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And yet they correlate: Psychophysiological activation predicts self-report outcomes of exposure therapy in claustrophobia

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Abstract

The study examines whether self-reported fear and physiological activation are concordant when claustrophobic patients are exposed to small spaces, whether the measures change in synchrony for individual patients and whether initial activation of measures can predict the outcome of an exposure treatment. Ten patients with claustrophobia participated in six in-vivo exposure sessions with continuous monitoring of self-reported fear and their EKG. Partial pressure of carbon dioxide (pCO_2), a measure of hyperventilation, was available in a subsample of patients. While evidence for concordance of self-reported fear and heart rate was limited, the measures changed synchronously within subjects. Most importantly, higher heart rate at the beginning of the first exposure session predicted better treatment outcome. Because self-reported fear turned out not to be a reliable predictor of the outcome, this is interpreted as evidence for the incremental validity of physiological measures of fear.

Keywords: Claustrophobia; Exposure therapy; Emotional processing; Treatment outcome; Psychophysiology; Heart rate

Multiple response theory states that phobic fear is reflected in autonomic nervous system activation, self-report, and avoidance behavior (Lang, 1968). Despite the positive reaction this statement has created with theorists (e.g., Foa & Kozak, 1986), physiological measurement is often neglected, partly because its contribution of useful and unique information has not been convincingly documented. In particular, the role of physiological measures is challenged by two factors. First, desynchrony often exists among different measures of fear (Rachman & Hodgson, 1974) indicating that the physiological measures do not sensitively reflect a construct closely allied with self-reported fear. Second, it has seldom been determined whether physiological measures possess predictive validity relative to self-report or behavioral measures. If physiological measures were indeed not tightly related to other kinds of measures, it would be vital to determine whether the unique information provided by physiological measures increases our understanding of fear, or whether it provides unique diagnostic or predictive information.

In a previous study with driving phobic patients we demonstrated how a large array of physiological measures is activated during exposure including autonomic and respiratory channels (Alpers, Wilhelm, & Roth, 2005). Interestingly, in a between-participants analysis the significant correlation between self-reported fear and heart rate, skin conductance, and end-tidal partial pressure of carbon dioxide (pCO_2) were around $r = .5$ which is rather high compared to

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other correlations between measures accessed with different methods. On the whole, this is evidence for concordance between different measures at a given point in time (Rachman & Hodgson, 1974).

In order to both replicate and extend our previous findings in a different specific phobia we recruited claustrophobic patients for the present study. Claustrophobia is common (Fredrikson, Annas, Fischer, & Wik, 1996) and it can be effectively treated with exposure therapy (Booth & Rachman, 1992; Öst, Alm, Brandberg, & Breitholtz, 2001). For our purpose claustrophobia is well suited since exposure to phobic situations can be designed to require little bodily movement, making it easier to interpret physiological activation as an effect of emotion (Stemmler, 1996).

An extension to the previous study in driving phobic patients was to investigate whether physiological activation and self-reported fear also correlate across time within one individual, i.e., whether measures change in synchrony or not (Hodgson & Rachman, 1974). This question is particularly interesting with respect to Foa and Kozak (1986) influential emotional processing theory of fear. It assumes that initial activation and ensuing reduction of physiological arousal during exposure to fear-evoking situations, is the underlying mechanism resulting in reduction of self-reported fear. Synchrony of different measures of phobic fear has rarely been examined within and across several sessions (for exceptions see: Nesse, 1985; Sartory, Rachman, & Grey, 1977) and results have been inconsistent. A common finding of early studies was that, self-reported fear but not heart rate decreased during treatment (Himadi, Boyce, & Barlow, 1985). This notion is particularly problematic because self-report can be biased but not heart rate.

Aside from these theoretical questions clinicians will only be convinced that physiological measures are valuable if their incremental validity can be documented, that is, if they have an additional benefit beyond what is possible to conclude from patients' report on what they experience. We hypothesized that initial activation during exposure may be better indicated by physiological arousal than by self-reported fear—partly because the latter is more subjected to expectancy biases. Foa and Kozak (1986) emotional processing theory proposes that the patient's fear network – propositions related to stimuli and phobic reactions – needs to be fully activated in order for exposure to result in therapeutic change. They suggest that physiological activation can serve as a genuine indicator for a successfully accessed network. Psychophysiological activation during the initial part of exposure would therefore predict therapeutic change. From a neuropsychological perspective (e.g., LeDoux, 2000), it is also convincing that physiological activation can more closely indicate activation of subcortical fear circuitry than verbal report, which is known to be cognitively controlled as a function of a multitude of cortical processes. However, successful therapeutic progress most probably requires altered processing in the fear circuitry.

So far only one group has examined initial activation in response to claustrophobic exposure. Contrary to their expectation, the authors found a non-significant correlation between initial HR activation and self-reported fear in a behavioral avoidance test (BAT) following a brief one session exposure (Kamphuis & Telch, 2000) and even positive correlations in a study where they controlled for initial fear levels (Telch, Valentiner, Ilai, Petruzzi, & Hehmsoth, 2000). Instead of using a BAT that resembles the procedure during exposure, we decided to examine the correlation between initial activation and change in a disorder-specific questionnaire after an extended intervention. Using questionnaires enabled us to examine more detailed the central components of claustrophobia, fear of suffocation and fear of confinement (Harris, Robinson, & Menzies, 1999; Rachman & Taylor, 1993).

To study these questions we designed a more complete treatment than the three exposure sessions in our previous study. Thus, during six exposure sessions and during pre and post quiet sitting we assessed self-report ratings of fear and continuously measured heart rate which has had the highest effect sizes in previous research on exposure in phobic patients (Alpers et al., 2005; Nesse, 1985). Thus the present study uses a theoretically relevant psychophysiological measure to explore the concurrent and incremental validity of physiological measures of fear.

1. Methods

1.1. Participants

1.1.1. Patient recruitment

In order to recruit participants a short report appeared in a local newspaper offering free evaluation and limited counseling for claustrophobic fear. A brief phone screening assessed the feared and avoided situations as well as the general health status. Inclusion criteria were age – between 18 and 60 years – and a primary diagnosis of a specific phobia of small places (claustrophobia). Exclusion criteria were past or present psychotic disorders, cardiovascular disease, epileptic seizures, psychoactive medications, and medications