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# Visual search attentional bias modification reduced social phobia in adolescents



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### ABSTRACT

**Background and objectives:** An attentional bias for negative information plays an important role in the development and maintenance of (social) anxiety and depression, which are highly prevalent in adolescence. Attention Bias Modification (ABM) might be an interesting tool in the prevention of emotional disorders. The current study investigated whether visual search ABM might affect attentional bias and emotional functioning in adolescents.

**Methods:** A visual search task was used as a training paradigm; participants ( $n = 16$  adolescents, aged 13–16) had to repeatedly identify the only smiling face in a  $4 \times 4$  matrix of negative emotional faces, while participants in the control condition ( $n = 16$ ) were randomly allocated to one of three placebo training versions. An assessment version of the task was developed to directly test whether attentional bias changed due to the training. Self-reported anxiety and depressive symptoms and self-esteem were measured pre- and post-training.

**Results:** After two sessions of training, the ABM group showed a significant decrease in attentional bias for negative information and self-reported social phobia, while the control group did not. There were no effects of training on depressive mood or self-esteem.

**Limitations:** No correlation between attentional bias and social phobia was found, which raises questions about the validity of the attentional bias assessment task. Also, the small sample size precludes strong conclusions.

**Conclusions:** Visual search ABM might be beneficial in changing attentional bias and social phobia in adolescents, but further research with larger sample sizes and longer follow-up is needed.

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### 1. Introduction

During adolescence important cognitive and social-emotional developments take place, marked by increased social pressure, more intense emotional experiences and risk-taking behaviors (Casey et al., 2010). In this vulnerable period, there is a peak prevalence of anxiety and depression, with a cumulative prevalence of approximately 15% by 16 years of age (Costello, Mustillo, Erkanli, Keeler, & Angold, 2003). These disorders have a detrimental influence on social and academic functioning and increase the risk of psychiatric disorders in adulthood (Woodward &

Fergusson, 2001). Therefore, early prevention of emotional disorders is of paramount importance.

Since anxiety and depression are highly comorbid, especially in adolescence (Axelson & Birmaher, 2001), it is important to look for common underlying mechanisms as a target for prevention. Cognitive models of emotional disorders propose that anxious and depressive symptoms are both caused and maintained by negatively biased attention, interpretation and memory processes (e.g., Beck & Clark, 1997; Daleiden & Vasey, 1997; Mathews & MacLeod, 2005). These information processing biases are closely linked and attentional bias, the tendency to preferentially focus attention on negative information, might be a predictor of other biases (White, Suway, Pine, Bar-Haim, & Fox, 2011). Attentional bias is considered an important target in treatment, and has been shown to diminish after cognitive behavioral therapy, with changes in bias being associated with treatment success (Legerstee et al., 2010).

Cognitive models of emotional disorders have been supported by numerous studies that have shown that attentional bias is

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related to anxiety and depression levels in healthy as well as clinical populations (for reviews, see Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & Van IJzendoorn, 2007; Cisler & Koster, 2010). Although most research focused on adults, there is also evidence of an attentional bias for negative information in anxious and depressive children and adolescents (Hankin, Gibb, Abela, & Flory, 2010; Puliafico & Kendall, 2006; Roy et al., 2008). Attentional bias seems to consist of both impaired attentional disengagement from as well as facilitated engagement towards negative information, although evidence for the latter is less consistent (Cisler & Koster, 2010; Heeren, Lievens, & Philippot, 2011; Koster, Crombez, Verschuere, Van Damme, & Wiersema, 2006). Although anxiety and depression are both associated with a bias for negative information, there is a difference in content. While anxious people focus mostly on threat, depressive people preferentially process sad or other mood-congruent stimuli (Hankin et al., 2010) and show less bias for positive information (Peckham, McHugh, & Otto, 2010).

Cognitive models not just argue that attentional bias is related to anxiety and depression; they suggest a causal role in the development and maintenance of these disorders. MacLeod, Rutherford, Campbell, Ebsworthy, and Holker (2002) were the first to provide evidence consistent with the hypothesis that attentional bias is causally related to emotional vulnerability. They used a modified version of the dot-probe task, which is usually employed to assess attentional bias (MacLeod, Mathews, & Tata, 1986), but was now adapted to manipulate attentional bias. Participants trained to attend to negative stimuli showed more negative emotions in response to a subsequent stressor than those trained away from negative stimuli. These results were replicated in other studies with adults (for an overview see MacLeod & Mathews, 2012) as well as children (Eldar, Ricon, & Bar-Haim, 2008). For instance, Eldar et al. (2008) trained healthy children to either shift attention to or away from threat. After two sessions, those trained to attend to threat showed a bias for negative information and responded with more anxiety to a subsequent stressor. However, the 'attend away from threat' group showed no change in attentional bias, which might be explained by floor effects in healthy children (Eldar et al., 2008).

