

Assessing Adolescent Anxiety in General Psychiatric Care: Diagnostic Accuracy of the Swedish Self-Report and Parent Versions of the Spence Children's Anxiety Scale

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Abstract

This study examined the psychometric properties and diagnostic accuracy of the Swedish translations of the Spence Children's Anxiety Scale, self- and parent report versions, in a sample of 104 adolescents presenting at two general psychiatric outpatient units. Results showed high informant agreement and good internal reliability and concurrent and discriminant validity for both versions and demonstrated that this scale can distinguish between adolescents with and without an anxiety disorder in a non-anxiety-specific clinical setting. The relative clinical utility of different cutoff scores was compared by looking at the extent to which dichotomized questionnaire results altered the pretest probability of the presence of a diagnosis as defined by the Schedule for Affective Disorders and Schizophrenia for School-Age Children. Optimized for screening and diagnostic purposes in Sweden, cutoff scores obtained in the current study outperformed a previously identified cutoff score derived from an Australian community sample. The Spence Children's Anxiety Scale is a useful clinical instrument for the assessment of anxiety in adolescents.

Keywords

anxiety disorders, adolescents, Spence Children's Anxiety Scale, test validity, diagnostic accuracy

Reports from recent epidemiological studies show that anxiety disorders are the most prevalent psychiatric disorders during childhood and adolescence (Merikangas, Nakamura, & Kessler, 2009), with lifetime prevalence among adolescents reported to be as high as 31.9% (Merikangas et al., 2010). Anxiety disorders with early onset are associated with impaired daily functioning, poor social, academic and health outcomes, and a chronic course into adulthood if left untreated (Cole, Peeke, Martin, Truglio, & Seroczynski, 1998; Essau, Conradt, & Petermann, 2002; Kessler et al., 1994; Woodward & Fergusson, 2001). In addition, anxiety disorders pose a tremendous economic burden on society (Andlin-Sobocki & Wittchen, 2005; Kessler, Ruscio, Shear, & Wittchen, 2010). Unfortunately, because impairing levels of anxiety in young people usually go undetected in primary and mental health care, only approximately one third of children with anxiety disorders receive treatment (Angold et al., 1998; Chavira, Stein, Bailey, & Stein, 2004; Esbjörn, Hoeyer, Dyrborg, Leth, & Kendall, 2010; Richardson, Russo, Lozano, McCauley, & Katon, 2010). One important factor for increasing the detection rates is the implementation and use of validated assessment procedures (Esbjörn et al., 2010; Wren, Bridge, & Birmaher, 2004; Wren, Scholle, Heo, & Comer, 2003).

Self- and parent rating scales are a time- and cost-effective method to gather information on symptoms of anxiety and can be helpful in the detection (i.e., screening), identification (i.e., diagnosing), and treatment (i.e., assessing symptom severity) of clinically anxious youths. The clinical relevance and diagnostic utility of self-report scales in the assessment of anxiety is ultimately dependent on sound psychometric properties established in settings that permit generalization to comparable clinical populations and correspondence with the diagnostic classification system(s) they were designed to reflect.

One self-report scale widely used to assess anxiety is the Spence Children's Anxiety Scale (SCAS; Spence, 1997), which has an accompanying parent version (SCAS-P; Nauta et al., 2004). It was specifically designed to evaluate the severity of anxiety symptoms in children

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and adolescents and to correspond to six *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; *DSM-IV*; American Psychiatric Association, 2000) categories of anxiety disorders: separation anxiety disorder, social phobia, obsessive-compulsive disorder (OCD), panic-agoraphobia, generalized anxiety disorder, and specific phobia (Spence, 1998; Spence, Barrett, & Turner, 2003). The SCAS's six-factor structure and psychometric properties have been examined in a number of studies in Australia where it was originally developed (Nauta et al., 2004; Spence, 1997, 1998; Spence et al., 2003) and across multiple cultures in five continents: Europe (Arendt, Hougaard, & Thastum, 2014; Essau, Anastassiou-Hadjicharalambous, & Munoz, 2011; Essau, Muris, & Ederer, 2002; Essau, Sasagawa, Anastassiou-Hadjicharalambous, Guzman, & Ollendick, 2011; Mellon & Moutavelis, 2007; Muris, Merckelbach, Ollendick, King, & Bogie, 2002; Muris, Schmidt, & Merckelbach, 2000; Nauta et al., 2004; Orgiles, Spence, Marzo, Mendez, & Espada, 2014), Asia (Essau, Leung, Conradt, Cheng, & Wong, 2008; Essau, Olaya, Pasha, O'Callaghan, & Bray, 2012; Ishikawa, Sato, & Sasagawa, 2009; Li, Lau, & Au, 2011; Zhao, Xing, & Wang, 2012), Africa (Muris, Schmidt, Engelbrecht, & Perold, 2002), and South America and North America (Brown-Jacobsen, Wallace, & Whiteside, 2011; Campbell & Crane, 2010; DeSousa, Petersen, Behs, Manfro, & Koller, 2012; Whiteside & Brown, 2008; Whiteside, Gryczkowski, Biggs, Fagen, & Owusu, 2012). Data obtained in these studies have strongly supported the internal consistency, test-retest reliability, and convergent, divergent and discriminant validity of the SCAS; however, the studies have predominantly been carried out in community samples, with only seven examining the SCAS in clinical settings (Arendt et al., 2014; Brown-Jacobsen et al., 2011; DeSousa, DeSousa, Pereira, Petersen, & Manfro, 2014; Nauta et al., 2004; Spence, 1998; Whiteside & Brown, 2008; Whiteside et al., 2012). Although findings from these clinical evaluations are encouraging, their generalizability is restricted because they have been carried out either in anxiety-specific clinics or in a two-staged procedure where children have been included only if they meet the criteria for an anxiety disorder. Neither of these procedures mirror conditions in general outpatient clinics or primary health care, where anxiety is often not a clear or agreed primary cause for help seeking (Emslie, 2008; Yeh & Weisz, 2001).

The current study addresses the lack of data on the diagnostic utility of the SCAS and SCAS-P in non-anxiety-specific clinical settings. It intends to expand the literature by examining the SCAS and SCAS-P in relation to the semistructured diagnostic interview Schedule for Affective Disorders and Schizophrenia for School-Age Children—Present and Lifetime version (K-SADS; Kaufman et al., 1997), here treated as the reference standard, within a

Swedish clinical sample of adolescents referred to a general psychiatric outpatient clinic. The objectives were (1) to investigate the psychometric properties of the Swedish translations of the SCAS and SCAS-P by (a) evaluating descriptive information and reliability, (b) examining the concurrent and discriminant validity of the SCAS and SCAS-P, and (c) examining informant agreement and effect; (2) to determine cutoff scores for screening and diagnostic purposes; and (3) to evaluate the diagnostic accuracy of the SCAS and SCAS-P.

Method

Setting

This observational, prospective study was carried out in two child and adolescent outpatient mental health service units in the county of Vastmanland, Sweden. The units provide services to children and adolescents younger than 18 years of age ($N = 37,494$) living in urban, suburban, and rural regions within the catchment area. Referrals to the service are made by parents, primary care units, social services, school health services, and hospital departments. The units operate under the National Health Care Guarantee, which guarantees access to services within 30 days from the date of referral.

