Self-Regulation and Positive Emotion in Bereavement

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Bereavement portends cardiovascular risk. Heart rate (HR), respiratory sinus arrhythmia (RSA), and skin conductance levels (SCL) therefore were recorded before and after a writing task in 30 recently bereaved participants. Half of participants wrote about the death of their loved ones; half wrote about their days. In the absence of any baseline group differences on any measure, HR, but not RSA and SCL, changed differentially by group. HR decreased only in the day-focused group, not the death-focused group. Data were then collapsed across conditions to investigate individual differences (versus the impact of the writing manipulation). Psychological indices (Beck Depression & Anxiety Scales [BDI, BAI], Impact of Events Scales [IES], Positive and Negative Affect Scales [PANAS]) were examined as predictors of change in HR, RSA, and SCL. Only RSA change was significantly related to any indices, specifically Positive and Negative Affect, and a trend for BAI. Hierarchical regression was used to predict RSA change, with BDI entered first, BAI second, and IES third. Positive and negative affect was subsequently entered in a stepwise fashion to determine whether affect predicted RSA change after variance was accounted for by other psychological indices. Participants with more positive affect during the previous week showed a significantly ($p < .01$) greater increase in RSA from pre- to post-writing. Self-regulation, indexed by RSA, is proposed as predicting both relatively greater positive affect during bereavement, and greater parasympathetic increase after a writing manipulation.

Introduction

- Bereavement portends cardiovascular risk, described as the "broken heart phenomenon" (Stroebe, 1994; Parkes, Benjamin, & Fitzgerald, 1969).

- One predictive factor for cardiovascular morbidity and mortality is low parasympathetic tone, as indexed by respiratory sinus arrhythmia (RSA) (Rich et al., 1988).

- Bereaved individuals have higher resting heart rates than their matched counterparts (O'Connor, Allen, & Kaszniak, 2002). Prolonged activation of this sort could deleterious consequences for the heart.

- Alternatively, by engaging the vagal system, sympathetic input to the heart is inhibited as individuals self-soothe and calm (Porges, 1997).

- Pennebaker (1997) has previously shown a relationship between health and bereavement through a writing task paradigm.

Self-Regulation

- Self-regulation is the ability to react appropriately to environmental events and return to a normal emotional state and may reflect a stable individual difference (Porges, 1997).

- Adults with high vagal tone have less negativity in response to moderate to high stressors, which mediates the relationship between RSA and constructive coping (Fabes and Eisenberg, 1997).

- The psychological operationalization of self-regulation includes the experience of positive affect, even during ongoing negative events. Expressing positive affect and facial expressions during a conversation in the first six months of bereavement predicts better adjustment at 18 months (Bonanno, Keltner, Holen, & Horowitz, 1995).

- In bereavement, an appropriate response to memories of the deceased is grief. Self-regulation includes the ability to apply the vagal brake after responding to a negative environmental challenge, such as remembering the death of a loved one.

Current Study

- The broken heart phenomenon suggests that physiological mechanisms may link the bereavement process and cardiovascular health.

- Self-regulation includes the ability to apply the vagal brake after responding to a negative environmental challenge, such as remembering the death of a loved one.
  - The task in this study was to write about the death of a loved one, or to write about one's daily activities.
  - The current study explored three psychophysiological indicators in bereaved individuals before and after a grief-eliciting or control writing task, including HR, SCL and vagal tone indexed by RSA.

- Self-regulation also includes the ability to experience positive affect during bereavement, a predominantly negative emotional experience.
  - The current study measured psychological indices of emotion and emotion processes, such as depression, anxiety, and positive/negative emotion in the prior week.

Hypotheses

- The ability to self-regulate (indexed by RSA) will positively correlate with high positive emotion after a stressful life event (bereavement).

- The Intervention Group will show greater physiological changes than the Control Group.

Method

Participants
- Thirty adults (18-65) who had experienced the death of a first- or second-degree family member in the last 18 months.
- Randomly assigned to either:
  - Intervention group (wrote about the death event, n=18).
  - Control group (wrote about their day, n=12).

Protocol
- Questionnaires (Beck Depression Inventory-II (BDI), Beck Anxiety Inventory (BAI), Impact of Events Scale (IES), Positive and Negative Affect Scale (PANAS)).
- Heart Rate (HR) and Skin Conductance Level (SCL) measurement.
- 20-min writing task (based on Pennebaker, 1997).
- Post-writing HR and SCL measurement.

Intervention Writing Topic	Control Writing Topic
What I would like you to write about today is what happened when your loved one died and your deepest feelings and thoughts about it. You can write about what your loved one died of, how you found out they were dying, when you heard the news that they had died, and what you did afterward. Whatever you choose to write, however, it is critical that you really delve into your deepest thoughts and feelings...	*...In today's writing, I want you to describe what you did yesterday from the time you got up until the time you went to bed. For example, you might start when your alarm went off and you got out of bed. You could include the things you ate, where you went, which buildings or objects you passed by as you went from place to place. The most important thing in your writing, however, is for you to describe your days as accurately and objectively as possible.*

Table 1. Writing Tasks for Intervention and Control Groups

Recording Procedures

- The electrocardiogram (ECG) was recorded for five minutes prior to and following the writing task. ECG was recorded with the J & J amplifier system, attaching Ag-AgCl electrodes to the left and right upper forearm with Signa Crème electrode conductive cream. The ground was attached to the lower right forearm. No instructions were given about how to breathe. ECG was sampled at 1024 Hz. Ectopic beats and abnormalities were monitored on the screen.

