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A longitudinal study of prevalence and predictors of incidence and persistence of sub-diagnostic social anxiety among Swedish adolescents

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Abstract

This longitudinal study aimed to examine the 1-year prevalence, incidence and persistence of sub-diagnostic social anxiety (SSA) as well as general risk factors for the incidence and persistence of SSA during early and mid-adolescence. A Swedish sample of adolescents ($N = 2{,}523$) aged 13–14 years at Time 1 and 14–15 years at Time 2 completed measures of anxiety, depressive symptoms, stressors and emotion regulation strategies across the two timepoints. SSA was defined and assessed by the Social Phobia Screening Questionnaire for Children. The prevalence of SSA was 16%, the incidence 12%, and the persistence 53% over time. Symptoms of depression and general anxiety, various stressors and emotion regulation strategies were overall significantly related to SSA. Predictors for the incidence of SSA were lower age, female gender and elevated general anxiety and behavioral avoidance (i.e. being afraid of new activities when there is uncertainty about the outcome). Predictors for persistent SSA were female gender and increased behavioral avoidance. In conclusion, SSA is very common among young individuals, and behavioral avoidance appears particularly important for understanding the development and persistence of SSA in adolescence.

Keywords: sub-diagnostic social anxiety, adolescents, prevalence, incidence, persistence, risk factors, longitudinal

Highlights

- Sub-diagnostic social anxiety (SSA) is common (16%) among Swedish adolescents aged 13–15 years
- The incidence of SSA was 12% and the persistence 53%
- Predictors of incidence were gender, lower age, anxiety and behavioral avoidance
- Predictors of persistence were gender and behavioral avoidance
- Behavioral avoidance is important for understanding the course of SSA

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Introduction

Adolescence is suggested to be a critical period for individuals with pre-adolescent vulnerabilities related to genetic, family, temperamental, and cognitive/social factors (Rapee et al., 2019). These well-known *specific* risk factors are presumed to interact with *general* risk-factors, related to the increased number of stressors involved in usual developmental changes in maturation, school context and peer relations during adolescence. General risk-factors are assumed to further increase the vulnerability for developing psychopathology (e.g. Powers & Casey, 2015; Spence & Rapee, 2016). They could for example be symptoms of mental ill-health, peer-harassment, disturbed sleep patterns, and dysfunctional emotion regulation strategies. So far, relatively little is known about the prospective impact of general risk-factors for the incidence and persistence of adolescent sub-diagnostic expressions of Social Anxiety Disorder (SAD; Diagnostic and Statistical Manual/DSM-5; American Psychiatric Association (APA), 2013).

SAD, characterized by excessive fear of being negatively scrutinized in performance and interaction situations, avoidance, and functional impairment due to fear and avoidance, is common among young individuals. The reported prevalence rates (1.8–10.6%) and age of onset estimates (10–24 years), have differed considerably between studies, however (Beesdo et al., 2009; Beesdo-Baum et al., 2012; Burstein et al., 2011; Gren-Landell et al., 2009a, 2011; Kessler et al., 2012). These discrepancies are suggested consequences of studying different age groups, assessment instruments (and cut-offs for diagnoses), the actual DSM diagnostic system used, and overall study designs (e.g. Beesdo et al., 2009). In more recent studies using DSM-IV clinical interviews (American Psychiatric Association (APA), 1994; Burstein et al., 2011; Kessler et al., 2012, Knappe et al., 2011), higher prevalence rates between 6 and 10.6% for 13–18-year-olds were reported. Also, in contrast to cross-sectional studies (e.g. Burstein et al., 2011; Fehm et al., 2008), longitudinal studies have indicated that the course of adolescent SAD is less stable than expected, with symptoms oscillating around the diagnostic threshold rather than being consistently stable over time (Beesdo-Baum et al., 2012; Knappe et al., 2009; Wittchen & Fehm, 2003). From this perspective, it would be of significant interest to study the course of adolescent sub-diagnostic social anxiety (SSA), i.e. adolescents who do not reach a full diagnosis of SAD. In the literature, SSA is classified when the individuals experience fear (criteria A in the DSM-IV), but do not fulfil one or two of the remaining DSM-IV criteria (Beesdo-Baum et al., 2012; Fehm et al., 2008; Gren-Landell et al., 2009a). Nevertheless, SSA is common in adolescence (Beesdo-Baum et al., 2012; Gren-Landell et al., 2009a; Knappe et al., 2009; Merikangas et al., 2002), ranging from 13.4% in a Swedish study (Gren-Landell et al., 2009a) to 19.2% among German adolescents/young adults (Beesdo-Baum et al., 2012). SSA has been found to precede later SAD, presenting an elevated risk of functional impairment and comorbid disorders (Beesdo-Baum et al., 2012; Fehm et al., 2008; Merikangas et al., 2002). So far, few studies have focused exclusively on the prevalence, incidence and persistence of SSA and general risk factors as possible predictors of outcome.

General risk factors of social anxiety in adolescence

Cross-sectional studies have shown that adolescent SAD and SSA are related to an elevated risk for *comorbid psychological disorders*, including other anxiety disorders, depression, and

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substance abuse (Beesdo-Baum et al., 2012; Burstein et al., 2011; Fehm er al., 2008; Knappe et al., 2011; Stein et al., 2001). In a prospective community study, Stein et al. (2001) showed that social anxiety was a significant predictor of later depressive disorder, but the presence of comorbid SAD and depression was associated with an overall malign course. Although social anxiety typically precedes depression in adolescence, depression can also precede social anxiety (Cummings et al., 2014). This may be related to social skills deficits due to an early onset of depression resulting in decreased interest in social activities (Cummings et al., 2014).

