Investigating why and for whom cognitive behavioural therapy for social anxiety disorder works: Examining the role of self-efficacy, cognitions, age, and sex

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Abstract

Research has shown that cognitive-behavioural therapy (CBT) is a frequently used effective intervention for social anxiety disorder (SAD) in children and adolescents. However, not much is known about the working mechanisms of CBT. This study examined variables that may play a role in the effectiveness of a CBT intervention for adolescents with SAD. Knowing which variables predict treatment outcome can help to enhance the efficacy of interventions for SAD. Research has shown that low self-efficacy, few positive cognitions and many negative cognitions are associated with SAD, hence the variables that were included were self-efficacy, positive cognitions, and negative cognitions. This study also examined whether age and sex acted as moderators on the relationship between a change in the predictor variables and a change in SAD. With the exclusion of dropouts and missing data, 36 adolescents aged 11-17 years with SAD participated in a group-based CBT intervention called Skills for Social and Academic Success (SASS). Before and after participation they filled out questionnaires measuring self-efficacy, cognitions and SAD. An interview was conducted to assess the severity of the SAD symptoms. Multiple regression analyses were conducted to examine whether change in SAD could be predicted by change in self-efficacy and cognitions. Results indicated that a change in positive and negative cognitions significantly predict a change in SAD symptoms, but only when using the questionnaire for SAD as the dependent variable. Furthermore, the change in negative cognitions is a stronger predictor for change in SAD for younger than for older adolescents. Sex did not act as a moderator on any of the variables. These results indicate that changing cognitions may be an important mechanism behind why CBT interventions work. Future research on this topic should focus on the role of positive as well as negative cognitions in CBT interventions.

Layman's abstract

Many adolescents suffer from a fear of being negatively judged by others or acting in an embarrassing way in social situations. This fear leads to avoidance of social situations. This is called social anxiety disorder (SAD), and it is often treated with cognitive behavioural therapy (CBT). In this form of therapy, dysfunctional thoughts and behaviours are challenged. It is an effective intervention for SAD, but not much is known about why it is effective. Knowing this could help improve CBT interventions. This study aimed to examine possible processes that drive the effectiveness of CBT. We looked at the role of positive thoughts, like 'I enjoy life', negative thoughts, like 'I am worthless', and self-efficacy, which is the belief in your ability to behave in a way that is necessary to reach certain goals. In total, 36 adolescents aged 11-17 years with SAD followed a group-based CBT intervention called Skills for Social and Academic Success (SASS). Before and after this intervention, they filled out self-report questionnaires to assess their positive and negative thoughts, self-efficacy and severity of their SAD. They also had an interview with a clinician to assess their level of SAD.

The results showed that a change in positive and negative thoughts is related to a change in SAD symptoms. This means that an increase in positive thoughts and a decrease in negative thoughts were related to a decrease in SAD. This was only true when using the anxiety scores from the adolescents themselves, but not the scores given by therapists. We also found that a change in negative cognitions may play a more important role in decreasing SAD for younger adolescents than for older adolescents. These results indicate that changing thoughts may be an important aspect of CBT interventions. Previous research has focused mainly on the negative thoughts, but it might be useful in the future to also consider positive thoughts.

Introduction

Social anxiety disorder (SAD) is one of the most prevalent psychological disorders. It has a lifetime prevalence of 12.1% (Kessler et al., 2005)**.** SAD is characterized by a persistent fear of social or performance situations with unfamiliar people and/or the possibility of being evaluated by others (American Psychiatric Association, 2013). People with SAD fear that they will act in an embarrassing way in front of others, and therefore often avoid such situations. SAD often develops during early adolescence (Stein et al., 2017). The median age of onset for SAD is 13 years (Kessler et al., 2005). It is important to treat SAD at an early age for several reasons: SAD has a high comorbidity rate with other anxiety disorders, depression and substance abuse disorders (Stein et al., 2017; Wittchen & Fehm, 2003). SAD can also significantly reduce quality of life (Fehm et al., 2007). For example, individuals with SAD have a higher chance of an impairment in their academic performance (Vilaplana-Pérez et al., 2020).

Cognitive behavioural therapy (CBT) interventions can significantly help children and adolescents with SAD (Garcia-Lopez et al., 2006; Melfsen et al., 2011; Scaini et al., 2016; Segool & Carlson, 2008). The basic idea behind CBT is that psychological disorders or emotional distress are maintained by maladaptive cognitions, including beliefs about the world, the self, and the future (Hoffmann et al., 2012). The goal of CBT is to change these maladaptive cognitions, which in turn will lead to changes in psychological distress and problematic behaviours. This is achieved by the therapist collaborating with the patient in challenging maladaptive cognitions and modifying maladaptive behaviours (Hoffmann et al., 2012). Some examples of techniques used to challenge cognitions and changing behaviours are: (a) psychoeducation on anxiety, (b) relaxation/breathing exercises, (c) cognitive restructuring, and (d) imaginal and/or in vivo exposure to feared situations (Arch & Craske, 2008).

In a recent meta-analysis by Scaini et al. (2016) it was found that CBT is an effective intervention for children and adolescents with SAD, and that these effects are lasting. They found that the children and adolescents showed an improvement when comparing measures of social anxiety at follow-up, ranging from 6 to 12 months after treatment, with post-treatment measures of social anxiety. Including social skills training in a CBT intervention can even further enhance a reduction in SAD symptoms (Scaini et al., 2016). An example of a program that uses a combination of CBT and social skills training is the Skills for Academic and Social Skills (SASS) program (Fisher et al., 2004). This program was found to be effective in reducing social anxiety symptoms when compared to both a wait-list group (Masia Warner et al., 2005), and an attentional control group (Masia Warner et al., 2007). Elements of this program include psychoeducation, cognitive restructuring, exposure tasks, assertiveness training, and homework assignments (Fisher et al., 2004).

