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ORIGINAL ARTICLE

Components of Attentional Bias to Threat in Clinically Anxious Children: An Experimental Study Using the Emotional Spatial Cueing Paradigm

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Abstract
Attentional bias to threat is believed to play a key role in the development and maintenance of anxiety disorders. However, the underlying attentional mechanisms related to anxiety are not well understood. The aim of the present study was to investigate the effect of cognitive therapy on the engagement and disengagement components of attentional bias to threat in clinically anxious children using the emotional spatial cueing paradigm. Anxiety was diagnosed using the Anxiety Disorders Interview Schedule and the Revised Child Anxiety and Depression Scale. Results from 27 clinically anxious children and 27 control children (7–13 years old) indicated that clinically anxious children showed significantly faster engagement to angry faces than control children. Results also indicated that clinically anxious children showed significantly faster disengagement from angry faces before treatment in comparison to control children and significantly slower disengagement from angry faces after treatment than they did before treatment. Findings suggests that cognitive therapy reduces attentional avoidance of threat in clinically anxious children and challenges the assumption that results can be generalized from subclinical to clinical samples.

Keywords Engagement · Disengagement · Attentional bias · Anxiety disorder · Children · Spatial cueing

Introduction

Cognitive theories states that adults and children with heightened levels of anxiety have information processing biases for threatening stimuli, and that this plays a key role in the development and maintenance of anxiety disorders (e.g., Mogg and Bradley 1998; Bar-Haim et al. 2007; van Bockstaele et al. 2014). Anxiety disorders are among the most prevalent psychiatric disorders in children (Polanczyk et al. 2015), and research investigating the underlying attentional mechanisms and treatment-related changes in cognition in anxiety are therefore of high relevance.

Meta-analyses have provided substantive evidence of attentional bias to threat in anxious adults (Bar-Haim et al. 2007) and anxious children (Dudeney et al. 2015). The strength of the association between attentional bias to threat and anxiety emphasize the relevance of changing the focus of information processing bias research. The focus should change from confirming the existence of this association to examining the components of attention, which make up attentional bias to threat in anxiety (Bar-Haim et al. 2007). The focus of the present study is whether attentional bias to threat in anxiety is caused by faster or slower engagement to threatening stimuli, or by faster or slower disengagement from threatening stimuli once it has been perceived (Clarke et al. 2013), and the potential effect of treatment on these processes.

Cognitive therapy is an effective treatment for most adults (Chambless and Ollendick 2001) and children (Seligman and Ollendick 2011) with anxiety disorders. A review by Tobon et al. (2011) also found support for the notion that cognitive therapy reduces information processing biases to threat in adults. Similar findings have been reported in child samples where a study showed that clinically anxious children had significantly greater attentional bias for emotional information than a group of control children, and that following treatment, their attentional bias was comparable with

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that of the control children (Reinholdt-Dunne et al. 2015). However, the study by Reinholdt-Dunne et al. (2015) did not investigate the engagement and disengagement components of attentional bias to threat. The aim of the present study is to get one step closer to this by investigating attentional engagement and disengagement before and after treatment, which may (i) help understand which information processing biases are of greatest importance in the development and maintenance of clinical anxiety in children, and (ii) shed light on processes targeted in cognitive therapy.