These findings fuelled interest in possible applications of ABM in the treatment of emotional disorders. Studies with subclinical and clinical adult populations found beneficial effects of ABM on social anxiety (Amir, Weber, Beard, Bomyea, & Taylor, 2008; Heeren, Reese, McNally, & Philippot, 2012; Li, Tan, Qian, & Liu, 2008), generalized anxiety (Amir, Beard, Burns, & Bomyea, 2009), and depression (Browning, Holmes, Charles, Cowen, & Harmer, 2012; Wells & Beevers, 2009; for a review see Hallion & Ruscio, 2011). However, some recent studies employing internet-delivered ABM did not find any differential effects (Boettcher, Berger, & Renneberg, 2012; Carlbring et al., 2012; Neubauer et al., 2013). Most studies focused on adults, but more recently, ABM with the dot-probe paradigm has also been employed in anxious children and adolescents with promising but also conflicting findings. Bar-Haim, Morag, and Glickman (2011) found effects on attentional bias and stress-reactivity in anxious children, but not on trait measures of anxiety or depression. Another study that preselected anxious children on attentional bias to threat, showed changes in clinician-rated symptoms, but again not on self-report measures (Eldar et al., 2012). Note that in adolescents, significant changes in self-reported symptoms were found (Riemann, Kuckertz, Rozenman, Weersing, & Amir, 2013; Rozenman, Weersing, & Amir, 2011). One study found a significant decrease in clinician, parent and self-reported symptoms after 12 sessions of training (Rozenman et al., 2011), but this study lacked a control group and found no significant change in attentional bias.

Inconsistent results with regard to bias change have also been shown by Britton et al. (2013), who found an unexpected bias away from happy faces after training towards happy faces combined with CBT. Taking into account the high prevalence of anxiety and depression in adolescents and the questions arising from the previous ABM studies using the dot-probe task, more research regarding ABM in this age group seems needed.

While most studies on ABM used the dot-probe paradigm developed by MacLeod et al. (2002), other paradigms have also been used. For example, Dandeneau and Baldwin (2004) developed a visual search attention training task to train participants to disengage from rejecting faces and to focus on accepting faces. Participants had to search for the one accepting/smiling face in a grid of 15 rejecting/disgust faces. One session of this training reduced bias for negative information and students who followed the training experienced less stress about an exam and felt less anxious and more competent about their school performance (Dandeneau, Baldwin, Baccus, Sakellaropoulou, & Pruessner, 2007). Also, in a field study, telemarketers following this training showed increased self-esteem and decreased stress-responses (Dandeneau et al., 2007). Another study with the same paradigm showed that the training increased resilience against social rejection and performance threat: trained participants were less vulnerable to these laboratory stressors than a placebo-control group and showed higher levels of state self-esteem (Dandeneau & Baldwin, 2009). An attractive aspect of this paradigm, is that it might combine improving disengagement from negative stimuli with increasing vigilance for positive information. While in most dot-probe training paradigms, attention is trained away from negative stimuli towards neutral stimuli, in this task participants also learn to reallocate their attention and to actively search for positive information. Furthermore, since more visual stimuli are provided in this task, it is probably more engaging for adolescents, who might be quickly bored. Note that promising effects have also been found using a modified version of this task in a sample of clinically anxious children (Waters, Pittaway, Mogg, Bradley, & Pine, 2013). Twelve sessions of this training induced an attentional bias for positive information and resulted in significant clinician-rated improvement compared to a control group. While this visual search paradigm seems attractive especially for adolescents, it has not yet been investigated in this population.

The aim of the current study was to investigate the effects of visual search ABM on attentional bias, self-esteem and anxiety and depressive symptoms in unselected adolescents. If we could boost self-esteem and decrease emotional problems in this population, this might indicate that ABM has promising preventative effects against the development of full-blown anxiety and depression. We used the visual search ABM task of Dandeneau et al. (2007), this time with adolescent instead of adult faces, to increase the ecological validity for our population. Participants had to search for the smiling face in a  $4 \times 4$  grid of faces with negative emotional expressions. To account for content specificity and target biases in both anxiety and depression we used angry, fearful and sad faces, with the additional advantage of training disengagement from a broad set of negative stimuli. A two session ABM training was compared to a placebo-control training. Attentional bias, self-esteem and anxiety and depressive symptoms were assessed before and after the training. Attentional bias is most often assessed with a dot-probe task. However, this task has been shown to have low internal consistency and retest reliability and seems an unreliable measure of attentional bias in non-clinical samples (Schmuckle, 2005). Therefore, we developed an assessment version of the visual search training task, the Emotional Visual Search Task (EVST), in which selective attention for positive

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