatization disorder. The CSI has previously been shown to have adequate good internal reliability with coefficient α’s in excess of .90, and adequate construct validity via moderate correlations (.20 to .43) with child-reported measures of anxiety and depression (Garber et al., 1991; Litcher et al., 2001; Meesters et al., 2003). We also ascertained the proportion of young people reporting 13 and 7 symptoms from the somatization score as these are the number of symptoms recognized as necessary for the diagnosis of Somatization disorder (after excluding sexual symptoms which are not covered in the CSI) in DSM-III-R and DSM-IV diagnostic criteria, respectively. In addition, we present the proportion of children reporting four symptoms as this is the number of symptoms suggested by Escobar (Escobar et al., 1987) for the diagnosis of “somatization syndrome,” and a cut-off point accordingly used in the original studies on the CSI (Garber et al., 1991).

To assess associated functional impairment, respondents were asked the extent to which any of the somatic symptoms impacted upon four global capacities: the ability to concentrate, to enjoy activities, to go to school, and to see friends. These are the domains used in previous studies to assess the impairment-related CSI somatic symptoms in clinical samples (Kramer & Garralda, 1998). Each question was answered on a 3-point severity scale [0 = not at all, 1 = somewhat, 2 = a lot (range 0–8)]. The coefficient α for this scale was .80. One final global question was added asking whether the somatic symptoms were made worse by stress, worry, or anxiety; which was answered 0 = no, 1 = yes, 2 = don’t know.

**The Moods and Feelings Questionnaire (MFQ)**-Self-report version (Angold, Costello, Pickles, & Winder, 1987) is a 25-item screening measure for depressive disorder symptoms for use with 8- to 18-year-olds. Respondents report the presence of moods and feelings over the previous 2 weeks on a 3-point scale; “not true,” “sometimes true,” and “true.” This results in a continuous score with a range from 0 to 68. Its validity as a screening tool for clinical (Kent, Vostanis, & Feehan, 1997; Wood, Kroll, Moore, & Harrington, 1995) and general population samples (Cooper & Goodyer, 1993; Sund, Larsson, & Wichstrom, 2001) has been established. Internal consistency for both clinical and nonclinical samples exceed .90.

The **Strengths and Difficulties Questionnaire (SDQ)**–Self-report version (Goodman, 1997, 1999; Goodman, Meltzer, & Bailey, 1998) is a well validated 25-item behavioral screening questionnaire for young people aged 4–16 years. Each item is scored on a 3-point scale (“not true,” “somewhat true,” and “certainly true”) for the previous 6 months generating five sub-scales: conduct problems, hyperactivity, emotional problems, peer problems and prosocial behavior, and a total difficulties score (sum of all sub-scales except prosocial). The internal consistency coefficients (Cronbach’s α’s) for the various self-reported SDQ scales are generally satisfactory. The Cronbach α for the SDQ total score has been found to be .73, for the SDQ emotional .66 (mean Inter-Item Correlation .28), for the SDQ conduct .61 (mean Inter-Item Correlation 0.24), for the SDQ hyperactivity–inattention .66 (mean Inter-Item Correlation 0.27), for the SDQ peer problems .54 (mean Inter-Item Correlation .18) and for the SDQ prosocial behaviour .62 (mean Inter-Item Correlation .23). Previous studies have used the SDQ in community samples of children and adolescents and reported internal consistencies using the Cronbach α coefficients between .30 and .78. Good concurrent validity has been demonstrated using different features such as clinical vs nonclinical status and different measures like the Child Behavior Checklist, the Children’s Depression Inventory, the Revised Children’s Manifest Anxiety and the Conner’s Parent Symptom Questionnaire (Du, Kou, & Coghill, 2008; Goodman, 2001; Koskelainen, Sourander, & Kaljonen, 2000; Muris, Meesters, & van den Berg, 2003; van Widenfelt, Goedhart, Treffers, & Goodman, 2003).
Procedure
Ethical approval was obtained from the local NHS research ethics committee, and the school and local education authority gave permission to approach parents and students. All eligible pupils and parents received letters and information sheets inviting their participation and providing the opportunity to opt out of the study. Information about the study was also presented in the school bulletin, which every family received directly from the school. Those wishing to participate did not need to provide written consent; their completion of the study questionnaires on the data collection day was taken as proof of consent. A pilot study was conducted to establish whether young people could understand and respond appropriately to the questionnaires, and to test the administration logistics.