Thus, research has found that CBT is an effective intervention for SAD (Scaini et al., 2016). The SASS program, which includes social skills training in a CBT program, has also proven to be effective (Masia Warner et al., 2005; Masia Warner et al., 2007). However, not much is known about

possible mechanisms that drive the effectiveness of these interventions. Learning more about the mechanisms behind why CBT works can help further enhance the efficacy of interventions for SAD, because it gives a better idea about what the focus of the intervention should be. The present study aims to close the gap in the literature by examining three potential mechanisms that may give an indication as to if and why the SASS intervention is effective for adolescents with SAD. The three mechanisms that will be explored are self-efficacy, positive cognitions and negative cognitions. Furthermore, potential effects of age and sex on the effectiveness of the SASS intervention will be examined. Even though SAD is a diagnosis and is not on a continuum, in the current study terms like 'less SAD symptoms', or 'a reduction in SAD symptoms' are mentioned.

Self-efficacy is defined as beliefs about your ability to behave in a way that produces desired results (Bandura, 1977). According to Bandura (1977), these beliefs determine if coping behaviour will be initiated and how much effort will be put in. Research has found that self-efficacy is related to SAD. More specifically: high levels of self-efficacy are associated with a lower severity of social anxiety (Rudy et al., 2012; Thomasson & Psouni, 2010). Rudy et al. (2012) looked at both general self-efficacy and social self-efficacy in children aged 11 to 14 years. They found that high levels of (social) self-efficacy were related to low levels of social anxiety. Moreover, they found that general self-efficacy, but not social self-efficacy, fully mediated the relationship between negative self-cognitions and SAD. This indicates that the relationship between negative self-cognitions and SAD, which will be further discussed below, can be explained by beliefs about one's global abilities. This is not the case for social self-efficacy however: social self-efficacy in itself did not statistically explain the relation between negative cognitions and social anxiety. Therefore in this study, only general self-efficacy is looked at. Thomasson and Psouni (2010) found that, in adults, the relationship between self-efficacy and social anxiety was partly mediated by dysfunctional coping strategies for handling anxiety in social situations, indicating that low levels of self-efficacy may lead to the use of dysfunctional coping strategies.

SAD is also associated with negative social cognitions (Goldin et al., 2013). In their cognitive model, Clark and Wells (1995) state that social anxiety results from problematic beliefs about the self and about the social world. When people with SAD enter a social situation, they believe that they will behave in an undesirable manner, and that behaving this way will have disastrous consequences (Clark & Wells, 1995). According to the model, social situations are seen as threatening by people with SAD because of dysfunctional assumptions they hold about themselves and how they should act in social situations. They have high standards for their social performance, and negative beliefs about their own worth. The model was designed for adults, but Leigh and Clark (2018) examined the application of this model to adolescents. They found three questionnaire studies that provided evidence for the notion that adolescents with SAD have negative social cognitions about themselves (e.g. "I will fail"), and about other peoples' reactions (e.g. "they will think I'm dumb"). Schreiber et al. (2012) found that in a sample of German adolescents aged 14-20 years, high scores on a questionnaire for social anxiety

were related to more negative social cognitions in social situations. Furthermore, they found that social cognitions predicted social anxiety (Schreiber et al., 2012). Hodson et al. (2008) found similar results to Schreiber and colleagues in a sample from the UK, consisting of adolescents aged 11-14 years. Rudy et al. (2012) found that negative social cognitions were related to social anxiety directly, but also indirectly because of their effect on self-efficacy. Leigh and Clark (2018) concluded that the studies they reviewed consistently showed that negative social cognitions are higher in adolescents with SAD than in adolescents without SAD.

Less is known about positive cognitions in people with SAD. However, research by Goldin et al. (2013) has shown that adults with SAD have fewer positive self-views than healthy controls before receiving CBT. CBT also significantly increased the positive self-views after treatment when compared to a wait-list control group. Furthermore, they found that increased positive self-views (but not reduced negative self-views) mediated the effect of CBT on social anxiety, and positive self-views predicted SAD symptom reduction at a 1-year follow-up. In short, positive self-views may play a very important role in the reduction of SAD following CBT. It is important that this is also examined with an adolescent sample. Hogendoorn et al. (2014) investigated different mediators of CBT for anxiety in children and adolescents aged 8-18 years. Using the same questionnaire for cognitions (CATS; Hogendoorn et al., 2010) as the current study, they found that an increase in positive thoughts, but not a decrease in negative cognitions, contributed to a decrease in anxiety.

It is also useful investigate for whom the SASS intervention works. In order to do this, the current study will examine the moderators sex and age. Baron and Kenny (1986) define a moderator as "…a qualitative (e.g., sex, race, class) or quantitative (e.g. level of reward) variable that affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable" (p. 1174). In a recent review by Norris and Kendall (2021) where they looked at moderators of outcome for anxiety treatments for children and adolescents, it was found that in most studies, age is not a significant moderator for outcome in several treatment types, including various CBT interventions. The same is true for sex as a moderator, though some studies found that females respond better to CBT when family is more involved. Because the current study does not use a control group, it is not possible to investigate if age and sex moderate the treatment outcome. However, it is possible to investigate if these variables moderate the potential relationship between the predictors (self-efficacy and cognitions), and changes in SAD level. This is useful because it can tell us not only if, but for whom the SASS intervention influences self-efficacy and cognitions.

The present study

The aim of this study is to examine potential variables that may explain the effectiveness of the SASS intervention for adolescents with SAD, and to examine whether age and sex act as moderators on the relationship between this the predictors and change in SAD symptoms after the SASS intervention. This leads to the following research questions: (a) is a change in level of clinical social anxiety after the SASS intervention predicted by changes in feelings of self-efficacy and

positive and negative cognitions, and (b) do age and gender act as moderators in the relation between the predictors and change in SAD following the SASS intervention? The measures used in this study allow for terms like 'change in SAD symptoms', because scale scores are given to the SAD level. A reduction in SAD symptoms therefore means a lower score on the measures used. Investigating factors that possibly drive intervention effects can give an indication about possible mechanisms behind why SASS works as an intervention for SAD. This can have implications for the way the SASS intervention is used. For example, if the intervention should focus more on self-efficacy and/or positive and negative self-cognitions. The same is true for the moderators. It can tell us more about for whom the SASS intervention influences cognitions and/or self-efficacy. This in turn can be used to improve the intervention for all adolescents or for a specific sex or age group.

