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Social Anxiety Scale for Adolescents (SAS-A) Short Form: Longitudinal Measurement Invariance in Two Community Samples of Youth

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Abstract

In this study, we examined the longitudinal measurement invariance of a 12-item short version of the Social Anxiety Scale for Adolescents (SAS-A) in two 4-year longitudinal community samples ($N_{\text{sample 1}}$ = 815, M_{age} T_1 = 13.38 years; $N_{\text{sample 2}}$ = 551, M_{age} T_1 = 14.82 years). Using confirmatory factor analyses, we found strict longitudinal measurement invariance for the three-factor structure of the SAS-A across adolescence, across samples, and across gender. Some developmental changes in social anxiety were found from early to mid-adolescence, as well as gender differences across adolescence. These findings suggest that the short version of the SAS-A is a developmentally appropriate instrument that can be used effectively to examine adolescent social anxiety development.

Keywords

adolescence, social anxiety symptoms, Social Anxiety Scale for Adolescents (SAS-A), longitudinal measurement invariance, gender differences, developmental trends

Adolescence, that is, the period of life between approximately 12 and 18 years of age (Lerner & Steinberg, 2013), is a critical phase for the development of anxiety symptoms, and social anxiety symptoms in particular. Social anxiety involves a marked and persistent fear of one or more social or performance situations in which the person is exposed to unfamiliar people or to possible scrutiny by others (American Psychiatric Association, 2013). Not only are social anxiety symptoms among the most prevalent psychopathological symptoms in the general population during adolescence (Kessler et al., 2012), but these symptoms also appear to be quite persistent over time and are associated with a wide range of psychosocial difficulties. Examples include difficulties in relationships with parents (e.g., higher parental rejection or lower parent–adolescent relationship quality; Knappe, Beesdo-Baum, Fehm, Lieb, & Wittchen, 2012), in relationships with peers (e.g., lower peer acceptance and lower quantity and quality of friendships; Kingery, Erdley, Marshall, Whitaker, & Reuter, 2010), and in the school context in which socially anxious adolescents encounter many distressing situations (e.g., giving an oral presentation, answering questions in class, and participating in group exercises, which may lead socially anxious adolescents to stop attending certain classes or even refuse to attend school altogether; Blöte, Miers, Heyne, & Westenberg, 2015). As a consequence, research that delineates the developmental course of social anxiety symptoms in the general population and identifies factors that affect this development is essential.

Theoretically, a developmental peak in social anxiety symptoms is hypothesized in midadolescence (Warren & Sroufe, 2004; Westenberg, Siebelink, & Treffers, 2001), which is supported by some (e.g., Weems & Costa, 2005; Westenberg, Drewes, Goedhart, Siebelink, & Treffers, 2004) but not all studies (e.g., Hale, Raaijmakers, Muris, Van Hoof, & Meeus, 2008; Nelemans et al., 2014; Van Oort, Greaves-Lord, Verhulst, Ormel, & Huizink, 2009). Furthermore, many studies suggest higher levels of social anxiety symptoms in adolescent girls compared with boys, which has been attributed, for example, to girls showing higher vigilance toward potential threat than boys and girls

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experiencing higher levels of parental overprotection compared with boys (for a systematic review, see McLean & Anderson, 2009). Yet developmental trends can only be uncovered and correctly interpreted if the instrument that is used to assess adolescent social anxiety symptoms is developmentally appropriate, which means that it captures the construct of social anxiety symptoms in a similar way across adolescence and that adolescents ascribe the same meaning to the items and (sub)scales over time. This important measurement characteristic of instruments, which is referred to as *longitudinal measurement invariance*, has received only limited attention in empirical studies so far and in studies on social anxiety symptoms in particular. Given that adolescence is a developmental period characterized by major biological, psychological, and social changes (Lerner & Steinberg, 2013), such longitudinal invariance is certainly not a given. It might very well be that there is heterogeneity in the way social anxiety is expressed across adolescence. Hence, in the current study, we aimed to examine the longitudinal measurement invariance of the Social Anxiety Scale for Adolescents (SAS-A; La Greca & Lopez, 1998), a widely used and well-established measure of adolescent social anxiety symptoms that has been highly recommended for screening purposes (e.g., Tulbure, Szentagotai, Dobrean, & David, 2012).

Measurement Characteristics of the SAS-A

The original version of the SAS-A (La Greca & Lopez, 1998) contains 18 items that represent three distinct subscales: Fear of Negative Evaluation (FNE; eight items), Social Avoidance and Distress in new social situations or with unfamiliar peers (SAD-New; six items), and Social Avoidance and Distress that is more general or pervasive (SAD-General; four items). The SAS-A has revealed good psychometric characteristics, including good reliability and construct validity of the scores obtained (Inderbitzen-Nolan & Walters, 2000; La Greca & Lopez, 1998; Storch, Masia-Warner, Dent, Roberti, & Fisher, 2004). The three-factor structure of the SAS-A has been consistently found across different countries, cultures, and ethnicities (e.g., Ranta et al., 2012; Zhou, Xu, Inglés, Hidalgo, & La Greca, 2008), across gender (e.g., Ingles, La Greca, Marzo, Garcia-Lopez, & Garcia-Fernandez, 2010; La Greca, Ingles, Lai, & Marzo, 2015; Pechorro, Ayala-Nunes, Nunes, Marôco, & Gonçalves, 2016), and across different age groups or cohorts in cross-sectional studies (e.g., Ingles et al., 2010; La Greca et al., 2015). Short versions of the measure have also been used in past studies (e.g., Benner & Graham, 2009), but generally little is known about the factor structure, the actual content, and the psychometric properties of these short versions.

Moreover, to our knowledge, no studies have previously examined the longitudinal measurement invariance of the three-dimensional structure of the SAS-A, for either the full or the short version. Empirical tests of this particular type of measurement invariance through structural equation modeling (SEM) are critically important. If such tests fail, that is, if the longitudinally invariant model fits the data poorly, researchers have to conclude that there are changes in the assessment of social anxiety symptoms over time. In that case, stability or change in levels of social anxiety symptoms over time cannot simply be interpreted as developmental stability or change, respectively, as these results may represent measurement artifacts instead. Similarly, establishing longitudinal measurement invariance across gender is an important prerequisite if one wants to correctly interpret potential gender differences in developmental changes of social anxiety symptoms over time. Tests for longitudinal measurement invariance, conducted on large samples of adolescents as a whole and across gender, allow researchers to conclude whether the SAS-A is a developmentally appropriate measure of social anxiety symptoms during adolescence.

The Present Study

In the present study, we addressed three aims regarding a 12-item short version of the SAS-A in two large-scale 4-year longitudinal community samples in Flanders, the Dutch-speaking part of Belgium. Belgium is a country in Western Europe, in which adolescents lead a life that is in many ways similar to adolescents' way of living in the United States (Goossens & Luyckx, 2007). Belgium can be regarded as an individualistic country, like the United States (Hofstede, 2001; https://geert-hofstede.com). No data appear to be available on the prevalence of social anxiety symptoms in Belgian adolescents, but the prevalence rate of social anxiety disorder among adults in Belgium (Bruffaerts, Bonnewyn, Van Oyen, Demarest, & Demyttenaere, 2004) is comparable to the rates observed in other European countries (Wittchen et al., 2011) as well as the United States (Grant et al., 2005).