In addition, *stressors* related to negative experiences of social events, particularly in relation to peers, are significantly correlated with the onset of SAD (Blöte et al., 2007). Significantly higher rates of lifetime victimization (including maltreatment, sexual and peer victimization), and low levels of peer acceptance are significant risk-factors of increased social anxiety during adolescence (Gren-Landell et al., 2011; Siegel et al., 2009; Storch et al., 2005; Teachman & Allen, 2007; Tillfors et al., 2012). Further, an unfavorable family environment involving lack of warmth and dysfunctional family functioning are associated with high persistence of both SAD and SSA (Knappe et al., 2009). Another potential *stressor* includes sleep problems, which are a reported overall risk factor for anxiety and depression in both adolescence and adulthood (Baglioni et al., 2011; Lovato & Gradisar, 2014). The changes in sleep patterns that typically occur during adolescence (including later sleep onset, later awakening and a general reduction in the quantity of sleep) could result in sleep restriction, which is associated with deficient emotion regulation and increased negative affectivity (Palmer & Alfano, 2017).

Moreover, *emotion regulation strategies* (i.e. to monitor, evaluate and modify emotional reactions to achieve one's goals; Thompson & Goodman, 2010), are particularly important during adolescence. Failure to manage emotions because of a heightened emotionality and an increased number of stressors during the period (Rapee et al., 2019) might result in maladaptive emotion regulation strategies such as worry, rumination, suppression and avoidance. Worry and rumination (i.e. to be caught up in negative repetitive thinking prior to or after a social event) are related to psychopathology in general (Aldao et al., 2010) and have been reported as maintaining factors for adult SAD (e.g. Clark & McManus, 2002; Harvey et al., 2004). Among adolescents, worry and rumination are predictive of adolescent ill-health other than social anxiety (Anniko et al., 2018a; Mazzer et al., 2019). Thus, the predictive role of worry and rumination for adolescent social anxiety in particular is still unclear. This is also true for another maladaptive emotion regulation strategy; namely, to inhibit or suppress inner emotional experiences. Of relevance for social anxiety is expressive suppression, which involves attempts to hide feelings of for instance nervousness or fear, as exhibiting those feelings might lead to criticism by others – and public scrutiny is a core feature of social anxiety. This strategy is associated with fewer close relationships and positive interaction experiences, and paradoxically also increases rumination in social anxiety (Goldin et al., 2014). Finally, emotion regulation strategies such as avoidance and escape play a central role in the development and maintenance of SAD as well as in other forms of psychological ill-health. That is, the experience of fear in social situations and the related unpleasant thoughts, emotions and body sensations makes the individual prone to avoid or escape such situations in the future (Aldao et al., 2010; Clark & McManus, 2002; Harvey et al., 2004). Even if worry, rumination, suppression and avoidance are different processes,

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they may have a similar function in that unpleasant experiences decrease in the short term but are maintained in the long run. To conclude, there is a lack of studies on the links between different emotion regulation strategies and incidence and persistence of SSA in adolescence.

The current study

This 1-year longitudinal study aimed to investigate the prevalence, incidence and persistence of SSA in a population of Swedish adolescents ($N = 2{,}523$) aged 13–15 years. We further aimed to examine the impact of general risk factors (comorbid symptoms, stressors and emotion regulation strategies) on the incidence and persistence of SSA. There is limited knowledge about the natural course and longitudinal impact of general risk-factors of SSA to date. Given the early onset and the high proportions of adolescents that develop SSA, identifying possible risk factors for its incidence and persistence is of significance. Based on previous findings mainly on SAD, we expected that elevated symptoms of general anxiety and depression and peer-related stressors would predict SSA. Because the predictive role of emotion regulation strategies is less clear from previous literature, this was explored in the current study.

Method

Participants

The data are from a five-wave longitudinal study examining transdiagnostic risk- and protective factors in relation to adolescents' mental ill-health (running from 2014 to 2018). The participants were registered in 18 public secondary schools in one large-sized (Örebro = 156.000 inhabitants) and two middle-sized (Karlskoga = 30.300 inhabitants, Köping = 26.000 inhabitants) urban communities situated in the middle of Sweden. The participants were representative of the Swedish population regarding being born in Sweden, if parents were divorced/separated and if they lived with two parents (Skolverkets årsredovisning. 2012; Statistiska Centralbyrån (SCB), 2018). The current study includes two waves of data collected one year apart (during spring 2014 and spring 2015, respectively). Adolescents in grades 7–8 (13–14 years) were recruited at baseline (Time 1/T1), with adolescents in grades 8–9 (14–15 years) included during Time 2. The decision of including only two waves was based on statistical power. Including additional waves resulted in a too restricted sample of participants who fulfilled the criteria for SSA at T1 (see below), making further analyses of incidence and persistence highly doubtful.

At T1, 122 parents declined their children's participation, and 446 adolescents declined to attend or were absent on the day of the data collection. T1 sample comprised 2,767 adolescents, with 2,961 providing data at Time 2. To be included in the current analyses, the participants were required to have data for T1 as well as T2. Ninety-one percent of the T1 participants took part in the T2 data collection (the internal attrition at T1 and T2 was less than 1% for the variables used in this paper). The final analytic sample for this study includes 2,523 (47.2% females $M_{age} = 13.7$ years; $SD = .6$). There were no significant differences between T2 responders and non-responders on the study variables at T1 ($p = .17$).

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Procedure

All measures and study procedures were approved by the Regional Ethics Review Board (reference number: 2013/384). In order to reduce sampling bias (Pokorny et al., 2001; Shaw et al., 2015), passive consent from the parents and active consent from the adolescents were used.

Data were collected in classrooms during school hours (90 minutes) by trained research assistants. Teachers were asked to leave the classroom to reduce biased answers (due to e.g. social desirability). The research assistants informed each class about the study and voluntary participation. They further administered the questionnaires and answered questions if needed. Adolescents who did not participate in the study continued with regular schoolwork during the time it took to complete the questionnaire. Each class received a SEK 300 class fund donation.

