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Modifying interpretation biases: Effects on symptomatology, behavior, and physiological reactivity in social anxiety

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ABSTRACT

Background and objectives: The present study investigated the effects of computerized interpretation training and cognitive restructuring on symptomatology, behavior, and physiological reactivity in an analogue social anxiety sample.
Methods: Seventy-two participants with elevated social anxiety scores were randomized to one session of computerized interpretation training ($n = 24$), cognitive restructuring ($n = 24$), or an active placebo control condition ($n = 24$). Participants completed self-report questionnaires focused on interpretation biases and social anxiety symptomatology at pre and posttraining and a speech task at posttraining during which subjective, behavioral, and physiological measures of anxiety were assessed.
Results: Only participants in the interpretation training condition endorsed significantly more positive than negative interpretations of ambiguous social situations at posttraining. There was no evidence of generalizability of interpretation training effects to self-report measures of interpretation biases and symptomatology or the anxiety response during the posttraining speech task. Participants in the cognitive restructuring condition were rated as having higher quality speeches and showing fewer signs of anxiety during the posttraining speech task compared to participants in the interpretation training condition.
Limitations: The present study did not include baseline measures of speech performance or computer assessed interpretation biases.
Conclusions: The results of the present study bring into question the generalizability of computerized interpretation training as well as the effectiveness of a single session of cognitive restructuring in modifying the full anxiety response. Clinical and theoretical implications are discussed.

Cognitive theories of social anxiety have postulated that information processing biases play a significant role in the maintenance of social anxiety disorder (Clark & Wells, 1995; Rapee & Heimberg, 1997). Studies have shown that social anxiety is associated with a tendency to interpret ambiguous social situations negatively, even when general distress and depression are controlled for (e.g., Amir, Foa, & Coles, 1998; Beard & Amir, 2009; Standage, Ashwin, & Fox, 2010). More recently, cognitive bias modification procedures have revealed that positive interpretation biases can be trained in individuals with elevated levels of trait and social anxiety (Amir & Taylor, 2012; Beard & Amir, 2008; Mathews, Ridgeway, Cook, & Yiend, 2007; Murphy, Hirsch, Mathews, Smith, & Clark, 2007; Salemink, van den Hout, & Kindt, 2009) and that trained positive interpretation biases can decrease self-reported social anxiety symptomatology (Beard & Amir, 2008) even after a single session of training (Cohen's d = .57 to .67; Mobini et al., 2014; Murphy et al., 2007).

Mathews and Mackintosh (2000) developed the most frequently used cognitive bias modification procedure for the training and assessment of interpretation biases (Beard, 2011). During the training phase of the Mathews and Mackintosh (2000) task, participants are presented with short ambiguous social scenarios that end with a word fragment that disambiguates the scenarios in a positive or negative direction when solved. For participants in the positive interpretation training condition, the majority of scenarios are disambiguated in a positive direction, whereas for participants in the negative interpretation training condition, the majority of scenarios are disambiguated in a negative direction. In the control condition scenarios are disambiguated in a

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positive and negative direction with equal frequency. The effects of interpretation training are assessed by: 1) reaction times for solving positive and negative word fragments, and 2) a recognition task examining the endorsement of positive and negative interpretations for new ambiguous social scenarios.

The tasks used to train and assess interpretation biases are similar in that they both involve lexically presented ambiguous stories with word fragments. Studies investigating the generalizability of trained interpretation biases to other measures of interpretation biases as well as subjective and behavioral reactions to stressors have generated mixed findings with some studies finding evidence for generalization (e.g., Clerkin & Teachman, 2011; Hoppitt, Mathews, Yiend, & Mackintosh, 2010, 2014; MacDonald, Koerner, & Antony, 2013; Steinman & Teachman, 2014) and others failing to find evidence for generalization (e.g., Salemink, van den Hout, & Kindt, 2010; Standage et al., 2010). In a recent meta-analysis by Menne-Lothmann et al. (2014) a total of 15 studies investigating the effects of interpretation training on emotional reactivity toward a stressor were analyzed. The analyses revealed significant heterogeneity across studies and an overall lack of effects of interpretation training on emotional reactivity towards a stressor. Possible explanations for the heterogeneity of results across studies include variability in the types of interpretation training procedures, the type of stressors, and the characteristics of the sample.

No studies to date have examined the effects of interpretation training on all components of the anxiety response (i.e., subjective, behavioral, and physiological), in individuals with elevated levels of social anxiety. However, there is evidence that modification of attention biases, another common information processing bias in social anxiety, leads to reductions in subjective, behavioral, and physiological (i.e., skin conductance) measures of anxiety during a social stressor in individuals with elevated levels of social anxiety (Heeren, Reese, McNally, & Philippot, 2012). It is important to expand this research to interpretation training to obtain a fuller understanding of how interpretation training influences all aspects of the anxiety response in individuals with social anxiety.

