



Pergamon

Anxiety Disorders  
17 (2003) 197–210

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JOURNAL  
OF  
**Anxiety  
Disorders**

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## Embarrassment and social phobia: the role of parasympathetic activation

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Received 1 July 2001; received in revised form 20 September 2001; accepted 1 February 2002

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### Abstract

The few studies on the psychophysiology of embarrassment have suggested involvement of parasympathetic activation. However, blushing, the hallmark of embarrassment and a prominent symptom in social phobia, is more likely to be produced by cervical sympathetic outflow. Hitherto, there has been no evidence of parasympathetic innervation of the facial blood vessels. In this study, a group of social phobics and control participants watched, together with a 2-person audience, a previously made videotape of themselves singing a children's song. Self-report measures confirmed that this task induced embarrassment. While two measures of respiratory sinus arrhythmia (RSA) during the task did not indicate heightened parasympathetic tone, increased heart rate (HR) and skin conductance marked sympathetic activation. Thus, our data do not support the notion that an increase in parasympathetic activation plays a significant role in social phobia and embarrassment. Social anxiety and embarrassment both resulted in sympathetic activation.

Published by Elsevier Science Inc.

*Keywords:* Sympathetic; Activation; Embarrassment

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## 1. Embarrassment and social phobia: the role of parasympathetic activation

Social phobia is defined as a marked and persistent fear of social or performance situations in which *embarrassment* may occur (DSM-IV, [American Psychiatric Association, 1994](#)). Astonishingly, only few researchers have tried to investigate embarrassment among social phobics directly. There are two main reasons to consider embarrassment as a promising avenue towards understanding social phobia. First, research has shown the profound impact of embarrassment on behavior. For example, embarrassment prevents teenagers from using condoms, thus promoting pregnancy or venereal disease (e.g., [Beckman, Harvey, & Tiersky, 1996](#); [Helweg-Larsen & Collins, 1994](#)). Embarrassment can be utilized as a negative reinforcer in a biofeedback treatment of scoliosis and kyphosis ([Birbaumer, Flor, Cevey, & Dworkin, 1994](#)). Thus, embarrassment could motivate the avoidance behavior of social phobics as much as anxiety. Second, the roles of parasympathetic and sympathetic activation in social phobia can be assessed by studying blushing, a frequent accompaniment of embarrassment. Although sympathetic activation seems to play a major role in some anxiety disorders, parasympathetic activation may be important in social phobia (e.g., [McNeil, Ries, & Turk, 1995](#)).

The two branches of the autonomic nervous system, the parasympathetic and the sympathetic, regulate certain organ systems antagonistically and to a certain extent, independently. For example, both branches exert control on the heart, the parasympathetic branch reducing heart rate (HR) and the sympathetic, increasing it. Thus, to fully understand the meaning of HR change, we need to be able to estimate both parasympathetic and sympathetic influences (for a more detailed account, see [Cacioppo, Tassinari, & Berntson, 2000](#)). A tonic (over of period of tens of seconds) increase in HR may have resulted from reduced parasympathetic activity, increased sympathetic activity, or, most likely, a mixture of both. We can estimate the contribution of parasympathetic activity to tonic HR from the amplitude of phasic HR fluctuation: with each inhalation, HR rises, and with each exhalation, HR falls, creating a rhythmic pattern in phase with respiration. This respiratory fluctuation, called respiratory sinus arrhythmia (RSA), is mediated predominantly by the parasympathetic nervous system.

The physiological response of social phobics in anxiety provoking social situations (e.g., giving a speech) has been studied by various research groups (e.g., [Beidel, Turner, & Dancu, 1985](#); [Hofmann, Newman, Ehlers, & Roth, 1995](#)). Generally, results indicate increased sympathetic arousal while being engaged in social situations like public speaking. In some studies, however, such arousal was not greater in phobics than in controls (e.g., [Puigcerver, Martinez-Selva, Garcia-Sanchez, & Gomez-Amor, 1989](#)).

On the other hand, based on a few studies on the psychophysiology of embarrassment, some authors suggested possible increases of parasympathetic

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