Attentional bias to threat in anxious individuals has primarily been studied using the emotional Stroop task (Mathews and MacLeod 1985) and the visual probe task (MacLeod et al. 1986). In the emotional Stroop task, the emotional cue and the probe are spatially and temporally integrated because the word or picture and the color appear at the same time and in the same physical location. In the visual probe task, the emotional cue and the succeeding probe are physically and temporally separated. The emotional Stroop task and the visual probe task differ in that the emotional Stroop task is a measure of emotional interference, whereas the visual probe task measures selective attention (Van Strien and Valstar 2004). Although, the visual probe task provides convincing evidence that anxious individuals show selective alignment of spatial attention with threatening stimuli, a bias in either attentional engagement or disengagement can equally account for the findings observed using this task. In order to determine the relative contributions of the engagement and disengagement components of attentional bias to threat, the present study therefore used an emotional version of Posner's (1980) spatial cueing paradigm. In the emotional spatial cueing paradigm, participants respond to the onset of a peripheral target. The probable location of the target is forewarned by a visual cue that indicates either the correct (valid trials) or the incorrect (invalid trials) target location. Reaction times on valid trials are believed to represent engagement of attention. The validity effect (invalid trials–valid trials) is believed to represent the effort required to disengage from invalid trials (e.g., Morales et al. 2016). Faster engagement is often referred to as enhanced engagement, slower disengagement is often referred to as delayed disengagement, and faster disengagement is often referred to as attentional avoidance.

Studies investigating attentional bias to threat in anxious adults, using the emotional spatial cueing paradigm, show mixed results (Bar-Haim et al. 2007; Van Bockstaele et al. 2014). The most robust finding is the finding of delayed disengagement from threat in anxious adults (Fox et al. 2001, 2002; Yiend and Mathews 2001; Cisler and Olatunji 2010). However, this finding may be limited to subclinical anxiety (Yiend et al. 2015). There is also evidence of early enhanced engagement to threat and late attentional avoidance of threat in anxious adults (Koster et al. 2006; Ellenbogen and Schwartzman 2009). Only three studies have investigated attentional bias to threat in clinically anxious adults using the emotional spatial cueing paradigm (Amir et al. 2003; Ellenbogen and Schwartzman 2009; Yiend et al. 2015), and these studies also suggested mixed results. Social phobia patients showed delayed disengagement from threat (Amir et al. 2003), clinically anxious patients showed subliminal delayed disengagement from threat and supraliminal attentional avoidance of threat (Ellenbogen and Schwartzman 2009), and generalized anxiety patients showed attentional avoidance of threat (Yiend et al. 2015). Overall, studies with adult samples show mixed results. However, the results may be explained by differences between subclinical and clinical anxiety and differences between different anxiety disorders.

Studies using the emotional spatial cueing paradigm have also been done with child samples. For instance, Morales et al. (2016) found that behaviorally inhibited children demonstrated slower disengagement from angry faces (validity effect) than non-behaviorally inhibited children. This finding is similar to the findings in subclinical adult samples (e.g., Fox et al. 2001) and social phobia adult patients (Amir et al. 2003). Interestingly, in the study by Morales et al. (2016), behavioral inhibition was the only significant predictor of social anxiety. Thus, similar psychopathology may explain similar findings between studies, i.e., the sample of the study by Morales et al. (2016) may be more similar to the sample of the study by Amir et al. (2003) than the sample of the study by Yiend et al. (2015). Also, Bar-Haim et al. (2011) used the emotional spatial cueing paradigm to train subclinically anxious children to disengage attention from threat and found that attention bias modification (ABM) facilitated attentional disengagement from threat. However, one major limitation of that study was that it did not include nonanxious control children. Using the same paradigm, Pollak and Tolley-Schell (2003) investigated attentional bias to threat in physically abused children and found that physically abused children demonstrated faster engagement to angry faces (valid trials) and slower disengagement from angry faces (validity effect) than nonabused children. Overall, studies with child samples show that the engagement and disengagement components of attentional bias to threat can be investigated in children using the emotional spatial cueing paradigm. However, this has not been investigated in clinically anxious children.