Collectively, the two samples in this study covered early to late adolescence. First, we aimed to describe the structure, the content, and the internal consistency of the 12-item short version of the SAS-A and to test for longitudinal measurement invariance of the three-factor structure using longitudinal confirmatory factor analyses (CFAs) in each sample as a whole as well as across the two samples using multigroup longitudinal CFAs. Second, we aimed to test for longitudinal measurement invariance across gender using multigroup longitudinal CFAs. Third, if longitudinal measurement invariance was established, we aimed to describe and interpret developmental trends in the three aspects of social anxiety symptoms captured by the SAS-A (i.e., FNE, SAD-New, and SAD-General) throughout adolescence.

Method

Participants

Sample 1. Participants in Sample 1 were 815 adolescents (46.1% girls) who took part in the ongoing longitudinal "Studying Transactions in Adolescence: Testing Genes in Interaction with Environments" (STRATEGIES) study in Flanders, the Dutch-speaking part of Belgium. All participants attended Grades 7 ($n = 400$) or 8 ($n = 415$) at the start of the study ($M_{age} = 13.38$ years, $SD_{age} = 0.68$, age range T_1 = 11-16 years) and the majority lived in intact two-parent families (79.1%). Virtually all participants had the Belgian nationality and all participants were fluent in Dutch. This sample is part of the larger STRATEGIES sample (N = 1,116), which also includes adolescents attending Grade 9 ($n = 296$; grade level was unknown for 5 participants). For the purposes of the present study, we only selected participants attending Grades 7 or 8 at the start of the study to limit the age range of participants at each measurement occasion while ensuring an adequate sample size for our intended statistical analyses. By selecting these grades in Sample 1 and Grades 9 and 10 in Sample 2, we could examine longitudinal measurement invariance from early to late adolescence. Twenty participants could not be included in the CFA analyses because of missing values on all items of the SAS-A across all years. All other 795 participants could be included in our longitudinal analyses, as missing values were handled in M*plus* Version 7.4 with full information maximum likelihood (FIML). Little's missing completely at random test showed a normed $\chi^2(\chi^2/df)$ of 1.02, $\chi^2(2077) = 2124.54$, $p = .23$, suggesting that missing item values in the SAS-A across 4 years could be reliably dealt with (Bollen, 1989).

Sample 2. Participants in Sample 2 were 551 adolescents (62.7% girls) who took part in the longitudinal "Personality and Loneliness/Solitude" (PALS) study in Flanders. All participants attended Grades 9 ($n = 270$) or 10 ($n = 281$) at the start of the study ($M_{age} = 14.82$ years, $SD_{age} = 0.79$, age range T_1 = 12-17 years) and the majority lived in intact two-parent families (82.8%). Virtually all participants had the Belgian nationality and all participants were fluent in Dutch. This sample is part of the larger PALS sample (N = 1,022), which also includes adolescents attending Grades 11 ($n = 276$) and 12 ($n = 195$). For the purposes of the present study, we again selected participants attending two different grades at the start of the study to limit the age range of participants at each measurement occasion while ensuring an adequate sample size for our intended statistical analyses. Two participants could not be included in the CFA analyses because of missing values on all items of the SAS-A across all years. All other 549 participants could be included in our longitudinal analyses, as missing values were handled in M*plus* Version 7.4 with FIML. Little's missing completely at random test showed a normed $\chi^2(\chi^2/df)$ of 1.00, $\chi^2(821) = 822.73$, $p = .48$, suggesting that missing item values in the SAS-A across 4 years could be reliably dealt with (Bollen, 1989).

Procedure

Data collection for the STRATEGIES study started in February-March 2012 in nine secondary schools in Flanders, the Dutch-speaking part of Belgium, which are known to attract students from middle-class socioeconomic backgrounds. A randomized multistage sampling approach was used to select participants. A total of 69 Flemish secondary schools from different provinces were invited to take part in the research project, stratified by educational track in order to include participants from the academic, technical, and vocational tracks. From the nine schools that were willing to participate (i.e., 13% of the schools that were invited to participate), 121 classes from Grades 7 to 9 were randomly selected to participate. Within these classes, all adolescents were invited to participate. Active written informed consent was obtained from parents and assent was obtained from adolescents before the start of the study (N = 1,116). Each year, participants completed questionnaires in a 50-minute session in their classroom during regular school time. The questionnaires were administered in Dutch and administration of the questionnaires was coordinated by a qualified school psychologist, assisted by graduate students in the field of psychology, who provided instructions, ensured confidentiality, and answered questions when necessary. All participants were followed for four successive years. Because only participants attending Grades 7 or 8 at the start of the study were included in this study ($n = 815$), these youth were followed from approximately 13 to 16 years of age.

Data collection for the PALS study started in February-March 2010 in one secondary school in Flanders that is known to attract students from middle-class socioeconomic backgrounds. Whereas two secondary schools were initially approached and both agreed to participation, one school withdrew participation after the first measurement wave and longitudinal data were thus available for one of these schools only. In this study, which concerns longitudinal measurement invariance, we only included data from the school in which participants were longitudinally followed across four successive years. All students from Grades 9 to 12 of all educational tracks (i.e., academic, technical, and vocational) were invited to participate. Active written informed consent from parents and assent was obtained from adolescents before the start of the study (N = 1,022). Each year, participants completed questionnaires in a 50-minute session in their classroom during regular school time. The questionnaires were administered in Dutch and a doctoral student in the field of developmental psychology, assisted by graduate students in the same field, supervised these sessions and provided instructions, ensured confidentiality, and answered questions when necessary. All participants were followed for four successive years. Because only participants attending Grades 9 or 10 at the start of the study were included in this study (n = 551), these youth were followed from approximately 14.5 to 17.5 years of age.

Measures

Social Anxiety Symptoms. In both samples, we used the SAS-A (La Greca & Lopez, 1998) – short version to assess adolescents' social anxiety symptoms. The SAS-A represents a slightly modified version of the Social Anxiety Scale for Children–Revised (SASC-R; La Greca & Stone, 1993), in which the wording was revised to make it more developmentally appropriate for adolescents/high school students. Specifically, items containing the term *other kids* were reworded to *peers*, *others* or *people*, and references to *playing with others* were reworded to *doing things with others* (La Greca & Lopez, 1998). The 12-item short version of the SAS-A consists of three subscales: FNE (four out of original eight items), SAD-New (four out of original six items), and SAD-General (four items). Sample items include "I worry about what others say about me" for FNE, "I feel shy around people I don't know" for SAD-New, and "I am quiet when I'm with a group of people" for SAD-General. All items were rated on a 5-point Likert-type scale, ranging from 1 (*not at all*) to 5 (*all the time*).

