# Further Support for Multidimensionality Within the Rosenberg Self-Esteem Scale

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Abstract Although the Rosenberg Self Esteem Scale is one of the most widely used measures of global self esteem, the underlying measurement structure of the items is still debated. In this study the dimensionality of a six item version of the Rosenberg Self Esteem Scale included in the National Population Health Survey of Canada was examined using nested confirmatory factor analyses. The results indicate that the six items measure two correlated dimensions of global self esteem. The first dimension appears to represent a measure of self competence, and the second is interpreted as a measure of self liking. Subsequent tests of predictive power and discriminant validity supported the two dimension interpretation. The two dimensions had substantially different relationships with theoretically related measures of anxiety, negative affect and happiness. In addition to these different correlations, latent variable regressions indicated that the self-competency factor consistently suppressed irrelevant variance in the self liking factor when predicting anxiety, negative affect and happiness.

**Keywords** Rosenberg self esteem scale · Confirmatory factor analysis · Dimensionality

The concept of global self esteem is typically defined as "the extent to which one prizes, values, approves or likes oneself" or "the overall affective evaluation of one's

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worth, value or importance (Blascovich and Tomaka 1991, p. 115)." Although there are competing theories concerning the fundamental role of global self esteem from an evolutionary perspective, there is widespread support of the notion that global self esteem buffers the impact of anxiety producing stimuli (Pyszczynski et al. 2004). For example, Dutton and Brown (1997) demonstrated that individuals with high global self esteem experience less emotional distress in response to failure than individuals with low global self esteem.

One result of the expanding literature that documents the buffering role of global self esteem has been the inclusion of a six item short-form version of the Rosenberg Self Esteem Scale (Rosenberg 1965) in population health surveys such as Canada's National Population Health Survey and the Canadian Community Health Survey (Statistics Canada 1995, 2001). However, despite wide-spread use of the Rosenberg Self Esteem Scale for more than a quarter century, there remains a nagging debate concerning the underlying factor structure of the Rosenberg Self Esteem Scale and its various short forms.

The purpose of this study was to use confirmatory factor analysis to compare the fit of competing measurement models of the Rosenberg Self Esteem Scale items using data from the 1994 National Population Health Survey. To provide additional support for the appropriateness of the measurement structure identified in the confirmatory factor analysis, tests of predictive power and discriminant validity were carried out. These analyses examined the relationships between the competing measurement models for the Rosenberg Self Esteem Scale items and theoretically related measures of anxiety, depression and happiness.

### Self Esteem and Depression

In addition to research supporting the anxiety-buffering properties of global self esteem, the work of early cognitive theorists such as Beck (1967) suggests that the construct of self esteem should function as a direct indicator of vulnerability to major depression. Support for this perspective has been found in studies that have shown that poor self esteem is a significant risk factor for the onset of clinical depression (Brown et al. 1990; Miller et al. 1989). Other researchers have focused on understanding the nature of the relationships among global self esteem, neuroticism and depression. For example, Roberts and Kendler (1999) concluded that when considered individually, both neuroticism and poor self esteem are risk factors for depression. However, neuroticism appears to be a more proximal indicator of risk because most or all of the risk explained by self esteem is mediated by neuroticism. Contrarily, Cheng and Furnham (2003) concluded that global self esteem is a powerful predictor of depression that mediates the influence of neuroticism. Schmitz et al. (2003) concluded that both neuroticism and self esteem predict depression, however a complex nonlinear interaction exists between the concepts suggesting that neuroticism and self esteem should be evaluated simultaneously when analyzing depression disorders. Despite the controversy regarding the specific roles of self esteem and neuroticism in predicting depression, there is empirical and theoretical support of a strong predictive relationship between measures of global self esteem and depression.

### Self Esteem and Happiness

Happiness has been described as the preponderance of positive affect over negative affect (Diener 1984). More recently, DeNeve and Cooper (1998) suggested that happiness is an overall affective appraisal while positive and negative affect are specifically focused on the recent occurrence of specific positive and negative emotions. Compared to the amount of research examining the relationship between depression and self esteem, substantially less attention has been paid to the link between self esteem and happiness. However, the recent rise in interest in positive psychology has led to a resurgence of research on happiness and its determinants. For example, a recent examination of the relationship between self esteem and happiness indicated that self esteem directly predicts happiness in addition to mediating the effects of extraversion and neuroticism on happiness (Cheng and Furnham 2003). Lyubomirsky et al. (2006) reported convincing evidence of the distinctiveness of happiness and self esteem. They concluded that self esteem and happiness are highly correlated (0.58) but distinct constructs, and that there is a need for research on the mechanisms that link (and distinguish) them.

