Adolescents at risk for social and test anxiety. Who are at risk and how can we help?

Sportel, Bouwina Esther

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Esther Sportel

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Adolescents at Risk for Social and Test Anxiety

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Chapter 1

General Introduction

General introduction

The Aim of Current Thesis

Social and test anxiety are characterized by a chronic course and have an invalidating influence on the people who suffer from them. The comorbidity with other anxiety disorders and depression is high, and suffering from these disorders has been associated with social isolation, substance abuse, and lowered academic performance (Stein & Kean, 2000; Wittchen, Fuetsch, Sonntag, Müller, & Liebowitz, 2000). Therefore, it is of the utmost importance to work towards a situation in which people at risk of these disorders are detected at an early stage, and to intervene before the full effects of these disorders develop. In line with this, the focus of this thesis is twofold; the first focus is on risk factors for developing internalising disorders; can we determine factors that enhance the chance that an individual develops internalising disorders? The second focus is to test the effectiveness of early interventions in social and test anxiety, to prevent early symptoms becoming a full blown disorder. Since the age of onset of social anxiety is in adolescence (Wittchen, Nelson, & Lachner, 1998; Wittchen & Fehm, 2003), this research project focuses on early adolescents, firstly to identify risk factors for onset, secondly to be able to intervene before the full blown disorder occurs.

Social and Test Anxiety

Social anxiety is characterized by a marked and persistent fear of social or performance situations in which embarrassment may occur. When exposed to this social or performance situation an immediate anxiety response is provoked, which may take the form of panic. These social or performance situations are often avoided or endured with dread. Adolescents and adults with this disorder are aware of the fact that their fear is excessive (American Psychiatric Association, 2000). In daily life, adolescents with social anxiety are characterized by an extreme fear in social situations, such as introduction rounds, or oral examinations in classes when these adolescents are expected to speak out loud. They may also experience extreme fear during birthday parties with lots of new (unknown) people, and in public places, such as a shopping mall or busy streets with all kinds of people that might be looking at them and judging them. One could then choose to avoid these situations, and thus also avoid the feelings of fear and anxiety that come along with it. However, this avoidance behavior has all kinds of negative consequences, including positive

experiences with social interactions, as well as a lack of friendships, hobbies, or social isolation. In the short run the benefit for these adolescents is not feeling anxious, but in the long run a risk arises at for example social isolation.

Test anxiety is related to social anxiety, however, with a focus more specifically on test situations, where judgment by others regarding performance is at hand (McDonald, 2001). Test anxious adolescents are specifically anxious to give talks in class or make exams, and also the moment of grades being made 'public' is often experienced as very anxiety provoking. They may suffer from or fear "black-outs" or "going blank" during exams. Some adolescents may do their utmost to prevent failure, become stressed and spend too much time on preparing for tests, while missing out on social events or spare time activities that are important for their social development. Other adolescents may avoid judgments and evaluations, by underachieving or by not showing up for tests or not fully prepared, thus missing school days and risking dropping out of school. It has been found that a consequence of avoiding school and school situations or enduring them with extreme fear can be lower grades, resulting ultimately in lower level of education or school drop-out (Wittchen et al., 1998). In their review Bögels and colleagues (2010) come to the conclusion that both in social anxiety and test anxiety the fear that anxiety may hinder performance plays an important role. In the case of fear of negative evaluation as core issue in test anxiety, test anxiety qualifies to belong to social anxiety disorder (Bögels et al., 2010).

Social anxiety disorder is among the most prevalent anxiety disorders in adolescence and adulthood (Kessler, Chiu, Demler, & Walters, 2005; Merikangas et al., 2010). In adolescence, the prevalence of social anxiety disorder varies from 9.5% for girls and 4.9% for boys, whereas the lifetime prevalence of social anxiety disorder is estimated at about 3% up to 13% (American Psychiatric Association, 2000; Wittchen et al., 1998). For test anxiety specifically the lifetime estimates varying between 10% and 30% (McDonald, 2001), however, the absence of DSM-IV criteria for test anxiety make these prevalence rates less generalizable.

Besides the high prevalence rates there are serious long term consequences of social anxiety: it may lead to other anxiety disorders or depression in adulthood (Wittchen, Stein, & Kessler, 1999), whereas it is also associated with alcohol and drug misuse, lowered academic and work performance, lower self esteem and

poorer development of social skills (Beidel & Turner, 2007; Stein & Kean, 2000; Wittchen et al., 1999).

Models of Social and Test Anxiety

Several models are developed during the past decades to explain the development and maintenance of social anxiety. The model of Clark and Wells (1995; see Figure 1.1) explains the maintenance of social anxiety as follows: when a person with social anxiety disorder enters a social situation, this will automatically activate various anxiety provoking assumptions concerning the situation, and as a results the person will experience/perceive social threats. In such a situation, a person with social anxiety disorder will direct his/her attention towards him or herself (processing of self as social object) and at the same time experience behavioral symptoms, such as avoidance behavior. Next to that, there are somatic and cognitive symptoms such as sweating and trembling. These various symptoms then again strengthen the self awareness and thus the perceived social danger. Since the negative beliefs are not disconfirmed, social situations will remain anxiety provoking, and people may enter a downward spiral. The same may hold for test anxiety, since social and test anxiety seem to share many underlying mechanisms (Bögels et al., 2010).

More recent, so called vulnerability models of social anxiety emphasize cognitive processes that may set people at risk for developing symptoms of social anxiety (Ouimet, Gawronski, & Dozois, 2009). These models generally assume that disturbed cognitive information processing may be critically involved in the generation and/or maintenance of social anxiety. Individuals with social anxiety disorder have a distorted cognitive information processing. Not only do they interpret social situations in a threat confirming manner but they also focus their attention more towards negative social information. For example, when speaking in front of a group of people, a socially anxious person will immediately notice the single person in the crowd who is yawning (attention) and automatically interpret the yawning in a negative manner, e.g. "I must be giving the worst talk ever", "I am extremely boring", etc. In these models, the automatic negative thoughts are strengthened in encounter with social threat situations or test situations. Both models provide leads for treatment, as will further be described in part II of the introduction.

Figure 1.1 The model of social phobia by Clark & Wells
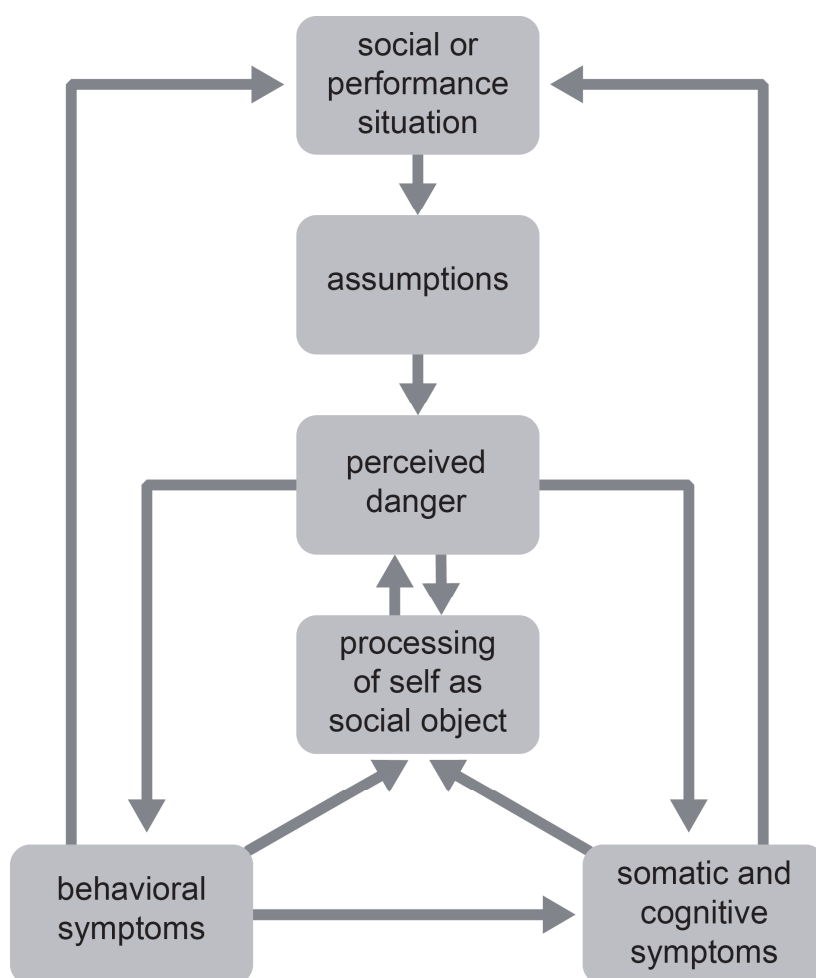
From a developmental psychopathology perspective several factors have been identified that may predispose a child to develop an internalizing disorder and are associated with the maintenance of internalizing disorders (Vasey & Dadds, 2001). Within these factors, temperament is considered a major candidate. Within temperament, especially behavioral inhibition and negative affect are assumed to be important. High behavioral inhibition, low attentional control, and their combination are assumed to be specifically relevant for the development of internalizing disorders (Lonigan & Phillips, 2001).

Part I – BIS/FFFS and Attentional Control as Risk Factors

Reactive and Regulative Temperament

Temperament can be described as "constitutionally based individual differences in reactivity and self-regulation, in the domains of affect, activity, and attention (Rothbart & Bates, 1998)". Rothbart and Bates (1998) propose that temperament

has biological basis, which is, then influenced by experience, heredity, and maturation (constitutionally), is responsive to change in external and internal environment (reactive) and can modulate reactiveness (self-regulation). Reactive temperament thus refers to temperament components that are responsive to change, internal and external. Examples of reactive temperament components are feelings of fear, emotionality, or cardiac responses. Regulative temperament on the other hand refers to processes that modulate reactivity, like effortful control, and orienting. Within reactive as well as regulative temperament, several components are identified that may be linked to the development and maintenance of internalizing complaints. For reactive temperament, behavioral inhibition system (BIS) has been identified as an important component; while for regulative temperament attentional control seems a relevant component (e.g., Johnson, Turner, & Iwata, 2003). Gaining insight into risk factors for internalizing disorders not only contributes to further development of theory, but may also provide clues for early interventions in teenagers: children or adolescents can be screened at an early stage for the possible risk of developing disorders, thereby opening the way for early intervention and prevention.

Reactive temperament: Behavioral Inhibition System and the Flight-Fight-Freeze System

The Behavioral Inhibition System was first proposed by Gray (1982) within the context of his Reinforcement Sensitivity Theory (RST). In its original description the RST consisted of three subsystems: the behavioral inhibition system (BIS), the behavioral activation system (BAS), and the fight-flight system (FFS). In this theory BIS reflects people's sensitivity towards punishment and proneness towards anxiety, BAS reflects one's sensitivity towards reward and proneness towards impulsivity, and FFS reflects the sensitivity towards unconditioned aversive stimuli.

With evidence from new experimental data in mind, the role of BIS and FFFS was reconsidered resulting in the renewed RST (Gray & McNaughton, 2000). In the new RST the FFS was replaced by the so-called flight-fight-freeze-system (FFFS), which is assumed to handle all aversive stimuli, conditioned as well as unconditioned. FFFS is related to fear, not anxiety and is responsible for avoidance and escape behaviours. People with a highly sensitive FFFS are supposed to have a proneness towards fear and have the tendency to react with avoidance. Following the revised

RST, the BIS is responsible for dealing with goal conflicts that can arise within the FFFS, within the BAS or between both systems. For example, BIS is activated when conflicting goals arise, such as approaching something rewarding (e.g., participating in a sports game and getting the chance to win by scoring the crucial penalty), while at the same time wanting to avoid something threatening (e.g., failing on scoring the crucial penalty). BIS is related to feelings of anxiety, not so much fear. People high on BIS are assumed to be vigilant for signs of danger and are often in a state of worry. The BAS remained largely unchanged compared to the original RST. The BAS mediates reactions to all appetitive stimuli and may generate feelings of anticipatory pleasure (Corr, 2008). Those high on BAS are associated with more impulsiveness and high risk behavior. In the light of the proposed functions BIS and FFFS seem most relevant for internalizing symptoms. Accordingly, BIS and FFFS have often been implied as being involved in the development and maintenance of internalizing symptoms (Corr, 2008).

BIS and FFFS in internalizing disorders

Although the revised theory of RST has already been published in 2000, a large part of current research still works with the former (originally formulated) concept of BIS, instead of the renewed concepts of BIS and FFFS. This might reflect a slowness to adopt, or the fact that various views on the RST are possible (Corr, 2008). Since both lines provide important leads for research, in the following I will discuss both research based on the original RST and research based on the renewed RST.

BIS-FFFS has mostly been studied with respect to internalizing disorders, and is often measured by the BIS/BAS-scales (Carver & White, 1994). Its nature of sensitivity towards punishment leads to the hypothesis of an association with anxiety and depression. In line with this, it has been found that BIS-FFFS is positively related to higher general anxiety scores (Campbell-Sills, Liverant, & Brown, 2004; Johnson et al., 2003; Jorm et al., 1999). Research into specific anxiety symptoms has shown similar results (see Bijttebier, Beck, Claes, & Vandereycken, 2009 for a review), with BIS-FFFS being positively related to social anxiety (Coplan, Wilson, Frohlick, & Zelenski, 2006; Kimbrel, Cobb, Mitchell, Hundt, & Nelson-Gray, 2008) and symptoms of obsessive-compulsive disorder (Fullana et al., 2004). In a similar vein, several

studies have found a positive relationship between BIS-FFFS and depressive symptoms (Campbell-Sills et al., 2004; Coplan et al., 2006; Jorm et al., 1999).

Studies that differentiated between BIS and FFFS have shown that high BIS as well as high FFFS are associated with higher anxiety symptoms in the context of anxiety in general, social phobia, panic disorder, separation anxiety disorder, and generalized anxiety (Vervoort et al., 2010). It has been argued that BIS might play a causal role in the etiology of all anxiety disorders, whereas FFFS has been proposed to be specifically related to panic disorders, social phobia, and specific phobia (Corr, 2008; Kimbrel, 2008). However, little research has been done testing these hypotheses, and thus the question remains whether indeed this is the case.

Regulative temperament: Attentional control

Where BIS and FFFS are considered being part of reactive temperament, attentional control is seen as a regulative temperamental factor (Rothbart & Bates, 2006), that is involved in the regulation of reactive temperament. Attentional control is one of the three subcomponents of the overarching concept of effortful control. Effortful control has been defined as the ability to inhibit a dominant response to perform a subdominant response (Rothbart & Bates, 1998). Attentional control is considered to be a subtype of effortful control, representing the ability to focus or switch attention when desired. Next to attentional control, inhibitory control and activation control are distinguished within effortful control, representing respectively the capacity to suppress inappropriate approach behavior and the capacity to perform an action when there is a strong tendency to avoid it.

Attentional control in internalizing disorder

Research has shown that effortful control is associated with less symptoms of psychopathology in children (Eisenberg, Wentzel, & Harris, 1998; Muris & Ollendick, 2005). Although it is more strongly related to externalizing disorders than to internalizing disorders, it has also been proposed to be important in buffering the generation of internalizing symptoms in children (Eisenberg, Fabes, Guthrie, & Reiser, 2000). For example, a study by Van Oort and colleagues (2011) showed in a longitudinal design that effortful control was negatively related to internalizing symptoms, thus higher levels of effortful control were associated with lower future levels of internalizing symptoms later. In anxious adolescents (diagnosed with at least one DSM-IV anxiety disorder), higher effortful control was associated cross-

sectionally with lower levels of anxiety compared to adolescents low on effortful control (Vervoort et al., 2011). Several cross-sectional studies have shown that there is a negative correlation between attentional control and symptoms of social anxiety, generalized anxiety, separation anxiety, panic disorder, obsessive-compulsive disorder, and depression (Muris, 2006; Muris, van der Pennen, Sigmond, & Mayer, 2008). However, longitudinal research into attentional control in relation with internalizing disorders has to our knowledge not been done so far. The question whether lowered attentional control is predictive for internalizing disorders still needs to be addressed.

BIS, FFFS, and AC: How do they interact in relation to internalising symptomatology?

Since BIS and FFFS are components of reactive temperament and attentional control is part of regulative temperament, the question arises how these two interact together. Lonigan (2001) stated that effortful control should have a protective function for those high on behavioral inhibition. Thus, children with high BIS-FFFS combined with low effortful control would be most at risk for developing an anxiety disorder, while those high on BIS-FFFS combined with high effortful control would be protected by the effortful control from developing internalizing symptoms. Some evidence for this has been found, showing that indeed high BIS and low effortful control was associated with the highest levels of internalizing symptoms (Muris, 2006; Muris, Meesters, & Rompelberg, 2007; Oldehinkel, Hartman, Ferdinand, Verhulst, & Ormel, 2007). Again, this research has been done cross-sectionally and it is important to test if this relation also holds up in a longitudinal design.

Getting insight in the relation between these temperamental factors and symptoms of internalizing disorders could lead to better screening of children and adolescents for being at risk of internalizing disorders. Thus far, the best predictors of an internalizing disorder over time are symptoms of that disorder at an earlier stage (O'Connor, Rasmussen, & Hawton, 2010; Sears & Armstrong, 1998), however, whether temperamental factors have additive value is still unclear. Although this has been looked into for some disorders longitudinally, and for most internalizing disorders cross-sectionally, this study adds to current knowledge by looking at these specific factors over *all* internalizing disorders and by testing the relationship

between temperament factors and internalizing symptoms both cross-sectionally and longitudinally within one sample.

Part II – Early intervention in social and test anxiety

Treatment of Social and Test Anxiety

Although behavioral inhibition, the flight-fight-freeze-system and attentional control are assumed to be involved in the development of internalizing disorders, and might be of influence in the maintenance of these disorders, treatment is not focusing explicitly on enhancing attentional control or lowering BIS and FFFS. Traditionally, the treatment of social and test anxiety has been based on the principles of cognitive behavioral therapy and the model by Clark and Wells (1995). Treatment ingredients aim to break the cycle of threat perception, alter dysfunctional thoughts, and decrease anxious feelings. Key ingredients usually are cognitive restructuring and exposure, but other methods have been used as well, such as relaxation training, psychoeducation, and social skills training. A review by Segool and Carlson (2008) showed that cognitive behavioral treatment containing cognitive restructuring, exposure, and psychoeducation in various combinations are effective in reducing symptoms of social anxiety disorder in children.

Next to the techniques mentioned before, we also included task concentration training, which has been found effective for treating social phobia and is in the Dutch guidelines for treatment of social anxiety (www.ggzrichtlijnen.nl) also recommend task concentration training (Mulkens, Bögels, De Jong, & Louwers, 2001). The focus in TCT is twofold: participants learn to a. focus their attention, and b. switch their attention. For example, when an adolescent with test anxiety makes an exam and he or she does not know the answer to the first question, the focus can become completely on 'not knowing' instead of focusing on the task (i.e., making the exam), the adolescent might then end up thinking about worst case scenarios related to what could happen (e.g., failing exam, failing school, ending up with underpaid job) or undesirable physical symptoms (e.g., symptoms as anticipated precursors of "going blank", noticing blushing or stammering during presentations). When this happens it is important for the adolescent to be able to switch back towards the task, instead of being caught in a loop of negative thoughts and experiences.

Most intervention research in adolescents aims at reducing symptoms in the case of a present social anxiety disorder (e.g., Masia-Warner et al., 2005; Masia-Warner, Fisher, Shrout, Rathor, & Klein, 2007). However, if the aim is to prevent the development of a full blown social anxiety disorder, and the generation of comorbid disorders and subsequent problems, one should aim at early intervention or prevention of social anxiety. With regard to prevention and early intervention little work has been done. A review by Neil and Christensen (2009) showed that school-based early intervention or prevention programs with adolescents already showing symptoms of anxiety are effective in reducing anxiety symptoms, with effect sizes in the small to moderate range. This effect, however, presented itself in only half of the covered studies at posttest, but became more pronounced at follow-up (ranging from 1 to 30 months after posttest). A meta-analysis by Teubert and Pinquart (2011) showed reasonable effect sizes at posttest as well as during follow-up (average 8.2 months). Thus, in early intervention and prevention studies it seems important to measure participants not only at posttest, but during an extended time period of several months up to several years. Besides that, it is found to be important to target preventive interventions at adolescents at risk for developing anxiety instead of using non-indicated interventions aiming at the complete community (Mychailyszyn, Brodman, Read, & Kendall, 2012).

A relatively recent development in the field of treatment of anxiety, based on dysfunctional cognitive processes, is cognitive bias modification (CBM). The more traditional CBT aims mainly at changing explicit beliefs and behavior, CBM directly targets the modification of automatic processes such as attentional bias and interpretation bias. It is assumed that change in cognitive biases is related to change in anxiety and depression. A meta-analysis on CBM programs for depression and anxiety for adults showed that overall CBM programs resulted in a change of attention bias and interpretation bias, with stronger effects for the latter (Hallion & Ruscio, 2011). CBM was found to lead to a decline in symptoms of anxiety and depression at posttest. However, the results indicated a publication bias. After correction for this bias the positive effect of CBM disappeared at posttest. In the field of social anxiety Beard, Weisberg, and Amir (2011), have shown in a pilot study (N = 13) that a combination of CBM targeting interpretive bias (CBM-I) and attention bias (CBM-A) was effective in reducing socially anxious complaints in adults. CBM-I was

also found to be effective in altering interpretive bias (e.g., Salemink, van den Hout, & Kindt, 2010).

Research with CBM in adolescents is still very scarce, some work in the field of social anxiety has been done by Vassilopoulos and colleagues (2009; 2012), who showed that in children aged 10-12 CBM for interpretation bias was effective in reducing self-reported symptoms of social anxiety. It is also shown that with regard to mood in adolescent, interpretation bias can be trained with CBM towards less self-reported negative affect with a positive training and less positive affect with a negative training (Lothmann, Holmes, Chan, & Lau, 2011). At this moment we are not aware of work in early intervention in social anxiety in adolescents or adults by using CBM. Since cognitive biases might be a vulnerability factor for anxiety disorders, CBM could be very suitable for early intervention and prevention in adolescents.

The Interventions in this Study

The aim of the study described in this thesis was to test the effectiveness of a cognitive behavioral group training, compared to a cognitive bias modification, and a no-intervention control group. This effectiveness study is especially relevant considering the potential benefits a successful CBT program in the context of a school setting, as well as the benefits that a CBM program could provide. CBT in the school setting could be well implemented by school counselors and would also provide schools with evidence based training methods to use at school, which are yet scarce.

Using CBM via screening at schools to decrease anxiety complaints would give a cost-effective, low threshold method to target anxiety in a group of anxious adolescents that might otherwise not find their way to regular care (Masia-Warner et al, 2007). The cognitive behavioral group training was based on various elements of the model of Clark and Wells (1995), while the CBM training was based on the vulnerability model (Ouimet et al., 2009).

The cognitive behavioral group training consisted of 10 sessions of training, once a week at school, immediately after school hours. Following the guidelines and previous evidence we chose to put together a program containing psychoeducation, task concentration training, cognitive restructuring, and exposure exercises. During psychoeducation adolescents received information about anxiety and its

characteristics in general and about social and test anxiety in particular. After psychoeducation adolescents continued with task concentration training, in which they learned to consciously switch or focus their attention to the task at hand. Next, they received cognitive restructuring, which focuses on identifying and adjusting dysfunctional thoughts. The final part of the program consisted of exposure exercises, where the adolescents had to actively face the situations they feared in a gradual order.

The cognitive bias modification (CBM) consisted of 20 sessions of training, twice a week, delivered through internet, and to be completed in the home environment. The choice for the frequency and intensity was based on comparability with the CBT training. Both groups of participants received during a period of ten weeks training, for 1.5 hours a week per person. Participants received emails with links to the 20 training sessions. After completing a session participants received an email complimenting them on the fulfilled training session. The composition of the CBM training was based on the kitchen sink approach, meaning that we put in several different CBM training methods, to get the maximum result. We chose to put in four different variants, firstly an interpretation bias retraining, following the CBM-I training by Mathews and Mackintosh (2000), in which participants were presented with ambiguous scenarios that were followed by word fragments that are to be solved in a benign direction. Second, we added an attention bias retraining based on the visual probe task and the exogenous cueing task (Amir, Beard, Burns, & Bomyea, 2009), with the main aim to learn participants to point their initial attention towards positive or neutral stimuli and away from negative or threatening stimuli. Third and fourth less well established tasks were added, namely a task to strengthen the association between social situations and positive outcome and an evaluative conditioning task to enhance implicit self-esteem.

Predicting intervention success

As mentioned in part I, it is important to look at BIS, FFFS, and AC as possible risk factors for internalizing disorders. However, next to being a risk factor for the development of disorders, it could be that these temperamental factors moderate the efficacy of interventions designed to reduce social and test anxiety. Thus adolescents high on BIS or FFFS and low on AC might not only be more at risk for developing these disorders, but when showing symptoms, they may also have a

smaller chance at a good treatment result. Up to our knowledge, no studies have been done so far looking into the role of temperamental factors as a moderator of treatment success in children and adolescents.

To conclude

In this thesis I will look into (i) BIS, FFFS, and AC and their relationship with internalizing symptoms cross-sectionally as well as longitudinally, (ii) the (differential) efficacy of two early intervention methods to reduce social and test anxiety, and (iii) how pretest levels of BIS, FFFS, and AC relate to the efficacy of the early intervention methods.

Chapter 2

Behavioral Inhibition and Attentional Control in Adolescents: Robust Relationships with Anxiety and Depression

Abstract

Behavioral inhibition (BIS) has been associated with the development of internalizing disorders in children and adolescents. It has further been shown that attentional control (AC) is negatively associated with internalizing problems. The combination of high BIS and low AC may particularly lead to elevated symptomatology of internalizing behavior. This study broadens existing knowledge by investigating the additive and interacting effects of BIS and AC on the various DSM-IV based internalizing problems dimensions. A sample of non-clinical adolescents (N = 1806, age M = 13.6 years) completed the Behavioral Inhibition System/Behavioral Activation System Scales (BIS/BAS), the attentional control subscale of the Adult Temperament Questionnaire (ATQ) and the Revised Child Anxiety and Depression Scale (RCADS). As expected, BIS was positively, and AC was negatively related to internalizing dimensions, with stronger associations of BIS than of AC with anxiety symptoms, and a stronger association of AC than of BIS with depressive symptoms. AC moderated the association between BIS and all measured internalizing dimensions (i.e., symptoms of generalized anxiety disorder, social phobia, separation anxiety disorder, panic disorder, obsessive-compulsive disorder, and major depressive disorder). Results of re-analyses with BIS split in BIS and FFFS showed a main effect for BIS, FFFS, and AC, and an interaction effect for BISxAC, but not FFFSxAC. Since high AC may reduce the impact of high BIS on the generation of internalizing symptoms, an intervention focused on changing AC may have potential for prevention, early intervention and treatment of internalizing disorders.

Introduction

The temperamental factors behavioral inhibition (BIS)[1] and attentional control (AC) have often been associated with the development of internalizing behaviors in youth as well as in adults (Johnson et al., 2003; Jorm et al., 1999; Muris, Meesters, de Kanter, & Eek Timmerman, 2005). BIS can be seen as reactive temperament and represents a proneness towards anxiety and a sensitivity towards signals of punishment and non-reward (Carver & White, 1994). From a developmental point of view one could argue that BIS causes the child to avoid stressful situations, which in turn could enhance the anxious symptoms. AC can be seen as regulative temperament, and represents the ability to focus and switch attention, and is a specific component of the overarching temperament trait of effortful control (Rothbart, Ellis, & Posner, 2004). Reactive temperament involves individual differences in emotional arousability, whereas regulative temperament modulates this reactivity. Eisenberg and colleagues (2000) have proposed that attentional control may especially be important in reducing internalizing symptoms, such as anxiety and sadness in children. As such, AC may be a moderator or buffering factor in the association between BIS and internalizing disorders. High levels of AC would thus prevent those high on BIS to develop anxiety and depression disorders (Muris & Ollendick, 2005; Nigg, 2000).

In support of the view that high BIS sets people at risk for developing internalizing psychopathology, previous work found positive relationships between BIS and symptoms of DSM-IV based anxiety disorders and depression. Cross-sectional studies showed a firm relation between BIS and anxiety in children (Muris & Ollendick, 2005) and between BIS and depression in children (Nigg, 2000). In prospective research Johnson et al. (2003) showed that BIS was associated with anxiety disorders and depression in young adults. Some research has been done into the relevance of AC for the various internalizing disorders. There is empirical evidence that low AC is linked to self-reported anxiety symptoms in children between age 5-8 (Eisenberg et al., 2001), children aged 9-13 (Muris, De Jong, & Engelen,

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[1] Note that in this dissertation we use behavioral inhibition as conceptualized by Gray (1973), which is somewhat different from the concept of behavioral inhibition described by Kagan, Reznick and Snidman (1988).

2004; Muris, 2006), adolescents aged 12-15 (Muris, 2006), and adolescents aged 12-18 year (Vervoort et al., 2011), in addition, it has been shown that effortful control is associated with symptoms of depression in children aged 9-13 (Muris, 2006) and adolescents aged 11-17 (Verstraeten, Vasey, Raes, & Bijttebier, 2009). Prospectively, averaged deficits in attentional control predicted which individuals still had high scores on internalizing problems or even deteriorated over time at time 2 compared to time 1 (Eisenberg et al., 2009). With regard to the proposed moderating role of AC in the association between BIS and internalizing disorders, three previous studies focusing on negative emotionality (similar to behavioral inhibition) have shown that the combination of high negative emotionality and low effortful control was associated with the highest levels of internalizing symptoms (Muris, 2006; Muris, Meesters, & Blijlevens, 2007; Oldehinkel et al., 2007).

Thus far research on BIS, AC, and their interaction has focused on specific disorders (e.g., social phobia), or on internalizing behavior in general. It remains therefore to be examined whether low AC, and/or high BIS can be best considered as more general characteristics of people suffering from symptoms of anxiety and/or mood disorders, or that the importance of low AC and/or high BIS varies across the various internalizing disorders. The same holds for the proposed synergistic influence of AC and BIS on the development of anxiety and mood symptomatology.

From a theoretical point of view we have no a priori reason to believe that BIS and AC are more relevant to some anxiety disorders than others (see also Nigg, 2000). The various etiological models of specific DSM-IV anxiety disorders include both the presence of BIS as a proneness towards perceived threat as well as the absence of AC as an impairment in the ability to regulate this proneness towards perceived threat. In these models the tendency to perceive threat involves negative social evaluations as in social phobia (Clark & Wells, 1995) , loss of control as in panic disorder (Clark, 1986), future disaster as in generalized anxiety disorder (Wells, 2005), and so forth, while low AC constitutes the inability to disengage attentional focus from such threat stimuli (Clark & Wells, 1995; Wells, 2005). While we thus regard BIS as relevant for all anxiety disorder, depressed individuals are not primarily pre-occupied with threat, rather, they have a negative focus on self, the future, and the world (Beck, Rush, Shaw, & Emery, 1979). Such a negative focus is dissimilar to BIS as defined as a proneness towards anxiety and a sensitivity towards signals of punishment and non-reward (Carver & White, 1994). However, AC does

have a role in the model by Beck (1979), in which depressed people are unable to switch their attention away from their negative thoughts. Note that none of the existing theoretical models of anxiety and depression are explicit as to a mutually enhancing effect of high BIS and low AC or, alternatively, on a buffering role of AC on the relation between BIS and anxiety and depression. The above leads to the hypothesis that both BIS and AC will play an important role in all anxiety disorders. In depression, however, we hypothesize a smaller role for BIS than in anxiety disorders and a similar role for AC compared to anxiety disorders. Intuitively, the proposed synergistic effect is plausible for all anxiety disorders as well as for depression, and this will be explored.

In sum, the present study seeks to expand our insights into the role of low AC combined with high BIS in symptoms of the various DSM-IV anxiety and mood disorders. In addition to considering main effects we will test the hypothesis that AC may exert its protective effect mostly among those who are highly behaviorally inhibited (i.e., as a moderator). We extend previous work by studying the full range of anxiety and mood symptomatology, and expect a substantial role for BIS and AC in all symptomatology related to the main anxiety disorders, and a more substantial role for AC than for BIS in depressive symptomatology.

Method

Participants and Procedure

As part of large scale anxiety early intervention study a total number of 5318 adolescents in the first and second year of regular secondary schools in the northern part of the Netherlands were invited to participate in a screening with the main goal of detecting adolescents with low to moderate levels of anxiety. The invitation was sent out to adolescents and their parents via the attended school. Both parents and adolescents had to sign an informed consent. Of the 5318, 1806 adolescents and their parents (34%) gave their active informed consent for participation in the current study (813 boys and 993 girls, mean age 13.6 yrs, *SD* = .66). Of the participants, 68% came from a rural area and 32% from an urban area, as defined by Statistics Netherlands (http://www.zorgatlas.nl/beinvloedende-factoren/demografie/groei-en-spreiding/bevolkingsdichtheid-per-gemeente) and following Reijneveld et al.(2010). Furthermore, 97.1% of the participants had the Dutch nationality, with at least one

Dutch parent, 2,9% of the participants were non-Dutch with at least one non-Dutch parent, 85,6% of the participants was living with their non-divorced biological parents. The assessment took place at school in groups of 15 participants at maximum. All questionnaires were completed on a laptop computer in the presence of a research assistant. At item level there are no missing data since the assessment took place on computers. The current study was approved by the medical ethical committee of the University Medical Center Groningen.