The 12-item short version of the SAS-A builds on descriptions of existing shortened versions of the SAS-A (e.g., Benner & Graham, 2009) and consisted of the four highest loading items for each subscale (see Table 2) that have been consistently found to load substantially on their designated factor in previous studies (e.g., Inderbitzen-Nolan & Walters, 2000; Ingles et al., 2010; La Greca et al., 2015; La Greca & Lopez, 1998; Pechorro et al., 2016). The original SAS-A items were translated from English to Dutch by a doctoral student in the field of developmental psychology and this translation was checked by a professor in the field of developmental psychology with intimate knowledge of both Dutch and English. Disagreements were settled by consensus. Internal consistency of all SAS-A subscale scores in the 12-item short version was good in both samples (see the "Results" section). Higher scores reflect higher levels of social anxiety.

Statistical Analyses

All internal consistency estimates, as assessed through Cronbach's alpha coefficient, were computed in SPSS Version 23, separately for Samples 1 and 2 and separately for boys and girls within the two samples. All tests for longitudinal measurement invariance were conducted in M*plus* Version 7.4 (Muthén & Muthén, 1998-2015), using maximum likelihood estimation with standard errors and chi square robust to nonnormality (i.e., MLR estimator). Four consecutive and nested CFA models with increasing equality constraints were specified, and the change in model fit of each model to the next was examined. If specifying increasing constraints from one model to the next in this iterative procedure did not significantly worsen model fit according to at least two out of three fit indices, longitudinal measurement invariance was assumed to hold. Following recommendations by Chen (2007), the following cutoff criteria for change in fit indices were used: ΔCFI (comparative fit index) $\geq -.010$, ΔRMSEA (root mean square error of approximation) $\geq .015$, and ΔSRMR (standardized root mean square residual) $\geq .030$ for metric invariance, but ΔSRMR $\geq .010$ for scalar and strict invariance (we briefly describe these forms of measurement invariance in more detail below). We parameterized our CFA models in such a way that all latent factor means were constrained equal to zero and all latent factor variances equal to 1, so that all factor loadings and item intercepts could be estimated. In all CFA models, residual covariances between the same items over successive years (e.g., between T_1 and T_2 and between T_2 and T_3) were included, following recommendations by Vandenberg and Lance (2000).

As a first step, we tested for *configural invariance* across four successive years. In this first step, we specified a CFA that reflected the conceptual three-factor model of the SAS-A across all 4 years, without specifying any equality constraints over time. When this model yields adequate fit, configural invariance is generally assumed, which suggests that the same three-factor structure and pattern of factor loadings holds across time. Model fit was assessed with the CFI, with values $\geq .90$ indicating acceptable fit and values $\geq .95$ indicating good fit, the RMSEA and its 90% confidence interval (90% CI), with values $\leq .08$ indicating acceptable fit and values of $\leq .05$ indicating good fit, and the SRMR, with values $\leq .10$ indicating acceptable fit and values of $\leq .05$ indicating good fit (Hu & Bentler, 1999; Kline, 2005).

In the second step, we tested for *metric* (or *weak factorial*) *invariance* across four successive years. In this step, we added equality constraints to the factor loadings of the three different SAS-A factors over time, thereby testing whether the size of the factor loadings is equal over time. When these constraints do not significantly worsen model fit, this implies that all items are equally important to the measurement of the respective SAS-A subscales over time.

In the third step, we tested for *scalar* (or *strong factorial*) *invariance* across four successive years. In this step, we added equality constraints to the item intercepts over time. When these constraints do not significantly worsen model fit, this implies that the levels and scaling of the items are equal over time.

In the fourth and final step, we tested for *strict* (or *full uniqueness*) *invariance* across four successive years. In this step, we added equality constraints to the residual variances of the items over time. When these constraints do not significantly worsen model fit, this implies that each item is measured with the same amount of error over time. If strict measurement invariance holds over time, this suggests that the three-factor structure of the SAS-A assesses different aspects of social anxiety symptoms identically over time.

Furthermore, we tested longitudinal measurement invariance across the two independent samples and across gender with multigroup analyses. A similar approach with four consecutive and nested CFA models with increasing equality constraints as outlined above was applied to test for longitudinal measurement invariance across samples and across gender. Specifically, four consecutive and nested longitudinal CFA models (i.e., representing configural, metric, scalar, and strict measurement invariance, respectively) with increasing equality constraints across Samples 1 and 2 and across boys and girls were estimated and evaluated with respect to changes in model fit.

When our longitudinal measurement invariance tests suggested that at least scalar invariance held across the four successive years, we examined developmental trends in the three aspects of social anxiety symptoms captured by the SAS-A (i.e., FNE, SAD-NEW, and SAD-General) using latent growth modeling (LGM; Kline, 2005) in M*plus* Version 7.4 (Muthén & Muthén, 1998-2015). In LGM, development is represented by latent factors: an intercept factor (i.e., mean initial level of social anxiety symptoms) and one or more slope factors (i.e., mean change in social anxiety symptoms over time). LGMs capture individual differences in developmental trends by including variances for the latent intercept and slope factors. Because there were four successive annual assessments in both samples, we were able to examine both linear and nonlinear (i.e., quadratic) growth functions. Model fit was assessed with the CFI, the RMSEA and its 90% confidence interval (90% CI), and the SRMR, using the aforementioned conventional standards (Hu & Bentler, 1999; Kline, 2005). The comparative fit of models with different growth factors (i.e., linear vs. quadratic) was tested with Satorra–Bentler scaled chi-square difference tests ($\Delta SB\chi^2$; Satorra & Bentler, 2001). Similarly, when our longitudinal measurement invariance tests suggested that at least scalar invariance held across boys and girls across the four successive years, we described gender differences in developmental trends in the three aspects of social anxiety symptoms captured by the SAS-A (i.e., FNE, SAD-NEW, and SAD-General) using multigroup LGMs in M*plus* Version 7.4 (Muthén & Muthén, 1998-2015).

Results

Descriptive Statistics

Concurrent correlations among the three latent SAS-A subscales and 1-year rank–order stability correlations across all four successive years for both samples separately are shown in Table 1. All correlations were taken from the longitudinal configural invariance models. These findings suggested strong correlations (i.e., $r \geq .50$; Cohen, 1992) among all three subscales of the SAS-A in both samples across all four successive years ($.52 \leq r\text{s} \leq .77$). Correlations were especially strong between the SAD-New and SAD-General subscales, more so than the correlations between FNE and these subscales. Furthermore, correlations suggested strong 1-year rank–order stability in all three subscales of the SAS-A in both samples across all four successive years ($.56 \leq r\text{s} \leq .76$). These 1-year rank–order stability correlations were approximately of equal size for all three SAS-A subscales.

Cronbach's alpha for all SAS-A subscale scores indicated good internal consistency (i.e., $\alpha \geq .70$) across years in both samples as a whole and, in both cases, for boys and girls separately (FNE: $.87 \leq \alpha \leq .95$; SAD-New: $.81 \leq \alpha \leq .92$; SAD-General: $.70 \leq \alpha \leq .84$). Latent reliabilities (i.e., composite reliability, CR; Raykov, 2001) based on the factor loadings in the longitudinal configural invariance models indicated good internal consistency for FNE (CR $\geq .88$), SAD-New (CR $\geq .83$), and SAD-General (CR $\geq .77$) across years in both samples.

