

Anxiety sensitivity and auditory perception of heartbeat[☆]

R.A. Pollock^{a,*}, A.S. Carter^b, N. Amir^c, L.E. Marks^{d,e}

^a*Psychiatric & Neurodevelopmental Genetics Unit, Center for Human Genetic Research, Massachusetts General Hospital & Harvard Medical School, 185 Cambridge Street, 6th Floor, Boston, MA 02114-2790, USA*

^b*Department of Psychology, University of Massachusetts, Boston, MA, USA*

^c*Department of Psychology, University of Georgia, Athens, GA, USA*

^d*John B. Pierce Laboratory, New Haven, CT, USA*

^e*Department of Epidemiology and Department of Psychology, Yale University, New Haven, CT, USA*

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Abstract

Anxiety sensitivity (AS) is the fear of sensations associated with autonomic arousal. AS has been associated with the development and maintenance of panic disorder. Given that panic patients often rate cardiac symptoms as the most fear-provoking feature of a panic attack, AS individuals may be especially responsive to cardiac stimuli. Consequently, we developed a signal-in-white-noise detection paradigm to examine the strategies that high and low AS individuals use to detect and discriminate normal and abnormal heartbeat sounds. Compared to low AS individuals, high AS individuals demonstrated a greater propensity to report the presence of normal, but not abnormal, heartbeat sounds. High and low AS individuals did not differ in their ability to perceive normal heartbeat sounds against a background of white noise; however, high AS individuals consistently demonstrated lower ability to discriminate abnormal heartbeats from background noise and between abnormal and normal heartbeats. AS was characterized by an elevated false alarm rate across all tasks. These results suggest that heartbeat sounds may be fear-relevant cues for AS individuals, and may affect their attention and perception in tasks involving threat signals.

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Introduction

Anxiety sensitivity (AS), or the “fear of anxiety,” characterizes a tendency to interpret arousal sensations as having harmful consequences, which may be physiological (e.g., impending heart attack), psychological (e.g., going crazy), or social (e.g., losing control) (Reiss & McNally, 1985). AS is thought to represent a stable trait-like factor that is qualitatively different from general fear and anxiety (Reiss, 1987; Reiss, Peterson, Gursky, & McNally, 1986). Theoretical and empirical work over the past two decades has afforded AS and other “fear-of-fear” constructs a central role in the etiology of anxiety disorders in general and panic disorder in particular

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*Corresponding author. Tel.: +617 726 0956; fax: +617 726 0830.

E-mail address: rpollack@partners.org (R.A. Pollock).

(Barlow, 1988; Chambless & Gracely, 1989; McNally, 1990; Reiss & McNally, 1985). The misinterpretation of bodily cues may lead to a self-perpetuating fear-of-fear cycle whereby the fear of benign arousal sensations produces anxiety, which in turn increases the frequency and intensity of physiological sensations, and subsequently fuels apprehension regarding the significance of these sensations. Prospective studies suggest that AS predicts frequency and intensity of panic attacks (Maller & Reiss, 1992) as well as the spontaneous onset of panic attacks in a stressful situation (e.g., military training) (Schmidt, Lerew, & Jackson, 1997, 1999).

If AS is characterized by particular cognitive states—both explicit and implicit beliefs about the catastrophic nature of certain physiological sensations—then these cognitions should in turn influence the perception and processing of these sensations (McNally, 1999a). Understanding the role of perceptual processes in AS may inform our understanding of emotional information processing in the pathogenesis of panic. To this end, the present research focuses on the role of AS in the detection and discrimination of auditory signals, such as heartbeat sounds, that may play a special and prominent role in AS and panic. If, for example, individuals high in AS find certain interoceptive signals, such as heartbeats, threatening, then these individuals may also exhibit differences in their approaches to making behavioral decisions about the naturally occurring (and potentially feared) bodily sensations that these signals represent. Although a great deal of research attention to date has attempted to understand patterns of cognitive bias for threat and interoceptive awareness in anxious individuals and individuals with panic (cf. McNally, 1999b), far less experimental work has focused on AS samples.

Research suggests that anxious individuals preferentially process threat-relevant material (e.g., MacLeod, 1991; MacLeod, Mathews, & Tata, 1986; Mathews, 1990). Clinical and empirical evidence suggests that patients with panic disorder may interpret ambiguous situations (e.g., McNally & Foa, 1987; McNally, Foa, & Donnell, 1989) and internal stimuli, such as fluctuations in heart rate, as dangerous (e.g., Ehlers & Breuer, 1992; Ehlers, Margraf, Roth, Taylor, & Birbaumer, 1988), show favorable attention to threat cues (Asmundson, Sandler, Wilson, & Norton, 1993; Ehlers, Margraf, Davies, Roth, & Birmaunr, 1988; McNally, Riemann, & Kim, 1990), and preferentially remember threatening or fearful information (e.g., Amir, McNally, Riemann, & Clements, 1996).

Although AS may confer risk for panic attacks (Schmidt et al., 1997, 1999), data suggesting a premorbid information processing bias are sparse. Researchers have examined the role of information processing bias in individuals with elevated AS who do not have a history of panic attacks. For example, McNally, Hornig, Hoffman, and Han (1999) investigated attention, memory, and interpretation bias in individuals with high and low AS who had not been diagnosed with any anxiety disorder. These researchers used a non-clinical sample, excluding participants with a history of panic, and found that individuals with elevated AS tended to interpret ambiguous panic relevant scenarios as threatening. No group differences were found for attentional bias or memory bias for threat.

Similarly, McCabe (1999) examined memory bias in individuals with high and low AS without history of panic. McCabe found that individuals with elevated AS exhibited a memory bias for threat-related words, but not for anxiety related, positive, or neutral words. Because she did not find group differences in implicit memory (i.e., automatic, non-conscious; Schacter, 1992) and because individuals with panic disorder do show an implicit memory bias (Amir et al., 1996), McCabe proposed that this finding may delineate the differences between individuals with high AS and those with panic disorder.

Finally, Amir and Beard (2004) hypothesized that individuals with elevated AS would show difficulty in inhibiting the threat relevant meaning of homographs (words with two meanings, e.g., faint). To test this hypothesis, the authors used a modified version of Gernsbacher's inhibition paradigm in which participants were first presented with a sentence (e.g., "The car sounds were faint.") and then a probe word (e.g., "pass-out") and were asked whether or not the probe word was related to the meaning of the sentence (Gernsbacher, Verner, & Faust, 1999). One half of the sentences ended in a homograph, and one half ended in a non-homograph word. Results revealed that individuals with elevated AS, but not those with low AS, showed difficulty in inhibiting the threat-relevant meaning of homographs when the interval between the presentation of the sentence and the probe word was short (i.e., 100 ms). Amir and colleagues (2004) concluded that difficulty inhibiting threat-relevant meanings may be a vulnerability factor involved in elevated AS, as well as the development of panic disorder.

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