Questionnaires

Symptoms of DSM-IV based anxiety and depression

The Revised Child Anxiety and Depression Scale (RCADS; Chorpita, Yim, Moffitt, Umemoto, & Francis, 2000) is a revised version of the Spence Children's Anxiety Scale (SCAS; Spence, 1998). It is a 47-item self-report, with items rated on a 4-point scale. The questionnaire consists of six scales: separation anxiety disorder (SAD), social phobia (SP), obsessive-compulsive disorder (OCD), panic disorder (PD), generalized anxiety disorder (GAD) and major depressive disorder (MDD). There is an overall scale indicating the total level of internalizing psychopathology. In psychometric research the internal consistency of the scale and subscales were found to be good in a normal as well as a clinical population (Chorpita et al., 2000; Chorpita, Moffitt, & Gray, 2005). The structure of the RCADS was found to be consistent with DSM-IV anxiety disorders and depression. In the current study the following Cronbach's alphas were found: total (α = .95), GAD (α = .84), SP (α = .86), SAD (α = .71), PD (α = .80), OCD (α = .72), and MDD (α = .80). These alphas were slightly higher compared to those reported in the Chorpita et al. study (2000).

Behavioral inhibition

The Behavioral Inhibition/Behavioral Activation System Scales (BIS; Carver & White, 1994) is a 20-item self-report measure, with items rated on a 4-point scale. The BIS-scale measures reactions to the anticipation of punishment. The BAS-scale measures the tendency to approach behavior and positive affect. The psychometric properties of this questionnaire showed sufficient internal consistency for all subscales (Carver & White, 1994). It was also shown that early adolescents' data on the BIS/BAS were comparable to those obtained from adults (Cooper, Gomez, &

Aucote, 2007), making the instrument useful for adolescents. We used the BIS-scale in current study, which showed a satisfactory internal consistency (α = .73).

Attentional control

The Adult Temperament Questionnaire (ATQ; Rothbart, Ahadi, & Evans, 2000) is a 77-item questionnaire, with items rated on a 7-point scale, measuring temperament. The instrument is an adaptation from the Physiological Reactions Questionnaire (Derryberry & Rothbart, 1988) and is developed by Evans and Rothbart (Evans & Rothbart, 2007). The ATQ contains four overarching scales; negative affect, extraversion, effortful control, and orienting sensitivity, each in turn consisting of subscales. For the purpose of the current study, the subscale Attentional Control of the scale Effortful Control was used, which measures the ability to focus and switch attention. The internal consistency of the ATQ is found to be good (for more information see: http://www.bowdoin.edu/%7Esputnam/rothbart-temperament-questionnaires/instrument-descriptions/adult-temperament-questionnaire.html). In the current study the subscale Attentional Control had satisfactory internal consistency (α = .71).

Statistical analyses

We used hierarchical regression analyses to relate BIS, AC, and their interaction to anxiety and depression. This was done separately for the following outcome variables: total symptoms (RCADS-TO), generalized anxiety disorder (RCADS-GA), social phobia (RCADS-SP), separation anxiety disorder (RCADS-SA), panic disorder (RCADS-PD), obsessive-compulsive disorder (RCADS-OC) and major depressive disorder (RCADS-DD). Since anxiety and depression tend to be more common in girls than in boys, we included gender as a main effect. In Step 1, the predictor variables gender, BIS and AC were included in the regression equation using forced entry, and in Step 2 the interaction between BIS and AC (BISxAC) was added. BIS and AC were centered following the recommendations by Aiken and West (1991). With regard to gender, none of the interactions with any of the variables were significant or strong enough (i.e. of at least a small effect size of η^2=.01). Therefore, we decided to exclude gender-interactions from further regression analyses (in line with the recommended procedure described by Aiken & West, 1991). Due to restriction of range and no significant correlations between age and other variables, age was not included in our final analyses.

Results

Descriptive Statistics

Means, standard deviations, correlations and gender differences for all measures can be found in Table 2.1. Gender differences were found on all the measures, with girls showing higher levels of anxiety and depression, and more BIS and slightly lower levels of AC than boys.

Symptoms of Anxiety and Depression related to Behavioral Inhibition and Attentional Control

For all dimensions of anxiety and mood problems, inclusion of BISxAC in Step 2 of the regression analysis led to a significant R^2-change. Thus we report findings for the moderator model. Table 2.2 shows the outcomes for all dimensions. Gender was a significant predictor for symptoms of depression and all types of anxiety disorders except obsessive-compulsive disorder. Girls showed higher levels of anxiety and depression compared to boys. In all analyses, BIS, AC and BISxAC showed significant results. Betas indicate that higher levels of BIS and lower levels of AC lead to higher levels of symptoms of anxiety and depression. On top of that, the interaction between BISxAC was also significantly related to all dimensions of anxiety and depression. Looking at possible differences between the various DSM-IV internalizing dimensions, it can be seen in Table 2.2 that for all anxiety problem dimensions, BIS was the strongest predictor, AC the second strongest predictor, and BISxAC the weakest but significant predictor. For depressive problems this picture was different: AC was the strongest predictor, with BIS coming in second place, and BISxAC coming last. For AC, the differences in regression weights between depressive symptoms and the anxiety dimensions is significant, with non-overlapping confidence intervals of B for symptoms of depression ranging from -.28 up to -.24 around point estimate B=-.26, and symptoms of social phobia (being the nearest anxiety interval) ranging from -.21 up to -.13 around point estimate B=-.17. No differences in regression weights for AC were found between the various DSM-IV based anxiety dimensions. For BIS the regression weight of symptoms of social phobia differed significantly from all other DSM-IV based anxiety dimensions as well as from symptoms of depression (social phobia: .75 up to .87 around point estimate B= .81 compared to nearest interval for panic disorder: .31 up to .39 around point

Table 2.1. Correlations, Means and SD for Internalizing Dimensions, and Gender Differences on Each Variable (N = 1806)

	TOT	GA	SP	SA	PD	OC	DD	BIS	AC	Mean	SD	Gender differences	
												F	p
Total	-									25.95	16.42	154.42	<.001
Generalized anxiety	.84*	-								4.12	2.98	124.18	<.001
Social phobia	.88*	.68*	-							8.07	4.79	145.37	<.001
Separation anxiety	.77*	.63*	.65*	-						2.18	2.36	203.40	<.001
Panic disorder	.84*	.64*	.66*	.58*	-					3.45	3.35	90.99	<.001
Obsessive compulsive disorder	.78*	.61*	.59*	.53*	.62*	-				2.70	2.57	19.31	<.001
Depressive disorder	.83*	.61*	.64*	.54*	.66*	.59*	-			5.44	3.73	86.68	<.001
Behavioral inhibition	.66*	.55*	.71*	.55*	.51*	.48*	.46*	-		18.08	3.51	104.14	<.001
Attentional control	-.54*	-.40*	-.47*	-.38*	-.44*	-.42*	-.52*	-.47*	-	20.40	5.81	5.81	.016
Age	-.02	-.02	-.01	-.04	.01	-.03	-.01	-.02	-.01	13.58	0.66	1.56	.22

Note. * p < .001. All gender differences, df (1,1804).

Table 2.2. Results of Hierarchical Regression Analysis for Variables Predicting DSM-IV based Internalizing Dimensions (N = 1806)

Dependent		Predictor	R^2 change	B	SE	ß
Total	1	Gender	.522**	4.90	.54	.15
		BIS		2.27	.09	.48
		AC		-.90	.05	-.32
	2	BISxAC	.018**	-3.33	.39	-.14
Generalized anxiety disorder	1	Gender	.325**	.88	.12	.15
		BIS		.34	.02	.40
		AC		-.11	.01	-.21
	2	BISxAC	.012**	-.50	.09	-.11
Social phobia	1	Gender	.544**	1.17	.16	.12
		BIS		.81	.03	.59
		AC		-.17	.02	-.21
	2	BISxAC	.014**	-.87	.11	-.12
Separation anxiety disorder	1	Gender	.360**	.99	.09	.21
		BIS		.28	.02	.42
		AC		-.08	.01	-.19
	2	BISxAC	.016**	-.44	.07	-.13
Panic disorder	1	Gender	.325**	.79	.13	.12
		BIS		.35	.02	.36
		AC		-.16	.01	-.28
	2	BISxAC	.018**	-.67	.10	-.14
Obsessive-compulsive disorder	1	Gender	.256**	.06	.11	.01[n.s.]
		BIS		.23	.02	.32
		AC		-.12	.01	-.28
	2	BISxAC	.007**	-.31	.08	-.082
Major depressive disorder	1	Gender	.343**	1.00	.15	.13
		BIS		.26	.02	.24
		AC		-.26	.01	-.41
	2	BISxAC	.009**	-.53	.11	-.10

Note. ** p < .001. All shown variables were significant at .000, except for gender on obsessive-compulsive disorder.

estimate B = .35). A closer look into the strength of the association of BIS within the various anxiety dimensions showed that the differences were small and that all regression weights had an overlap with at least two other anxiety dimensions. These differences were therefore considered as less relevant. No differences were found between regression weights for the interaction term BISxAC in the various DSM-IV-based internalizing symptomatologies.

Figure 2.1 displays the interaction effect for internalizing complaints in general. As can be seen in Figure 2.1, if participants have high scores on BIS their score on internalizing symptoms is higher, this is also the case in reverse for AC, were low AC is related to higher scores on internalizing symptoms. The highest scores are found for participants with high BIS in combination with low AC, this interaction effect is significant.

Figure 2.1. Interaction effects of Behavioral Inhibition and Attentional Control for DSM-IV based Internalizing Complaints (RCADS total subscale)
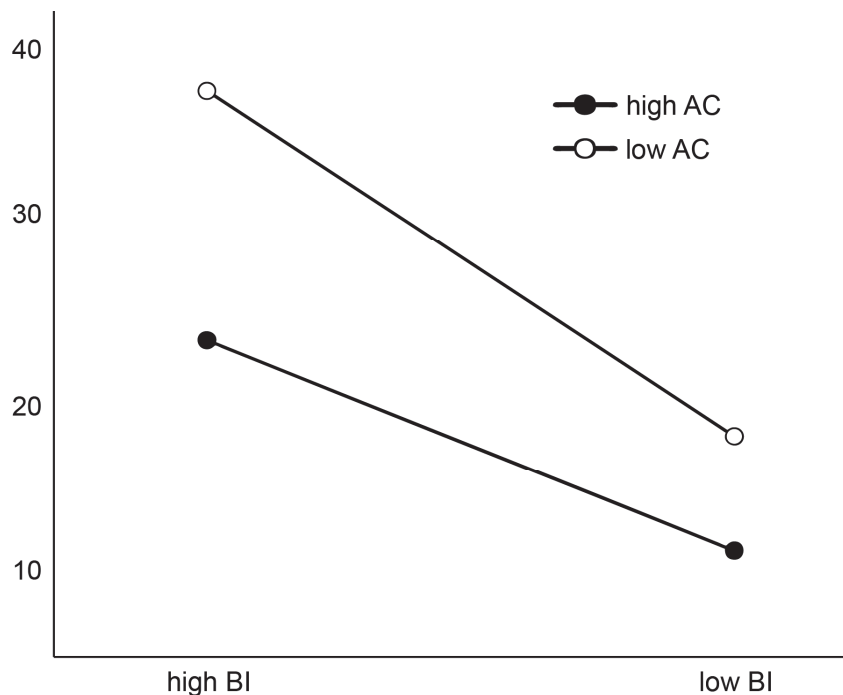
Discussion

The present study examined the independent and joint associations of BIS, AC, and their interaction with DSM-IV based internalizing problems. Results of the current study can be summarized as follows: (i) BIS was positively and AC was

negatively related to the severity of symptoms of all DSM-IV based internalizing, (ii) the BISxAC interaction effect consistently showed cumulative predictive validity where high AC reduced the effect of BIS on all DSM-IV based internalizing problem dimensions, (iii) in symptoms of depression, AC played a larger role than in the DSM-IV based anxiety dimensions. Symptoms of depression were most strongly related to AC, while symptoms of social phobia, separation anxiety disorder, generalized anxiety disorder, panic disorder and obsessive compulsive disorder were most strongly related to BIS.

Replicating previous research (e.g., Johnson et al., 2003; Muris et al., 2005), the present results showed a robust relationship between high BIS and DSM-IV based internalizing disorders. Next to that our results broaden current knowledge by showing this relation for different DSM-IV based anxiety disorders. Importantly, a negative and robust association was also found for low AC, as was shown before by Eisenberg (2001). Although BIS systematically showed the strongest relationship with symptoms of anxiety, AC was also found to have substantial additional explanatory power to symptoms of DSM-IV anxiety disorders. Thus the present results indicate that low AC is an important additional characteristic of all DSM-IV based anxiety domains. Comparing the various DSM-IV based disorders, it appears that for symptoms of social phobia BIS is significantly more influential than in the other measured dimensions. This difference however may be due to the fact that the items in the BIS subscale partly focus on a sensitivity for social evaluation, hence, to the specific operationalization of BIS in the present study (Carver & White, 1994), rather than reflecting a stronger association with social phobia per se. These findings would hold only if the results were replicated using different models such as the Kagan model of BIS (Kagan et al., 1988) or the broader construct of negative affectivity from the temperament model of Rothbart (2000). For all other DSM-IV based anxiety disorders, the strength of the association with BIS was highly similar. For symptoms of depression, we found that AC plays a larger role than for the DSM-IV based anxiety dimensions which was according to expectations. Also as expected, no differences emerged across the various anxiety dimensions with respect to AC.

Perhaps most important, BISxAC independently contributed to the model. This again was a robust finding in all measured anxiety and depression dimensions. These results are consistent with previous research that focused on the role of

effortful control in internalizing problems in general (Oldehinkel et al., 2007), in depression (Muris, 2006; Verstraeten et al., 2009), and in anxiety (Muris et al., 2004). These findings extend previous findings by showing that this buffering effect holds for symptoms of generalized anxiety disorder, social phobia, separation anxiety disorder, panic disorder, obsessive-compulsive disorder, and major depressive disorder. The results are consistent with the view that high AC may function as a buffer between BIS and the development of DSM-IV based internalizing complaints (Muris & Ollendick, 2005), while individuals with high BIS combined with low AC report the highest levels of DSM-IV based internalizing symptoms. If prospective studies would show that high BIS and low AC precede DSM-IV based internalizing symptoms, this might be of importance for identifying adolescents at high risk of developing an anxiety or mood disorder. It should be noted however that the interaction had small additive value on top of BIS and AC, with BIS and AC each having the largest associations, thus the identification of potentially at risk adolescents should focus primarily on high BIS or low AC.

Our results are not only of theoretical interest but also provide clues for clinical interventions. More specifically, our findings support the view that training AC might be a helpful strategy in the prevention and/or treatment of internalizing disorders. In support of this, there is already some preliminary evidence for the useful application of cognitive control training in depressed adults (Siegle, Ghinassi, & Thase, 2007) and of task concentration training in social phobia (Mulkens et al., 2001). It would be interesting to see whether also in children and/or adolescents AC training would help to reduce symptoms of internalizing disorders. In a similar vein it would be interesting to examine whether AC training may also be helpful in the prevention of the onset or recurrence of internalizing disorders in adolescence.

One possible limitation is that AC was assessed by a self-report measure. It cannot be ruled out that subjective AC does not (completely) match with actual capacity of self-regulation by AC (Reinholdt-Dunne, Mogg, & Bradley, 2009). It would therefore be important for future research to test whether similar results would emerge when using a behavioral measure of executive functioning (EF) such as the Attentional Network Task (Fan, McCandliss, Sommer, Raz, & Posner, 2002; Reinholdt-Dunne et al., 2009). Some promising research in this field has been done by Derakshan (2009), who showed that in undergraduate students anxiety is related to attentional control as measured by task-switching tasks. Adding a parent or

teacher report of AC may be another helpful strategy to differentiate between individuals' perception of their AC and their actual capacity to regulate their attention. This differentiation is also of importance for training applications, with training either focused on direct training AC through a specific attentional control training or focused on changing the perceptions of AC, for instance through cognitive therapy, or both.

Second, the present sample may have been prone to selection bias, since invited adolescents were all informed beforehand on the nature of our research. That is, the current data were collected as part of a large screening with the ultimate aim to select groups of adolescents to be included in training for the prevention of anxiety. When comparing the means on the self-report questionnaire (RCADS) with same aged adolescents measured in the context of a large longitudinal cohort study in the Netherlands (Van Oort, Greaves-Lord, Verhulst, Ormel, & Huizink, 2009), the adolescents in our sample have higher scores on all DSM-IV based internalizing dimensions. However, there seems to be no obvious reason to assume that the present correlational findings would be different in a less anxious sample.

Third, one could argue that in particular the cross-sectional study of the association between BIS and anxiety is somewhat tautological. While the BIS scale measures the predisposition to anxiety, the DSM-IV scales measure the actual experience, i.e., the state, of anxiety (Jorm et al., 1999). We acknowledge that these measurements are likely to be confounded by one another. Nonetheless, the association between BIS and anxiety and mood disorders has already been established prospectively, as well as by means of different methods and operationalizations of the BIS construct (Biederman et al., 1993; Kagan et al., 1988). The additional value of the current paper lies in the fact that we showed that AC had additional value above and beyond BIS for all DSM-IV based anxiety and mood problems, by itself and in interaction with BIS.

Finally, it should be acknowledged that the cross-sectional design of our study does not allow any firm conclusion regarding the direction of found associations. To arrive at more solid grounds in this respect it would be important to test presently found associations in a longitudinal design and to determine prospectively whether the combination of AC and BIS and their interaction have prognostic value for the onset of mood and/or anxiety disorders.

To conclude, both high BIS and low AC were found to have independent and mutually enhancing associations with all anxiety and depression dimensions that were derived from the DSM-IV. Since AC may buffer the relationship between BIS and internalizing problems as well as protect for internalizing problems by itself, the training of attentional control strategies may be a promising route for modifying or preventing symptoms of anxiety and depression in adolescents.

Addendum

After the publication of this article, while working on chapter 3, the renewed RST (Gray & McNaughton, 2000) seemed important and relevant to use for analyses. However, in this paper we had chosen to use the BIS-scale as one scale, instead of dividing it into a BIS-scale and a FFFS-scale. For the clarity of line of reasoning in this thesis adding a section with the analyses with the two subscales seemed essential. Thus, in addition to the analyses above, the regression analyses were repeated with the BIS-scale divided into BIS and FFFS as described in chapter 1, and in line with chapter 3. We performed regression analyses with all subscales of internalizing symptomatology as dependent variables, entering the following independent variables: BIS, FFFS, AC (main effects), and BISxAC, FFFSxAC, BISxFFFS, BISxFFFSxAC (interaction effects).

Table 2.3. Means, SD, Correlations, and Gender Differences on BIS, FFFS, and AC (N = 1811)

	BIS	FFFS	AC
Mean	10.09	7.99	20.40
SD	2.49	1.55	5.81
Gender diff (F / p)	71.06 / <.001	81.24 / <.001	5.48 / .019
Behavioral inhibition	-	.47	-.50
Fight-Flight-Freeze	.47	-	-.33
Attentional control	-.45	-.33	-

Note. All correlations significant at $p < .01$. All gender differences, df (1,1809).

Table 2.3 shows the means (SD) of the BIS, FFFS, and AC scales as well as the correlations between these scales. Table 2.4 displays the correlations between these scales and the indices of anxiety / depression symptoms. Table 2.5 shows the outcome of the regression analyses for total symptoms, social anxiety, and depressive disorder.

Table 2.4. Correlations for Internalizing Dimensions on BIS, FFFS, and AC (N = 1811)

	BIS	FFFS	AC
Total RCADS	.63	.47	-.54
Generalized anxiety	.50	.37	-.40
Social phobia	.69	.49	-.47
Separation anxiety	.50	.43	-.38
Panic disorder	.48	.38	-.44
Obsessive-compulsive disorder	.45	.29	-.42
Depressive disorder	.45	.31	-.52

Table 2.5. Results of Hierarchical Regression Analysis for Variables Predicting DSM-IV based Internalizing Dimensions (N = 1811)

Dependent		Predictor	R^2 change	*B*	SE	*ß*
Total	1	Gender	.526**	4.93	.54	.15
		BIS		2.64	.13	.40
		FFFS		1.58	.19	.15
		AC		-.89	.05	-.31
	2	BISxAC	.020**	-0.14	.02	-.14
Social phobia	1	Gender	.552**	1.19	.15	.12
		BIS		.97	.04	.50
		FFFS		.53	.06	.17
		AC		-.16	.02	-.20
	2	BISxAC	.015**	-.04	.01	-.12
Major depressive disorder	1	Gender	.346**	1.01	.15	.14
		BIS		.33	.04	.22
		FFFS		.12*	.05	.05
		AC		-.26	.01	-.40
	2	BISxAC	.009**	-.02	.01	-.10

Note. ** $p < .001$. All shown variables were significant at .0001, except * at $p < .05$.

The results of the regression analyses show a significant main effect for BIS, FFFS, and AC on all measured internalizing symptoms and an interaction effect for BISxAC on all subscales. An interaction between FFFSxAC was only found for the OCD-subscale. These results indicate that various internalizing symptoms are related to attentional control as we had already found above, and also to the separate constructs BIS and FFFS. This indicates that the freeze-flight-fight-system, responsible for feelings of fear and reaching safety as well as behavioral inhibition,

the goal-directed system activated upon conflict are independently related to all measured internalizing symptoms.

In the results section above, we showed that a combination of BIS and AC was associated with higher levels of anxiety and depression. Looking more closely at BIS and FFFS, we found that this was especially the case for the interaction between BIS and AC and not so much for the interaction between FFFS and AC (with an exception for OCD). Thus, in case of a goal-directed conflict, combined with a difficulty to direct attention (e.g., towards solutions) adolescents report higher levels of internalizing symptoms. The relationship between high FFFS and internalizing symptoms seems largely independent of AC as FFFS contributed only as a main factor.

Chapter 3

Predicting Internalizing Symptoms over a two year period by Behavioral Inhibition, the Fight-Flight-Freeze-system and Attentional Control

Abstract

Identifying risk factors for the development of internalizing disorders is of major importance. In this context, behavioral inhibition (BIS), the fear-flight-fight-system (FFFS), and attentional control (AC) have been proposed as being possible risk factors for both anxiety disorders and depression. Even though related cross-sectionally, it is still unclear whether these factors are precursors for internalizing disorders. In this longitudinal study, 1811 participants (aged 12-15) completed questionnaires on BIS/FFFS, AC, and internalizing symptoms at pretest and at two years follow-up. Supporting the alleged importance of BIS/FFFS and AC in the development of internalizing symptoms, BIS/FFFS and AC showed predictive value for anxiety and depression symptoms at two years follow-up. For anxiety symptoms this predictive value was not independent of the level of symptoms at pretest. For depression symptoms, AC showed predictive value over and above pretest level of depression symptoms. In the context of early detection of at risk adolescents, results suggest that screening of current anxiety and depression symptoms is most relevant in addition to a focus on AC for the screening of depression. However, it cannot be ruled out that at a further extended follow-up also BIS/FFFS might show independent predictive value for symptoms of anxiety and/or depression.

Introduction

There is growing evidence that temperamental factors are involved in the development of internalizing disorders (e.g., Muris & Ollendick, 2005). Among these temperamental factors behavioral inhibition (BIS), fear-flight-fight-system (FFFS), and attentional control (AC) appear to be important (e.g., Johnson et al., 2003). The concepts of BIS and FFFS have been conceptualized in the reinforcement sensitivity theory (RST) by Gray (1982), and later on revised by Gray and McNaughton (2000). According to the RST, FFFS gives rise to feelings of fear together with responses aimed at reaching safety. BIS is considered as a goal-directed system, which is activated upon conflict within FFFS or BAS or between FFFS and BAS. FFFS is hypothesized to be specifically involved in panic disorder and social phobia, whereas BIS would underlie all anxiety disorders and depression (e.g., Corr, 2008). Since empirical research so far has primarily focused on BIS rather than making the distinction between BIS and FFFS, most previous evidence concerning BIS might also cover FFFS.

The positive relationship between symptoms of internalizing disorders and BIS has been established cross-sectionally for various kinds of anxiety related disorders (e.g., Corr, 2008). The cross-sectional relationship between depression symptoms and BIS is also well-established, with several studies reporting a link between depression and BIS (e.g., Johnson et al., 2003).

AC is the ability to focus and switch attention, and might also be involved in the etiology and maintenance of internalizing disorders (Rothbart et al., 2004). It can be seen as part of regulatory temperament: high AC would provide a person with the ability to inhibit a dominant response (Rothbart & Bates, 1998). Accordingly, adolescents low in AC might be vulnerable for internalizing disorders because they are less able to direct attention away from anxiety and/or depression provoking stimuli (switching), and are at the same time less able to focus their attention on the task at hand (focusing; Sportel, Nauta, De Hullu, De Jong, & Hartman, 2011).

Previous cross-sectional research showed a robust negative relation between AC and symptoms of social anxiety, generalized anxiety, separation anxiety, obsessive-compulsive disorder, panic disorder, and depression (Muris, 2006; Muris et al., 2008; Vervoort et al., 2011). In anxiety disorders the link with BIS is stronger

than with AC, whereas for depression symptoms AC holds a stronger link compared to BIS (Sportel et al., 2011).

Besides the relationship between AC and BIS on the one hand and internalizing disorders on the other, there is evidence that a combination of high BIS and low AC is associated with the highest levels of anxiety (e.g., Sportel et al., 2011). These findings suggest that especially adolescents with both high BIS and low AC are at risk for developing an anxiety disorder. A combination of high BIS and low AC has also been found to be related to symptoms of depression (Sportel et al., 2011). How FFFS would fit into this picture has not yet been the focus of empirical research. Since FFFS is assumed to be specifically related to social phobia and panic disorder, we expect highest levels of social anxiety and panic symptoms in adolescents with combined high FFFS and low AC.

The studies mentioned above employed a cross-sectional design, and thus no conclusions can be drawn regarding the direction of the reported relationships. In an attempt to test further the alleged role of temperamental factors in the development of internalizing symptoms, Van Oort and colleagues (Van Oort et al., 2011) used a longitudinal approach, and showed a predictive relationship between low effortful control (an overarching concept containing AC, activation control, and inhibitory control) and heightened future levels of anxiety in adolescents.

The current study was designed to replicate and extend this important finding. Following a similar longitudinal approach we tested whether in addition to AC also the separated systems BIS and FFFS have independent predictive validity for future symptoms of internalizing disorders. This approach also allowed us to test whether especially the combination of low AC and high BIS or FFFS might be involved in the development of internalizing disorders. Moreover, we not only tested the prognostic value of BIS, FFFS, and AC for the development of anxiety symptoms but also for the development of depression symptoms. This study focussed on early adolescence, since the onset of anxiety and depression symptoms is associated with this age group (Kessler et al., 2005). Following from the above, we hypothesized that high BIS, high FFFS (for social anxiety and panic disorder), and low AC at pretest would be predictive of higher internalizing symptoms at follow-up. In addition, we expected that individuals with a combination of high BIS and/or FFFS with low AC would be especially at risk for developing internalizing complaints.

Previous research showed that the initial level of internalizing symptoms is also strongly associated with future levels of internalizing symptoms. This has been shown for depression and anxiety over a two-year period in adolescents aged 12-17 (O'Connor et al., 2010; Sears & Armstrong, 1998), and for the period of preadolescence until 16, and from 16 up to 17.5 years (Bosquet & Egeland, 2006). However, these studies did not include temperamental factors. It remains therefore unclear whether temperamental factors have prognostic value over and above the level of baseline symptoms. Since the present study included both baseline measures of internalizing symptoms and measures of AC, BIS, FFFS, the present design allowed to test to what extent the alleged predictive value of temperamental factors is independent of the level of baseline symptoms.

Method

Participants and Procedure

As part of an early intervention study, a large group of adolescents (816 boys; 995 girls, mean age 13.7 yrs, SD = .71) in the first or second year of 25 secondary schools in the northern part of the Netherlands were screened with the main goal of detecting adolescents with 'at risk' levels of anxiety. As part of the procedure, all participants were invited for a follow-up of the screening two years later. At two year follow up 1161 participants completed the assessment (534 boys and 627 girls, mean age 15.6 yrs, SD = .71). Participants were tested group wise at school. Questionnaires were completed on a laptop computer in the presence of a research assistant. At item level there are no missing data since the assessment took place on computers. At participant level, there was 35.9% missing data at the two year follow up. The study was approved by the medical ethics committee of the University Medical Center Groningen.

Questionnaires

Symptoms of DSM-IV based anxiety and depression

The Revised Child Anxiety and Depression Scale (RCADS; Chorpita et al., 2000) is a 47-item self-report questionnaire, with items rated on a 4-point scale (0-3). It consists of six scales: separation anxiety disorder (SAD), social phobia (SP), obsessive-compulsive disorder (OCD), panic disorder (PD), generalized anxiety

disorder (GAD) and major depressive disorder (MDD). There is an overall scale indicating the total level of internalizing psychopathology. In this sample the Cronbach's alphas at pretest were as follows: total (α = .95), GAD (α = .84), SP (α = .86), SAD (α = .71), PD (α = .80), OCD (α = .72), and MDD (α = .80).

Behavioral inhibition/Freeze-Flight-Fight-System

The Behavioral Inhibition/Behavioral Activation System Scales (BIS; Carver & White, 1994) is a 20-item self-report measure, with items rated on a 4-point scale (1-4). We used the BIS/FFFS-scales in the current study. The psychometric properties of this questionnaire showed sufficient internal consistency for all subscales (Carver & White, 1994). The BIS-scale showed a satisfactory internal consistency at pretest (α = .71), the FFFS-scale showed an internal consistency at pretest of (α = .45). Due to this low internal consistency the results of the FFFS-scale should be interpreted with care.

Attentional control

The Adult Temperament Questionnaire (ATQ; Rothbart et al., 2000) is a 77-item questionnaire, with items rated on a 7-point scale (1-7). For the purpose of the current study, the subscale Attentional Control (AC) of the scale Effortful Control was used, which measures the ability to focus and switch attention. In the current study the AC subscale had satisfactory internal consistency (α = .71).

Missing data

Not all participants who completed the pretest (N = 1811) also completed the follow up assessment (n = 1161). Possible reasons for this drop out were: 1. went to another school, 2. did no longer want to participate, or 3. did not show up during the assessments. To optimally deal with the missing data we used multiple imputation (Jelicić, Phelps, & Lerner, 2010). Missing data was imputed 40 times using PASW Statistics18.0, based on all available data from pretest and RCADS subscales from two year follow-up. Multiple imputation renders pooled results over all performed imputations. All analyses were performed on the original data as well, which yielded similar, although somewhat larger effects.

Statistical analyses

We used hierarchical regression analyses to predict anxiety and depression from BIS, FFFS, AC, and their interactions. All outcome variables were measured at two

year follow-up, while the predictor variables were measured at pretest. The hierarchical regression analyses were done separately for: total RCADS symptoms, generalized anxiety disorder, social phobia, separation anxiety disorder, panic disorder, obsessive-compulsive disorder, and symptoms of major depressive disorder. Since anxiety and depression tend to be more common in girls than in boys, we included gender as a main and interaction variable. With regard to gender, none of the interactions with any of the variables were significant (for all effect sizes: η^2 <.01). In line with the recommendations by Aiken and West (1991) we therefore included gender as a main effect only. In the first model, as Step 1, the predictor variables gender, BIS, FFFS, and AC were included in the regression equation using forced entry, and in Step 2 the interactions BIS, FFFS, and AC were added.

Next, we built a second model in which we controlled for the level of anxiety and depression during pretest, by adding the relevant RCADS subscale into the regression. In Step 1, the predictor variables gender, BIS, FFFS and AC were included in the regression equation using forced entry, as well as the relevant RCADS subscale, and in Step 2 the interactions with BIS, FFFS, and AC. Due to restriction of range and lack of significant correlations between age and other variables, age was not included in our analyses.

Results

Descriptives

Table 3.1 shows means and standard deviations for all internalizing measures at pretest and two year follow-up. Table 3.2 shows correlations between measures, with all correlations being in the expected direction.

Predicting anxiety and depression symptoms from BIS, FFFS, and AC

In the first series of models, we looked into the predictive value of BIS, FFFS and AC for internalizing symptoms at two year follow-up. Because the interaction terms had no additive predictive value nor led to a significant R^2-change, they were removed from the final analyses. BIS showed independent predictive value for the total RCADS, social anxiety, GAD, and OCD, whereas FFFS showed independent predictive value for social anxiety, and separation anxiety (see Table 3.3). AC showed independent predictive value for all types of anxiety symptoms apart from social anxiety as well as for symptoms of depression (Table 3.3). For all models

explained variance was significant, with low absolute percentages, varying from 3% up to 11%.