Three hypotheses follow this research question. The first hypothesis is that a greater increase in feelings of self-efficacy predicts a greater change in the level of SAD after the SASS intervention. Rudy et al. (2012) found that self-efficacy is often low in adolescents who suffer from SAD. In other words, adolescents with SAD often do not believe they have the skills to perform in social situations. The SASS intervention might enhance feelings of self-efficacy, for example by teaching the adolescents different social skills and/or how to challenge their cognitions. This can in turn reduce SAD symptoms.

The second hypothesis is that a greater increase in positive cognitions predicts a greater change in the severity of SAD symptoms after the SASS intervention. This hypothesis is based on the finding that CBT can increase positive self-views in adults with SAD (Goldin et al., 2013; Thurston et al., 2017), and the finding by Hogendoorn et al. (2014) that positive thoughts can act as a mediator in decreasing anxiety symptoms. A change in positive thoughts may be an important factor in SAD symptom reduction following the SASS intervention.

The third hypothesis is that a greater decrease in negative cognitions predicts a greater change in the severity of SAD symptoms after the SASS intervention. Research by Niles et al. (2014) has found that a decline in negative cognitions predicts the social anxiety symptoms at the end of CBT treatment for adults. This finding, combined with the finding that having many negative cognitions is associated with high social anxiety (Hodson et al., 2008; Schreiber et al., 2012; Rudy et al., 2014), may indicate that a reduction in negative cognitions following the SASS intervention predicts a reduction in SAD symptoms.

Finally, it is explored whether the moderators age and sex influence both the effectiveness of the SASS intervention and the association between the predictor variables and SAD. To date, there is too little research on the influence of age and sex on the relationship between a change in cognitions and self-efficacy and a change in SAD symptoms after a CBT intervention to form a specific hypothesis.

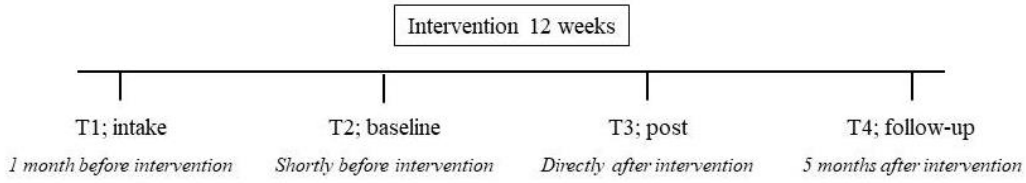
Method

Design

The current study is an intervention study with a within-subjects design. All participants received the same treatment. The participants were assessed at four time points (Figure 1). These are one month before treatment (intake; T1), shortly before starting the treatment (baseline; T2), immediately after the 12-week long intervention (post-treatment; T3), and five months after the last therapy session (follow-up; T4). The current study compared the measures at T2 with the measures at T3. This study is part of a larger research project, which is called "In Je Sas!". In this project, the effectiveness of a blended care approach is researched. Blended care means adding a Mobile Health (mHealth) element to face-to-face treatment. In this approach clients have access to a mobile app that can further help them, in addition to usual face-to-face treatment.

Figure 1

Timeline of the Research Procedure



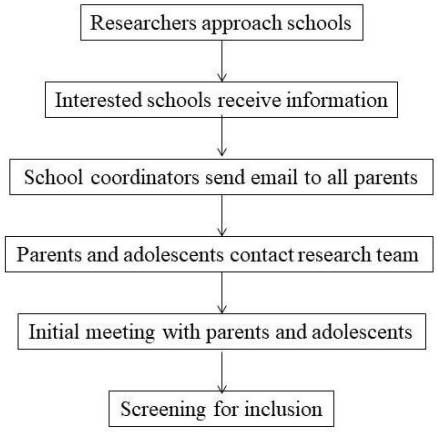
Participants

The participants were adolescents from the Netherlands. They were recruited from secondary schools in Leiden and its surrounding area (Figure 2). The principals and learning and/or care coordinators of local schools were approached and asked to help with recruiting adolescents for the study. If the school was interested, the school staff received information about the intervention, social anxiety, and public speaking anxiety. After this, the school's learning coordinators could send out an email to all parents of the school, containing information about the treatment. Parents and the adolescent could then choose to contact the research team. In this manner, the research team was not directly involved in recruiting the participants, so there was no added pressure to participate from the research team. After the contact had been made between interested participants and the researchers, the adolescents and their parents were invited for an initial meeting. The adolescents were invited for participation in the research if they were still interested and deemed to meet the inclusion criteria after this meeting. After receiving consent from the parents and adolescent, the participants were screened to confirm they met the inclusion criteria. During this screening, a semi-structured clinical interview (ADIS-C/P, explained in detail below) was used. Following this interview, no official diagnosis can be given, but it does give an indication about the severity of the SAD and if the SAD can be considered to be at a clinical level. To be considered for participation, the subjects had to be between the ages 12-17, report some level of life impairment as a result of social anxiety, meaning SAD influences their daily

life, and report social anxiety as their main concern, meaning that if comorbid disorders are present, these are not more severe than the SAD. Participants were excluded if they also had complaints that could interfere in treatment (e.g. behaviour problems, attention difficulties, psychotic symptoms, and developmental difficulties), or if they reported self-harm behaviour or suicidal ideation.

Figure 2

Overview of Participant Recruitment



Some adolescents dropped out during the study (N = 3), therefore data for T3 was missing for these participants and they were excluded from the analyses. For one participant T3 data from the SAS-A and CBSA was missing. The reason for the missing questionnaires is unclear, but this participant was excluded from the analyses as well. Data on items 18-50 from the CATS was missing for three participants. A possible reason for this was that the questionnaires were filled out on paper and they did not notice the items on the back of the form. These missing items were replaced by the mean scores from the other participants on the individual missing items (mean imputation). Preliminary analyses were run after the mean imputation to compare the results including these three participants to the results excluding these participants. The difference was minimal, therefore these three participants were included in the analyses. For the CSR-scores, data from the pre-test was missing for 2 participants, and data from the post-test was missing for 5 participants. Replacing these missing scores with a mean score would distort the reliability of the results, because only one score was given at each measurement point, instead of a mean score from several items. The change in social anxiety could then be highly over- or underestimated. Therefore these participants were excluded from the analyses that used the CSR-scores as dependent variable. For 8 other randomly missing single items, the mean score of other participants on those specific missing items was used.

