ELSEVIER

Anxiety Disorders
19 (2005) 177–191

JOURNAL OF Anxiety Disorders

Covariation bias and its physiological correlates in panic disorder patients

Christine Amrhein[a,c], Paul Pauli[b,*], Wilhelm Dengler[a], Georg Wiedemann[a]

[a]*Clinic for Psychiatric Medicine and Psychotherapy, University Hospital of Tübingen, Tübingen, Germany*
[b]*Institute of Psychology, Biological Clinical Psychology, and Psychotherapy, University of Würzburg, Marcusstr. 9-11, Würzburg D-97070, Germany*
[c]*Institute of Medical Psychology and Behavioral Neurobiology, University of Tübingen, Tübingen, Germany*

Received 11 June 2003; received in revised form 5 January 2004; accepted 20 January 2004

Abstract

A covariation bias, i.e., the overestimation of random contingencies between fear-relevant stimuli and aversive consequences, seems to characterize anxiety disorders. Panic patients ($n = 30$) and healthy controls ($n = 25$) were exposed to panic-relevant, neutral, and phobia-relevant but panic-irrelevant picture stimuli, followed randomly be aversive consequences (acoustic startle stimuli). While covariation estimates reflected objective contingencies in both groups, only panic patients revealed a more negative Contingent Negative Variation (CNV) to panic-relevant than to phobia-relevant and neutral pictures. For startle reflex, only main effects of picture category were found, indicating that valence effects of picture stimuli were not specifically distorted in panic patients. CNV presumably reflects a biased processing of disorder-relevant stimuli by panic patients, perhaps with the expectation that aversive consequences will follow these stimuli.

Keywords: Covariation bias; Contingent Negative Variation; Startle reflex; Panic disorder

* Corresponding author. Tel.: +49-931-31-2843; fax: +49-931-31-2733.
E-mail address: Pauli@psychologie.uni-wuerzburg.de (P. Pauli).

0887-6185/$ – see front matter © 2004 Elsevier Inc. All rights reserved.
doi:10.1016/j.janxdis.2004.01.004

1. Introduction

Cognitive theories of panic disorder have underlined the role of cognitive processes in development and maintenance of the disorder (e.g., Clark, 1986). Panic patients were found to show an attentional bias (McNally et al., 1994) and lowered perceptual thresholds (Pauli et al., 1997) for fear-relevant word stimuli. Interpretational and memory biases are reflected in findings that panic patients compared to healthy controls, are prone to interpret ambiguous bodily sensations as threatening (Clark et al., 1988), and to remember anxiety-related situations (Becker, Rinck, & Margraf, 1994) and anxiety-related words (McNally, Foa, & Donnell, 1989; Pauli, Dengler, & Wiedemann, submitted) especially good. Finally, panic patients are assumed to be characterized by a covariation bias (CB), an overestimation of aversive consequences following panic-relevant stimuli (Pauli, Montoya, & Martz, 1996, 2001).

In a typical covariation bias experiment, fear-relevant (FR) and fear-irrelevant (FI) picture stimuli followed by aversive or neutral consequences are presented to participants. Covariation estimates (CEs) for picture category–consequence combinations may be assessed before the experiment (pre-experimental or a priori CEs or expectancy estimates), during the experiment (on-line CEs or expectancy of consequences estimates), or after the experiment (post-experimental or a posteriori CEs). A covariation bias (CB) is reflected in enhanced CEs for the FR stimuli–aversive consequence combination compared to other combinations.

While pre-experimental CBs have been found frequently in both anxiety patients and healthy controls (e.g., Amin & Lovibond, 1997; Kennedy, Rapee, & Mazurski, 1997; McNally & Heatherton, 1993), a post-experimental CB was rarely present in healthy controls, but was observed consistently in phobic patients (e.g., De Jong, Merckelbach, & Arntz, 1995; De Jong, Merckelbach, Bogels, & Kindt, 1998; Pauli, Wiedemann, & Montoya, 1998; Pury & Mineka, 1997; Tomarken, Sutton, & Mineka, 1995), in high fear subjects (e.g., Amin & Lovibond, 1997; Tomarken, Mineka, & Cook, 1989), and in panic-prone individuals (Pauli et al., 1996, 2001). It seems that low fear but not high fear individuals are able to correct a pre-existing CB on the basis of disconfirming situational information, and this is reflected in changing on-line CBs (Pauli et al., 1996). Similarly, the experience of relatively high contingencies between FR stimuli and negative consequences can induce a post-experimental CB even in low fear subjects (Pauli et al., 1996; Tomarken et al., 1989), but not the experience of a high contingency between FI stimuli and aversive consequences (Pauli et al., 2001). However, an existing CB in anxiety disorder patients may be reduced by treatment (De Jong, Merckelbach, Arntz, & Nijman, 1992), and the efficacy of this change was found to be a significant predictor of long-term treatment success (De Jong, van den Hout, & Merckelbach, 1995).

Covariation estimates are subjective measures, and therefore are highly susceptible to problems of experimental demand. Neurophysiologic measures