On the index study day, younger pupils (aged 11–13 years) completed the questionnaires during a 1 hr lesson; while students aged 14–16 years utilized a 33 min lesson, as this minimized lost time for those preparing for exams. The teachers supervised questionnaire completion and noted who was absent, as well as the age and gender of pupils who declined to participate in the study. A second assessment day was arranged to obtain questionnaires from those initially absent; the same format was used.

Data Analysis
The age and gender of participating and nonparticipating students were compared to establish sample bias. Descriptive statistics were used to analyze the characteristics of the sample and the questionnaire data. Due to the skewness and kurtosis results for the independent and dependent measures falling outside the range of normality (−3 to 3 and −8 to 8, respectively) it was necessary to use nonparametric statistics (Mann–Whitney and Kruskal–Wallis) to establish statistical significance (although mean and SD results are also presented to facilitate comparison with previous studies). Age and gender effects on the CSI were also examined. Associations between the CSI, the MFQ, the SDQ and functional impairment scale were assessed via one-tailed nonparametric correlational tests (Spearman rank), while response to stress was assessed using Kruskal–Wallis test. Internal reliability was assessed using Cronbach’s α. Following data screening, exploratory factor analysis (EFA), using principle axis factoring and both varimax and oblimin rotation, was used to explore the factor structure of the CSI. Statistical analysis was carried out using SPSS v15 for Windows.

Results
Demographic Data
There were no age or gender differences between the 1,173 participating students and the combined 78 nonparticipating.

Over two-thirds of participants (71%) lived with two natural parents. Half the sample (54%) was from professional occupation families (based on the parent with the highest rated occupation), 43% were from skilled nonmanual and manual occupation families and the remaining 3% of parents were unemployed.

The Children’s Somatization Inventory
The distribution of the CSI total scores showed a large positive skew; the median CSI total score for the 35-items was 12 (5, 23), while the median CSI somatization score was 0 (0,1). To facilitate comparison with previous nonclinical studies in other countries, the mean scores reported for comparable age sub-groups within each study are presented in Table I. The results indicate that, with the exception of Meesters et al.’s (2003) study, mean scores were generally comparable across different cultures.

Overall, the most frequently endorsed symptoms were headaches (66%), low in energy (49%), sore muscles (49%), faintness (45%), nausea (44%), stomach pain (43%), hot and cold spells (42%), pain in the heart (41%), weakness (41%), and lower back pain (40%). Restricting frequency to those who reported experiencing symptoms “a lot” or “a whole lot” the following items were most frequently endorsed: headaches (13%), nausea (12%), sore muscles (11%), low energy (11%), lower back pain (11%), hot and cold spells (10%), stomach pains (9%), and weakness (8%). One-third of the respondents (37%) reported at least one frequent somatization symptom; four or more symptoms were endorsed by 12% of respondents; 7 or more symptoms by 4% of the sample; and 13 or more symptoms by 0.8% of the sample.

Gender and Age Effects
Girls had a significantly higher median score [14.5 (7, 27)] than boys [8 (8, 19)] on the CSI total (U = 91,888, p < .001) with an effect size of .21. With age divided in three groups (11–12 years, n = 316; 13–14 years, n = 434; 15–16 years, n = 280) there was an overall statistically significant effect of age [H(2) = 6.19, p = .045] but post hoc tests (using a Bonferroni correction so that a .0167 level of significance was used) revealed significantly higher scores in the 11- to 12-year-old group [mdn 14 (6, 24)] than the 13- to 14-year-old group [(mdn 11 (5, 21)]
Table II. Median CSI total scores and the proportion of cases with ≥4 symptoms in the age and gender groups