For the analyses with the SAS-A scores as dependent variable, exclusion of the drop-out participants resulted in a total of 36 participants. Their mean age was 14.75 (SD = 1.663, range = 11-17), and 52.8% were boys (N = 19). For the analyses with the CSR-scores, there was a total of 29 participants. Their mean age was 14.90 (SD = 1.698, range = 11-17), and 47.1% were boys (N = 13).

Measures

Self-efficacy

To measure feelings of self-efficacy, Harter's Self-Perception Profile for Adolescents (SPPA) was used. In this questionnaire, feelings of competence and self-worth in different domains are measured. These domains are Scholastic Competence, Social Acceptance, Athletic Competence, Physical Appearance, Romantic Appeal, Close Friends, and Global Self-Worth (Wichstraum, 1995). Not all subscales were relevant for the current study, therefore only the subscales Social Acceptance and Global Self-Worth were used. The questionnaire has good convergent and discriminant validity, and good internal reliabilities (Cronbach's α = .68-.87; Rose et al., 2012; Wichstraum, 1995). On each item in the SPPA, participants are asked to choose who they resemble most in two groups of persons that are dissimilar on a characteristic. After deciding who they resemble most, the participants choose if the description of these persons is "Really true for me" or "Sort of true for me." Each item therefore has four answer options, of which the participant chooses one. In a research comparing the SPPA to a questionnaire specifically designed to measure self-efficacy (Bandura's Multidimensional Scales of Perceived Self-Efficacy; MSPSE), it was found that there is overlap between the dimensions of self-efficacy and competency self-concept (Hughes et al., 2011). This indicates that the SPPA is a valid instrument for measuring self-efficacy. The Dutch version of the SPPA that was used is known as the *Competentiebelevingsschaal voor Adolescenten.*

Cognitions

To measure positive and negative cognitions, the Children's Automatic Thoughts Scale (CATS; Schniering & Rapee, 2002) was used. On this scale, the frequency of negative cognitions (e.g. "I'm going to look silly", or "I am a failure") is measured on a five-point scale. For this study, an adaptation of the CATS was used (the CATS-N/P), which also contains ratings of positive cognitions (e.g. "I feel good about myself"; Hogendoorn et al., 2010). This adaptation provides insight into both positive and negative cognitions in adolescents. The adapted version has good internal reliability (Cronbach's α = .83-.94), moderate test-retest reliability (Pearson's r = .61-.77 for the Total score), good discriminant validity, and satisfactory convergent validity (Hogendoorn et al., 2010).

Social anxiety

Two measures were used for the changes in level of SAD symptoms. Firstly, the Anxiety Disorders Interview Schedule for children and parents (ADIS-C/P) was used. This is a semi-structured interview designed for children aged 6-18 years. The interview was developed to diagnose and differentiate between anxiety and other related disorders in children and adolescents (Silverman et al., 2001). After the interview, a Clinical Severity Rating (CSR) is given, this score was used for the analyses in this study. The CSR score, ranging from 0-8, indicates the severity of the disorder. When a score of 4 or higher is given, the disorder is on a clinical level. Different researches found an interrater and test-retest reliability for the ADIS-C/P (Silverman & Ollendick, 2005).

In addition to the ADIS-C/P, the change in SAD was measured using the Social Anxiety Scale for Adolescents (SAS-A; La Greca & Lopez, 1998). This self-report questionnaire assesses adolescents' subjective experience of social anxiety. It contains 18 items and 4 filler items, measured on a 5-point scale. The scale consists of three subscales: fear of negative evaluation, social avoidance and distress in new social situations, and general distress and social avoidance. The scale has good construct validity and high reliability (Cronbach $\alpha = .93$ for Total score; Storch et al., 2004). For the current study only the total scale will be used.

Other measures

Other measurements that were used in the project, but were not used in this study, are: the *Autisme Spectrum Vragenlijst* (ASV), a questionnaire to screen for autism; the Children's Depression Inventory (CDI-2) to measure depression; the Personal Report of Public Speaking Anxiety (PRPSA) to measure fear of public speaking; the Therapeutic Alliance Scale for Adolescents (TASA) to measure feelings of therapeutic alliance; a blended care survey to measure participants' experience with the program; the SPOSY to study the speech behaviour of the participants using video recordings of them performing a short speech in front of a video recording of an audience; Tobii Pro Glasses 2 to track eye gaze behaviour during the speeches; and lastly, the intensity of use of the mHealth app will be measured.

Procedure

After screening and being approved for inclusion in the research, the participants were invited for an intake (T1). The intake was the first of four measurement time points. The ADIS-C/P was carried out at all time points. However, at T2 only the child and not the parent was interviewed. This interview was performed by trained psychologists and/or trained master psychology students. The ADIS-C/P was sometimes performed face-to-face, but most often online through Microsoft Teams. A research by Crippa et al. (2008) comparing performing a different structured clinical interview for SAD through the telephone versus face-to-face, found a very high agreement on the diagnosis of SAD. No research using an online medium like Microsoft Teams has been done, but based on the findings by Crippa et al. (2008), the online interviews were deemed reliable. The following self-report questionnaires were also collected at all four time points: SAS-A, CDI, SPPA, PRPSA, and CATS. The ASV was used at T1, and the TASA and blended care survey at T3. Apart from the questionnaires, participants were invited to the research lab and asked to perform a public speaking exercise at T2 and T3. This was not a stress-test, but intended to study public speaking behaviour. After preparing the speech about a subject they like, they performed the speech in front of a pre-recorded audience, while wearing eye-tracking glasses.

The CBT intervention used in the current study was based on the Skills for Academic and Social Success (SASS) program, with an addition of an mHealth element. SASS was developed for secondary schools and originally consists of 12 weekly sessions of about 40 minutes (Fisher et al., 2004). For this project, the sessions were about 60-90 minutes long. Instead of at schools, the sessions

were held at a treatment centre. The groups consisted of about 6 participants, excluding the program trainer and an assisting psychology master student. Before the first session, the participants were invited for an individual session to set individual goals and communicate expectations. The group sessions have a focus on peers helping and supporting each other. The sessions consisted of several different elements: psychoeducation, social skills training through role play, cognitive restructuring techniques, exposure tasks (both inside and outside of the building), assertiveness training, and homework assignments. One and two months after treatment ended, two booster sessions took place. Parents were also invited for two parent meetings, where they received psychoeducation on social anxiety and they were taught some cognitive restructuring techniques which helped them to further support their children at home.