Table 3.1. Pooled Means and Standard Deviations for all Measures at Pretest and two year Follow-up; t-tests for differences between Pretest and two year Follow-up (N = 1811)

	Pretest		Two year follow-up		*t-test*
	Mean	SD	Mean	SD	t
Total	25.94	16.14	20.49	11.13	14.40*
Generalized anxiety	4.12	2.97	3.28	2.17	11.20*
Social phobia	8.07	4.80	6.96	3.69	9.32*
Separation anxiety	2.17	2.36	1.59	1.66	9.55*
Panic disorder	3.44	3.34	2.42	2.30	12.11*
Obsessive compulsive disorder	2.70	2.57	1.75	1.89	14.22*
Depressive disorder	5.44	3.73	4.55	3.10	9.29*
BIS_anx	10.09	2.49	9.56	2.11	7.66*
FFFS_fear	7.99	1.55	7.33	1.61	13.50*
Attentional control	20.40	5.81	21.57	4.71	-8.01*

Note. * *p* < .001.

Table 3.2. Pooled correlations for all measures (imputed data, N = 1811)

Two year follow-up	Subscale pretest-two year follow-up°	Pretest BIS_anx	Pretest FFFS_fear	Pretest AC
Total	.38	.24	.18	-.21
Generalized anxiety	.35	.11	.13	-.14
Social phobia	.35	.27	.22	-.16
Separation anxiety	.30	.16	.15	-.13
Panic disorder	.31	.13	.11	-.13
Obsessive compulsive disorder	.29	.13	.08	-.14
Depressive disorder	.35	.17	.10	-.21
BIS_anx	-	.30	.20	-.17
FFFS_fear	-	.22	.28	-.12
Attentional control	-	-.17	-.10	.35

Note. All correlations are significant at p < .001.

Table 3.3. Pooled results of hierarchical regression analysis for variables predicting DSM-IV based internalizing dimensions (N = 1811)

Dependent	Predictor	R^2 change	*B*	SE
Total	Gender	.113***	4.41***	0.52
	BIS_anxiety		0.55***	0.12
	FFFS_fear		0.31	0.19
	AC		-0.24***	0.05
Generalized anxiety disorder	Gender	.063***	0.62***	0.12
	BIS_anxiety		0.09**	0.03
	FFFS_fear		0.03	0.04
	AC		-0.03*	0.01
Social phobia	Gender	.115***	1.31***	0.19
	BIS_anxiety		0.25***	0.04
	FFFS_fear		0.21**	0.07
	AC		-0.03	0.02
Separation anxiety disorder	Gender	.063***	0.57***	0.09
	BIS_anxiety		0.04	0.02
	FFFS_fear		0.07*	0.03
	AC		-0.03*	0.01
Panic disorder	Gender	.043***	0.62***	0.12
	BIS_anxiety		0.04	0.03
	FFFS_fear		0.05	0.04
	AC		-0.03**	0.01
Obsessive-compulsive disorder	Gender	.026***	0.12	0.10
	BIS_anxiety		0.06*	0.02
	FFFS_fear		<0.01	0.04
	AC		-0.03***	0.01
Major depressive disorder	Gender	.085***	1.14***	0.16
	BIS_anxiety		0.07	0.04
	FFFS_fear		-0.04	0.06
	AC		-0.10***	0.02

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

In a second series of models we looked at the predictive value of BIS, FFFS and AC while controlling for pretest levels of the relevant internalizing symptoms. Again, the interactions between BIS, FFFS and AC were excluded based on lack of significance or minimal effect size. The results of these analyses are summarized in Table 3.4.

Table 3.4. Pooled results of hierarchical regression analysis for variables predicting DSM-IV based internalizing dimensions (N = 1811), including relevant internalizing disorder at pretest

Dependent	Predictor	R^2 change	*B*	SE
Total	Gender	.165***	3.30***	0.52
	Total_pre		0.22***	0.02
	BIS_anxiety		-0.03	0.13
	FFFS_fear		-0.04	0.19
	AC		-0.05	0.05
Generalized anxiety disorder	Gender	.138***	0.46***	0.11
	GA_pre		0.24***	0.02
	BIS_anxiety		<0.01	0.03
	FFFS_fear		-0.02	0.04
	AC		<0.01	0.01
Social phobia	Gender	.150***	1.05***	0.18
	SP_pre		0.21***	0.03
	BIS_anxiety		0.04	0.05
	FFFS_fear		0.10	0.07
	AC		<0.01	0.02
Separation anxiety disorder	Gender	.104***	0.39***	0.09
	SA_pre		0.18***	0.02
	BIS_anxiety		-0.01	0.02
	FFFS_fear		0.01	0.03
	AC		-0.01	0.01
Panic disorder	Gender	.106***	0.45***	0.12
	PD_pre		0.21***	0.02
	BIS_anxiety		-0.03	0.03
	FFFS_fear		-0.01	0.04
	AC		<0.01	0.01
Obsessive-compulsive Disorder	Gender	.085***	0.10	0.10
	OC_pre		0.21***	0.02
	BIS_anxiety		-0.01	0.02
	FFFS_fear		-0.02	0.03
	AC		-0.01	0.01

Table 3.4 *(continued)*. Pooled results of hierarchical regression analysis for variables predicting DSM-IV based internalizing dimensions (N = 1811), including relevant internalizing disorder at pretest.

Dependent	Predictor	R2 change	B	SE
Major depressive disorder	Gender	.144***	0.88***	0.15
	DD_pre		0.25***	0.02
	BIS_anxiety		-0.01	0.03
	FFFS_fear		-0.07	0.05
	AC		-0.04*	0.02

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

Higher levels of internalizing complaints at pretest predicted higher levels of internalizing symptoms at two year follow-up. However, BIS, FFFS, and AC did not show any additive predictive value over pretest anxiety symptoms for anxiety related disorders. For depression, AC did have predictive value over and above pre-test depression symptoms

Discussion

The main results can be summarized as follows; (i) BIS predicted overall internalizing symptoms, symptoms of generalized anxiety disorder, and social anxiety disorder and OCD in particular at two year follow-up, (ii) FFFS predicted social anxiety, and separation anxiety at two year follow-up, (iii) low AC at pretest predicted internalizing symptoms at two year follow-up (except for symptoms of social anxiety), (iv) the interaction between BIS/FFFS and AC was not related to internalizing symptoms at two year follow-up, (v) when controlling for level of pretest anxiety symptoms, BIS, FFFS, and AC showed no cumulative predictive value for anxiety symptoms at two year follow-up, (vi) AC did show cumulative predictive value for depression symptoms at two year follow-up over and above the level of pretest depression symptoms, (vii) all found relationships were independent of gender.

Replicating previous findings, low AC showed prognostic value for future symptoms of anxiety (Van Oort et al., 2011). Since the interaction term of AC and BIS showed no independent predictive value for future levels of anxiety (or depression), no support was found for the view of Lonigan and Phillips (2001) that the role of low AC in the development of internalizing disorders would be especially prominent for those individuals who are also characterized by high levels of BIS.

Importantly, the current study showed that this prognostic value of low AC was not specific for anxiety symptoms but was evident for depression symptoms as well, which accords well with current models of depression emphasizing the crucial role of impaired attentional disengagement from negative self-referent information in the persistence of negative thoughts; a hallmark of depression symptomatology (Koster, De Lissnyder, Derakshan, & De Raedt, 2011). Good control over attention might prevent individuals engaging in prolonged and repetitive negative thoughts, which in turn might help to prevent developing depression symptoms.

With regard to the reactive temperamental factors, results showed that high BIS and high FFFS displayed differential predictive value for the future level of internalizing symptoms. Thus consistent with previous cross-sectional research (Muris et al., 2008; Sportel et al., 2011), the findings best fit the view that BIS, FFFS, and AC have a summative effect in the development of anxiety symptoms. As predicted FFFS was found to be especially relevant for social anxiety (Gray & McNaughton, 2000). In apparent contrast to the hypothesized importance of FFFS in the development of panic disorder (e.g., Gray & McNaughton, 2000), neither BIS nor FFFS scores were predictive for panic symptoms at two year follow-up. One explanation could be that the present age-range was not particularly sensitive to test the predictive validity of FFFS for future PD symptoms, as these symptoms tend to arise at an older age (see Kessler et al., 2005. In line with this, the overall PD symptom scores at two years follow up were rather low. One way to test this explanation would be to repeat the assessment at a future follow-up when the participants are in their mid-twenties.

Consistent with the general finding that girls show a higher prevalence of internalizing disorders than boys (e.g., McLean & Anderson, 2009) also in the current study, girls showed a higher level of anxiety and depression symptoms. In addition, girls displayed higher levels of BI and FFFS together with lower AC. Yet, the relationship between these temperamental factors and internalizing symptoms was similar for boys and girls, and thus seems to represent a more general gender-independent phenomenon. Please note that levels of internalizing symptoms generally declined over the period of two year. A straightforward explanation for this decline is not at hand. However, compared to the TRAILS-sample (Van Oort et al., 2009), our participants started at a higher level of symptoms and thus there could be regression toward the mean.

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In addition, it should be acknowledged that BIS, FFFS, as well as AC lost their predictive value for future anxiety symptoms if corrected for premorbid anxiety. However, controlling for prior anxiety may be a too stringent test. That is, to the extent that BIS, FFFS, and AC indeed play a role in the development of anxiety symptoms, also baseline levels of anxiety will be related to BIS, FFFS, and AC; controlling for baseline anxiety may thus result in throwing out the child with the bath water. In line with this, pretest anxiety symptoms were indeed related to BIS, FFFS as well as AC (see Sportel et al., 2011).

The earlier finding of Van Oort et al. (2011) that effortful control did show predictive value for anxiety symptoms over and above pretest levels of anxiety might be explained by the fact that effortful control represents a more elaborate, overarching construct; in addition to AC, it includes activation control and inhibitory control. Activation control and inhibitory control are both related to actual behaviour, and may thus lead to an actual approach of situations one initially might want to avoid, or an avoidance of situations one initially might want to approach. To gain further insight into the role of AC compared to the other two elements of effortful control experimental manipulation as suggested by Siegle and colleagues (2007) may be a helpful approach. Moreover, it could be fruitful to replicate the current findings by using a behavioral measure of executive functioning such as the Test of Everyday Attention for Children (Manly et al., 2001), since measuring AC by means of a self-report questionnaire might not provide data representing the full concept, as has been shown by Muris and colleagues (2008).

Within the light of the joint subsystems hypothesis (JSH; Corr, 2008), it would also be interesting for future research to investigate to what extent the relationship between BIS and future internalizing symptoms is moderated by BAS, and from this perspective to examine whether BIS and BAS function can be best considered as interdependent subsystems (as suggested by the JSH), or as largely independent subsystems as suggested by the separable subsystems hypothesis (SSH).

A strength of this study is the large number of participants and the longitudinal approach. However, the longitudinal character also brings drop out as a limitation. We solved the problem using multiple imputation, but an imputation remains a statistical procedure and cannot fully replace actual data. Even though results were similar for the original data set without imputation, it cannot be ruled out that the findings might have been different in a complete data set. However, in studies with a

relatively long follow-up period a high drop-out is not uncommon, for example Gillham and colleagues (2007) faced a drop out of over 50%. In our sample drop out was caused mainly by participants that, a. did not want to participate anymore for no or unclear reasons, b. changed schools, and c. were absent during the assessment moments. In addition, the screening took place as part of a broader prevention study of social anxiety, which might have caused a participation bias.

The clinical implications regarding screening and identification of high-risk groups, or regarding the development of interventions is that actual symptoms of anxiety and depression are the most logical target. Temperamental factors appear to be less relevant in this respect. However, when it comes to the prevention of depression it may also be helpful to address AC in identifying at-risk adolescents (cf. Siegle et al., 2007).

To conclude, consistent with the view that high BIS, high FFFS, and low AC sets adolescents at risk for the development or maintenance of internalizing disorders, the current study shows that BIS, FFFS, and AC have cumulative predictive value for the level of future anxiety symptoms in adolescents, although the predictive value of these temperamental factors was no longer significant after controlling for baseline anxiety levels. Specifically AC was found to have independent predictive value for depression symptoms at two years follow up even when controlling for baseline symptom level.

Chapter 4

Cognitive Bias Modification versus CBT in Reducing Adolescent Social Anxiety: A Randomized Controlled Trial

Abstract

Social anxiety is a common mental disorder among adolescents and is associated with detrimental long term outcomes. Therefore, this study investigated the efficacy of two possible early interventions for adolescent social anxiety and test anxiety.

An internet-based cognitive bias modification (CBM; n = 86) was compared to a school-based cognitive behavioral group training (CBT; n = 84) and a control group (n = 70) in reducing symptoms of social and test anxiety in high socially and/or test anxious adolescents aged 13-15 years. Participants (n = 240) were randomized at school level over the three conditions. CBM consisted of a 20-session at home internet-delivered training; CBT was a 10-session at school group training with homework assignments; the control group received no training. Participants were assessed before and after the intervention and at 6 and 12 month follow-up.

At 6 month follow-up CBT resulted in lower social anxiety than the control condition, while for CBM, this effect was only trend-significant. At 12 month follow-up this initial benefit was no longer present. Test anxiety decreased more in the CBT condition relative to the control condition in both short and long term. Interestingly, in the long term, participants in the CBM condition improved more with regard to automatic threat-related associations than both other conditions.

The results indicate that the interventions resulted in a faster decline of social anxiety symptoms, whereas the eventual end point of social anxiety was not affected. Test anxiety was influenced in the long term by the CBT intervention, and CBM lead to increased positive automatic threat-related associations.

Introduction

Social anxiety disorder (SAD) is one of the most common mental disorders in children and adolescents, with about 9.5% of girls and 4.9% of boys facing social anxiety disorder in their adolescent period (14-24 years old; Wittchen & Fehm, 2003). Social anxiety is associated with poor development of social skills, reduced social interactions, low self esteem and lower academic performance (Stein & Kean, 2000), as well as future comorbid anxiety disorders, depression, and substance abuse (Wittchen et al., 2000). Because of the pervasive impact of social anxiety disorder on current and future well-being, early detection and intervention of SAD seems of paramount importance. Previous research has shown that prevention and early intervention in a school setting can be effective in reducing anxiety symptoms and in preventing the onset of anxiety disorders in general, both at short and long term (see Neil & Christensen, 2009 for a review).

Current cognitive models emphasize the role of threat-confirming information processing biases in the development and maintenance of anxiety and imply a reciprocal relationship between fear and threat-confirming cognitive biases (Muris & Field, 2008). Socially anxious people are known to show an attentional bias towards threat (Staugaard, 2010) and to interpret ambiguous information in a relatively negative way (Salemink & van den Hout, 2010). These biased information processes are hypothesized to be an etiological and maintaining factor in anxiety and therefore could serve as a target for symptom reduction and early intervention.

Thus far, most interventions for social anxiety have focused on explicit, verbalizable cognitions, such as Cognitive Behavioral Therapy (CBT). This type of interventions has been shown to be effective in reducing anxiety symptoms (Ginsburg, 2009; Masia-Warner et al., 2005) and in preventing the onset of anxiety disorders in a school setting with effect sizes in the small to moderate range (Neil & Christensen, 2009). Recent research suggests that it might also be feasible to more directly target cognitive biases. There is accumulating evidence that (social) anxiety can be reduced through Cognitive Bias Modification (CBM) procedures focusing on interpretive bias (Beard & Amir, 2008) or attentional bias (Amir et al., 2009). A central aim of this study was to test if CBM might also be efficacious in early intervention and symptom reduction.

Biased information processing is already involved in adolescents with a subclinical level of social anxiety. Recent studies have shown that high socially anxious adolescents, when compared to low-socially anxious adolescents, show relatively more negative automatic threat-related associations (De Hullu, De Jong, Sportel, & Nauta, 2011) and more negative and less positive interpretations of ambiguous social situations (De Hullu, 2012). Both high and low socially anxious adolescents show an initial attentional bias towards threatening faces and words (De Hullu, 2012). In the current study, we designed a Cognitive Bias Modification training to target attentional bias, interpretive bias, dysfunctional associations, and implicit self esteem in socially anxious adolescents. Based on the argument made by Hirsch, Clark, and Mathews (Hirsch, Clark, & Mathews, 2006) that cognitive biases are likely to be mutually reinforcing, we chose to include tasks that modify different biases into one training, thus allowing for effects of the training on interpretive bias to interact with effects on attentional bias and vice versa in an attempt to maximize the efficacy of the training. We combined some well-established paradigms such as a word fragment task to modify interpretive bias (Mathews & Mackintosh, 2000) and a modified visual probe task to modify attentional bias (MacLeod, Rutherford, Campbell, Ebsworthy, & Holker, 2002) with less-often used paradigms, such as a conditioning paradigm to modify implicit social anxiety associations (Clerkin & Teachman, 2010) and a classical conditioning task to amplify self-related positive associations (Baccus, Baldwin, & Packer, 2004).

The CBM intervention was contrasted with a more traditional CBT group training. In the present CBT-based intervention we integrated ingredients that have been shown to be effective in the treatment of social anxiety in children and adolescents. We created an intervention based on current golden-standard treatment protocols (Kendall, Hudson, Choudhury, Webb, & Pimentel, 2005; Masia-Warner, Fisher, Shrout, Rathor, & Klein, 2007), adjusted for the purpose of early intervention in a Dutch sample of adolescents. It has been shown that effective CBT studies in children and adolescents typically used cognitive restructuring and exposure techniques (for a review see Segool & Carlson, 2008). In our effort to tailor the intervention to social anxiety, we added psycho-education based on the model by Clark and Wells (1995). In line with this model emphasizing self-awareness, we also included Task Concentration Training (TCT, Mulkens et al., 2001), which is found to

be effective in reducing social anxiety and is therefore recommended as a treatment for SAD in the Dutch clinical guidelines (www.ggzrichtlijnen.nl).

In short, Cognitive Bias Modification and Cognitive Behavioral Group training were contrasted with a no-treatment control condition. Both types of training were rolled out in a school-based setting and focused on adolescents (age 13-15) with mild to moderate symptoms of social anxiety. Since social anxiety in adolescents often takes the form of test anxiety (e.g., fear of poor performance on tests or in front of an audience (Beidel & Turner, 2007), and reducing test anxiety is a major concern of schools and teachers, we also focused on this component of social anxiety in the content of the interventions and added test anxiety symptoms next to social anxiety as a primary outcome measure in the present design. Finally, since current dual process models emphasize the importance to differentiate between deliberate self-reports and more automatically activated associations (Gawronski & Bodenhausen, 2006), the efficacy of both interventions was not only indexed by structured interviews and self-report questionnaires but also by a performance measure of social anxiety-relevant automatic associations (De Hullu et al., 2011).

Method

Design & Ethics Statement

This study used a multi-arm parallel group approach and employed a stratified design with balanced randomization (1:1:1). It was approved by the medical ethics committee of the University Medical Center Groningen, the Netherlands. All participants, together with at least one parent or caretaker, provided written informed consent prior to the start of the study. The study was registered in the Dutch trial register with number NTR965 (www.trialregister.nl). Power analysis showed that for a medium effect, with a power of .80, within three groups (p = .05) sample size had to be 52 for each condition. Because of anticipated drop-out we aimed at 75 participants per condition. Recruitment took place in 2007 and 2008, all assessments took place between 2007 and 2011.
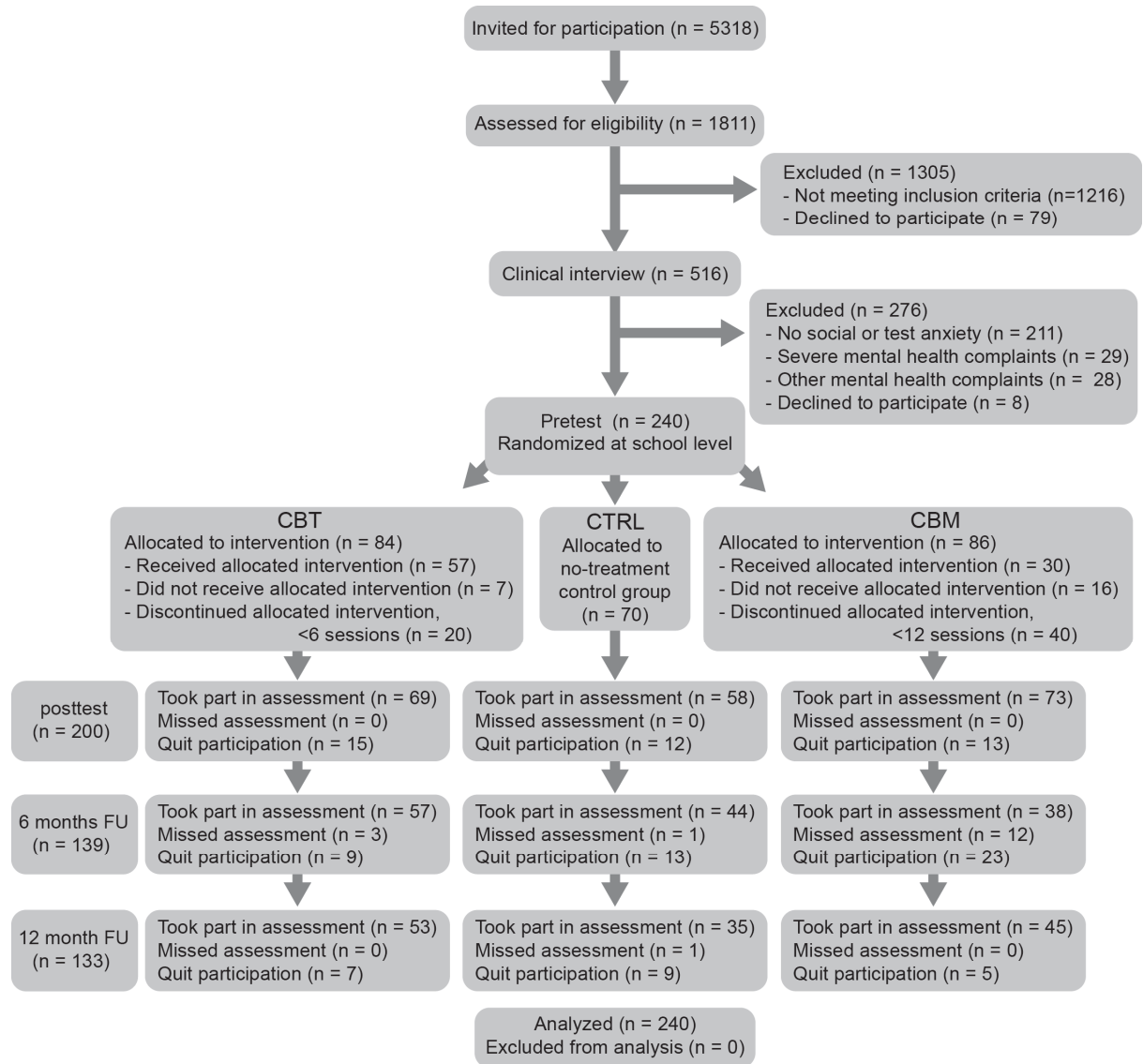
Participants

We invited 5318 adolescents in the first and second year of regular secondary schools in the Northern part of the Netherlands for the initial screening (see Figure 4.1 for flow diagram). Participants who handed in the required informed consent

forms (N = 1811) were screened using the Revised Child Anxiety and Depression Scale (RCADS, Chorpita et al., 2000) and the Spielberger's Test Anxiety Inventory; Van der Ploeg, 1988). Participants scoring above cut-off for social and/or test anxiety (n = 516) were invited for a clinical assessment using the Anxiety Disorders Interview Schedule for Children (ADIS-C; Silverman & Albano, 1996). Used cut-off scores for girls were >10 on RCADS social phobia and >43 on TAI, cut-off scores for boys were >9 on RCADS social phobia and >38 on TAI. The RCADS cut-off scores were based on the 75th percentile in a large Dutch cohort of young adolescents (N = 2230, the TRAILS-study; Huisman et al., 2008), TAI cut-off scores were based on the 75th percentile in the Dutch manual (Van der Ploeg, 1988). Screening took place in two waves, including 12 schools in the first year and 13 schools in the second year.

Based on the ADIS-C, adolescents with low-level social anxiety were included in the current study (N = 240; age 12-15; 66 boys). These adolescents met at least DSM-IV criteria A and B for social phobia, showing fear of negative evaluation in multiple social contexts. Distribution of the ADIS Clinician Severity Ratings (CSRs) of the included participants was: CSR = 4, n = 31; CSR = 3, n = 51; CSR = 2, n = 32; CSR = 1, n = 2; 124 included adolescents did not meet full criteria for SAD and were thus assigned a CSR of 0. For ethical reasons, adolescents with DSM IV diagnoses other than anxiety and/or with severely interfering anxiety diagnoses and/or who expressed a need for regular treatment were referred to regular mental health centers to receive a regular evidence-based intervention. After the pretest, participants were randomized in a stratified design at school-level over one of three conditions (see Figure 4.1). Based on the number of participating adolescents, schools were grouped in three equally sized clusters of three schools. The three clusters of schools were randomly allocated to one of the three conditions. This procedure guaranteed that the number of participants would be similar across conditions. Of the 24 participating schools, 8 schools received CBT, 7 schools CBM, and 7 schools were assigned to the control condition. In two small schools no students were eligible for inclusion. The allocation of the schools was done by the project leader, by blindly drawing same size papers with the conditions CBT, CBM or Control from a bowl (in the presence of the last author). Neither participants, nor researchers supervising the assessments did receive information about the condition until after the pretest, to make sure condition was not of influence in the testing nor in the willingness to participate. Not all participants completed all assessments: post-

test (n = 200), 6 months follow-up (n = 139), 12 months follow-up (n = 133). Drop-out did not differ between conditions.

Figure 4.1. Study overview

Interventions

The CBM intervention consisted of 20 sessions (40 minutes each), delivered twice a week via the internet. Participants received information explaining the rationale of the training. Each week, participants received an e-mail with links to two training sessions (Table 4.1), and were reminded if they did not complete a session. The backbone of CBM consisted of tasks to modify interpretation (9 sessions) and attention bias (8 sessions). The *interpretive bias* modification tasks were constructed along the lines of the CBM-I designed by Mathews and Mackintosh (Mathews & Mackintosh, 2000). Participants were presented with ambiguous social scenarios (60

trials/session) that were followed by word fragments that had to be solved in a benign direction. We added an imagination training to the first session and before each task; participants were instructed to visualize the scenarios, since previous research has shown that this may amplify the task's effectiveness (Holmes, Mathews, Dalgleish, & Mackintosh, 2006).

Table 4.1. Order of tasks in the CBM training

Week	1	2	3	4	5	6	7	8	9	10
First task	IB	ABa	IB	AA	ABb	IB	IB	IB	AA	ABb
				SE	SE				SE	SE
Second task	IB	ABa	AA	IB	ABb	ABa	ABaE	ABb	IB	IB
		SE	SE		SE	SE	SE	SE		

Note. IB = interpretive bias task; ABa = attentional bias task, stimulus disappears at probe onset; ABb = attentional bias task, stimulus remains on screen; AA = automatic association task; SE = implicit self esteem enhancement task.

The *attention bias* (AB) modification tasks (8 sessions of 450 trials) were based on the visual probe task and the exogenous cueing task (cf. Amir, Beard, Burns et al., 2009). The aim was to guide participants to point their initial attention (stimulus presentation time was 500 ms) at positive (happy faces/positive words) or neutral stimuli and away from threatening stimuli (faces or words expressing social rejection). Participants were instructed to indicate as fast as possible whether the small arrow (probe) that appeared 500 ms after stimulus onset was directed upwards or downwards. Presentation time of the probe was tailored to individual performance. If the probe was identified correctly for more than 75% of the trials, in the next block the presentation time of the probe arrow decreased with 25 ms, and in the same way it increased when performance was poor. This tailoring kept the task at the right level of difficulty for individual participants. For half of the sessions (4 out of 8 sessions), the stimulus did not disappear upon probe presentation but remained on the screen, allowing for prolonged attention to the benign stimulus. We also included two less established tasks. First, we added a task (3 sessions of 500 trials) that aimed to strengthen the association between social-evaluative situations and positive outcomes. Participants sorted words related to (social) evaluative situations (*exam),* neutral words (*chair),* and positive outcome words (*success*) into two categories: Dutch or English. Social cues and positive outcome words were both consistently

presented in Dutch, and thus shared one response button. Second, a short evaluative conditioning task (Baccus et al., 2004; Clerkin & Teachman, 2010) of 240 trials was added to 10 sessions, aiming to enhance implicit self-esteem by associating self-relevant information (e.g., name, first letter of name, hometown) with positive outcomes.

The CBT intervention (Nauta, Sportel, & De Hullu, 2013) consisted of ten weekly sessions of 1.5 hours that were delivered in small groups (3-10 participants) by a licensed (CBT) psychologist, at school, after school hours. Components were: 1. psycho-education, aiming at recognizing and understanding anxiety symptoms using the model of Clark and Wells (1995) as the starting point (session 1, 2); 2. TCT (following; Bögels, Sijbers, & Voncken, 2006), to improve participants' awareness of their attentional focus, and to improve attentional control (session 3, 4); 3. cognitive restructuring, focusing on the identification / modification of dysfunctional thoughts (session 5, 6); 4. exposure, practicing with anxiety provoking situations (session 7, 8, 9). The last session (10) focused on how to avoid personal pitfalls and relapse. Participants also received homework assignments. The training protocol is highly structured and contains detailed information on all interventions, including some verbatim text fragments; the workbook includes background information and exercises for adolescents. Both materials can be received upon request.

Both interventions took approximately 1.5 hours a week, with a total duration of ten weeks.

Control group

One cluster of participating schools was randomly allocated to the no-intervention control group. After the pretest, participants in these schools received a letter explaining that they formed the control group and thus were invited to all assessments but would not receive the training. It was stated that they were free to seek treatment if they felt the need, but none of the participants did actually seek treatment elsewhere during this study.

Training attendance

On average, participants in the CBM condition completed 8.5 out of 20 CBM sessions (SD = 6.9) while participants in the CBT condition attended 6.7 sessions out of 10 CBT sessions (SD = 3.3). A proportion of participants in the CBM condition (n = 16) did not start the CBM training, mostly due to technical difficulties.

Outcome measures

Social anxiety symptoms were indexed by the social phobia subscale (9 items) of the Revised Child Anxiety and Depression Scale (RCADS; Chorpita et al., 2000) with items rated on a 4-point scale ranging from 0 *(never)* to 3 *(always)*. Internal consistency of the RCADS-SP was satisfactory (at pretest α = .79).

Test anxiety was indexed by the Spielberger Test Anxiety Inventory (Spielberger TAI; Van der Ploeg, 1988), with 20 items rated on a 4-point scale, ranging from 1 (almost never) to 4 (all the time). In the current study, reliability at pretest proved to be excellent (α = .95).

As an implicit measure of social anxiety symptoms we assessed threat-related automatic associations by means of a Single Target Implicit Association Test (stIAT) with the target category 'social or school activity', and attribute labels positive versus negative outcome (see De Hullu et al., 2011 for details). StIAT scores were computed according to the algorithm proposed by Greenwald (2003), which recently has shown to perform also best in a laboratory setting (Glashouwer, Smulders, De Jong, Roefs, & Wiers, 2013). In this paper, we report the so-called D4 measure, with a 600 ms error penalty for incorrect responses. A high score indicates relatively strong automatic associations between social or school activities and positive outcomes. Split-half reliability as indexed by Spearman-Brown corrected coefficient was .72 for the stIAT.

To assess the presence of SAD during pretest and posttest, we carried out clinical interviews using the anxiety and mood sections of the ADIS-C (Silverman & Albano, 1996). In the current sample, the interrater-reliability was very high with 99.7% overlap (based on ratings by a psychologist and independent rater scoring a random selection (n = 30) of the available ADIS-C interviews (n = 248) from pretest.

Procedure

The assessments were performed on laptops at school, during or after school hours. Measures were presented in fixed order. After the pretest, participants were informed about the assigned condition. Posttest was after 12 weeks, followed by follow-up assessments at 6 and 12 months. Participants received a gift certificate (5 Euro) for each assessment. The ADIS at posttest was conducted via telephone. Interviewers remained blind for participants' condition.

Change in cognitive biases

For assessment of the effect of the CBM training on participants' cognitive biases, participants completed several tasks before and after the training period. To examine attentional bias to social threat, we used two versions of a visual probe task that was specifically designed for this study: one using pictorial stimuli (Visual Probe task with Faces; VPF), and one using verbal stimuli (Visual Probe task with written Words; VPW). Each visual probe task comprised 76 trials; 12 practice trials (neutral-neutral, stimuli not present in the critical trials) and 64 critical trials (32 positive-neutral and 32 negative-neutral). Trials ran in a fixed random order. Stimuli were presented supraliminally on a white background. On each trial a black fixation cross appeared for 500 ms followed by a stimulus pair presented horizontally for 500 ms. Probes were small black arrows pointing upwards or downwards, presented immediately after the stimuli disappeared. In the VPF, stimuli were neutral, friendly (happy) and threatening (contempt) faces, selected from the Karolinska Directed Emotional Faces series (KDEF; Lundqvist, Flykt, & Öhman, 1998), showing straight profile images of 32 men and 32 women. Each stimulus pair consisted of two pictures of faces belonging to the same individual, either friendly-neutral or threatening-neutral. In the VPW, stimuli were 64 different word pairs, matched for number of characters (3-11), with fixed random presentation of 32 combinations of neutral (*spoon, curtain*) – friendly (*smile, success*) and 32 combinations of neutral (*stove, blanket*) – threatening (*shame, failure*) words.