The present study is, to the authors' knowledge, the first study to investigate the effect of cognitive therapy on the engagement and disengagement components of attentional bias to threat in clinically anxious children using the emotional spatial cueing paradigm. The present study adopted the emotional version of Posner's (1980) spatial cueing paradigm used by Pollak and Tolley-Schell (2003) and used 500 ms angry faces as stimuli since previous studies with children have shown differences in engagement and

disengagement with this exposure duration and stimuli (Pollak and Tolley-Schell 2003; Bar-Haim et al. 2011; Morales et al. 2016). Three studies with anxious adults have used the emotional spatial cueing paradigm with angry faces as stimuli. The study by Fox et al. (2001) showed delayed disengagement from threat in anxious adults, the study by Mogg et al. (2008) showed enhanced engagement to threat in anxious adults (after accounting for non-attentional behavioral freezing), and the study by Yiend et al. (2015) showed attentional avoidance of threat in anxious adults. The study by Yiend et al. (2015) was the only study to include a stimulus exposure time of 500 ms. The present study did not include a within-group measure of attentional bias independent of time because previous research has shown low test–retest correlations for bias scores (threat trials–neutral trials) and concluded that individual reaction times is a better indicator of reliability (Eide et al. 2002). Measurement error may be particularly significant when using reaction time based tasks with children, where reaction times are more variable than when using similar tasks with adults.

In the present study, we expected all children to respond faster to valid than invalid cues, which would be consistent with an early processing advantage for valid targets. Hence, the first hypothesis of the present study was that invalid trials would result in increased reaction times across samples. Similar to the supraliminal part of the study by Ellenbogen and Schwartzman (2009), the present study used a clinical sample and supraliminal stimuli. Thus, the study by Ellenbogen and Schwartzman (2009) is the previous study that most closely resembles the present study. Accordingly, the second hypothesis of the present study was that clinically anxious children show greater attentional avoidance of threat than control children (i.e., faster disengagement at pre-test). According to Beck and Clark (1997), cognitive therapy discourages, rather than reinforces, the patient's automatic tendency to engage in cognitive avoidance. Thus, the third hypothesis of the present study was that clinically anxious children show less attentional avoidance of threat following treatment with cognitive therapy (i.e., slower disengagement at post-test than at pre-test).

Methods

Participants

The total sample consisted of 60 children ranging in age from 7 to 13 years ($M = 9.5$, SD = 1.6). Anxious children were recruited at Center for Anxiety, Department of Psychology, University of Copenhagen. Nonanxious children were recruited at a local afterschool to match the anxious group on age and gender. Due to errors in the experimental task the data of three anxious children and three control children were excluded. As a result, the groups consisted of 27 anxious (17 girls; 63.0%) and 27 nonanxious (16 girls; 59.3%) children. The anxious children completed treatment with cognitive therapy and were tested before and after treatment with approximately 12 weeks between the tests. To briefly summarize, the first session included identifying treatment goals with the child and parents, psycho-education on anxiety, and socialization to cognitive therapy. An individualized treatment plan was developed, which targeted emotions, thoughts and behaviors using standard cognitive therapy techniques in subsequent sessions (e.g., thought restructuring combined with behavioral experiments and exposure). The final session focused on relapse prevention (see Reinholdt-Dunne et al. 2015). Nonanxious children were also tested a second time approximately 12 weeks after the first test. No active-control was used for the nonanxious children. Parental consent had been granted before the children participated in the study, and after being shown the study apparatus, children verbally assented to participation.

Measures

The Emotional Spatial Cueing Paradigm (Posner 1980)

In the emotional spatial cueing paradigm, a single cue appears in one of two locations and is followed by a target presented at the cued location on a majority of trials (valid trials) and at the alternative location on a minority of trials (invalid trials). The present version of the emotional spatial cueing paradigm (Pollak and Tolley-Schell 2003) included eight angry (four female and four male) and eight neutral (four female and four male) adult face cues from the NimStim face stimulus set (Tottenham et al. 2009). Twelve face cues were used in the experimental trials, and four face cues were used in the practice trials. The face cues were reproduced in grayscale using Photoshop, and the experiment was created in SuperLab. Facial images were presented on a 15.6″ Lenovo laptop, and responses were obtained from a PST serial response box.

