



What Works in Preventing Emerging Social Anxiety: Exposure, Cognitive Restructuring, or a Combination?

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Abstract

Programs that aim to reduce symptoms of social anxiety in children generally include multiple components, such as exposure and cognitive restructuring. It is unknown if separate components yield positive intervention effects in children or whether a combination of components is required. We investigated the effectiveness of exposure, cognitive restructuring, and a combination of both components in reducing social anxiety symptoms and anxiety-related social-emotional outcomes in an indicated-prevention setting. To this end, we conducted a cluster-randomized microtrial using a sample of 191 children aged 8 to 13 years ($M = 10.48$, $SD = 1.10$). Children with elevated social anxiety symptoms participated in one of three group interventions, each lasting four weeks, and completed a questionnaire on four measurement occasions. Latent change models demonstrated that the intervention with either exposure or cognitive restructuring reduced social anxiety symptoms and anxiety-related outcomes. The analyses showed that both of these intervention components were effective, with more favorable effects for exposure. Combining exposure and cognitive restructuring techniques did not yield greater benefit than either component alone. Future research should investigate whether specific components may be more effective for particular subgroups (e.g., based on sex or level of behavioral inhibition) in more detail.

Keywords Social anxiety · Exposure · Cognitive restructuring · Microtrial · Intervention components

Highlights

- Exposure had a positive effect on social anxiety, distress, avoidant behavior, positive thoughts, perceived social threat, internalizing behavior, social skills, and self-perceived competence in children with emerging social anxiety.
- Cognitive restructuring had a positive effect on social anxiety, distress, avoidant behavior, positive thoughts, perceived social threat, internalizing behavior, self-efficacy, and self-perceived competence in children with emerging social anxiety.
- An intervention combining exposure and cognitive restructuring was less effective in preventing social anxiety and related outcomes than either component alone.
- Stacking multiple intervention components may not necessarily yield greater prevention benefits.
- Findings reveal the possible benefits of short-term intervention modules.

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Social anxiety disorder (SAD) is among the top three most prevalent disorders in Western societies (Kessler et al., 2005); an estimated seven to 13 percent of individuals experience SAD at some point during their life (Furmark, 2002). Social anxiety is characterized by a fear of negative evaluation and distress in and potential avoidance of social situations. Even though the average age of onset for social anxiety disorder is thirteen, prodromal symptoms of social anxiety can already be present in childhood (Miers et al., 2013). The prevalence of social anxiety disorder in adolescents ranges from three to nine percent (Ranta et al., 2015). Social anxiety disorder is relatively stable over time, and individuals suffering from this disorder are generally reluctant to seek help (Baer & Garland, 2005). Social anxiety is conceptualized as existing on a continuum from normal, healthy levels of arousal to levels of arousal that cause distress and inhibit normal functioning (Rapee & Spence, 2004). Socially anxious children and adolescents often experience excessive physiological arousal in social situations, particularly in public performance situations (American Psychiatric Association, 2013; Rapee & Spence, 2004). In addition, maladaptive, automatic cognitions may inhibit the correct processing of social information (i.e., interpreting others' social behavior as a negative evaluation) and may trigger anxious and avoidant behavior (Miers et al., 2011).

Many intervention programs for youth, both preventive and curative, are currently available to reduce social anxiety in children and adolescents. In particular, group interventions in the clinical context have shown positive effects on specific social anxiety symptoms such as social distress, behavioral avoidance, enhanced social skills, and social interaction, and on secondary outcomes such as general anxiety and depressive symptoms (Scaini et al., 2016; Kley et al., 2012). However, social anxiety interventions combine multiple components, so what component drives program effects is unknown. To fill this gap, this study presents a microtrial study (Howe et al., 2010) investigating which intervention components (i.e., gradual exposure, cognitive restructuring, or a combination) effectively reduce social anxiety symptoms and secondary outcomes that may be negatively influenced by children's anxiety in children with elevated social anxiety symptoms in a prevention context.

The peer context plays an important role in children's development of social skills (e.g., Smith & Hart, 2002). Therefore, it is crucial to direct preventive intervention efforts at school-age children (Alves et al., 2022). Implementing interventions in children's day-to-day social context may protect them from developing clinical-level social anxiety that might interfere with their healthy social development (Baer & Garland, 2005). Research also suggests that social anxiety is more difficult to treat in adolescence (e.g., Crawley et al., 2008). Therefore, to contribute to the prevention of social anxiety, we focused on evaluating preventive intervention component effects in children aged eight to thirteen with emerging social anxiety.

Two core components of interventions aimed at preventing or treating (social) anxiety are exposure and cognitive restructuring (e.g., Higa-McMillan et al., 2016). Exposure aims to reduce affective and behavioral symptoms of anxiety by entering and remaining in a situation that provokes fear (Rodebaugh et al., 2004). By exposing the individual to fear-provoking stimuli, they learn new adaptive responses to fearful situations (e.g., engagement instead of avoidance). Exposure thus reduces the association between anxiety-provoking situations and their feared negative consequences and helps children overcome their avoidance of social situations. Exposure might also teach anxious children to control and reduce visible signs of arousal, which can help them experience successful social interactions. In turn, this may decrease their negative peer experiences, such as isolation and bullying victimization (Rapee & Spence, 2004). Additionally, by creating positive experiences, exposure might increase an anxious child's perceived social competence (Donders & Verschueren, 2004).

Cognitive restructuring focuses on the cognitive processes that emerge in (anticipation of) or following (i.e., rumination) situations that provoke anxiety to identify and challenge automatic, negative, and self-defeating thoughts and to implement more positive, helpful thoughts (McLellan et al., 2015). Cognitive restructuring teaches children to change negative cognitive appraisals, reduce self-criticism, and modify interpretations of social stimuli to reduce anxiety in social situations (Rodebaugh et al., 2004). For example, socially anxious children generally anticipate adverse performance outcomes, overestimate the visibility of their nerves, and negatively evaluate their behavior and their performance (Miers et al., 2009). Some socially anxious children even undermine their adequate social competence through their negative self-perceptions (Miers et al., 2009; Miers et al., 2011). By tackling maladaptive cognitions using cognitive restructuring, children learn to more accurately perceive and thus anticipate social situations, which should reduce their anxiety (Taylor et al., 1997).

The treatment of socially anxious children is challenging due to its various interrelated etiological determinants (Ranta et al., 2015). Nevertheless, a recent meta-analysis showed that cognitive-behavioral therapy interventions have significant effects (Cohen's $d = 0.71$) on children's and adolescents' social anxiety symptoms (Scaini et al., 2016). However, the programs included in this study combined cognitive techniques, exposure, and social skills training in multicomponent programs, making it difficult to infer the effectiveness of individual intervention components. Information about the effects of separate intervention components is crucial because it provides insight into which components are necessary for improvement, thereby maximizing intervention effects.

Our goal of identifying effective intervention program components to prevent childhood-based social anxiety is

informed by previous research on anxious individuals. A review of five meta-analyses concluded that both exposure and cognitive restructuring reduced social anxiety symptoms in adults and that a combination of cognitive restructuring and exposure did not seem superior to exposure alone (Rodebaugh et al., 2004). However, cognitive awareness may be less developed in children (i.e., pre-adolescents), and, therefore, more cognitive-oriented approaches may yield less effect. Also, some studies suggest that a cognitive approach may be less effective for children and adolescents with social anxiety than other affective disorders (e.g., Crawley et al., 2008).

A meta-analysis by Scaini et al. (2016) showed the effectiveness of cognitive-behavioral interventions for children and adolescents with a clinical diagnosis of social anxiety, but this study did not specifically compare the effects of exposure and cognitive restructuring. Another meta-analysis provided more insight by showing that cognitive-behavioral therapy-based interventions and exposure-based interventions had similar effects in children with anxiety and avoidance problems ($d = 1.19$ and 1.05 , respectively; Higa-McMillan et al., 2016). Furthermore, a large RCT into anxiety interventions (i.e., the CAMS trial) found similar results, indicating that the introduction of cognitive restructuring and exposure was associated with significant declines in anxiety symptom severity and that exposure seemed to be most effective in children compared to adolescents (Peris et al., 2015). A multiple single-case study by Nakamura et al. (2009) also concluded that exposure might be a key element in interventions for anxiety-disordered children.

