Introduction

Theory and research suggest a link between self-esteem and vagal tone (parasympathetic influence on the heart). A review of the literature suggests that vagal tone may connote security from threat. Terror Management Theory (TMT; Greenberg, Solomon, & Pyszczynski, 1986) posits that for humans, who live in a largely symbolic world, self-esteem is a crucial provider of security. Consequently, from this perspective that self-esteem provides security from threat, we posit that feelings of self-esteem should promote vagal tone.

In support, a significant body of research shows parallels between correlates of self-esteem and correlates of vagal tone. Both self-esteem and vagal tone buffer against sympathetic and amygdala-related threat responses (e.g., Greenberg et al., 1992; Levy, 1990; Porges, 1995). Further, both self-esteem and vagal tone tend to predict reduced psychological threat experience such as anxiety, depression, and hostility (e.g., Heatherton & Polivy, 1991; Thayer and Lane, 2000). In two studies we sought to more directly assess this connection and our hypothesis that self-esteem promotes vagal tone.

Study 1

In an initial exploration, we first assessed the relationships between vagal tone and explicit and implicit self-esteem.

Method

Participants.

Twelve undergraduates

Procedure & Materials

1. Implicit self-esteem: Implicit Self-evaluation Survey (adapted from Pelham & Hetts, 1999).

   Word Completions:
   1. OVE 2. OVE 3. OVE
   4. OVE
   5. OVE
   6. OVE
   7. OVE
   8. OVE
   9. OVE
   10. OVE
   11. OVE
   12. OVE
   13. OVE
   14. OVE
   15. OVE
   16. OVE
   17. OVE
   18. OVE
   19. OVE
   20. OVE

   Notes: Order of target word completions suggest positive/negative associations with the self.

2. Explicit self-esteem: Rosenberg Self-esteem Scale (Rosenberg, 1979)

3. Vagal tone: We extracted two putative measures of parasympathetic nervous system activity from seven 1-2 minute interbeat interval (IBI) series using CMet software (Allen, 2003).

   1. Respiratory Sinus Arrhythmia (RSA): the variability in IBLs in the respiratory frequency.
   2. pNN50: the proportion of consecutive IBIs that differed by more than 50 milliseconds.

4. Vagal tone stability: standard deviation of the seven RSA and pNN50 measurements taken over the course of an hour-long experiment.

Results

| Implicit self-esteem & RSA: $r = .46$, $p = .14$ |
| Implicit self-esteem & RSA stability: $r = -.50$, $p = .10$ |
| Explicit self-esteem & RSA: $r = -.20$, $p = .53$ |
| no effects for the pNN50 approached significance, all $p s > .2$ |

Study 2

Having found a correlational trend in support of our proposition, we went on to test the causal prediction that self-esteem promotes vagal tone. To do so, we gave people either positive or negative feedback and assessed the impact of this feedback on vagal tone.

Method

Participants

Fifty-five undergraduates (34 males and 21 females)

Procedure

1. Rosenberg self-esteem scale: assessed before experiment
2. Vagal tone reading 1: 4-5 minute EKG recording
4. Vagal tone reading 2: 2-3 minutes
5. Personality feedback
6. Vagal tone reading 3: 2-3 minutes
7. Self-esteem IAT 2
8. Anxiety IAT
10 Explicit state self-esteem
11. Vagal tone reading 4: 2-3 minute EKG recording

Vagal tone acquisition and data reduction:

RSA and pNN50 extracted from each IBI series. We averaged readings 1 and 2 to obtain pre-feedback vagal tone. We averaged readings 3 and 4 to obtain post-feedback vagal tone.
Results

Effects of feedback

**Effect of feedback on self-esteem IAT**

\[ F(1, 53) = 3.51, p = .066 \]

- **Implicak self-esteem IAT**
  - Pre-feedback: 0.59
  - Post-feedback: 0.46
  - Positive feedback
  - Negative feedback

**Effect of feedback on pNN50**

\[ F(1, 52) = 3.56, p = .065 \]

- **vagal tone indexed by pNN50 scores**
  - Pre-feedback: 15.5
  - Post-feedback: 15.8
  - Positive feedback
  - Negative feedback

No other effects for feedback approached significance:
- explicit Rosenberg self-esteem change, \( F(1, 48) = .24, p = .63 \)
- RSA change, \( F(1, 52) = .02, p = .90 \)
- anxiety IAT, \( F(1, 53) = 1.60, p = .21 \)
- positive mood (from PANAS), \( F(1, 51) = .05, p = .83 \)
- negative mood (from PANAS), \( F(1, 52) = .80, p = .38 \)
- non-self practice IAT change, \( F(1, 53) = .168, p = .20 \)

**Correlations**

- self-esteem IAT change & pNN50 change: \( r = .36, p < .01 \)
- self-esteem IAT change & RSA change: \( r = .08, p = .61 \)
- Rosenberg change & pNN50 change: \( r = .27, p = .065 \)
- Rosenberg change & RSA change: \( r = .40, p < .01 \)

**Discussion**

We proposed that self-esteem promotes vagal tone. In support, Study 1 suggested an association between implicit self-esteem and vagal tone. In Study 2 we manipulated self-esteem and found that positive feedback tended to increase vagal tone as indexed by pNN50 scores, whereas negative feedback did not affect vagal tone. Perhaps negative feedback did not affect vagal tone because participants were in a new situation in which their self-esteem was already jeopardized.

In addition to this effect of feedback, pre- and post-feedback changes in the self-esteem IAT corresponded with pre- to post-feedback changes in pNN50 scores. We also found that pre to post self-report self-esteem corresponded with pre to post RSA. Curiously, self-esteem IAT changes did not correspond with RSA changes.

In addition, inconsistent to some extent with Study 1, baseline self-esteem measures did not predict baseline vagal tone. There were few participants in Study 1, however, and the relationship between baseline measures did not reach significance. Thus, it seems likely that state changes in self-esteem, rather than baseline levels, most clearly affect vagal tone. Future work will continue to test this idea.

**References**


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