### Measurement Structure of the Rosenberg Self Esteem Scale

The Rosenberg Self Esteem Scale is a widely used scale that purports to provide a one-dimensional assessment of global self esteem (Rosenberg 1965). Although the commonly used version of the scale contains ten questions (five with a positive orientation and five with a negative orientation), a subset of six questions was selected for inclusion in the 1994 National Population Health Survey of Canada (NPHS; Statistics Canada 1995). The selection of the six items was based on the results of a principal components analysis (varimax rotation) published in the appendix of a paper by Pearlin and Schooler (1978). The selected questions with their published factor loadings arising from their one factor solution are presented in Table 1 (the loadings for the remaining unselected questions were not included in the publication).

Table 1 Rosenberg self esteem scale items

Rosenberg Self Esteem	Scale items included in the National Population Health Survey <sup>a,b</sup>
Q1	I feel that I have a number of good qualities (.79).
Q2	I feel that I'm a person of worth, at least on an equal plane with others (.79).
Q3	I am able to do things as well as most other people (.68).
Q4	I take a positive attitude towards myself (.65).
Q5	On the whole I am satisfied with myself (.56).
Q6	All in all, I am inclined to feel that I'm a failure (46).
Rosenberg Self Esteem	Scale items omitted from the National Population Health Survey <sup>a</sup>
Q7	At times I think I am no good at all.
Q8	I feel I do not have much to be proud of.
Q9	I certainly feel useless at times.
Q10	I wish I could have more respect for myself.

<sup>a</sup> National Population Health Survey (Statistics Canada 1995)

<sup>b</sup> Factor loadings in brackets reported in Pearlin and Schooler (1978)

A one-factor model might be an appropriate representation for the six indicators. However, it is well known that exploratory factor analyses, including principal components analyses, are frequently not able to identify models that contain higherorder factor structures or multiple correlated factors. For example, Hunter and Gerbing (1982) concluded many years ago that exploratory factor analysis is a "poor ending point for the construction of uni-dimensional scales (p. 273)." Not only does EFA tend to under-factor, but it combines highly correlated variables into the same factor. This can be problematic when variables are correlated for reasons other than being measures of the same factor (Rubio et al. 2003).

Numerous studies of the factor structure of the Rosenberg Self Esteem Scale have been performed on the full set of ten Rosenberg Self Esteem Scale items, as well as a variety of different subsets. However, little is known about the extent to which the validity of the one-factor model proposed by Pearlin and Schooler (1978) is supported in terms of confirmatory factor analysis. One theory on the factor structure of the Rosenberg Self Esteem Scale that has gained widespread acceptance is that a method effect related to the wording of negative items contaminates the model fit of the one dimensional model (Marsh 1996). Typically, researchers have achieved acceptable model fit for the one dimensional model by adding error correlations (correlations among the unique components) across the negatively worded items. Alternatively, some researchers have included an additional latent variable as a single method effect associated with negatively worded items. For a comprehensive review of the different proposed models of the Rosenberg Self Esteem Scale and their origins see Corwyn (2000). Given that the items included in the National Population Health Survey contain only one item with negative wording, there is no need to add correlated error terms among negatively worded items.

A second perspective on the relationship between the Rosenberg Self Esteem Scale and the concept of global self esteem has been offered by Tafarodi and Swann (1995, 2001). They proposed that global self esteem is composed of two interdependent but distinct concepts. The first, labeled 'self competence,' is defined as the valuative experience of oneself as a causal agent, an intentional being with efficacy and power. The second dimension, labeled 'self liking,' is defined as the valuative experience of oneself as a social object, a good or bad person according to internalized criteria. In relation to the six Rosenberg Self Esteem Scale items included in the National Population Health Survey, Tafarodi and Swann (2001) reported evidence suggesting that items five and four are indicators of self liking whereas items one, two, three and six are indicators of self competence (see Table 1).

