RESTING CARDIAC VAGAL CONTROL AND QUALITY OF PARTNER RELATIONSHIP IN WOMEN NEWLY DIAGNOSED WITH BREAST CANCER

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Abstract

▪ Cardiac vagal control as measured by respiratory sinus arrhythmia (RSA) is associated with a variety of indices of health and mental health.

▪ Whereas lower resting RSA characterizes a variety of chronic illnesses, higher resting RSA is associated with better affective regulation, social engagement, and coping with life stressors.

▪ To date, little is known about the association between RSA and partner relationship quality.

▪ The present study examined whether resting RSA was related to self-reported partner relationship quality in a sample of 39 women in committed partner relationships who were diagnosed with stage 0, I, II, or III breast cancer.

▪ Ten minutes of resting electrocardiographic (ECG) data were recorded: the first 5 minutes from each participant alone, and the second 5 minutes while a companion was touching the participant's forearm, if a companion was present, otherwise both segments were recorded from the participant alone. Participants completed questionnaires on the quality of their committed partner relationships.

▪ Although there was no significant effect of the physical-touch manipulation, higher RSA during both recording periods predicted greater relationship satisfaction as measured by the Dyadic Adjustment Scale (DAS) and more positive partner interactions on the Social Relationships Inventory (SRI).

Introduction

▪ Data suggest that cardiac vagal control as measured by heart rate variability in the high frequency band, also known as respiratory sinus arrhythmia (RSA), is a predictor of outcomes in a variety of psychiatric (e.g., Beauchaine, 2001; Chambers & Allen, 2002) and medical conditions (Masi, Hawkley, Rickett, & Cacioppo, 2007).

▪ According to polyvagal theory (Porges, 1995), resting levels of RSA indicate individual differences in ability to regulate emotions and respond to environmental demands. Data suggest that higher levels of resting RSA are associated with better affective regulation (Calkins, Grazioano, & Keane, 2006), social engagement (Horsten et al., 1999), and coping with life stressors (e.g., Fabes & Eisenberg, 1997).

▪ Although studies have examined RSA in the context of social functioning and social relations (e.g., Egizio et al., 2008; Horsten et al., 1999), little is known about an association between cardiac vagal control and quality of intimate partner relationship.

▪ Data suggest that hand-holding, especially with an intimate partner, alleviates anxiety in stressful situations as evident from neural responses to threat (Coan, Schaefer, & Davidson, 2006).

▪ No study to date investigated whether physical contact with an intimate partner enhances vagal control in individuals who are faced with a significant life stressor of a life-threatening diagnosis.

▪ The present study tested the following hypotheses:

Hypothesis 1: Physical contact with a companion will enhance cardiac vagal control in women newly diagnosed with breast cancer, and the extent of this enhancement will be predicted by reported intimate partner relationship quality.

Hypothesis 2: Individuals reporting higher levels of intimate partner relationship satisfaction and more positive partner interactions, as indicated by self-report measures, will evidence higher cardiac vagal control as indexed by RSA.

Method

Subjects

▪ A total of 105 female participants with stage 0, I, II, or III breast cancer participated in the study. All participants were tested in conjunction with oncology clinic visits.

▪ Participants who were currently undergoing cardio-toxic chemotherapy regimens or taking cardio-vascular medications were excluded from analyses. Eleven participants were excluded due to missing questionnaire data, leaving a final sample of 39 participants (Mean age = 52.7; Mean time since diagnosis = 4.6 months).

Procedure

▪ J & J Amplifier System (Poulsbo, WA) was used to record the ECG. Gel free Ag – AgCl electrodes were attached to the left and right wrist and the ground electrode was attached to the lower right forearm. The participants were given no instructions on how to breathe. ECG signal was sampled at 512 Hz.

▪ ECG recording #1 (5 minutes):
  – All participants and companions, if present, sat quietly for 5 minutes.

▪ ECG recording #2 (5 minutes):
  – For a participant with a companion at the visit, the companion moved to a chair adjacent to the participant and gently touched the participant's forearm while continuing to refrain from talking or moving.
  – For participants who came to the visit alone, ECG was recorded while participants sat quietly alone.

