Exploring the Relationship Between Self-esteem and Vagal Tone

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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.

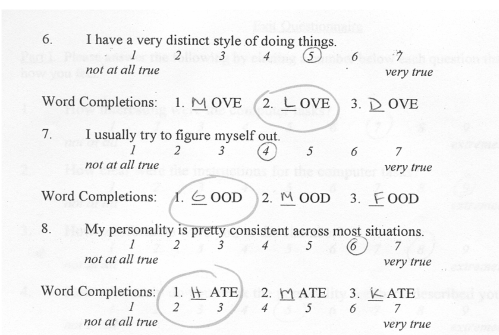
Method

Participants.

Twelve undergraduates

Procedure & Materials

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



6. I have a very distinct style of doing things.
1 2 3 4 5 6 7
not at all true — very true

Word Completions: 1. M OVE 2. L OVE 3. D OVE

7. I usually try to figure myself out.
1 2 3 4 5 6 7
not at all true — very true

Word Completions: 1. G OOD 2. M OOD 3. F OOD

8. My personality is pretty consistent across most situations.
1 2 3 4 5 6 7
not at all true — very true

Word Completions: 1. H ATE 2. M ATE 3. K ATE

Note: 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 Arrythmia (RSA): the variability in IBIs 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 *ps* > .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

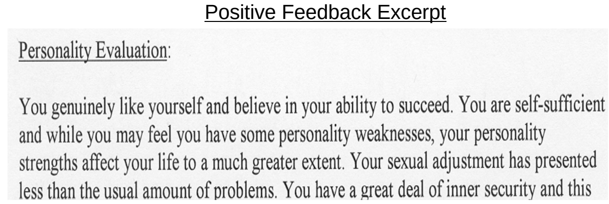
Participants

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
3. Self-esteem Implicit Association Test 1 (IAT; Greenwald, McGhee, & Schwartz, 1998). Reaction time measure. Higher scores indicate stronger Self + Positive associations as compared to Self + Negative associations.
4. Vagal tone reading 2: 2-3 minutes
5. Personality feedback

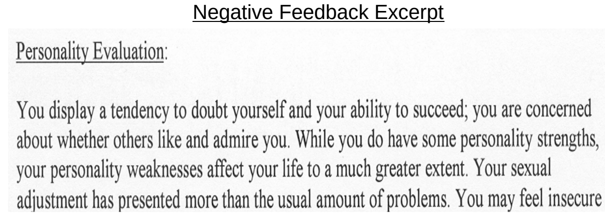
Positive Feedback Excerpt



Personality Evaluation:

You genuinely like yourself and believe in your ability to succeed. You are self-sufficient and while you may feel you have some personality weaknesses, your personality strengths affect your life to a much greater extent. Your sexual adjustment has presented less than the usual amount of problems. You have a great deal of inner security and this

Negative Feedback Excerpt



Personality Evaluation:

You display a tendency to doubt yourself and your ability to succeed; you are concerned about whether others like and admire you. While you do have some personality strengths, your personality weaknesses affect your life to a much greater extent. Your sexual adjustment has presented more than the usual amount of problems. You may feel insecure

6. Vagal tone reading 3: 2-3 minutes
7. Self-esteem IAT 2
8. Anxiety IAT
9. Mood: PANAS (Watson & Clark, 1991)
10 Explicit state self-esteem
11. Vagal tone reading 4: 2-3 minute EKG recording

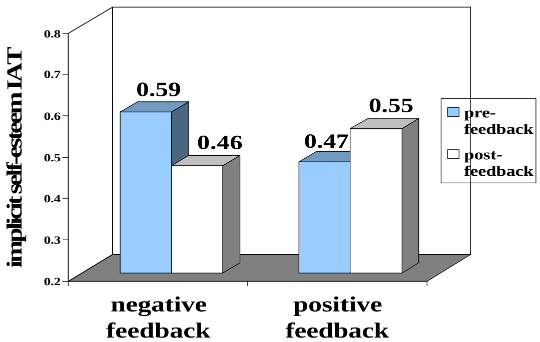
Vagal tone acquisition and data reduction:

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.

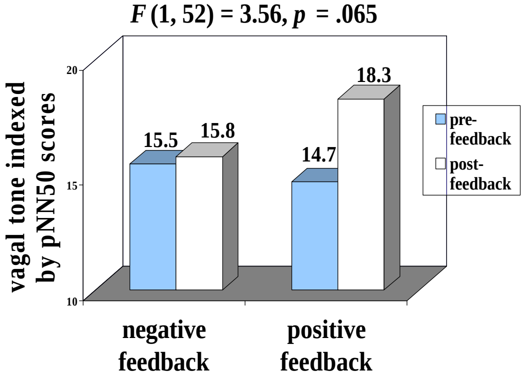
Results

Effects of feedback

Effect of feedback on self-esteem IAT
F **(1, 53) = 3.51, *p* = .066**



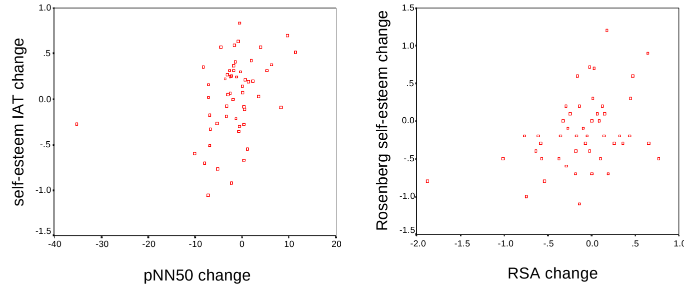
Effect of feedback on pNN50
F **(1, 52) = 3.56, *p* = .065**



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, $F(1, 53) = .1.68$, $p = .20$

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: $r = .40$, $p < .01$



Note: with outlier omitted, the correlation remains significant

No correlations between baseline self-esteem and baseline vagal tone approached significance.
- Rosenberg & RSA baseline, $p > .3$
- Rosenberg & pNN50 baseline, $p > .4$
- self-esteem IAT pre-feedback & RSA baseline, $p > .6$
- self-esteem IAT pre-feedback & pNN50 baseline, $p > .9$

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.

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