The Revised Child Anxiety and Depression Scale (RCADS, Chorpita et al. 2000)

The RCADS is a 47-item self-report questionnaire measuring child anxiety and depression. The questionnaire consists of six subscales: Social phobia, panic disorder, major depression, separation anxiety, generalized anxiety, and obsessive–compulsive disorder. The social phobia subscale consists of nine items, panic disorder consists of nine items, major depression consists of ten items, separation anxiety consists of seven items, generalized anxiety consists of six items, and obsessive–compulsive disorder consists of six items. Items have to be scored on a 4-point scale with

0 = never, 1 = sometimes, 2 = often, and 3 = always. A total score can be computed by summing across relevant items. In this study, internal consistency was excellent (α = 0.95).

The Anxiety Disorder Interview Schedule for Children and Parents (ADIS-c and ADIS-p, Silverman and Albano 1996)

The ADIS-c and ADIS-p are structured diagnostic interviews, designed to assess childhood anxiety disorders (separation anxiety, generalized anxiety, social phobia, and specific phobia) as well as co-morbid psychiatric disease such as childhood depression and obsessive–compulsive disorder. The ADIS interviews are based on DSM-IV diagnostic criteria. The interviews with the children and their parents were conducted separately by trained graduate students, who were supervised by a qualified clinical psychologist with specialist expertise in child psychopathology. A clinical severity rating, ranging from 0 to 8, was derived from interview data, with scores of four or above being considered within the clinically significant range. Children with depression scores of four or above were not included in the study. A combined diagnosis was derived from child and parent ratings.

Procedure

The anxious group was assessed at pre-test and post-test on measures of anxiety (ADIS and RCADS) and the engagement and disengagement components of attentional bias to threat (emotional spatial cueing paradigm). Between the pre-test and post-test, the anxious group received treatment with cognitive therapy. The cognitive therapy was delivered at Center for Anxiety, Department of Psychology, University of Copenhagen by a qualified clinical psychologist with specialist expertise in child psychopathology. The control group was assessed at pre-test on a measure of anxiety (RCADS) and the engagement and disengagement components of attentional bias to threat (emotional spatial cueing paradigm) and at post-test on the emotional spatial cueing paradigm. The children were tested individually on both anxiety and attentional bias measures.

During the emotional spatial cueing paradigm, the children sat in a dimly lit and soundproof room. The 15.6″ screen was situated so that the stimuli appeared at the child's horizontal line of sight. Trials began with a fixation cross presented for 200 ms. After the offset of fixation, a face appeared 5° to the left or right of the screen for 500 ms. 200 ms after face offset, a target (red star) was presented 5° to the left or right of the screen for 200 ms. The child's task was to press the left or right button on the response box to indicate the target position. The children used their index fingers to press the left and right buttons on the response box to indicate the left and right sides of the screen. The target appeared with the same probability on the left and right sides of the screen. Cues were valid when the target followed in the same position and invalid when the target followed in the different position. The probability of cues being valid was 75%.

To ensure that the children understood the task, they were given 40 practice trials using faces that were not included in the experimental block. The practice trials were divided into four blocks. The children received support after each practice block. The experimental block consisted of 160 trials: 90 angry valid trials, 30 angry invalid trials, 30 neutral valid trials, and 10 neutral invalid trials. To integrate emotion processing into the task, some trials required the child to hold back a response to the target. On these trials, a neutral face instead of an angry face appeared as the cue. Neutral trials were randomly spread between angry trials, so that they were presented at the rate of 1:4. These trials were