The findings from these studies suggest that exposure and cognitive-behavioral exercises might be independently effective in improving children's anxiety-related problems. However, these studies mostly assessed intervention effects in children with clinical anxiety levels not specific to social anxiety. Also, Peris et al. (2015) analyzed data from an intervention that included more intervention components than only exposure and cognitive restructuring, and, consequently, the independent effect of exposure and cognitive restructuring remains unclear. Furthermore, whether these intervention components are equally effective in a prevention context is unknown. Thus, empirical research into the separate effectiveness of components in childhood social anxiety interventions is absent, especially in an indicated-prevention context.

We applied a microtrial approach to identify whether exposure, cognitive restructuring, or a combination of both effectively reduced social anxiety in children. A microtrial is a brief, focused randomized experiment to assess whether an isolated intervention component brings about significant change (Howe et al., 2010). Using this approach has two specific advantages. First, it can elucidate which intervention components are not effective and can thus help to develop leaner, more efficient interventions. The availability of leaner

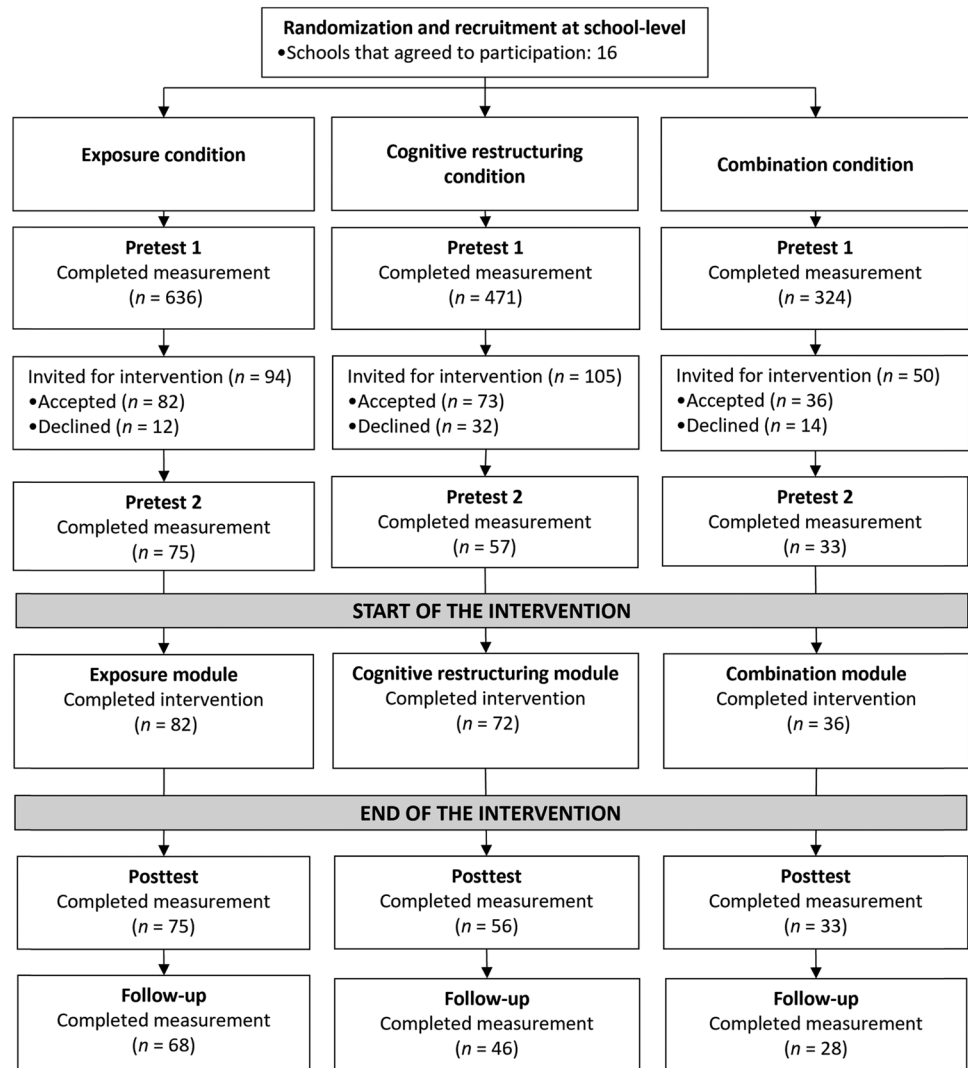
interventions is expedient as these might be more cost-effective, and the burden on clinicians and families might be lower. Second, the microtrial approach can elucidate which components *are* effective and thus provide knowledge to develop more specific, targeted interventions (Leijten et al., 2015). This approach is in line with the call for *explanatory* research into mechanisms of change, as opposed to traditional RCTs into intervention effects (Nakamura et al., 2009).

The sample for the present microtrial consisted of eight- to thirteen-year-old children with elevated symptoms of social anxiety who participated in a brief four-week preventive group intervention. We aimed to answer two research questions: Are brief group interventions using exposure, cognitive restructuring, or combining both components effective in reducing social anxiety symptoms and related outcomes?, and Is there a difference in effectiveness between the brief group interventions?

In line with the aim of microtrials to suppress specific risk mechanisms or enhance protective mechanisms (Howe et al., 2010) we include several outcome measures divided into primary and secondary outcomes. Both primary and secondary outcomes included risk and protective mechanisms. Our primary outcomes were directly related to the diagnostic criteria for social anxiety disorder and prominent social anxiety cognitive models (American Psychiatric Association, 2013; Clark & Wells, 1995) and consisted of social anxiety symptoms, distress, avoidant behavior, approach behavior, positive thoughts, and perceived social threat. Previous research has related social anxiety in youth to low self-esteem and fewer friendships (Fordham & Stevenson-Hinde, 1999), impaired social skills (Miers et al., 2009), loneliness, and depression (Rapee & Spence, 2004). Such negative outcomes may impede successful social interactions, which in turn may increase risk for social anxiety through heightened fear of negative evaluation (Fredrick & Luebbe, 2022). In contrast, a more positive evaluation of social skills, self-efficacy, and competence, and less loneliness and depression may benefit children's positive social experiences and lower their fear of negative evaluation. In the long term, this may be associated with a higher quality of life, therefore acting as a protective mechanism (Alves et al., 2022). Thus, in line with previous microtrial studies we assessed changes in social anxiety symptoms as well as secondary outcome measures related to social anxiety more broadly (de Jong et al., 2021): internalizing behavior, self-efficacy, social skills, and self-perceived competence. These secondary outcomes may be impaired in children with social anxiety and might improve by proxy of reduced social anxiety symptoms.

We expected social anxiety symptoms and related secondary outcomes to reduce in all three types of preventive intervention. We specifically focussed on eight- to thirteen-year-olds because this is the age group approaching the

Fig. 1 Participant flow



onset period for clinical diagnosis of social anxiety (Rapee & Spence, 2004). We did not formulate hypotheses about the expected difference in the effectiveness of exposure versus cognitive restructuring due to a lack of relevant research for this age group and anxiety type. Nevertheless, we might expect that a combination of two evidence-based intervention components would yield more substantial effects than the separate components.

Method

Participants

Participants for this study were children with emerging social anxiety symptoms from the three highest grades of 16 Dutch primary schools (equivalent to American grades four to six), predominantly located in urban areas. We randomized participants into conditions at the school level.

Seven schools agreed to participate in the exposure condition, five in the cognitive restructuring condition, and four in the condition combining both components (hereafter labeled the combination condition). A total of $N = 1431$ children completed Pretest 1 (i.e., the baseline sample). In this baseline sample, children had a mean age of 10.56 ($SD = 1.03$) years, 48.5% ($n = 694$) were girls and 43.8% ($n = 608$) reported having a Non-Western ethnicity.

We invited a total of 248 children from the baseline sample to take part in the study (see flowchart in Fig. 1). The parents of 23% ($n = 57$) of these children did not actively consent to participation, resulting in a final sample of 191 children: 82 children in the exposure condition, 73 children in the cognitive restructuring condition, and 36 children in the combination condition. Due to the smaller number of schools in the combination condition, fewer children could be invited for this intervention, resulting in fewer children in this condition.

The final sample had a mean age of 10.48 years ($SD = 1.07$, range 8.11 to 13.29 years) with somewhat more girls (63.4%, $n = 121$). Ethnicity was defined as follows: 55% ($n = 104$) of the children had a Western origin (87% Dutch) and 44% ($n = 84$) had a Non-Western origin (30% Turkish, 27% Moroccan, 16% Surinamese/Antilles, 27% other). Three children did not disclose their ethnicity. Children in our sample had a mean score of 54.28 on the Social Anxiety Scale for Adolescents (SAS-A), which is just above the clinical cut-off (La Greca, 1999). In total, 65.8% of the sample scored above the clinical cut-off at Pretest 1 (exposure condition 59.3%, cognitive restructuring condition 74%, and combination condition 63.9%). Descriptive statistics of the baseline sample, the children selected and those that were not selected for the interventions are presented in Supplementary Appendix A, Tables A.1 and A.2.