- Interbeat interval series were first derived from the raw ECG, using an r-spike detection algorithm, followed by hand screening with correction for artifacts (missed or erroneous beats). The index of heart rate variability primarily under vagal control is the respiratory sinus arrhythmia (RSA) band (.12-.4 Hz). IBI series were passed through an optimal finite impulse response digital filter with a .12-.40 Hz bandpass, sampled at 10Hz. Natural log transformed variance in this .12-.40 Hz signal was extracted as the index of RSA (See Allen, 2002, Poster #95).

- Average skin conductance level across five minutes was computed.

Results

Differences Between Groups at Baseline

❑ Because of randomization, there were no baseline differences between groups on any of the psychological indices, except BAI ($F=4.48$, df=1, 29, $p<.04$). Control mean was 20, Intervention mean was 12.5 (range 0-63).

❑ The control group had a significantly larger decrease in HR than the intervention group ($F=6.934$, df=1,29 $p<.01$), but there were no other significant differences between groups in physiological measures. Mean HR decreased from pre- to post-writing in the Control Group, but increased in the Intervention Group (Fig. 1).

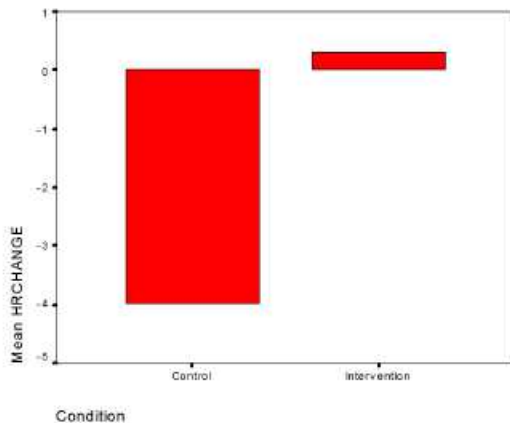## Group Differences in HR Change Pre- to Post-Writing

Figure 1. Mean HR Change (from pre- to post-writing)

Analyses of Individual Differences

❑ Self-regulation may also be a trait, and be activated without regard to the Intervention or Control condition. Those participants who wrote about their day (Control condition) may still have experienced emotion during the task, and therefore their psychophysiological responses may look like those in the Intervention condition.

❑ For the following analyses, therefore, data were collapsed across writing conditions to investigate individual differences in physiological responses as a function of engaging in a writing task..

❑ Psychological indices (BDI, BAI, IES, PANAS) were examined as predictors of change in HR, RSA, and SCL. Only RSA change was significantly related to any indices, specifically Positive and Negative Affect, and a trend for BAI.

❑ Hierarchical regression was used to predict RSA change, with BDI entered first, BAI second, and IES third. PANAS was subsequently entered in a stepwise fashion. Although entered last, Positive Affect during the previous week was the only significant predictor (Table 2).

❑ Regression Analyses Predicting RSA Change

Predictor	Standardized Coefficient	*p* value
Group	-0.232	0.191
BDI	0.419	0.079
BAI	-0.049	0.834
IES-Avoid	0.334	0.093
IES-Intrude	-0.235	0.186
PANAS-Neg	-0.42	0.099
PANAS-Pos	0.648	0.009**

Table 2. Regression analysis of predictors of RSA Change (R^2=.509, $p<.016$).

Correlation Between Positive Affect and RSA Change

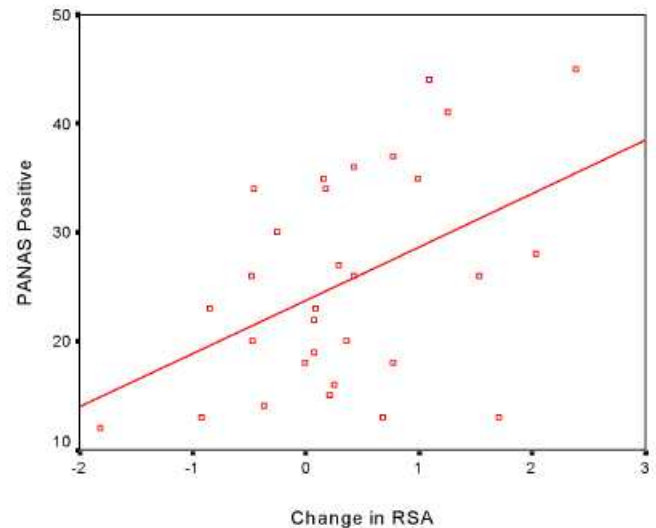❑ The correlation between Positive Affect and RSA Change was not due to outliers.

Figure 3. Correlation between PANAS-Positive Subscale and RSA Change (r=.451, $p<.012$)

Discussion

❑ In comparing a grief-eliciting writing task (Intervention) with a day-focused writing task (Control), only HR change showed a significant difference between groups, with the Control group decelerating.

❑ Positive affect in the prior week is the best predictor of increased vagal tone after a writing task, as compared to depression, anxiety, the impact of the event, or negative affect.

❑ Self-regulation, as indexed by RSA and the experience of positive emotion after a stressful life event, appears to be an individual difference, and not sensitive to a writing manipulation.

  ❑ One interpretation is that self-regulation is causing both more positive affect in the week because of regulating well after stressors, *and* is showing up as increased RSA (regulation) after a specific writing task.

  ❑ Another interpretation is that having a more positive week makes it easier to regulate after doing a specific writing task.

❑ This study indicates a need for further research to determine if individuals with low RSA are at increased mental and physical health risk during bereavement.

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