In addition to the SASS group sessions, the adolescents could make use of an mHealth module, with an app called *Jouw Omgeving*. This app allowed adolescents to communicate with their therapist and each other, record their daily moods and situations they encountered, set up plans for difficult situations, and work on their fear ladder, a hierarchal arrangement of feared situations, ranging from situations that provoke mild anxiety to situations that induce the most fear.

Participation in the research ended in three possible ways. Firstly, the participation could end after data collection was completed. Secondly, when the participants chose to stop, they were told at the beginning of the research that they could do this at any point. Lastly, participation ended when the therapist decided the intervention was not a good match for the participant.

Statistical analyses

Preliminary analyses

All statistical analyses were performed using SPSS. First it was checked whether the SAS- and CSR-scores significantly decreased following the intervention by using a within-subjects t-test. A p-value of $p < 0.05$ was considered to be significant. Following this, the correlations between all variables on both T2 and T3 were also checked. This was done to investigate whether bivariate relations between predictors and outcome measures existed. This could then be used to interpret the results of the regression analyses.

Multiple regression analyses

To answer the research questions, multiple regression analyses were performed. First, a correlation between the SAD-levels (CSR and SAS-A scores) was checked, as well as a correlation between SAD-levels and demographic variables such as age and sex. The scores for the questionnaires (SPPA, CATS, SAS-A) were made by calculating the mean score for the relevant subscales. The change scores were calculated so that higher scores indicate a positive change in the variable. Because it was expected that positive cognitions and self-efficacy would increase following the intervention, the pre-test scores were subtracted from the post-test scores for the CBSA and CATS-positive scores. For social anxiety and negative cognitions, a decrease was expected, which meant that for the SAS-A, CSR and CATS scores the post-test scores were subtracted from the pre-test scores. Because of a high

number of variables used in a relatively small sample, the analyses for the two research questions were divided, so that only significant predictors that were found in the first analyses for answering the first research question were used in the moderation analyses for the second research question. Adding all variables to one analysis would influence the power of the analysis.

Investigating predictors of a change in SAD level after SASS intervention.

For the first research question, two standard multiple regression analyses were performed to investigate if the level of SAD after the SASS intervention could be predicted by a change in self-efficacy, positive cognitions and negative cognitions. First the assumptions for regression were checked to make sure the analysis was reliable and valid. For each regression, the change in scores between pre-test (T2) and post-test (T3) was used. For the first regression, the change in SPPA scores, CATS scores on the positive subscale and CATS scores on the negative subscale were the independent variables, and the change in SAS-A scores was the dependent variable. In the second regression, the same independent variables were used, but change in CSR scores following the ADIS-C/P acted as the dependent variable. Age and sex were added as main effects in both regression analyses. A p-value of $p < 0.05$ was considered to be significant.

Investigating age and sex as moderators on relation between predictors and change in SAD after SASS intervention.

For the second research question, only the significant predictors from the first analyses were included in the analyses. This was done because age and sex can only be investigated as moderators on a relationship if the relationship is significant. Age and sex were added to the regression, as well as an interaction between these predictors and the significant predictors found in the first analysis. The interaction of the predictors and the moderators was looked at (see also Kendall & Comer, 2010). A p-value of $p < 0.05$ was considered to be significant.

Results

Preliminary analyses

The within-subjects t-tests revealed that SAD symptoms significantly decreased after the SASS intervention. This was shown for both the SAS-A scores (pre-test ($M = 58.34$, $SD = 14.37$), post-test ($M = 49.33$, $SD = 11.25$), $t(35) = 4.48$, $p < .001$), and the CSR scores (pre-test ($M = 5.48$, $SD = 1.40$), post-test ($M = 3.41$, $SD = 1.45$), $t(28) = 8.35$, $p < .001$).

The results from the correlation analyses are summarized in Table 1.

Table 1

Correlations Between the Study Variables

	Correlations Between Study Variables T2								
Variable	*N*	*M*	*SD*	1	2	3	4	5	6
1. Social Anxiety CSR	34	5.41	1.42	-					
2. Social Anxiety SAS-A	36	3.24	0.80	.714**	-				
3. Self-efficacy Social Acceptance	36	2.47	0.61	-.239	-.392*	-			
4. Self-efficacy Global Self-worth	36	2.56	0.77	-.494**	-.643**	.294	-		
5. Positive Cognitions	36	1.54	0.93	-.396*	-.601**	.526**	.637**	-	
6. Negative Cognitions	36	0.91	0.59	.440**	.691**	-.239	-.667**	-.265	-
	Correlations Between Study Variables T3								
	N	*M*	*SD*	1	2	3	4	5	6
1. Social Anxiety CSR	31	3.32	1.45	-					
2. Social Anxiety SAS-A	36	2.74	0.63	.622**	-				
3. Self-efficacy Social Acceptance	36	2.73	0.57	-.345	-.398*	-			
4. Self-efficacy Global Self-worth	36	2.98	0.73	-.585**	-.676**	.297	-		
5. Positive Cognitions	36	1.81	0.99	-.479**	-.363*	.467**	.615**	-	
6. Negative Cognitions	36	0.56	0.39	.437*	.637**	-.316	-.476**	-.130	-

*$p < .05$, **$p < .01$.

The results show that at both T2 and T3, both self-efficacy scales correlate significantly with positive cognitions, but only the global self-worth scale of self-efficacy correlates significantly with negative cognitions, the social acceptance scale does not. Furthermore all variables are significantly correlated to SAD, with the exception of the correlation between the social acceptance self-efficacy scale and the CSR scores. These were not significant at both T2 and T3. It is noteworthy that the self-efficacy subscales don't correlate at both T2 and T3. This goes against expectations. A possible

explanation is the small sample size. The significance score for both correlations was approximately .10 ((p = .112) for T2, and (p = .092) for T3).