Design

We used a cluster-randomized microtrial design to evaluate the effects of separate intervention components to enhance specific outcomes (Howe et al., 2010). Schools were randomized into a condition before the invitation to participate and were blind to the assigned condition. We adopted cluster randomization as individual-level randomization was not practically feasible, and cluster randomization ensured there would not be contamination across conditions (Campbell et al., 2000). Our microtrial included three conditions and four time points: Pretest 1 (approximately five weeks before the start of the intervention), Pretest 2 (one week before the start of the intervention), Posttest (one week after the end of the intervention), and Follow-up (three months after Posttest). By including two pretest measurements, individual change (i.e., natural development) before the intervention could be compared to the change from Pretest 2 to Posttest (i.e., pre-post intervention effects). Additionally, including two pretest measurements allowed participants to be their own control, strengthening the power of our study. A priori power analysis showed that 52 participants were necessary per condition to find a main effect of condition with a medium effect of 0.40, a power of 0.80, and an alpha of 0.05 (two-sided). This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of the University of Amsterdam (24-04-2017/No. 8033). We retrospectively registered the study [blinded for submission].

Sampling Procedures

From a database of all Dutch elementary schools, we selected schools that were located within the trainers' work catchment area; these selected schools were randomized

into one of the three conditions. Schools that solely offered special education programs or with fewer than 50 children in the highest three grades were excluded from participation. We invited schools that met our criteria by invitation letter. We anticipated a fair number of schools to turn down the invitation due to the high workload in primary schools, and therefore, we invited a total of 100 primary schools to the sample. Seven schools agreed to participate. A second recruitment wave added nine schools to the sample. These schools were recruited through an advertisement in a national magazine for school counselors. More detailed information about the participating schools is provided in Supplementary Appendix A, Section A.3. Participants were screened for the intervention based on their Pretest 1 scores.

Procedure

We informed parents about the study and requested passive consent before the first measurement occasion, which served as Pretest 1 and was used to screen participants for the intervention. At Pretest 1, research assistants or the first author visited children in their classrooms to explain the goals of the study. We did not tell children that Pretest 1 was used to identify children with emerging social anxiety symptoms to avoid drawing negative attention (i.e., stigmatization) to children selected for the intervention. The completion of the questionnaires took approximately 60 min on each measurement occasion. Children without parental consent stayed in the classroom and worked on individual tasks or read a book.

Children were selected for the interventions based on their score on the Social Anxiety Scale for Adolescents (SAS-A; La Greca, 1999) at Pretest 1. For every school, children's scores on the SAS-A were mean-centered per grade, and the children scoring in the highest 20% on social anxiety within their class distribution were considered eligible for the intervention. Children were selected based on class means because research has shown that social anxiety in childhood and adolescence is influenced by class climate (Gazelle, 2006) and peer comparisons (Rapee et al., 2020), and therefore, the mean class level was deemed a suitable benchmark to select children with emerging social anxiety. After selection, school personnel reviewed the eligible children. School personnel did not agree with the selection of seven participants—because of participation in another social-emotional intervention program, not speaking Dutch fluently, or a clinical diagnosis of Autistic Spectrum Disorder, for example—and were allowed to propose other children. The SAS-A scores of the proposed children had to be higher than the class mean to participate in the intervention.

After the final list of participants had been agreed upon, we distributed another information letter requesting active

parental consent to participate in the rest of the study. There was no monetary incentive. Children with parental consent participated in the intervention, which was provided by eight certified trainers (75% female) with an average of five years of experience. All trainers had a degree in Social Work, Pedagogics, or Psychology. The children completed the questionnaire an additional three times (see Fig. 1). School personnel supervised the measurement at Pretest 2, Posttest, and Follow-up. After the last measurement occasion, all schools received 50 euros for their participation. The final sample sizes of the three conditions were unequal due to two reasons i) the number of schools that agreed to participate in our study across the three conditions was unequal, and ii) the number of children that could be selected for the interventions was dependent on class size, yielding a smaller number of selected children at schools with smaller class sizes. We collected all data between September 2017 and April 2019.

Primary Outcome Measures

Social Anxiety

To assess our primary outcome measure, children filled out the Dutch translation of the Social Anxiety Scale for Adolescents (SAS-A; La Greca, 1999), a 22-item scale assessing fear of negative evaluation, social avoidance, distress in new situations, and general social avoidance and distress. Items were rated on a five-point scale ($1 = \text{never}$, $5 = \text{always}$), and the sum of the 18 substantive items (four are filler items) comprised the total score. A score of 50 or above means children experience clinical levels of social anxiety (La Greca, 1999). The SAS-A has good construct validity (Inderbitzen-Nolan & Walters, 2000). In this study, reliability was satisfactory across measurement occasions ($\alpha = 0.77$ to 0.91).

Distress, Avoidant, Approach Behavior, and Self-Efficacy

To assess levels of distress and if children actively try to avoid specific social situations, we developed a questionnaire based on social situations from the Anxiety Disorders Interview Schedule for Children (ADIS-C; Silverman & Albano, 1996). Research previously used these situations to measure distress and avoidance (e.g., Miers et al., 2014). We adapted the scale by selecting five social situations that can provoke anxiety and are relevant to the current age group (i.e., answering a question in class, reading aloud in class, giving an oral presentation, playing with unfamiliar children, and asking a classmate a question), and by adding an item to measure the tendency to approach social situations. These adaptations resulted in the Distress, Avoidance, Approach, and Self-efficacy (DAAS) scale.

The DAAS presents children with a social situation (e.g., “Imagine you are in class and your teacher asks you to answer a question”). Children rated (i) how distressed they would feel when faced with the presented situation (subscale Distress; $1 = I \text{ feel good}$ to $5 = I \text{ feel very tense}$, five items); (ii) the extent to which they try to avoid the situation (subscale Avoidance, $1 = I \text{ never do}$ to $5 = I \text{ always do}$, five items); (iii) the extent to which they look forward to the situation if it were to occur in one week (subscale Approach, $1 = I \text{ look forward to it a lot}$ to $5 = I \text{ do not look forward to it at all}$, five items); and (iv) the extent to which they feel efficacy to take on the situation described (subscale Self-Efficacy, $1 = I \text{ will do very well}$ to $5 = I \text{ will not do well at all}$, five items). The sum of the five items comprised the total score for each subscale. The reliability was satisfactory across measurement occasions (Distress: $\alpha = 0.63$ to 0.91 ; Avoidance: $\alpha = 0.65$ to 0.91 ; Approach: $\alpha = 0.72$ to 0.94 ; Self-efficacy: $\alpha = 0.67$ to 0.95).

Positive Thoughts and Perceived Social Threat

The Children’s Automatic Thoughts Scale – Negative/Positive (CATS-N/P; Hogendoorn et al., 2010) was used to assess children’s negative and positive thoughts. The subscales Perceived social threat (10 items) and Positive thoughts were used (10 items). Children answered items on a five-point scale ($1 = \text{never}$ to $5 = \text{always}$), and the sum of the items comprised the subscale scores. The CATS-N/P has satisfactory discriminant validity in a community sample (Hogendoorn et al., 2010). In this study, the reliability of was good across measurement occasions (Perceived social threat: $\alpha = 0.85$ to 0.96 ; Positive thoughts: $\alpha = 0.82$ to 0.97). Previous research has shown that clinical anxiety groups score $M = 18.26$ on the social threat subscale Schniering and Rapee (2002) and $M = 16.09$ on the positive thoughts subscale (Hogendoorn et al., 2013).

Secondary Outcome Measures

Internalizing Behavior

Children’s internalizing behavior was measured using the subscale Internalizing problem behavior from the Dutch translation of the self-report version of the Social Skills Improvement System-Rating Scales (SSIS-RS; Gresham & Elliott, 2008; van den Heuvel et al., 2017). This 10-item subscale is answered on a four-point scale ($1 = \text{not true}$ to $4 = \text{very true}$). The items pertain to children’s experience of anxiety, loneliness, and depression, as well as physical signs of anxiety and depression (i.e., nausea and tiredness). The sum of the items comprised the subscale score. The English version of the SSIS-RS has strong internal consistency, and convergent and divergent validity (Gresham et al., 2011). In

this study, reliability was satisfactory across measurement occasions ($\alpha = 0.62$ to 0.89).

