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Emotional response patterns during social threat in individuals with generalized social anxiety disorder and non-anxious controls

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ABSTRACT

Patterns of synchrony in repeated measures of heart rate, skin conductance levels, negative affect, and positive affect were investigated in patients with social anxiety disorder and non-anxious controls during a speech task. Despite expected low levels of absolute concordance between measures of affect and arousal overall, results revealed clearly defined and specific patterns of emotional response coherence that distinguished between the two groups and depended on the types of measures used. Specifically, findings demonstrated that (a) for both patients and controls, increased heart rate was significantly synchronized with increased negative affect, with patients showing overall stronger levels of synchrony between these two measures than controls; (b) for controls only, increased heart rate was significantly synchronized with increased positive affect; and (c) for patients only, increased skin conductance was significantly synchronized with both increased negative affect and decreased positive affect. These findings are discussed in relation to current conceptualizations of the construct of emotion as well as directions for future research and potential implications for clinical practice.

1. Introduction

The nature of the relationship between peripheral autonomic arousal and subjective affective experience in social anxiety disorder (SAD) is complex. According to contemporary cognitive models of SAD, social anxiety is driven, at least in part, by negative attributions that individuals make about the likelihood and social costs of displaying publicly observable symptoms of physiological arousal (Clark & Wells, 1995; Hofmann, 2007; Rapee & Heimberg, 1997). Indeed, many socially anxious individuals report that they are afraid of social situations because they might display observable signs of anxiety, such as blushing, sweating, or shaking (e.g., Bögels, Mulkens, & de Jong, 1997; Moscovitch, 2009). Studies have found that highly socially anxious individuals are more likely to believe that outward appearance accurately reflects internal physiological arousal (e.g., Wild, Clark, Ehlers, & McManus, 2008). They overestimate the extent to which other people notice their symptoms of anxiety (Borkovec, Wall, & Stone, 1974; McEwan & Devins, 1983), and perceive that others interpret these symptoms in an overly negative manner (Roth, Antony, & Swinson, 2001; Voncken, Alden, & Bögels, 2007).

Yet, previous studies of emotional response coherence in socially anxious participants have found low within-subject correlations of subjective distress and physiological arousal across both social and non-social tasks (Cuthbert et al., 2003; Edelmann & Baker, 2002; Lang & McTeague, 2009; Mauss, Wilhelm, & Gross, 2004). For example, Mauss et al. (2004) found that subjective anxiety ratings (on a 0-10 scale) were uncorrelated with several different measures of arousal in highly socially anxious individuals during a public speech (controlling for baseline levels of anxiety and arousal). Similarly, Edelmann and Baker (2002) reported low within-subject correlations of physiological responses and perceived physiological responses among individuals with SAD and clinical and non-clinical controls. Thus, despite theoretical models that predict strong coupling between subjective reports of anxiety and physiological arousal in social anxiety, the data from the extant literature reflect a high level of emotional response discordance (see also Mauss, Levenson, McCarter, Wilhelm, & Gross, 2005). Indeed, in SAD, as in other anxiety disorders, the absolute degree of concordance (at one point in time) or synchrony (concurrent changes from one time point to another) between measures of subjective distress and physiological reactivity appears to be modest, at best (Cook, Melamed, Cuthbert, McNeil, & Lang, 1988; Lang, 1978).

It is possible to interpret these emotional discordance data in a number of different ways. According to some (e.g., Hodgson & Rachman, 1974; Lang, 1994; Rachman & Hodgson, 1974), discor-

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dance supports the notion that there are separate emotion response systems (i.e., verbal-cognitive, physiological, and behavioral) that co-exist with each other but vary largely independently of one another. Others (e.g., Zinbarg, 1998) have argued that the structure of emotion is inherently hierarchical and, as such, is comprised of higher order latent emotional constructs that direct and coordinate lower level outputs in information processing, behavior, and physiology. Accordingly, one should not expect the observable indicators of lower level outputs to be perfectly, or even strongly, correlated with each other because they are influenced by a multitude of factors, including measure variance, that are expected to constrain their overall level of concordance. More radically, Russell (e.g., 2003, 2009) contends that individual emotional events are simply "psychological constructions" that consist of a collection of components that may come together in different ways at different times in different people, but that it is not necessary to presume the existence of any unitary construct of emotion that underlies and drives such components and their interrelationships.

Thus, one of the central challenges of emotion theory and research today is to better understand how the components of emotional response patterns are organized in relation to each other and identify factors that may account for individual differences in synchrony and desynchrony between these components (e.g., Cacioppo, Berntson, & Klein, 1992; Lang & McTeague, 2009; Lang, 1985, 1994; Matsumoto, Nezlek, & Koopmann, 2007). In the present study, we wished to extend the investigation of emotional response coherence in social anxiety beyond simply observing how strongly correlated single measures of distress and arousal are at single time points, to examining the nature of the patterns of association between multiple measures of affect and arousal across multiple time points during social threat.