Recruitment of Participants

The project was approved by the Ethics Review Board of Uppsala University. Participants were prospectively enrolled between August 2011 and June 2013 during predefined recruitment periods of a total of 63 weeks. Patients were eligible if they met the age criteria (minimum age of 13 years during the calendar year of assessment, maximum age of 17 years at time of consenting to participation), irrespective of presenting symptoms. Exclusion criteria were inadequate Swedish-speaking skills of either child or parent, and developmental disability. At each participant's first visit, clinical staff confirmed eligibility, checked for exclusion criteria, and obtained informed written consent to participate from both adolescent and parent.

Measures

Spence Children's Anxiety Scale—Self-Report and Spence Children's Anxiety Scale—Parent (SCAS-P). The SCAS (Spence, 1997) and the SCAS-P (Nauta et al., 2004) are 44-item (38 score-generating items and 6 positive filler items to reduce negative bias), Likert-type (0 = *never*, 3 = *always*) questionnaires designed to assess anxiety symptoms in children and adolescents. The SCAS and SCAS-P provide a total score as well as scores on six subscales: panic attacks and agoraphobia, separation anxiety, physical injury fears, social phobia, OCD, and generalized anxiety. In the original study

by Spence (1997), the internal reliability coefficient for the total scale was .92 and ranged from .60 to .82 for the subscales. Further validity and reliability data supporting the SCAS and SCAS-P has been reported by Spence and others (Brown-Jacobsen et al., 2011; Campbell & Crane, 2010; Essau, Muris, et al., 2002; Essau, Sakano, Ishikawa, & Sasagawa, 2004; Essau, Sasagawa, et al., 2011; Ishikawa et al., 2013; Mellon & Moutavelis, 2007; Muris et al., 2000; Muris, Merckelbach, et al., 2002; Nauta et al., 2004; Orgiles et al., 2014; Orgiles, Mendez, Spence, Huedo-Medina, & Espada, 2012; Spence, 1998; Whiteside & Brown, 2008; Whiteside et al., 2012). The English versions of the SCAS and SCAS-P were adapted and translated to Swedish using the guidelines recommended by the International Test Commission (Hambleton, Merenda, & Spielberger, 2005), and a committee formed by two of the authors (SO and SV) assessed the translations for appropriate cultural and linguistic adaptation. Prior clinical pilot applications verified the current Swedish version, downloadable on the SCAS website (www.scaswebsite.com/index.php?p=1_19).

Schedule for Affective Disorders and Schizophrenia for School-Age Children—Present and Lifetime Version 2009. The K-SADS (Kaufman et al., 1997) is a semistructured diagnostic interview designed to guide clinicians in the collection of evidence for 33 *DSM-IV* psychiatric disorders in children and adolescents aged 6 to 17 years. It consists of a screening interview where symptom severity above threshold determines which additional diagnostic supplements should be completed. The K-SADS is widely used as a diagnostic tool and reference standard in child and adolescent mental health research (Ambrosini, 2000; Hammerness et al., 2008; Silverman & Ollendick, 2005).

Procedure

Clinical staff administered the SCAS and SCAS-P as part of a regular intake package on each participant's first or second visit. The semistructured interview was conducted within 14 days of questionnaire completion ($M = 3.67$, $SD = 3.55$). Interviewers were unaware of the results of the SCAS and SCAS-P. One third (33.7%) of the interviews violated the set time frame of 14 days, and in these instances the SCAS and SCAS-P were readministered directly after the semistructured interview. These reassessments were subsequently used in the analysis, replacing the questionnaires from initial visits. Adolescents and parents were interviewed together. All diagnoses were based on full *DSM-IV* criteria and determined by the individual interviewer solely on the basis of information collected using the K-SADS. Diagnoses were not ranked as primary or secondary. The diagnoses of panic with or without agoraphobia and agoraphobia without a history of panic disorder were combined into one category: panic/agoraphobia.

Interviewer Training and Interrater Reliability

Three authors (SO, SV, and KS) and two clinical interviewers (one psychiatrist and one psychologist) administered the K-SADS interviews. Interviewers received extensive training by an experienced psychiatrist/K-SADS teacher (KS) prior to data collection. A free-marginal multirater kappa (multirater κ_{free} ; Brennan & Prediger, 1981; Randolph, 2005) was chosen to calculate interrater reliability. This kappa statistic differs from the commonly used Cohen's kappa in that it allows for multiple raters and free marginals (Cohen's kappa assumes only two raters and fixed marginals, i.e., when raters know the quantity of cases that should be distributed into each category). Interrater reliability before data collection was calculated from interviewers' individual ratings on videotaped model interviews and showed adequate agreement: multirater $\kappa_{\text{free}} = .88$, percentage overall agreement (P_o) = .94. To prevent drift, calibration meetings were held monthly throughout the study, using video recordings of 13% of randomly selected interviews. Average multirater κ_{free} (P_o) reliability during data collection was as follows: all diagnoses .94 ($P_o = .97$), any anxiety .92 ($P_o = .96$), separation anxiety .83 ($P_o = .92$), social phobia .92 ($P_o = .96$), specific phobia 0.94 ($P_o = .97$), OCD 1.00 ($P_o = 1.00$), generalized anxiety 1.00 ($P_o = 1.00$), and panic/agoraphobia .94 ($P_o = .97$).

Data Analyses

Statistical analyses were conducted using SPSS 20 running on Windows 7. A p value less than .05 was considered significant. For those who consented to participation and were administered both the SCAS/SCAS-P and the K-SADS ($n = 125$), the total number of missing values on score-generating SCAS items was 4.13% for adolescents and 3.85% for parents. Little's (1988) missing completely at random test indicated that data were missing completely at random, adolescents: $\chi^2(578) = 564.01$, $p = .654$; parents: $\chi^2(707) = 695.64$, $p = .613$, suggesting that reduction of power, but no bias, was introduced when a total of 21 participant pairs (i.e., pairs of adolescents and parents) with missing values exceeding 28% on either SCAS or SCAS-P (due to questionnaire failures) were excluded from the analysis. Of the remaining 104 cases, the average number of missing responses was 0.18 (0.5%) for adolescents and 0.25 (0.7%) for parents. The frequency of missing data points on individual SCAS items ranged from 0% to 2.9%. Expectation-maximization imputation, an iterative method for finding maximum likelihood estimates of missing values, was used (Dempster, Laird, & Rubin, 1977). After imputation, continuous scores on the SCAS and SCAS-P were used to compute means, standard deviations, and dichotomous variables for the total score and the six subscales. To explore differences between groups for continuous and ordinal data, independent t tests were performed and validated by the

nonparametric Mann–Whitney U test. A chi-square test was used for dichotomous and categorical variables. The internal consistency of the SCAS and SCAS-P total score and subscales was calculated with Cronbach's alpha. To investigate agreement between parent report and child report, Spearman's rho correlations were calculated. Concurrent validity was examined by calculating Spearman's rho correlations between the SCAS/SCAS-P total score and subscales and K-SADS screening scores for social phobia (0-3), generalized anxiety (0-9), specific phobia (0-6), panic/agoraphobia (0-9), OCD (0-6), separation anxiety (0-15), and the sum of K-SADS anxiety screening scores (0-48).