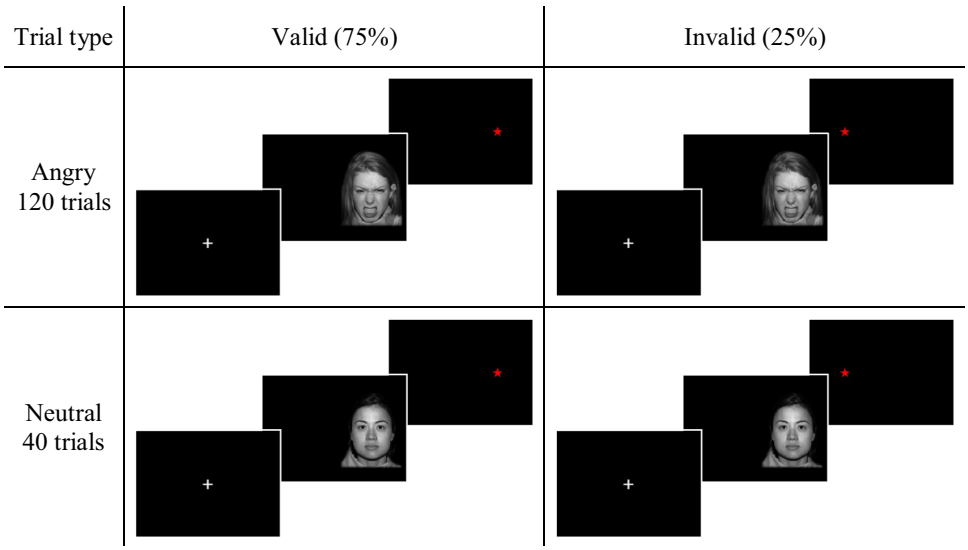

Fig. 1 Sample stimuli and schematic of types of trials

incorporated to encourage the child to process the emotion in faces, and not to just look at the screen at the appearance of a star. To preserve the child's anticipation that cues predicted target presentation, these cues were also 75% valid (see Fig. 1).

The analysis was carried out exclusively on the angry trials. Before calculating the validity effect, reaction times (RTs) from trials with errors and outliers (less than 200 ms and more than 2 SDs above each participant's mean) were excluded. Lower values on valid trials are believed to reflect enhanced engagement. The validity effect was calculated by subtracting the mean RT on valid trials from the mean RT on invalid trials. Lower values are believed to reflect attentional avoidance and higher values are believed to reflect delayed disengagement.

Results

Participant Characteristics

Eighteen children were diagnosed with primary generalized anxiety, six children were diagnosed with primary separation anxiety, two children were diagnosed with primary specific phobia, and one child was diagnosed with primary social phobia. Nineteen children had co-morbid anxiety disorders before treatment. The secondary diagnoses were generalized anxiety (5), separation anxiety (5), specific phobia (11), and social phobia (6). Twenty-four children (89%) were free of their primary anxiety diagnosis after treatment with cognitive therapy. The nonresponders were two children with primary generalized anxiety and one child with primary social phobia. One child had co-morbid anxiety disorders after treatment. The secondary diagnosis was specific phobia. Twenty children (74%) were free of all anxiety diagnoses after treatment with cognitive therapy. The seven children with anxiety diagnoses after treatment with cognitive therapy all reported lower clinical severity ratings after treatment than before treatment.

Independent-samples and dependent-samples t-tests were conducted to investigate between-group and within-group differences on the RCADS. Between group results showed that clinically anxious children scored significantly higher on the RCADS before treatment than control children, $t(52) = 7.73$, $p < .001$, $d = 2.42$, but not after treatment, $t(50) = 1.78$, $p = .081$, $d = 0.49$. Within-group results showed that clinically anxious children scored significantly higher on the RCADS before treatment than after treatment, $t(24) = 8.74$, $p < .001$, $d = 1.57$ (see Table 1).

Emotional Spatial Cueing Paradigm

A $2 \times 2 \times 2$ mixed design ANOVA, with time (pre vs. post) and trial type (valid vs. invalid) as the within-subjects independent variables, and group (anxious vs. control) as the between-subjects independent variable, was conducted. There was a significant interaction effect of time × group, $F(1, 52) = 8.20$, $p = .006$, $\eta_p^2 = 0.14$, the difference in RTs between pre-test and post-test was larger in the control group than in the anxious group. There was a significant interaction effect of trial type × group, $F(1, 52) = 5.48$, $p = .023$, $\eta_p^2 = 0.10$, the difference in RTs between valid trials and invalid trials was larger in the control group than in the anxious group. There was also a significant interaction effect of time × trial type, $F(1, 52) = 10.05$, $p = .003$, $\eta_p^2 = 0.16$, the difference in RTs between pre-test and post-test was larger on valid trials than invalid trials. There was a significant main effect of time, $F(1, 52) = 27.41$, $p < .001$, $\eta_p^2 = 0.35$, and trial type, $F(1, 52) = 96.19$, $p < .001$, $\eta_p^2 = 0.65$, RTs were faster at post-test than pre-test and on valid trials than invalid trials.