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>CSI total score Mdn (interquartile)</th>
<th>Kruskal–Wallis</th>
<th>≥4 symptoms (%; n)</th>
<th>Chi-square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girls</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11–12</td>
<td>[17 (7.5, 30)]</td>
<td></td>
<td>21.3 (n = 42)</td>
<td></td>
</tr>
<tr>
<td>13–14</td>
<td>[13 (7, 23)]</td>
<td>ns</td>
<td>15.7 (n = 37)</td>
<td>ns</td>
</tr>
<tr>
<td>15–16</td>
<td>[15 (7, 28.5)]</td>
<td></td>
<td>23.8 (n = 38)</td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11–12</td>
<td>[10 (5, 20)]</td>
<td></td>
<td>12.6 (n = 19)</td>
<td></td>
</tr>
<tr>
<td>13–14</td>
<td>[8 (4, 18.25)]</td>
<td>ns</td>
<td>13.7 (n = 35)</td>
<td>ns</td>
</tr>
<tr>
<td>15–16</td>
<td>[7 (3, 17)]</td>
<td></td>
<td>11.3 (n = 19)</td>
<td></td>
</tr>
</tbody>
</table>

(U = 61,245.5, p = .012) with an effect size of .09. Due to the violation of the normality assumption it was not possible to examine the Age × Gender interaction nonparametrically. However, we did examine the CSI total scores and the proportion of cases with ≥4 symptoms among the girls and boys separately within the three age groups (Table II) but found no significant group differences.

There were no significant differences in the CSI total scores of young people from White British origin and in those from other ethnic groups, nor when those from families with professional occupations were compared with the rest. However, young people living with both natural parents had higher CSI total scores [mdn = 11 (4, 21)] than those in other living situations [mdn = 15 (7, 30)] (U = 91,990, p < .001).

**Internal Consistency and Exploratory Factor Analysis**

Data screening revealed an α coefficient of .93 for the 35-item CSI and a mean item-total correlation of .51, with a range between .67 and .33. There was also adequate item variance, but 12 of the CSI items did not meet the criteria for normality (skewness outside −3 to +3, kurtosis outside −8 to +8). Therefore, all items were subjected to logarithm transformation and examined again for normality. Six items (constipation, blindness, dizziness, paralysis, difficulty urinating, and pain urinating) still did not meet the criteria for normality and were thus excluded from the subsequent analyses.

The resultant 29-item CSI displayed moderate inter-item correlations, the Kaiser–Meyer–Olkin measure of sampling adequacy was .94, and Bartlett’s test of sphericity was significant [χ²(406) = 9,676.52, p < .001].

Principle axis factoring was used with both varimax and direct oblimin rotations (the latter because correlations between factors was anticipated). The initial eigen values suggested a five-factor solution accounting for 11, 10, 8, 6, and 5%, but this model was clinically unsatisfactory. As two previous studies found a four-factor solution to be preferential we also tested a four-factor solution. However, it was not clinically satisfactory either, so 2-, 3-, 5-, and 6-factor solutions were tested. At each stage, items with primary factor loadings <.40 or secondary loadings >.30 were removed from the solution and the remaining factors retested until a “clean” solution was identified.

A three-factor solution comprising 17-items and accounting for 41% of the variance was considered the most parsimonious model. The varimax rotation factor loadings are presented in Table III. As anticipated, the three factors were moderately correlated (Table IV).

The three-factor solution closely resembles that reported by Meesters et al. (2003); therefore, the same factor labels were used. The overall median 17-item CSI total score was 6 (2, 13). Internal consistency for the 17-item CSI was α = .88, and for each of the three factors: Pseudoneurological α = .82, Pain/weakness α = .75, and Gastrointestinal α = .80. Correlations between the 17-item CSI Total score and each factor ranged from .70 to .86. Finally, the 35- and 17-item CSI’s were highly significantly correlated (r = .93, p < .001).
Associations Between Somatic and Emotional/Behavioral Symptoms

The overall median MFQ score was 14 (6, 25) [mean 17.2 (SD 14.4)]. The median SDQ total difficulties score was 12 (9, 17) [mean 12.9 (SD 5.4)] and the median SDQ subscale scores were: emotional problems 3 (2, 5) [mean 3.51 (SD 2.3)], conduct problems 2 (1, 4) [mean 2.8 (SD 2)], hyperactivity problems 5 (3, 6) [mean 4.8 (SD 2.3)], peer relationship problems 1 (1, 3) [mean 1.9 (SD 1.7)], and prosocial behavior 7 (6, 8) [mean 6.9 (SD 1.9)].