Measures

Social anxiety

Social anxiety was assessed by the Social Phobia Screening Questionnaire for Children (SPSQ-C). It is a modified version of the Social Phobia Screening Questionnaire (SPSQ; Furmark et al., 1999) used in adult studies (e.g. Tillfors & Furmark, 2007), developed, adapted and validated in Sweden for use in children and adolescents up to age 18 (SPSQ-C; Gren-Landell et al., 2009b). The SPSQ-C is based on the DSM-IV (APA, 1994) criteria for SAD. It includes 12 items. Items 1–8 measure fear in social interaction and performance situations, rated on a 3-point scale (1 = *No fear*, 2 = *Some fear*, 3 = *A lot of fear)*. The items are "Speaking in front of the class," "Raising my hand during class," "Making a phone call to someone I do not know so well," "Being with classmates during breaks," "Going to a party or a birthday party," "Initiating conversation with someone I do not know so well," "Eating with others during lunch," and "Looking in someone's eyes while speaking." Items 9–11 measure the functional impact of social anxiety (" The fear I feel in one or more of the eight situation makes it really difficult for me") during studies, leisure activities and in contact with friends. The items are rated on a 3-point scale (1 = *Yes, definitely,* 2 = *Yes, some*, 3 = *No (or feel no fear)*. Item 12 includes a *yes* or *no* question regarding the duration of social anxiety (i.e. "The fear I feel in any of the situations I have experienced, I have *had for at least 6 months"*). The Swedish validation of the SPSQ-C (N: 2128), has demonstrated moderate to satisfactory reliability (Cronbach's alpha = .78, test-retest r = .60) and fair to good validity (sensitivity = 71%; specificity = 86%) in relation to DSM-IV diagnostic criteria of SAD (Gren-Landell et al., 2009b, 2011). Previous studies have found similar temporal stability using SPSQ-C as a measure of high social anxiety using longitudinal data (e.g. Van Zalk et al., 2020). In the current study, the Cronbach's alpha for the eight items was .79 at T1.

In order to identify participants with sub-diagnostic social anxiety (SSA), the respondent had to rate 1) "a lot of fear" for at least one of the eight social situations; 2) "*yes, definitely*" or "*yes, some*" for functional impairment in at least one life domain (studies, leisure activities, or in contact with friends and, 3) persistence of social anxiety during at least 6 months. The items correspond to criteria A (fear), E (functional impairment) and F (duration) in the DSM-IV (APA, 1994). Criteria C (to realize that the fear is unreasonable) does not have to be

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fulfilled in individuals younger than 18 years. The SPSQ-C has previously been used as a diagnostic instrument by Gren-Landell et al. (2009a) and Tillfors et al. (2011).

Generalized anxiety and depression

Generalized anxiety

To assess generalized anxiety, the Overall Anxiety Severity and Impairment Scale (OASIS; Norman et al., 2006) adapted for adolescents was used. It consists of 5 items, which concerns the frequency and severity of anxiety, avoidance and the functional impact because of anxiety. The OASIS is rated on a 5-point scale with response items corresponding to each question. Example items are: "In the past week, when you have felt anxious, how intense or severe was your anxiety?" (1 = *No anxiety,* 2 = *Infrequent*, 3 = *Occasional*, 4 = *Frequent*, 5 = *Constant*) and "In the past week, when you have felt anxious, how intense or severe was your anxiety?" (1 = *Little or none,* 2 = *Mild*, 3 = *Moderate*, 4 = *Severe*, 5 = *Extreme*). The OASIS has shown satisfactory psychometric properties in an adolescent subclinical (Norman et al., 2006) and an adult clinical sample (Campbell-Sills et al., 2009). In a Swedish longitudinal study of adolescent stress and worry ($N = 1453$), Cronbach's alphas were estimated to .87 at baseline and .88 at two-year follow-up (Anniko et al., 2018b). In the current study, the Cronbach's alpha was .87 at T1.

Depression

The Center for Epidemiology Studies Depression Child (CESD-C; Radloff, 1977; Weissman et al.,1980) was used to assess depressive symptoms during the past week. CESD-C consists of 20 items rated on a 4-point scale (0 = *Not at all,* 1 = *A little*, 2 = *Some*, 3 = *A lot*). Examples of items are "I felt like I was too tired to do things," and "I felt like crying." Good to excellent Cronbach's alphas (.89–.91), and satisfactory validity have been reported in Swedish adolescent samples (Anniko et al., 2018b; Mazzer et al., 2019; Olsson & von Knorring,1997). In the current study, the Cronbach's alpha was .95 at T1.

Stressors

Peer harassment

The Short-Personal Experiences Checklist (PECK; Hunt et al., 2012) was used to assess relational and physical harassment during the last month. It consists of 10 items rated on a 5-point scale (1 = *Never,* 2 = *Sometimes,* 3 = *Every month,* 4 = *Every week,* 5 = *Daily*). Example items are: "Other kids say mean things behind my back," and "Other kids hit me." The PECK has shown excellent internal consistency (Cronbach's alpha = .91) and satisfactory convergent validity (Hunt et al., 2012). In the current study, the Cronbach's alpha was .84 at T1.

Daily stress

The Adolescent Stress Questionnaire-Short version (ASQ-S; Anniko et al., 2018a) was used to assess daily stressors during the past sixth months. The ASQ-S consists of nine stress domains and 27 items rated on a 5-point scale (1 = *Not at all stressful* or *Irrelevant to me,* 2 = *A little stressful*, 3 = *Moderately Stressful*, 4 = *Quite stressful*, 5 = *Very stressful*). The nine

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domains reflect stress due to arguments at home, school performance, school attendance, romantic relationships, peer pressure, teacher interaction, future uncertainty, school/leisure conflict and financial pressures. The ASQ-S has shown satisfactory reliability (Cronbach's alphas: .85–.93), and concurrent and predictive validity in non-clinical samples of Swedish adolescents (Anniko et al., 2018a; Mazzer et al., 2019). In the current study, the Cronbach's alpha for the full ASQ-S was .93 and ranged between .77 and .88 at T1 for the subscales.

