



Anxiety Disorders
19 (2005) 521–537

JOURNAL
OF
**Anxiety
Disorders**

The effect of fear on paralinguistic aspects of speech in patients with panic disorder with agoraphobia

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Received 5 January 2004; received in revised form 26 March 2004; accepted 20 April 2004

Abstract

The present study investigated the effect of fear on paralinguistic aspects of speech in patients suffering from panic disorder with agoraphobia ($N = 25$). An experiment was conducted that comprised two modules: Autobiographical Talking and Script Talking. Each module consisted of two emotional conditions: Fearful and Happy. Speech was recorded digitally and analyzed using PRAAT, a computer program designed to extract paralinguistic measures from digitally recorded spoken sound. In addition to subjective fear, several speech characteristics were measured as a reflection of psychophysiology: rate of speech, mean pitch and pitch variability. Results show that in Autobiographical Talking speech was slower, had a lower pitch, and a lower pitch variability than in Script Talking. Pitch variability was lower in Fearful than in Happy speech. The findings indicate that paralinguistic aspects of speech, especially pitch variability, are promising measures to gain information about fear processing during the recollection of autobiographical memories.

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Keywords: Panic disorder; Fear memory; Emotion; Speech; Paralinguistic

Many modern psychological theories of fear have integrated a biological perspective, which resulted in multi-leveled models of fear. These models emphasize the two-fold reaction to dangerous stimuli: an immediate reaction caused by an automatically responding, conditioned system and a slightly slower

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reaction caused by a voluntary, more cognitive system (Brewin, 2001; Brewin, Dalgleish, & Joseph, 1996; Lang, Bradley, & Cuthbert 1998; Lang, Davis, & Öhman, 2000; LeDoux, 1995; LeDoux, 1996). The automatically responding system induces both physiological and behavioral involuntary reactions to a dangerous situation. The second system, however, is responsible for the interpretation and attribution of the dangerous situation. A consequence of the neurologically different routes for physiological and behavioral responses, on the one hand, and higher mental responses, on the other hand, is that in acute, Fearful situations a person can, in principle, react immediately and independently from cognitive and appraisal functions.

Different emotional states are characterized by specific changes in the somatic nervous systems (altered general muscle tonus and coordinated movement) and the autonomic nervous system, i.e., the sympathetic and parasympathetic nervous systems. It is beyond the scope of this paper to give a detailed description of these physiological processes, but it is evident that behavioral and physiological changes affect paralinguistic aspects of speech, i.e., content-filtered, non-semantic, non-grammatical aspects of the voice such as pitch and rate of speech (for more information see Darby, 1981; Scherer, 1986). After all, a vocalization is the result of actions of a great number of muscles in the chest, throat and head, so any alterations in muscle tonus will affect vocal characteristics. In fear for example, increased muscle tension could lead to a high pitched voice. Likewise, changes in respiration (which produces changes in subglottal pressure) and salivation (which leads to changes of resonance characteristics of the vocal tract) have their own effect on voice characteristics. How exactly the complicated physical changes influence both each other and the voice quality is still under investigation.

Because speech is influenced by immediate behavioral and physiological reactions to stressors, it reflects the main response components of the memory fear structure, i.e., the automatically responding route. When Fearful memories are recollected and recounted aloud, paralinguistic aspects of speech can reveal information about the emotional and physiological processes that take place during the recollection of that memory. Consequently, speech could be a useful tool to provide information about emotional processing of fear during exposure to Fearful stimuli. This is relevant for psychotherapy because speech is a central part of the treatment. In clinical psychology, most studies thus far have focused on the content and the organization of speech during exposure to Fearful stimuli (Amir, Stafford, Freshman, & Foa, 1998; Foa, Molnar, & Cashman, 1995; Pennebaker, 1993; Pennebaker & Francis, 1996; Pennebaker, Kiecolt-Glaser, & Glaser, 1988; Pennebaker, Mayne, & Francis, 1997; van Minnen, Wessel, Dijkstra, & Roelofs, 2002). In contrast, the physiological aspects of speech have received far less attention. To date, only two studies have focused on paralinguistic aspects of speech in clinical psychology. McNally, Otto, and Hornig (2001) investigated whether independent listeners can identify differences in paralinguistic aspects of speech. Patients with different types of anxiety disorders or with a major depressive disorder as well as healthy speakers were asked to talk about Fearful

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