Table IV presents the correlations between the CSI total and somatization scores and the three factors derived from the exploratory factor analysis, the MFQ, and the SDQ scores. For this analysis, we have used the SDQ total difficulties score and the emotional, conduct, and hyperactivity subscale scores, as they represent emotional and behavioral problems more directly. The results indicate good positive correlations with self-reported depressive symptoms (MFQ), and moderate positive correlations with the emotion sub-scale of the SDQ. There were weak correlations with the conduct and hyperactivity sub-scales of the SDQ.

The proportion of young people reporting any impairment from somatic symptoms in everyday activities ranged from 47% of the sample (443/941) in relation to their ability to concentrate, by 41% (387/946) regarding reduced capacity for enjoyment, 30% (278/939) in terms of not going to school, and 24% (227/937) with regards to seeing friends. Considerable impairment in the ability to enjoy activities and the ability to concentrate was reported by 10% and 9% of the sample respectively, with 5% and 4% respectively reporting considerable impairment with regards to seeing friends or going to school. The total impairment score was moderately correlated with the CSI total score and the somatization score as well as with the three factors (Table IV).

Of the 920 young people who answered this question, 231 (25%) reported the somatic symptoms were made worse by stress, anxiety or worry, 327 (36%) were unsure, and 362 (39%) did not report an association. Statistical analysis (Table V) revealed a main effect for response to stress \( H(2) = 179.14, p < .001 \) with post hoc analyses (using a Bonferroni correction with the level of significance at \( p = .0167 \)) indicating that those who perceived a negative effect of stress on somatic symptoms yielded significantly higher scores on the CSI total score than either of the other two groups, while those who were unsure of the effect also scored significantly higher than those who perceived no effect.

As presented in Table V, there was also a statistically significant association between reports of stress affecting somatic symptoms and higher MFQ, SDQ-emotional scores and impairment.

**Discussion**

We used the CSI in a British sample of secondary school students and identified rates of physical symptoms generally comparable to those reported in other countries (Garber et al., 1991; Litcher et al., 2001). The CSI had good internal consistency and factor analysis identified three main factors: pseudoneurological, pain/weakness, and gastrointestinal. A quarter of the sample reported symptoms were made worse by stress, and at least 10% reported marked impairment from symptoms. There were moderate correlations between CSI total and somatization scores and reported impairment, stress links, and

| Table IV. Correlations Between the CSI, three CSI factors, Moods and Feelings Questionnaire (MFQ), Strengths and Difficulties Questionnaire (SDQ) and CSI Impairment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. CSI total | – | – | – | – | – | – | – | – | – | – | – |
| 2. CSI somatization | .70** | – | – | – | – | – | – | – | – | – | – |
| 3. F1 Pseudoneurological | .70** | .56** | – | – | – | – | – | – | – | – | – |
| 4. F2 Pain/weakness | .82** | .53** | .44** | – | – | – | – | – | – | – | – |
| 5. F3 Gastrointestinal | .81** | .59** | .48** | .47** | .55** | – | – | – | – | – | – |
| 6. MFQ | .67** | .48** | .51** | .46** | .55** | – | – | – | – | – | – |
| 7. SDQ: Total | .47** | .40** | .41** | .30** | .38** | .57** | – | – | – | – | – |
| 8. SDQ: Emotion | .50** | .40** | .36** | .30** | .40** | .56** | .67** | – | – | – | – |
| 9. SDQ: Conduct | .25** | .24** | .25** | .20** | .18** | .30** | .67** | .17** | – | – | – |
| 10. SDQ: Hyperactivity | .26** | .20** | .26** | .17** | .17** | .27** | .69** | .17** | .48** | – | – |
| 11. CSI: Impairment | .62** | .46** | .41** | .41** | .63** | .46** | .28** | .34** | .14** | .12** | – |

** Note: p < .01. **
emotional symptoms. This suggests that multisymptomatic complaints can be an expression of somatization and confirms the CSI as a useful measure with good construct and discriminate validity for studying somatic symptoms and somatization in young people.