To assess changes in interpretive bias, two tasks were used: the Recognition task and the Adolescent Interpretation and Belief Questionnaire (AIBQ; Miers, Blöte, Bögels, & Westenberg, 2008). The Recognition Task was adapted from earlier versions (Mathews & Mackintosh, 2000; Salemink & van den Hout, 2010) such that the scenarios presented were appropriate for adolescents in a school environment. On the computer screen, participants read a scenario of a social situation, followed by a word fragment that they were asked to solve. The (social) situation remained ambiguous, and a comprehension question appeared which made sure that participants had read the text. Incorrect answers on the comprehension questions are an indicator that the participant did not read the scenario carefully, such that the answers to the recognition question will not reflect actual interpretations but guesses. After 10 trials describing various social situations, the title of the description was repeated and participants were asked to rate the similarity (1 = *very similar in meaning* to 4 = *very different in meaning*) of four different interpretations (positive,

negative, neutral, or irrelevant) of the situation to the original situation that they have read before. Positive and negative interpretive biases are calculated from the ratings on positive and negative interpretations. Mean scores for the 10 situations are reversed such that higher scores indicate a higher (positive or negative) interpretive bias. The AIBQ is a questionnaire designed to assess interpretations and beliefs about both social and non-social ambiguous situations in adolescents. An example of an item measuring interpretive bias for social situations is as follows: *You've invited a group of classmates to your birthday party, but a few have not yet said if they're coming. Why haven't they said something yet?* After this description, three interpretations of the situation (positive, negative, and neutral) were presented individually and respondents were asked to rate how likely it is that this interpretation would pop up in their mind (1 = *does not pop up in my mind* to 5 = *definitely pops up in my mind*). Interpretive bias was calculated by adding up the scores from each interpretation/situation combination divided by the number of situations (5), resulting in a range with minimum 1 (no bias) to 5 (strong bias).

Statistical Analyses

Multilevel analysis, using MLwiN Version 2.18 (Rasbash, Charlton, Browne, Healy, & Cameron, 2009), was used to answer the research questions whether (a) cognitive biases did change as a result of cognitive bias modification, (b) the two training conditions were effective in reducing symptoms of social anxiety and (c) whether one of the training conditions was more effective than the other. We preferred multilevel modeling because it provides an elegant way to deal with missing data, by taking all available data into account. Multilevel models were estimated for the three outcome measures of social and test anxiety, namely RCADS Social Phobia, Spielberger TAI and stIAT. As a first step in the modeling, we defined the assessment session as a first level and participant as second level. School could have been added as a third level, however, exploratory analyses showed no effect of school. School was found to hold 0% up to 2.2% of the variance, and was therefore not included as a grouping variable in further analyses. Next, an unconditional model was employed to estimate the variance partitioned at each level. In a more specific model, looking into the various time segments, the categorical variable time (assessment point) was added, with random slopes for level 2. For the conditional model, third, the interaction variable time x training condition was added in a fixed

manner, with control condition and pretest as reference categories. This model is also used for reporting change in cognitive biases between pretest and posttest, where we replaced the outcome variable (e.g., social anxiety) by the reported bias index (e.g., interpretive bias). Finally, an overall model was created by adding time and group x time interaction, with pretest and 12 month follow-up as markers, to get an idea of the overall change within and between the groups. We checked whether these models could be improved by including treatment attendance as covariate. The reported effect sizes for group differences are derived from the differences between groups at time points, reported effect sizes over time were derived from differences between time points.

For analyzing possible group differences at start, t-tests and Pearsons X^2 tests were used when comparing two means (e.g., for differences between completers and non-completers), and ANOVA or Pearsons X^2 test was used when comparing more than two means (e.g., for differences between the three conditions at start).

Results

Change in cognitive biases

Multilevel analysis, using MLwiN Version 2.18 (Rasbash et al., 2009) was used to answer the question whether information processing in the CBM condition developed differently from CBT and CTRL conditions between pretest and posttest. For interpretive bias as measured by the recognition task, interpretations became less negative in the CBM condition compared to the control group (coefficient = -0.48, *SE* = 0.08, *p* < .001) and the CBT condition (coefficient = -0.46, *SE* = 0.08, *p* < .001). Interpretations became more positive in the CBM condition compared to the control group (coefficient = 0.43, *SE* = 0.08, *p* < .001) and the CBT condition (coefficient = 0.43, SE = 0.08, *p* < .001). For social interpretive bias as measured by the AIBQ, interpretations became less negative in the CBM condition compared to the control group (coefficient = -0.33, *SE* = 0.14, *p* = .008). Positive social interpretations generally increased (time effect coefficient = 0.33, *SE* = 0.10, *p* = .001) but there was no effect of condition. For attentional bias to threatening faces, there were no significant effects of time or condition. Attentional bias to friendly faces increased in the CBM condition compared to the control group (coefficient = 20.12, *SE* = 9.53, *p* =

.017). All in all, these results provide (at least partial) support for the efficacy of CBM to modify the targeted cognitive biases.

Missing Data

A detailed overview of the participant flow is provided in Figure 4.1. In total, 33 of the 86 participants in CBM, 50 of the 84 participants in CBT, and 34 of the 70 participants in the control condition completed all four test sessions. There was no indication of selective attrition. That is, at pretest, there were no differences between participants who completed all test sessions and those who only completed pre-test (RCADS-sp: t = -0.55, p = .58; TAI: t = 0.48, p = .64; stIAT: t = -0.57, p = .57).

Descriptive Statistics

Means (SD) for the outcome measures as a function of test session are shown in Table 4.2. At pretest, there were no differences between conditions (RCADS-sp: $F_{(2,239)}$ = 0.30, p = .74; TAI: $F_{(2,120)}$ = 0.02, p = .99; stIAT: $F_{(2,227)}$ = 0.16, p = .85). For the ADIS-C diagnosis of Social Anxiety Disorder (SAD), we performed a

Table 4.2. Means and standard deviations of RCADS, TAI and stIAT at the four assessment points by condition (Cognitive Bias Modification/Cognitive Behavior Therapy/no-treatment control)

Dependent	CBM		CBT		Control	
	Mean	SD	Mean	SD	Mean	SD
RCADS social phobia						
pretest	13.64	4.95	13.11	4.26	13.27	4.52
posttest	11.34	5.42	12.35	4.84	11.59	4.75
6 month FU	10.00	5.91	9.71	3.71	11.48	4.89
12 month FU	10.15	5.73	10.13	4.70	10.94	4.55
Spielberger TAI Test Anxiety						
pretest	41.09	13.94	41.82	13.28	41.59	13.23
posttest	35.51	11.47	34.76	10.82	38.56	13.17
6 month FU	34.27	12.09	31.11	8.63	37.36	12.44
12 month FU	32.62	11.83	31.58	9.67	35.14	11.08
stIAT Automatic Threat-related Associations						
pretest	-0.02	0.35	-0.03	0.29	0.00	0.27
posttest	-0.01	0.27	-0.11	0.29	-0.03	0.28
6 month FU	0.00	0.29	-0.08	0.34	-0.01	0.29
12 month FU	0.07	0.27	-0.10	0.29	-0.06	0.26

Pearson's X² analysis using a dichotomic variable, which is 1 when SAD is present (in cases with a CSR of 4 or higher on the ADIS-C) or 0 in the absence of SAD. At pretest, no differences were found between conditions (X^2 (2) = 1.36, p = .54). In the CBT condition, 9 out of 84 (10.7%) met criteria for SAD compared to 14 out of 86 (16.3%) in the CBM condition and 8 out of 70 (11.4%) in the CTRL condition.

Differences across conditions for the various time segments

To test the interventions' efficacy we subjected the three outcome measures to multilevel analysis. As a first step, levels were defined, with test session at first level and participant at second level. Next, an unconditional model was used to estimate the variance partitioned at each level. Then, an overall model was created, with pretest and 12 month FU as markers, to test overall change within and between the groups. After adding time as variable, group x time was added. The reported effect sizes for group differences are derived from the differences between groups at time points; reported effect sizes over time were derived from differences between time points. All analyses were conducted following the intent-to-treat principle, including all 240 participants. We explored the pattern of change with regard to the three time segments that were covered in this project: from pre- to posttest, from posttest to 6 month FU from 6 month FU to 12 month FU (see Table 4.3). Therefore, we construed a more specific model by adding the variable time (point of assessment), with random slopes for level 2. For the conditional model, the variable time x training condition was added, with control condition and pretest as reference categories.

As can also be seen in Figure 4.2, already in the first segment there was an overall decrease in RCADS Social Phobia scores (ES: Cohen's d = 0.42). From posttest to 6 month FU the coefficients of the time x group interaction show that the subsequent reduction was stronger within the CBT condition than within the control condition (ES: Cohen's d = 0.41). For the CBM condition the pattern was similar, although the difference between CBM and the control condition did not reach significance (coefficient = -1.48, SE = 1.06, p = .08). A significant overall decrease in test anxiety (TAI scores) was found between pretest and posttest (ES: Cohen's d = 0.42). The CBT group showed a significantly stronger reduction of test anxiety scores compared to the control condition between pretest and posttest and from posttest to 6 months FU (ES: Cohen's d = 0.32 and d = 0.58 respectively). For the

Table 4.3. Estimated effects for the conditional models between pretest - posttest, posttest - 6 months follow-up and 6 months follow-up - 12 month follow-up for Cognitive Bias Modification (CBM) vs. Cognitive Behavioral Group Training (CBT) vs. No-treatment control group

	RCADS Social Phobia		TAI Test Anxiety		stIAT Automatic Threat-related Associations	
	β	SE	β	SE	β	SE
Time effect						
Intercept	13.35	0.30	41.49	0.78	-0.02	0.02
Posttest vs pretest	-1.68**	0.73	-3.20*	1.80	0.00	0.04
6 mth FU vs posttest	0.14	0.79	1.30	1.89	0.04	0.05
12 mth FU vs 6 mth FU	0.09	0.89	1.18	2.09	-0.02	0.06
CBM vs control						
Posttest vs pretest	-0.27	0.89	-2.56	2.16	0.01	0.05
6 mth FU vs posttest	-1.48	1.06	-3.09	2.53	-0.01	0.07
12 mth FU vs 6 mth FU	-0.50	1.05	-2.53	2.48	0.13*	0.07
CBT vs control						
Posttest vs pretest	-0.58	0.90	-3.67*	2.18	-0.09*	0.05
6 mth FU vs posttest	-1.76*	0.96	-6.26***	2.28	-0.06	0.06
12 mth FU vs 6 mth FU	-0.40	1.03	-3.56	2.34	-0.04	0.06
CBM vs CBT						
Posttest vs pretest	0.32	0.84	1.11	2.03	0.10*	0.05
6 mth FU vs posttest	0.29	1.02	3.16	2.40	0.05	0.07
12 mth FU vs 6 mth FU	-0.10	0.95	1.04	2.21	0.17**	0.06

Note: * $p < .05$; ** $p < .01$, *** $p < .001$.

stIAT no overall time effects emerged. Yet, during the first segment there was a time x condition interaction indicating that CBT showed less reduction in negative associations than both the control (ES: Cohen's d = 0.28), and CBM condition (ES: Cohen's d = 0.36). For this segment, no differences were found between the control condition and CBM. From 6 to 12 months follow-up, the further increase in positive

automatic associations was found to be stronger for CBM (ES: Cohen's *d* = 0.61) than for both the CBT and the control condition.

Figure 4.2. RCADS Social Phobia over time for Cognitive Bias Modification (CBM), Cognitive Behavioral Training (CBT) and No-Treatment Control Group (CTRL)
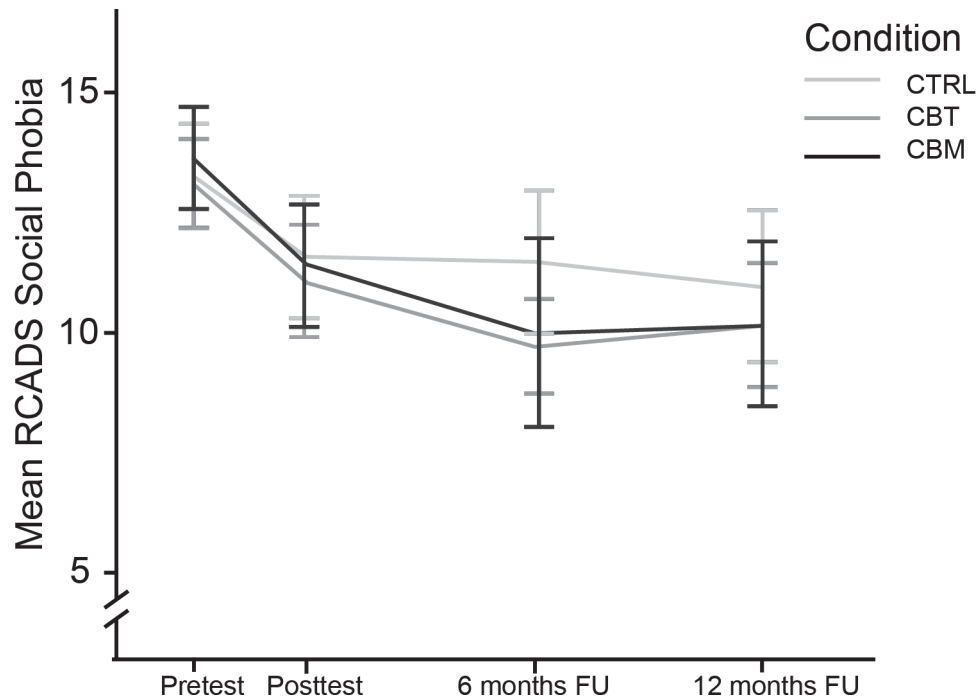
Efficacy at one-year follow up

Table 4.4 provides an overview of the results for the long term efficacy of the interventions. Most critical, the RCADS scores decreased between pretest and 12 month follow-up (coefficient = -0.21, *SE* = 0.04, *p* < .001, ES: Cohen's *d* = .64); yet this effect was not especially pronounced for CBM/CBT conditions (*p* >.15). Test anxiety decreased between pretest and 12 month follow-up (coefficient = -0.56, *SE* = 0.09*, p* < .001, ES: Cohen's *d* = 0.71), with a significant overall difference between the CBT and the control condition (coefficient = -0.40*, SE* = 0.18*, p* = .01, ES: Cohen's *d* = 0.34). For the stIAT, there was no overall effect of time (coefficient = 0.00, *SE* < 0.01, *p* = .50). However, there was a significant time x condition effect for CBM versus CBT (coefficient = 0.01, *SE* < 0.01, *p* = .003, ES: Cohen's *d* = 0.61), with the CBM condition showing a stronger reduction in threat-related associations.

Table 4.4. Estimated effects for the conditional models between pretest and 12 months follow-up for Cognitive Bias Modification (CBM) vs Cognitive Behavioral Group Training (CBT) vs No-treatment control group (CTRL)

	RCADS Social Phobia		TAI Test Anxiety		stIAT Automatic Threat-related Associations	
	β	SE	β	SE	β	SE
Intercept	12.73	0.22	39.89	0.60	-0.03	0.02
Time effect	-0.21***	0.04	-0.56***	0.09	0.00	0.00
CBM vs CTRL	-0.06	0.08	-0.25	0.19	0.01	0.00
CBT vs CTRL	-0.08	0.08	-0.40*	0.18	-0.01	0.00
CBM vs CBT	0.03	0.08	0.15	0.17	0.01**	0.00

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

Presence of Social Anxiety (ADIS)

At posttest, the number of social anxiety disorder diagnoses in each group was 8 out of 68 (11.8%) in the CBT condition, 9 out of 68 (13.2%) in the CBM condition and 2 out of 57 (3.5%) in the no treatment control condition. Since only a small fraction of the participants received a diagnosis of SAD, these data could not meaningfully be subjected to statistical analysis to test change over time or differences between groups.

Influence of treatment attendance

For both conditions, the overall number of attended sessions was not related to the level of social anxiety at posttest (coefficient = -0.01, *SE* = 0.01, *p* = .22). Yet, there was an effect for pretreatment social anxiety indicating that individuals with lower initial anxiety attended fewer sessions (coefficient = 0.19, *SE* = 0.07, *p* = .003). On average, participants in the CBT condition attended 6.7 sessions (out of 10 sessions; SD = 3.3) and in the CBM condition 8.5 sessions (out of 20 sessions, SD = 6.9). The mean (SD in parentheses) number of tasks completed in CBM was 5.00 (2.57) for interpretive bias; 3.71 (2.75) for attentional bias; 2.13 (0.80) for automatic associations and 5.61 (3.08) for self-esteem tasks.

Discussion

Summary of main findings

This study was the first to test the efficacy of CBM in an early intervention study, using a multifaceted CBM approach. The major findings can be summarized as follows: (i) In the short run (6 months follow-up) participants in the CBT condition showed a larger reduction in social anxiety symptoms than participants in the control condition, and a similar trend was evident in the CBM condition, with effect sizes in the small to moderate range, (ii) In the long run (12 months follow-up) the control condition eventually showed a similar reduction in social anxiety symptoms as both active conditions, (iii) After CBT, adolescents reported a stronger decrease of test anxiety compared to the no-intervention control group, (iv) From post-test to 12 months follow up the CBM group showed a stronger decrease of negative automatic associations than both the CBT and the no-intervention control group.

Effects of CBM and CBT on social anxiety

Regarding our main explicit outcome measure for social anxiety (Revised Child Anxiety and Depression Scale, social phobia subscale (Chorpita et al., 2000) we found an overall improvement over time. In addition, we found a relatively strong improvement in the CBT condition at 6 months follow-up, and a similar trend for CBM. An advantage for the active conditions was not evident immediately following the intervention (i.e., at posttest). In prevention research (see Neil & Christensen, 2009 for a review) it is common that effects are not visible directly after the intervention, which may also count for our participants with relatively low levels of social anxiety. In the present study, this lack of effect may at least partly be due to the fact that our social anxiety questionnaire did not give a specific instruction on reporting on the recent weeks. Participants may have reported on their behavior in general over the last months, thus reducing the sensitivity of this instrument to detect immediate improvement. Moreover, it seems reasonable to assume that after training, participants still need further practice and reassuring experiences in concrete social situations before they actually correct their original (dysfunctional) cognitions. The difference between the active conditions and control condition at 6 month follow-up may thus be regarded as the actual treatment effect: participants had time to practice the newly learned skills and/or to experience the corrective

impact of the interventions on habitual information processing strategies. This finding is comparable to Aune and Stiles (2009), who tested the efficacy of a universal CBT program and found a prevention effect for syndromal and subsyndromal social anxiety 8 months after the active intervention period.

At 12 month follow-up, we found no differences between the three conditions in social anxiety. Participants in the control condition further improved, whereas participants in both training conditions remained at the same level of social anxiety. One explanation could be that participants in the training condition had already approached normal levels of social anxiety at post treatment. In line with this, Chorpita et al. (2000) reported an average of 11.7-12.3 on the RCADS social phobia scale in this age group in a normal sample, where our post-intervention scores at 12 month follow-up were between 10.1 and 10.9. However, direct comparison of our scores to a Dutch population sample seem to indicate that the scores in our sample were still above the normal level at post-treatment (> 1 SD of the mean score), and only within the normal range at 12 months follow-up (Van Oort et al., 2009). Thus, it seems that there was still sufficient room for further improvement. Perhaps it could be beneficial in this respect to add booster training sessions during the follow up period. This may not only help to further decrease the level of symptoms and to prevent the recurrence of symptoms but may also stimulate/motivate the participants to further train their acquired skills. It would be important for future research to examine whether indeed this type of additional components would help to further improve these interventions.

Effect of CBM and CBT on test anxiety

Over time, CBT did result in a stronger decrease of test anxiety than the no-intervention control condition. This decrease in test anxiety may well reflect a direct effect of the CBT group training, since specifically in this condition, participants learn to actively cope with their test anxiety. In the CBM condition, quite some scenario's in the interpretive bias task focus on test-anxiety specific situations, but participants received no help to directly cope with acute test anxiety.

Effects of CBM and CBT on clinical diagnoses of social anxiety disorder

In the present study we not only examined the impact of the interventions on the level of self-reported social anxiety, but also investigated whether the interventions would be effective in preventing the development of social anxiety disorder (SAD).

The results of the ADIS-C diagnostic interview showed that, overall, the number of diagnoses of SAD was very low in all groups including the no-intervention control group. The absence of a substantial number of SAD diagnoses rendered it impossible to test the efficacy of our interventions to prevent the development of SAD. It remains therefore to be tested (e.g., on the basis of a longer follow up period) whether the present intervention can also be used to actually prevent the development of SAD.

Automatic evaluative threat-related associations

Interestingly, CBM showed a more favorable effect in reducing automatic social threat-related associations than CBT in all time segments. Specifically in the longer-term (from 6 to 12 months FU), the CBM condition also showed a more favorable effect than the controls. Although within the present time frame CBM did not have a more favorable effect on self reported social anxiety than the control condition, it would be interesting to see whether in the longer term differential effects may arise. Moreover, it would be interesting to add social tasks to the verbal assessments, since the reduction of automatic associations through CBM might be especially effective in modifying relatively spontaneous fear behaviors (Gawronski & Bodenhausen, 2006). Together, the pattern of findings with regard to participants´ automatic threat associations not only supports the efficacy of CBM, but also points to the relevance of complementing the routinely used self-report measures with performance based measures that may be more sensitive to automatically activated associations in memory.

CBM Treatment Integrity

Since attentional bias to threat was hypothesized to be an important factor in adolescent social anxiety, we added a large number of attentional bias training sessions to the multifaceted CBM training in the current study. We expected attentional bias to change in the CBM condition into a more benign pattern of attention to friendly stimuli and attention away from threat. These expectations, however, were not confirmed. Although attentional bias to friendly faces did change in the short term, this change was very small and we did not find a similar change in attentional bias to friendly words. The effects of CBM on interpretive bias were more convincing. In the CBM condition, interpretive bias measured using the recognition task became more positive and less negative during the training period. Earlier

research (Salemink et al., 2010; Salemink & van den Hout, 2010) showed that changes in interpretive bias caused by CBM seldom generalize to other measures of interpretive bias, but we found that interpretative bias as measured by the AIBQ changed as well; negative interpretive bias decreased in the CBM condition relative to the control condition and all groups developed a more positive interpretation style. All in all, the present findings provided partial support for the efficacy of CBM to modify the targeted processes, thereby confirming its validity; especially as a method to modify interpretive bias.

The CBM combined multiple tasks in an attempt to increase its efficacy. Yet, studies in CBM with favorable effects have thus far focused on single cognitive mechanisms. Thus, it cannot be ruled out that the combination of tasks might in fact have led to suboptimal effects. The finding that the decrease in automatic threat-associations was most pronounced for the CBM condition nevertheless supports the validity of the CBM approach. Future research is required to test which element of our CBM was most effective in decreasing associations to threat. In our CBM, only 3 sessions were directly devoted to modifying automatic associations. Perhaps increasing the number of these sessions could improve the efficacy of CBM in reducing the strength of automatic threat associations. In addition, it is worth noting that CBM did not result in a convincing reduction of attentional bias, whereas interpretive bias was strongly reduced. This suggests that the impact of the present CBM approach might improve further by focusing more on interpretive bias and/or by attempts to improve the efficacy of the attentional bias tasks.

Methodological considerations and limitations of the study

Some comments are in order regarding the limitations of the current study. First, training attendance was quite low, especially in the CBM condition, which may have been a factor in the generally small effects of the interventions. Nevertheless, in other CBM studies with favorable effects on anxiety, the entire CBM program usually contains fewer sessions (e.g., 8 sessions of attentional bias modification (Amir, Beard, Burns et al., 2009)) and the number of attended treatment sessions in our training appeared to be unrelated to the later level of social anxiety. This latter, counterintuitive, finding may be explained by the relationship between number of attended training sessions and the initial level of social anxiety. Highly anxious participants completed more sessions than those with less anxiety. Probably,

motivation to continue the training was lower in participants with less anxiety who were also more assertive in declaring that they wanted to quit, thereby increasing the chances of drop-out. Training attendance could probably be improved by limiting technical difficulties in the CBM condition (e.g., an operating system/browser-independent CBM training that does not need separate plug-ins to be installed) and offering (financial) incentives to complete CBM (or CBT) sessions. Second, although the finding that the decrease in automatic threat-associations was most pronounced for the CBM condition is promising and supports the validity of the CBM approach, future research is required to test which element of the CBM training is most effective in decreasing associations to threat. Furthermore, earlier research has demonstrated that automatic associations may be especially relevant in guiding more spontaneous fear behaviors (Huijding & De Jong, 2006). Unfortunately, the present study did not include indices of relatively spontaneous fear behaviors (e.g., heart rate during an actual evaluative conversation). For a more comprehensive appreciation of the relevance of the relatively strong reduction of the automatic associations in the CBM condition, it would be important for future research to include such tasks as an additional outcome measure.

Finally, it should be acknowledged that we received informed consent from only one-third of the invited adolescents and their parents. Therefore, we cannot rule out the influence of selection bias on the present findings. The medical ethics committee did not allow further contact with the non-responders, leaving the reasons for their non-response unclear. In the information letter, the aim of the study was pointed out, which may have led to non-response in a particular subsample of anxious adolescents. In addition, a considerable number of participants dropped out during various stages of the project. Drop-outs did not differ on important variables such as age, gender, and initial anxiety levels from those who completed all assessments, thus justifying our use of multilevel analyses. However, with a small effect size to be expected in a sample of moderately anxious adolescents, the limited power remains problematic. Definitive conclusions on the efficacy of early interventions such as described here should be drawn on the basis of meta-analysis of multiple studies (Cuijpers, 2003).

Conclusions

In sum, the current study showed that our early CBT intervention has a beneficial effect in terms of reducing test anxiety in the short and longer term. In the mid-long term (6 months follow-up) this early CBT intervention also resulted in a relatively strong decrease in social anxiety with a similar trend for CBM. However, in the longer term (12 months follow-up) this training benefit disappeared. Importantly, the automatic social threat-related associations weakened most following CBM (specifically in the longer term). This seems especially relevant in light of earlier findings showing that this type of automatic associations have prognostic value for the future onset and unfavorable course of anxiety disorders (Glashouwer, De Jong, & Penninx, 2011; Glashouwer, De Jong, & Penninx, 2012). It would be important for future research to test the relative efficacy of the various components of the preventive CBM. On the basis of such findings the optimal combination of effective components could be selected, which in turn might help to improve further the efficacy of CBM as a tool to prevent the generation and/or persistence of SAD symptoms.

Chapter 5

Long term effects of Cognitive Bias Modification and CBT in the Reduction of Adolescent Social Anxiety and Test Anxiety: two year Follow Up of a Randomized Controlled Trial

Abstract

This study reports the long term outcomes of a RCT comparing an internet-based cognitive bias modification training (CBM; n = 86), a school-based cognitive behavioral group training (CBT; n = 84), and a no-intervention control group (CTRL; n = 70) in the early intervention of social and test anxiety in adolescents aged 13-17 years with high levels of social or test anxiety. In the period of two years after the 10-weeks intervention period, test anxiety in the CBM and CBT condition decreased significantly compared to the no-treatment control group. Self-reported social anxiety symptoms decreased over time regardless of condition, as did self-reported depressive symptoms and internalizing symptoms. All effect sizes were in the small to moderate range. The incidence of DSM IV diagnosed social anxiety disorder at two-year follow up was very low and did not differ between conditions, as did parent-reported social anxiety symptoms. Threat-related automatic associations significantly improved in the CBM condition compared to CBT and CTRL, suggesting that CBT for social anxiety could be improved by adding components that focus on associations between social situations and positive outcomes.

Introduction

In adolescence, many youngsters face the fear of negative evaluation. Quite some of these adolescents even develop a social anxiety disorder. With estimates of 9.5% of girls and 4.9% of boys, social anxiety disorder is considered the most common mental disorder in adolescence (Wittchen & Fehm, 2003). Social anxiety disorder is associated with poor social skills, reduced social interactions, low self-esteem and low school performance (Stein & Kean, 2000). It can also lead to many adverse outcomes in adulthood, such as comorbid anxiety disorders, depression, alcohol and drug misuse and lowered academic or work performance (Wittchen et al., 2000). Thus, the development of social anxiety disorder during adolescence can have a great impact on current and future performance. Only a small proportion of children and adolescents with social anxiety disorder seek or receive professional help and many adolescents suffering from social anxiety remain unnoticed (Magee, Eaton, Wittchen, McGonagle, & Kessler, 1996).

Because social anxiety has such a pervasive impact on the well-being of school children, early intervention of social anxiety is of great importance. Previous research has shown that prevention and early intervention in a school setting can be effective in reducing anxiety symptoms and in preventing the onset of anxiety disorders in general, both at short and long term (see Neil & Christensen, 2009 for a review). Various programs have been successfully applied in the early intervention of anxiety disorders, using CBT techniques delivered by a mental health practitioner or teacher. In over half of published studies, the intervention leads to a significant reduction in anxiety symptoms compared to a no-intervention control group, with effect sizes in the small to moderate range (e.g., Neil & Christensen, 2009).

Thus far, only few studies specifically focused on the school-based intervention of social anxiety. Masia-Warner (2005) found that the school-based SASS-program (Skills for Academic and Social Success) was effective in reducing social anxiety in a group receiving the SASS-program versus a control group. A broader early intervention program (Dadds, Spence, Holland, Barrett, & Laurens, 1997), including a relatively large amount of children with social anxiety disorder, showed no effect for CBT-based intervention compared to a control group immediately after the intervention, however, a significant difference was found at six months follow-up. At

one year follow-up this difference was no longer present, but at two year follow-up the difference emerged again (Dadds et al., 1999).

Our group evaluated the efficacy of an early intervention that was specifically focused on adolescents with elevated levels of social anxiety, who were therefore assumed to be at risk for developing a full-blown social anxiety disorder (Sportel, De Hullu, De Jong, & Nauta, 2012). This study tested the relative efficacy of two types of interventions and compared a Cognitive Behavioral Group training (CBT) with an internet-delivered Cognitive Bias Modification training (CBM). Although it was found that the level of social anxiety generally decreased over time (also for the no-intervention control group), both types of interventions resulted in a relatively strong reduction of social anxiety symptoms at six months follow up. Unexpectedly, this advantage relative to the no-treatment control group was no longer significant at one year follow up. However, to effectively test the long-term effect of a preventive study or an early intervention, it is important to follow participants over a prolonged period of time and investigate not only specific effects on social and test anxiety but also effects on a broader range of symptomatology, to ensure all potential effects are detected (Gillham, Shatté, & Reivich, 2001). Therefore, the present study tested the efficacy of the early intervention CBT and CBM programs of Sportel et al. (2012) at a longer term (two-year follow up) with a broader scope of outcome measures.

A limitation of using self-report measures is that they rely primarily on the participant's own view on their symptoms, which might not optimally reflect the reality of their anxiety symptoms. One way to counter this limitation is to use other informants, such as participant's parents. At long-term follow up we therefore included both child and parent reports of social anxiety. Another way to counter this limitation is by using structured interviews, such as the Anxiety Disorders Interview Schedule for Children (ADIS; Silverman & Albano, 1996). Although this intervention study aims at reducing anxiety symptoms, it is also important to include commonly comorbid symptomatology in the assessment of long-term effects, such as depression and other anxiety disorders (Feldner & Zvolensky, 2004). In this follow-up report, we therefore evaluated the impact of our program on adolescents' level of self-reported depression and anxiety disorder symptoms over time, along with our primary measures, namely symptoms of social and test anxiety and the diagnosis of social phobia.

Another recent development in anxiety research is the use of implicit instruments to tap into processes associated with anxiety symptoms, such as automatic associations between social situations and indicators of a negative outcome (De Hullu et al., 2011). Although adolescents may be unaware of their automatic associations, these associations are hypothesized to influence the way they perceive social situations (Ouimet et al., 2009) and an assessment of threat-related associations could be an important addition to explicit measures of anxiety. Therefore, we complemented explicit self-report indices of subjective social anxiety with an implicit performance measure that was designed to index more automatic social threat associations.

Method

Trial Design

The present study used a multi-arm parallel group approach and employed a stratified design with balanced randomization (1:1:1). This study was named Project PASTA, Project for Adolescent Social and Test Anxiety.