Longitudinal Measurement Invariance of the SAS-A

In both samples, we started with a CFA model that reflected the conceptual three-factor model of the SAS-A across all 4 years without specifying any equality constraints over time to test for longitudinal configural invariance. Fit of the configural model was acceptable to good in both samples, $SB\chi^2(1002) = 2122.71$, RMSEA [90% CI] = .038 [.035, .040], CFI = .940, SRMR = .050 in Sample 1, $SB\chi^2(1002) = 1702.72$, RMSEA [90% CI] = .036 [.033, .039], CFI = .938, SRMR = .062 in Sample 2, respectively. The factor loadings for all three subscales of the SAS-A for both samples across all 4 years are shown in Table 2 (all loadings were high, i.e., ≥ .53; Cohen, 1992; Kline, 2005).

Because the configural model showed acceptable to good fit, we moved on to test metric, scalar, and strict measurement invariance models in both samples. Model fit statistics of all measurement invariance models in both samples are shown in Table 3. All changes in CFI, RMSEA, and SRMR were below the specified cutoff criteria in both samples. This suggests that the increasing equality constraints over time specified in each of the subsequent models did

Table 1. Summary of Latent Correlations Across Four Successive Years.

Sample/Subscale	FNE	SAD-New	SAD-General
Sample 1 (*N* = 795)			
1. Fear of Negative Evaluation (FNE)	**.60-.74**	—	—
2. Social Avoidance and Distress–New (SAD-New)	.57-.69	**.59-.73**	—
3. Social Avoidance and Distress–General (SAD-General)	.58-.63	.68-.74	**.56-.68**
Sample 2 (*N* = 549)			
1. Fear of Negative Evaluation (FNE)	**.64-.69**	—	—
2. Social Avoidance and Distress–New (SAD-New)	.53-.59	**.66-.71**	—
3. Social Avoidance and Distress–General (SAD-General)	.52-.63	.61-.77	**.63-.76**

Note. Ranges of 1-year stability correlations over successive measurement occasions on the diagonal (in boldface) and ranges of concurrent correlations at each measurement occasion off the diagonal. All correlations reported in this table were between the latent SAS-A subscales and taken from the longitudinal configural invariance models in Samples 1 and 2, respectively.

Table 2. Factor Loadings of the SAS-A Items Across Four Successive Years in the Configural Invariance Model.

	Sample 1 (*N* = 795)				Sample 2 (*N* = 549)			
Subscale/Item in original questionnaire	T_1	T_2	T_3	T_4	T_1	T_2	T_3	T_4
Fear of Negative Evaluation (FNE)								
I worry about what others think of me (8)	.82	.82	.85	.86	.85	.88	.90	.91
I'm afraid that others will not like me (9)	.88	.92	.91	.93	.78	.81	.82	.85
I worry what others say about me (12)	.79	.88	.84	.86	.89	.88	.87	.91
I worry that others don't like me (14)	.86	.92	.93	.92	.86	.90	.89	.90
Social Avoidance and Distress–New (SAD-New)								
I feel shy around people I don't know (4)	.75	.75	.79	.81	.66	.71	.69	.76
I get nervous when I talk to peers I don't know very well (10)	.85	.86	.90	.90	.83	.85	.87	.88
I get nervous when I meet new people (13)	.85	.83	.88	.90	.82	.85	.84	.90
I feel nervous when I'm around certain people (20)	.72	.72	.71	.78	.68	.55	.68	.71
Social Avoidance and Distress–General (SAD-General)								
I'm quiet when I'm with a group of people (15)	.57	.57	.64	.66	.68	.63	.62	.63
I'm afraid to invite others to do things with me because they might say no (19)	.80	.83	.80	.85	.55	.73	.65	.56
I feel shy even with peers I know very well (21)	.53	.65	.66	.64	.57	.65	.62	.60
It's hard for me to ask others to do things with me (22)	.81	.85	.86	.85	.70	.77	.75	.71

Table 3. Model Fit Statistics for the Different Levels of Measurement Invariance Across Four Successive Years.

Sample/Model	$SB\chi^2$ (*df*)	CFI	ΔCFI	RMSEA [90% CI]	ΔRMSEA	SRMR	ΔSRMR
Sample 1 (*N* = 795)							
Model 1: Configural invariance	2122.71 (1002)	.940		.038 [.035, .040]		.050	
Model 2: Metric invariance	2168.38 (1038)	.939	−.001	.037 [.035, .039]	−.001	.053	.003
Model 3: Scalar invariance	2280.54 (1074)	.935	−.004	.038 [.035, .040]	.001	.053	.000
Model 4: Strict invariance	2448.12 (1110)	.928	−.007	.039 [.037, .041]	.001	.055	.002
Sample 2 (*N* = 549)							
Model 1: Configural invariance	1702.72 (1002)	.938		.036 [.033, .039]		.062	
Model 2: Metric invariance	1752.05 (1038)	.937	−.001	.035 [.033, .038]	−.001	.065	.003
Model 3: Scalar invariance	1815.74 (1074)	.934	−.003	.035 [.033, .038]	.000	.065	.000
Model 4: Strict invariance	1908.14 (1110)	.929	−.005	.036 [.033, .039]	.001	.066	.001
Samples 1 and 2 (*N* = 1,344)[a]							
Model 1: Configural invariance	4389.65 (2232)	.928		.038 [.036, .040]		.060	
Model 2: Metric invariance	4609.09 (2244)	.921	−.007	.040 [.038, .041]	.002	.089	.029
Model 3: Scalar invariance	4990.44 (2256)	.909	−.012	.042 [.041, .044]	.002	.088	−.001
Model 4: Strict invariance	5101.38 (2268)	.905	−.004	.043 [.042, .045]	.001	.088	.000

Note. CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual.
[a]Within each sample, equality constraints of the strict longitudinal invariance model were applied. All $SB\chi^2$ values were significant at $p < .001$.

not significantly worsen model fit, and that strict longitudinal measurement invariance thus held for the three-factor structure of the SAS-A from early to late adolescence.

Moreover, because strict longitudinal measurement invariance held for the three-factor structure of the SAS-A in both samples independently, we additionally tested for different levels of measurement invariance across the two different samples, to assess whether the three subscales of the SAS-A were measured similarly over time across the two samples. In these analyses, we started with a multigroup CFA model that reflected the conceptual three-factor model of the SAS-A across all 4 years including all equality constraints associated with strict longitudinal measurement invariance, without specifying any equality constraints across the samples (i.e., configural invariance model). Fit of the configural model was acceptable to good, $SB\chi^2(2232) = 4389.65$, RMSEA [90% CI] = .038 [.036, .040], CFI = .928, SRMR = .060.

Because the configural model showed acceptable to good fit, we moved on to test metric, scalar, and strict measurement invariance models across the two samples. Model fit statistics of all measurement invariance models are shown in Table 3. For all models, at least two out of the three fit indices (i.e., CFI, RMSEA, and SRMR) showed changes that were below the specified cutoff criteria. This suggests that the increasing equality constraints across the two samples specified in each of the subsequent models did not significantly worsen model fit, and that strict longitudinal measurement invariance thus held for the three-factor structure of the SAS-A across the two samples from early to late adolescence.

