



THE PSYCHOPHYSIOLOGY OF TERROR MANAGEMENT: MORTALITY SALIENCE DECREASES RESPIRATORY SINUS ARRHYTHMIA

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Introduction

Terror Management Theory (TMT; Greenberg, Pyszczynski, & Solomon, 1986) states that the uniquely human awareness of mortality engenders a potential for paralyzing anxiety. Humans mitigate death-related concerns through the construction and maintenance of cultural worldviews (CWVs), shared conceptions of the nature of reality that afford psychological bases for literal (i.e., religious) and symbolic (i.e., nationalistic) death transcendence.

Hundreds of empirical tests of TMT have shown that reminders of mortality (mortality salience; MS) intensify individuals' vigilance to defend their CWVs (for a review see Greenberg, Solomon, & Arndt, 2007). Yet the psychophysiological consequences of MS and their role in CWV defense remain largely unknown. Arndt, Allen & Greenberg (2001) found that MS briefly elevated corrugator EMG and also CWV defense, yet the magnitude CWV defense was not predicted by the EMG increase.

Aims and Hypotheses of the Present Study

To further explore the psychophysiological underpinnings of terror management, we administered a standard MS manipulation (c.f., Rosenblatt et al., 1989) and examined its impact on respiratory sinus arrhythmia (RSA)—heart rate variability tied to the respiratory cycle. RSA indexes cardiac vagal control, a physiological index of parasympathetic nervous system influence on the heart and an important underlying mechanism in emotional, self-regulatory, and behavioral processes (Porges, 1995). Consistent with the idea that reduced vagal control is characterized by heightened psychological vulnerability, low levels of RSA have been associated with various indices of defensiveness and anxiety (e.g., Miovius & Allen, 2005; Friedman & Thayer, 1998; George et al., 1989). Accordingly, **we hypothesized that MS would cause vagal withdrawal, as indicated by a decrease in RSA.**

Additionally, we examined physiological correlates of CWV defense in a startle paradigm, wherein eyeblink startle magnitudes were assessed during the presentation of worldview-threatening imagery, as well as generally unpleasant imagery. If affective priming of the startle reflex is based on motivational variables (e.g., Lang, 1995) and MS heightens motivation for CWV defense (e.g., Greenberg et al., 2007), then MS should intensify startle potentiation to worldview-threatening images. Accordingly, **we hypothesized that MS would cause potentiated startle to worldview-threatening images relative to images which are generally unpleasant.**

Finally, we sought to identify whether MS-induced changes in RSA would relate to MS-induced startle potentiation. Consistent with research linking RSA to heightened affective modulation of startle (e.g., Ruiz-Padiala, Sollers, Vila, & Thayer, 2003), **we hypothesized that decreases in RSA due to MS would relate to increases in MS-induced startle potentiation to worldview-threatening images.** Such a prediction links the physiological impact of MS itself with a physiological index of CWV defense.

Method

Participants

Participants were 66 university students (41 females, 25 males) who, on a mass pretest, circled 9 in response to: "My identification as an American is important to me" (1=Not at all; 5= Somewhat; 9=Very much so).

Procedure

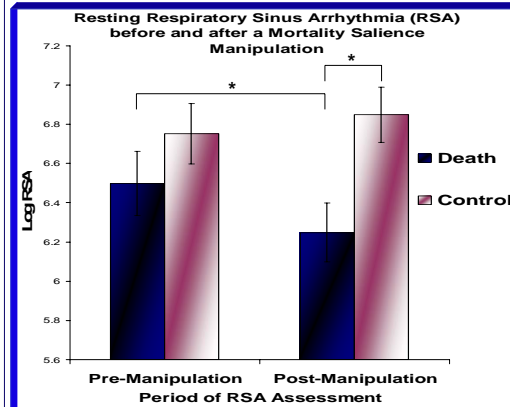
- First, participants were told they were participating in a study on "personality and how brainwaves relate to image viewing."
- Second, electrocardiographic (ECG) activity was recorded during a 5-minute resting period. Heart period variability in the high frequency band (.12–4 Hz) was later extracted using CMetX software (Allen Chambers, & Towers, 2007).
- Third, participants completed a packet of filler personality questionnaires, concluding with the MS manipulation.
 - Those in the MS condition received two open-ended questions:
 - "Please describe the emotions that the thought of your own death arouses in you."
 - "Jot down, as specifically as you can, what you think will happen to you as you physically die and once you are physically dead."
 - Control participants instead received parallel questions pertaining to an important upcoming exam.
- Fourth, resting ECG a was assessed during a second 5-minute resting period immediately following this manipulation.
- Finally, participants were presented with a series of images (6 seconds each), including 12 generally unpleasant IAPS images as well as 12 images of an anti-America nature. The anti-US and unpleasant images were pilot tested to be matched on valence and arousal. Also presented, but not reported here, were 12 neutral images, 12 generally pleasant images, and 12 pro-America images.
 - Ninety-five decibel 50-ms white noise startle probes were presented at varying latencies following image onset.
 - Bipolar leads measured ocularis activity in response to the probes, with startle amplitude defined as the peak of the high-pass (12 Hz) filtered rectified smoothed signal that occurred within 20-120 ms post-startle. Startle amplitudes were log-transformed, averaged within picture type, and converted to within subject z-scores across all picture types.