Social Skills

Children's social skills were also measured using the SSIS-RS. We used the subscales Assertion (seven items), Cooperation (seven items), Communication (six items), Responsibility (seven items), Empathy (six items), Engagement (seven items), and Self-control (six items). All items were answered on a four-point scale ($1 = \textit{not true}$ to $4 = \textit{very true}$). The sum of the items across the subscales comprised the outcome Social skills. In this study, reliability was good across measurement occasions ($\alpha = 0.96$ to 0.99).

Self-Perceived Competence

Children's self-perceived competence was measured using the Dutch translation (Veerman et al., 1997) of the Self-perception Scale for Children (SPPC; Harter, 1985), which comprises 36 items. We used a shorter version, comprising items from the conceptually most relevant subscales namely social acceptance, behavioral conduct, and global self-worth. In the original version items consist of two opposing statements, and children indicate how true the best fitting statement is for them. We reformulated items and answering categories to simplify the items and make them more consistent with the other measures. An example item is "Some children find it difficult to make friends". Items were answered on a four-point scale ($1 = \textit{I am not like these children}$ to $4 = \textit{I am exactly like these children}$), and the sum of the items comprised the scale score. The SPPC had good internal consistency, test-retest stability, and convergent validity in a community sample (Muris et al., 2003). In this study, reliability was good across measurement occasions ($\alpha = 0.82$ to 0.86).

Intervention Modules

The intervention modules were inspired by cognitive behavioral training programs such as Cool Kids (Rapee et al., 2006) and PASTA training (Sportel et al., 2013). We adapted exposure exercises and cognitive restructuring exercises to fit the purpose of this study. We extensively reviewed and revised the modules with professionals with five to 10 years of training experience to ensure the appropriateness for the target audience and employability of the modules. Psychoeducation is an important component in improving treatment effects and therefore was included in each condition (de Mooij et al., 2020).

Several elements were the same for all three intervention modules: (i) they started with three exercises on

psychoeducation about social anxiety; (ii) the exercises gradually built up to the (hypothetical) situation of giving an oral presentation in front of the class; (iii) they were provided by trained professionals with an average of 10.6 years of experience in CBT for children ($SD = 8.5$, range 2–27 years); (iv) they were implemented as a group training consisting of four one-hour sessions, provided over a month; (v) given during school hours in groups of eight to 10 children, and (vi) included supporting materials like a workbook for participants and posters. At the end of each session, trainers stimulated children to practice what they had learned outside of the intervention. Table 1 and the following paragraphs provide a broad overview of the intervention modules. Supplementary Appendix B, Tables B.1, B.2, and B.3 provide more detailed information, and the module manuals are available upon request from the third author [blinded for submission]. Implementation was closely monitored by the first author, who scheduled calls with the trainers after completion of the intervention to check program fidelity. Trainers indicated all exercises were implemented as described in the intervention manual.

In the exposure module, children were taught that they could overcome anxiety by decomposing an anxiety-provoking situation into small steps (i.e., habitual desensitization). The exposure module included exercises targeting three situations that can be difficult for socially anxious children: one social interaction situation, starting and joining a conversation, and two performance situations, asking and answering a question and giving an oral presentation. These situations were divided into smaller steps that gradually increased in difficulty. These steps were presented to children using the metaphor of a stepladder, which disassembles larger tasks or goals into small steps. Children practiced with these situations using role-plays. Trainers were instructed not to talk to children about their thoughts in this module, but to solely focus on practicing with fear-evoking situations.

In the cognitive restructuring module, children were taught that they could overcome anxiety by changing their thinking patterns. The cognitive restructuring module used the same three social situations hypothetically (e.g., "Imagine you have to answer a question in class") to teach children to reflect on the influence their thoughts have on their behavior. Exercises consisted of written exercises and group discussions. The cognitive restructuring module worked with a handout containing six steps to turn negative thoughts into positive, helpful thoughts. The cognitive restructuring condition did not include role-plays. Trainers were instructed not to talk to children about children confronting their fears by engaging in anxiety-provoking situations but to solely focus on practicing with challenging unhelpful thoughts.

Table 1 Broad session overview of the implemented intervention modules

Session	Exposure module	Cognitive restructuring module	Combination module
1	<ul style="list-style-type: none"> • Psychoeducation about (social) anxiety. • Habitual exposure: starting and joining a conversation (step 1 of 3). • Habitual exposure: asking and answering a question (step 1 of 3). • Habitual exposure: giving a presentation (step 1 of 4) 	<ul style="list-style-type: none"> • Psychoeducation about (social) anxiety. • Group discussion of the Thoughts-Feelings-Behavior-model using a story character: connecting thoughts and feelings (giving a presentation step 1 of 4). • Written exercise with the Thoughts-Feelings-Behavior-model: giving a presentation (step 2 of 4). 	<ul style="list-style-type: none"> • Psychoeducation about (social) anxiety. • Habitual exposure: starting and joining a conversation (step 1 of 3). • Explain two strategies to decrease anxiety: change thoughts (cognitive restructuring) and face the situation (exposure). • Habitual exposure: giving a presentation (step 1 of 4)
2	<ul style="list-style-type: none"> • Habitual exposure: asking and answering a question (step 2 of 3). • Habitual exposure: starting and joining a conversation (step 2 of 3). • Habitual exposure: giving a presentation (step 2 of 4) 	<ul style="list-style-type: none"> • Group exercise to practice identifying and transforming helpful and non-helpful thoughts. • Written exercise with Thoughts-Feelings-Behavior-model: asking and answering a question (step 2 of 3). • Written exercise with Thoughts-Feelings-Behavior-model: starting and joining a conversation (step 2 of 3). 	<ul style="list-style-type: none"> • Group discussion of the Thoughts-Feelings-Behavior-model using a story character: connecting thoughts and feelings. • Written exercise with Thoughts-Feelings-Behavior-model: giving a presentation. • Group discussion on the Thoughts-Feelings-Behavior-model: connecting thoughts, feelings, and behavior. • Habitual exposure: starting and joining a conversation (step 2 of 3).
3	<ul style="list-style-type: none"> • Habitual exposure: starting and joining a conversation (step 3 of 3). • Habitual exposure: asking and answering a question (step 3 of 3). • Habitual exposure: giving a presentation (step 3 of 4) 	<ul style="list-style-type: none"> • Group discussion on the Thoughts-Feelings-Behavior-model: connecting thoughts, feelings, and behavior. • Written exercise with Thoughts-Feelings-Behavior-model: asking and answering a question (step 3 of 3). • Written exercise with Thoughts-Feelings-Behavior-model: starting and joining a conversation (step 3 of 3). 	<ul style="list-style-type: none"> • Group exercise to practice identifying and transforming helpful and non-helpful thoughts. • Written exercise with Thoughts-Feelings-Behavior-model: starting and joining a conversation (step 3 of 3) • Habitual exposure: giving a presentation (step 2 of 4)
4	<ul style="list-style-type: none"> • Habitual exposure: giving a presentation (step 4 of 4) • Review of all sessions. • Closure of the module with a certificate. 	<ul style="list-style-type: none"> • Introduction of the session. • Group game to recap transforming non-helpful thoughts to helpful thoughts. • Written exercise with Thoughts-Feelings-Behavior-model: giving a presentation (step 4 of 4). • Review of all sessions. • Closure of the module with a certificate. 	<ul style="list-style-type: none"> • Introduction of the session. • Written exercise with Thoughts-Feelings-Behavior-model: giving a presentation (step 3 of 4). • Habitual exposure: giving a presentation (step 3 of 4) • Review of all sessions. • Closure of module with a certificate.

In the combination module, children were taught that they could overcome anxiety by decomposing an anxiety-provoking situation into small steps and by identifying negative thoughts and replacing them with positive, helpful thoughts. The combination module combined exposure and cognitive restructuring in all sessions. This module combined role-play exercises with written exercises and group discussions. As this module had to fit exposure exercises and cognitive restructuring exercises into four sessions, participants worked with only two social situations: starting and joining a conversation and giving an oral presentation. The exercises aimed at cognitive restructuring preceded the exposure exercises in every session and were similar in structure to the exercises in the cognitive restructuring module. The exposure exercises were mostly the same as in the exposure module, with one key difference: the instructions before the exposure exercises reminded children to think about the positive thoughts they had previously formulated.