Receiver operating characteristic (ROC) analyses examined the ability of the SCAS and SCAS-P total score and subscale scores in predicting the presence or absence of SCAS-related anxiety disorders in the sample. The strength of the prediction is indicated by the area under the curve (AUC), which ranges from 1.0 (perfect association) to .5 (no association; Hanley & McNeil, 1982). For all possible cutoff scores provided by ROC analysis, the highest cutoff score with a minimum sensitivity of .90 was identified for screening purposes for total scores and all subscales, with no differentiation between boys and girls. Likewise, the lowest cutoff score with a minimum specificity of .90 was identified for diagnostic purposes, again with no differentiation between boys and girls. Additionally, for the SCAS, cutoff scores published on the SCAS website for 12- to 15-year-old boys and girls (www.scaswebsite.com/index.php?p=1_9), equivalent to the t -score of 60 outlined in the t -score tables, were examined for the total score and subscales and are henceforth referred to as $T60$. Dichotomized variables were used for calculating efficiency (proportion of participants correctly classified as either having or not having an anxiety disorder), sensitivity, and specificity. Posttest probabilities were calculated by methods of positive (PPV) and negative (NPV) predictive values and likelihood ratios (LRs) for different cutoff scores. LRs, calculated from the sensitivity and specificity of a test, indicate how many times more likely a particular test result is in individuals with a disorder than in those without and range from 0 to infinity. LRs greater than 1 indicate the presence of the disorder, with stronger evidence indicated by higher numbers. LRs smaller than 1 indicate that disease is less likely. LRs equal to 1 lack diagnostic value (McGee, 2002). Results are reported in accordance with the recommendations of the Standards for Reporting of Diagnostic Accuracy (Bossuyt et al., 2003).

Results

Description of Sample

During the study period, 202 consecutive patients were eligible for inclusion. Of these, 73 were excluded: 28 declined to participate and 45 were missed due to clinical and

administrative staff's high workloads (26 were not asked to participate and 19 did not receive an appointment for the semi-structured interview). There were no significant differences in sex or age between excluded and included patients, regardless of reason for exclusion. Of the remaining 129 patients, 4 did not show up for the diagnostic interview and 21 were excluded from analysis because of inadequate data on the SCAS or SCAS-P (Figure 1). There were no significant differences in sex, age, or proportions of anxiety between those excluded because of inadequate data and the remaining participants. The study group consisted of 104 adolescents (62 girls, 59.6%) aged 12 to 18 years ($M = 15.8$, $SD = 1.5$), predominantly ethnic Swedes (97%), and their parents. A majority of parents were separated (58.7%). The most common causes for referral were symptoms of attention deficit hyperactivity disorder (28.8%) followed by symptoms of depression (27.9%) and anxiety (20.2%). Four adolescents (3.8%) had anxiety as a single referral cause.

Based on the K-SADS, the total number of diagnoses per adolescent ranged from 0 to 8 (median = 2, interquartile range = 1-3). A majority of the adolescents, 69.2%, had at least one comorbid disorder. Eight (7.7%) had no diagnoses. Fifty-seven (54.8%) adolescents (74% of all girls, 26% of all boys) were diagnosed with at least one anxiety disorder with a female to male ratio of more than 4:1. Most frequent anxiety diagnoses were social phobia ($n = 30$), generalized anxiety ($n = 20$), and specific phobia ($n = 19$). Logistic regression showed that reports of problematic symptoms of anxiety at the time of referral did not predict a K-SADS-derived diagnosis of anxiety. There were no differences between anxious and nonanxious adolescents in age, parents' marital status, or number of comorbid nonanxiety disorders. However, there was a significant sex difference, with a higher proportion of girls among anxious adolescents compared with nonanxious adolescents, $\chi^2 = 23.3$, $p < .001$. Table 1 shows sociodemographic and diagnostic characteristics of anxious and nonanxious adolescents.

Reliability

Cronbach's internal reliability coefficients (α s) for the SCAS and SCAS-P total scores and subscales for the total sample, and separate coefficients for the anxious and nonanxious subgroups, were determined and are presented in Table 2. Reliability estimates for the SCAS and SCAS-P total scores and most subscales fell in the good to excellent range in the total sample and the anxious group, whereas the estimates for SCAS-P subscales in the nonanxious group generally showed somewhat lower internal reliability.

Concurrent Validity

Concurrent validity, measured as Spearman's rho, was evaluated by examining the relationship between scores of the SCAS and SCAS-P and interviewer ratings on the K-SADS

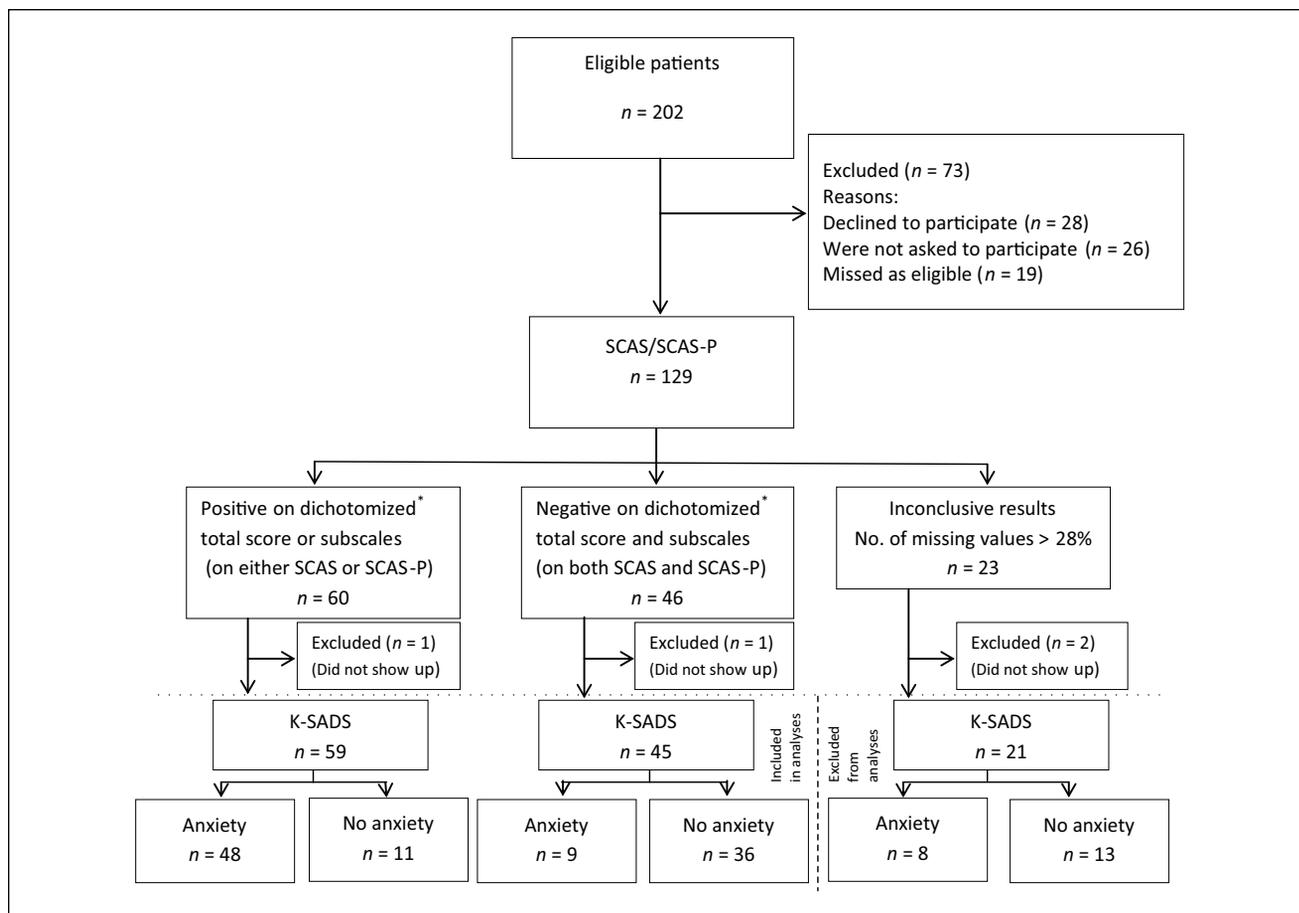


Figure 1. Study flowchart.

