Behaviour Research and Therapy 53 (2014) 30–40

Contents lists available at ScienceDirect

Behaviour Research and Therapy

journal homepage: www.elsevier.com/locate/brat

Moderation and mediation of the effect of attention training in social anxiety disorder☆

Jennie M. Kuckertz [a], Elena Gildebrant [b], Björn Liliequist [b], Petra Karlström [b], Camilla Väppling [b], Owe Bodlund [c], Therése Stenlund [d], Stefan G. Hofmann [e], Gerhard Andersson [f], Nader Amir [a], Per Carlbring [g,*]

[a] Joint Doctoral Program in Clinical Psychology, San Diego State University/University of California, San Diego, CA, USA
[b] Department of Psychology, Umeå University, Umeå, Sweden
[c] Department of Clinical Science, Umeå University, Umeå, Sweden
[d] Department of Community Medicine and Rehabilitation, Umeå University, Umeå, Sweden
[e] Department of Psychology, Boston University, Boston, MA, USA
[f] Department of Behavioural Sciences and Learning, Linköping University, Linköping, Sweden
[g] Department of Psychology, Stockholm University, SE-106 91 Stockholm, Sweden

ARTICLE INFO

Article history:
Received 4 June 2013
Received in revised form
8 October 2013
Accepted 3 December 2013

Keywords:
Social phobia
Social anxiety disorder
Attention
Treatment
Information processing

ABSTRACT

While attention modification programs (AMP) have shown promise as laboratory-based treatments for social anxiety disorder, trials of internet-delivered AMP have not yielded significant differences between active and control conditions. To address these inconsistencies, we examined the moderational and mediational role of attention bias in the efficacy of attention training. We compared data reported by Carlbring et al. (2012) to an identical AMP condition, with the exception that participants were instructed to activate social anxiety fears prior to each attention training session (AMP + FACT; $n = 39$). We also compared all attention training groups to an internet-delivered cognitive-behavioral therapy (iCBT) condition ($n = 40$). Participants in the AMP + FACT group experienced greater reductions in social anxiety symptoms than both active ($n = 40$) and control ($n = 39$) groups reported by Carlbring et al., and did not differ in symptom reductions from the iCBT group. Higher attention bias predicted greater symptom reductions for participants who completed AMP, but not for the control group. Moreover, change in attention bias mediated the relationship between AMP group (active condition reported by Carlbring et al. versus AMP + FACT) and change in social anxiety symptoms. These results suggest the importance of interpreting findings related to symptom change in attention training studies in the context of bias effects.

Trial registration: ISRCTN01715124

Social anxiety disorder (SAD) is common, with a lifetime prevalence rate of 12.1% (Kessler et al., 2005) and is associated with significant interference in social, academic, and occupational functioning (Kessler, 2003; Schneier et al., 1994). Researchers have turned to cognitive models of social anxiety in order to develop new, easily disseminated treatments. For example, three recent meta-analyses (Beard, Sawyer, & Hofmann, 2012; Hakamata et al., 2010; Hallion & Ruscio, 2011) suggest that attention modification programs (AMP) may be effective for SAD and other anxiety disorders. AMP is a computerized program designed to modify basic cognitive vulnerabilities that may be important maintenance factors of anxiety (Amir, Weber, Beard, Bomyea, & Taylor, 2008), and is based on the hypothesis that anxious individuals preferentially allocate their attentional resources to threat-relevant stimuli (Clark & Wells, 1995; Heinrichs & Hofmann, 2001; Hofmann, 2007; Rapee & Heimberg, 1997). Research examining this hypothesis has generally been supportive of these theories (MacLeod, Mathews, & Tata, 1986; Mogg, Philippot, & Bradley, 2004; for a review see Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van IJzendoorn, 2007). Given the presence of an attentional bias in anxious individuals, AMP is designed to facilitate processing of neutral stimuli and thus redirect anxious individuals' attention from threatening stimuli.

* Corresponding author.
E-mail address: Per@Carlbring.se (P. Carlbring).

0005-7967/$ – see front matter © 2013 The Authors. Published by Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.brat.2013.12.003

For example, Amir et al. (2009) examined the effects of an AMP protocol in socially anxious individuals using a variant of the dot-probe detection task (MacLeod et al., 1986; MacLeod, Rutherford, Campbell, Ebsworthy, & Holker, 2002). In this study, participants were presented with two faces on a computer screen, one above the other. Face pairs comprised a face with a threatening expression (disgust) and a neutral face. After a brief presentation of the faces, the faces disappeared and one of the two faces was replaced by a probe (i.e., the letter 'E' or 'F'). Participants had to indicate with a left or a right mouse click whether the probe was an 'E' or 'F'. In the active training condition (AMP), the probe always appeared in the location of the neutral face, thus directing participants' attention away from the threatening face. In the attention control condition (ACC), the probe replaced the neutral face 50% of the time, and replaced the threat face 50% of the time. Amir et al. found that after eight sessions, 50% of the active condition, compared to 14% of the control condition, lost their diagnosis of SAD. Moreover, the active condition experienced significantly improved outcomes relative to the control group on social anxiety symptoms, as measured by the Liebowitz Social Anxiety Scale (LSAS; Liebowitz, 1987).