Statistical Analyses

We analyzed the data using latent change models (LCMs) in *Mplus* version 7.31 (Muthén & Muthén, 1998–2015). LCMs have a larger power to detect effects and are robust to non-normality compared to analyses of variance (Kline, 2011; Schmidt et al., 2014). All analyses were intention-to-treat, and models were fit using full information maximum likelihood (e.g., Raykov, 2005) to make optimal use of available information. We assessed non-independence of observations due to nesting of participants in schools using linear mixed models in SPSS (Version 28), with school specified at level two. Intraclass correlations for nine outcome variables ranged from 0.014 to 0.126 (i.e., 1.4–12.6% variance explained at the school level) and were non-significant, meaning there is not a random effect of school-level variation on participant-level scores. Thus, the Pretest 1 means did not vary by school (Garson, 2020). There was a significant random effect of school-level ($ICC = 0.261$,

$p = 0.03$) for distress, so we accounted for non-independence by correcting the standard errors of the estimates for the non-independence of the data (type = complex command) in further analyses (Muthén & Muthén, 1998–2015).

To assess if the three conditions yielded significant changes in the 10 outcome variables, we evaluated LCMs using a multigroup approach, basing our models on Schmidt et al. (2014). A base model with Pretest 2 as the intercept allowed us to assess changes in children's self-reported behavior from Pretest 1 to Pretest 2 (hereafter labeled the pre-intervention period), and from Pretest 2 to post-test (hereafter labeled the intervention period). An equivalent model with Posttest as the intercept allowed us to assess the changes from Posttest to Follow-up (hereafter labeled the follow-up period). Supplementary Appendix C, Fig. C.1 illustrates the model. Model fit was considered good when the chi-square statistic was non-significant, the root mean square error of approximation (RMSEA) value was lower than 0.08, and the comparative fit index (CFI) value was higher than 0.95 (Hu & Bentler, 1999).

To assess within- and between-condition differences, the parameters representing change between time points were constrained to equality within conditions (e.g., pre-intervention period change and intervention period change in the EX-condition) and between conditions (e.g., intervention period change in the EX-condition and CR-condition). We then compared the constrained model's chi-square statistic to the base model's chi-square statistic. A significant chi-square difference meant that the parameters constrained in the model were statistically different. *Mplus* syntax for the LCMs is available in Supplementary Appendix C.

Results

Compared to the children that were not selected to participate in the intervention based on Pretest 1, there were more girls in the final sample ($\chi^2 [1, N = 1420] = 18.51, p < 0.001$). There were no differences in age and ethnicity between selected and not-selected children (see Supplementary Appendix A, Table A.1). All children that participated in the interventions completed all four intervention sessions. Table 2 presents demographics and the raw means and standard deviations of all outcome variables at every measurement occasion for all three conditions.

Before our main analyses, we assessed if there were between-condition differences in children's age, sex, and ethnicity. The cognitive restructuring condition (CR-condition in this section) contained significantly more non-Western children (79.5%) than the exposure condition (EXP-condition in this section; 22%) and the combination

condition (CM-condition in this section; 22.2%; $\chi^2 [2, N = 188] = 65.67, p < 0.001$). Further analyses of Pretest 1 scores revealed that non-Western children reported significantly more social anxiety (SAS-A) compared to Western children ($F [1186] = 7.00, p < 0.01$), therefore we controlled for ethnicity in further analyses. Children in the CR-condition reported less distress (DAAS; $F [2187] = 13.56, p < 0.001$) and more approach behavior (DAAS; $F [2187] = 9.01, p < 0.001$) at Pretest 1 compared to children in both the EXP-condition and the CM-condition. The conditions did not differ in children's age ($F [2189] = 1.71, p = 0.15$) or sex ($\chi^2 [2, N = 191] = 6.18, p = 0.05$), nor were there Pretest 1 differences on the other outcome variables. Analyses of variance showed there was not a systematic influence of age or sex on our findings, so we did not control for age or sex in further analyses.

An inspection of bivariate correlations indicated that all variables significantly correlated in the predicted direction at all time points. Overall, correlations between outcome variables were in the expected direction: social anxiety disorder related variables (social anxiety, distress, avoidant behavior, and negative thoughts) and internalizing behavior showed positive inter-correlations, and negative correlations with the positively formulated outcomes (positive thoughts, approach behavior, self-efficacy, social skills, and self-perceived competence). The latter variables showed positive inter-correlations. There was a weak correlation between children's age and internalizing behavior at Pretest 1 and self-efficacy at Follow-up. There was a weak correlation between children's sex and social anxiety, distress, approach behavior, positive thoughts, negative thoughts, and self-efficacy at Pretest 2, and avoidant behavior and approach behavior at Posttest. There was a weak correlation between children's ethnicity and social anxiety, distress and approach behavior at Pretest 1, distress, approach behavior, and self-efficacy at Pretest 2, distress, avoidant behavior, approach behavior, and self-efficacy at Posttest, and distress and approach behavior at Follow-up. None of these correlations exceeded the 0.40 threshold. Supplementary Appendix D, Tables D.1 and D.2 present the correlation matrices.

Intervention Component Effects

We assessed the effectiveness of the individual intervention components using unconstrained multigroup latent change models (LCMs), and the fit indices were adequate for all outcomes: chi-squares were non-significant, RMSEA values were lower than 0.08, and CFI values were higher than 0.95 (see Supplementary Appendix D, Table E.1 for the full fit statistics). Table 2 presents parameter estimates for all models. Bold parameters indicate a significant difference between the change during the intervention period and the

Table 2 Means (M) and standard deviations (SD) for the primary and secondary outcomes (N = 191)

	Exposure (n = 82)			Cognitive restructuring (n = 73)			Combination (n = 36)					
	Pretest 1 M (SD)	Pretest 2 M (SD)	Posttest M (SD)	Follow-up M (SD)	Pretest 1 M (SD)	Pretest 2 M (SD)	Posttest M (SD)	Follow-up M (SD)	Pretest 1 M (SD)	Pretest 2 M (SD)	Posttest M (SD)	Follow-up M (SD)
Age at Pretest 1 (M/SD)	10.32 (0.95)			10.64 (1.12)					10.53 (1.18)			
Sex: Girls (n [%])	44 (53.7)			53 (72.6)					24 (66.7)			
Ethnicity: Non-Western (n [%])	18 (22.0)			58 (82.9)					8 (22.2)			
Primary outcomes												
Social anxiety	53.22 (9.73)	52.00 (13.04)	45.92 (13.59)	42.60 (12.29)	55.96 (11.10)	49.79 (13.27)	40.80 (15.52)	39.84 (15.66)	53.29 (11.23)	51.70 (12.96)	50.34 (15.62)	45.31 (14.52)
Above clinical cut-off (>50.0; n [%])	48 (59.3)	40 (53.3)	30 (40.0)	15 (22.1)	54 (74.0)	30 (52.6)	16 (28.6)	12 (26.1)	23 (63.9)	19 (57.6)	17 (53.1)	11 (39.3)
Distress	14.77 (3.37)	15.17 (4.38)	13.34 (4.70)	12.28 (4.12)	12.12 (3.77)	12.07 (4.60)	9.54 (4.30)	9.83 (4.37)	15.26 (3.84)	15.23 (4.52)	13.15 (5.50)	12.48 (5.54)
Avoidant behavior	10.72 (3.92)	11.15 (4.59)	9.99 (3.85)	8.74 (3.65)	10.04 (3.47)	9.25 (3.69)	7.82 (3.35)	8.20 (3.37)	10.81 (4.50)	11.70 (4.94)	10.89 (3.93)	9.95 (4.54)
Approach behavior	8.86 (3.68)	9.03 (4.18)	9.65 (3.42)	10.19 (3.90)	11.00 (3.98)	11.07 (3.57)	12.92 (3.71)	12.83 (4.06)	8.11 (3.90)	7.33 (4.20)	8.98 (4.38)	9.31 (5.19)
Positive thoughts	21.40 (6.84)	22.22 (8.83)	24.74 (8.06)	24.72 (8.80)	23.12 (9.07)	24.27 (8.62)	27.14 (8.20)	26.43 (9.93)	22.90 (7.75)	21.77 (9.48)	23.19 (8.29)	24.11 (8.33)
Perceived social threat	21.84 (7.42)	20.70 (7.33)	19.16 (7.44)	17.10 (6.06)	22.31 (8.96)	21.22 (8.72)	18.42 (8.13)	18.27 (8.27)	20.95 (8.45)	20.65 (8.68)	20.90 (9.35)	18.00 (7.80)
Secondary outcomes												
Internalizing behavior	21.76 (6.45)	21.45 (6.72)	20.13 (7.01)	18.85 (6.99)	21.06 (6.52)	20.53 (7.92)	18.51 (6.09)	17.52 (6.55)	21.99 (6.82)	22.36 (7.20)	19.38 (6.50)	20.89 (8.00)
Self-efficacy	11.11 (3.05)	10.89 (3.70)	12.19 (3.66)	12.48 (3.52)	12.19 (3.66)	12.41 (3.57)	13.94 (3.71)	13.65 (4.06)	11.14 (3.66)	10.14 (3.95)	12.19 (3.94)	12.96 (3.56)
Social skills	136.27 (20.94)	141.25 (17.11)	145.06 (19.33)	148.06 (19.05)	137.35 (22.26)	141.39 (22.41)	143.83 (23.79)	145.62 (28.17)	133.47 (19.19)	136.13 (18.02)	133.12 (21.46)	137.38 (18.83)
Self-perceived competence	54.03 (8.81)	55.50 (8.57)	57.41 (8.61)	58.97 (8.31)	53.75 (9.89)	55.81 (10.01)	58.49 (9.45)	57.77 (9.72)	54.34 (8.78)	55.30 (9.37)	56.60 (8.67)	58.06 (7.46)

pre-intervention period. Supplementary Appendix E, Table E.2 presents the complete fit indices for the constrained models and chi-square differences.