Insomnia severity

The Insomnia Severity Index (ISI; Bastien et al., 2001) consists of 7 items measuring severity of insomnia problems during the past 2 weeks. The first three items concern difficulties of falling asleep, staying asleep and problems of waking up to early and are rated: 1 = *None*, 2 = *Mild*, 3 = *Moderate*, 4 = *Severe*, 5 = *Very much*. The next four items ask about satisfaction with the current sleep pattern, how much the sleep problem interfere with daily functioning, how noticeable the sleeping problem might be for others, and how worried about the sleeping problem the respondent is. These items are rated on a five-point scale with response items corresponding to each question. An example item is: "To what extent do you consider your sleep problem to interfere with your daily functioning e.g. daytime fatigue, concentration, memory, mood, etc.?" (1 = *Not at all Interfering,* 2 = *A little,* 3 = *Somewhat* 4 = *Much*, 5 = *Very Much Interfering*). Satisfactory internal consistency (Cronbach's alphas = .83–.88) (Chung et al., 2011; Kanstrup et al., 2014) and test-retest reliability (Chung et al., 2011) has been reported in Chinese and Swedish adolescent samples. In the current study, the Cronbach's alpha was .85 at T1.

Emotion regulation

Worry

The Penn State Worry Questionnaire for Children (PSWQ-C; Chorpita et al., 1997) consists of 14 items rated on a 4-point scale (0 = *Not at all true,* 1 = *Sometimes true*, *2* = *Often true*, 3 = *Always true*). Examples of items are: "My worries really bother me" and "I am always worrying about something." The PSWQ-C has shown good psychometric properties in non-clinical and clinical samples of children and adolescents (Chorpita et al., 1997; Esbjørn et al., 2013; Pestle et al., 2008). In a Swedish longitudinal study of adolescents, Cronbach's alphas were estimated to .89 at baseline and .92 at two-year follow-up (Anniko et al., 2018b). In the current, study the Cronbach's alpha was .90 at T1.

Rumination

The Children's Response Styles Scale (CRSS; the rumination subscale; Rood et al., 2010; Ziegert & Kistner, 2002) consists of 10 items rated on a 5-point scale (1 = *Never,* 2 = *Almost never*, 3 = *Sometimes*, 4 = *Often*, 5 = *Always*). Example items includes "When I'm feeling sad, I think about the other times that I felt this way" and "When I'm feeling sad, I think: why can't I stop feeling this way?." The CRSS has shown satisfactory internal consistency (Cronbach's alpha = .81) and validity (Ziegert & Kistner, 2002). In a Swedish study of an

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adolescent sample, Cronbach's alpha was estimated to .91 (Mazzer et al., 2019). In the current study, the Cronbach's alpha was .93 at T1.

Suppression

The Emotion Regulation Questionnaire for Children and Adolescents - Suppression subscale (ERQ–CA; Gullone & Taffe, 2012) consists of 4 items rated on a 5-point scale (1 = *Strongly disagree,* 2 = *Disagree*, 3 = *Half and half*, 4 = *Agree*, 5 = *Strongly agree*). Example item are "When I am feeling bad (e.g. sad, angry, or worried) I am careful not to show it" and "I keep my feelings to myself." The scale has shown adequate Cronbach's alpha (.73) as well as 3-month test-retest reliability, $r = .69$ (Gullone & Taffe, 2012). In the current study, the Cronbach's alpha was .68 at T1.

Behavioral avoidance

Six items from the "behavioral nonsocial' subscale were selected from the Cognitive Behavioral Avoidance Scale (CBAS; Ottenbreit & Dobson, 2004). The scale comprises 6 items rated on a 5-point scale (1 = *Not at all true,* 2 = *Somewhat true*, 3 = *Moderately true*, 4 = *Very true*, 5 = *Extremely true*). Example items include "Rather than try new activities, I tend to stick with the things I know," and "I avoid trying new activities that hold the potential for failure." The CBAS subscale has shown satisfactory divergent validity with other measures of avoidance, particularly dispositional harm avoidance, and measures of both anxiety and depression. It has shown adequate Cronbach's alpha (.75) and a satisfactory test-retest reliability ($r = .88$) (Ottenbreit & Dobson, 2004). In the current study, the Cronbach's alpha was .75 at T1.

Data analyses

Individuals who completed the survey at both T1 and T2 ($N = 2523$) were included in the analyses. To examine the associations between the general risk-factors (predictor variables) at T1, Pearson's *r* was used. A formal statistical test (variance inflation factor) showed no evidence of multicollinearity between the predictor variables. Other assumptions for logistic regression were checked as well, such as outliers and linearity in the logit for any continuous independent variables, meeting assumptions for the analyses. In order to examine the predictors in relation to incidence and persistence of social anxiety, unadjusted (univariate) logistic regression analyses were executed in the first step in which each predictor was tested one at a time in relation to incidence and persistence of social anxiety (yes/no). As a subsequent step, the significant variables in the first step were entered simultaneously (multivariate) in adjusted analysis as predictors. In the logistic regression analyses, all predictor variables were z-transformed to enable comparisons between the predictors.

Results

Prevalence, incidence, and persistence of Sub-diagnostic social anxiety

At T1, 14.3% ($n = 362$) and at T2, 17.9% ($n = 452$) fulfilled our criteria for SSA. As can be seen in Table 1, significantly more girls than boys fulfilled the criteria. In addition,

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Table 1. Socio-demographic characteristics of participants with sub-diagnostic and no social anxiety at Time 1.