Frequency of Symptoms, Age and Gender Effects, and Cross-country Comparisons

The CSI total and somatization results obtained in the current study were generally comparable to those described in American and Ukrainian populations (Garber et al., 1991; Litcher et al., 2001). However, the total number of symptoms in the present study was higher than in Meesters et al. (2003) suggesting better physical well being or less somatization in the Netherlands. Further work might seek to replicate this finding and examine possible explanations. For example, school stresses are often connected to the somatization of distress (Garralda, 1999) which could reflect differences in academic demand and pressure across different national curricula and educational systems.

The most common and recurring CSI symptoms were also similar to those reported in studies from other countries, as were the gender effects with higher scores in girls. Biological factors, such as menstruation, and psychological changes linked to the increased rate of emotional symptoms following puberty in girls are thought to contribute to higher levels of symptoms in girls (Eminson et al., 1996). Findings related to age have been less clear-cut (Campo et al., 1999; Garber et al., 1991; Offord et al., 1987; Perquin et al., 2000). In our sample, the mid-adolescent group had the lowest CSI total scores, but this was only significant in comparison with the younger age group. Different educational demands could contribute to this: participants in the middle age-group may be less stressed than the younger group needing to adapt to a new school. The increased somatic symptoms in children from non-intact families are similarly likely to reflect higher stress levels in these young people.

Internal Consistency and Factor Analysis

The high internal consistency was consistent with previous studies (Garber et al., 1991; Litcher et al., 2001; Meesters et al., 2003) and the results of the exploratory factor analysis revealed a three-factor model that corresponds to the structure Meesters et al. (2003) reported as underpinning the CSI within a Dutch sample, the only other western European nonclinical sample. These factors closely correspond to three out of the four DSM-IV Somatization disorder symptom domains, the fourth domain that includes sexual symptoms is less appropriate for children and adolescents. This may be an argument for future versions of the Diagnostic and Statistical Manual providing a separate developmentally appropriate category of Somatization disorder for children and adolescents.

In the current study, the exploratory factor analysis resulted in a shorter CSI version containing 17 items: this was highly correlated with the 35-item CSI and had good construct validity as evidenced by significant positive correlations with both MFQ and the emotional sub-scale of the SDQ. Walker et al. (Walker, Beck, Garber, & Lambert, 2008) have recently investigated the dimensionality of the CSI in a sample of pediatric patients with abdominal pain and found a CSI-24 version to be reliable and a psychometrically sound refinement, with a large factor representing the presence of multiple symptoms explaining almost 30% of total variance and a weak gastrointestinal second factor. Further work is required to clarify the relative merits of focusing on a strong general CSI factor representing a continuum of symptom reporting rather than separate symptom clusters, and the use of shortened CSI versions in both general and clinical populations.

Association with Stress, Emotional Symptoms, and Impairment

Consistent with previous studies, we found significant positive correlations between somatic and emotional

<table>
<thead>
<tr>
<th>Symptoms get worse with stress</th>
<th>No ( n = 362 )</th>
<th>Uncertain ( n = 327 )</th>
<th>Yes ( n = 231 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSI total score</td>
<td>7 (3, 15)(_{ab})</td>
<td>14 (8, 25)(_{ac})</td>
<td>25 (13, 39)(_{bc})</td>
</tr>
<tr>
<td>CSI somatization score</td>
<td>0 (0, 1)(_{ab})</td>
<td>0 (0, 2)(_{ac})</td>
<td>1 (0, 4)(_{bc})</td>
</tr>
<tr>
<td>CSI impairment</td>
<td>0 (0, 1)(_{ab})</td>
<td>2 (0, 3)(_{ac})</td>
<td>3 (1, 4)(_{bc})</td>
</tr>
<tr>
<td>MFQ scores</td>
<td>8 (3, 16)(_{ab})</td>
<td>17 (10, 27)(_{ac})</td>
<td>26 (14, 39)(_{bc})</td>
</tr>
<tr>
<td>SDQ emotional</td>
<td>2 (1, 4)(_{ab})</td>
<td>4 (2, 5)(_{ac})</td>
<td>5 (3, 7)(_{bc})</td>
</tr>
</tbody>
</table>