Note. SCAS = Spence Children's Anxiety Scale; SCAS-P = Spence Children's Anxiety Scale-Parent; K-SADS = Schedule for Affective Disorders and Schizophrenia for School-Age Children.

*Diagnostic cutoff.

screening interview. Significance tests for dependent correlations were conducted to determine if the strength of the relation with the K-SADS screening interview differed between the SCAS and the SCAS-P (Steiger, 1980). The SCAS/SCAS-P total scores and all subscale scores were positively and significantly related to the K-SADS anxiety screening scores (coefficient for self-report first): total score $r = .74/.63$, social phobia $r = .62/.57$, generalized anxiety $r = .63/.52$, specific phobia (physical injury fears) $r = .48/.49$, panic/agoraphobia $r = .54/.45$, OCD $r = .37/.22$, and separation anxiety $r = .60/.38$ (all $ps < .001$). Stronger relationships between the K-SADS and the SCAS, compared to SCAS-P, were observed for the total score ($Z = 2.18$, $p = .029$) and the separation anxiety subscale ($Z = 2.72$, $p = .007$). No other differences in the strength of the relationships were found to be significant.

Discriminant Validity

Means and standard deviations for the SCAS and SCAS-P total score and subscales for the total sample, and separate

means and standard deviations for anxious and nonanxious adolescents, are presented in Table 2. There were no differences in total mean scores between those who completed the SCAS/SCAS-P before the K-SADS and those who were readministered the questionnaire after the K-SADS. Scores of anxious adolescents were significantly higher on the SCAS/SCAS-P total scores and all subscales, with mostly large effect sizes, determined by Cohen's d (Cohen, 1988), compared to SCAS/SCAS-P scores of nonanxious adolescents ($p < .001$).

Informant Agreement and Effect

To evaluate the agreement between parent- and self-reports of anxiety symptoms, correlations using Spearman's rho were calculated between the SCAS and SCAS-P. Both the total score and all subscales were positively and significantly related: total score $r = .71$; social phobia $r = .69$, generalized anxiety $r = .64$, physical injury fears $r = .69$, panic/agoraphobia $r = .62$, obsessive-compulsive $r = .54$, and separation anxiety $r = .52$ (all $ps < .001$). Compared to

Table 1. Sociodemographic and Diagnostic Characteristics of K-SADS–Defined Anxious and Nonanxious Adolescents.

Variables	Anxious, <i>n</i> = 57	Nonanxious, <i>n</i> = 47	<i>t</i> / χ^2 (<i>df</i>)	<i>p</i>
Sex				
Girls, <i>n</i> (%)	46 (80.7)	16 (34.0)	23.3 (1)	< .001
Age, <i>M</i> (<i>SD</i>)	16.0 (1.4)	15.6 (1.6)	−1.4 (102)	.156
Parents' marital status				
Divorced, <i>n</i> (%)	32 (56.1)	29 (61.7)	1.8 ^a	.673
Base rates, % (<i>n</i>)				
Any anxiety disorder	54.8 (57/104)	—		
Any SCAS-related anxiety ^b	52.9 (55/104)	—		
Social phobia	28.8 (30/104)	—		
Generalized anxiety disorder	19.2 (20/104)	—		
Specific phobia	18.3 (19/104)	—		
Panic/agoraphobia	12.5 (13/104)	—		
Posttraumatic stress disorder ^c	9.6 (10/104)	—		
Obsessive-compulsive disorder	6.7 (7/104)	—		
Separation anxiety disorder	4.8 (5/104)	—		
Anxiety NOS ^c	1.9 (2/104)	—		
No. of anxiety disorders, <i>M</i> (<i>SD</i>)	1.7 (1.1)	—		
No. of nonanxiety disorders, <i>n</i> (%)			4.9 ^a	.284
1	21 (36.8)	21 (44.7)		
2	17 (29.8)	14 (29.8)		
3	8 (14.0)	3 (6.4)		
4	4 (7.0)	0		
5	1 (1.8)	1 (2.1)		
No disorder, % (<i>n</i>)	—	7.7 (8/104)		

Note. K-SADS = Schedule for Affective Disorders and Schizophrenia for School-Age Children; *df* = degrees of freedom; SCAS = Spence Children's Anxiety Scale; NOS = not otherwise specified.

^aFisher's exact test, two-tailed.

^bSocial phobia, generalized anxiety disorder, specific phobia, panic/agoraphobia, obsessive-compulsive disorder, separation anxiety disorder, and anxiety NOS.

^cNot included in analysis of diagnostic accuracy.

those administered the questionnaire at their first visit, the relationship between the SCAS and SCAS-P was significantly stronger among those completing the questionnaire after the diagnostic interview on the social phobia ($Z = -2.28, p = .023$), panic/agoraphobia ($Z = -2.42, p = .015$), and generalized anxiety ($Z = -2.02, p = .044$) subscales.

To investigate differences in mean scores, a series of *t* tests were conducted. In the total sample, scores on the SCAS were significantly higher than scores on the SCAS-P on the total score and on four out of six subscales (generalized anxiety, physical injury fears, panic/agoraphobia, and obsessive-compulsive, all *ps* < .05); however, all effect sizes fell in the small to medium range ($d = 0.39-0.64$). The same pattern of significant mean score differences between the SCAS and SCAS-P total score and generalized anxiety, physical injury fears, panic/agoraphobia, and obsessive-compulsive subscales was also found when the anxious group was analyzed separately, with effect sizes ranging from small to medium ($d = 0.38-0.71$). In the nonanxious group, significant mean score differences between the SCAS and the SCAS-P were found only on the physical injury fears, obsessive-compulsive and generalized anxiety

subscales with small to medium effect sizes ($d = 0.34-0.55$). Significant sex differences in mean scores were observed in the total sample on both the SCAS and SCAS-P total score and all subscales (all *ps* < .05). SCAS and SCAS-P scores of girls were higher than scores of boys, with effect sizes ranging from medium to large (SCAS: $d = 0.47-1.10$; SCAS-P: $d = 0.43-0.94$). However, when groups were analyzed separately, significant sex differences were observed among anxious adolescents only on the SCAS total score ($Z = -2.11, p = .035, r = .28$) and two subscales (separation anxiety $Z = -2.47, p = .014, r = .32$; physical injury fears $Z = -2.52, p = .012, r = .33$), with girls scoring higher than boys. In nonanxious adolescents, only the physical injury fears subscale showed significant sex differences, with girls scoring higher than boys ($Z = -3.20, p = .001, r = 0.47$). On the SCAS-P, no significant sex differences in mean scores were observed when ratings of anxious and nonanxious adolescents were analyzed separately, except on the physical injury fears subscale where SCAS-P scores of both anxious and nonanxious girls were higher than SCAS-P scores of boys ($Z = -2.01, p = .045, r = .27$ and $Z = -2.16, p = .031, r = .32$, respectively). Compared with SCAS-P scores of

Table 2. Cronbach's Alpha, Mean Score, and Between-Groups Differences by K-SADS-Defined Anxious Status on the SCAS and SCAS-P Total Score and Subscales.