Predictors of change in SAD levels after SASS intervention

An analysis of standard residuals showed that the data did not contain outliers. Multicollinearity was also not found. Lastly, a scatterplot of standardised predicted values showed that the assumptions of homogeneity of variance and linearity were met.

Regression analysis using change in SAS-A scores as dependent variable

A hierarchical multiple regression analysis was carried out to test if the change in social anxiety (SAS-A scores) could be predicted by change in scores on the predicting variables (the social acceptance and global self-worth scale on the SPPA and positive and negative cognitions on the CATS) after controlling for the influence of age and sex. Age and sex were entered at step 1 of the analysis, the four predictors were entered in step 2 of the model, see Table 2 for the results.

Table 2

Hierarchical Regression of Change in Social Anxiety using SAS-A scores

	Model 1			Model 2		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Age	-.053	.069	-.132	-.059	.057	-.146
Sex	-.203	.227	-.153	.047	.202	.036
ΔSocial Acceptance				.009	.221	.007
ΔGlobal Self-worth				.157	.239	.126
ΔPositive Cognitions				-.525	.243	-.368*
ΔNegative cognitions				.846	.257	.610**
Adjusted R^2	-.011			.379		
F for change in R^2	.809			6.172**		

*p < .05, **p < .01

Age and sex explain 4,7% of the variance in change in social anxiety, this model was not significant (F(2,33) = .809, p = .454). After entering the predictors in step 2, the total variance explained by the model as a whole was 48,5% (F(4,29) = 6.172, p = .001). The predictors explained an additional 43.8% of the variance in change in social anxiety, after controlling for age and sex, R^2_{change} = .438. In this model, only the change in negative cognitions and positive cognitions were significant predictors for change in social anxiety, meaning that a decrease in negative cognitions, and an increase in positive cognitions significantly predicted a decrease in SAD symptoms. Therefore, only the cognitions were included in the moderator analyses using the SAS-scores as the dependent variable.

Regression analysis using change in CSR scores as dependent variable

A second hierarchical multiple regression analysis was carried out in the same manner to test if the change in social anxiety on CSR scores could be predicted by the change in scores on the

predicting variables after controlling for sex and age. Sex and age were entered at step 1 of the analysis again, the four predictors were entered in step 2 of the model, see Table 3 for the results.

Table 3

Hierarchical Regression of Change in Social Anxiety using CSR scores

	Model 1			Model 2		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Age	-.121	.151	-.154	-.063	.163	-.080
Sex	-.388	.507	-.147	-.635	.582	-.241
ΔSocial Acceptance				.601	.628	.244
ΔGlobal Self-worth				-.498	.679	-.216
ΔPositive Cognitions				.096	.706	.035
ΔNegative cognitions				-.798	.698	-.315
Adjusted R^2	-.023			-.040		
F for change in R^2	.689			.892		

In this hierarchical regression analysis, neither model 1 nor model 2 were significant. None of the chosen variables were significant predictors of a change in social anxiety when using CSR scores. Though the beta coefficient of the change in negative cognitions was not significant ($p = .266$) it is noteworthy that it is negative, because that indicates that an increase in negative cognitions predicts a decrease in social anxiety. A possible explanation is the presence of one or more outliers. This was explored by making a scatter plot of the change in SAD by change in negative cognitions. No outliers were found.

Moderation analysis of age and sex

Using change in SAS-A scores as the dependent variable

To investigate moderation effects, a hierarchical regression analysis was run, with age, sex, change in negative cognitions, and change in positive cognitions in the first step, and the interactions were added in the second step. This was done to assess whether these interactions were significant in the relation with the change in SAD symptoms. To reduce problems with multicollinearity, the independent variables were mean centred first. All assumptions were met. One significant interaction was found: age moderated the relationship between negative cognitions and the change in SAD symptoms. This was evidenced by a statistically significant coefficient of the interaction term ($p = .006$). The other interaction effects of age by positive cognitions, sex by positive cognitions, and sex by negative cognitions were not significant, see Table 4.

Table 4

Analysis of Moderation of Age and Sex on Relationship Between Change in Cognitions and Change in SAD Symptoms

	Model 1			Model 2		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Age	-.049	.053	-.122	.036	.057	.090
Sex	.061	.193	.046	.069	.183	.052
ΔPositive Cognitions	-.473	.191	-.332*	-2.95	.201	-.207
ΔNegative cognitions	.751	.204	.542***	1.119	.229	.807***
Age by ΔPositive Cognitions				-.042	.108	-.051
Sex by ΔPositive Cognitions				-.563	.400	-.201
Age by ΔNegative Cognitions				-.563	.189	-.490**
Sex by ΔNegative Cognitions				-.167	.439	-.056
Adjusted R^2	.410			.522		
F for change in R^2	7.080***			2.821*		

* $p < .05$, ** $p < .01$, *** $p < .001$

To interpret these results, the significant moderator variable was categorised into two age groups: young (11-14 years), and old (15-17 years). Figure 3 shows the different slopes for the two different age groups. As seen in this graph, there is a stronger correlation between change in negative cognitions and change in SAD symptoms for the young group than for the old group. This means that for younger adolescents, the change in negative cognitions is a stronger predictor for change in SAD symptoms than for older adolescents.

As an exploratory follow-up to the significant interaction, a correlation analysis revealed that the correlation between change in negative cognitions and change in SAD symptoms was significant for both age groups, ($r = .67$, $n = 13$, $p = .012$) for the young group, and ($r = .59$, $n = 22$, $p = .004$) for the old group. This tells us that the correlation between change in negative cognitions and change in SAD symptoms is slightly higher for young adolescents than for old adolescents. To calculate whether the correlations differ significantly from each other, Fisher's r-to-z transformation was used. This calculation revealed that the difference between the two correlations was not significant ($p = .734$).