These results have been replicated in independent laboratories (Heeren, Reese, McNally, & Philippot, 2012; Schmidt, Richey, Buckner, & Timpano, 2009). Schmidt et al. (2009) found that 72% of participants in the active condition, compared to 11% of participants in the control condition, did not meet diagnostic criteria for SAD after eight sessions of attention training. Heeren et al. (2012) compared the efficacy of three attention training conditions (attend towards positive, control condition, and attend-towards threat) on social anxiety symptoms, social anxiety-related behavior, and physiological response to a social stressor. These investigators found that after four sessions of attention training, both the attend toward positive and control conditions displayed significant reductions in social anxiety symptoms from pre- to post-treatment, however, these results were only maintained at follow-up for the attend towards positive group. Moreover, behavioral improvements in social anxiety symptoms and reduced physiological response associated with a speech performance task were only demonstrated for the attend towards positive group.

Despite these initial promising results of attention training, several recent RCTs of attention training for SAD have failed to find expected group differences between the active and control attention training groups (Boettcher, Berger, & Renneberg, 2011; Boettcher, Hasselrot, Sund, Andersson, & Carlbring, 2014; Carlbring et al., 2012; Neubauer et al., 2013). While these studies all demonstrated main effects of time such that participants experienced small to medium reductions in social anxiety symptoms, groups did not differ in symptom reduction as demonstrated in previous studies. What would account for these differing results? First, task differences across studies may have influenced the results. For example, Boettcher et al. (2011) and Neubaurer et al. (2013) used different facial stimuli sets than that used by both Amir et al. (2009) and Schmidt et al. (2009). Similarly, it is not clear whether laterality effects may have influenced the null findings obtained by Neubaurer and colleagues, as they instructed participants to respond to stimuli by using either their right hand or their left hand, whereas Amir et al. (2009) and Schmidt et al. both instructed participants to use the same hand using a left or a right mouse click. Although these factors are in need of further examination, discrepancies across procedures may have accounted for some of the discrepant results.

With issues of replicability and procedural standardization in mind, Carlbring et al. (2012) compared the efficacy of active and control attention training conditions in an internet-delivered attention training protocol, with all other task procedures matched to those used by Amir et al. (2009). Carlbring and colleagues found that while both active and control attention training groups experienced reductions in social anxiety symptoms from pre- to post-treatment, these improvements did not vary by condition.

Discrepant findings have sparked discussion questioning the utility of this intervention (Emmelkamp, 2012). More specifically, these discrepant results raise questions regarding why, how, when, and where attention training is effective for individuals with SAD. These questions translate directly into what are the mediators and moderators of response in AMP. The premises of AMP are (a) individuals with social anxiety demonstrate an attentional bias towards threat, and (b) AMP can successfully reduce this attentional bias which in turn will result in a reduction in social anxiety symptoms. One of the advantages of AMP is that questions regarding mechanism of change as well as moderators of response can be readily examined (Maric, Wiers, & Prins, 2012). Unfortunately, these basic questions are not always systematically tested in attention training studies, rendering the interpretation of results difficult.

However, several research groups have tested questions of moderating and mediating factors involved in AMP. For example, there is some evidence to suggest that attention training is most effective for individuals who present with an attention bias for threat at pre-treatment. Amir, Taylor, and Donohue (2011) found that initial level of attention bias at pre-treatment moderated the relationship between assigned attention training condition (active, control) and improvement in social anxiety symptoms.

Researchers have also tested the hypothesis that the mechanism involved in attention training is reduction in attention bias towards threat. Amir et al. (2009) conducted formal mediation analyses showing that change in attention bias mediated the relationship between treatment condition (active, control) and reduction in social anxiety. Similarly, Heeren et al. (2012) found that change in attention bias mediated the relationship between treatment condition and change in physiological reactivity from pre- to post-treatment, as well as fear of negative evaluation from post-treatment to follow-up. Given the theoretical rationale of attention training as well as the results of reported mediational analyses, change in attention bias appears to be an important mechanism involved in AMP and thus studies that fail to demonstrate this change in bias would not be expected to find changes in symptoms. Consistent with this hypothesis, the three studies that failed to find an effect of AMP on symptoms also failed to show an effect of training on attention bias (Boettcher et al., 2011; Carlbring et al., 2012; Neubauer et al., 2013).

One obvious difference between studies that found attention training efficacious and those that failed to find these effects is the location of training (laboratory versus internet). However, it seems unlikely that the location of training would in itself affect the efficacy of this treatment. For example, internet-delivered CBT (iCBT) for SAD has been found to be equally effective as traditional therapist-delivered CBT for SAD (Andrews, Davies, & Titov, 2011; Hedman et al., 2011), although it is also the case that iCBT includes exposures completed outside the home. However, a second related factor, i.e., the amount of naturalistic fear activation that is incorporated into various studies based on location of study (laboratory versus at home) may have influenced the results. Indeed, as some have suggested (Boettcher et al., 2011; Carlbring et al., 2012), perhaps the act of participating in laboratory trials is anxiety-provoking for socially anxious participants and serves as a form of passive exposure, or facing one's fears, as participants may be putting themselves in situations that involve interacting with authority figures, being supervised by research assistants, and answering personal and sensitive questions outside the safety and comfort of their homes. These naturalistic exposures are unlikely to