Demographics	SSA ($n = 362$)	NSA ($n = 2161$)	Group differences (F/χ^2)
Age M (SD)	13.6 (0.6)	13.7 (0.6)	1.93
Female (n, %)	275 (76.0)	916 (42.4)	140.28***
Born in Sweden/yes (n, %)	325 (89.8)	1919 (88.8)	0.30
Swedish is spoken at home (n, %)	284 (78.4)	1612 (74.6)	2.73
Parents divorced/ separated (n, %)	139 (38.5)	713 (33)	4.62*
Living with both parents (n, %)	242 (66.8)	1551 (71.8)	4.25*

Note. * $p < .05$; ** $p < .01$; *** $p < .001$. SSA = sub-diagnostic social anxiety; NSA = no social anxiety.

significantly more participants with SSA than non-SSA had divorced parents, and significantly fewer lived with both parents. Among those that did not fulfil criteria at T1, 12.0% ($n = 259$) met the criteria at T2. Of those that did fulfil the criteria at T1, 53.3% ($n = 193$) did so at T2. Thus, the prevalence of SSA at the two time-points was approximately 16%, the incidence 12%, and the persistence slightly more than 50%.

Correlations between predictor variables

As can be seen in Table 2, with a few exceptions there were significant correlations between the majority of predictor variables.

Predictors of the incidence of Sub-diagnostic social anxiety

To examine predictors for developing SSA at T2 among those without SSA at T1, unadjusted logistic regression analyses were first executed. Each predictor at a time was first tested in relation to incidence of SSA (yes/no). As is displayed in Table 3, all except three of the predictor variables (suppression, physical harassment and stress of teacher interaction), were significantly associated with the incidence of SSA. In a subsequent adjusted analysis, while controlling for all significant predictor variables from the unadjusted analyses as well as age and gender, elevated general anxiety and behavioral avoidance were related to an increased risk of developing SSA at T2. Lower age (OR = 0.71, 95% CI 0.57–0.90, p =.004) and female gender (OR = 2.85, 95% CI 2.08–3.91, p<.001) were also associated with the incidence of SSA.

Predictors of the persistence of Sub-diagnostic social anxiety

Unadjusted logistic regression analyses were executed where each predictor was tested one at a time in relation to persistence of SSA (yes/no). As can be seen in Table 4, many predictor variables were significantly associated with the persistence of SSA, including insomnia severity, behavioral avoidance, rumination and stress (at home, with peers and regarding future uncertainty). In a subsequent adjusted analysis, while controlling for all significant

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Table 2. Associations between the predictor variables and sub-diagnostic social anxiety at T1.

Measure		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	SSA																				
2	ISI	.30																			
3	OASIS	.46	.53																		
4	CESD-C	.44	.62	.74																	
5	ERQ-CA	.12	.20	.17	.23																
6	CBAS	.19	.23	.27	.31	.21															
7	PSWQ	.40	.49	.67	.69	.15	.31														
8	CRSS	.31	.40	.54	.62	.17	.28	.64													
9	RVH (PECK)	.16	.33	.39	.47	.12	.23	.31	.31												
10	PH (PECK)	.04	.12	.14	.15	.11	.24	.08	.08	.45											
11	SHL (ASQ)	.22	.40	.43	.49	.11	.24	.44	.40	.36	.19										
12	SSP (ASQ)	.26	.41	.44	.49	.11	.36	.50	.43	.35	.18	.48									
13	SSA (ASQ)	.22	.45	.39	.45	.14	.33	.40	.33	.37	.21	.37	.59								
14	SRR (ASQ)	.06	.26	.25	.26	.04	.13	.18	.20	.26	.20	.31	.26	.24							
15	SPP (ASQ)	.23	.31	.38	.46	.15	.44	.34	.30	.55	.39	.40	.43	.40	.31						
16	STI (ASQ)	.16	.34	.33	.35	.12	.37	.30	.27	.41	.35	.39	.53	.50	.30	.54					
17	SFU (ASQ)	.28	.46	.49	.57	.14	.29	.55	.47	.34	.12	.47	.57	.46	.25	.40	.44				
18	SSLC (ASQ)	.21	.38	.37	.44	.11	.34	.41	.35	.34	.22	.41	.66	.57	.24	.41	.53	.56			
19	SFP (ASQ)	.14	.32	.30	.38	.12	.32	.30	.27	.32	.24	.40	.42	.43	.26	.39	.39	.38	.48		
20	Age	.04	.09	.06	.08	.03	.05	.09	.07	.03	.01	.05	.07	.08	.07	.01	.04	.14	.06	.06	
21	Gender	−.24	−.18	−.30	−.35	.09	−.05	−.34	−.36	−.13	.14	−.24	−.31	−.18	−.02	−.09	−.07	−.25	−.19	−.11	.03

Note. All correlations above were significant at the .001 level, except for the correlations between ERQ-CA and SRR (ASQ), SSA and SRR (ASQ), SSA and PH (PECK), age and ERQ-CA, age and SPP (ASQ), age and RVH (PECK), age and PH (PECK), age and gender, and gender and SRR (ASQ) ($p < .05$). Gender was coded as 1 (girl) and 2 (boy). SSA = Sub-diagnostic Social Anxiety; ISI = Insomnia Severity Index; OASIS = Overall Anxiety Severity and Impairment Scale; CESD-C = Center for Epidemiology Studies Depression Child; ERQ-CA = The Emotion Regulation Questionnaire for Children and Adolescents - Suppression subscale; CBAS = Cognitive - Behavioral Avoidance Scale; PSWQ = The Penn State Worry Questionnaire for Children; CRSS = The Children's Response Styles Scale (the rumination subscale); PECK = Short-Personal Experiences Checklist; RVH = Relational Verbal Harassment; PH = Physical Harassment; ASQ = Adolescent Stress Questionnaire; SHL = Stress of Home Life; SSP = Stress of School Performance; SSA = Stress of School Attendance; SRR = Stress of Romantic Relationships; SPP = Stress of Peer Pressure; STI = Stress of Teacher Interaction; Stress of Future Uncertainty; SSLC = Stress of School/Leisure Conflict; SFP = Stress of Financial Pressure.