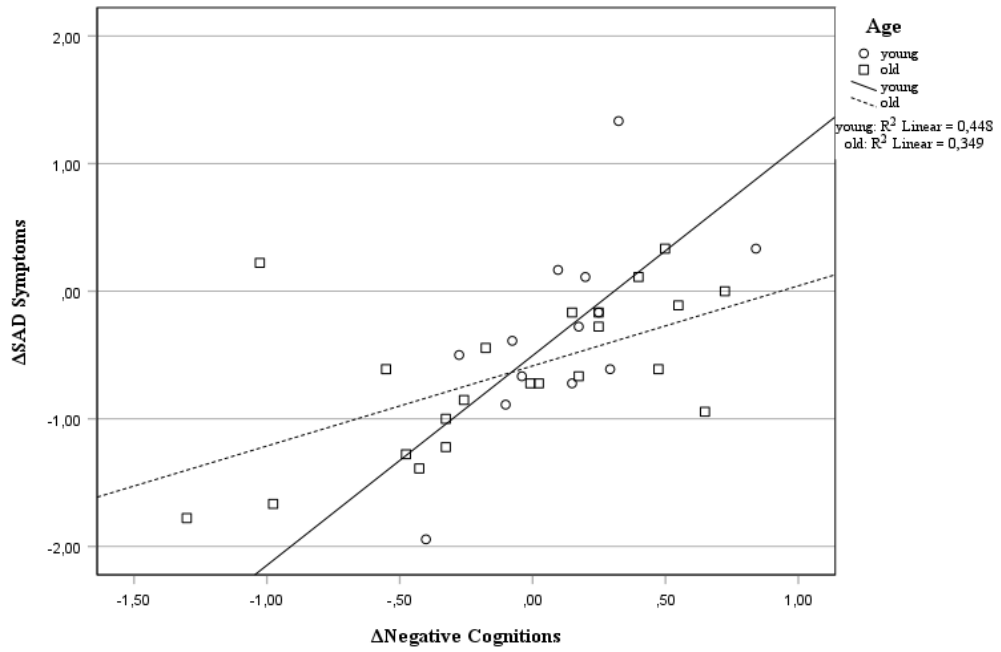


Figure 3. Scatter Plot of Moderation Analysis for Two Age Groups

Discussion

Many studies have shown that CBT interventions can be effective in treating anxiety disorders such as SAD (e.g. Melfsen et al., 2011; Scaini et al., 2016; Segool & Carlson, 2008). However, not much is known about why these interventions work and what the mechanisms underlying CBT are. The present study aimed to close this gap in literature by exploring whether a change in cognitions and self-efficacy could predict a change in SAD symptoms for adolescents after following a CBT intervention program (the SASS program). Self-efficacy and cognitions were assessed by questionnaires directly before and after the intervention. The level of SAD was assessed in two ways: by a questionnaire and by a clinical interview with the adolescents before and after the intervention. The results showed that, when using the SAS-A questionnaire as measurement for change in SAD symptoms, a decrease in negative cognitions and an increase in positive cognitions predict a decrease in SAD symptoms, but change in self-efficacy does not. When using the CSR-scores following the ADIS-C/P interview, none of the chosen variables were significant predictors of change in SAD. The present study also examined possible moderators of the relationship between change in negative cognitions and change in SAD symptoms. The results indicate that the change in negative cognitions is a stronger predictor for change in SAD symptoms for younger adolescents than for older adolescents. No such interaction was found for age and positive cognitions or sex and negative/positive cognitions.

With regard to the first research question, this study's finding that a decrease in negative cognitions, like 'Í am worthless', or 'I'm going to look silly', and an increase in positive cognitions, like 'I enjoy life', or 'I feel good about myself', predict a decrease in SAD symptoms after a CBT treatment is in line with previous research. Muris et al. (2009) found that in a group of children with anxiety, a decrease in anxiety symptoms following CBT treatment was associated with a decrease in

negative cognitions. Normann et al. (2016) also found that a reduction in negative thinking was associated with a reduction in anxiety following CBT. Our finding fits with the model by Clark and Wells (1995). This model states that negative social cognitions play an important role in SAD: social situations are seen as threatening because of the negative cognitions and assumptions people with SAD hold about these situations. It therefore makes sense that a decrease in negative cognitions is associated with a decrease in SAD symptoms. Though research on the relationship between positive cognitions and SAD is scarce, some studies have shown that an increase in positive cognitions predicted a decrease in anxiety symptoms (e.g. Asbrand et al., 2019; De Mooij et al., 2023; Hogendoorn et al., 2014). Hogendoorn et al. (2014) found that in a group of children and adolescents a change in positive cognitions preceded a change in anxiety symptoms following a CBT intervention. Interestingly, they did not find this effect for negative cognitions. A recent study by De Mooij et al. (2023) showed that cognitive restructuring, which is an important feature of CBT interventions, resulted in an increase in positive thoughts in children with SAD. They also mention that this increase in positive thinking may play an important, if not crucial, role in the improvement of self-efficacy. Asbrand et al. (2019) examined cognitions that occur after a social situation in children with SAD before and after attending a group-based CBT intervention. They found that after receiving CBT, children reported more positive thoughts following a stressful social situation than before receiving CBT. Similar to Hogendoorn et al. (2014), they did not find the same effect for negative thoughts. The current study adds to and extends the existing literature by showing that an increase in positive cognitions can predict a decrease in SAD symptoms.

It is important to note that these findings were only found when using a change in SAS-A scores as the dependent variable, not when CSR scores were used. One possible explanation for this difference is that only the child CSR scores were used, because parents were not interviewed before the intervention. Grills and Ollendick (2003) found a poor level of agreement among parents and children when administering the ADIS-C/P. They found that clinicians were more likely to reach a diagnosis following parent input. In other words: CSR scores were usually higher when using parent input. This could mean that for this study, the severity of the SAD was underestimated for some adolescents. Future research could improve this by interviewing the parents before the intervention as well. Another possible explanation for the lack of significant results is the small sample size. Since data was missing for 7 participants, the sample size was smaller for analyses using CSR scores, than for the analyses using SAS-A scores.