Longitudinal Measurement Invariance of the SAS-A Across Gender

Because strict longitudinal measurement invariance held for the three-factor structure of the SAS-A across both samples, we tested for longitudinal measurement invariance across gender in the two samples combined (N = 1,342). Specifically, we started with a multigroup CFA model that reflected the conceptual three-factor model of the SAS-A across all 4 years for both boys and girls including all equality constraints associated with strict longitudinal measurement invariance, without specifying any equality constraints across gender (i.e., configural invariance model). Fit of the configural model was acceptable to good, $SB\chi^2(2232) = 4412.05$, RMSEA [90% CI] = .038 [.036, .040], CFI = .926, SRMR = .060. The factor loadings for all three subscales of the SAS-A for both boys and girls across all 4 years are shown in Table 4 (all loadings ≥ .57).

Because the configural model showed acceptable to good fit, we moved on to test metric, scalar, and strict measurement invariance models across gender. Model fit statistics of all measurement invariance models are shown in Table 5. All changes in CFI, RMSEA, and SRMR were below the specified cutoff criteria. This suggests that the increasing equality constraints across gender specified in each of the subsequent models did not significantly worsen model fit, and that strict longitudinal measurement invariance thus held across gender for the three-factor structure of the SAS-A from early to late adolescence.

Table 4. Factor Loadings of the SAS-A Items for Boys (n = 630) and Girls (n = 712) Across Four Successive Years in the Configural Invariance Model.

Subscale/Item in original questionnaire	Boys (T_1-T_4)	Girls (T_1-T_4)
Fear of Negative Evaluation (FNE)		
I worry about what others think of me (8)	.81	.86
I'm afraid that others will not like me (9)	.85	.87
I worry what others say about me (12)	.84	.86
I worry that others don't like me (14)	.88	.90
Social Avoidance and Distress–New (SAD-New)		
I feel shy around people I don't know (4)	.74	.73
I get nervous when I talk to peers I don't know very well (10)	.86	.88
I get nervous when I meet new people (13)	.85	.86
I feel nervous when I'm around certain people (20)	.71	.70
Social Avoidance and Distress–General (SAD-General)		
I'm quiet when I'm with a group of people (15)	.59	.62
I'm afraid to invite others to do things with me because they might say no (19)	.76	.74
I feel shy even with peers I know very well (21)	.57	.64
It's hard for me to ask others to do things with me (22)	.80	.81

Note. Within adolescent gender, equality constraints of the strict longitudinal invariance model were applied.

Developmental Trends in SAS-A Subscales

Because results suggested strict longitudinal measurement invariance of the three-factor structure of the SAS-A in both samples, we briefly present results from LGMs that describe the developmental trends in FNE, SAD-New, and SAD-General in both samples separately. Table 6 presents an overview of the developmental parameters for all LGM models and Figure 1 illustrates developmental trends of FNE, SAD-New, and SAD-General in both samples. Furthermore, because results suggested strict longitudinal measurement invariance of the three-factor structure of the

Table 5. Model Fit Statistics for the Different Levels of Measurement Invariance of the SAS-A Boys (n = 630) and Girls (n = 712) Across Four Successive Years.

Model	$SB\chi^2$ (*df*)	CFI	ΔCFI	RMSEA [90% CI]	ΔRMSEA	SRMR	ΔSRMR
Model 1: Configural invariance	4412.05 (2232)	.926		.038 [.036, .040]		.060	
Model 2: Metric invariance	4431.97 (2244)	.926	.000	.038 [.036, .040]	.000	.063	.003
Model 3: Scalar invariance	4681.10 (2256)	.918	−.008	.040 [.038, .042]	.002	.066	.003
Model 4: Strict invariance	4717.90 (2268)	.917	−.001	.040 [.039, .042]	.000	.066	.000

Note. CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual. Within adolescent gender, equality constraints of the strict longitudinal invariance model were applied. All $SB\chi^2$ values were significant at $p < .001$.

Table 6. Estimates of the Intercept and Slope Factors in the Latent Growth Models.

	Intercept		Linear slope		Quadratic slope	
Sample/Model	*M*	*SD*	*M*	*SD*	*M*	*SD*
Sample 1 (N = 795)						
FNE	2.65***	0.79***	0.17***	0.52	−0.04**	0.13
SAD-New	2.59***	0.72***	0.19***	0.20***	−0.05***	×[a]
SAD-General	1.95***	0.57***	0.01	0.10	×[b]	×[b]
Sample 2 (N = 549)						
FNE	2.55***	0.88***	−0.04	0.66*	0.02	0.17†
SAD-New	2.59***	0.62***	0.02	0.16**	×[b]	×[b]
SAD-General	1.87***	0.49***	0.00	0.12*	×[b]	×[b]

Note. FNE = Fear of Negative Evaluation, SAD-New = Social Avoidance and Distress to New Situations, SAD-General = Generalized Social Avoidance and Distress. Sample 1 covered approximately ages 13 to 16 years, whereas Sample 2 covered approximately ages 14.5 to 17.5 years.
[a]Because individual differences (i.e., variance) in the quadratic slope were very small and nonsignificant, we fixed this parameter to zero for reasons of parsimony (which also resulted in a slightly better model fit). [b]Growth in these models was best captured by a linear slope only (see the "Results" section).
†$p < .055$. *$p \leq .05$. **$p \leq .01$. ***$p \leq .001$.

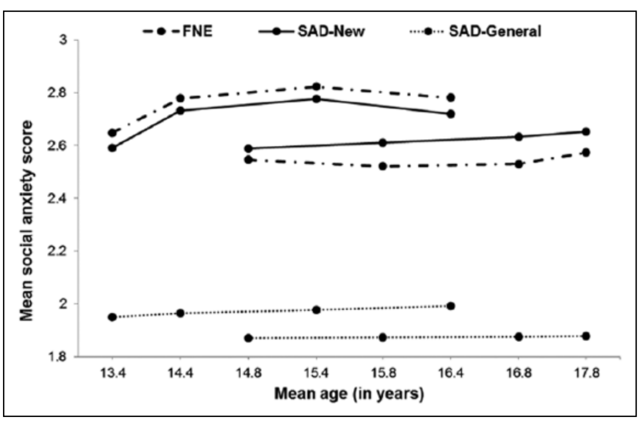

Figure 1. Developmental trends in the three Social Anxiety Scale for Adolescents (SAS-A) subscales Fear of Negative Evaluation (FNE), Social Avoidance and Distress to New Situations (SAD-New), and Generalized Social Avoidance and Distress (SAD-General) in Sample 1 (M_{age} = 13.4-16.4 years) and Sample 2 (M_{age} = 14.8-17.8 years). Social anxiety scores ranged from 1 to 5.

SAS-A across gender across both samples, we also briefly present results from multigroup LGMs to describe gender differences in developmental trends for FNE, SAD-New, and SAD-General in both samples separately. These gender-specific developmental trends of FNE, SAD-New, and SAD-General can be found in Figure 2 and Table 7 presents an overview of the gender-specific developmental parameters for all LGM models.