Table 3. Predictors for the incidence of sub-diagnostic social anxiety: Descriptive statistics, univariate logistic regression analyses and multivariate logistic regression analyses.

Predictors at T1	No SA (T2), n = 1902 M (SD)	SSA (T2), n = 259 M (SD)	Unadjusted model: OR (95% CI)	Adjusted model: OR (95% CI) [a]
Insomnia symptoms (ISI)	4.7 (4.4)	6.7 (5.3)	1.46 (1.31-1.64) ***	1.13 (0.95-1.36)
Anxiety (OASIS)	2.2 (2.8)	4.1 (3.6)	1.70 (1.53-1.90) ***	1.32 (1.07-1.64) *
Depression (CESD-C)	10.0 (8.8)	16.3 (11.1)	1.98 (1.73-2.28) ***	1.14 (0.88-1.47)
Suppression (ERQ-CA)	10.7 (3.5)	11.1 (3.2)	1.12 (0.99-1.28)	
Behavioral avoidance (CBAS)	11.9 (4.3)	13.1 (3.8)	1.29 (1.15-1.45) ***	1.20 (1.02-1.41) *
Worry (PSWQ)	12.4 (7.4)	17.4 (8.8)	1.74 (1.55-1.96) ***	1.16 (0.94-1.43)
Rumination (CRSS)	23.2 (8.9)	28.1 (8.0)	1.73 (1.51-1.98) ***	1.07 (0.88-1.31)
Relational-verbal harassment (PECK)	8.2 (2.9)	9.0 (3.5)	1.28 (1.14-1.44) ***	0.99 (0.83-1.17)
Physical harassment (PECK)	4.9 (2.0)	4.8 (1.9)	0.97 (0.84-1.12)	
Stress of home life (ASQ)	6.6 (2.9)	7.7 (3.3)	1.42 (1.26-1.61) ***	0.97 (0.83-1.15)
Stress of school performance (ASQ)	7.3 (3.1)	8.8 (3.3)	1.58 (1.39-1.80) ***	1.11 (0.90-1.37)
Stress of school attendance (ASQ)	3.7 (2.0)	4.3 (2.2)	1.29 (1.14-1.46) ***	0.84 (0.69-1.01)
Stress of romantic relationships (ASQ)	3.9 (1.9)	4.1 (2.3)	1.13 (1.00-1.28) *	0.95 (0.82-1.11)
Stress of peer pressure (ASQ)	5.2 (2.3)	6.0 (2.8)	1.31 (1.16-1.47) ***	1.05 (0.87-1.26)
Stress of teacher interaction (ASQ)	4.5 (2.3)	4.7 (2.2)	1.11 (0.98-1.27)	
Stress of future uncertainty (ASQ)	5.7 (2.7)	6.9 (3.2)	1.49 (1.32-1.69) ***	0.99 (0.83-1.19)
Stress of school/leisure conflict (ASQ)	6.1 (3.1)	7.3 (3.4)	1.40 (1.24-1.58) ***	1.00 (0.81-1.22)
Stress of financial pressure (ASQ)	3.1 (1.9)	3.6 (2.1)	1.27 (1.13-1.43) ***	1.01 (0.86-1.19)
Age (years)	13.8 (0.7)	13.6 (0.6)	0.76 (0.62-0.94) *	0.71 (0.57-0.90) **
Gender (% girls)	39.1%	71.0%	3.81 (2.88-5.06) ***	2.85 (2.08-3.91) ***

Note. In the logistic regression analyses, all predictor variables were z-transformed to enable comparisons between the predictors. Gender was coded as 1 (girl) and 2 (boy). SSA = Sub-diagnostic social anxiety; ISI = Insomnia Severity Index; OASIS = Overall Anxiety Severity and Impairment Scale; CESD-C = Center for Epidemiology Studies Depression Child; ERQ-CA = The Emotion Regulation Questionnaire for Children and Adolescents - Suppression subscale; CBAS = Cognitive - Behavioral Avoidance Scale; PSWQ = The Penn State Worry Questionnaire for Children; CRSS = The Children's Response Styles Scale (the rumination subscale); PECK = Short-Personal Experiences Checklist, ASQ = Adolescent Stress Questionnaire.

predictor variables from the unadjusted analyses as well as age and gender, behavioral avoidance was the only significant predictor associated with an increased risk of maintaining SSA at T2. While female gender (OR = 1.87, 95% CI 1.12–3.11, p=.017) was associated with persistent SSA, age was not (OR = 1.16, 95% CI 0.81–1.65, p=.430).

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Table 4. Predictors for the persistence of sub-diagnostic social anxiety: Descriptive statistics, univariate logistic regression analyses and multivariate logistic regression analyses.

