CARDIAC VAGAL CONTROL, SOCIAL FUNCTIONING AND EMOTIONAL ADJUSTMENT IN BREAST CANCER

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Abstract

▪ Examining psychosocial and biological factors associated with coping with breast cancer can help to identify patients at greatest risk for experiencing difficulties in coping with their illness.

▪ Cardiac vagal control (CVC), as measured by respiratory sinus arrhythmia (RSA), has been proposed as a marker of capacity for emotional and social functioning.

▪ The association between RSA, perceived social support, anxiety, and quality of intimate partner relationships was examined in a sample of 43 women diagnosed with stage 0, I, II, or III breast cancer.

▪ Greater RSA at baseline was associated with more positive partner interactions, greater affection, and a more beneficial trajectory of change in anxiety over time. Additionally, lower RSA at baseline was associated with a decrease in perceived social support over time.

▪ The findings suggest that CVC may be an index of capacity for social and emotional functioning during coping with breast cancer diagnosis and treatment, and it may help identify individuals in need of emotionally supportive interventions.

Introduction

▪ According to Polyvagal theory (Porges, 1995), cardiac vagal control (CVC), as measured by respiratory sinus arrhythmia (RSA), indexes individual differences in the ability to regulate emotions and respond to environmental demands.

▪ Individuals with high CVC at rest and decreased CVC during stress should exhibit better social functioning and have greater ability to self-regulate in response to stressors.

▪ Across the literature, low cardiac vagal control has been associated with state and trait anxiety as well as anxiety spectrum disorders (Cohen & Benjamin, 2006), while higher vagal control has been linked to the increased connectedness to others and positive emotions (Kok & Fredrickson, 2010), better social support (Horsten et al., 1999), and greater marital quality (Smith et al., 2010).

▪ Cancer patients often experience diminished active support after completion of treatment (Stanton et al., 2005). The first year post-diagnosis may be especially stressful for women with breast cancer as they cope with treatment and transition to survivorship (Stanton et al., 2005).

▪ *Study Aim*: To examine baseline cardiac vagal control, measured by RSA, as an index of social and emotional functioning in women coping with stressors of breast cancer diagnosis, treatment, and survivorship.

Method

Subjects

▪ 106 female participants with stage 0, I, II, or III breast cancer participated in the study.

▪ A final sample consisted of 42 participants who were not undergoing cardio-toxic chemotherapy regimens, not taking anxiolytic medications or those that affect cardiac functioning, and had at least 3 available observations for assessment of social support, anxiety, and quality of partner relationship (Mean age = 53, SD = 8.8; Mean time since diagnosis = 4.5 months, SD = 3.9 months; min = 0.3 months, max = 17.7 months).

Procedure

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

▪ At the initial visit, a 5-minute resting ECG segment was recorded.

▪ Multidimensional Scale of Perceived Social Support (MSPSS), Taylor Manifest Anxiety Scale (TMAS), Affection Subscale of the Dyadic Adjustment Scale (DAS), and Social Relationships Inventory (SRI) were filled out by participants at each study visit. Observations every three months for up to 1 year period after the initial visit were included in the analyses.

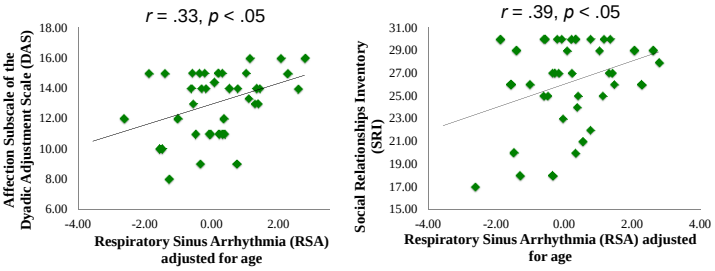
ECG Data Reduction

▪ The raw digitized ECG signal from a 5-minute resting session was analyzed off-line. QRSTool Software (Allen, Chambers, & Towers, 2007) was used to extract interbeat interval (IBI) series from the raw ECG recording. The extracted interbeat series was inspected for artifacts such as missed, erroneous, or ectopic beats and hand-corrected. CMetX Cardiac Metric Software (Allen et al., 2007) was used to calculate an estimate of respiratory sinus arrhythmia, by deriving heart rate variability in the HF band (0.12–0.4 Hz), which is assumed to be related to respiration and under vagal control. CMetX converts the IBI series to a time-series sampled at 10 Hz with linear interpolation and then applies a 241-point optimal finite impulse response digital filter designed using FWTGEN V3.8 (Cook & Miller, 1992) with half-amplitude frequencies of a .12 and .40 Hz. The natural log of the variance of the filtered waveform was used as the estimate of RSA.

Results

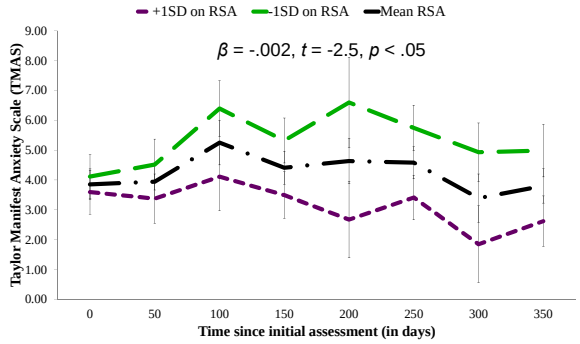
▪ Consistent with literature on RSA, there was a significant negative association between RSA and age in the subset of subjects free of medications (r = -.37, p < .05). Therefore, age was entered in the regression model as a predictor of RSA and nonstandardized residuals were calculated. Values of RSA residualized on age were used in all of the following analyses, and the pattern of presented findings remained unchanged compared to models with RSA unadjusted for age.

▪ *Higher resting RSA was associated with greater affection and more positive partner interactions.*

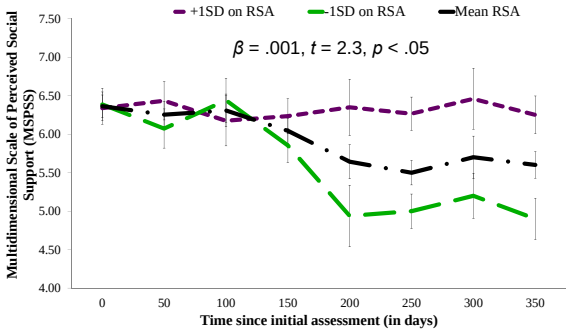


Results (Cont'd)

▪ *Higher resting RSA was associated with a decrease in anxiety over time.*



▪ *Lower resting RSA was associated with a decrease in perceived social support over time.*



Discussion

- Number of promising findings in a small but clinically relevant sample.
- As predicted, the present study revealed that greater vagal control in women diagnosed with breast cancer is associated with better social and emotional functioning.
- The findings suggest that CVC, as measured by respiratory sinus arrhythmia, may be an index of capacity for social and emotional functioning during coping with breast cancer diagnosis and treatment.
- Future investigations should examine vagal control as a predictor of a favorable trajectory in other medical conditions.
- Patients low in vagal control at illness onset might constitute a vulnerable group in need of emotionally supportive interventions to improve coping with illness and treatment.
- Together these findings support the premise of Polyvagal theory that vagal control is indeed associated with social and emotional functioning in breast cancer patients.

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