Participants

For this study a total of 5318 adolescents in the first and second year of regular secondary schools in the north of the Netherlands were invited to participate in a study with main focus early intervention and symptom reduction in social and test anxiety. The current study was approved by the medical ethics committee of the University Medical Center Groningen and registered in the Dutch trial register with number NTR965. Figure 5.1 displays a flow diagram of this study. As can be seen, a total of 1811 participants were screened for social and test anxiety. Participants scoring above cut-off on social and test anxiety as measured by the Revised Child Anxiety and Depression Scale (RCADS; Chorpita et al., 2000) and the Dutch version of the Spielberger's Test Anxiety Inventory (ETAV; Van der Ploeg, 1988; n = 516) were invited to participate in a clinical interview. Used cut-off scores for girls were >10 on RCADS social phobia and >43 on TAI, cut-off scores for boys were >9 on RCADS social phobia and >38 on TAI. The RCADS cut-off scores were based on the 75th percentile in a large Dutch cohort of young adolescents (N = 2230, the TRAILS-study; Huisman et al., 2008). Screening took place in two waves, including 11 schools in the first year and 13 different schools in the second year.

Figure 5.1. Flowchart of the study from screening until two-year follow up
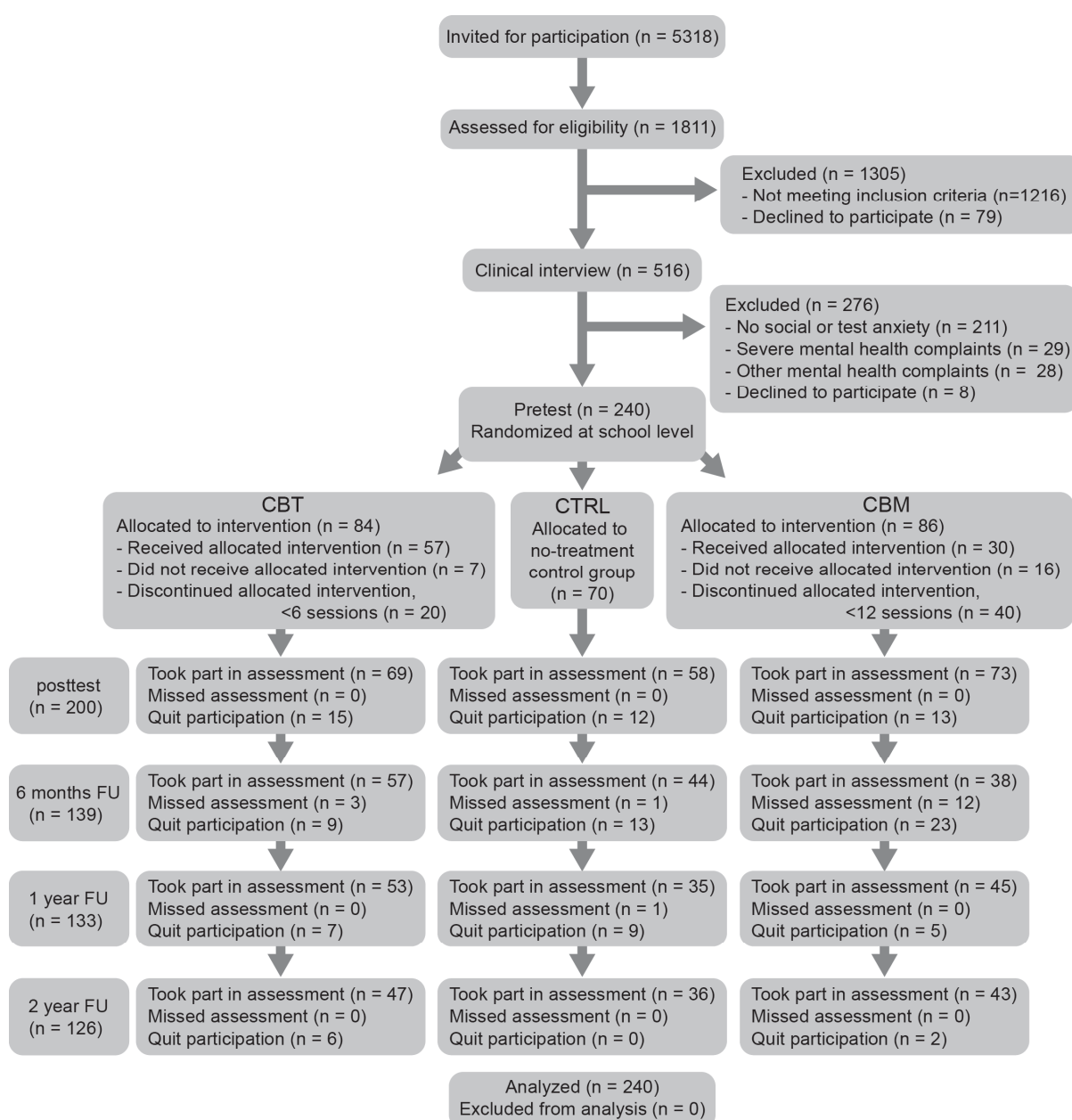
Based on the Anxiety Disorders Interview Schedule for Children (ADIS-C; Silverman & Albano, 1996), 240 adolescents (age 12-15) with mild to moderate levels of social anxiety were included in the current study. The ADIS-C provides a DSM-IV diagnosis of various anxiety disorders, as well as a clinician severity rating (CSR) that is rated on a 9-point-scale (0 = not at all disturbing/disabling; 8 = very severely disturbing/disabling; with a rating under 4 being sub-clinical). Since this early intervention study aims at individuals with mild to moderate levels of social anxiety, we excluded adolescents with CSR ratings of 5 and higher (n = 29), and advised these adolescents to seek treatment. Thus, adolescents were included when

they showed symptoms of social anxiety (i.e., afraid to speak in class or talk to strangers), but indicated only mild (CSR <4, n = 209) or moderate (CSR = 4, n = 31) interference of social anxiety with their daily life (Albano & Hayward, 2004).

Two weeks after the ADIS-C interview, 240 included participants took part in the pretest (T1; questionnaires and performance measures) and were subsequently randomized at school-level over one of three conditions. Precise numbers for each condition can be found in Figure 5.1. Three months after pretest, the participants completed a posttest (T2; n = 200), and follow-ups at 6 months (T3; n = 139), 12 months (T4; n = 133) and 24 months (T5; n = 126). Drop-out was comparable over the three conditions.

At pretest the mean age of the 240 participants (66 boys, 174 girls) was 14.09 years, SD = 0.65. About one-third (31%) of the participants came from an urban area and 69% from a rural area, as defined by Statistics Netherlands (http://www.zorgatlas.nl/beinvloedende-factoren/demografie/groei-en-spreiding/bevolkingsdichtheid-per-gemeente). Furthermore 97.1% of the participants had the Dutch nationality, with at least one Dutch parent. The other 2.9% had either two non-Dutch parents, or was non-Dutch him- or herself with at least one non-Dutch parent. The majority (80.8%) of the participants were living with their non-divorced biological parents. All these demographic statistics are comparable to those of the total group of participants that were initially screened within the context of Project PASTA.

Interventions

Cognitive bias modification (CBM)

The cognitive bias modification (CBM) training consisted of twenty 40-minute sessions, delivered over the internet twice a week over a period of 10 weeks. Based on the literature available on modifying cognitive biases, the training mainly consisted of tasks to modify attentional biases and interpretive biases. These tasks were supplemented by relatively new tasks that were designed to modify automatic association and implicit self-esteem. Since the latter types of tasks are not yet well established in the literature, the backbone of the intervention consisted of attention and interpretation modification. Each session consisted of one or two different tasks out of four available tasks. Before the start of the CBM training, participants received information explaining the rationale of the training by letter and in a phone call. They

received an e-mail with links to two training sessions each week, and were reminded if they did not complete the session by e-mail or phone. After each session, they received a compliment for completing it by e-mail. The training was delivered in a Macromedia Authorware (http://www.adobe.com/products/authorware/) webplayer applet, available for Windows and Apple operating systems (for details see De Hullu, 2012).

Since it was shown that it is feasible to train interpretive biases (Salemink, van den Hout, & Kindt, 2007) and attentional biases (Browning, Holmes, & Harmer, 2010) in a benign direction, the backbone of our CBM training consists of tasks to modify these biases. One large part of the training (9 sessions) consisted of interpretive bias modification tasks along the lines of the CBM-I originally designed by Mathews and Mackintosh (2000). The objective was to implicitly guide participants to come up with benign interpretations of ambiguous social situations, which would help them to process real-life situations in a fear-disconfirming manner. During these tasks participants were presented with ambiguous social scenarios that were followed by word fragments that had to be solved in a benign direction (e.g., *You are at the birthday party of a good friend. You had great difficulty in finding him a nice birthday present. He unwraps the package and his face shows en--ym-nt.).* Most (80%) of the trials were ambiguous with positive word fragments, 20% were neutral filler trials without ambiguity or emotional content, to make the induction procedure less obvious. After each trial, a comprehension question (e.g., *Was it easy to find a present for your friend?*) followed to make sure participants would read the entire story. The number of trials and the type of ambiguous scenario's describing various aspects of adolescents' social life (school, sports, parents, friends, family) were based on Salemink et al. (2009), although we used less trials (60 compared to 104 trials per session) to limit the burden on the participants. The other large part of the training (8 sessions) consisted of attention bias modification tasks, which were based on the visual probe task (showing a pair of stimuli on the left and right side of the screen; Amir, Elias, Klumpp, & Przeworski, 2003; MacLeod et al., 2002), and the exogenous cueing task (showing one stimulus on the left or right side, with the opposite side blank; Posner, 1980; Yiend & Mathews, 2001). The objective was to guide participants to point their initial attention (presentation time of the stimuli was 500 ms) at positive (happy faces/words) or neutral (neutral faces/words) stimuli and away from fear-confirming stimuli (threatening faces/words). Initial attention to safe

or positive information as opposed to initial attention to threat could help them in real-life situations to decrease avoidance behaviors and help disconfirm their fears. Participants were instructed to indicate as fast as possible whether the small arrow (probe) that appeared after 500 ms was directed upwards or downwards. Each session consisted of 450 trials, with pictorial (faces) and verbal stimuli (words) in equal proportions. Exogenous cueing task trials and visual probe trials were delivered intermixed. In half of the training sessions, the stimulus did not disappear after the probe appeared but stayed on screen, thus allowing for prolongated attention to the benign stimulus. Three training sessions aimed at changing automatic associations to social anxiety relevant stimuli. We developed a task based on the implicit association test (Greenwald, McGhee, & Schwartz, 1998), which aimed to couple social-evaluative situations with positive outcomes. In this task, consisting of 500 trials per session, participants were instructed to sort words appearing on the screen into two categories: Dutch or English. Stimuli were neutral words (e.g., *chair),* words related to (social) evaluative situations, (e.g., *exam)*, and positive outcome words (e.g., *success*). Social cues and positive outcome words were both consistently presented in Dutch, and were thus sharing one response button, while neutral words were all in English. The goal of this task was to strengthen the association between (feared) social-evaluative situations and a positive outcome of that situation. Finally, an evaluative conditioning task (Baccus et al., 2004; Clerkin & Teachman, 2010) of 240 trials was added to 8 sessions of attentional bias or automatic association tasks, aiming to enhance implicit self-esteem by associating self-relevant information (e.g., name, first letter of name, hometown) with positive outcomes. Participants were instructed to point the mouse as fast as they could in the quarter of a matrix where a word or object appeared. After the mouse-click, the stimulus was replaced by positive (in case of personal stimuli) or neutral (in case of non-personal stimuli) feedback. Positive feedback stimuli were smileys and positive outcome words, neutral feedback stimuli were pictures of household objects and neutral words.

The combination of tasks used in this CBM training differs in several ways from its predecessors in other CBM studies in clinical or subclinical populations. First, most studies used single-session (Amir, Bomyea, & Beard, 2010) or up to 8 sessions (Amir et al., 2009; Blackwell & Holmes, 2010; Vassilopoulos et al., 2009) training programs. We shaped our training to be similar to the CBT condition regarding time-

investment needed by participants in the CBT condition. Also, since CBM is a developing field, it is unclear what number of sessions per task is needed for a significant and lasting effect. We chose to aim for a larger impact of the training by offering extensive training sessions for a long period of time. Second, we combined multiple tasks in the CBM training, based on the argument made by Hirsch et al. (2006) that cognitive biases may mutually influence each other. The present multiple task approach was preferred in an attempt to increase the efficacy of the CBM training. Moreover, we anticipated that offering a variety of tasks would also help to keep participants motivated for the training. Third, at the start of each task, a screen was shown shortly explaining the rationale for that particular training. For example, in the interpretation training task the explanation was*: "when you feel bad, this sometimes makes the world look bad too. Putting on "rose-colored glasses" can help you to perceive the world more positively and improve your mood".* During every session it was emphasized that a lot of practice is needed to change one's way of thinking. Fourth, performance on tasks was tracked and after each block, during a short break, a summary of speed and performance was shown on the screen, in an attempt to make the task more challenging. Also, the number of trials completed and number of trials left was shown, to help participants to continue the task to the end. Fifth, in the interpretive bias tasks, we added instructions to visualize the scenario presented, as previous research has shown that imagining the positive interpretations may amplify the effectiveness of the task (Holmes et al., 2006). Therefore, in the first interpretive bias training session, a short imagination training was included (a stepwise instruction to imagine the taste of a lemon). Last, the speed in the attentional bias task was tailored to individual performance. If the target was identified correctly for more than 75% of the trials, in the next block the presentation time of the target arrow decreased with 25 ms, and in the same way it increased when performance was poor. This tailoring kept the task at the right level of difficulty for individual participants.

Cognitive behavioral group training (CBT)

The cognitive behavioral group training (CBT) consisted of ten weekly sessions of 1.5 hours. All training sessions took place at school, if possible immediately after school hours. The groups had a minimum of 3 and a maximum of 10 participants. All

sessions were delivered by a psychologist from a local center for child and adolescent psychiatry.

The CBT training had four main components, 1. psycho-education, consisting of broadening the participants' knowledge on anxiety symptoms in general and on social and test anxiety more specifically, using the model of Clark and Wells (1995) to explain anxiety symptomatology; 2. task concentration training (Mulkens et al., 2001), with as major aim the improvement of the awareness of the focus of attention and the ability to control this attention; 3. cognitive restructuring, focusing on the identification and modification of dysfunctional thoughts; and, 4. exposure, practicing with personal anxiety provoking situations. The first two sessions consisted of psycho-education, followed by two sessions of task concentration training, two sessions of cognitive restructuring and three sessions of exposure. The last session focused on personal pitfalls and how to avoid them. Each session had a similar framework, starting with discussing homework assignments, followed by the introduction of a new theme and active exercises, such as attention training, identification of thinking errors, role-play or in vivo exposure exercises. Next to the sessions the participants had homework assignments each week, taking one up to two hours a week. The training protocol can be requested from the authors.

Controls

Participants in the control condition participated in all measurements, but did not receive training. The participants were allowed to make use of care as usual.

Procedure

Informed consent

All designated participants received information about the project at school, given by the researchers and interns in class. At the same day information letters were sent to the adolescents and their parents or caretakers at their home addresses via their schools, together with a letter of recommendation to participate from the school, an informed consent form and a return envelope. The information for parent and child contained some explanation concerning social anxiety, and the three conditions to which participants could be assigned. All adolescents in first and second year of the participating regular secondary schools were invited. As a reward a gift certificate worth 20 Euro was raffled for each 20 actual participants. Adolescents willing to

participate had to fill out and sign the informed consent together with at least one parent or caretaker and send it back by mail (free of charge) to the researchers. Returned informed consents were collected in a database and used for inviting the adolescents for the screening. Participants could withdraw from the study at any given time, without presenting a reason.

Screening

The screening took place during school hours, at school in groups of 10 -15 students. During the 50 minute screening participants completed tasks and filled out questionnaires on laptops in a fixed order. A researcher or intern was present at all times to answer questions, other participants and the researchers were not able to see the responses during the assessment, ensuring confidential and independent responding. At the end of the screening, those scoring above cut-off on social phobia and/or test anxiety automatically received a message on the laptop screen indicating they had a high chance of being invited for the next step in the project. Those scoring otherwise received the message that there was little chance to be invited for the next step.

Intake Interview and Pretest

Adolescents with a score above cut-off on social or test anxiety were invited for a clinical interview, the Anxiety Disorders Interview Schedule for Children (ADIS-C; Silverman & Albano, 1996). All interviews took place at school, during school hours, and were held by the researchers or other trained psychologists. Participants were included when they showed mild to moderate symptoms of social anxiety disorder; as indicated by an ADIS-C clinician rated severity (CRS) index of 4 or lower. Participants were excluded when they had no socially anxious symptoms or severe social anxiety (CRS >4) or other primary disorders.

When participants were selected for the project based on the interview results, feedback was given to the participant and his or her parents informing that the participant had heightened levels of social anxiety and was invited for the next step in the project. Within three weeks the participants completed a pretest, one or two weeks before the start of the training period. The pretest took place at school, immediately after school hours, with other selected participants of that school in a group of maximum 15 adolescents. The assessment was performed on laptops and consisted of tasks and questionnaires, together taking approximately 30-45 minutes

to complete. Again, researchers and interns were present to answer questions and to ensure confidentiality. After the pretest, participants received information on what condition they were assigned to: no training, CBT group training or CBM internet training, together with detailed information about how the project was to proceed.

Posttest, 6 Month Follow-up, 12 Month Follow-up and 24 Month Follow-up

Twelve weeks after pretest, posttest took place, followed by follow-up assessments at 6, 12, and 24 months. Invitations were sent by mail one or two weeks before the assessment. One or two days before the assessment, participants received a phone call from the researchers or an intern to remind them to be present. All assessments included tasks and questionnaires and were completed on laptops, at school, immediately after school hours. Participants received a gift certificate of 5 Euro for each assessment.

Measures

Anxiety Disorders Interview Schedule

The Anxiety Disorder Interview Schedule-Children (ADIS-C; Silverman & Albano, 1996) is a semi-structured interview based on DSM-IV classification of psychopathology (American Psychiatric Association, 2000). Besides the focus on anxiety, the interview also includes other mental disorders such as depression, dysthymia and externalizing disorders. Obtained scores are rated by the clinician in a clinician severity rating (CSR), a 9-point scale with 0 meaning not at all disturbing/disabling, and 8 meaning very severely disturbing/disabling, a score of 4 and higher is indicating the presence of a disorder. The ADIS-C was used for DSM-IV diagnoses of anxiety disorders and depression. Participants were interviewed at pretest (T1) in a private room at school and posttest (T2) and follow-up (T5) by telephone. Interviews were held by the first authors and other trained psychologists. Parents of participants were not interviewed. The validity of ADIS-C (to assess the presence of anxiety disorders) has been shown to be satisfactory (Wood, Piacentini, Bergman, McCracken, & Barrios, 2002). In the current sample, the inter-rater-reliability was very high with 99.7% overlap (based on ratings by a psychologist and independent rater scoring a random selection (n = 30) of the available audio-recorded ADIS-C interviews (n = 248) from pretest). In the analyses, we use a dichotomic variable indicating a DSM-IV Social Anxiety Disorder (SAD) diagnosis,

which is 0 when no SAD is present and 1 when SAD is present, in cases with a CSR of 4 or higher on the ADIS-C.

Revised Child Anxiety and Depression Scale – Child Version

The Revised Child Anxiety and Depression Scale (RCADS; Chorpita et al., 2000) is a revised version of the Spence Children's Anxiety Scale (SCAS; Spence, 1998). In this study, we used both the parent version and the child version of the RCADS. The child version is a 47-item self-report, with items rated on a 4-point scale ranging from 0 (never) to 3 (always). The questionnaire consists of six scales: separation anxiety disorder, social phobia, obsessive-compulsive disorder, panic disorder, generalized anxiety disorder and major depressive disorder. A total score gives an impression of the level of overall internalizing symptoms. In the current study, the social phobia (9 items), generalized anxiety (6 items) and depression (10 items) subscales of the RCADS were used, as well as the total score. The internal consistency of the scale and subscales were found to be good in a normal as well as a clinical population (Chorpita et al., 2000; Chorpita et al., 2005). The structure of the RCADS was found to be consistent with DSM-IV anxiety disorders and depression. In the current study, internal consistency was satisfactory for the social phobia subscale (at pretest α = .79), the generalized anxiety subscale (at pretest α = .85), for the depression subscale (at pretest α = .80), and for the total scale (at pretest α = .93). The RCADS was used at screening, pretest, posttest, 6 month follow-up, 12 month follow-up and 24 month follow-up.

Revised Child Anxiety and Depression Scale - Parent Version

The parent version of the RCADS is equal to the child version, with 47 items asking about the child. The internal consistency for the social phobia subscale was good (at T5 α = .86). The RCADS – parent version was completed by parents at 24 month follow-up.

Spielberger Test Anxiety Inventory

The Spielberger Test Anxiety Inventory (Spielberger TAI; Spielberger et al., 1980) is a 20-item self-report, with items rated on a 4-point scale, ranging from 1 (almost never) to 4 (all the time). The instrument consists of three scales, a sum scale, a worrying scale, and an emotionality subscale. In this study the Spielberger TAI was used on all assessment points. Previous research showed good reliability for the

sum scale and the two subscales (Van der Ploeg, 1988). In the current study, the sum scale was used and its reliability at pretest proved to be excellent (α = .95). The TAI was administered in the screening, pretest, posttest, 6 month follow-up, 12 month follow-up and 24 month follow-up.

Brief Fear of Negative Evaluation-II Scale

The Brief Fear of Negative Evaluation-II (BFNE-II; Carleton, McCreary, Norton, & Asmundson, 2006; authorized Dutch translation by Van Wees-Cieraad & De Jong, Unpublished Manuscript) is a 12-item, 5-point Likert scale ranging from 0 (does not fit me at all) to 4 (fits me very well). The BFNE-II is based on BFNE by Leary (1983), with the difference that the reverse-worded items in the BFNE are reworded in the other direction in the BFNE-II. The internal consistency of the BFNE-II was found to be excellent, with α = .95. In our sample we also found α = .95 at pretest. In current study the BFNE-II was used in pretest, posttest, 6 month follow-up, 12 month follow-up and 24 month follow-up.

Implicit Association Test

To examine threat-related automatic associations with social cues, we used a Single Target Implicit Association Test (stIAT) that was specifically designed for this study. This variant of the IAT (Greenwald et al., 1998) is a computerized reaction time task that measures to what extent a single target category is associated with two attribute categories. Following the design of Wigboldus, Holland, and Van Knippenberg (2005), a social cues stIAT was constructed with the target category *social or school activity*, and the attribute labels positive outcome and negative outcome. We chose to use these attribute labels to indicate threatening and safe associations with the target words. We labeled the target category *social or school activity* to provide a neutral category that could contain cues that are feared by socially anxious people, such as *conversation* or *exam*. The instructions and format of the present stIAT were based on an IAT (De Jong, Sportel, De Hullu, & Nauta, 2012) that was tailored to the present age group and piloted extensively. In the stIAT, participants are asked to categorize words appearing in the centre of the screen as quickly as possible into the target category or the attributes, by pressing the left or right button on a response-box. The test phase consists of two blocks of 64 trials, each preceded by a short practice phase of 24 trials. After a correct response, the next stimulus is presented after 500 ms. After an incorrect response a red X appears shortly above

the stimulus. Meanwhile, the stimulus remains on the screen until the correct response is given. The order of the category combinations is fixed across participants to reduce method variance. This is assumed to enhance the sensitivity of the stIAT as a measure of individual differences, which is important in view of the aim of the present study (cf. Borg, De Jong, & Weijmar Schultz, 2010; Schnabel, Asendorpf, & Greenwald, 2008; Steffens & König, 2006). Negative stIAT effects indicate relatively fast responses when social and school activities shared the response key with negative outcome. For someone with a fear of social situations, associations between social cue words and negative outcome are assumed to be relatively strong, resulting in a fast response when the target category (social- or school situation) and negative outcome will be paired, and a relatively slow response time when the target category is paired with positive outcome. For someone without social anxiety, the reverse response pattern is expected.

In the current study the stIAT was used in pretest, posttest, 6 month follow-up, 12 month follow-up and 24 month follow-up. The split-half reliability of the stIAT was sufficient with Spearman-Brown corrected coefficient of .72 at pretest.

Sample Size

Before the start of current project the necessary sample size to find a medium effect was defined using power calculations. These calculations showed that for a medium effect, with a power of .80, within three groups, at $p = .05$ the sample size had to be at least 52 for each condition. Keeping drop-out in mind, we aimed at 75 participants in each condition (total anticipated N = 225). To reach this number we subsequently calculated the number of adolescents that should be interviewed. To reach this number of participants, we calculated, given cut-off scores (based on previous research) and chance of not meeting inclusion criteria that 346 adolescents were to be interviewed, meaning that approximately 1400 children were to be screened for social and test anxiety.

Randomization

Stratified randomization took place at school-level. Schools were, based on number of participants, randomly grouped by three and then the three grouped schools were all allocated to one condition each, to make sure the amount of participants in each condition would be approximately the same. Of the 24 participating schools, 8 schools received CBT, 7 schools received CBM, and 7

schools got the control condition. Two small schools were excluded from randomization since no students were eligible for inclusion. The allocation of the schools was done by the project leader (4th author), by blind drawing same size papers with the conditions CBT, CBM or Control from a bowl (in the presence of the 3rd author). Participants and researchers supervising the assessments did not receive information about the condition until after the pretest (T1), to make sure condition was not of influence in the testing nor in the willingness to participate. After the pretest, all participants received a letter containing information about how the study continued, including information about the condition. In following assessments the interns supervising the assessments were not aware of the conditions of the participants. The first authors performing the interviews were aware of the school conditions but performed the interviews based on a name and participant number list, not containing school information.

Statistical Analyses

Several variables were defined for the analyses. We defined assessment completers versus assessment non-completers, where completers were only those who completed all assessments. Next to that we defined treatment adherence with three groups, namely those who did not start treatment, those who dropped out of the training before completing 50% of the sessions and those who completed 50% plus one of the sessions.

Multilevel analysis, using MLwiN Version 2.18 (Rasbash et al., 2009), was used to answer the question whether (a) the two training conditions were effective in reducing symptoms of social and test anxiety and (b) whether one of the training conditions was more effective than the other.

Multilevel models were estimated for the four primary outcome measures of social and test anxiety, namely RCADS-SP-C, Spielberger TAI, BFNE-II (child questionnaires) and stIAT, and the secondary outcome measures RCADS internalizing symptoms, RCADS-Depression and RCADS-Generalized Anxiety (child questionnaires). As a first step in the modelling the levels were defined, with test session at first level and participant at second level. School could have been added as a third level, however, exploratory analyses showed no effect of school. School was found to hold 0% up to 2.2% of the variance, and was therefore not included as a grouping variable in further analyses. Next, an unconditional model was employed

to estimate the variance partitioned at each level. Then, an overall model was created, with pretest and 24 month follow-up as markers, to get an idea of the overall change within and between the groups. After adding time as variable, group x time was added. In a more specific model, looking into the various time segments (12 months follow-up vs. 24 months follow-up), the categorical variable time (assessment point) was added, with random slopes for level 2. For the conditional model, third, the interaction variable time x training condition was added in a fixed manner, with control condition and pretest as reference categories. After that, we checked whether the model could be improved by including gender and treatment adherence as covariates. The reported effect sizes (Cohen's *d*) for group differences over a particular time span are derived from the difference scores for each group. Reported effect sizes over time were derived from differences between pretest and 24 month-FU. In calculating effect sizes, we followed the method recommended by Dunlap, Cortina, Vaslow and Burke (1996), taking into account the correlation between measures. When appropriate, we report 95% confidence intervals.

To obtain a full set of parent-reported social anxiety (RCADS-SP-P) at 24 month follow up, missing data (46.67%) were imputed using multiple imputation. Multiple imputation is one of the state-of-the-art and preferred methods for dealing with missing data (Jelicić et al., 2010). Missing data was imputed 40 times using PASW Statistics 18.0, based on all available scores (self-report and stIAT) from pretest, post-test, 6 months, 12 months and 24 months follow-up. Multiple imputation renders pooled results, over all 40 imputations. Subsequently, we performed an ANOVA analysis to test whether 24 month follow-up parent reported social anxiety scores were different between CBM, CBT or control conditions.

To analyze possible group differences at start, t-tests and Pearson's X² tests were used when comparing two means, for differences between completers and non-completers, and ANOVA or Pearsons X² test was used when comparing more than two means, for differences between the three conditions at start.

Results

Missing Data

There were no missing items on the questionnaires, since all data was gathered using laptops. However, we did have missing measurements at several points in

time. The pattern of missing data was as follows: 31 (36.0%) of the 86 participants in the CBM conditions completed all six measurements, in the CBT condition 42 (50.0%) of the 84 participants completed all measurements, and in the control conditions 31 (44.3%) of the 70 participants completed all six measurements. In this study we dealt with the missing data as follows: First we compared, at pretest, those who did not participate in all measurements with those who completed all measurements, by means of a X^2-test or t-test, for the primary and secondary outcome measures: ADIS-C SAD (presence or absence of DSM-IV SAD, ADIS-C CSR ≥ 4), RCADS social phobia, Spielberger TAI, stIAT, and BFNE-II. These tests showed that both groups did not differ significantly at pretest (ADIS-C SAD: X^2 (1) = 0.89, p = .44; RCADS-sp: t = 0.04, p = .98; TAI: t = 0.68, p = .50; stIAT: t = 0.26, p = .79; BFNE-II: t = -.34, p = .73).

Secondly, we compared the non-completers in the three conditions, to see whether differences were present in their pretest data, by means of an ANOVA or X^2-test with condition as factor. No differences were found between the non-completers in the three conditions (ADIS-C SAD: X^2 (2) = 0.24, p = .89; RCADS-sp: $F(2,135)$ = 1.16, p = .32; TAI: $F(2,135)$ = 0.19, p = .83; stIAT: $F(2,127)$ = 0.48, p = .62; BFNE-II: $F(2,135)$ = 0.228, p = .80).

Descriptive Statistics

The means and standard deviations for all primary and secondary outcome measures at the assessment points are shown in Table 5.1. At pretest, there were no differences between the CBT, CBM and CTRL condition on the primary outcome measures (RCADS-sp $F(2,239)$ = 0.30, p = .74; Spielberger TAI $F(2,239)$ = 0.06, p = .94; BFNE-II $F(2,239)$ = 0.31, p = .74; stIAT $F(2,227)$ = 0.16, p = .85 and ADIS-C SAD X^2 (2) = 1.36, p = .54). All analyses were conducted following the intent-to-treat principle. Table 5.2 provides an overview of the overall time effects for the primary and secondary outcome variables. Table 5.3 provides an overview of the primary outcome variables divided into the time segment one year follow-up - two year follow-up. Significant results from the tables are described in the text below.

Table 5.1. Means and standard deviations of all primary and secondary outcome measures at the assessment points by condition: Cognitive Bias Modification (CBM) vs. Cognitive Behavior Therapy (CBT) vs. no-treatment control (Control)

	CBM		CBT		Control	
Dependent	Mean	*SD*	Mean	*SD*	Mean	*SD*
RCADS-child social phobia						
T1	13.64	4.95	13.11	4.26	13.27	4.52
T4	10.15	5.73	10.13	4.70	10.94	4.55
T5	9.53	5.86	8.96	5.16	10.83	5.38
Spielberger TAI						
T1	41.09	13.94	41.82	13.28	41.59	13.23
T4	32.62	11.83	31.58	9.67	35.15	11.08
T5	32.35	12.12	31.04	10.10	36.57	12.88
BFNE-II						
T1	23.52	11.64	22.40	10.36	22.31	11.13
T4	20.13	13.26	17.36	10.54	19.74	11.68
T5	17.48	13.67	17.35	12.07	20.14	11.54
stIAT						
T1	-0.02	0.35	-0.03	0.29	0.00	0.27
T4	0.07	0.27	-0.10	0.29	-0.06	0.26
T5	0.08	0.28	-0.08	0.27	0.02	0.27
ADIS-C SAD						
T1	0.16	0.37	0.11	0.31	0.11	0.32
T5	0.10	.30	0.02	.15	0.06	.25
RCADS-parent social phobia						
T5	7.38	3.80	6.87	2.80	7.09	2.91
RCADS-child total						
T1	42.42	18.10	38.63	17.04	38.80	16.32
T5	26.43	18.54	23.63	14.95	29.43	16.31
RCADS-child depression						
T1	8.83	4.40	7.49	4.21	7.41	4.09
T5	5.50	3.94	5.91	4.74	6.40	4.04
RCADS-child generalized anxiety						
T1	5.99	3.43	5.64	3.45	5.56	3.61
T5	4.38	3.74	3.17	2.63	4.11	2.83

Table 5.2. Estimated time effects for the conditional models for all outcomes between pretest and two year follow-up

	RCADS-SP		TAI		BFNE-II		stIAT		RCADS-total		RCADS-dep		RCADS-gad	
	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE
Intercept	12.42	0.20	38.87	0.53	21.94	0.48	-0.03	0.01	36.57	0.71	7.375	0.18	5.22	0.14
Time	-0.08*	0.04	-0.13	0.09	-0.12	0.10	< 0.01	< 0.01	-0.41***	0.13	-0.06*	0.03	-0.07**	0.02
CBM vs control	-0.04	0.05	-0.20*	0.12	0.01	0.13	< 0.01*	< 0.01	-0.05	0.16	< -0.01	0.04	0.03	0.03
CBT vs control	-0.08	0.05	-0.28**	0.11	-0.14	0.12	< -0.01*	< 0.01	-0.20	0.16	-0.02	0.04	-0.03	0.03
CBM vs CBT	0.04	0.05	0.08	0.11	0.15	0.12	0.01***	< 0.01	0.14	0.15	0.02	0.04	0.05*	0.03

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

Differences between CBM, CBT, and Control Condition over Time (pretest – 24 months follow-up) for Primary Outcome Measures

Social phobia (RCADS)

The unconditional means model for RCADS social phobia scores showed that 52.9% of variance was between subjects and 47.1% of variance was within subjects. The time variable indicated that social phobia scores decreased between pretest and two year follow-up (coefficient = -0.08, *SE* = 0.04, *p* = .02, *ES*: *d* = 1.01, CI [0.43, 1.98]), this decrease did not differ between the three conditions (*p*-values between *p* = .06 and *p* = .24).