Interpretation training procedures are believed to work at an implicit level such that through repeated practice individuals learn to associate ambiguous social situations with positive or neutral outcomes, rather than negative outcomes. In contrast, cognitive-behavior therapy involves an explicit focus on the role of maladaptive thinking patterns and cognitive biases in social anxiety disorder and involves an active process through which individuals develop the skills to identify cognitive distortions and develop alternative perspectives for anxiety-provoking situations. Given the different approaches, it is important to understand how interpretation training and components of cognitive-behaviour therapy, such as cognitive restructuring, compare in their effects on interpretation biases, symptomatology, and reactivity toward a stressor. A number of researchers have suggested that interpretation training should be added to cognitive-behavior therapy for social anxiety disorder to enhance outcome. However, there is a lack of research comparing the effects of interpretation training and cognitive-behavior therapy on social anxiety. It is possible that there are no differences between the two conditions on symptomatology and the anxiety response and that cognitive restructuring on its own is effective in modifying interpretation biases. Therefore, it is important to compare the two strategies before adding interpretation training to cognitive-behavior therapy.

Most recently, Mobini et al. (2014) found that both a single session of interpretation training and a single session of computer administered cognitive behavior therapy consisting of psychoeducation about social anxiety disorder, introduction to the cognitive-behaviour therapy model of social anxiety disorder, cognitive restructuring, and behavioral exposures resulted in an increase in positive interpretations of ambiguous social situations from pretraining to posttraining and a decrease in social anxiety symptomatology from pretraining to 1-week follow-up (Cohen's $d = .65$) in individuals with elevated social anxiety.

The present study extends the current literature on interpretation training by comparing the effects of a single session of interpretation training and a single session of cognitive restructuring to an active placebo control condition on symptomatology, interpretation biases, and subjective, behavioral, and physiological measures of anxiety during a stressor in a social anxiety analogue sample. Given the novelty of the research questions with regard to examining the effects of interpretation training on all three components of the anxiety response (i.e., subjective, behavioral, and physiological) and comparing interpretation training and cognitive restructuring, a single-session experiment was designed to test the hypotheses. A stepped approach beginning with single-session, proof-of-concept experiments and proceeding to multisession experiments is typical in the cognitive bias modification literature and is considered "best practice" in intervention development (e.g., Amir, Weber, Beard, Bomyea, & Taylor, 2008; see Beard, 2011 for a review). In fact, tests of single-session procedures have been highly informative. For example, single session interpretation training procedures have been shown to lead to moderate positive changes in interpretation biases and anxiety symptomatology in anxious populations (e.g., MacDonald et al., 2013; Mobini et al., 2014; Murphy et al., 2007; Cohen's d ranging from .63 to .78). Single-session cognitive restructuring procedures have also been shown to lead to large decreases in anxiety symptomatology (e.g., De Jongh et al., 1995; Cohen's $d = 1.25$).

We predicted that only participants in the interpretation training and cognitive restructuring conditions would exhibit a significant decrease on social anxiety symptomatology, and interpretation biases from baseline to posttraining. Moreover, we predicted that during the speech task participants in the interpretation training and cognitive restructuring conditions would report significantly lower levels of anxiety, would show significantly lower levels of heart rate and skin conductance, and would rate their speech performance as significantly better compared to participants in the control condition. Lastly, we predicted that objective raters blind to group status and to the hypotheses of the present study would also rate the speech performance of participants in the interpretation training and cognitive restructuring conditions as significantly higher compared to participants in the control condition. Based on previous studies, we did not expect to find any significant differences on any of the measures between the interpretation training and cognitive restructuring conditions.

1. Method

1.1. Participants

Participants were recruited from the community through flyers and online postings. Individuals between the ages of 17 and 65 years old who scored 19 or higher on the *Social Phobia Inventory* (SPIN; Connor et al., 2000) and 16 or higher on the *Personal Report and Confidence as Speaker* (PRCS; Paul, 1966); indicated their English language ability as good or higher for reading, writing, and speaking; and did not endorse ever receiving CBT were invited to participate in the study. Previous research has shown that 79% of participants who score 19 or higher on the SPIN meet the diagnostic criteria for social anxiety disorder (Connor et al., 2000) and that scores ranging from 16 to 20 on the PRCS (Paul, 1966) are a valid indicator of speech anxiety (Phillips, Jones, Rieger, & Snell, 1997). In total, 112 individuals met the aforementioned eligibility criteria and

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