ECG Data Reduction

▪ The off-line analysis of raw digitized ECG signals from each 5-minute resting session was performed by extracting interbeat interval (IBI) series from the raw ECG recording by using QRSTool Software (Allen, Chambers, & Towers, 2007). Since even a single artifact can distort an index of RSA (Bernston & Stowell, 1998), the extracted interbeat series was hand-corrected for artifacts such as missed, erroneous, or ectopic beats.

▪ Heart rate variability in the HF band (0.12–0.4 Hz), which is assumed to be related to respiration, was derived with CMetX Cardiac Metric Software (Allen et al., 2007) and used to calculate an estimate of respiratory sinus arrhythmia. CMetX program converted IBI series to a time-series sampled at 10 Hz with linear interpolation. A 241-point optimal finite impulse response digital filter designed using FWTGEN V3.8 (Cook & Miller, 1992) with half-amplitude frequencies of a .12–.40 Hz bandpass was applied to a time-series representation of the IBI series at a sample rate of 10 Hz. The natural log of the variance of the filtered waveform was used as the estimate of RSA.

This work was funded by USA Med Research & Materiel Command, Breast Cancer Research Program.
Award Type/#: W81XWH-04-1-0603 - Idea Award to Karen Weihs, M.D.

Results

Effect of Physical Touch on RSA

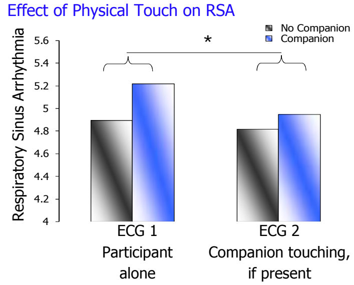

Figure 1. Test of within-subject effects yielded a main effect of recording session (F = 11.94 (1, 37), p = .00, ε = .24) on RSA; however, contrary to prediction, RSA was lower during the second ECG recording. There was no significant effect of companion's presence at visit (F = .27 (1, 37), p = .60, ε = .01), and no interaction between ECG recording (ECG 1/ECG 2) and companion's presence (No Companion/Companion) at visit (F = 3.54 (1, 37), p = .07, ε = .10) on RSA.
Note: * indicates a significant comparison (p < .01).

RSA and Quality of Partner Relationship

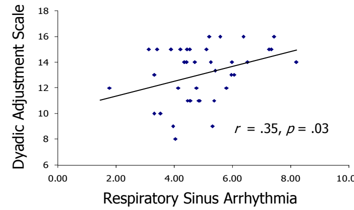

Figure 2. To examine whether there was an association between RSA and quality of partner relationship, RSA was collapsed between the 1st and 2nd ECG recording sessions. There was a significant correlation between RSA and quality of partner relationship as measured by DAS (r = .35, p = .03), indicating that higher RSA was associated with better quality of partner relationship.

RSA and Quality of Partner Interactions

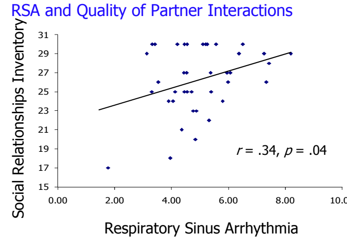

Figure 3. To examine whether there was an association between RSA and partner interactions, RSA was collapsed between the 1st and 2nd ECG recording sessions. There was a positive correlation between RSA and partner interactions as measured by SRI (r = .34, p = .04), indicating that higher RSA was associated with more positive partner interactions.

Conclusion

▪ These findings suggest that higher resting RSA is associated with higher partner relationship quality and more positive partner interactions in women who are coping with a significant stressor of breast cancer diagnosis.

▪ Even though this study did not find an association between physical contact and enhancement of RSA, future studies should investigate this phenomenon employing different methodologies in larger samples. Because the companion at the visit was not always the partner, this study may have been less likely to detect such an effect.

▪ The present findings suggest the promise of prospectively examining whether better relationship quality and more positive partner interactions along with higher RSA can predict better emotional and physical outcomes in this sample of breast cancer patients.

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