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Interactive effects of state anxiety and trait anxiety on emotional Stroop interference

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Abstract

This study examined main, interaction, and quadratic effects of state and trait anxiety on attentional bias toward threat related stimuli. Students ($n = 121$) completed a card version of an emotional Stroop task. While there were no main effects for trait anxiety or state anxiety, regression analyses revealed a significant contribution of the interaction term of both variables. Only for individuals high in trait anxiety, was state anxiety positively related to Stroop interference. In contrast, the low anxious group showed the opposite response pattern. A quadratic effect of trait anxiety was also found but the interaction term proved to be the most important predictor. Implications of these findings are discussed with respect to divergent theoretical conceptions of attentional biases. © 2001 Elsevier Science Ltd. All rights reserved.

Keywords: Emotional Stroop; Trait anxiety; State anxiety; Stroop interference

1. Introduction

In recent years, there has been a large interest in exploring the cognitive processes that are assumed to cause or maintain emotional disorders (Mathews & MacLeod, 1994). Beck (1976) promoted the clinical view that negative thinking styles may represent important factors in anxiety and depressive disorders. He emphasises the role of long term schematic memory structures representing past threatening experiences, which guide the processing of current information. According to Beck's theory, enduring cognitive structures called danger schemata will serve to favour selectively the encoding of schema congruent, i.e. threatening, information in individuals vulnerable to anxiety.

Coming from a cognitive-experimental perspective, Bower (1981) introduced a theory which posits that emotional states are represented as nodes in an associative memory network. An

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emotion node is activated whenever an individual is experiencing the corresponding emotional state and activation spreads through the associative connections to prime related nodes, which contain mood congruent information. Therefore, Bower's model predicts that increased levels of any particular emotion, such as state anxiety, will lead to a processing bias favouring the encoding of emotionally congruent stimuli.

Thus, a common prediction that anxiety will be associated with the selective processing of threat related stimuli can be derived from both theories. However, Bower (1981) and Beck (1976) diverge upon the roles played by state and trait variables in the occurrence of this cognitive bias. Beck proposes that this vulnerability will be associated with enduring danger schemata, i.e. trait anxiety (TA). According to Bower, in contrast, this processing bias will be a correlate of the current level of state anxiety (SA). Building upon these theories and a comprehensive literature review, Williams, Watts, MacLeod and Mathews (1997) introduced a model that posits interactive effects of TA and SA [see also Eysenck's (1992) hypervigilance theory for a similar prediction]. Williams et al. propose that SA influences the functioning of an appraisal system called affective decision mechanism that assesses the subjective threat value of stimuli. With increasing SA, the system reacts with higher threat appraisals for a given stimulus. The output of this system is fed into an resource allocation mechanism, which determines the orientation of attention toward or away from the source of threat. Individual differences in TA affect this latter mechanism. According to the model, high and low anxious individuals react differently to increasing threat and anxiety. High anxious individuals show vigilance, i.e. they orient attention toward the source of threat, whereas low anxious individuals show cognitive avoidance, i.e. they divert attention from threatening stimuli. Thus, TA moderates the relationship between SA and attentional orientation. For individuals high in TA, SA and vigilance should be positively correlated. In contrast, this correlation should be negative for individuals low in TA.

The most widely used experimental paradigm employed to investigate this processing bias is a modified version of the Stroop colour naming task (Stroop, 1935). Participants are presented with words written in different colours and told to name the colour — not the word — as rapidly as possible. The emotional variant of the Stroop task contains threat related and neutral words (for an overview, see Williams, Mathews & MacLeod, 1996). The time for naming the colour of the threat-related words minus the naming time for the neutral words provides the relevant measure. This index, called emotional Stroop interference, is an indicator of the degree to which attentional resources are captured by the word content.

Evidence has accumulated that clinically anxious patients show longer colour naming times for words with threatening content than for nonthreatening words, indicating attentional bias toward threatening information (Ehlers, Margraf, Davies & Roth, 1988; Mathews & MacLeod, 1985; Watts, McKenna, Sharrock & Trezise, 1986; Williams et al., 1996). The results concerning the influence of SA as compared to TA, however, remain unclear. Some of the studies using clinical samples found that emotional Stroop interference was more closely related to SA than to TA (e.g. Mathews & MacLeod, 1985) while others found TA to be a better predictor of interference scores (e.g. Mogg, Mathews & Weinman, 1989). Other clinically oriented studies examined the effects of state anxiety on Stroop interference in social phobia (Amir, McNally, Reimann, Burns, Lorenz & Mullen, 1996), spider phobia (Chen, Lewin & Craske, 1996) and dental anxiety (Muris, Merckelbach & de Jongh, 1995). Of course it is difficult to disentangle separate and joint (interactive) effects of SA and TA in research designs employing clinical patients because they usually show

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