The present study did not find that self-efficacy was a significant predictor for a change in SAD symptoms. This contradicts what was expected based on existing literature. Research has found that self-efficacy is often low in individuals with SAD (Rudy et al., 2012; Thomasson & Psouni, 2010). Gaudiano and Herbert (2006) found that change in social self-efficacy was associated with CBT treatment outcome in adolescents with SAD. They did not look at the influence of a change in cognitions, however. For the present study, it was hypothesised that the SASS intervention would

increase feelings of self-efficacy by teaching social skills and challenging cognitions, which in turn would decrease SAD symptoms. One explanation could be that the questionnaire used (SPPA; Wichstraum, 1995) did not measure self-efficacy but a different construct. The SPPA was designed to measure feelings of competence and self-worth, and though these dimensions have overlap with self-efficacy (Hughes et al., 2011), the questionnaire was not designed to specifically measure self-efficacy. Future research could improve this by using a questionnaire that was designed to specifically assess self-efficacy. Another explanation for the lack of an effect for self-efficacy is the shared variance. The correlation analysis showed that self-efficacy significantly correlated with positive cognitions, and global self-worth significantly correlated with negative cognitions. Self-efficacy might be related to a reduction in SAD on its own, but it loses this relation when entered in a multiple regression because only the cognitions have unique relations to the outcome variable. As previously mentioned, an increase in positive cognitions may play an instrumental role in the increase in self-efficacy, because adolescents will also think more positively about their ability to restructure their negative thoughts in social situations (De Mooij et al., 2023; Goldin et al., 2012). Future research should focus on the possible relationship between self-efficacy and positive cognitions.

The second research question, regarding possible moderators of the relationship between a change in cognitions/self-efficacy and a change in SAD symptoms, was of a more exploratory nature. The findings showed that there is a significant interaction effect between age and negative cognitions when predicting change in SAD symptoms. The follow-up moderator analyses indicate that there is a stronger relationship between change in negative cognitions and change in SAD symptoms for young adolescents than for old adolescents. A possible explanation for this effect could be that the brain is still developing during adolescence, and people become less flexible in their cognitions as they grow older (Gopnik et al., 2017). Several neuroscientific studies show that the brain becomes less plastic after childhood, and the brain changes most during early to mid-childhood (Knowland & Thomas, 2014). This could indicate that negative cognitions are more rigid and harder to change in older adolescents than in younger adolescents. Because of this, the cognitions may affect the SAD level more for younger adolescents. However, research on this is scarce, and future research should further explore this possible interaction between age and negative cognitions when predicting change in SAD symptoms. It is also important to note that these results should be interpreted with caution, because the size of the two different age categories was small and the correlations did not differ significantly from each other.

Age did not act as a moderator for positive cognitions. This means that the relation between change in positive cognitions and change in SAD level was not influenced by age. The change in positive cognitions was associated with a decrease in SAD in the same way across all ages. Sex also did not moderate the relation between both negative and positive cognitions and change in SAD level. This means that there is no difference in the relationship between change in cognitions and change in

SAD level between boys and girls. This means that the SASS intervention decreases negative cognitions and increases positive cognitions equally for both boys and girls.

Limitations and recommendations for future research

The present study has some limitations. The first is the small sample size. A small sample size reduces the chance of finding significant results. A second limitation is the lack of diversity of the sample. Exact data from this is unknown, but the majority of participants was white and had a high social-economic status (SES). These two limitations make it hard to generalize the findings. Future research could improve this by using a larger and more heterogenous sample. This could then tell us if the intervention is effective for adolescents with SAD from all ethnicities and SES, and if the possible mechanisms behind why CBT interventions work are the same for adolescents of different ethnicities and/or SES.

Another aspect of this study that could be improved in future research is the study design. One important limitation of the current study is the lack of a control-group. Because of the within-subjects design of the study, it is not possible to tell whether the changes in SAD level following an intervention were the result of the intervention, or if other factors like the passing of time could have played a role. The same holds for the change in cognitions and self-efficacy. To draw stronger conclusions about the mechanisms behind the efficacy of CBT interventions, it could also be useful to perform a mediation analysis in future research. In order to do this you need a control group as well as temporal precedence (Kendall et al., 2017; Maric et al., 2012). Temporal precedence means that the intervention is followed by changes in the mediating variable, and that these changes in the mediator precede changes in the outcome of the intervention. For this you need more than two assessment points, and at least one assessment point should be during the intervention. Because of this study's design, all results should be interpreted with caution and conclusions about cause and effect can most definitely not be drawn. However, this study is a valuable first step in research on the possible mechanisms behind why CBT works.

Implications

The findings suggest that the SASS intervention results in a change in cognitions that can predict a change in SAD symptoms. The current research adds to existing literature, because it indicates that CBT can change maladaptive cognitions, which is the goal of CBT (Hoffmann et al., 2012), but it also increases positive cognitions. Research on the latter is scarce, so the current study is a useful addition and it indicates that future research should also focus on the effect of CBT on positive cognitions and the effect this has on decreasing the (social) anxiety symptoms. This is also in line with the current movement towards a more positive approach to psychology (Jankowski et al., 2020). For example, Fava et al. (2005) found that adding a positive psychotherapy approach (well-being therapy) to a CBT intervention for generalized anxiety disorder, significantly improved the observer-rated anxiety when compared to a CBT-only intervention. Thus, it may be beneficial to include positive cognitions in theories about the mechanisms behind CBT.

The finding that the relationship between change in negative cognitions and the change in SAD is stronger for younger than for older adolescents suggest that cognitions may influence the SAD level of younger adolescents more. In other words: a focus on negative cognitions in a CBT intervention may be more beneficial for younger than for older adolescents. A focus on positive cognitions is equally important for all ages, as age did not act as a moderator on the relationship between an increase in positive cognitions and a change in SAD. Furthermore, the SASS intervention decreases negative cognitions and increases positive cognitions equally for boys and girls. In sum, our research has provided new insights into how and for whom the SASS intervention works. In practice, therapists aware of these mechanisms of change can implement it in their techniques, which in turn could make CBT interventions even more effective.

Conclusion

The findings from this study suggest that a decrease in negative cognitions and an increase in positive cognitions predict a decrease in SAD symptoms following the SASS intervention. This could indicate that changing cognitions is an important mechanism behind why CBT interventions work. The finding that positive cognitions are also a significant predictor for change in SAD symptoms is a new one, as research in the past has mainly focused on the role of negative cognitions. Future research should focus on the role of positive cognitions as well as negative cognitions in treatment outcome of CBT for SAD.

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