Medians (Mdn) that share subscripts differ significantly (\( p \leq .0021 \)) on Mann–Whitney comparisons.

***\( p < .001 \)
symptoms indicating adequate construct validity of the CSI (Egger et al., 1999; Garber et al., 1991; Garralda, 1996; Taylor et al., 1996), and low correlations with behavioral symptoms indicative of adequate discriminant validity.

In addition, a quarter of respondents recognized a link between somatic symptoms and stress, whilst a further third were uncertain. These two groups had higher CSI, MFQ and SDQ total and emotional scores than young people denying psychosomatic links of this kind, which is in line with the notion of increased stress reactivity in children with functional somatic symptoms (Beck, 2008). Overall, the findings suggest that higher CSI scores are more likely to be an expression of the somatization of distress, and that asking about the effect of stress on somatic complaints is a helpful screening tool for young people at high risk for somatization.

Subjective impairment on domains such as enjoyment and concentration was reported by one in ten respondents, while one in twenty reported impairment in domains such as seeing friends and going to school. This order of impairing effects of somatic symptoms is a replication of the only other study to use these impairment items (Kramer & Garralda, 1998) and may be secondary to the use of suboptimal symptom coping strategies (Walker, Freeman Baber et al., 2008). Impairment levels correlated significantly with the number of physical and emotional symptoms, and with perceptions that symptoms got worse with stress. This indicates that for a substantial minority of young people somatic symptoms are impairing and, therefore, clinically relevant. The addition of impairment screening questions to the CSI might help explore these issues further.

**Strengths and Limitations**

The strengths of the study included the size of the sample, the largest nonclinical sample using the CSI so far, and the good response rate, providing representative data on a whole UK school population. By studying the psychometric properties of the CSI, examining links with emotional and behavioral symptoms, and adding information about impairment and possible links with stress, the study confirms and expands the possible uses of the CSI to the study of somatization in nonclinical samples of young people.

An intrinsic limitation of the CSI is that it does not provide information on possible medical explanations for symptoms. Further work is required to establish whether symptoms reported on the CSI are an expression of organic problems. Furthermore, we relied on self-report data and although children and adolescents are regarded as better informants than parents when reporting emotional or internalizing experiences (Achenbach, McConaughy, & Howell, 1987), Garber, Van Slyke, and Walker (1998) found discordant reports of somatic and depressive symptoms between mothers and children with chronic abdominal pain, with mothers reporting a greater number of symptoms.

Although the SDQ scores were comparable to national data (SDQ, 2001), the mean MFQ depressive symptom scores were higher than expected compared to other surveys (Cooper & Goodyer, 1993; Sund et al., 2001; Yates et al., 2004) suggesting either a tendency to over-report symptoms or a high risk for depression in this sample. Given the strong associations between depressive and somatic symptoms this may have led to an over-estimation of somatic symptoms. Finally, even though in our study CSI total symptoms were not linked to ethnicity or socioeconomic family status, there was a predominance of White ethnicity and professional occupations in our sample and the results may not be generalizable to more diversified cultural and socioeconomic groups. Therefore, it will be necessary to validate the findings in a more diverse, ethnically and socioeconomically representative sample.

In summary, using the CSI with a sample of British secondary school young people we have identified rates of somatic symptoms generally comparable to those in other countries. We have confirmed adequate psychometric properties of the instrument in this sample. When complemented by measures of impairment and perceived association with stress, the CSI provides a good basis for the study of somatization in children and adolescents.

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