Subscale	Informant									
	SCAS					SCAS-P				
	Total sample (n = 104)	Anxious (n = 57)	Nonanxious (n = 47)	t (df)	d	All (n = 104)	Anxious (n = 57)	Nonanxious (n = 47)	t (df)	d
Total score (range 0-114)										
Cronbach's α	.94	.91	.84			.91	.89	.81		
M (SD)	29.93 (18.56)	40.56 (17.55)	17.05 (9.35)	8.72 (88.42)***	1.75	23.70 (14.37)	31.03 (14.09)	14.81 (8.56)	7.23 (94.33)***	1.43
Social phobia (range 0-18)										
Cronbach's α	.78	.71	.65			.83	.84	.71		
M (SD)	7.31 (4.25)	9.50 (3.95)	4.66 (2.89)	7.22 (100.68)***	1.42	7.15 (4.38)	8.87 (4.39)	5.06 (3.38)	5.00 (101.56)***	0.98
Generalized anxiety (range 0-18)										
Cronbach's α	.84	.79	.71			.78	.75	.62		
M (SD)	6.65 (4.00)	8.75 (3.81)	4.11 (2.47)	7.48 (96.91)***	1.48	4.97 (3.11)	6.35 (3.10)	3.30 (2.18)	5.88 (99.72)***	1.16
Physical injury fears (range 0-15)										
Cronbach's α	.65	.61	.61			.56	.55	.40		
M (SD)	3.68 (3.01)	4.60 (3.20)	2.56 (2.36)	3.73 (100.86)***	0.73	2.90 (2.57)	3.75 (2.71)	1.86 (1.96)	4.11 (100.43)***	0.81
Panic/agoraphobia (range 0-27)										
Cronbach's α	.86	.81	.70			.73	.64	.69		
M (SD)	5.31 (5.22)	8.01 (5.37)	2.04 (2.47)	7.49 (81.85)***	1.52	3.51 (3.38)	4.99 (3.30)	1.72 (2.52)	5.59 (102)***	1.12
Obsessive-compulsive (range 0-18)										
Cronbach's α	0.82	.77	.83			.79	.80	.69		
M (SD)	3.80 (3.84)	5.11 (4.00)	2.21 (2.98)	4.22 (101.03)***	0.83	2.15 (2.81)	2.95 (3.14)	1.19 (2.00)	3.48 (96.06)***	0.69
Separation anxiety (range 0-18)										
Cronbach's α	.75	.72	.47			.75	.76	.44		
M (SD)	3.18 (3.17)	4.60 (3.45)	1.47 (1.59)	6.11 (81.81)***	1.24	3.02 (3.09)	4.12 (3.50)	1.68 (1.78)	4.60 (86.10)***	0.92

Note. K-SADS = Schedule for Affective Disorders and Schizophrenia for School-Age Children; SCAS = Spence Children's Anxiety Scale; SCAS-P = Spence Children's Anxiety Scale-Parent.

*** $p < .001$, two-tailed.

anxious boys, there was a tendency for SCAS-P scores of anxious girls to be higher on the SCAS-P total score ($Z = -1.94$, $p = .052$, $r = .26$). However, only 11 boys fulfilled the criteria for a diagnosis of anxiety, and because of the low power, the observed sex differences should be interpreted with caution.

Cutoff Scores and Diagnostic Accuracy

Spence Children's Anxiety Scale-Self-Report. The overall ability of the SCAS to predict the diagnoses of social phobia, generalized anxiety disorder, specific phobia, panic/agoraphobia, OCD, and separation anxiety disorder as assessed by the K-SADS was examined by ROC analyses. The predictive power, measured as AUC, was significant for both the total score (example ROC curve in Figure 2) and all subscales and fell in the fair to good range, except for the separation anxiety subscale, which showed excellent predictive ability. With the exceptions of the panic/agoraphobia and separation anxiety subscales, the $T60$ cutoff scores' specificities were consistently higher than their sensitivities. For the total score, an indication of the presence of any SCAS-related anxiety disorder using the $T60$ cutoff score yielded the highest PPV and an increase in probability of an anxiety disorder from the pretest probability of 52% (i.e., base rate based on K-SADS results) to a posttest probability

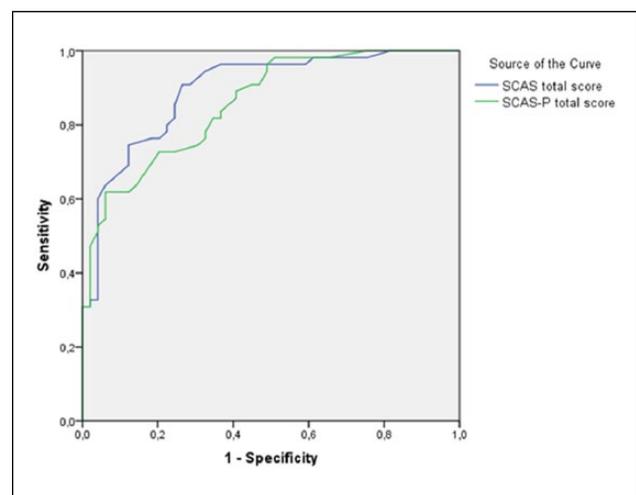


Figure 2. Receiver operating characteristic curves for six anxiety disorders.

Note. SCAS = Spence Children's Anxiety Scale; SCAS-P = Spence Children's Anxiety Scale-Parent. The receiver operating characteristic curves illustrate the predictive ability of the SCAS and SCAS-P total scores for social phobia, generalized anxiety disorder, specific phobia, panic/agoraphobia, obsessive-compulsive disorder, and separation anxiety disorder among an adolescent general psychiatric sample.

of 93%. PPVs for the subscales varied for different cutoff scores and were markedly higher for the diagnostic cutoff

Table 3. Diagnostic Accuracy of the SCAS and SCAS-P Total Score and Subscales for Screening, Diagnostic, and T60 Cutoff Scores.