Children in the EXP-condition significantly improved on all outcome measures during the intervention period. These improvements were significantly larger than the non-significant changes during the pre-intervention period for social anxiety ($\Delta\chi^2 = 17.25$, $p < 0.001$), distress ($\Delta\chi^2 = 8.84$, $p < 0.01$), approach behavior ($\Delta\chi^2 = 5.97$, $p < 0.05$), positive thoughts ($\Delta\chi^2 = 15.21$, $p < 0.001$), perceived social threat ($\Delta\chi^2 = 11.48$, $p < 0.001$), internalizing behavior ($\Delta\chi^2 = 6.25$, $p < 0.05$) and self-perceived competence ($\Delta\chi^2 = 8.39$, $p < 0.01$). Improvements during the intervention period on children's avoidant behavior and self-efficacy were not significantly larger than during the pre-intervention period ($\Delta\chi^2 = 3.08$, $p > 0.05$ and $\Delta\chi^2 = 2.09$, $p > 0.05$, respectively). Children's improvement in social skills was significant during both the pre-intervention period and the intervention period, however, the improvement during the intervention period was significantly larger ($\Delta\chi^2 = 14.23$, $p < 0.001$).

Children reported an additional significant improvement in social anxiety, distress, and avoidant behavior during the follow-up period. However, children's improvement in social anxiety and distress during the follow-up period was significantly smaller than during the intervention period ($\Delta\chi^2 = 33.91$, $p < 0.001$, and $\Delta\chi^2 = 27.56$, $p < 0.001$, respectively). The improvement in avoidant behavior during the follow-up period was significantly larger than the improvement during the intervention period ($\Delta\chi^2 = 19.43$, $p < 0.001$). Children did not show significant further improvement on any other outcome measures, but intervention effects were sustained at follow-up.

Children in the CR-condition significantly improved on all outcome measures during the intervention period except for social skills. The improvements for social anxiety ($\Delta\chi^2 = 37.01$, $p < 0.001$), distress ($\Delta\chi^2 = 16.75$, $p < 0.001$), approach behavior ($\Delta\chi^2 = 15.30$, $p < 0.001$), positive thoughts ($\Delta\chi^2 = 11.31$, $p < 0.001$), perceived social threat ($\Delta\chi^2 = 9.37$, $p < 0.01$), internalizing behavior ($\Delta\chi^2 = 9.57$, $p < 0.01$), self-efficacy ($\Delta\chi^2 = 13.47$, $p < 0.001$), and self-perceived competence ($\Delta\chi^2 = 9.17$, $p < 0.01$) during the intervention period were significantly larger than the non-significant changes on these outcomes during the pre-intervention period. Children in the CR-condition also significantly improved on social anxiety during the pre-intervention period, however, improvement during the intervention period was significantly larger ($\Delta\chi^2 = 37.01$, $p < 0.01$). Children's improvement in avoidant behavior during the intervention period was significantly larger than children's significant worsening during the pre-intervention period ($\Delta\chi^2 = 19.27$, $p < 0.001$). Although children's improvement in social skills was not significant during the

intervention period, it was significantly larger than the non-significant change during the pre-intervention period ($\Delta\chi^2 = 4.89$, $p < 0.01$).

Children's self-perceived competence significantly improved further during the follow-up period. This improvement was significantly larger than children's improvement in self-perceived competence during the intervention period ($\Delta\chi^2 = 7.45$, $p < 0.01$). Children did not show significant further improvement on any other outcome measures during the follow-up period, but intervention effects were sustained at follow-up.

Children in the CM-condition significantly improved in distress, approach behavior, internalizing behavior, and self-efficacy during the intervention period. However, only children's improvement in distress and internalizing behavior was significantly larger than the change during the pre-intervention period ($\Delta\chi^2 = 6.04$, $p < 0.05$, and $\Delta\chi^2 = 4.55$, $p < 0.05$, respectively). Children's improvements in approach behavior, and self-efficacy during the intervention period were not significantly larger than the non-significant changes during the pre-intervention period ($\Delta\chi^2 = 1.25$, $p > 0.05$, and $\Delta\chi^2 = 1.58$, $p > 0.05$, respectively). Children in the CM-condition did not significantly improve in social anxiety, avoidant behavior, positive thoughts, perceived social threat, social skills, or self-perceived competence. Children did not show significant further improvement on any of the outcome measures, but the intervention effects were sustained at follow-up.

Differences in Effectiveness between the Intervention Conditions

To assess whether there were between-condition (i.e., EXP-, CR-, and CM-condition) differences concerning the changes during the intervention period and the follow-up period, we compared a model that constrained these periods to equality across the conditions with a model that estimated these changes for each condition separately. In Table 3, subscripts indicate significant differences between the conditions. Supplementary Appendix E, Table E.3 presents the fit indices for the constrained models and chi-square difference tests.

During the intervention period, children's significant improvements in social anxiety and perceived social threat were similar in the EXP-condition and the CR-condition, but children's significant improvement in social anxiety was significantly larger in the CR-condition than in the CM-condition ($\Delta\chi^2 = 5.30$, $p < 0.05$). Also, children's significant improvement on perceived social threat was significantly larger in the EXP-condition and the CR-condition than in the CM-condition ($\Delta\chi^2 = 4.76$, $p < 0.05$). Children's significant improvement on social skills during the intervention period was significantly larger in the EXP-condition than

Table 3 Model parameters for the unconstrained latent change models controlling for ethnicity across conditions

