

## Utility of the Heart Rate Response as an Index of Emotional Processing in a Female Rape Victim With Posttraumatic Stress Disorder

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*We tested the utility of the heart rate response as an indicator of emotional processing in prolonged exposure therapy for a female rape victim. Physiological data, for the first and the last available imaginal exposure to the rape, showed that the heart rate response was a useful index of successful activation and habituation of fear structures during therapy. The results suggest that the heart rate response may provide an objective and unbiased assessment of emotional processing that is not dependent on either self-report or interviewer-based assessments.*

**E**MOTIONAL PROCESSING THEORY has been proposed as a model to explain fear reduction in posttraumatic stress disorder (PTSD; Foa & Kozak, 1986, 1998). The theory has its bases in the bioinformational theory of emotion (Lang, 1977, 1979; Lang, Cuthbert, & Bradley, 1998), which posits that fear is represented in underlying memory structures that serve as templates for fear behavior. These fear structures incorporate cognitive representations of the stimulus characteristic of the fear situation, the verbal, physiological, and overt behavioral responses to it, and interpretive information about the meaning of the stimulus and response elements of the structure.

Foa and Kozak (1986) distinguish between normal and pathological fear by suggesting that pathological fear structures involve excessive response elements and resistance to modification. However, these fear structures are often not entirely available to consciousness and, therefore, need to be assessed through converging measures (Foa & Kozak). Lang (1979) suggests that because fear is accompanied by physiological activity determined by the response elements of the fear structure that underlies it, physiological responses measured during fear evocation can provide an index of the fear structure.

The treatment of pathological fear conditions such as anxiety disorders, including PTSD, involves a processing of the fear by targeting and subsequently modifying these underlying memory structures. Exposure therapies usually accomplish this by meeting two conditions: (a) activation of the fear structure and (b) integration of information that is incompatible with its pathological elements (Foa & Kozak, 1986; Jaycox, Foa, & Morral, 1998). The incorporation of new information that is incompatible with

the existing fear structure allows for an eventual decrease in the fear response. This ongoing course of change in the fear structure is referred to as emotional processing.

In order to measure the ongoing change in the fear structure, Foa and Kozak (1986) suggest that behavior that directly reflects the structure should be assessed at several points during therapy. Given Lang's (1979) suggestion that physiological response information is coded in the structure, Foa and Kozak recommend the use of physiological measures in addition to self-report for assessing emotional processing in the course of therapy.

In a review of psychophysiological research in PTSD, Griffin, Nishith, Resick, and Yehuda (1997) concluded that the most reliable physiological discriminator in PTSD appears to be the heart rate response. The heart rate response provides an index of autonomic reactivity in PTSD as defined under Criterion D of the *DSM-III-R* (American Psychiatric Association, 1987) and *DSM-IV* (American Psychiatric Association, 1994). The differences in physiological reactivity, including the heart rate response, seem to be most notable for trauma-specific stimuli (Griffin et al., 1997; Litz, Orsillo, Kaloupek, & Weathers, 2000).

Based on the results of various clinical studies using exposure therapies, Foa and Kozak (1986) suggest that there may be three valid aspects of emotional processing that can be tapped into by the cardiac response:

- **Activation:** Initial increases in physiological responsiveness during flooding has been found to be positively related to treatment outcome in specific phobics and agoraphobics (Borkovec & Sides, 1979; Lang, Melamed, & Hart, 1970; Watson & Marks, 1971).
- **Within-sessions habituation:** Both linear (Grayson, Foa, & Steketee, 1982; Stern & Marks, 1973; Watson, Gaiend, & Marks, 1972) and curvilinear (Mathews & Shaw, 1973; Ornstein & Carr, 1975) decreases (habituation) in cardiac activity, within sessions, have been reported with repeated presentations of the feared

material in phobics and obsessive-compulsives. Furthermore, heart rate habituation during imagery of fearful material has been found to relate to treatment outcome in simple phobics (Borkvec & Sides, 1979; Lang et al., 1970; Watson et al., 1972).

- Between-sessions habituation: Decreases in initial reactions to feared stimuli have been reported during treatment by exposure (Grayson et al., 1982) and have been found to relate to treatment outcome. Successful emotional processing in therapy is inferred from physiological activation and habituation within and across exposure sessions.