Among the anxiety disorders, social anxiety disorder (SAD) is unique in its affective profile, as it is characterized not only by increased levels of negative affect, as are the other anxiety disorders, but also uniquely by diminished levels of positive affect (e.g., Brown, Chorpita, & Barlow, 1998; Brown, Silvia, Myin-Germeys, & Kwapil, 2007; Kashdan, 2007; Naragon-Gainey, Watson, & Markon, 2009). However, few, if any studies, have investigated how the characteristic affective profile of SAD, including both increases in negative affect and decreases in positive affect, might synchronize within a socially threatening context with changes in specific measures of peripheral autonomic arousal. Is stronger response coherence observed for some measures relative to others? Does presence of a SAD diagnosis impact the patterns of emotional synchrony during social threat in a manner that one might expect to see if anxiety was a unitary construct (e.g., Zinbarg, 1998), or do patterns of synchrony/desynchrony between measures of anxiety and arousal in SAD appear random and arbitrary (e.g., Russell, 2009)?

Here, we tracked negative affect, positive affect, skin conductance, and heart rate, levels among individuals with generalized SAD and non-anxious participants as they unfolded during a speech task. In light of the previous findings in the literature, we predicted that the absolute levels of synchrony between any of the various measures of affect and arousal would be modest across both groups. Of greatest interest, however, was whether *differential patterns* of synchrony would emerge between specific measures of affect and arousal between the two groups. Given scant previous research examining this particular question, we did not formulate a priori hypotheses about specific differences we might find in patterns of emotional synchrony between measures and groups. We reasoned that any notable differences that did emerge between measures or groups would require replication and further investigation in future studies. Thus, our primary goal in this study was to document significant effects that would emerge, with an eye toward continuing to move the emotion debate away from the question of whether there is or is not synchrony between measures of affect and arousal, and toward questions about the nature of, and factors accounting for, individual differences in patterns of emotional synchrony, as advocated by other emotion scholars (e.g., Matsumoto et al., 2007). In so doing, we hoped as well to begin to shed some important light on the role of psychopathology as a potential moderator of such differences.

2. Materials and methods

2.1. Participants

The sample consisted of 39 individuals with a DSM-IV diagnosis of generalized SAD and 39 non-anxious control participants. Most clinical participants ($n = 29$) were recruited through a large community outpatient clinic in Northeastern United States. The remaining clinical participants ($n = 10$) and all control participants were recruited from the surrounding community via newspaper, Internet, and flyer advertisements. All clinical participants were diagnosed by doctoral student interviewers using the *Anxiety Disorders Interview Schedule for DSM-IV* (ADIS-IV; Di Nardo, Brown, & Barlow, 1994). Interviewers were trained according to the procedures in Brown, Di Nardo, Lehman, and Campbell (2001). Non-outpatient clinical participants and all non-clinical participants were screened over the phone and subsequently evaluated with the ADIS-IV. Potential clinical participants were excluded if they were actively psychotic, manic, suicidal, homicidal, or substance-abusing, were currently receiving psychotherapeutic treatment, or had made a change in their medication status within the previous month. Nineteen eligible clinical participants declined participation. The most common reasons for declining participation were too busy to participate ($n = 8$) and apprehension about some aspect of the study procedure ($n = 7$). Control participants were included in the study if they had no current DSM-IV disorders and endorsed no significant symptoms of social anxiety.

All participants in the clinical sample received a principal diagnosis of generalized SAD (i.e., if there were multiple diagnoses, symptoms of SAD were associated with the highest clinical severity rating) and all participated in the present study before beginning treatment. The most frequent comorbid diagnoses were major depressive disorder ($n = 10$), dysthymic disorder ($n = 8$), generalized anxiety disorder ($n = 6$), panic disorder with agoraphobia ($n = 4$), specific phobia ($n = 4$), and obsessive-compulsive disorder ($n = 3$). Of the overall sample, the majority was male (61.5%) and average age was 30.62 ($SD = 10.30$, range = 18–63). Sixty-eight percent of participants were Caucasian, with remaining participants identifying as Asian (10.3%), African-American (9.0%), Hispanic (2.6%), and Other (e.g., biracial; 10.3%). Median annual income was $25,000 (USD), and participants completed an average of 16.06 ($SD = 2.32$; range = 11–23) years of education. Clinical and control participants did not differ in age, $t\ (76) = .50$, $p = .62$, years of education, $t\ (76) = .51$, $p = .12$, or ethnicity, $\chi^2\ (6, n = 78) = 3.11$, $p = .80$. Each group was comprised of 24 men and 15 women.

2.2. Procedure

Participants were tested individually after providing informed consent. They were seated in a laboratory room facing a video camera, which stood in front of a one-way mirror. The experimenter affixed the heart rate and skin conductance sensors and moved into an adjacent room behind the one-way mirror, from where communication with participants occurred via intercom. First, participants sat quietly for a 5-minute initial baseline period, after which they completed measures of the Positive and Negative Affect Schedule–State Version (PANAS-S; Watson, Clark, & Tellegen, 1988). Participants were then informed that they would be required to give an impromptu 10-minute videotaped speech on randomly