Independent-samples and dependent-samples *t*-tests were conducted to investigate between-group and within-group differences in engagement and disengagement. Between-group results showed that engagement was

Table 1 Descriptive statistics for anxious and control groups

	Anxious children ($N = 27$)		Control children ($N = 27$)	
	Time 1	Time 2	Time 1	Time 2
	M (SD)	*M* (SD)	*M* (SD)	*M* (SD)
Age	10.1 (1.6)		9.0 (1.5)	
RCADS	51.5 (18.8)	25.4 (14.0)	19.2 (10.9)	
Error (% trials)	8.0 (7.3)	5.5 (5.0)	9.2 (6.3)	6.8 (6.8)
Missing (% trials)	15.3 (8.5)	14.4 (7.4)	16.4 (7.6)	15.1 (8.6)
Valid trials RT (ms)	366.9 (52.5)	338.2 (48.0)	436.5 (64.8)	380.4 (52.5)
Invalid trials RT (ms)	387.7 (62.5)	387.2 (64.4)	487.2 (94.6)	443.2 (67.4)
Validity effect RT (ms)	20.8 (34.8)	48.9 (29.0)	50.7 (60.0)	62.8 (35.2)

RCADS the revised child anxiety and depression scale

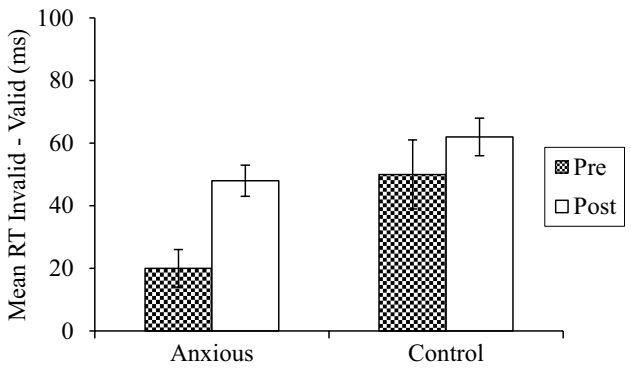

Fig. 2 Difference scores were calculated by subtracting reaction time (RT) on valid trials from reaction time on invalid trials; thus, this figure depicts the magnitude of the difference between valid and invalid trials at pre-test and post-test

significantly faster in the anxious group than in the control group at both pre-test, $t(52) = 4.34$, $p < .001$, $d = 1.18$, and post-test, $t(52) = 3.08$, $p = .003$, $d = 0.84$. Within-group results showed that engagement was significantly faster at post-test than at pre-test in both the anxious group, $t(26) = 4.54$, $p < .001$, $d = 0.55$, and the control group $t(26) = 6.90$, $p < .001$, $d = 0.95$. Between-group results showed that disengagement was significantly faster in the anxious group than in the control group at pre-test, $t(52) = 2.24$, $p = .029$, $d = 0.61$, but not at post-test, $t(52) = 1.58$, $p > .1$, $d = 0.43$. Within-group results showed that disengagement was significantly slower at post-test than at pre-test in the anxious group, $t(26) = 4.01$, $p < .001$, $d = 0.88$, but not in the control group, $t(26) = 1.14$, $p > .1$, $d = 0.25$ (see Fig. 2).

Discussion

The present study is, to the authors' knowledge, the first study to investigate the effect of cognitive therapy on the engagement and disengagement components of attentional bias to threat in clinically anxious children using the emotional spatial cueing paradigm. Only three studies have investigated attentional bias to threat in clinically anxious adults using the emotional spatial cueing paradigm (Amir et al. 2003; Ellenbogen and Schwartzman 2009; Yiend et al. 2015).