Test anxiety (Spielberger TAI)

For Spielberger TAI scores, the unconditional means model showed that 61.8% of variance was between subjects and 38.2% of variance was within subjects. No overall decrease in test anxiety was found between pretest and two year follow-up, however, a significant overall difference between CBT (ES: *d* = .98, CI [-1.86 - 3.90]) and the control condition (ES: *d* = .56, CI [-2.53 - 4.83]; coefficient = -0.28, *SE* = 0.11, *p* = .01) and between CBM (ES: *d* = 1.04, CI [-1.91 - 4.79]) and the control condition (ES: *d* = .56, CI [-2.53 - 4.83]; coefficient = -0.20, *SE* = 0.12, *p* = .05), indicating that participants in the CBT and the CBM condition showed a larger decrease over time in level of test anxiety than control participants.

Fear of Negative Evaluation (BFNE-II)

Scores on the BFNE-II revealed that in the unconditional means model 60.1% of variance was between subjects and 39.0% of variance was within subjects. We did not find an overall time effect for fear of negative evaluation, nor a difference between the conditions.

Threat-related implicit associations (stIAT)

The unconditional means model for stIAT scores showed that 25.9% of the variance was between subjects and 74.1% of variance was within subjects. Overall, no time effects were found (coefficient < 0.01, *SE* < 0.01, *p* = .50). However, there was a significant time X condition effect for CBM (ES: *d* = 0.45, CI [0.38 - 0.55]) versus CBT (ES: *d* = .23, CI [0.16 - 0.31]; coefficient = 0.01, *SE* < 0.01, *p* < .001) CBM versus control (ES: *d* = 0.09, CI [0.02 - 0.18]; coefficient < 0.01, *SE* < 0.01, *p* = .02) and CBT versus control (coefficient < -0.01, *SE* < 0.01, *p* = .02). Thus, over time

participants in the CBM condition were more likely to associate social threat-related words with a positive outcome. Participants in the CBT condition over time showed less positive associations to social threat related words than participants in the control condition.

Presence of Social Anxiety (ADIS)

At two year follow-up, the number of social anxiety disorder diagnoses in each group was 1 out of 45 (2.2%) in the CBT condition, 4 out of 42 (9.5%) in the CBM condition and 2 out of 32 (6.3%) in the no treatment control condition. Since only a small fraction of the participants received a diagnosis of SAD, these data could not meaningfully be subjected to statistical analysis to test change over time or differences between groups.

Differences between CBM, CBT, and Control Condition over Time for Secondary Outcome Measures

Internalizing symptoms (RCADS)

The unconditional means model for RCADS internalizing symptoms scores showed that 56.8% of variance was between subjects and 43.2% of variance was within subjects. The time variable indicated that internalizing symptoms scores decreased between pretest and two year follow-up (coefficient = -0.41, *SE* = 0.13, *p* < .001, ES: *d* = 1.09, CI [-1.13 - 4.05]), this decrease did not differ between the three conditions.

Depression (RCADS)

The unconditional means model for RCADS depression scores showed that 56.3% of variance was between subjects and 43.7% of variance was within subjects. The time variable indicated that depression scores decreased between pretest and two year follow-up (coefficient = -0.06, *SE* = 0.03, *p* = .02, ES: *d* = 0.63, CI [0.09 - 1.39]), this decrease did not differ between the three conditions.

Generalized anxiety (RCADS)

The unconditional means model for RCADS generalized anxiety scores showed that 59.5% of variance was between subjects and 40.5% of variance was within subjects. The time variable indicated that generalized anxiety scores decreased between pretest and two year follow-up (coefficient = -0.07, *SE* = 0.02, *p* < .01, ES: *d*

= 0.77, CI [0.33 - 1.33]). Next to that, a difference was found between the CBM (ES: *d* = 0.67, CI [-0.06 - 1.83]) and the CBT condition (ES: *d* = 1.04, CI [0.31 - 1.80]), with a stronger reduction of generalized anxiety symptoms in the CBT condition (coefficient = 0.05, *SE* = 0.03, *p* = .03).

Parent reported social anxiety

We performed *t*-tests on the multiple imputed data to look at differences at two year follow-up in social phobia between conditions as reported by the participants' parents. No significant differences were found between any of the conditions at two year follow-up (CBT-ctrl: *t* = .843, *p* = .40; CBM-ctrl: *t* = .48, *p* = .63; CBT-CBM: *t* = -.46, *p* = .65).

Differences between CBM, CBT, and Control Condition between one year follow-up and two year follow-up

In the following we focus on the time segment between one year follow-up and two year follow-up and test whether or not change in reported symptoms differs between the three conditions.

Social phobia (RCADS)

Looking at the time between one year follow-up and two year follow-up, no time difference was found for social anxiety symptoms, implying no overall decrease in symptoms of social anxiety between one year follow-up and two year follow-up. No significant differences were found between the three conditions at this time segment, but for the CBT condition social anxiety appeared to have decreased slightly more compared to the control condition (trend significant; coefficient = -1.87, *SE* = 1.21, *p* = .06).

Test anxiety (Spielberger TAI)

A significant overall increase in test anxiety was found between one year follow-up and two year follow-up (coefficient = 3.78, *SE* = 1.98, *p* = .03, ES: *d* = 0.02, CI [-1.82 - 2.12). However, in the time fragment between one and two year follow-up CBM (ES: *d* = 0.04, CI [-3.42 - 3.79]) as well as CBT (ES: *d* = 0.06, CI [-2.54 - 2.98]) conditions showed a significant decrease of test anxiety compared to the control condition (ES: *d* = 0.17, CI [-3.55 - 4.44]; CBM-ctrl: coefficient = -4.51, *SE* = 2.38, *p* = .03, and CBT-ctrl: coefficient = -5.34, *SE* = 2.33, *p* = .01).

Table 5.3. Estimated effects for the conditional models for all primary outcomes, two year follow-up compared to one year follow-up

	RCADS-SP		TAI		BFNE-II		stIAT	
	β	SE	β	SE	β	SE	β	SE
Intercept	10.35	0.042	32.86	0.94	18.92	1.00	-0.02	0.03
Time	0.50	1.00	3.78*	1.98	1.23	2.31	0.04	0.06
CBM vs control	-1.30	1.249	-4.51*	2.38	-2.67	2.85	0.06	0.07
CBT vs control	-1.87	1.21	-5.34*	2.33	-2.80	2.76	-0.10	0.07
CBM vs CBT	0.57	1.12	0.83	2.24	0.13	2.66	0.16**	0.06

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

Fear of Negative Evaluation (BFNE-II)

At time segment level no time effects were found, nor differences between conditions.

Threat-related automatic associations (stIAT)

There was no overall effect of time for threat-related automatic associations. Between one year follow-up and two year follow-up, participants in the CBM condition (ES: d = 0.02, CI [-0.06 - 0.11]) developed relatively more positive automatic associations compared to CBT (ES: d = 0.02, CI [-0.06 - 0.10]; coefficient = 0.16, SE = 0.06, p = .004). No differences were found between the control condition and CBM or CBT.

Influences of Gender and Treatment Adherence

Gender

We looked into gender differences over time for social anxiety from pretest tot two year follow-up. Overall gender differences over time were found, with girls showing less reduction in social anxiety (coefficient = 0.10, SE = 0.04, p = .01). Looking at gender differences over time between conditions no significant results were found.

Treatment adherence

Next, we examined the influence of treatment adherence. The participants in the control condition were not included in the analysis, since they did not receive a training. Adherence was measured as the number of sessions participants attended. On average participants in the CBT condition participated in 6.7 sessions (out of 10 sessions; SD = 3.3) and in the CBM condition in 8.5 sessions (out of 20 sessions, SD = 6.9). For self-reported social anxiety no time effect was found for attendance, coefficient = -0.05, SE = 0.06, p = .20. Thus, the number of attended sessions was not of influence on the level of social anxiety at two-year follow-up.

Discussion

In the present early intervention study we tested the relative efficacy of a CBM-intervention compared to a CBT group treatment and a no-intervention control group in adolescents with elevated levels of social anxiety, focusing on long-term effects that were evident two years after the start of the intervention period. First, looking at the long term effects between pretest and two year follow up, the major findings can be summarized as follows: The mean level of symptoms of social anxiety decreased, regardless of condition. Participants in the active training conditions (CBM and CBT) showed a stronger improvement in test anxiety compared to the control condition. Automatic associations became more positive in the CBM condition compared to both other conditions, and more negative in the CBT condition compared to both other conditions. Over time, the mean level of overall anxiety symptoms, depression symptoms, and generalized anxiety symptoms decreased, with a stronger reduction in generalized anxiety in the CBT condition compared to the CBM condition. There was no difference between conditions in parent-reported symptoms of social anxiety.

In the one year time span between the one year follow-up and two-year follow up measurements, social anxiety symptoms seem to decrease more in the CBT condition than in the control condition, but this effect was only borderline significant. Test anxiety decreased over time for all conditions, but this decrease was significantly stronger in both active conditions than the control condition. Automatic associations became more positive in the CBM condition compared to the CBT condition.

These findings provide partial support for the efficacy of the studied early intervention programs: although social anxiety decreased over time regardless of

condition, the decrease in test anxiety was significantly stronger for both CBM and CBT compared to the no-intervention control group. This effect was present directly after the training period and stable over time, and although the difference in effect size was quite small (range $d = 0.56$ for the control group compared to $d = 0.98$ for the CBT and $d = 1.04$ for the CBM group), this prolonged benefit for the actively trained adolescents might be very meaningful at an individual level with less stress at exams and possibly improved academic performance. The absence of effects on social anxiety but presence of effects on test anxiety can be explained by the material used in both training conditions: scenarios in the CBM interpretation bias task and in the CBT training focused specifically on situations at school, which were quite often exams and tests. Social anxiety plays a role in various situations, including friends, clubs, and social life outside of school. The impact of our training conditions on social anxiety symptoms might be small because of the variety of factors in the adolescent's environment that can also provide a source for change. Making a meaningful change in social anxiety symptoms in adolescents with relatively few complaints (compared to clinical cases) might need a broader approach that also involves friends and parents.

The need for prevention and early intervention programs has been put forward by policy makers and mental health institutions but the practice of testing prevention and early intervention effects in research has some hurdles that are hard to tackle. First, even in an at-risk populations such as the high socially anxious adolescents selected in this indicated prevention program, the prevalence of social anxiety disorder is quite low, with low power to detect differences between groups as a complicating consequence. Second, in this at-risk group, the mean level of social anxiety symptoms decreased over time; many adolescents improve regardless of receiving an intervention. The value that can be added by providing a training is only small. This decrease of symptoms in an at-risk group has been observed in similar intervention studies (Sheffield et al., 2006) and longitudinal studies as well (e.g., the TRAILS cohort, in which the anxiety scores of high-anxious youngsters also dropped from age 13-14 to age 15-16, personal communication, April 11th, 2011).

It would be premature to conclude from the lack of effect on social anxiety in our study that a school-based intervention in this way is not worthwhile, since test anxiety has significantly decreased in both active conditions. Cognitive Bias Modification can be easily delivered through the internet and requires no therapist

involvement, and thus seems to be a promising venue for further research. In time, CBM may be applicable in prevention, and early intervention as well as in treatment, although it is important to test which aspect of the training is most effective in modifying cognitive biases and decreasing symptoms of anxiety. Delivering an intervention by way of external psychologists seems to be less suitable, since they are very costly, which makes implementation of such a program less feasible. A CBT program such as studied by Aune and Stiles (2009) which targets not only adolescents but teachers, parents and the community as well, seems to be a fruitful approach, and fits with the idea that targeting adolescents' social environment could be important in the prevention of social anxiety.

Since power limitations are present in most universal and indicated prevention studies and in early intervention studies as well (Cuijpers, 2003) , the effect of prevention and early intervention efforts can best be tested by combining studies in a meta-analysis (e.g., Fisak, Richard, & Mann, 2011; Neil & Christensen, 2009).

Our study is one of the first to measure automatic associations in a longitudinal RCT design. The finding that automatic associations to threat diverge over time for both active conditions, with relatively more positive associations in the CBM condition and relatively more negative associations in the CBT condition sheds some light on the meaning of automatic associations in the context of anxiety. Automatic associations are regarded as complementary to self-reported anxiety, and our findings fit with this idea such that anxiety decreases about equally in both groups while automatic associations diverge. These pathways might reflect different associations that are emphasized in both training conditions: while in most CBM tasks the relationship between threatening situations and positive outcomes was strengthened (e.g., ambiguous scenarios led to positive interpretations), the focus in CBT was on threatening situations and how to decrease anxiety while limiting avoidance, with much less focus on positive outcomes. Thus, relatively negative automatic associations may reflect past learning experiences which emphasized the relationship between social threat and negative outcomes. Since positive associations between social cues and expected outcome might be protective of developing anxiety, CBT could probably be improved by adding components that strengthen positive associations. Furthermore, it would be interesting to test whether automatic associations to threat are related to actual performance in test situations. Unfortunately, we did not include a behavioral test of social anxiety (e.g., a stress

task, Westenberg et al., 2009) or social exclusion game (Williams, Cheung, & Choi, 2000) in our design, but would recommend doing so in future studies to test this relationship as well as to provide additional information on the level of social anxiety.

To conclude, although both active interventions did not lead to long-term changes in symptoms of social anxiety, both CBT and CBM interventions were successful in reducing test anxiety, whereas this desirable effect was maintained at long term follow up. Taken together with the finding that CBM was able to change automatic threat-related associations in the long term into a more positive direction, these findings points to relevance of CBM as an efficient and low-key intervention for test anxiety. Since it is easy to implement at a relative low cost, CBM could be used for early intervention. Future studies, however, should find out which components of CBM are most effective and take care to include more behavioral tests of social anxiety.

Chapter 6

The Moderating Role of Behavioral Inhibition and Attentional Control on Intervention Success

Introduction

In this thesis it has been shown that behavioral inhibition (BIS), the flight-fight-freeze-system (FFFS), and attentional control (AC), as measured by self-report questionnaires, are cross-sectionally linked to symptoms of various anxiety disorders and depression (chapter 2). It has also been shown that over a two year period of time behavioral inhibition, the flight-fight-freeze-system, and attentional control do not predict symptoms of anxiety disorders over and above the pretest level of these disorders. For symptoms of depression, attentional control was shown to have independent predictive value for over a two year period of time (chapter 3).

Next to investigating the role of behavioral inhibition and attentional control in symptoms of anxiety and depression, we tested the efficacy of an intervention aimed at preventing social and test anxiety in adolescents. Six months after training, adolescents showed less social anxiety compared to the no-intervention control condition. This additional effect disappeared after one year (chapter 4) and remained absent at two year follow-up (chapter 5). For test anxiety we found a significant decrease within the CBT condition at posttest (chapter 4) and for both CBT and CBM at follow up (chapter 5). For total internalizing symptoms and depression at two year follow-up no differences were found between the conditions, but an overall decline in reported symptoms was found.

Even though most of the youngsters reported a decrease of symptoms over time, there was a large variability across individuals in this respect. Some adolescents showed more benefit from the training than others. It is unclear why some people are more susceptible to change than others. One may argue that some trait characteristics of individuals may either facilitate or impede treatment success. Candidate predictors include temperamental factors such as BIS, FFFS, and AC. For BIS it could be that those high on BIS or FFFS have the tendency to avoid negative stimuli, or choose to avoid when encountering negative stimuli. If they are trained to approach such negative information, those highest on BIS and FFFS, might be those benefitting the most from the interventions. On the other hand, they could, in line with their temperamental trait, avoid the specific challenges within the interventions and thus benefit less than participants lower on BIS or FFFS. For AC it could be that those low on AC benefit most from the intervention, since they specifically learn to focus their attention, in CBM by focusing on positive or neutral information, in CBT

by focusing on the task to be performed. Again, it could also be that those low in AC have a hard time improving their attention and thus benefit less from the interventions.

The aim of this chapter is, therefore, to investigate if pretest levels of BIS, FFFS, and AC are related to levels of anxiety and depression after the intervention phase at posttest and two year follow-up. Focusing on the most important outcome variables in this thesis, we chose to include social anxiety, test anxiety, depressive symptoms, and total level of internalizing symptoms.

Method

Details regarding trial design, participants, interventions, and procedures can be found in chapters 4 and 5. This Methods section will focus on the statistical analyses.

Statistical analyses

Multilevel analysis was used to test the moderating effect of behavioral inhibition, FFFS, and attentional control on the course of symptoms of social anxiety, test anxiety, and depression, as well as total internalizing symptoms. In the moderating model all main effects, two way interaction effects, and three way interactions effects for condition (CBM, CBT, ctrl), assessment point (posttest, two year follow-up) and behavioral inhibition, FFFS or attentional control were included. After running the full model, non significant interaction parts were removed. Next, the moderator model was tested against the basic model from chapters 4 and 5 (in this case with variables posttest, 2 year follow-up, CBM, CBT, posttestxCBM, posttestxCBT, FUxCBM, FUxCBT), using the difference in fit (-2*loglikelihood (IGLS Deviance)) of both models in a X^2-test. In the models used the CBT and CBM condition were always contrasted with the control group; and posttest and follow-up were compared to pretest.

Results & Discussion

Descriptives

Table 6.1 shows the mean and standard deviation for BIS, FFFS, and AC at pretest.

Model fit

Table 6.2 shows the fit of the moderator model versus the basic model. As can be seen, for social anxiety the moderator model did not have a better fit than the basic model, indicating no additional effect for adding BIS, FFFS, and AC to the analysis. For test anxiety, depression, and internalizing symptoms, the moderator model gave a better fit to the data than the basic model.

Table 6.1. Means and standard deviation for BIS, FFFS, and AC at pretest

	Pretest	
	Mean	Standard deviation
BIS	12.41	1.58
FFFS	9.19	1.44
AC	19.04	6.27

Table 6.2. Model fit for social anxiety, test anxiety, depression and internalizing symptoms with BIS, FFFS, and AC as moderators

	Moderator model	Basic model	p-value
RCADS social phobia	4727.315	4731.778	.21
St TAI test anxiety	6139.517	6162.057	< .001
RCADS depression	4384.151	4409.811	< .001
RCADS internalizing	6701.859	6715.514	< .01

Social anxiety

For social anxiety the final model contained the main effects of time, condition, BIS, FFFS, and AC, and the interaction between timeXcondition. As can be seen in Table 6.3, a significant main effect was found for FFFS. The main effect of FFFS indicates that higher pretest scores on FFFS are related to more social anxiety. Thus, regardless of condition, adolescents who reported at pretest a relatively strong tendency to react with fear and avoidance, generally reported also more socially anxious complaints over all assessment points. No main effect or interaction effect was found for BIS or AC, and also no interaction effect for FFFS. Thus, the treatment effect with regard to social anxiety was not moderated by BIS, FFFS, or AC.

Table 6.3. Final models of multilevel analysis for social anxiety, test anxiety, depression and internalizing symptoms

	Social phobia		Test anxiety		Depression		Internalizing symptoms	
	β	SE	β	SE	β	SE	β	SE
Post	-0.41	0.55	0.10	1.26	-2.61	2.01	1.04	1.79
FU2yr	-1.35*	0.66	-1.83	1.51	-0.09	0.53	-2.96	2.14
CBT	-0.92	0.70	-3.16*	1.77	-0.45	0.58	-2.83	2.42
CBM	-0.24	0.72	-1.86	1.78	-0.43	3.41	1.56	2.44
PostxCBT	0.24	0.73	-1.11	1.68	-0.13	0.59	-0.25	2.38
PostxCBM	-0.24	0.74	-1.97	1.69	5.26	3.55	-4.78*	2.40
FUxCBT	-0.78	0.87	-1.74	2.00	-0.44	0.71	-4.55*	2.84
FUxCBM	-0.45	0.90	-2.40	2.06	-1.57*	0.73	-4.46	2.94
BIS	0.04	0.16	0.07	0.39	-0.02	0.13	0.11	0.53
FFFS	0.34*	0.21	0.87*	0.52	-0.25	0.21	1.02	0.70
AC	-0.05	0.05	-0.54***	0.12	-0.19***	0.04	-0.55***	0.17
PostxFFFS	-	-	-	-	0.33	0.22	-	-
CBMxFFFS	-	-	-	-	0.15	0.37	-	-
PostxCBMx FFFS	-	-	-	-	-0.72*	0.39	-	-

Note: *** $p < .001$, ** $p < .01$, * $p < .05$. Non significant variables not in the final models: PostxBIS, PostxFFFS, PostxAC, FUxBIS, FUxFFFS, FUxAC, CBMxBIS, CBMxFFFS, CBMxAC, PostxCBMxBIS, PostxCBMxFFFS, PostxCBMxAC, PostxCBTxBIS, PostxCBTxFFFS, PostxCBTxAC, FUxCBMxBIS, FUxCBMxFFFS, FUxCBMxAC, FUxCBTxBIS, FUxCBTxFFFS, FUxCBTxAC.

Test anxiety

The final model for test anxiety contained the main effects of time, condition, BIS, FFFS, and AC, and the interaction effects of timeXcondition. As can be seen in Table 6.3, there were significant effects for FFFS and AC on test anxiety. We did not find any moderating effects of BIS, FFFS, or AC. But, we found that those high on FFFS at pretest showed more symptoms of test anxiety, also adolescents low on attentional control showed more symptoms of test anxiety. Thus, adolescents with a tendency to avoid and proneness towards fear showed more test anxious

complaints, and adolescents with less control over focusing and shifting attention also reported more symptoms of test anxiety.

Depression

When looking at depression, there was a main effect of attentional control indicating that a lower ability to focus or switch attention at pretest was associated with a generally higher level of depressive symptoms. For depression we also found a moderator effect for the interaction PosttestxCBMxFFFS. This effect was not found when we compared the CBM condition with the CBT condition. Figure 6.1 shows the direction of the interaction. For this graph FFFS was divided in three groups of approximately equal size. Low FFFS contains scores from 3 up to 8 (n = 79, 32.9%), mid FFFS contains the score 9 (n = 83, 34.5%), and high FFFS contains the scores 10 up to 12 (n = 78, 32.5%). As can be seen, the interaction effect is caused mainly

Figure 6.1. The interaction PosttestxCBMxFFFS plotted for depressive symptoms
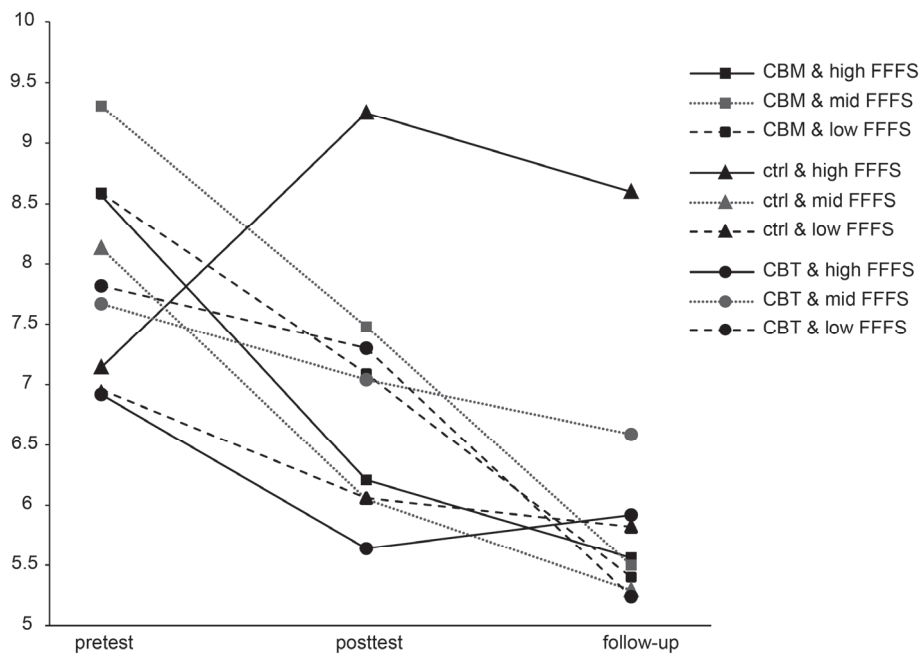
by the control condition, behaving in an upward direction between pretest and posttest for the group high on FFFS. This shows that participants in the control group, high on FFFS, show more symptoms of depression at posttest compared to the CBM condition and the low FFFS participants in the control condition. All other conditions show a decline in symptoms, except for the high FFFS group in the control condition. Hence it seems that for participants high on FFFS, taking part in a training (especially CBM) prevents the development of more depressive symptoms.

Internalizing symptoms

For total level of internalizing symptoms we found a main effect of AC. The main effect of AC indicates that lower attentional control was related to higher levels of internalizing symptoms. We did not find any interaction effects for internalizing symptoms, or main effects of BIS or FFFS.

Conclusions

The aim of this chapter was to test if BIS, FFFS, and/or attentional control had a moderating effect on treatment efficacy. As the main finding the results showed that pretest levels of BIS, FFFS, and attentional control did not moderate treatment efficacy with regard to symptoms of social anxiety, test anxiety, or total anxiety symptoms. Yet, there was preliminary evidence indicating that FFFS moderated the efficacy of the CBM training compared to the control condition. Participants high on FFFS in the control condition showed significantly more symptoms of depression compared to the participants that had received the CBM training. This was with an exception for FFFS, for which we found that high pretest FFFS appears to prevent development of depressive complaints.

We can conclude that for social anxiety, test anxiety, and total level of internalizing symptoms, there are no moderating effects of BIS, FFFS, or AC. Thus, participants with more extreme levels of BIS, FFFS, or AC do not benefit more or less from the training conditions compared to participants with moderate levels of these temperamental characteristics. For depression a preventive relation seems to appear for participants high on FFFS, with those who have received training, and especially the CBM training being protected for an increase in depressive symptoms. However, future research is necessary to get more insight in this relation, and longer term follow-up would be necessary to see how these results hold up over time.

In contrast to chapter 4 and chapter 5 some time and timeXcondition effects were not found. This might be explained by the absence of six months follow-up and one year follow-up in the analysis, making it harder to correctly estimate posttest and interaction-effects for these variables. We chose to leave the six month follow-up and twelve month follow-up out of the present analyses, since they were not of relevance for the research question in this chapter. Next to that, adding extra variables (i.e., BIS, FFFS, and AC) to the model might have caused lower power, which might

explain why the timeXcondition effects for social anxiety and test anxiety for CBT and CBM found in chapter 4 and chapter 5 were not found here.

Lack of findings for the candidate moderator variables BIS, FFFS, and AC could partly be due to a limited variability. When comparing the means and standard deviations at pretest with the screening group, the means were higher for BIS and FFFS, and lower for AC for the participants included for the intervention study, and the standard deviations were smaller, as could be also expected from the findings in chapter 2 and chapter 3. This could have resulted in an underpowering of this the analyses.

To conclude, we have found no reason to assume that the effectiveness of the CBM or CBT training is related to pretest levels of BIS, FFFS, and/or AC for anxiety symptoms, but for depression there are some indications that especially for high FFFS individuals preventive interventions might be helpful to buffer the development of depressive symptoms.

Chapter 7

General Discussion

General discussion

Early in adolescence, around the age of 12 until 14, many adolescents deal with some level of symptoms of social anxiety. The core of social anxiety is the fear of negative evaluation by others. The symptoms may take the form of social anxiety, with adolescents being anxious to ask questions in the class room or invite someone for a cinema visit; for others the focus lies more specifically on test anxiety, and feared situations can be for example presentations or exams (American Psychiatric Association, 2000; McDonald, 2001; Wittchen et al., 1998).

Symptoms of social and test anxiety can greatly influence adolescents, not only at the point in time when the symptoms are first experienced, but also later on in life. For example, social anxiety at age 13 can lead to lower performance at school and over the years to a lower educational level (Wittchen et al., 1998). Since the impact of social and test anxiety might be considerable, an early intervention seems of utmost importance. However, to be able to deal with the first symptoms of social and test anxiety it is important to gain more insight in risk factors for the development of these anxiety complaints. Previous research shows that symptoms of anxiety earlier in time are good predictors for anxiety symptoms later on (O'Connor et al., 2010; Sears & Armstrong, 1998). However, other factors may also play a role in the development of anxiety. Relatively stable temperamental factors are important candidate factors to contribute to the development of anxiety disorders. Youth with an overactive reactive temperamental system may be extra sensitive to threat signs and anticipated punishment and may therefore be more prone to developing internalizing disorders. Also, children with difficulty regulating their emotions, for instance by having difficulty switching attention from threat signs to safety information, may also have a proneness towards the development of internalizing disorders (Lonigan & Phillips, 2001).

Thus, on the one hand these risk factors could be reactive temperamental factors, dealing with reacting upon emerging situations, and on the other hand there is a role for regulative temperament. Within reactive temperament research has focused on behavioral inhibition as predictor for anxiety, within regulative temperament an important role is attributed to attentional control (Lonigan & Phillips, 2001). However, although some work in this area has been done cross-sectionally, longitudinal research into this matter is still scarce. Whether behavioral inhibition and attentional control are indeed risk factors for the development of anxiety over a longer period of time is yet to be determined, and was a focus in this thesis. Along

with determining whether or not behavioral inhibition and attentional control are risk factors for the development of internalizing disorders, it was the aim of the current thesis to examine whether using a (relevant) symptom checklist such as the Revised Child Anxiety and depression Scale (Chorpita et al., 2000) would be the best method for the selection of participants in an early intervention study for internalizing complaints, or if specific questionnaires targeting certain behavioral inhibition and attentional control would provide a better selection method.

Identifying risk factors of anxiety is an important first step to identify individuals at risk for internalizing disorders. The next step is to develop interventions for these adolescents that are at risk for developing internalizing disorders, starting with the group of adolescents with mild symptomatology that can be seen as a proneness towards developing full-blown disorders. A lot of research has been done in the area of interventions for adolescents with full-blown anxiety disorders (Reynolds, Wilson, Austin, & Hooper, 2012), but for adolescents with a proneness towards developing a disorder (reporting symptoms of anxiety, or with the disorder in a mild form), few interventions have been developed so far. Therefore, we developed two interventions aiming at reducing these early symptoms of internalizing disorders. The first intervention was derived from the gold standard, cognitive behavioral therapy. Our CBT intervention includes most of the characteristic CBT interventions for anxiety, such as cognitive restructuring and exposure, and was adapted to function as an intervention for symptoms of anxiety. The other intervention in this study is a cognitive bias modification (CBM) intervention. It is hypothesized that disturbed cognitive processes play an important role in anxiety disorders, in CBM these cognitive processes are targeted directly through computer tasks. In this study we tested the efficacy of these interventions, compared to a control group. The aim of this series of studies was to test the efficacy of two early interventions targeting symptoms of social and test anxiety, studying short term and long term effects until 24 months follow-up. We also investigated the effects on a wider range of outcome, namely depressive symptoms, symptoms of generalized anxiety and the total level of internalizing symptoms.

Comparing CBT, CBM and a control group in one study helps in the ongoing debate on the usefulness of CBM research. Some researchers argue that CBM is a promising new kind of treatment (MacLeod & Holmes, 2012; March, 2010), while others wonder if CBM is really that promising, and claim that CBT or exposure is

more effective and useful (Emmelkamp, 2012). A direct comparison as is being done in this study adds empirical data to this discussion.

Finally, we were interested if the above mentioned temperamental factors influence the effectiveness of the interventions: it can be hypothesized that adolescents high on BIS or FFFS or low on attentional control, benefit less from the intervention. In treatment, the focus almost automatically lies on anxiety provoking stimuli, especially those sensitive to signs of danger and feelings of anxiety, thus high on BIS, could be distracted by these stimuli during training, thus benefitting less. Adolescents high on FFFS are supposed to react with avoidance, this could be avoidance of own cognitions or situations to be practiced and therefore hamper training progress; low AC could result in not focusing enough on the interventions and their implications, but instead remaining focused on the fears and having trouble to switching attention to the task (during for example exposure). In turn, these adolescents may not experience that situations may not be as frightening as they expected, eventually leading to maintenance of anxiety.

The results from the temperamental studies are described in chapter 2 and 3, the results of the effectiveness study is described in chapter 4 and 5, whereas the results of the possible influence of temperamental factors on the effectiveness of the interventions are described in chapter 6. Below the findings within this thesis will be discussed.