Predictors at T1	No SA (T2), n: 169 M (SD)	SSA (T2), n: 193 M (SD)	Unadjusted model: OR (95% CI)	Adjusted model: OR (95% CI) [a]
Insomnia severity (ISI)	8.2 (5.6)	9.4 (6.0)	1.20 (1.00-1.44) *	1.07 (0.87-1.32)
Anxiety (OASIS)	6.5 (4.4)	7.2 (4.5)	1.15 (0.97-1.37)	
Depression (CESD-C)	22.9 (12.4)	24.8 (14.4)	1.13 (0.95-1.35)	
Suppression (ERQ-CA)	11.8 (3.2)	11.7 (3.3)	0.98 (0.78-1.22)	
Behavioral avoidance (CBAS)	13.5 (4.2)	15.0 (4.4)	1.42 (1.13-1.77) **	1.31 (1.02-1.68) *
Worry (PSWQ)	21.8 (8.4)	22.7 (8.9)	1.12 (0.91-1.37)	
Rumination (CRSS)	30.6 (8.3)	32.5 (7.9)	1.30 (1.02-1.66) *	1.02 (0.76-1.36)
Relational-verbal bullying (PECK)	9.6 (3.6)	10.0 (4.3)	1.09 (0.92-1.29)	
Physical bullying (PECK)	5.2 (2.3)	5.1 (2.2)	0.95 (0.79-1.15)	
Stress of home life (ASQ)	8.2 (3.4)	9.0 (3.6)	1.23 (1.01-1.49) *	1.04 (0.82-1.31)
Stress of school performance (ASQ)	9.6 (3.2)	9.9 (3.2)	1.11 (0.89-1.38)	
Stress of school attendance (ASQ)	5.1 (2.4)	5.1 (2.3)	0.99 (0.81-1.20)	
Stress of romantic relationships (ASQ)	4.3 (2.5)	4.2 (2.3)	0.97 (0.81-1.16)	
Stress of peer pressure (ASQ)	6.6 (3.2)	7.4 (3.6)	1.21 (1.02-1.43) *	1.08 (0.88-1.33)
Stress of teacher interaction (ASQ)	5.4 (2.9)	5.7 (2.9)	1.09 (0.91-1.30)	
Stress of future uncertainty (ASQ)	7.8 (3.3)	8.6 (3.4)	1.26 (1.04-1.53) *	1.03 (0.80-1.33)
Stress of school/leisure conflict (ASQ)	8.1 (3.4)	8.4 (3.5)	1.07 (0.88-1.30)	
Stress of financial pressure (ASQ)	4.0 (2.3)	4.0 (2.2)	0.99 (0.82-1.20)	
Age (years)	13.7 (0.6)	13.8 (0.6)	1.18 (0.87-1.60)	
Gender (% girls)	70.9%	81.3%	1.79 (1.13-2.85) *	1.87 (1.12-3.11) *

Note. In the logistic regression analyses, all predictor variables were z-transformed to enable comparisons between the predictors. Gender was coded as 1 (girl) and 2 (boy). SSA = Sub-diagnostic Social Anxiety; ISI = Insomnia Severity Index; OASIS = Overall Anxiety Severity and Impairment Scale; CESD-C = Center for Epidemiology Studies Depression Child; ERQ-CA = The Emotion Regulation Questionnaire for Children and Adolescents - Suppression subscale; CBAS = Cognitive - Behavioral Avoidance Scale; PSWQ = The Penn State Worry Questionnaire for Children; CRSS = The Children's Response Styles Scale (the rumination subscale); PECK = Short-Personal Experiences Checklist; ASQ = Adolescent Stress Questionnaire.

Discussion

The aim of this study was to examine the prevalence, incidence and persistence of SSA among Swedish adolescents aged 13–15 years (N = 2,523), and the longitudinal impact of general anxiety and depressive symptoms, stressors and emotion regulation for predicting

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incidence and persistence. In summary, the prevalence of SSA was approximately 16% at T1 and T2, the incidence 12%, and the persistence about 53%. Lower age, female gender, elevated general anxiety symptoms, and behavioral avoidance were significant predictors of the incidence of SSA. Persistence of SSA was significantly predicted by female gender and elevated behavioral avoidance.

The prevalence, incidence and persistence of Sub-diagnostic social anxiety

The prevalence rate of SSA in the current study (14.3% at T1 and 17.9% at T2) is consistent with previous findings demonstrating that a high proportion of adolescents (13.4–19.2%) suffer from SSA (Beesdo-Baum et al., 2012; Gren-Landell et al., 2009a; Knappe et al., 2009). In contrast to these studies, our study could only focus on SSA (and not SAD), as not all DSM criteria were covered in the basic project assessments. That is, criteria B (exposure to the feared situation almost always provokes an anxiety response) and D (avoiding and enduring the situation) were missing. Nevertheless, the social anxiety of our participants was associated with both functional impairment and with at least 6 months duration i.e. indicating clinically significant social anxiety. Thus, it seems plausible to assume that our sample not only consisted of SSA but to some extent also of SAD. In the above- mentioned study (Gren-Landell et al., 2009a) investigating an age range similar to this study, it was found that 4.4% of Swedish adolescents (12–14 years) fulfilled criteria for SAD. Thus, it's possible that the proportion of SSA in our study could be somewhat lower and closer to the proportion of SSA (i.e. 13.4%) reported by Gren-Landell et al. (2009a).

Many new cases of SSA (12%, $n = 259$) appeared at T2 (i.e. one year later), when participants were 14 to 15 years of age. The reported incidence rates from adolescent longitudinal studies, particularly of SSA, are very limited. Nevertheless, Beesdo and colleagues examined 3021 participants (14–24 years) in a 10-year prospective study (Beesdo et al., 2007). They found that the incidence rates of SAD steadily increased after 9 years of age during adolescence but reached an inflection point appearing at 17 years for boys and 19 years for girls. In addition, the cumulative incidence of SAD during the period was estimated to 11%. In a later study of the same population (Beesdo-Baum et al., 2012), the 10-year cumulative incidence of SSA ("threshold SAD") was estimated to 6%. However, meaningful comparisons of incidence rates with our study are difficult due to differences in length of follow-up and age-ranges, as well as somewhat different calculations of incidence.

In the current study, more than half of participants (53%) who had SSA at T1 (13–14 years), remained having SSA one year later (T2). Typically, the onset of SAD happens during early or mid-adolescence (e.g. Lijster et al., 2017), with particularly early onset related to high persistence and stability of symptoms (Beesdo et al., 2009; Beesdo-Baum et al., 2012; Fehm et al., 2008). Also, SSA has been reported to follow a persistent course with an increased probability of remaining in SSA, but also progress into SAD over time (Beesdo-Baum et al., 2012; Knappe et al., 2009). In a 10-year prospective study ($N = 1395$), Knappe et al. (2009) found that adolescents (14–17 years) were affected by SSA during 69% of the time-period. Additionally, Beesdo-Baum et al. (2012) showed a high persistence of SSA; 67% of participants (14–24 years) spent at least 67% of the 10-year period with symptoms after the initial onset. The corresponding percentage of persistence for participants with SAD in these studies was 57% (Knappe et al., 2009) and 62% (Beesdo-Baum et al., 2012). Thus,

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despite some fluctuations around the diagnostic threshold, SSA appears prospectively as persistent as SAD across adolescence. This stresses the importance of early interventions for this group. Findings from adult populations (e.g. Bruce et al., 2005) show that once SAD has been established it persists into adulthood. In a 12-year prospective study of participants ranging between 18 and 86 years, Bruce and colleagues (2005) found that SAD was the most chronic and unremitting of anxiety disorders, and that comorbid general anxiety disorder decreased the probability of recovery.