Developmental Trends in Sample 1. Fit of the LGM models ranged from adequate to excellent for all SAS-A subscales. Including a quadratic growth factor in the LGM was a significantly better reflection of the data for both FNE and SAD-New, $SB\chi^2(1) = 8.92$, CFI = .985, RMSEA [90% CI] = .100 [.048, .164], SRMR = .020, $\Delta SB\chi^2(4) = 20.44$, $p < .001$; and $SB\chi^2(4) = 3.33$, CFI = 1.000, RMSEA [90% CI] = .000 [.000, .049], SRMR = .014, $\Delta SB\chi^2(1) = 16.15$, $p < .001$, respectively, whereas development in SAD-General was best captured by linear growth, $SB\chi^2(5) = 7.91$, CFI = .995, RMSEA [90% CI] = .027 [.000, .061], SRMR = .037,

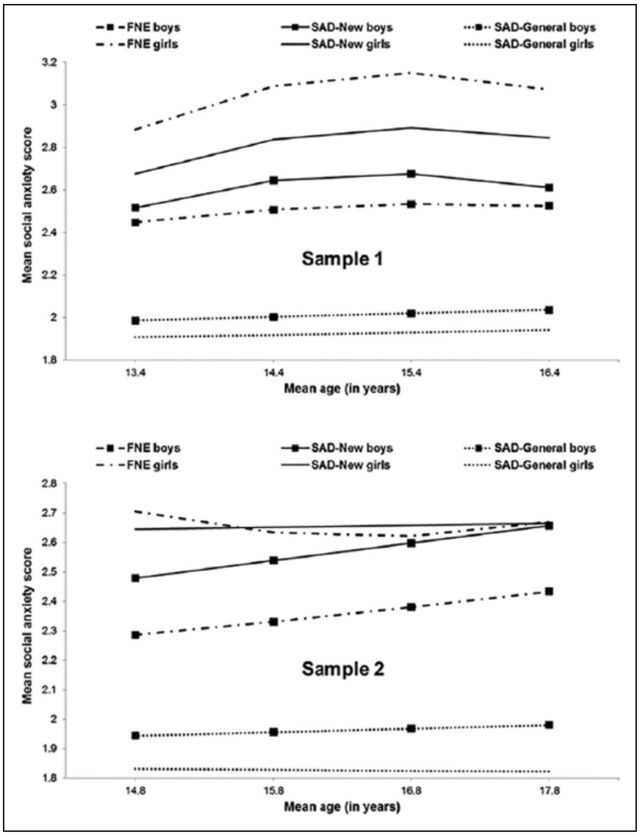

Figure 2. Gender differences in developmental trends of Fear of Negative Evaluation (FNE), Social Avoidance and Distress to New Situations (SAD-New), and Generalized Social Avoidance and Distress (SAD-General) in Sample 1 at the top and Sample 2 at the bottom. Social anxiety scores ranged from 1 to 5.

$\Delta SB\chi^2(1) = 1.78$, $p = .182$. Results suggested no significant mean-level change in SAD-General over four successive years from approximately ages 13 to 16 years, but a significant linear increase over time in both FNE and SAD-New that significantly leveled off in midadolescence (see Figure 1). Significant individual differences in the intercept were found for all SAS-A subscales (i.e., significant variance in the intercept factor), but significant individual differences in development (i.e., significant variance in the linear slope factor) were found for SAD-New only.

Concerning gender differences, model fit ranged from adequate to excellent for the multigroup LGMs of the different SAS-A subscales. For FNE, $SB\chi^2(2) = 9.12$, CFI = .985, RMSEA [90% CI] = .095 [.039, .161], SRMR = .021. Results from Wald tests suggested that girls reported significantly higher intercept levels ($M_{\text{intercept}} = 2.88$) than boys ($M_{\text{intercept}} = 2.45$), $p < .001$. Moreover, girls showed stronger increases in FNE over time ($M_{\text{linear.slope}} = 0.28$) than boys ($M_{\text{linear.slope}} = 0.08$), $p = .021$, and a trend toward a stronger leveling off in FNE over time ($M_{\text{quadratic.slope}} = -0.07$) than boys ($M_{\text{quadratic.slope}} = -0.02$), $p = .061$. Specifically, no significant change in FNE was found for boys, but for girls a significant linear increase in FNE was found over time that significantly leveled off afterward. For SAD-New, $SB\chi^2(8) = 4.73$, CFI = 1.000, RMSEA [90% CI] = .000 [.000, .039], SRMR = .020, results from Wald tests suggested that girls reported significantly higher intercept levels ($M_{\text{intercept}} = 2.68$) than boys ($M_{\text{intercept}} = 2.52$), $p = .021$. However, no significant gender differences were found in developmental trends of SAD-New, as no significant differences between boys and girls were found concerning the linear slope, $p = .642$, nor the quadratic slope, $p = .876$. For SAD-General, $SB\chi^2(10) = 10.93$, CFI = .998, RMSEA [90% CI] = .015 [.000, .058], SRMR = .045, no significant gender differences were found in either initial levels or developmental trends of SAD-General, as no significant differences between boys and girls were found concerning intercept levels of SAD-General, $p = .148$, nor concerning the linear slope, $p = .812$. In sum, boys and girls significantly differed in both initial levels and the development of FNE over time and in initial levels but not the development of SAD-New, but they did not differ in either initial levels or the development of SAD-General from approximately ages 13 to 16 years (see Figure 2).

Developmental Trends in Sample 2. Fit of the LGM models was excellent for all SAS-A subscales. Including a quadratic growth factor in the LGM model was a significantly better reflection of the data for FNE, $SB\chi^2(1) = 0.10$, CFI = 1.000, RMSEA [90% CI] = .000 [.000, .078], SRMR = .003, $\Delta SB\chi^2(4) = 9.90$, $p = .042$, whereas development in SAD-New and SAD-General was best captured by linear growth, $SB\chi^2(5) = 9.40$, CFI = .989, RMSEA [90% CI] = .040 [.000, .079], SRMR = .045, $\Delta SB\chi^2(4) = 7.46$, $p = .114$; and $SB\chi^2(5) = 7.66$, CFI = .991, RMSEA [90% CI] = .031 [.000, .072], SRMR = .029, $\Delta SB\chi^2(4) = 4.11$, $p = .391$, respectively. Results suggested no significant mean-level change in any of the SAS-A subscales over four successive years from approximately ages 14.5 to 17.5 years (see Figure 1), although significant individual differences in development were found for all SAS-A subscales (i.e., significant variance in the intercept and slope factors).

Concerning gender differences, model fit ranged from adequate to excellent for the multigroup LGMs of the different SAS-A subscales. For FNE, $SB\chi^2(2) = 3.01$, CFI = .997, RMSEA [90% CI] = .043 [.000, .135], SRMR = .016. Results from Wald tests suggested that girls reported significantly higher intercept levels ($M_{\text{intercept}} = 2.71$) than boys ($M_{\text{intercept}} = 2.29$), $p < .001$. However, no significant gender differences were found in developmental trends of FNE, as no significant differences between boys and girls were found concerning the linear slope, $p = .172$, nor the quadratic slope, $p = .440$. For SAD-New, $SB\chi^2(10) = 20.17$, CFI = .977, RMSEA [90% CI] = .061 [.020, .099], SRMR = .056, results from Wald tests suggested that girls

Table 7. Estimates of the Intercept and Slope Factors in the Latent Growth Models for Boys and Girls Separately.