While the clinical data provide diverse support for the proposed indices of emotional processing, the findings are largely limited to a population of phobics. In veterans with chronic PTSD, higher heart rate reactivity has been shown to differentiate the PTSD group from the non-PTSD group (Litz et al., 2000). Furthermore, greater heart rate habituation in exposure therapy has been shown to predict better treatment outcome (Boudewyns & Hyer, 1990; Mueser, Yarnold, & Foy, 1991; Shalev, Orr, & Pitman, 1993). However, none of the studies to date have applied the heart rate measure in the assessment of rape-related PTSD and associated symptomatology.

The purpose of this paper was to examine the heart rate response of a female rape victim during the course of imaginal exposures in prolonged exposure therapy used to treat rape-related posttraumatic stress reactions. The patterns of change in her heart rate response were used to examine activation and habituation within and across sessions. It was hypothesized that (a) activation would be reflected in an initial increase in the heart rate response from baseline to start of imaginal exposure; (b) within-session habituation would be reflected in a gradual decrease in the heart rate response from the start of imaginal exposure to its completion; and (c) between-session habituation would be reflected in a decrease in the starting heart rate response from the first imaginal exposure to the last available imaginal exposure.

## Method

### Identifying Information

The client was a 25-year-old single, Caucasian woman who was raped at the age of 15 by her then boyfriend. She stated that her boyfriend came inside her home, "put his arms around me and started kissing my neck," all the while reassuring her that "it wouldn't go all the way." The client reported that "my arms were pinned," and that he continued to force his way and ended up raping her.

Subsequent to the rape, the client sought group therapy to deal with trauma issues but did not deem it helpful. At the time of seeking individual therapy, the client was

experiencing difficulties having sexual intercourse with her current boyfriend because of reminders of the rape, and therefore decided to seek services through a federally funded treatment outcome study for rape-related PTSD.

Prior to treatment, the client was assessed by a master's-level clinician who served as an independent evaluator. Criterion A was assessed in the context of a semistructured trauma interview (Resick, 1990) following which the diagnostic criteria for PTSD were assessed using the CAPS (Blake et al., 1990). The client met *DSM-IV* criteria for chronic PTSD related to the rape (CAPS; Blake et al.). Although she met lifetime criteria for major depression and alcohol dependence on the SCID-IV (First, Gibbon, Spitzer, & Williams, 1996), she was not currently depressed or alcohol dependent.

The client's symptoms included having recurrent and intrusive recollections about the rape, intense psychological distress at exposure to trauma cues including sexual intercourse, recurrent distressing dreams about the rape, difficulty falling and staying asleep, increased irritability, difficulties concentrating, and increased hypervigilance. She reported making persistent efforts to avoid thoughts and feelings related to the trauma, efforts to avoid activities or situations related to trauma cues, and feeling detached and estranged from her boyfriend and not deriving any sense of enjoyment from her relationship with him.

### Assessment Measures

*PTSD Symptom Scale: Self-Report (PSS-SR; Foa, Riggs, Dancu, & Rothbaum, 1993).* The PSS-SR consists of 17 self-report items that correspond to the symptoms of the *DSM-III-R* diagnostic criteria for PTSD. Each symptom is rated for frequency on a 4-point scale (range: 0 to 51). The total score is calculated as the sum of the frequency ratings for the items. A score of less than 10 is considered mild or no PTSD symptoms; scores between 10 and 27 are indicative of moderate PTSD symptoms; scores greater than 28 indicate severe PTSD symptoms (Nishith, Hearst, Mueser, & Foa, 1995). Parallel to the *DSM-IV*, the items of the PTSD symptom scale were clustered into three areas: re-experiencing (five items), avoidance (seven items), and arousal (five items). The self-report version of the PSS was used at all assessment points.

### Physiological Assessment

Prior to the start of each therapy session the participant was prepared for physiological data collection by the primary author. The physiologic measure of heart rate (HR) was measured to get an index of autonomic arousal during the imaginal exposures. The Coulbourn Instruments modular instruments system was used to get a measurement of HR. The HR was obtained from standard limb electrocardiogram leads connected to the underside of the left forearm about 4 inches from the wrist and

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