Temperament – Behavioral Inhibition, the Fight-Flight-Freeze-System and Attentional Control as Risk Factors for Internalizing Disorders

In this thesis we investigated the relationship between internalizing disorders on the one hand and the behavioral inhibition system (BIS), the fight-flight-freeze-system (FFFS), and attentional control (AC) on the other hand. This relationship was examined cross-sectionally (chapter 2) and longitudinally (chapter 3).

For both chapters we used the complete sample of Project PASTA (Project for Adolescent Social and Test Anxiety), consisting of 1811 participants from 25 different secondary schools in the northern part of the Netherlands. This sample was gathered by inviting over 5000 adolescents in their first or second year at secondary school (aged 12-15) to participate in a study with main aim the detection of

adolescents with symptoms of social and test anxiety. In total 1811 adolescents took part in the screening. Two years after the screening all participants were invited for the follow-up study and 1161 adolescents eventually took part in this follow-up assessment.

Cross-sectional study

Behavioral inhibition as well as the fear-fight-flight-system was positively related to symptoms of both anxiety and depression. This is in line with previous research regarding the relation between behavioral inhibition and internalizing disorders (Johnson et al., 2003; Muris et al., 2005). As expected, BIS was related to all symptoms of anxiety disorders, which also fits with the original reinforcement sensitivity theory (RST; Gray, 1982). Compared to the renewed RST (Gray & McNaughton, 2000), these findings fit the theory partly: in the renewed RST BIS is hypothesized to be related to all internalizing disorders, as we have found, and FFFS is hypothesized to be specifically related to panic disorder and social anxiety disorder. We found that FFFS was related to all internalizing disorders, which is not in line with the renewed RST. However, up to this point, empirical data for the renewed RST was scarce. This study casts serious doubt on the implications of the renewed RST (e.g., that FFFS would only be associated with panic disorder and social anxiety disorder). The tendency to react with fear was not only elevated in adolescents with symptoms of panic disorder or social phobia, but also in adolescents with all other internalizing symptoms.

The role of AC was as expected, with higher levels of internalizing complaints for adolescents with lower AC. This is in line with previous research into the matter, regarding AC or the overarching concept of effortful control (Eisenberg et al., 2001; Muris, 2006; Muris et al., 2008). Thus, adolescents with low control over focusing or switching their attention report more anxiety and symptoms of depression.

In this study we found that adolescents high on BIS in interaction with low AC showed the highest level of symptoms of anxiety and depression, as expected considering previous research (Coplan et al., 2006; Kimbrel et al., 2008; Vervoort et al., 2010). For FFFS no such interaction with AC appeared. Thus, self-reported low attentional control, combined with self-reported high goal-directed conflicts (BIS) is associated with more internalizing complaints: in a situation where a goal-directed conflict arises and a decision needs to be made, while at the same time, the ability to

focus attention on this conflict or to switch attention away from the conflict is limited, a state of indecisiveness and doubts is created, which is in turn in relation to symptoms of anxiety and depression.

These data, however, are of a cross-sectional nature, to further examine the direction of the found relations between BIS, FFFS, and AC and internalizing disorders longitudinal research is crucial. Longitudinal research can shed light on the question whether high BIS, high FFFS, and low AC were already present before the onset of internalizing symptoms.

Longitudinal study

Over a two year time period, BIS predicted total level of anxiety symptoms, generalized anxiety symptoms, symptoms of social anxiety and OCD. These results were partly in line with our expectations based on previous research (Muris et al., 2008; Sportel et al., 2011) and the RST theory (Corr, 2008; Gray & McNaughton, 2000). We expected high BIS to be associated with higher levels of symptoms of internalizing disorders over time. However, we found a predictive relation for BIS with regard to overall internalizing disorders, GAD, social anxiety disorder and panic two years later, but not to symptoms of separation anxiety, obsessive-compulsive disorder, and depression. When including baseline symptoms in the analyses, BIS was no longer a significant predictor, implying that level of BIS at age 12-14 is not predictive of internalizing symptoms over a two year time period over and above earlier levels of internalizing symptoms.

We found that over time FFFS predicted symptoms of social anxiety and separation anxiety. This is in line with the RST theory, suggesting that for social anxiety disorder FFFS is supposed to be most relevant (Corr, 2008). Separation anxiety disorder is not specifically assumed to be predicted by FFFS. An obvious explanation for this finding is not at hand, it could be that is separation anxiety disorder the actual separation of the child or adolescent from the parent could be seen as the aversive stimulus, provoking a reaction from the child or adolescent, which is in line with the definition of FFFS. For panic disorder, which is also hypothesized to be related to FFFS, we found no relation with FFFS. One reason for this could be that panic disorder usually arises at an older age (Kessler et al., 2005), an explanation that is in line with the fact that the found level of PD symptoms in our sample was quite low.

When controlling for pretest levels of internalizing symptoms, the predictive value of FFFS for separation anxiety and social anxiety was no longer present. This implies that, although FFFS is cross-sectionally related to internalizing symptoms, and is also longitudinally related to social anxiety and separation anxiety, FFFS in early adolescence is not predictive of internalizing symptoms over time over and above baseline internalizing symptoms.

As expected we found that AC was predictive of internalizing disorders, thus adolescents low on AC had relatively high levels of internalizing disorders. This is in line with previous longitudinal research (Van Oort et al., 2011) as well as cross-sectional research (Muris et al., 2008; Sportel et al., 2011). Thus, adolescents with low control at pretest showed higher levels of internalizing symptoms two years later. This relation was the strongest for depressive symptom, since even when controlling for pretest levels of depressive symptoms, AC had predictive value for depressive symptoms over a two year period, but not for any of the measured symptoms of anxiety disorders. This is in line with current models of depression emphasizing the crucial role of impaired attentional disengagement from negative self-referent information in the persistence of negative thoughts (Koster et al., 2011). Good control over attention might prevent individuals engaging in prolonged and repetitive negative thoughts, which in turn might help to prevent developing depression symptoms.

Unexpected, the interactions between BIS and AC and between FFFS and AC did not predict the level of internalizing symptoms at follow-up. Thus, adolescents high on BIS or FFFS combined with low AC did not report more complaints compared to adolescents without one of these combinations. This is not in line with the theory by Lonigan and Phillips (2001), which postulates that especially the reactive characteristic high BIS, combined with the regulative characteristic AC would set people at greatest risk for developing an internalizing disorder. Although empirical evidence for the theory by Lonigan and Philips (2001) is still scarce, the findings in this thesis point towards a re-evaluation of this aspect of the theory, in which the interaction between BIS and AC should no longer have the current prominent role.

There could be other explanations for not finding the alleged interaction between BIS and AC. For example, the difference between the theory and current findings could be related to the fact that Lonigan and Phillips (2001) originally describe

negative affect in combination with effortful control instead of BIS and AC. BIS has been linked to negative affect throughout the years (Corr, 2008), negative affect is described as a non-specific component of generalized distress, common for anxiety and depression. BIS, however, is described as goal-directed conflict within FFFS, BAS, or between FFFS and BAS. This makes BIS a lot more specific compared to negative affect. It could be that negative affect is a broader construct, including various traits that would have had an effect on symptoms of internalizing disorders over time. With respect to AC, effortful control is an overarching construct consisting of AC, and activation control and inhibitory control. Both negative affect and effortful control thus seem to represent larger constructs, it could be that the theory by Lonigan and Phillips (2001) does hold up for other subdividings of these constructs.

We also found that when controlling for pretest level of the relevant internalizing disorder, the predictive value of BIS, FFFS, and AC disappeared, except for AC as predictor for depressive symptoms. Thus, BIS, FFFS, and AC do not have independent predictive value with regard to internalizing symptoms over and above internalizing symptoms earlier on. This may be due to the relative old age group (12-14 years) in our sample, BIS, FFFS, or AC could have already been colored by the level of internalizing complaints at the time of the initial screening, thus it cannot be ruled out that at an earlier age BIS, FFFS, and AC could be predictors of internalizing complaints later on. Previous research has thus far used BIS as specified by Kagan (1988) to look into this matter, but research looking at BIS - according to Gray (1982)-, FFFS, and AC is absent.

Future research regarding BIS, FFFS, and AC should give further insight in the predictive value of these factors in the development of anxiety. For example by assessing children before the first symptoms arise, at an age ample before the commonly measured onset age for the particular disorder. By doing this, the possibility can be ruled out that the measured pretest levels of internalizing disorders were already colored by levels of BIS, FFFS, and AC at an earlier stage. For example, in social anxiety, in which onset is usually found above the age of ten, assessing BIS, FFFS, and AC at age seven or eight could be wise, but is still to be investigated. By doing so, the alleged role of the combination of BIS and AC according to Lonigan and Philips (2001) could be put to investigation. When assessing these characteristics at a young age including assessing parents or caretakers should be considered.

One of the aims of studying the risk factors for internalizing disorders was to examine whether using a (relevant) symptom checklist, such as the RCADS (Chorpita et al., 2000), would be the best method for the selection of participants in an early intervention study for internalizing complaints, or if specific questionnaires targeting certain risk factors would provide a better selection method. The results indicate that when screening adolescents at the age of 12-14 for internalizing complaints, the level of symptoms reported at the screening is the best predictor for the level of complaints two years later. Thus, the selection of participants at this age for an early intervention study cannot be improved by adding self-report measures of BIS, FFFS, or AC to the assessment battery for anxiety disorders. However, for depression adding a measure for attentional control to an assessment battery could help to better screen adolescents for being at risk of depression.

With regard to the used methods to assess the variables described in the temperamental studies there is room for improvement. For example, the manner in which AC was measured could be altered. In our study we measured AC using the attentional control subscale of the Adult Temperament Questionnaire (Rothbart et al., 2000). It has been shown that measuring AC by self-report might not provide data that represents the full concept (Muris et al., 2008), thus adding a measure of executive functioning such as the Test of Everyday Attention for Children (Manly et al., 2001) or the Attentional Network Task (Fan et al., 2002; Reinholdt-Dunne et al., 2009) might add to current findings by providing neuropsychological data as obtained on tasks, instead of self-reported data. Muris and colleagues (2008) however also conclude that performance-based measures of AC are not convincingly related to psychopathological symptoms cross-sectionally. These conclusions, however, are again based on self-report measures of psychopathological symptoms. Replacing the self-report with other-report or behavioral measures might shed another light on the role of AC with regard to internalizing disorders, since one might wonder whether self-reported anxiety and depression provides an accurate display of the internalizing symptoms. For future research a study combining self-report measures on temperamental factors and internalizing symptoms with other-report, behavioral or neuropsychological measures would be suggested in an attempt to get a hold of the complete concept.

Finally, it could be argued that the BIS/BAS-scales and the RCADS show a relatively high level of overlap between the various items and similar formulations of

the items, which would be of influence for the current findings, for example *"I feel afraid that I will make a fool of myself in front of people"* (RCADS) and *"I feel worried when I think I have done poorly at something important"* (BIS/BAS-scales). There is a difference, which lies in the fact that the BIS/BAS-scales are designed to measure a predisposition, whereas the RCADS is designed to measure the actual anxiety. This pleads for measuring both BIS/FFFS and internalizing symptoms in various manners, for example by adding behavioral measures or other-report measures.

Effectiveness – Early Intervention in Social and Test Anxiety

The second aim of this thesis was to test the efficacy of two low-threshold interventions to reduce early symptoms of social and test anxiety. We investigated the efficacy of the interventions at posttest, 6 month follow-up and 12 month follow-up (chapter 4) and at 24 month follow-up (chapter 5). For the long term outcome a broader range of outcome variables was looked at, in order to investigate whether the interventions were not only successful in reducing social and test anxiety, and if they were also effective in reducing or preventing symptoms of other internalizing disorders (chapter 5). Besides the effectiveness of the interventions, the influence of pretest levels of BIS, FFFS and AC on the outcome of the interventions was investigated (chapter 6).

For these chapters we used a selected subsample of the 1811 adolescents screened. The flow chart in chapter 5 provides critical details such as the number of participants and drop out for each condition.

Findings

In all three conditions (CBT, CBM, and control), levels of social and test anxiety dropped between pretest and posttest and there were no significant differences between conditions. At six month follow-up, participants reported significantly less symptoms of social anxiety after CBT than after the no-intervention condition. For the CBM intervention, this was trend significant ($p < .10$). At 12 and 24 months follow-up, there was an overall decrease in level of social anxiety symptoms, with no significant differences between the various conditions. For all found differences the effect sizes were in the small to moderate range, for the interventions conditions as well as the control condition. Our findings are in line with previous research showing that in early intervention and prevention directly after training no differences emerged between

the conditions. At six months follow-up these differences between the conditions emerged, but in the long the differences were no longer present (Dadds et al., 1999). The fact that the differences did not emerge immediately after training could be related to the severity of the complaints. In prevention and early intervention it is not uncommon to see differences emerge later on (Neil & Christensen, 2009).

After the CBT and CBM conditions, adolescents reported lower levels of test anxiety relative to youth in the no-intervention condition. In the CBT condition this effect already emerged at posttest and remained stable over time, whereas in the CBM condition the difference in effectiveness was only significant at 24 month follow-up. With regard to test anxiety the results were in line with our expectations, with a beneficial effect for participants in the CBT and CBM condition. Overall, the found effect sizes were in the moderate range, indicating a definite effect of the conditions, but leaving room for improvement.

These findings imply that it is useful to apply CBT in this age group. For test anxiety the CBT intervention is successful in reducing complaints compared to the control condition, while for social anxiety some positive results were found, but mainly in the mid-long term. Even though that at a longer term the beneficial surplus effect of the CBT intervention on social anxiety disappeared, participants in this condition returned to a lower level of complaints at an earlier point in time, which may also be regarded as beneficial. Although it is probably not cost effective to provide both the screening and the intervention compared to this benefit on social anxiety, on an individual level participation in an intervention could make life easier at an earlier stage for these adolescents. For adolescents dealing with test anxiety, providing this intervention via schools is useful. It would probably be necessary to investigate how the screening could be altered in such a manner that screening using questionnaires, followed by an extensive interview is no longer necessary and the selection of adolescents can be done by for example school psychologists.

The CBM training led to small but some positive effects. Participants in the CBM condition had lower levels of test anxiety after two years, and the effect of the intervention on social anxiety was trend significant six months after training compared to the control condition. The CBM intervention was found to be effective in altering the interpretation bias as well as automatic associations. The CBM training used in this project gave promising results; however, at this point in time it seems too early to implement the method broadly. The effects generated by the CBM training

are in line with those from the CBT training, although somewhat less pronounced and smaller overall, but not convincing enough for implementation at this stage in its current form. In light of the discussion whether CBM is a useful intervention (Emmelkamp, 2012), our findings indicate that when compared to CBT, CBM does not sort the same effects. However, CBM seems to influence different processes, which might add to CBT. CBM specifically seems useful for interpretive bias compared to attentional bias. Further development of CBM (as is discussed further on) could lead to an intervention with additive value. Whether or not this value could add over and above CBT alone remains to be investigated.

There is room for improvement in the used methods to assess social anxiety and test anxiety. Adding a behavioral instrument to assess anxiety may enhance the validity. For example the Trier Social Stress Test (TSST) could function as such a behavioral measure, by inducing stress to the participants and measuring various outcome variables like cortisol level and heart rate. The TSST is also available for groups (TSST-G; Von Dawans, Kirschbaum, & Heinrichs, 2011), making it easier to apply to more participants at once and being less time consuming. By using the TSST(-G) on a few of the assessments the change within participants with respect to their reaction to stress can be measured, as well as the relative difference in change between conditions could be interesting to look at. Behavioral measures may be closer related to implicit methods, thus, it could be that participants in the CBM training show a relatively large change in behavioral measures compared to the control group or CBT condition. Perhaps, such a measure could have a mediating role, with a change in heart rate and cortisol as first signal of change, followed by a change in self-reported anxiety. This would be in line with the current finding that for test anxiety the participants in the CBM condition did not report lower test anxiety until after two years.

With regard to the control condition, the findings were not as expected. Since participants in the control condition (i) showed elevated symptoms of anxiety at the screening, (ii) were thus at risk for further developing internalizing symptomatology, and (iii) did not receive any training, we expected them to either report the same or higher levels of social and test anxiety over time. However, symptomatology significantly dropped over time and the onset of disorders was extremely low in our sample. With regard to social anxiety, participants in the control condition showed no significant difference compared to the CBM condition on any of the assessed time

points, and compared to the CBT condition only between posttest and 6 month follow-up. Looking at the period between pretest and 24 month follow-up, no differences emerged with regard to social anxiety between the control condition and the active conditions.

One could argue that we did not select the right population by our criterion of including participants with elevated symptoms of social and test anxiety. However, chapter 3 shows that anxiety symptomatology was the single best predictor of long-term symptomatology, which clearly supports the validity of our a priori selection criteria and seems to rule out the idea that the selection was not appropriate.

Another explanation could be that the control condition was an intervention after all: even though we did not intervene in the control group, our presence at school throughout the years, along with the interviews and feedback, and filling out the questionnaires may have influenced these adolescents. For example, in the interview a lot of possible anxiety provoking situations were addressed, which might have resulted in a heightened awareness within adolescents. They may have realized that within the possible variety of anxious situations there were just few relevant for them, reassuring them there complaints were not that massive, leading to lower reported anxiety at follow-ups. On the other hand, adolescents might have realized that they had quite some complaints, resulting in -successfully- dealing with these themselves, finding support with friends or family or seeking treatment in regular mental health care. This argument, however, does not hold up considering the fact that we found an overall decline of level of internalizing symptoms in the complete sample (N = 1811), and thus the decline appears to be unrelated to the participants in the control condition.

Pretest level of BIS, FFFS, and AC did not moderate treatment success for social anxiety, test anxiety or total level of internalizing symptoms. We did not have any explicit expectations for the tested moderator effects. Apparently, participants high or low on BIS, FFFS, or AC did not benefit more from the interventions, nor experienced detrimental effects. It was found that FFFS moderated the level of depressive symptoms in the CBM condition compared to the control condition at posttest. Further inspection lead to the conclusion that the CBM intervention lead to a prevention of the normal increase in depressive symptoms. So, overall there was no moderator effect of BIS, FFFS, or AC on internalizing symptoms, with the exception of FFFS, which moderated the level of depressive symptoms at posttest.

General Limitations & Future Research

Next to some limitations already addressed above other limitations leading to suggestions for future research can be denoted with regard to the studies described in this thesis. First, since this study was primarily designed as an intervention study for social anxiety and test anxiety, it cannot be ruled out that there is a participation bias. Before entering the study, all invited adolescents and their parents received full information about the nature of the study and the entire procedure. In this information we highlighted that also non-anxious adolescents were encouraged to participate, to get insight in the prevalence of social and test anxiety in this age group. The invitation process could have caused a subsample of adolescents not to attend for several reasons. First, because some adolescents were sure they were non-anxious and therefore chose not to join since the purpose of the screening was not clear enough to them; second, some adolescents were anxious and avoided confrontation with their fears and anxiety and thus the study; third, some adolescents read the information and considered a maximum of six assessments (when included in the intervention study) as too many; or fourth, parental consent next to adolescent consent could have caused lower response with parents unwilling to let their child participate or due to practical issues, such a forgetting to sign the informed consent and sending it back. This could limit the generalization of the results to a broader population. In the first case you would expect an overestimation and in the second case an underestimation of the prevalence of certain disorders. With respect to our data, we found relatively low prevalence rates for disorders (chapter 4 and 5), and the average scores on our anxiety measures were slightly higher compared to those found in TRAILS (Van Oort et al., 2009). Overall there are some indications that our findings may overestimate the presence of anxiety symptoms, while at the same time there is an underestimation of presence of disorders.

Another limitation is the drop-out rate, in the longitudinal temperamental study we dealt with a drop-out rate of 35.9% and in the intervention study the drop-out rate after two year was 44.6%. The reasons for adolescents to drop out of our study varied between (i) no longer feeling like participating, (ii) absence during follow-up, (iii) changed schools or left school, or other reasons that were unclear. This level of drop-out is seen more frequently in this kind of longitudinal school-based research, Gillham and colleagues (2007) for example dealt with a drop-out of 56.8% at three

year follow-up. In our study, participants had the freedom to end their participation in the study at any given time, without providing a reason. However, in a group of adolescents with a strong -age related- urge to do as they like, this resulted in drop-out just because the adolescents in question did not feel like participating anymore.

We tried to motivate participants for all assessments by sending them emails to invite them for the assessments, sending them emails to notify them about the time and place when they were expected. In the temperamental studies we made sure that participants from the same class were assessed together and during school hours. Furthermore, absent participants were picked up in class by one of the researchers or the school secretary; and participants that completed the assessment could win a 20 Euro gift certificate. Participants in the intervention study almost always had their assessments immediately after school hours and were reminded by telephone the day before the assessment. In addition, they were rewarded with a 5 euro gift certificate, and in case one or more participants missed an assessment we returned to the school for a re-assessment. The adolescents' parents were involved in the study, increasing the awareness of the participation in the study in families. Drop-out could probably be reduced by, and is seen less in studies with, more financial room for manoeuvre. Extra financial input could be used for research assistants to even more intensively try to keep participants in the study, but also to give participants more substantial rewards, such as city trips, tablets, and gift cards as are for example used in the TRAILS study (www.trails.nl).

The extensive screening procedure we used in this study puts up a barrier for implementation of the interventions in schools. The procedure was very time consuming and costly, including inviting the youth, signing informed consent, filling out questionnaires and performing tasks at school, and being interviewed through a semi-structured interview. Our randomized controlled trial was set up to investigate the content of the screening as well as the relative effectiveness of the two interventions. This type of study typically involves many outcome measures and questionnaires and computer tasks. For such a randomized controlled trial, a broad screening is necessary to get a good idea of the characteristics of the sample, and to evaluate a wide variety of outcome measures. When implementing this intervention to schools, the screening procedure needs to be simplified. The screening could be done by for example school psychologist by using two self-reports (e.g., the Revised Child Anxiety and Depression Scale for anxiety and mood symptoms and the Test

Anxiety Inventory (to get better insight in these types of problems)) and a short intake evaluation with the school psychologist. In such an interview it is important to identify adolescents with too many (comorbid) complaints, to refer them to regular care and to identify adolescents with other primary complaints, to be able to refer them to regular care or get them into another school program targeting their primary complaints.

Even though the CBT intervention was more effective than the no intervention condition, there is still quite some room for improvements that may lead to additional benefits for the adolescents. One way to enhance the effectiveness of the intervention could be to incorporate contacts with the teachers, parents, class mates, and the community into the intervention. Several investigators found beneficial effects of including a broader range of persons around the participant in a study (e.g., Aune & Stiles, 2009; Masia-Warner et al., 2005), however, the found effect sizes were comparable to those we found. This would of course ask for an altering of, or an extension to the intervention, for example by adding a sessions for the parents to the CBT training, as well as sessions for the teachers in order to facilitate generalization of the used skills at school and at home. In the community general practitioners could be informed about such a study. For future research it would also be interesting to look into the mechanisms of change in CBT. For example, the TCT component was put into the intervention to change attention, so that participants would become better at focusing and switching their attention, but whether or not TCT actually resulted in changed attention is to be investigated. Assessing mechanisms at several time points throughout the interventions could provide insight in this matter.

With regard to the CBM intervention more future research is necessary before implementation is an option. For example, in the current intervention we used a kitchen sink approach, meaning that we combined several CBM interventions into one training, however, which of the elements of the intervention were useful is still unclear. For future research it remains important to get insight in the most effective components in such an intervention, to optimize the effectiveness. Given the results from the current study it would be interesting to look further into the possibilities of an interpretation bias training. Other studies (e.g., Vassilopoulos et al., 2009) also find that interpretation bias in children and adolescents can be changed, making a focus on interpretation bias a good candidate for future research. Besides looking at the

various components of the training it would also be useful to investigate in making the CBM intervention more attractive for the participants. In our study the training took two times forty minutes of computer tasks each week for ten weeks, the tasks could become a bit boring since the amount of trials in the tasks was very high and the week after week repetition was quite long. Making the tasks more attractive, for example by making the tasks appear more like a computer game with challenges or presenting the tasks in a smart phone app, the drop-out during the training could be reduced, leading to more statistical power, but possibly also to a steeper decrease in anxiety symptoms. Whether or not this would actually help is yet to be investigated, with little research already done in the area. A side effect of a more appealing CBM training could also be that the participants might be more enthusiastic about it to their peers, thereby reaching adolescents that might have anxiety complaints that would not have sought help otherwise.

Furthermore, several studies have shown that few adolescents find their way to mental health institutions (Essau, Conradt, & Petermann, 1999; Kashdan & Herbert, 2001; Wittchen et al., 1999), this could be a group that could be well reached through social media and other websites, while at the same time offering them an online training. This training could take place on a smartphone or tablet using an app; some promising research in this area is going on (Enock, Hofmann, & McNally, 2011; Ly, Dahl, Carlbring, & Andersson, 2012) but robust evidence is not yet available. CBM or CBT via app on smartphone or tablet might also be able to function as pre-treatment or in prevention, with participants on a wait list or with mild symptoms of anxiety starting their treatment.

In sum

This thesis adds to existing knowledge in several ways. First, we have looked at the relation between temperamental factors and symptoms of various internalizing disorders cross-sectionally as well as longitudinally. Second, by testing the effectiveness of two low threshold interventions designed to reduce social and test anxiety in adolescents. A main conclusion from the temperamental questions addressed in this thesis is that although cross-sectionally BIS, FFFS, and AC and their interactions are strongly related to almost all internalizing symptoms, this is not the case longitudinally. Thus, these temperamental factors are linked to internalising disorders, but the current findings do not provide evidence for the idea that they

could be relevant for the development of internalising disorders. The main conclusions from the intervention study are that at posttest symptoms of social anxiety decreased evenly in all conditions, and at six month follow-up more in the CBT condition than in the no intervention condition (small to moderate effect sizes); CBT had a positive effect on level of test anxiety in the mid-long and long term (moderate differential effect sizes); and, participants in the CBM condition showed a stronger decline in symptoms of test anxiety as well as a trend significant effect on symptoms of social anxiety compared to the control group, which makes it a promising method for future research.

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Nederlandse Samenvatting – Dutch Summary

Nederlandse samenvatting

Dit proefschrift beschrijft de uitkomsten van een onderzoek naar enerzijds de voorspellers van sociale angst en faalangst bij middelbare scholieren en anderzijds de effectiviteit van twee laagdrempelige trainingen gericht op de afname van sociale angst en faalangst. Sociale angst en faalangst zijn veel voorkomende vormen van angst, met een vaak chronisch beloop, en voor beide geldt dat angst voor negatieve beoordeling door anderen een belangrijke rol speelt. Het leven van mensen met bijvoorbeeld sociale angststoornis kan door de angst behoorlijk beïnvloed worden, zo is er sprake van een hoge comorbiditeit met depressie en andere angstklachten, maar liggen er ook relaties met bijvoorbeeld sociaal isolement, middelenmisbruik en verminderde schoolprestaties. Het is dus van belang om mensen met sociale angstklachten of faalangstklachten in een vroegtijdig stadium op te sporen en er voor te zorgen dat de klachten niet de kans krijgen zich verder te ontwikkelen.

Hieruit volgen de vragen die in dit proefschrift behandeld worden. Ten eerste kijken we naar risicofactoren die bij kunnen dragen aan het ontwikkelen van angstklachten. Dus, welke persoonskenmerken maken dat iemand een grotere kans heeft angstig te worden? Daarnaast onderzoeken we twee laagdrempelige trainingen, die beide gericht zijn op vermindering van klachten bij adolescenten met milde tot matige sociale angstklachten en faalangstklachten. Zijn deze trainingen effectief in het verminderen van angstklachten? En is dan de ene training effectiever dan de andere?

Deelnemers

De deelnemers aan dit onderzoek waren bij aanvang allemaal leerlingen uit de eerste en tweede klassen van 24 middelbare scholen in de provincies Groningen, Friesland en Drenthe. Op school werden alle leerlingen uit de eerste en tweede klassen van vmbo-tl, havo en vwo uitgenodigd om deel te nemen aan een onderzoek naar sociale angst en faalangst bij middelbare scholieren. Daarnaast werden ook de ouders benaderd per post met uitgebreide informatie over het onderzoek. Wanneer zowel jongere als ouder aangaven via een toestemmingsverklaring akkoord te zijn met deelname aan het onderzoek kon het kind deelnemen aan de eerste screening. Van de ruim 5300 uitgenodigde leerlingen deden uiteindelijk 1811 leerlingen (12-15 jaar) mee aan de eerste screening, waarbij middels vragenlijsten werd bepaald of er sprake was van een verhoogde score op sociale angst en faalangst. Dezelfde 1811 leerlingen werden twee jaar later nogmaals uitgenodigd voor een vervolgmeting,

hieraan deden uiteindelijk 1161 leerlingen mee. De gegevens van de 1811 leerlingen zijn gebruikt voor het beantwoorden van de vragen in hoofdstuk 2 en 3.

Bij de screening bleken ruim 500 adolescenten een verhoogde score te hebben op sociale angst of faalangst, deze leerlingen werden uitgenodigd voor een semi-gestructureerd interview waarbij de aanwezige klachten nauwkeurig in kaart werden gebracht. Leerlingen met milde tot matige klachten op het gebied van sociale angst en faalangst werden uitgenodigd voor verdere deelname aan het onderzoek. Dit leverde een totaal van 240 leerlingen op bij aanvang van de trainingen. Redenen voor leerlingen om niet mee te kunnen doen aan het verdere onderzoek waren divers, zo waren er leerlingen bij wie geen klachten aanwezig waren, zodat deelname aan een training niet nodig was. Ook waren er leerlingen met juist erg veel klachten, of heel andersoortige klachten, deze leerlingen zijn doorverwezen naar de reguliere zorg. De gegevens van de 240 deelnemende leerlingen zijn gebruikt voor het beantwoorden van de vragen in hoofdstuk 4, 5 en 6.

Inleiding

Hoofdstuk 1 van dit proefschrift beschrijft de achtergrond van waaruit de verschillende vragen die onderzocht worden zijn ontstaan. Sociale angst is een aanhoudende angst is sociale situaties of situaties waarbinnen gepresteerd moet worden en waarbij de kans bestaat dat iemand in verlegenheid wordt gebracht of schaamte ervaart. Een adolescent met sociale angst kan het bijvoorbeeld moeilijk vinden om op feestjes met nieuwe mensen te praten, in de supermarkt te vragen waar een bepaald product ligt of tijdens voorstelrondjes iets te zeggen. Faalangst is gerelateerd aan sociale angst, maar bij faalangst ligt de focus meer specifiek op test- of toetssituaties, waarbij het oordeel van anderen en de persoon zelf over prestaties aan de orde is. Een adolescent met faalangst zal bijvoorbeeld dichtklappen tijdens een proefwerk of spreekbeurt, maar ook op het moment dat de docent de cijfers van een toets hardop voorleest in de klas.

Als gevolg van deze angstklachten kan een adolescent zich terug gaan trekken en proberen moeilijke situaties uit de weg te gaan, zodat de angst minder kans krijgt. Iemand met sociale angst kan er voor kiezen niet naar feestjes te gaan en dus niet met onbekende mensen in aanraking te komen, iemand met faalangst kan er voor kiezen zich ziek te melden voor een spreekbeurt zodat hij of zij het beter kan voorbereiden of in de hoop dat er aan het einde van het schooljaar geen ruimte meer

is om het nog in te halen. Op de korte termijn werken deze strategieën, de angst krijgt minder kans en dus heeft de adolescent minder last. Op de langere termijn zijn de strategieën echter nadelig, wie nooit naar feestjes gaat, krijgt ook niet de kans te oefenen in het sociale contact en leert niet dat het praten met onbekende mensen misschien best mee valt. Ook bij het vermijden van spreekbeurten leert iemand niet dat de situatie wellicht minder eng is dan vooraf verwacht. Het gevolg van dit vermijdingsgedrag kan bijvoorbeeld een sociaal isolement, lagere cijfers op school en schoolverzuim zijn.