	Intercept		Linear slope		Quadratic slope	
	M	*SD*	*M*	*SD*	*M*	*SD*
Sample/Model	Boys/*Girls*	Boys/*Girls*	Boys/*Girls*	Boys/*Girls*	Boys/*Girls*	Boys/*Girls*
Sample 1 (N = 795)						
FNE	2.45***/*2.88****	0.58*/*0.92****	0.08/*0.28****	0.41/*0.59*	−0.02/*−0.07****	0.09/*0.16*
SAD-New	2.52***/*2.68****	0.71***/*0.73****	0.18***/*0.21****	0.22***/*0.18**	−0.05**/*−0.05***	×[a]
SAD-General	1.99***/*1.91****	0.52***/*0.62****	0.02/*0.01*	0.10/*0.10*	×[b]	×[b]
Sample 2 (N = 547)						
FNE	2.29***/*2.71****	0.68*/*0.95****	0.04/*−0.10*†	0.67†/*0.68**	0.00/*0.03*	0.17/*0.16*
SAD-New	2.48***/*2.64****	0.62***/*0.62****	0.06*/*0.01*	0.16/*0.17***	×[b]	×[b]
SAD-General	1.94***/*1.83****	0.48***/*0.49****	0.01/*−0.00*	0.15†/*0.09*	×[b]	×[b]

Note. FNE = Fear of Negative Evaluation, SAD-New = Social Avoidance and Distress to New Situations, SAD-General = Generalized Social Avoidance and Distress. Sample 1 covered approximately ages 13 to 16 years, whereas Sample 2 covered approximately ages 14.5 to 17.5 years. Sample 1 contained 427 boys and 368 girls. Sample 2 contained 203 boys and 344 girls.
[a]Because individual differences (i.e., variance) in the quadratic slope were very small and nonsignificant, we fixed this parameter to zero for reasons of parsimony (which also resulted in a slightly better model fit). [b]Growth in these models was best captured by a linear slope only (see the "Results" section).
†$p \le .088$. *$p \le .05$. **$p \le .01$. ***$p \le .001$.

reported significantly higher intercept levels ($M_{\text{intercept}}$ = 2.64) than boys ($M_{\text{intercept}}$ = 2.48), p = .018. However, no significant gender differences were found in developmental trends of SAD-New, as no significant differences between boys and girls were found concerning the linear slope, p = .122. For SAD-General, SB$\chi^2(10)$ = 16.70, CFI = .978, RMSEA [90% CI] = .050 [.000, .090], SRMR = .046, results from Wald tests suggested that boys reported significantly higher intercept levels ($M_{\text{intercept}}$ = 1.94) than girls ($M_{\text{intercept}}$ = 1.83), p = .046. However, no significant gender differences were found in developmental trends of SAD-New, as no significant differences between boys and girls were found concerning the linear slope, p = .569. In sum, boys and girls significantly differed in initial levels of FNE, SAD-New, and SAD-General, but they did not significantly differ in the development of these social anxiety symptoms from approximately ages 14.5 to 17.5 years (see Figure 2).

Discussion

Longitudinal measurement invariance, that is, the empirical demonstration through structural equation modeling (SEM) that an instrument is measuring a certain construct in a similar way across time, has been a neglected issue in research on social anxiety in adolescence. Yet, such research is vital if researchers want to draw valid conclusions regarding developmental trends in social anxiety symptoms in this particular phase of the life span.

First, the findings of the present study support strict longitudinal measurement invariance of the three-factor structure of a 12-item short version of the SAS-A—a widely used measure of adolescent social anxiety symptoms—in two independent 4-year longitudinal studies involving large community samples of adolescents, as well as across these two samples. This finding suggests that developmental trends of social anxiety symptoms assessed by the SAS-A can be correctly interpreted within adolescent community samples and meaningfully compared across samples. Also, these findings suggest that FNE, SAD-New, and SAD-General assessed by the SAS-A are relatively homogeneous constructs across adolescence. Naturally, because our study is the first to test for longitudinal measurement invariance of the three-factor structure of the SAS-A across adolescence, more research on this methodological issue in different samples and situations is required. However, the fact that we found longitudinal invariance across two independent samples, which were only partially overlapping in age and thereby covered early to late adolescence, is very promising and lays a foundation for invariance in other Western European and U.S. samples.

Second, strict longitudinal measurement invariance across gender was demonstrated in this study, which allows for meaningful comparisons between boys and girls regarding their developmental trends of social anxiety symptoms across adolescence. Boys thus do not appear to interpret items of the SAS-A any differently than girls and the 12 items in the short version of the SAS-A appear to be equally reflective of social anxiety symptoms for boys and girls across adolescence (i.e., boys and girls appear to ascribe the same meaning to the SAS-A items and subscales). In conclusion, our findings suggest that the 12-item short version of the SAS-A is a sound, developmentally appropriate measure of social anxiety that can be used effectively to examine the developmental course of social anxiety symptoms across adolescence.

Developmental Trends in Social Anxiety Symptoms Across Adolescence

Because strict longitudinal measurement invariance was established, we described developmental trends in the three aspects of social anxiety symptoms captured by the SAS-A (i.e., FNE, SAD-New, and SAD-General) from early to mid-adolescence (Sample 1) and from mid- to late adolescence (Sample 2). The findings suggested an increase in symptoms of fear of negative evaluation (FNE) and social avoidance and distress in new situations or with unfamiliar peers (SAD-New) from early adolescence onward that leveled off in mid-adolescence, which resulted in a peak in these symptoms in mid-adolescence around 15 years of age. No developmental changes were found in these symptoms from mid- to late adolescence and for more general or pervasive social avoidance and distress (SAD-General) symptoms across the entire adolescent period. The developmental changes in fear of negative evaluation and social avoidance and distress in new situations or with unfamiliar peers are consistent with developmental theory, which hypothesizes an age-normative peak in social anxiety symptoms in mid-adolescence due to heightened self-consciousness and hence increased fear of negative social evaluation (Warren & Sroufe, 2004; Westenberg et al., 2001). These results are also consistent with some previous findings (e.g., Weems & Costa, 2005; Westenberg et al., 2004) and suggest that adolescence is a critical period for the development of social anxiety symptoms.

In addition to these age-normative mean-level changes in social anxiety symptoms, particularly from early to mid-adolescence, there were large individual differences between youth in their social anxiety development across adolescence (i.e., significant variance around the LGM parameters). Interestingly, this was particularly the case from mid- to late adolescence, the developmental period during which we found no significant mean-level changes in any of the three aspects of social anxiety symptoms captured by the SAS-A. The fact that adolescents appear to show large differences in social anxiety symptom trajectories may obscure mean-level developmental changes at the total sample level. Indeed, several studies that have addressed heterogeneity in social anxiety symptom development using person-centered approaches have been able to distinguish different subgroups of youth following different social anxiety trajectories across adolescence (e.g., Miers, Blöte, De Rooij, Bokhorst, & Westenberg, 2013; Nelemans et al., 2014) and across childhood as well (e.g., Broeren, Muris, Diamantopoulou, & Baker, 2013). Hence, it is important for future research to pay attention to individual differences in social anxiety symptom development across adolescence, and in particular after the age-normative developmental peak in mid-adolescence.