	Exposure			Cognitive restructuring			Combination					
	intercept μ (SE)	$\Delta_{2,1}$ μ (SE)	$\Delta_{3,2}$ μ (SE)	intercept μ (SE)	$\Delta_{2,1}$ μ (SE)	$\Delta_{4,3}$ μ (SE)	intercept μ (SE)	$\Delta_{2,1}$ μ (SE)	$\Delta_{3,2}$ μ (SE)	$\Delta_{4,3}$ μ (SE)		
Primary outcomes												
Social anxiety	51.49 ^{***} (1.64)	-0.39 (1.30)	-6.71^{***} (1.37)	-2.79 [*] (1.17)	50.03 ^{***} (1.72)	-5.90 ^{**} (1.71)	-8.88^{***} (1.63)	-2.13 (1.76)	51.25 ^{***} (2.44)	-1.98 (2.26)	-1.07 _a (2.88)	-3.05 (1.57)
Distress	15.02 ^{***} (0.57)	0.27 (0.46)	-2.01^{***} (0.51)	-0.98 [*] (0.43)	11.90 ^{***} (0.61)	-0.31 (0.58)	-2.44^{***} (0.53)	0.09 (0.55)	15.35 ^{***} (0.83)	-0.04 (0.64)	-2.01[*] (0.80)	-0.09 (0.54)
Avoidant behavior	11.04 ^{***} (0.58)	0.27 (0.45)	-1.16 [*] (0.47)	-1.30 ^{**} (0.37)	9.13 ^{***} (0.48)	-0.98 [*] (0.40)	-1.35^{***} (0.46)	0.35 _a (0.40)	11.93 ^{***} (0.91)	1.14 (0.66)	0.73 (0.75)	-0.61 _b (0.77)
Approach behavior	8.74 ^{***} (0.53)	0.08 (0.40)	0.96^{**} (0.36)	0.56 (0.38)	11.27 ^{***} (0.46)	0.36 (0.85)	1.82^{***} (0.49)	-0.12 (0.36)	6.89 ^{***} (0.74)	-0.79 (0.51)	1.59 [*] (0.63)	0.22 (0.52)
Positive thoughts	21.67 ^{***} (1.12)	0.75 (1.02)	2.72^{**} (0.91)	0.40 (0.87)	23.94 ^{***} (1.12)	1.15 (1.01)	3.13^{**} (1.06)	-0.66 (0.91)	22.08 ^{***} (1.79)	-0.10 (0.88)	0.29 (1.05)	0.51 (1.35)
Perceived social threat	20.08 ^{***} (0.95)	-1.06 (0.77)	-2.18^{**} (0.91)	-1.22 (0.84)	21.17 ^{***} (1.10)	-1.17 (0.95)	-2.54[*] (1.01)	-0.83 (0.98)	20.51 ^{***} (1.65)	0.24 (0.88)	0.80 _{ab} (1.12)	-2.26 (1.63)
Secondary outcomes												
Internalizing behavior	21.09 ^{***} (0.86)	-0.51 (0.66)	-1.45[*] (0.72)	-1.09 _a (0.84)	20.72 ^{***} (1.06)	-0.44 (0.91)	-2.33[*] (0.99)	-1.39 _b (0.86)	22.75 ^{***} (1.32)	-0.18 (1.08)	-2.76^{**} (0.94)	2.73 _{ab} (1.49)
Self-efficacy	10.75 ^{***} (0.46)	-0.54 (0.38)	1.16 ^{**} (0.40)	0.73 (0.40)	12.55 ^{***} (0.46)	0.34 (0.40)	1.54^{**} (0.46)	-1.30 (0.40)	9.77 ^{**} (0.70)	-1.05 (0.62)	1.89 ^{**} (0.58)	0.35 (0.40)
Social skills	140.36 ^{***} (2.24)	4.01 [*] (1.76)	4.95^{**} (1.54)	1.60 (2.31)	140.02 ^{***} (2.83)	3.49 (2.50)	2.43_b (1.21)	2.43 (2.32)	135.30 ^{***} (3.43)	2.86 (1.78)	-2.81 _a (3.26)	2.53 (3.42)
Self-perceived competence	55.08 ^{***} (1.07)	0.51 (0.84)	2.93^{***} (0.85)	0.34 _a (0.87)	55.79 ^{***} (1.26)	1.90 (1.99)	2.38[*] (2.28)	9.52 [*] (4.18)	54.51 ^{***} (1.72)	1.54 (1.23)	1.23 (1.75)	2.19 _b (1.75)

Intercept = pretest 1; $\Delta_{2,1}$ = pre-intervention period; $\Delta_{3,2}$ = intervention period; $\Delta_{4,3}$ = Follow-up period. Asterixis indicate a significant within-group change ($p < 0.05$, $^{**} p < 0.01$, $^{***} p < 0.001$). Latent means in bold indicate that there was a significant ($p < 0.05$) within-group difference between the intervention period and the pre-intervention period. Latent means in the same row that share subscripts indicate that there was a significant ($p < 0.05$) difference between conditions

children's non-significant change in the CM-condition ($\Delta\chi^2 = 4.44$, $p < 0.05$), but not significantly larger than children's non-significant change in the CR-condition ($\Delta\chi^2 = 1.32$, $p > 0.05$). There were no significant between-condition differences during the intervention period on any of the other outcome measures.

During the follow-up period, children's significant improvement in avoidant behavior was significantly larger in the EXP-condition than children's non-significant change in the CR-condition ($\Delta\chi^2 = 9.08$, $p < 0.01$), but not significantly larger than children's non-significant change in the CM-condition ($\Delta\chi^2 = 0.63$, $p > 0.05$). Children's non-significant worsening of internalizing behavior during the follow-up period in the CM-condition was significantly different from children's non-significant improvement on internalizing behavior in the EXP-condition and CR-condition ($\Delta\chi^2 = 4.63$, $p < 0.05$, and $\Delta\chi^2 = 5.32$, $p < 0.05$, respectively). Children's significant improvement in self-perceived competence was significantly larger in the CR-condition than in the EXP-condition ($\Delta\chi^2 = 4.42$, $p < 0.05$), but not significantly larger than in the CM-condition ($\Delta\chi^2 = 0.31$, $p > 0.05$). There were no significant between-condition differences for any other outcome measures during the follow-up period.

Clinical Relevance

To give an indication of the clinical relevance of the changes in the intervention conditions, we analyzed the number of children scoring above the clinical cut-off on the SAS-A in the different conditions. Analyses showed that in the exposure condition, 59.3% ($n = 48$) of the participants scored above the clinical cut-off at Pretest 1, versus 40.0% ($n = 30$) at Posttest ($\chi^2 [74] = 11.90$, $p < 0.001$) and 22.1% ($n = 15$) at Follow-up ($\chi^2 [67] = 7.062$, $p < 0.01$). In other words, 69% of the participants that scored in the clinical range of social anxiety at Pretest 1 improved to "normal" levels (i.e., below the clinical cut-off) of social anxiety at Follow-up. In the cognitive restructuring condition, 74.0% ($n = 54$) of the participants scored above the clinical cut-off at Pretest 1, versus 28.6% ($n = 16$) at Posttest ($\chi^2 [56] = 4.82$, $p < 0.05$) and 26.1% ($n = 12$) at Follow-up ($\chi^2 [46] = 3.18$, $p = 0.07$). Thus, 78% of the participants in this condition improved to the non-clinical range of social anxiety from Pretest 1 to Follow-up. In the combination condition, 63.9% ($n = 23$) of the participants scored above the clinical cut-off at Pretest 1, versus 53.1% ($n = 17$) at Posttest ($\chi^2 [32] = 0.40$, $p = 0.53$) and 39.1% ($n = 11$) at Follow-up ($\chi^2 [28] = 1.10$, $p = 0.29$). Hence, 47% of the participants in this condition improved to the non-clinical range of social anxiety from Pretest 1 to Follow-up.

In addition, the interventions showed clinically relevant change in the following outcome measures: social threat

cognitions and positive thoughts. Between Pretest 1 and follow-up participants' social threat cognitions reduced by an average of 3.88, which is broadly in line with a 5-point change following a full CBT intervention (Rapee et al., 2022) for youth with social anxiety disorder; positive thoughts increased by an average of 2.61, comparable to previously reported change in anxious youth following treatment of 3.29 (Hogendoorn et al., 2013).

Discussion

This microtrial aimed to identify whether brief preventive group interventions using exposure, cognitive restructuring, or both effectively reduced social anxiety in children with emerging symptoms. We assessed changes in symptoms of social anxiety and social-emotional outcomes that might change by proxy of the reduction in social anxiety symptoms. Our findings show that exposure and cognitive restructuring effectively improved social anxiety and related outcomes as single intervention components. Exposure improved children's symptoms of social anxiety and all related outcomes measured, except for self-efficacy. Cognitive restructuring also improved children's symptoms of social anxiety and related outcomes, except for social skills. After intervention with exposure or cognitive restructuring, 69 and 78%, respectively, of the children scoring in the clinical range of social anxiety at Pretest 1 returned to "normal" levels of anxiety at Follow-up; this is in line with previous studies (Kendall & Peterman, 2015). Overall, our findings demonstrate that exposure and cognitive restructuring are similarly effective in reducing social anxiety and related outcomes in children with emerging symptoms, which is in line with findings from previous research (e.g., Peris et al., 2015; Rodebaugh et al., 2004).

Previous research has found that reductions in anxious self-talk are associated with reduced anxiety symptoms (Kendall & Treadwell, 2007). In line with that study, we found that cognitive restructuring positively affected children's cognition. Children reported more positive thoughts and perceived less social threat after the intervention. This was also found for exposure—noteworthy given that only cognitive restructuring paid explicit attention to children's cognition. Exposure might elicit self-administered cognitive restructuring (Rodebaugh et al., 2004), and the exposure exercises might have served as expectancy violation exercises by disconfirming children's expectation of negative evaluation (Craske et al., 2014). In this way, exposure may cause children to adjust their unhelpful thoughts without explicitly focusing on the negative cognitions. This finding implies a possibility of improving children's cognition within a four-week exposure-based intervention. If exposure is effective in improving children's self-perceptions —

as our findings suggest— this relatively easy-to-execute component could be used to prevent the development of maladaptive thoughts in at-risk children. This is important given that research has shown that negative self-perceptions mediate the longitudinal relationship between shyness and social anxiety (Blöte et al., 2019).