Report and subscale	Base rate, %	AUC [95% CI]	Cutoff	Sensitivity, %	Specificity, %	Efficiency, %	PPV, %	NPV, %	LR+[95% CI]	LR- [95% CI]
SCAS										
Total score ^a	52.9	0.89***[0.83, 0.96]	Screening ^b ≥22	90.91	73.47	82.69	79.37	87.80	3.43 [2.13, 5.50]	0.12 [0.05, 0.29]
			Diagnostic ^b ≥33	63.64	93.88	77.88	92.11	69.70	10.39 [3.41, 31.68]	0.39 [0.27, 0.55]
			T60 ^b	49.09	95.92	71.15	93.10	62.67	12.03 [3.01, 47.99]	0.53 [0.41, 0.69]
Social phobia	28.8	0.87***[0.80, 0.94]	Screening ≥7	96.67	60.81	71.15	50.00	97.83	2.47 [1.84, 3.30]	0.05 [0.01, 0.38]
			Diagnostic ≥11	56.67	90.54	80.77	70.83	83.75	5.99 [2.77, 12.95]	0.48 [0.32, 0.73]
			T60	73.33	77.03	75.96	56.41	87.69	3.19 [2.00, 5.11]	0.35 [0.19, 0.63]
Generalized anxiety	19.2	0.79***[0.68, 0.89]	Screening ≥5	95.00	41.67	51.92	27.94	97.22	1.63 [1.32, 2.00]	0.12 [0.02, 0.82]
			Diagnostic ≥11	55.00	90.48	83.65	57.89	89.41	5.78 [2.68, 12.46]	0.50 [0.30, 0.81]
			T60	65.00	75.00	73.08	38.24	90.00	2.60 [1.59, 4.25]	0.47 [0.25, 0.86]
Physical injury fears (specific phobia)	18.3	0.77***[0.65, 0.89]	Screening ≥2	94.74	36.47	47.12	25.00	96.88	1.49 [1.23, 1.81]	0.14 [0.02, 0.99]
			Diagnostic ≥8	36.84	92.94	82.69	53.85	86.81	5.22 [1.98, 13.77]	0.68 [0.48, 0.96]
			T60	52.63	77.65	73.02	34.48	88.00	2.35 [1.32, 4.21]	0.61 [0.37, 0.99]
Panic/agoraphobia	12.5	0.90***[0.79, 1.00]	Screening ≥4	92.31	54.95	59.62	22.64	98.04	2.05 [1.55, 2.70]	0.14 [0.02, 0.93]
			Diagnostic ≥11	84.62	91.21	90.38	57.89	97.65	9.62 [4.77, 19.41]	0.17 [0.05, 0.60]
			T60	84.62	74.73	75.96	32.35	97.14	3.35 [2.19, 5.11]	0.21 [0.06, 0.74]
Obsessive-compulsive	6.7	0.79*[0.60, 0.98]	Screening ≥1	100	24.74	29.81	8.75	100	1.33 [1.19, 1.49]	0.00
			Diagnostic ≥11	57.14	95.88	93.27	50.00	96.88	13.86 [4.37, 43.95]	0.45 [0.19, 1.05]
			T60	57.14	86.60	84.62	23.53	96.55	4.26 [1.88, 9.65]	0.49 [0.21, 1.17]
Separation anxiety	4.8	0.92**[0.85, 1.00]	Screening ≥5	100	75.76	76.92	17.24	100	4.12 [2.91, 5.84]	0.00
			Diagnostic ≥9	60.00	93.94	92.31	42.86	97.94	9.90 [3.45, 28.44]	0.43 [0.15, 1.25]
			T60	80.00	80.81	80.77	17.39	98.77	4.17 [2.30, 7.57]	0.25 [0.04, 1.43]
SCAS-P										
Total score ^a	52.9	0.86***[0.79, 0.93]	Screening ^b ≥15	90.91	53.06	73.08	68.49	83.87	1.94 [1.42, 2.64]	0.17 [0.07, 0.41]
			Diagnostic ^b ≥27	61.82	93.75	75.96	91.89	68.18	9.89 [3.24, 30.17]	0.41 [0.29, 0.57]
Social phobia	28.8	0.81***[0.72, 0.90]	Screening ≥6	90.00	50.00	61.54	42.19	92.50	1.80 [1.39, 2.33]	0.20 [0.07, 0.60]
			Diagnostic ≥12	46.67	90.54	77.88	66.67	80.72	4.93 [2.21, 11.00]	0.59 [0.42, 0.83]
Generalized anxiety	19.2	0.70**[0.58, 0.82]	Screening ≥4	90.00	46.43	54.81	28.57	95.12	1.68 [1.31, 2.15]	0.22 [0.06, 0.82]
			Diagnostic ≥10	15.00	90.48	75.96	27.27	81.72	1.57 [0.46, 5.41]	0.94 [0.77, 1.14]
Physical injury fears (specific phobia)	18.3	0.73**[0.61, 0.85]	Screening ≥1	94.74	22.35	35.58	21.43	95.00	1.22 [1.04, 1.43]	0.24 [0.03, 1.65]
			Diagnostic ≥7	26.32	92.94	80.77	45.45	84.95	3.73 [1.27, 10.95]	0.79 [0.60, 1.04]
Panic/agoraphobia	12.5	0.81***[0.70, 0.93]	Screening ≥3	92.31	54.95	59.62	22.64	98.04	2.05 [1.55, 2.70]	0.14 [0.02, 0.93]
			Diagnostic ≥8	38.46	91.21	84.62	38.46	91.21	4.37 [1.68, 11.36]	0.67 [0.44, 1.04]
Obsessive-compulsive	6.7	0.82**[0.60, 1.00]	Screening ≥1	85.71	37.11	40.38	8.96	97.30	1.36 [0.97, 1.91]	0.38 [0.06, 2.41]
			Diagnostic ≥6	71.43	91.75	90.38	38.46	97.80	8.66 [3.84, 19.52]	0.31 [0.10, 1.01]
Separation anxiety	4.8	0.94**[0.85, 1.00]	Screening ≥4	100	70.71	72.14	14.71	100	3.41 [2.51, 4.64]	0.00
			Diagnostic ≥7	80.00	93.94	93.27	40.00	98.94	13.20 [5.42, 32.17]	0.21 [0.04, 1.23]

Note. AUC = area under the curve; PPV = positive predictive value; NPV = negative predictive value; LR+ = positive likelihood ratio; CI = confidence interval; LR- = negative likelihood ratio; SCAS = Spence Children's Anxiety Scale; SCAS-P = Spence Children's Anxiety Scale-Parent. Base rate: rate of adolescents receiving a diagnosis based on the Schedule for Affective Disorders and Schizophrenia for School-Age Children; Efficiency: correctly classified.

^aEstimates for any of the diagnoses of social phobia, generalized anxiety, specific phobia, panic/agoraphobia, obsessive-compulsive disorder, separation anxiety, or anxiety NOS.

^bScreening: cutoffs corresponding to a sensitivity ≥0.90; Diagnostic: cutoffs corresponding to a specificity ≥0.90; T60: cutoffs corresponding to t-score 60 in tables for adolescents 12 to 15 years published online at www.scaswebsite.com.

*p < .05. **p < .01. ***p < .001.

scores than the PPVs for the screening and T60 cutoff scores. When the SCAS indicated the absence of an anxiety disorder, NPVs for all subscales and cutoff scores were consistently higher than the pretest probabilities of not having a SCAS-related anxiety disorder.