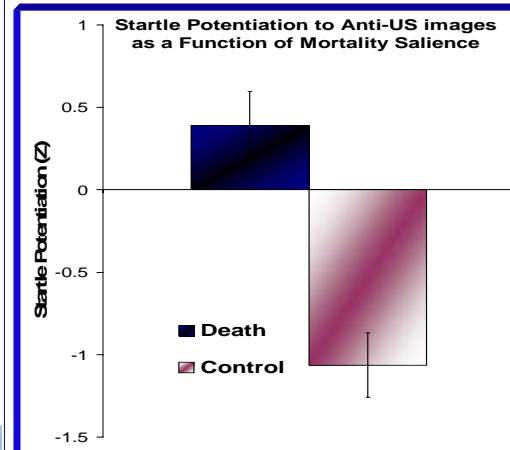
Sample anti-American pictures used in this study



Results



The condition (death vs. control) by time (pre-manipulation vs. post manipulation) interaction ($F(1,64)=20.64, p < .05$) revealed that although RSA did not differ between MS and control participants pre-manipulation, following the MS manipulation, RSA decreased in subjects who contemplated death and also that RSA post-manipulation was lower compared to that of the controls. Note: * denotes comparisons significantly different ($p < .05$)

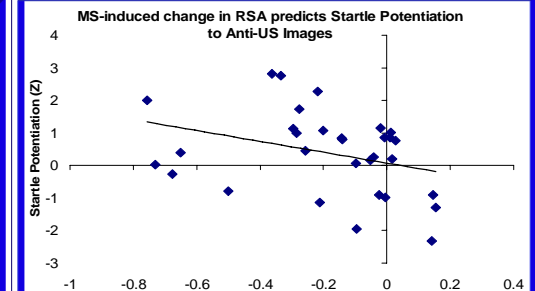


An index of anti-US startle potentiation was created by subtracting the log-transformed and standardized startle magnitudes to unpleasant images from those to anti-US images. Contemplating death potentiated startle to anti-US images relative to control ($F(1,64)=25.81, p < .05$).

Handouts available: www.psychofizz.org. This poster is dedicated to the memory of Ernest Becker (pictured right), without whose brilliant ideas this research would not have been conceptualized or executed: www.ernestbecker.org.



Results (cont.)



To examine whether MS-induced changes in RSA could predict startle potentiation, post-manipulation RSA values were residualized on pre-manipulation RSA values; the residuals thus reflected deviations in RSA from that which would have been predicted by baseline RSA. Consistent with the interaction depicted at the left, contemplating death resulted in lower residualized RSA scores than the control condition ($F(1,64)=27.96, p < .05$). These residualized RSA values were then examined within group as predictors of startle potentiation to anti-US images. This relationship was not significant among control participants ($r = .21, ns$), but among death-salient participants, lower residual log RSA predicted heightened startle potentiation to anti-US images ($r = -.34, p < .05$).

Discussion

These findings suggest a mechanism by which reminders of one's mortality may lead to increased worldview defense. Reminders of mortality decreased respiratory sinus arrhythmia and heightened startle potentiation to worldview-threatening imagery. Moreover, the extent of MS-induced lowering of RSA predicted startle potentiation to worldview-threatening imagery. By inference, reminders of mortality decrease regulatory capacity (indexed by RSA), which may thus lead to heightened defensive responding as a way to restore a sense of meaning and purpose. Additional research should focus on other intermediate mediating variables, and moderators of this influence, to further elucidate the mechanisms underlying the well-documented effect of death reminders to provoke worldview defense.

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