The structure of the exposure and cognitive restructuring intervention modules may explain their similar effect on many outcomes. As well as teaching children to adjust their unhelpful thoughts, the cognitive restructuring intervention might also prompt imaginal exposure by instructing children to visualize hypothetical social situations. This mechanism was previously found in research with adults with post-traumatic stress disorder: visualizing a situation yielded a significant change in anxiety levels (Bryant et al., 2003). The possibility that exposure exercises prompt children to engage in self-administered cognitive restructuring may suggest that it is impossible to rule out non-targeted components in separate component interventions; there might be some cognitive restructuring in an exposure-only intervention and vice versa.

However, the exposure and cognitive restructuring components had a differential effect on several outcomes. Unlike exposure, cognitive restructuring did not improve children's social skills, which might be due to the focus on cognition. While exposure is focused more “outward” towards behavior, cognitive restructuring is focused more “inward” towards the child's inner world, which may make a difference in improving social skills. Children may specifically need to enact social situations that provoke anxiety and practice improving their social skills (e.g., Miers et al., 2011)—which was the case in the exposure intervention but not the cognitive restructuring condition. We also found that exposure did not improve children's self-efficacy, whereas cognitive restructuring did. In addition, cognitive restructuring was more effective in increasing children's positive thoughts, and this increase in positive thinking may be instrumental to the improvement in self-efficacy (i.e., children's prediction of how well they will perform certain tasks). Also, children's belief in their ability to restructure unhelpful thoughts and thereby control their emotions in anxious situations may increase their self-efficacy (e.g., Goldin et al., 2012).

The positive effects of both exposure and cognitive restructuring were sustained until the three-month follow-up on all outcomes for which an intervention effect was found. Exposure continued to have an effect on social anxiety, distress, and avoidance of social situations up to three months after the intervention ended, and cognitive restructuring continued to have an effect on self-perceived competence up to three months after the intervention ended. In contrast to these sustained effects during the follow-up period, our findings suggest that the effect of exposure on

avoidant behavior needs time to ‘internalize’, as positive effects of the intervention only emerged in the follow-up period. It may be that children's avoidance of anxiety-provoking situations only reduces after a reduction in anxiety symptoms and distress in these situations has been established. An alternative explanation may be that, in line with the gradual nature of the exposure component, children continued to work towards engaging in anxiety-provoking situations, thereby reducing their avoidant behavior (e.g., Peris et al., 2015).

An important finding of this microtrial is that an intervention combining exposure and cognitive restructuring was less effective in preventing social anxiety than either component alone. Although this finding should be interpreted with caution due to the small sample size of the combination condition, it is in line with previous research (e.g., Rodebaugh et al., 2004). Stacking multiple intervention components may thus not necessarily yield greater intervention benefits. In fact, our findings suggest that compared to a combined intervention, cognitive restructuring was superior in reducing children's social anxiety, that both exposure and cognitive restructuring outperformed the combined intervention in reducing children's perceived social threat, and that exposure outperformed the combined intervention in increasing children's social skills. Possibly, each component may need to be administered in a certain minimum dosage and a combination of exposure and cognitive restructuring might only be effective when the separate components are implemented in the right dosage. The combination intervention included fewer exposure exercises and cognitive restructuring exercises than the time-equal separate interventions, which may explain the apparent absence of effects for the combined intervention. We cannot rule out that a higher dose of the combination of exposure and cognitive restructuring would have an additive positive effect on social anxiety symptoms; four sessions might be too few to implement both exposure and cognitive restructuring sufficiently. By the same token, the lack of effects in the combined intervention may be ascribed to the fact that children practiced with fewer social situations (i.e., two instead of three) in this intervention. Alternatively, exposure and cognitive restructuring may be more potent in the absence of other intervention components (Peris et al., 2015).

Interpretation of our findings must take into account that all interventions developed for this study included psychoeducation about anxiety. Previous research (de Mooij et al., 2020) has shown this is an important component in enhancing intervention effects. Therefore, we cannot rule out that this common element is responsible for our lack of differences between the intervention conditions. Future research may consider a factorial design to assess treatment order effects (Leijten et al., 2015).

Our study is not without limitations. First, one may view the group setting of the brief interventions as a form of exposure in itself. Although the exposure condition explicitly targeted social exposure through speaking in front of a group, differences with the cognitive restructuring condition may be somewhat less optimal. However, research has shown that group CBT (which included both exposure and cognitive restructuring) had similar effects to individual CBT (Silverman et al., 2008); thus, we do not expect the group context to have confounded our findings. Second, we assessed all outcomes with self-report measures. Although this is common in anxiety research, including parent reports, teacher reports and observations could provide a more comprehensive assessment of the children's social anxiety (Silverman & Ollendick, 2005). Third, there was an uneven distribution of participants across the conditions. Third, implementation forms were not completed for all training groups. The workload of primary school teachers is high in the Netherlands, and as a result, many schools were reluctant to participate in a study with multiple measurement occasions. Only a few schools randomized into the combination condition agreed to participate, and thus only a small number of children participated in the combined condition. We could not include a no-treatment control group for similar reasons, which limits our ability to conclude the effects of the brief interventions compared to no treatment. However, due to the use of two pretest measurements, we could compare pre-post intervention effects to children's natural development before the intervention's implementation, which provides stronger conclusions regarding intervention effects. Including a follow-up measurement allowed us to assess the sustainability of intervention effects, and including multiple outcome measures related to social anxiety provided a detailed picture of the effectiveness of the interventions. Fourth, it should be taken into account that the study may be underpowered to detect small to medium effects for the number of outcome measures, hence it is important that our findings are replicated in future studies. Finally, our findings should be interpreted in light of its mild to moderately symptomatic community sample. It may be that the differences between the separate intervention components are more pronounced in a clinical sample of socially anxious children.

Future research using a microtrial approach might include multiple informants and observational data to assess the moderating effects of common factors such as working alliance and client and/or therapist motivation, a more evenly distributed sample, and a no-treatment control group. An observational measure, such as a role-play task, may be included as a real-world assessment of changes in children's social behavior in school. Possibly, this could provide researchers with more insight into the generalization of the effects of the intervention components (e.g., Le & Beidel,

2017). Future research might also evaluate the effectiveness of other components frequently included in social anxiety interventions, such as problem-solving. Assessing the effects of a parent component in social anxiety interventions might also prove insightful, as research has shown parenting to be an etiological factor that may predict social anxiety (Spence & Rapee, 2016).

It was beyond the scope of this study to assess subgroup variability in the effectiveness of intervention components. In line with research suggesting that social anxiety is more prevalent in women (Asher et al., 2017), slightly more girls than boys from the baseline sample reported elevated levels of social anxiety and were selected for our interventions. Future research could assess *what works for whom* in social anxiety interventions. Research has also shown that social anxiety symptoms may differ based on ethnicity (e.g., fear of embarrassing oneself versus the other person), which may mean intervention components aimed at social anxiety are also differentially effective based on participants' ethnic backgrounds (Hofmann et al., 2010). A child's level of behavioral inhibition before the training (e.g., Clauss & Blackford, 2012) or the use of safety behaviors such as avoiding eye contact (e.g., Blakey & Abramowitz, 2016) may also influence intervention effectiveness. Social anxiety is also often comorbid with other anxiety disorders and depression (Spence & Rapee, 2016). Future research might collect data on comorbid disorders to assess how this impacts intervention component effects. Insight into what works for whom regarding indicated prevention interventions could be valuable to better tailor interventions to a child's individual needs.

These limitations notwithstanding, we were the first to assess components of social anxiety interventions separately, and our findings provide valuable information about separate and combined effects of exposure and cognitive restructuring. Our findings have several practical implications, the most important being that a relatively brief, four-week intervention could protect children from developing elevated levels of social anxiety and associated negative consequences. Because we found the stand-alone exposure and cognitive restructuring approaches to be effective, we conclude that practitioners can safely focus on exposure or cognitive restructuring alone if there is little time for a multicomponent intervention.

Our study provides preliminary evidence that exposure might be the most valuable component regarding the breadth of intervention effects, although cognitive restructuring yielded positive effects too. From a prevention perspective, the effectiveness of short-term intervention modules is advantageous because they are easy to implement. The modules were highly structured, so future implementation by teachers or school-based clinicians might be feasible. Moreover, the regular school curriculum could integrate

intervention module exercises, which could make addressing elevated social anxiety in children more cost-effective, and less burdensome for both children and parents as it could reduce the need to visit clinical childcare facilities.

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Compliance with Ethical Standards

Conflict of Interest The authors declare no competing interests.

Consent to Participate Written informed consent was obtained from the parents or legal guardians of participants.

Ethics Approval This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of the University of Amsterdam (24-04-2017/No. 8033).

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