Diagnostic accuracy or performance expressed in LRs has the advantage over predictive values (i.e., PPVs and NPVs) in that it is calculated from the sensitivity and specificity of a cutoff score and therefore is not driven by disorder prevalence. Thus, LRs are transferable to different settings and base rates whereas predictive values are dependent on the base rates in the reference group from which the estimates were originally calculated. However, LRs are not directly interpretable as

PPVs and NPVs are, and a graphical conversion tool such as a nomogram is useful in translating LRs to posttest probabilities (Fagan, 1975). In a nomogram, a straight line can be drawn from the pretest probability in the left column (Figures A1-A7), through the LR in the middle column and the posttest probability can be read off at the end of the line in the right column. Base rates, AUC, sensitivities, specificities, efficiency, predictive values, and LRs for screening, diagnostic, and T60 cutoff scores for the SCAS total score and all subscales are presented in Table 3. LR nomograms for the SCAS total score and subscales with pre- and posttest probabilities for an anxiety disorder at different cutoff scores are provided in Figures A1 to A7 (available online at <http://asm.sagepub.com/supplemental>).

To summarize, for all subscales, the diagnostic cutoff was the best cutoff for overall correct classification (efficiency), and scores above this threshold yielded the highest increase in the probability of an anxiety disorder. For the total score, the screening cutoff yielded the highest efficiency and the *T60* the highest increase in probability of anxiety. For both the total score and the subscales, scores under the screening cutoff yielded the highest decrease in the probability of anxiety.

Spence Children's Anxiety Scale—Parent Report. With regard to parental reports of adolescents' anxiety symptoms, ROC analyses showed that the predictive power of the SCAS-P was significant for both the total score (example ROC curve in Figure 2) and all subscales and fell in the fair to good range, except for the separation anxiety subscale, which showed excellent predictive ability. Significance tests for the difference between dependent ROC curves were calculated to determine if the predictive power differed between the SCAS and SCAS-P (DeLong, DeLong, & Clarke-Pearson, 1988). Significantly different ROC curves, with lower AUC for the SCAS-P, were found only for the social phobia subscale ($Z = 2.47, p = .014$). For the total score and the subscales, the diagnostic cutoff was the best cutoff for overall correct classification (efficiency) and scores above this threshold yielded the highest increase in the probability of an anxiety disorder. For both the total score and the subscales, scores under the screening cutoff yielded the highest decrease in the probability of anxiety. Overall, posttest increases and decreases of probabilities of a diagnosis of anxiety were smaller for the SCAS-P compared to the corresponding adolescent SCAS subscales and cutoff levels. Furthermore, using the diagnostic cutoff, five out of seven negative LRs (LR⁻) and one of seven positive LRs (LR⁺) included a value of 1 in a 95% confidence interval, thus lacking clinical value. For the screening cutoff, two out of seven LR⁻ and one of seven LR⁺ included a value of 1. Base rates, AUC, sensitivities, specificities, efficiency, predictive values, and LRs for screening and diagnostic cutoff scores for the SCAS-P total score and all subscales are presented in Table 3. LR nomograms for the SCAS-P total score and subscales with pre- and posttest probabilities for an anxiety disorder at different cutoff scores are provided in online Figures A1 to A7. The nomogram template is used with permission from the Centre for Evidence-Based Medicine, Oxford, United Kingdom (Centre for Evidence-Based Medicine, 2014).

Discussion

The current study represents the first investigation of the psychometric properties and diagnostic accuracy of the Swedish version of the SCAS and SCAS-P among clinically referred adolescents. Moreover, it is the first evaluation of

the SCAS and SCAS-P within a non-anxiety-specific clinical setting where participants have been included irrespective of anxiety status as defined by either index test or reference standard, thus avoiding spectrum bias, a commonly observed methodological shortcoming in studies of diagnostic accuracy that can inflate estimates (Cook, Cleland, & Huijbregts, 2007). Overall, the results show good psychometric properties and support the reliability and validity of the Swedish translations of the SCAS and SCAS-P. These scales can differentiate adolescents with an anxiety disorder from those without within a general psychiatric outpatient clinical sample. Finally, based on the results of the current study, screening and diagnostic cutoff scores are proposed. Overall, for both the SCAS and SCAS-P total score and subscales, a negative result from the screening cutoff and a positive result from the diagnostic cutoff yield mostly meaningful changes of pretest probabilities of anxiety with greater changes for the SCAS compared to SCAS-P.

There are no fully comparable previous studies of the psychometric properties of the SCAS and SCAS-P in youths with anxiety disorders, because the few existing clinical studies have been performed in samples of either only younger children or results have been reported for a broader age range (6-18 years). Because anxiety disorders differ in terms of age of onset, with separation anxiety disorder and some types of specific phobias typically having early childhood onset while social phobia, panic/agoraphobia, and generalized anxiety disorder emerge in later childhood and adolescence (Beesdo, Knappe, & Pine, 2009), the broad age range in previous clinical studies of the SCAS and SCAS-P may have resulted in different mean scores than in the current study. With this limitation in mind, the mean scores and internal reliability coefficients of the SCAS and SCAS-P in the current anxious sample were comparable with those reported in Danish, North American, Brazilian, and Dutch/Australian anxious samples (Arendt et al., 2014; Brown-Jacobsen et al., 2011; DeSousa et al., 2014; Nauta et al., 2004; Whiteside et al., 2012).

Specifically, the mean scores in the nonanxious clinical group were largely equivalent to those obtained in previous studies of the SCAS and SCAS-P in Belgian, Dutch/Australian, and North American community samples (Muris, Merckelbach, et al., 2002; Nauta et al., 2004; Whiteside & Brown, 2008). However, on the SCAS, non-anxious adolescents' self-reported levels of anxiety were generally lower than both the Australian normative sample (Spence et al., 2003) and the Swedish, German, British, Italian, Cypriot, and Spanish community samples (Essau, Sasagawa, et al., 2011; Orgiles et al., 2014), and a Brazilian community sample negatively screened for anxiety (DeSousa et al., 2014). Differences in mean scores are probably explained by differences in sample characteristics of the studied populations. For example, in the current non-anxious sample, the proportion of boys was high (66%),

which may have had the effect of lowering mean scores because previous studies of the SCAS have shown boys to report lower scores than girls (Muris, Merckelbach, et al., 2002; Orgiles et al., 2014; Spence et al., 2003). Furthermore, all adolescents were assessed with a diagnostic interview making their anxiety status known, potentially resulting in the nonanxious group being less anxious than community samples, which may well include anxiety-disordered youths that cause the spectrum of anxiety symptoms to be broader. Finally, cultural differences in the meaning and interpretation of questionnaire items have to be considered as a possible explanation of mean score differences between studies conducted in different countries and populations (Byrne et al., 2009).

Congruent with previous studies of the SCAS and SCAS-P in clinical samples, agreement between self- and parent-reports was high when symptoms were measured in a continuous manner. Similarly, this study showed that the overall predictive power did not differ between the SCAS and SCAS-P, when continuous scores were used as predictors. This is in contrast to previous research suggesting that adolescence, internalizing problems, and different perceptions of symptoms are associated with lower parent-child agreement (De Los Reyes & Kazdin, 2005). Considering the low rate of problematic symptoms of anxiety reported at referral in relation to a much higher rate being diagnosed with at least one anxiety disorder after the diagnostic interview, the high level of agreement in this non-anxiety-specific sample is remarkable. However, whereas the administration of the K-SADS typically involves separate interviews, adolescents and parents were interviewed together in the current study. This procedure may have had an impact on the inclination of both informants to describe symptoms of anxiety and facilitated a shared view of symptoms, consequently affecting the base rates of anxiety and the level of agreement, the latter noticeable among the one third of participants who completed the questionnaire after the interview. Besides observed sex differences in the total sample, the only consistent effect on SCAS and SCAS-P scores was that of group membership, where both self- and parent ratings were significantly higher in the anxious group. Informant and sex effects were found to some extent and were more salient in the anxious group, where significant mean score differences were found on more scales compared to the non-anxious group.