As expected in the first hypothesis, all children responded faster to valid than invalid cues, which is consistent with an early processing advantage for valid targets. This result had a large effect size. In support of the second hypothesis, clinically anxious children showed significantly faster disengagement from angry faces before treatment than control children. This result had a medium effect size. In line with the third hypothesis, clinically anxious children showed significantly slower disengagement from angry faces following cognitive therapy than they did at intake assessment. This result also had a large effect size. The pattern of results at pre-test is similar to the supraliminal part of the study by Ellenbogen and Schwartzman (2009) who found that clinically anxious adults show attentional avoidance of threat in comparison to nonanxious controls. Our finding of attentional avoidance of threat is also similar to results with adults with generalized anxiety by Yiend et al. (2015). Interestingly, however, our findings are dissimilar to that of Amir et al. (2003) who reported delayed disengagement of threat in socially anxious adults. One explanation for this difference may be varying samples, i.e., the sample of the present study were more similar to the sample of the study by Yiend et al. (2015) than the sample of the study by Amir et al. (2003). In the present study, 18 participants were diagnosed with primary generalized anxiety and only one participant was diagnosed with primary social anxiety.

As mentioned, the present study supported the second hypothesis of attentional avoidance of threat in clinically anxious children and the third hypothesis of reduced attentional avoidance of threat following treatment with cognitive therapy. Contrasting Ellenbogen and Schwartzman (2009), our results also showed enhanced engagement to threat in clinically anxious children at both pre and post assessment. Notwithstanding that, previous studies, using the emotional spatial cueing paradigm with subclinically anxious adults, also find enhanced engagement to threat (Koster et al. 2006; Mogg et al. 2008; Massar et al. 2011). These studies, however, have primarily used stimulus exposure times from 100 to 200 ms. Similar to our study, Pollak and Tolley-Schell (2003) also used a stimulus exposure time of 500 ms with physically abused children and found that responses were faster on valid trials in the angry condition, than control children's responses on either happy or angry valid trials. They suggested that the presence of angry cues may lower children's thresholds for initiating motor responses resulting in enhanced engagement. Thus, the differences in engagement to threat could be described as non-attentional behavioral speeding. In regards to delayed disengagement, Mogg et al. (2008) made a similar deduction in suggesting that the results of delayed disengagement from threat in anxious individuals, primarily observed in subclinical samples, may be explained by non-attentional behavioral freezing. However, a vigilance-avoidance explanation is perhaps more plausible than non-attentional behavioral speeding since cognitive therapy discourages the patient's automatic tendency to engage in cognitive avoidance.

The vigilance-avoidance hypothesis proposes that anxiety-related attentional biases vary over time. Studies have suggested a pattern of early vigilance followed by effortful avoidance of threat in anxious individuals (Koster et al. 2006; Ellenbogen and Schwartzman 2009). In the emotional

spatial cueing paradigm, vigilance is demonstrated by faster engagement to threat on valid trials and avoidance is demonstrated by faster disengagement from threat on invalid trials (measured by the validity effect). The results of the present study support the vigilance-avoidance hypothesis. The vigilance hypothesis is supported by the fact that the clinically anxious children show significantly faster engagement to threat than the control children at both pre-test and post-test. The avoidance hypothesis is supported by the fact that the clinically anxious children show significantly faster disengagement from threat than the control children at pre-test. The fact that the clinically anxious children show significantly slower disengagement from threat at post-test than pre-test, suggests that cognitive therapy targets the avoidance tendency in clinically anxious children. This is in line with the exposure component of cognitive therapy. According to Beck and Clark (1997), exposure is a necessary component of anxiety reduction because it ensures that more elaborate strategic constructive processing of the threat stimulus can take place rather than the cognitive avoidance, which is more typically seen in anxiety disorders. The fact that avoidance and not vigilance reduces after treatment, suggests that cognitive therapy is working on later stages of processing. This is in line with the thought restructuring component of cognitive therapy. According to Cisler and Koster (2010), vigilance is believed to be a more automatic bottom-up process and avoidance is believed to be a more strategic top-down process.