Figuur 1. Het model voor sociale angst van Clark en Wells
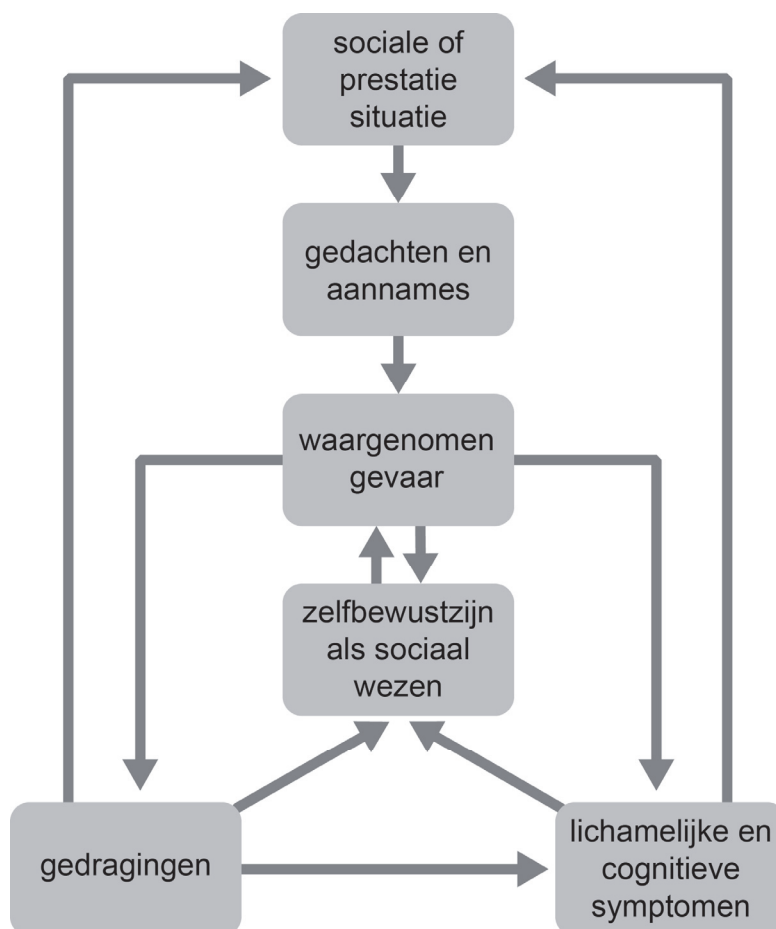
Een belangrijk theoretisch model van sociale angst en faalangst is het model van Clark en Wells (zie Figuur 1). Volgens dit model zal het zo zijn dat wanneer iemand met sociale angst in een sociale situatie terecht komt, er direct allerlei beangstigende gedachten opkomen met betrekking tot de situatie met als gevolg ervaren dreiging. Het gevolg hiervan is het verleggen van de aandacht naar zichzelf of de eigen rol in

de situatie en ook proberen de situatie uit de weg te gaan. Ook kan iemand op een dergelijk moment bijvoorbeeld gaan zweten of trillen. De verschillende symptomen die iemand dan bij zichzelf bemerkt kunnen de aandacht op zichzelf en de eigen rol in de sociale situatie versterken. Wanneer dit gebeurt worden de veronderstellingen of gedachten die iemand had bij het aangaan van de situatie niet kritisch beoordeeld en dus niet aangepast, waardoor de persoon de volgende keer in eenzelfde situatie weer met angst zal reageren.

Er zijn ook modellen die zich meer richten op cognitieve processen die er voor kunnen zorgen dat mensen kwetsbaar zijn voor het ontwikkelen van angstklachten. Binnen deze modellen wordt er vanuit gegaan dat een verstoorde informatieverwerking een cruciale rol speelt in het ontstaan en voortbestaan van sociale angst. Zo richten mensen met angstklachten hun aandacht sneller op beangstigende stimuli (aandachtsbias) en interpreteren ze stimuli ook eerder op een negatieve manier (interpretatiebias). Bijvoorbeeld zal iemand met sociale angst tijdens een presentatie snel die ene persoon in de zaal zien die zit te gapen, terwijl de rest die aandachtig luistert minder opvalt. Ook zal diezelfde persoon in die situatie het gapen sneller interpreteren als *"Ik ben saai en mijn praatje is slecht"* in plaats van *"Misschien is hij/zij (de gaper) moe"*. Het model van Clark en Wells is als uitgangspunt genomen voor de cognitieve gedragstraining in dit proefschrift, modellen rondom cognitieve processen zijn het uitgangspunt voor de cognitieve bias modificatie training.

Gedragsinhibitie, FFFS en aandachtscontrole als risicofactoren

Vanuit het perspectief gericht op de ontwikkeling van angstklachten zijn factoren geïdentificeerd die er wellicht voor kunnen zorgen dat een kind een verhoogde kans heeft op het ontwikkelen van een angststoornis. Hierin lijkt temperament een belangrijke rol te spelen. Temperament bestaat uit een biologische basis, die beïnvloed wordt door ervaring, erfelijke kenmerken en groei. Temperament is enerzijds reactief en beïnvloedt de reactie op informatie die binnenkomt. Anderzijds heeft temperament een regulerende rol, die de reactie kan bijsturen. Voor angst belangrijke kenmerken van het temperament zijn enerzijds het reactieve Flight-Fight-Freeze-systeem (FFFS) en gedragsinhibitie en anderzijds de regulerende aandachtscontrole.

Het FFFS is een systeem dat reageert op alle aversieve stimuli, zowel geconditioneerd als ongeconditioneerd en hangt samen met angst. Bijvoorbeeld wanneer iemand met sociale angst ineens geconfronteerd wordt met een persoon wiens oordeel erg belangrijk gevonden wordt. Het FFFS zorgt voor vermijding en vluchtgedrag bij ervaren dreiging. De angstige persoon gaat bijvoorbeeld de confrontatie uit de weg. Mensen met een actief FFFS zijn meer gericht op angst en hebben de neiging in het geval van dreiging te reageren met vermijding.

Gedragsinhibitie hangt ook samen met angst, maar dan meer met angst die we zouden omschrijven als vrees of ongerustheid. Gedragsinhibitie wordt geactiveerd in aversieve situaties en is met name gericht op conflicten binnen andere systemen. Bijvoorbeeld een conflict waarbij er gekozen moet worden tussen iets leuks (e.g., bij een sportwedstrijd de kans pakken om een penalty te nemen op een beslissend moment) en iets beangstigends (e.g., de kans lopen mis te schieten en af te gaan). Mensen met een actief gedragsinhibitie systeem zijn alert op signalen van gevaar en hebben de neiging veel te piekeren.

Met aandachtscontrole bedoelen we zowel de mate waarin iemand in staat is zijn aandacht ergens op te richten en daarop vast te houden, als de mate waarin iemand in staat is zijn aandacht indien gewenst te wisselen van het ene naar het andere onderwerp. Wanneer iemand met een lage aandachtscontrole angstklachten heeft zou de lage aandachtscontrole deze klachten kunnen versterken. Iemand zou bijvoorbeeld moeite kunnen hebben de aandacht weg te richten van een beangstigende situatie of de aandacht vast te houden op een belangrijke taak zonder zich af te laten leiden. Iemand met faalangst kan bijvoorbeeld grote moeite hebben om tijdens een proefwerk de aandacht op de vragen te richten en gericht te houden, in plaats van de aandacht te richten op de mogelijkheid te falen en daar voortdurend aan te denken.

In hoofdstuk twee en drie beschrijven we de resultaten van de studies naar de relatie tussen de temperamentsfactoren FFFS, gedragsinhibitie en aandachtscontrole en angstklachten. In hoofdstuk twee gebeurt dit cross-sectioneel, dus het meten van de temperamentsfactoren gebeurt op hetzelfde tijdstip als het meten van de angstklachten (N = 1811). In hoofdstuk drie gebeurt dit longitudinaal, de temperamentsfactoren zijn gemeten tijdens de eerste screening (N = 1811), de angstklachten tijdens de herhaling van de screening twee jaar later (n = 1161).

Het blijkt dat cross-sectioneel reactief temperament (zowel FFFS als gedragsinhibitie) positief samenhangt met verschillende angstklachten en depressie, dus deelnemers met een hogere score op gedragsinhibitie of FFFS vertonen meer symptomen van angststoornissen en depressie. Regulerend temperament (aandachtscontrole) hangt eveneens samen met symptomen van angst en depressie, adolescenten die moeite hebben hun aandacht ergens op te focussen en moeite hebben hun aandacht te verplaatsen vertonen meer angstklachten en symptomen van depressie. Daarnaast blijkt dat degenen met een combinatie van hoge gedragsinhibitie en lage aandachtscontrole de meeste klachten rapporteren. In een conflictsituatie waarin iemand bijvoorbeeld een keuze moet maken, terwijl deze persoon ook moeite heeft met het focussen van de aandacht op de keuze, kan een situatie ontstaan waarin iemand besluiteloos wordt en gaat piekeren, wat dan weer gepaard gaat met verhoogde angstklachten. Om te kunnen zeggen dat deze temperamentsfactoren adolescenten kwetsbaar maken voor het ontwikkelen van angstklachten of depressieve klachten hebben we longitudinaal gekeken of temperamentsfactoren een voorspellende waarde hebben voor angst en depressie.

Uit de longitudinale studie blijkt dat over tijd gedragsinhibitie voorspellend is voor totaal aantal gerapporteerde angstklachten, gegeneraliseerde angstklachten, sociale angstklachten en symptomen van obsessieve-compulsieve stoornis. Voor FFFS vinden we dat FFFS voorspellend is voor latere symptomen van sociale angst en separatieangst. Voor al deze bevindingen geldt dat wanneer we de angst op de eerste meting meenemen in de analyses, de voorspellende waarde van gedragsinhibitie en FFFS verdwijnt. Dit betekent dat angst op de voormeting een betere voorspeller is van angst twee jaar later dan de gemeten temperamentsfactoren. De verwachting dat gedragsinhibitie voorspellend zou zijn voor alle gemeten angstklachten en FFFS voornamelijk voor sociale angst en paniekstoornis wordt maar ten dele bevestigd in dit onderzoek. De reden dat we bij paniekstoornis geen voorspellende waarde vinden voor FFFS te maken hebben met het gegeven dat bij paniek de klachten vaak pas op wat latere leeftijd (boven de 20 jaar) optreden, de meting zou dan dus te vroeg geweest zijn. Dat gedragsinhibitie en FFFS niet meer voorspellend zijn wanneer we controleren voor angst op de eerste meting kan samenhangen met het feit dat de angst op de eerste meting wellicht al gekleurd is door eerdere invloed van gedragsinhibitie of FFFS. Wel in lijn met de verwachtingen is de bevinding dat aandachtscontrole voorspellend is voor alle

gemeten angstklachten en depressie. Wanneer we bij aandachtscontrole controleren voor klachten op de eerste meting, dan zien we dat aandachtscontrole nog steeds voorspelt voor depressieve klachten. Dit wil zeggen dat deelnemers die bij de eerste meting een verlaagd niveau van aandachtscontrole hadden, twee jaar later meer depressieve klachten lieten zien dan deelnemers zonder verlaagd niveau van aandachtscontrole, zelfs wanneer er rekening wordt gehouden met al bestaande depressieve klachten. Goede controle over de aandacht zou er een rol in kunnen spelen dat adolescenten minder snel in een herhaaldelijke cirkel van negatieve gedachten terecht komen, waardoor depressieve klachten minder de kans krijgen te ontstaan.

De combinatie van gedragsinhibitie en aandachtscontrole en FFFS en aandachtscontrole bleek geen extra voorspellende waarde te hebben voor het aantal klachten twee jaar later. Dit in tegenstelling tot de theorie van Lonigan en Phillips, waarin verondersteld wordt dat juist de combinatie van reactief en regulerend temperament tot de meeste klachten zou leiden. Een reden hiervoor kan zijn dat de in dit onderzoek onderzochte concepten gedragsinhibitie en aandachtscontrole te ver af liggen van de originele concepten neuroticisme en effortful control zoals voorgesteld door Lonigan en Phillips. Gedragsinhibitie wordt vaak vergeleken met neuroticisme, maar lijkt een specifieker concept. Gedragsinhibitie is namelijk gericht op doelgerichte conflicten, terwijl neuroticisme meer wordt gezien als een algemene component van angst en depressie. Ook voor aandachtscontrole geldt dat effortful control een breder concept is, dat naast aandachtscontrole eveneens 'activation control' en 'inhibitory control' bevat. 'Activation control' en 'inhibitory control' richten zich respectievelijk op de controle over het uitvoeren van gedrag dat iemand graag zou willen vermijden en op het niet uitvoeren van gedrag dat iemand juist wel graag zou willen uitvoeren. Deze twee onderdelen van effortful control zijn meer gericht op daadwerkelijke gedragingen en zouden wellicht een sterkere samenhang met angst en depressie kunnen laten zien.

Voor toekomstig onderzoek is het van belang om gedragsinhibitie, FFFS en aandachtscontrole op een eerder moment te meten, om zodoende te kijken of de niveaus van internaliserende klachten al bij de voormeting gekleurd waren door de temperamentsfactoren. Belangrijk is dan om per stoornis te kijken naar de gemiddelde beginleeftijd en dan ruim voor die leeftijd de temperamentskenmerken in kaart te brengen. Voor sociale angst zou er dan gemeten kunnen worden rond de

leeftijd van zeven of acht jaar, aangezien er veelal gevonden wordt dat sociale angst ontstaat na het tiende jaar.

Behalve het kijken naar de samenhang tussen temperamentskenmerken en internaliserende klachten, was het eveneens een doel om te kijken of deze kenmerken wellicht beter in staat zouden zijn dan de gebruikelijke symptoomvragenlijsten om toekomstige angst te voorspellen. Dit is van belang om adolescenten met een verhoogd risico vroegtijdig op te kunnen sporen en eventueel een training aan te bieden om verergering van klachten te voorkomen. Uit het onderzoek in hoofdstuk drie blijkt dat de angstklachten op de eerste meting goede voorspellers zijn van de angstklachten op de tweede meting, hier bovenop hebben de gemeten temperamentsfactoren geen toegevoegde waarde. De selectie van deelnemers voor een vroeginterventie kan dus niet verbeterd worden door het toevoegen van deze maten aan de screening. Depressieve klachten zijn hierop de uitzondering, het meten van aandachtscontrole heeft hier toegevoegde waarde en het is dus raadzaam bij de screening voor depressie bij adolescenten ook een maat voor aandachtscontrole mee te nemen.

De gebruikte maten kunnen nog verbeterd of uitgebreid worden, zo is de vraag gerezen of aandachtscontrole het best gemeten kan worden met een vragenlijst, of dat een maat voor executief functioneren toegevoegde waarde zou hebben. Subjectieve aandachtscontrole en objectieve aandachtscontrole kunnen van elkaar verschillen, daarom is het voor toekomstig onderzoek belangrijk zowel subjectieve als objectieve aandachtscontrole te meten.

Voor de maat voor gedragsinhibitie, de BIS/BAS-schaal geldt dat de inhoud van de items een vrij grote overlap vertoont met de items van de maat voor internaliserende klachten, de RCADS. Hierdoor is het denkbaar dat de gevonden samenhang tussen gedragsinhibitie en angstsymptomen te herleiden is tot deze item overlap. Ook hier zou een oplossing kunnen zijn om op verschillende manieren te meten, met bijvoorbeeld een gedragsmaat of rapportage door derden.

Vroeginterventie bij sociale angst en faalangst

In hoofdstuk vier en vijf beschrijven we de uitkomsten van de studie naar de effectiviteit van twee trainingen voor sociale angst en faalangst. Wanneer we kijken naar onderzoek gericht op sociale angst en faalangst, dan zien we dat zich dit vaak richt op adolescenten bij wie sprake is van een aanwezige angststoornis. Echter, op

het moment dat het doel is te voorkomen dat klachten zich verder ontwikkelen en in te grijpen als er nog weinig klachten zijn, zou onderzoek zich moeten richten op de groep adolescenten met milde tot matige klachten. In dit veld is nog maar beperkt onderzoek gedaan, er is bijvoorbeeld bekend dat onderzoek op scholen effectief kan zijn in het verminderen en voorkomen van angstklachten, waarbij gevonden is dat het zinvoller is om trainingen aan te bieden aan leerlingen met symptomen van angst dan aan alle leerlingen op een school. Bij zogenaamde vroeginterventie, dus interventies bij mensen met matige tot hooguit milde klachten van bijvoorbeeld sociale angst komt er naar voren dat de positieve resultaten vaak pas na een iets langere tijd zichtbaar worden, dus meerdere maanden na afloop van een training. Het lijkt bij onderzoek naar vroeginterventie dus belangrijk om niet alleen direct na afloop van een training te kijken, maar deelnemers gedurende een langere tijd te volgen.

Traditioneel gezien is onderzoek naar behandeling van angstklachten veelal gebaseerd op de principes van de cognitieve gedragstherapie. Belangrijke ingrediënten van de cognitieve gedragstherapie zijn psycho-educatie, cognitieve herstructurering en exposure. Bij sociale angst kan taak concentratietraining ook een bijdrage leveren, aangezien deze training zich specifiek richt op het richten van de aandacht en mensen met sociale angst vaak geneigd zijn hun aandacht op zichzelf te richten.

Een nieuwere ontwikkeling binnen de behandeling van psychische klachten is cognitieve bias modificatie (CBM), een methode die er op gericht is cognitieve processen te veranderen. Waar cognitieve gedragstherapie zich meer expliciet richt op het veranderen van gedrag en gedachten, richt CBM zich op het veranderen van automatische processen, zoals aandachtsbias en interpretatiebias. Bij een training voor aandachtsbias wordt bijvoorbeeld geleerd de aandacht te richten op positieve informatie en niet op negatieve informatie, bij training voor interpretatiebias wordt geleerd om informatie positiever te interpreteren in situaties die zowel positief als negatief geïnterpreteerd zouden kunnen worden. Hierbij wordt verondersteld dat een verandering in automatische processen tot een verandering van angstklachten zal leiden. Onderzoek geeft aanwijzingen dat CBM kan leiden tot een verandering in aandachtsbias en interpretatiebias en van CBM wordt soms gevonden dat het klachten reduceert. Onderzoek naar de werkzaamheid van CBM is echter nog schaars.

In dit proefschrift beschrijven we de effectiviteit van twee laagdrempelige trainingen gericht op vroeginterventie bij sociale angst en faalangst. De eerste training is een groepstraining gebaseerd op de principes van cognitieve gedragstherapie en het model van Clark en Wells. De training bestaat uit een training van 10 sessies van anderhalf uur op school, aansluitend aan schooltijd. Deze training vond plaats in groepen van 3 tot 10 leerlingen en werd gegeven door psychologen van Accare, een lokale instelling voor kinder- en jeugdpsychiatrie. Op basis van eerder onderzoek en richtlijnen werd deze training opgebouwd uit een aantal onderdelen. Als eerste psycho-educatie, gericht op het vergroten van de kennis over angstklachten, waarbij deelnemers concrete informatie kregen over sociale angst en faalangst en hun kenmerken. Ten tweede taakconcentratie training, gericht op het verbeteren van richten en wisselen van aandacht. Hierbij werden bijvoorbeeld oefeningen gedaan waarbij de deelnemers afgeleid werden en toch hun aandacht moesten blijven focussen op de taak. Ten derde cognitieve herstructurering, gericht op het opsporen en aanpassen van dysfunctionele gedachten. Deelnemers ging op zoek naar de niet-helpende gedachten die zij hadden in sociale situaties of faalangstsituaties en probeerden deze om te zetten in helpende gedachten. Als vierde ten slotte exposure, gericht op oefenen met beangstigende situaties. Bijvoorbeeld een deelnemer die moeite had om onbekende mensen aan te spreken ging een oefening doen om juist mensen aan te leren spreken.

De tweede training is een CBM training van 20 sessies van 40 minuten via het internet. Deelnemers deden twee keer per week vanaf de computer thuis een sessie, dit gedurende 10 weken. De tijd die in totaal besteed werd aan CBM was vergelijkbaar met de tijd voor de cognitieve gedragstraining. De CBM training bestaat uit verschillende componenten, waarbij elk onderdeel een bepaald proces probeert te beïnvloeden. In deze CBM training zit bijvoorbeeld een interpretatiebiastraining waarbij deelnemers ambigue situaties aangeboden krijgen die meestal een positief (of anders neutraal) einde kennen. Het idee is dat doordat er telkens een positief einde is, deelnemers vervolgens in hun dagelijkse leven ook sneller geneigd worden om positief te denken in onduidelijke situaties. Naast de interpretatiebiastraining bestaat de CBM training voor een groot deel uit een aandachtsbiastraining waarbij de aandacht wordt weggetraind van negatieve of bedreigende stimuli en richting neutrale of positieve stimuli. Hierbij krijgt de deelnemer bijvoorbeeld telkens twee

plaatjes te zien met gezichten, het ene gezicht is bijvoorbeeld boos, het andere blij. Na het verdwijnen van de plaatjes verschijnt achter één van de plaatjes een pijltje dat naar boven of naar beneden wijst. De deelnemer moet dan na aangeven welke kant het pijltje op wijst (boven of beneden). Bij deze taak verschijnt het pijltje altijd achter het neutrale of blije gezicht. Het doel is dat deelnemers na verloop van tijd sneller hun aandacht automatisch gaan richten op neutrale of blije gezichten, in plaats van op boze gezichten. Daarnaast werd de training aangevuld met een taak om de associatie tussen sociale situaties en positieve uitkomsten te versterken en een taak om de eigenwaarde te vergroten.

Voor sociale angst werd gevonden dat er een algehele daling is over de periode van twee jaar. Na een half jaar rapporteren de deelnemers die de cognitieve gedragstraining (CGT) kregen minder sociale angstklachten dan de deelnemers die geen training hebben ontvangen. Het blijkt dat de deelnemers in de CGT groep een versnelde daling van de sociale angst laten zien, maar dat na twee jaar alle groepen op een vergelijkbaar niveau eindigen. Gekeken naar faalangst zien we dat de deelnemers in de CGT groep en de cognitieve bias modificatie (CBM) groep na twee jaar minder klachten rapporteren dan de deelnemers in de controlegroep. In de CGT groep ontstaat dit verschil al direct na de training en blijft aanwezig op de latere meetmomenten. In de CBM groep vinden we alleen een verschil met de controlegroep bij de twee jaar follow-up. De grootte van de gevonden effecten is beperkt, maar vergelijkbaar met de gevonden effectgroottes in soortgelijk onderzoek.

Na een periode van twee jaar vinden we een afname van het totaal aantal angstklachten, symptomen van gegeneraliseerde angst en depressieve symptomen voor alle groepen. Alleen bij gegeneraliseerde angst zien we dat deelnemers in de CGT groep minder klachten rapporteren dan deelnemers in de CBM groep.

Al met al lijkt het nuttig om CGT in te zetten bij adolescenten met verhoogde sociale angstklachten en faalangstklachten op middelbare scholen. Voor faalangst helpt het de klachten te verminderen en dit effect blijft ook over tijd in stand, voor sociale angst helpt het deelnemers om op een vroeger tijdstip minder angstklachten te hebben. Om CGT in te zetten op bijvoorbeeld scholen is het wel noodzakelijk om te kijken hoe de screening van de potentiële deelnemers vereenvoudigd kan worden. In dit onderzoek was de screening erg tijdsintensief: leerlingen werden eerst gescreend middels vragenlijsten en vervolgens vond er een interview plaats van gemiddeld 60 tot 90 minuten.

Voor het inzetten van de CBM training op scholen lijkt het nog te vroeg. Hoewel de resultaten in dezelfde lijn lagen als de resultaten die we vonden voor de CGT training, zijn de effecten van de CBM training minder duidelijk. Voor faalangst rapporteerden deelnemers twee jaar na de training lagere niveaus, voor sociale angst was er sprake van een trend naar significantie bij zes maanden follow-up. CBM bleek effectief in het veranderen van interpretaties en automatische associaties, de training is dus geschikt om deze te veranderen, maar de angstklachten veranderen nog niet direct mee. Binnen deze CBM training veranderde de aandachtsbias niet. Voor implementatie van CBM lijkt het dus nog te vroeg. CBM spreekt echter wel andere processen aan dan CGT en is in staat cognitieve vertekeningen te veranderen en zou dus wellicht in de toekomst een waardevolle aanvulling kunnen zijn op CGT.

Ook binnen de effectiviteitsstudie is er op het gebied van gebruikte instrumenten nog winst te behalen. Bijvoorbeeld door een gedragsmaat of fysiologische maat toe te voegen om angst te meten. De Trier Social Stress Test zou hiervoor bijvoorbeeld gebruikt kunnen worden. Hierbij worden deelnemers in een stressvolle situatie gebracht, waarna bijvoorbeeld hartslag en cortisol gemeten wordt. Dergelijke uitkomstmaten zouden dichter bij impliciete methoden kunnen liggen, waarop ook CBM geënt is. Het zou dus kunnen dat CBM in eerste instantie vooral een verandering in bijvoorbeeld hartslag of cortisol met zich meebrengt en dat in tweede instantie de gerapporteerde angst daalt. Dit past bij de bevinding dat bij faalangst CBM pas na twee jaar effectief blijkt op de vragenlijsten, maar komt weer niet overeen met de bevindingen op sociale angst.

De deelnemers in de controlegroep laten een daling zien in sociale angst en een stabiel niveau van faalangst gedurende twee jaar. Dit is niet in lijn met de verwachtingen, aangezien de deelnemers in de controlegroep verhoogde symptomen hadden bij de eerste screening, dus het risico hadden sociale angst of faalangst te ontwikkelen en geen training kregen. De veronderstelling was dat zij zouden verslechteren of hooguit op hetzelfde niveau zouden blijven. Voor faalangst vinden we het laatste, maar voor sociale angst vinden we een algehele daling van angstklachten. Een kritische lezer zou zich af kunnen vragen of de selectie van de deelnemers juist is geweest. Gezien de resultaten in hoofdstuk twee en drie lijkt het dat de selectie van kandidaten voor de training geschikt was, hier vinden we dat de angst bij de eerste meting een goede voorspeller is voor angst bij de tweede meting.

Dus de deelnemers die bij de eerste meting al een verhoogd niveau van angst lieten zien waren grotendeels ook degenen die na twee jaar verhoogde angstklachten hadden.

In hoofdstuk zes wordt gekeken of we het resultaat van de training kunnen voorspellen op basis van de temperamentsfactoren gedragsinhibitie, FFFS en aandachtscontrole enerzijds en trainingssucces anderzijds. Het blijkt dat geen van de genoemde factoren gerelateerd is aan het trainingssucces, dat wil zeggen dat deelnemers die bij aanvang van de studie een hogere gedragsinhibitie, hogere FFFS of lagere aandachtscontrole evenveel baat hadden bij de trainingen dan deelnemers met een lagere gedragsinhibitie, lagere FFFS of hogere aandachtsbias. Het bleek dat FFFS als enige wel invloed uitoefende op het niveau van depressieve klachten in de CBM groep vergeleken met de controlegroep bij de nameting. Hiervoor geldt dat dit verschil terug te vinden was in een afwijking binnen de controlegroep, die een stijging van depressieve symptomen liet zien tussen de voormeting en de nameting. CBM lijkt dus op de kortere termijn een preventieve invloed te hebben op het ontwikkelen van depressieve klachten bij adolescenten, waarbij dit alleen zo is voor degenen die bij de voormeting hoog scoorden op FFFS.

Conclusie

In het afsluitende hoofdstuk zeven worden de resultaten die gevonden zijn in de beschreven studies samengevat en gerelateerd aan eerder onderzoek. Verder worden aanbevelingen gedaan voor toekomstig onderzoek.

De eerste vraag die gesteld wordt in dit proefschrift heeft betrekking op de risicofactoren voor het ontwikkelen van angstklachten en depressie. Er kan geconcludeerd worden dat er een duidelijke samenhang is tussen de bekeken temperamentsfactoren gedragsinhibitie, FFFS en aandachtscontrole enerzijds en internaliserende klachten anderzijds, zowel cross-sectioneel als longitudinaal. Echter, de bevinding dat de temperamentsmaten niet langer voorspellend zijn wanneer gecontroleerd voor klachtniveau op de voormeting, doet de vraag rijzen of het klachtniveau op de voormeting wellicht al gekleurd is door de temperamentsfactoren. Toekomstig onderzoek op een eerder moment in de ontwikkeling van kinderen kan hier antwoord op geven, er kan dan gekeken worden of een verhoogde mate van FFFS of gedragsinhibitie of een verlaagde aandachtscontrole al aanwezig zijn voor de eerste ontwikkeling van symptomen.

De tweede vraag behelst de effectiviteit van de twee onderzochte interventies. We vinden dat de CGT training leidt tot minder faalangstklachten direct na de training en dit effect blijft bestaan gedurende de twee jaren dat de deelnemers gevolgd zijn. Voor sociale angst zien we dat de deelnemers in de CGT groep een verbetering laten zien ten opzichte van de controlegroep zes maanden na de training, dit effect verdwijnt echter doordat op termijn ook de controlegroep daalt tot hetzelfde niveau. De CBM training leidt over een periode van twee jaar tot minder faalangst dan de controlegroep, en laat voor sociale angst een trend zien vergelijkbaar met de CGT training. De CBM training laat veranderingen zien die in dezelfde lijn liggen als de resultaten van de CGT training, maar in minder sterke mate. In conclusie: CGT helpt bij de vermindering van faalangst op korte en lange termijn en bij de vermindering van sociale angst op korte termijn, CBM helpt bij de vermindering van faalangst op lange termijn, waarbij voor beide trainingen de groottes van de effecten beperkt zijn.

Dankwoord

Dankwoord

Je zou kunnen denken dat ik de afgelopen jaren van tijd tot tijd mijn uiterste best heb gedaan om het afronden van dit proefschrift zo lang mogelijk te rekken. Misschien zou dat idee hier door mij niet eens ontkend worden, eigenlijk weet ik wel zeker dat ik dat idee niet zou ontkennen. Ik kon gewoon nog geen afscheid nemen, ik heb met zoveel plezier aan dit project en met de betrokkenen gewerkt, dat het idee dat het klaar zou zijn, af zou zijn, echt voorbij zou zijn, mij zowel ongeloofwaardig voorkwam als onwenselijk en bijkans onmogelijk, dus dat ik her en der bewust dan wel onbewust wat vertraging heb ingebouwd zou onzinnig zijn te ontkennen.

Van afscheid nemen heb ik nooit gehouden, op geen enkel gebied. Voor mijn ouders is dit al jaren overduidelijk, een aardig deel van hun toch behoorlijk ruim bemeten zolder staat vol met mijn 'jeugd'. Speelgoed, werkjes, maar ook de lolly die ik ooit kreeg uit Parijs en toch echt véééél te mooi was om op te eten. Vaak kreeg ik de vraag eindelijk mijn zooi eens te verwijderen, maar toe nu toe is het uitstellen daarvan heel goed gelukt. Wegdoen van mijn lievelingskleren van ooit, ook onmogelijk, met als resultaat een bescheiden kledingarchief met daarin bijvoorbeeld de lievelingstrui uit groep 5 met snorkel in verkeerde kleur (zelfgebreid door mijn moeder, maar bij gebrek aan kleurentelevisie was er ergens iets mis gegaan), het Red Hot Chili Peppers-shirt waar ik van mijn 15^e tot mijn 17^e vrijwel permanent in liep, die broek die 10 jaar meeging, tot ie twee jaar geleden besloot om bij alle naden los te gaan, terwijl tegelijkertijd de rits het plots niet meer deed. Allemaal gehouden, zonder spijt, ze houden stuk voor stuk de tijd gevangen.

Afscheid nemen van mensen valt me misschien nog het zwaarst. Wanneer besluit je dat het over is, mooi geweest is? Als het ooit leuk was, dan kan het dat in potentie toch nog steeds zijn? Ga je voor de clean-cut of laat je het doodbloeden? Misschien is hierbij het probleem dat ik iets dood laten bloeden een waardeloze methode vind, niet alleen in relatie tot mensen, altijd. Iets dood laten bloeden voelt alsof je niet het lef hebt om de situatie aan te pakken, alsof je kiest voor de gemakkelijke weg. Je steekt je kop in het zand en wacht rustig af tot de ander dan maar besluit dat het mooi geweest is of je staat eindeloos naast elkaar met je kop in het zand want 'de ander houdt ook van doodbloeden'. De clean-cut aan de andere kant is weer zo radicaal en zorgt er voor dat ik achter blijf met zo'n 'ja, maar… had het niet nog…'-gevoel. In eerste instantie blijft de middenweg over, je kaart eens iets aan, kijkt wat er gebeurt en hoopt dat de boel weer vlot trekt, desnoods gooi je er

een flinke ruzie tegenaan en wie weet. Maar goed, feit blijft dat er altijd mensen op de nominatie staan uit je leven te verdwijnen, en hoe dat proces goed te laten verlopen is voor mij nog steeds een raadsel.

Project PASTA, toen ik er aan begon leek vijf jaar een eindeloze periode en afscheid nog mijlenver weg en nu is het daar. Tijd voor afscheid. Af. Klaar. Project PASTA in actieve zin bestaat niet meer. Het kost me moeite en maakt me blij tegelijkertijd, hoe vaak is nu iets echt af? Mijn dank gaat uit naar de mensen die hebben geholpen de tijd tot het afscheid nog enigszins beperkt te houden en mijn dank gaat evenzeer uit naar de mensen die dit afscheid hielpen uitstellen. Kies zelf tot welke categorie je zou willen horen.

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Curriculum Vitae

Esther Sportel was born in Veendam, November 19th 1976, and raised in Scheemda. She finished secondary education (VWO) at Dollard College in Winschoten in 1996. After a short period of studying Dutch language and literature in Groningen and a three year period of figuring out which direction to go, she started studying Psychology at the Faculty of Behavioral & Social Sciences at the University of Groningen in October 2000. In May 2005 she received her Master's degree in Psychology, with Clinical Psychology as subdirection. In June 2005 she started working at the department of Clinical Psychology as lecturer and researcher for the period of one year. In June 2006 Esther started her PhD project, called Project PASTA, together with Eva de Hullu. Parallel to the project Esther kept on working as a lecturer for the department of Clinical Psychology. In November 2013 Esther started working as postdoctoral researcher at GGZ Drenthe.

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