One important aim of the current study was to examine the diagnostic accuracy of the SCAS and SCAS-P in a non-anxiety-specific clinical setting using different cutoff scores, namely, the *T60*, derived from a normative sample in Australia and equivalent to a sex- and age-group-specific *t*-score of 60 (i.e., 1 standard deviation above the mean) in that sample, and cutoff scores optimized for screening purposes, with a minimum sensitivity of .90, and diagnostic purposes, with a minimum specificity of .90, derived from ROC

analysis of the current sample. Results showed that on the SCAS, the *T60* sensitivities generally fell between estimates of the screening and diagnostic cutoff scores, and closer to estimates of the diagnostic cutoff scores than the screening cutoff scores, showing that the *T60* cutoff scores, suggested for the detection of elevated levels of anxiety, were not optimal for screening purposes in a Swedish adolescent clinical population. Because sensitivities and specificities are functions of the chosen cutoff level, common practices for choosing this level require some comment. First, when cutoff levels such as the *T60* are derived using the normal distribution method, the sensitivities and specificities that correspond to those levels are not known beforehand (although the rationale for this method is that the chosen cutoff level, typically set at 1, 1.5, or 2 standard deviations, provides a corresponding specificity of .84, .93, and .97, respectively) and can be calculated only after the level has been set. Local cutoff scores, established by the normal distribution method, have been evaluated in a previous North American study of the clinical utility of the SCAS and SCAS-P (Brown-Jacobsen et al., 2011). In line with findings from the current study, results showed that this method yielded highly varying sensitivities and specificities, illustrating the advantage of empirically derived cutoff scores for accomplishing tailored test characteristics that meet specific objectives, such as consistently high sensitivities or specificities. Second, the common practice of maximizing both sensitivity and specificity in one single, empirically derived cutoff score was used in a validation study of the SCAS and SCAS-P obsessive-compulsive subscale in a combined OCD-specialized clinical and community sample with a base rate of OCD of 14% (Whiteside et al., 2012). The sensitivities/specificities of the cutoff scores were .76/.83 for the SCAS and .95/.87 for the SCAS-P. Although both convenient and a common practice, the chosen strategy of maximizing sensitivity and specificity in one cutoff score resulted in considerably lower sensitivities for the SCAS cutoff score compared to the SCAS-P, a circumstance that ultimately will reduce the effect on posttest alterations of the probability of OCD. In summary, because the performance of any questionnaire is highly dependent on both base rates and the chosen cutoff level, careful consideration of how and where a questionnaire is intended for use is critical, and one single cutoff may not be the best alternative if several objectives are to be met.

Likelihood ratios, which have been described as one of the best ways to measure diagnostic accuracy (McGee, 2002), can be used to compare the relative clinical utility of different cutoff scores by looking at how much questionnaire results alter the pretest probability (i.e., base rates) of the presence of a diagnosis, and have the advantage over positive and negative predictive values in that they are transferable to different settings and base rates. Positive results on the SCAS subscales using the diagnostic cutoff scores resulted in greater increases in the probabilities of an anxiety

disorder than the *T60*. Likewise, a negative result on the SCAS total score and subscales using the screening cutoff scores yielded greater decreases in the probabilities of an anxiety disorder than the *T60* cutoff scores. To illustrate how LRs obtained in one population can be used in different settings with different base rates, we can calculate posttest probabilities for the presence of any anxiety disorder in a nonclinical setting (e.g., school health services), using a nomogram (Fagan, 1975). Assuming a base rate (i.e., pretest probability) of any anxiety disorder of 10% in that setting, a straight line can be drawn from the 10%-mark in the left column in the nomogram, align it with the LR corresponding to the chosen subscale and cutoff score in the middle column, and read off the posttest probability at the end of that line, in the right column (Figures A1-A7). Positive results on the SCAS total score using screening, diagnostic, and *T60* cutoff scores would thus yield 28%, 53%, and 57% posttest probabilities of the presence of an anxiety disorder. In the same setting, negative results on the SCAS total score using screening, diagnostic, and *T60* cutoff scores would result in decreases to 1%, 4%, and 6% posttest probabilities of having an anxiety disorder, showing that the screening cutoff for the SCAS total score is effective in ruling out the probability of an anxiety disorder in nonclinical settings.

Notably, the rates of problematic anxiety reported at time of referral (20%) were lower than the rates of any anxiety disorder based on the semistructured K-SADS interview (55%). Problematic symptoms of anxiety at time of referral did not predict a diagnosis of anxiety, highlighting the importance of the utilization of validated screening procedures to increase detection rates of clinically anxious youths (Esbjörn et al., 2010; Wren et al., 2004; Wren et al., 2003).

Limitations

Several limitations of the current study must be acknowledged. The most important limitation is the small sample size and the low base rates of OCD and separation anxiety disorder, although indicators of the validity of the current investigation are multiple: the length of the study period leading to the collection of data during several seasons; the proportion of girls (63%) observed in referrals to the involved units during the 6-month period following the end of the study, which was similar to the proportion observed in the current sample (60%); the consecutive inclusion of participants irrespective of presenting symptoms or results on the SCAS, SCAS-P, or K-SADS; and finally, prospective data collection in a nonspecialized setting. However, a systematic review of sources of bias in diagnostic accuracy studies found some evidence that data-driven selection of cutoff levels led to overestimation of both sensitivity and specificity, with the amount of bias increasing with smaller sample sizes (Whiting, Rutjes, Westwood, Mallett, & Quadas-2 Steering Group-1, 2013).

Another important limitation of the current study is the small number of boys fulfilling criteria for an anxiety disorder ($n = 11$), precluding the identification of different cutoff scores for boys and girls. Also, a majority of parents did not report their educational level or socioeconomic status, precluding analyses of these demographics. To provide further evidence for the validity of the proposed cutoff scores and establish optimal clinical cutoff scores for boys and girls, future research would have to include larger samples.

Finally, this study used the definitions of SCAS-related anxiety disorders found in the *DSM-IV* (American Psychiatric Association, 2000). Although the core features of these disorders remain the same in the fifth edition (American Psychiatric Association, 2013), some changes may have implications for assessments with the SCAS and SCAS-P, the major ones being that in the *DSM-5*, the chapter on anxiety disorders no longer includes OCD and the diagnoses of panic disorder and agoraphobia are not linked, leading to the coding of two diagnoses if they co-occur. Future replications of the current study using the definitions in the *DSM-5* will be of interest.

Conclusions

The SCAS and SCAS-P are reliable and valid clinical and research tools for assessing social phobia, generalized anxiety disorder, specific phobia, panic/agoraphobia, OCD, and separation anxiety disorder in adolescents. The results of this study suggest that both self- and parent reports can adequately screen for anxiety symptoms in adolescents, using the cutoff scores for screening purposes identified in this study. General implementation and utilization of these scales can improve detection rates and direct adolescents to mental health care services for further assessment. For this purpose, this study also identified diagnostic cutoff scores to aid clinicians in the diagnostic process and treatment planning of youths with anxiety disorders.

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Declaration of Conflicting Interests

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