Gender-Specific Developmental Trends in Social Anxiety Symptoms Across Adolescence

Because strict longitudinal measurement invariance was established across gender, we could also describe gender differences in developmental trends in the three aspects of social anxiety symptoms captured by the SAS-A across adolescence. Findings suggested that girls reported significantly higher levels of both fear of negative evaluation and social avoidance and distress in new situations or with unfamiliar peers across adolescence than boys. These findings are in line with previous suggestions that adolescent girls tend to report higher levels of social anxiety symptoms than adolescent boys across adolescence (e.g., Hale et al., 2008; Nelemans et al., 2014; Van Oort et al., 2009), although gender differences are generally found to be small. Because of our tests of longitudinal measurement invariance, we may tentatively conclude that this gender difference is unlikely to be driven by gender differences in either the expression of social anxiety symptoms or the interpretation of items of the 12-item short version of the SAS-A across adolescence, but rather reflects true mean-level differences between boys and girls.

In addition to mean-level differences, boys and girls differed significantly in their development of fear of negative evaluation from early to mid-adolescence. Specifically, whereas boys showed no significant mean-level change in fear of negative evaluation over time, girls showed the theoretically expected increase in symptoms from early adolescence onward with a peak in fear of negative evaluation around mid-adolescence around 15 years of age. The heightened levels of social anxiety symptoms in mid-adolescence theorized by developmental theory thus seem to apply to girls only and less so to boys and particularly for the fear of negative evaluation aspect of social anxiety symptoms. Interestingly, a comparable pattern of gender-specific developmental trends was reported by Nelemans et al. (2014), even though a different instrument was used to assess adolescent social anxiety symptoms.

For more general or pervasive social avoidance and distress symptoms, no significant gender differences were found from early to mid-adolescence, but boys reported slightly higher mean levels from mid- to late adolescence. This lack of gender difference from early to mid-adolescence and particularly the direction of the significant gender difference from mid- to late adolescence may seem unexpected, given the substantial evidence indicating that women typically report higher levels of anxiety than men (McLean & Anderson, 2009). However, other studies have also found nonsignificant gender differences in these symptoms (e.g., Inderbitzen-Nolan & Walters, 2000; Pechorro et al., 2016; Storch et al., 2004) or higher levels for adolescent boys compared with girls (e.g., Ingles et al., 2010; La Greca et al., 2015; La Greca & Lopez, 1998; Ranta et al., 2012; Zhou et al., 2008). Yet there appears to be no clear explanation for nonsignificant gender differences in these more general or pervasive social avoidance and distress symptoms or adolescent boys reporting higher levels of these symptoms than adolescent girls. For future research, it therefore seems important to further investigate this gender issue in more detail.

Strengths, Limitations, and Suggestions for Future Research

The present study is characterized by two key strengths. First, this study included data from two independent 4-year longitudinal studies involving large community samples of adolescents, which allowed for replication and extension of findings across slightly different situations. Moreover, we were able to directly test the appropriateness of the 12-item short version of the SAS-A across both samples with a slightly different age range, thereby covering a large age range from early to late adolescence. Second, in this study we did not solely address longitudinal measurement invariance as an important and neglected measurement characteristic of social anxiety scales but also moved on to describe and interpret developmental trends in the three aspects of social anxiety symptoms captured by the SAS-A (i.e., FNE, SAD-New, and SAD-General) across adolescence. Interpreting such trends is of course the ultimate objective for which tests of longitudinal measurement invariance serve as a preliminary step only.

Yet, some limitations of this study should also be noted, which may provide important directions for future research. First, virtually all adolescents in the two community samples in this study had the Belgian nationality, the vast majority lived in intact two-parent families, and all adolescents were recruited from Flanders, the Dutch-speaking part of Belgium. Hence, caution should be exercised when generalizing our findings. Future research may want to rely on samples that are more diverse in terms of both ethnicity and family constellation (e.g., divorced co-parents or single-parent) to examine the generalizability of our findings to different situations. Statistical tests of longitudinal measurement invariance *within* different countries, cultures, and ethnicities are needed to meaningfully compare developmental trends in social anxiety symptoms in different situations, and such statistical tests are also essential *across* different countries, cultures, and ethnicities for meaningful comparisons of developmental trends in social anxiety symptoms across different situations. On a related note, this study focused on adolescents from the general population. For practitioners it may be important to examine the generalizability of our findings on longitudinal measurement invariance of the 12-item short version of the SAS-A in clinical samples, as practitioners are likely interested in making meaningful inferences about changes in social anxiety symptoms of their clients over time (e.g., across treatment).

Second, in this study we relied on self-report measures exclusively for adolescent social anxiety symptoms. Although adolescents appear to be better judges of their own anxiety symptoms than, for example, parents (Cosi, Canals, Hernández-Martinez, & Vigil-Colet, 2010; Stallings & March, 1995), and adolescent self-reports are thus essential in examining anxiety symptom development, a multi-informant and multimethod approach could provide important additional information on associations between adolescent self-reported social anxiety symptoms and other psychosocial outcomes in particular. On a related note, it is essential to establish longitudinal measurement invariance for other psychological constructs. Although some efforts are currently being conducted for other internalizing symptoms, such as depressive symptoms (e.g., Fried et al., 2016), such studies remain scarce.

Third and finally, in this study we have illustrated developmental trends of different aspects of social anxiety across adolescence and gender differences in these trends, but it is important for future research to address these issues in greater detail. It is also important to acknowledge that the gender distribution was approximately equal in Sample 1 (46.1% girls), but included a majority of girls in Sample 2 (62.7% girls). In addition to illustrating such developmental trends in social anxiety symptoms, more research is needed to better understand the large individual differences in adolescent social anxiety symptom development. Such research, for example, could focus on biological, psychological, and environmental factors that may positively or negatively affect developmental trends (i.e., risk and protective factors) and potential mechanisms underlying these changes in social anxiety symptoms across adolescence. Furthermore, as mentioned earlier, heterogeneity in social anxiety symptom development may be addressed through person-centered approaches that distinguish between different trajectory classes across adolescence and explain adolescents' membership in these classes.

Despite these limitations, the present study makes a substantial contribution to the measurement of social anxiety across adolescence and to our understanding of age-normative developmental trends in adolescent social anxiety symptoms across adolescence. Overall, our findings of longitudinal measurement invariance—replicated in two independent samples as well as across these samples and across gender—add to the extant body of literature supporting the excellent quality of the SAS-A across different situations (e.g., cultures, countries, ethnicities, and age categories; Ingles et al., 2010; La Greca et al., 2015; Pechorro et al., 2016; Ranta et al., 2012; Zhou et al., 2008), and extend these qualities to the sound measurement of different aspects of social anxiety symptoms across adolescence. The entire pattern of findings in the present study demonstrates the usefulness of a 12-item short version of the SAS-A for developmental research.

Authors' Note

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