General risk factors of incidence and persistence of Sub-diagnostic social anxiety

Many of the selected predictors were significantly associated with the incidence and persistence of SSA. However, when controlling for all other significant predictors in the unadjusted analyses, a few risk factors remained.

Consistent with our expectations, elevated general anxiety was predictive of *incidence* of SSA, but depressive symptoms and peer-related stressors were not. We did not have any clear expectations about the role of emotional regulation strategies for predicting SSA. Elevated general anxiety in this study is reflected by frequency of anxiety and avoidance, intensity of anxiety, and how much the anxiety interfered with daily life activities and social life. Thus, in this sample general anxiety appears to be a forerunner to SSA, which rather involves fear in specific social situations associated with both impairment and duration. Additionally, behavioral avoidance (i.e. avoiding novelty), lower age (being 13 rather than 14 years old) and being a female predicted incidence. That is, early general tendencies of elevated general anxiety in combination with behavioral avoidance as a maladaptive emotion regulation strategy increases the risk of SSA. In turn, these indices may be related to heightened vulnerability due to pubertal changes (particularly in females), and because of considerable external changes within this early adolescent period. It is well documented that female gender increases the risk for high social anxiety and SAD (e.g. Kessler et al., 2012), which might be related to an earlier onset of pubertal (hormonal and morphological) changes in girls. These changes would increase social expectations of maturity and confuse the young girls, who typically lack strategies for coping with the increasingly intense and unstable expressions of emotions at this time (e.g. Rapee et al., 2019). External changes may also contribute to an increased vulnerability. That is, at the age of 13 young people in Sweden typically change schools and move to larger classes with new classmates. From having one or two teachers whom they are familiar with, they get separate teachers for different subjects, increasing their exposure to more individuals further. Hence, age-related internal and external changes in combination with heightened emotionality and immature emotional regulation strategies within the period might result in psychological ill-health such as SSA and SAD (e.g. Rapee et al., 2019; Spence & Rapee, 2016).

We expected that peer related stressors (i.e. verbal and physical bullying) would be related to SSA as many studies have reported significant associations to high social anxiety and SAD (e.g. Siegel et al., 2009; Storch et al., 2005). In our unadjusted analyses, verbal bullying was associated with incidence but not persistence. However, in the adjusted analyses neither one of these indices were of importance for predicting incidence and prevalence in SSA. Moreover, despite the fact that social anxiety/SAD typically predicts depression (e.g. Cummings et al., 2014), we expected that general ill-health such as elevated depressive

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symptoms would increase vulnerability and being linked to SSA. Indeed, depression was associated with incidence (but not persistence) of SSA in the unadjusted analyses, but was found to be of relatively less importance for incidence and persistence in the adjusted analyses. However, it is possible that adolescent clinical levels of depression and SAD would have revealed another picture (e.g. Cummings et al., 2014).

Like risk factors for incidence, female gender and behavioral avoidance were risk factors for the *persistence* of SSA. However, these were the only factors that predicted persistence. Behavioral avoidance is related to behavioral inhibition (and harm avoidance), a temperament trait characterized by increased sensitivity for contextual stimuli, negative affectivity and avoidance of novelty such as new people and unknown situations (Cloninger et al., 1993; Kagan et al., 1988). In a longitudinal study of participants aged 14–24 years, behavior inhibition was related to an earlier onset of SAD (Knappe et al., 2011). Our results are consistent with a previous longitudinal study (Beesdo-Baum et al., 2012) showing that elevated behavioral avoidance was the most important risk factor of both incidence and persistence of SAD and SSA. Thus, it seems that this emotional regulation strategy is closer to the more specific temperamental trait of behavioral inhibition. Behavioral inhibition is considered a specific risk factor for an early onset of SAD (Knappe et al., 2011) and for developing SAD (Buzzell et al., 2017; Cloninger et al., 1993; Spence & Rapee, 2016).

Limitations and strengths

An obvious limitation in this study was the lack of formal participant diagnoses, as all DSM criteria were not measured which only made it possible to assess SSA. Thus, the sample could be somewhat mixed and to some extent also include participants with SAD, particularly as functional impairment and duration $\geq$ 6 months was part of the classification. Another limitation is that the results are based on changes across one year and thus included a limited age range, which does not cover possible fluctuations of SSA across a longer period of time. As previously is mentioned, the decision of including only two waves was based on a lack of statistical power for the analyses when additional waves were included.

The strengths of the study include the longitudinal design, the large sample of adolescents and the low dropout rate. Further, by using passive approval from parents it likely reduced the risk for selection bias as there is a higher chance that adolescents from lower socio-economic groups participate when passive approval compared to active approval from parents is used (Pokorny et al., 2001; Shaw et al., 2015). Based on the large longitudinal sample from three Swedish communities paired with the low dropout rate, the external validity can be regarded as relatively good, and generalizable to adolescents in rural middle-sized and large communities in Sweden.

Conclusions

SSA is very common among young adolescents. Elevated behavioral avoidance is a central predictor for developing and persisting in SSA over time. Possibly, this tendency of being afraid of trying new activities when there is uncertainty about the outcome may be related to a specific vulnerability trait in adolescents with SSA.

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No potential conflict of interest was reported by the authors.

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