An explanation to why clinically anxious children exhibit attentional avoidance of threat and subclinical samples exhibit delayed disengagement from threat may be that the avoidance tendency is only present in the clinical population. It is plausible that being highly afraid (clinically anxious) of something leads to avoidance, being afraid (subclinically anxious) of something leads to vigilance, and not being afraid (nonanxious) leads to indifference, i.e., fleeing, monitoring, and not caring about a spider. According to Bar-Haim et al. (2011), attention bias modification (ABM) facilitates attentional disengagement from threat. However, based on the findings from the present study, one could argue that training clinically anxious children to disengage attention from threat may increase avoidance and thus enhance, and not reduce, the difference in anxiety symptoms between clinically anxious children and nonanxious children. Bar-Haim et al. (2011) reported that in response to a stressor task, children in the ABM condition reported less state anxiety relative to control children. On the other hand, in line with the findings from the present study, this anxiety reduction may be explained by attentional avoidance, i.e., fleeing from a spider will most likely briefly reduce state anxiety in spider phobic individuals. The issue is that attentional avoidance is in conflict with the exposure component of cognitive therapy and may prevent treatment success. However, training anxious individuals to delay disengagement from threat may not be desirable either, particularly due to the amount of studies showing delayed disengagement from threat in anxious individuals. Another solution may be to teach anxious individuals to flexibly move attention (Ege and Reinholdt-Dunne 2016).

A limitation of the present study is that it included multiple diagnoses. Thus, the study is not able to distinguish between different anxiety disorders. Two-thirds of the anxious children in the present study were diagnosed with primary generalized anxiety. Hence, the results of the study are comparable to adult studies investigating generalized anxiety (e.g., Yiend et al. 2015). However, the results of the study are not comparable to adult studies investigating other diagnoses (e.g., Amir et al. 2003). Another limitation of the present study is that the version of the emotional spatial cueing paradigm included a between-group measure of attentional bias and a within-group measure of time, but not a within-group measure of attentional bias independent of time. A within-group measure of attentional bias independent of time would have required a comparison of threat and neutral stimuli. However, the present study used neutral stimuli to incorporate emotion processing into the task. Future research using the emotional spatial cueing paradigm with anxious children should distinguish between different anxiety disorders and include a within-group measure of attentional bias independent of time. Future research using the emotional spatial cueing paradigm with anxious children should also investigate different types of stimuli and different stimulus exposure times. The emotional spatial cueing paradigm is a measure of covert attention. Another method of assessing attentional engagement and disengagement is through the use of eye tracking. Eye-movement measures of attention are likely to index more overt orienting of attention, whereas cueing and probe tasks may index covert shifts of attention (Clarke et al. 2013). Future research may want to include measures of overt attention when studying the engagement and disengagement components of attentional bias to threat.

Conclusively, the present study suggests that cognitive therapy reduces attentional avoidance of threat in children with anxiety disorders and challenges the assumption that results can be generalized from subclinical to clinical samples. The present study also concludes that training children with anxiety disorders to disengage attention from threatening stimuli may enhance, and not reduce, the difference in anxiety symptoms between clinically anxious children and nonanxious children because they are learning attentional avoidance. Future research should further examine the mechanisms of selective attention in anxious children before applying manipulations of cognitive biases to treatment. Variations of the emotional spatial cueing paradigm

and additional measures of attention may further uncover the engagement and disengagement components of attentional bias to threat in clinically anxious children.

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Compliance with Ethical Standards

Conflict of Interest Andreas Blicher and Marie Louise Reinholdt-Dunne declare that they have no conflict of interest.

Ethical Approval All procedures performed involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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