### **Research Objectives**

The purpose of this study was to use confirmatory factor analyses to compare the fit of the following two competing models of the six item Rosenberg Self Esteem Scale. Model One, a one factor model proposed by Corwyn (2000), specifies that all six items load onto a single self esteem factor. Model Two is a correlated two factor model informed by the work of Tafarodi and Swann (1995, 2001), which posits that items four and five are indicators of self liking, and items one, two, three and six are indicators of self competence. A series of latent variable regression analyses were

then used to compare the predictive power associated with using a single versus two dimensional model to predict measures of anxiety, depression and happiness. Support for using a two-dimensional model would be indicated by an increase in the amount of outcome variance explained compared to that explained when using the single factor model. The latent variable regressions could also be considered as assessments of discriminant validity. In the context of this investigation, support for a two-dimensional representation of self esteem would be indicated by meaningful differences in the relationships between each of the self esteem factors in the two factor model and one or more of the outcomes.

#### Method

Data

The data analyzed in this study were obtained from respondents, 19 years of age and older, who participated in the British Columbia portion of the 1994 National Population Health Survey (Statistics Canada 1995). The sampling design for this survey is a stratified cluster design. Sampling weights adjusting for differing opportunity for inclusion were included in the dataset provided by Statistics Canada.

Instruments

*Rosenberg Self Esteem Scale* As described in the introduction, six of the ten Rosenberg Self Esteem Scale questions were included in the National Population Health Survey. Respondents' answers to the questions were scored using a five point Likert scale: Strongly disagree=0, Disagree=1, Neither agree nor disagree=2, Agree= 3, or Strongly agree=4. After reversing the score for question six, a total score for the scale was created by summing the responses, with higher scores indicating greater self esteem.

*Depression and Anxiety* The questions used to measure depression were originally included as a short-form version of the Kessler Psychological Distress Scale (Department of Human Services 2002). Statistics Canada (1995) reported that the scale was derived from the work of Kessler and Mroczek (1994) and is based on a subset of items from the Composite International Diagnostic Interview. This instrument was designed to produce diagnoses according to the definitions and criteria of both Diagnostic and Statistical Manual of Mental Disorders III-Revised and the International Classification of Diseases-10.

A tripartite or three dimensional model of depression and anxiety was originally proposed by Clark and Watson (1991). In this model, depression is specifically characterized by low positive affect (anhedonia), anxiety is specifically characterized by physiological hyperarousal, and both anxiety and depression are typified by indicators of general negative affect (Joiner and Lonigan 2000). Based on this three dimensional characterization of symptom expression, the Distress Scale items in the National Population Health Survey were grouped into a measure of general negative affect and a measure of anxiety characterized by physiological hyperarousal. All item responses were scored using a five point Likert scale: All of the time=4, Most of the time=3, Some of the time=2, A little of the time=1, or None of the time=0.

Scores on the negative affect factor had a possible range of 0 to 12 with higher scores indicating greater negative affect. The questions were Question 1: During the past month, about how often did you feel so sad that nothing could cheer you up?; Question 2: During the past month, about how often did you feel hopeless?; and Question 3: During the past month, about how often did you feel worthless?

Scores on the anxiety factor had a possible range of 0 to 8 with higher scores indicating greater anxiety. The questions were: Question 1: During the past month, about how often did you feel nervous? and Question 2: During the past month, about how often did you feel restless or fidgety?

*Happiness* The construct of happiness was assessed using a single question that was included in the survey as part of the Health Utility Index (Feeny et al. 1992). The question was "Would you describe yourself as being usually: (1) happy and interested in life; (2) somewhat happy; (3) somewhat unhappy; (4) unhappy with little interest in life; or (5) so unhappy that life is not worthwhile." Responses were reverse coded so that higher scores indicated greater happiness. Although this question does not address multiple dimensions of happiness, it does possess reasonable face validity in that it appears to provide a crude overall affective appraisal. To allow for some measurement error, a reliability of .80 was utilized when modeling this variable as a single indicator of latent happiness.

#### Analysis Strategy

The responses to the Rosenberg Self Esteem Scale items are based on an ordinal scale. Although many researchers employing confirmatory factor analysis have traditionally treated ordinal responses as if they were continuous, recent advances in statistical modeling software have made other potentially more robust modeling strategies accessible. A generally accepted approach for analyzing ordinal data in structural equation modeling analyses involves the use of polychoric correlations with diagonally weighted least squares estimation using the asymptotic covariance matrix. This approach assumes that there is an underlying continuous variable that represents the attitude manifested in the ordinal responses. Basically, a metric is assigned to the ordinal variable by estimating a response threshold using the proportion of cases responding in or below each category. These thresholds are then mapped onto a standard normal distribution (Joreskog 2005). The latent variable analyses of polychoric correlations (using diagonally weighted least squares estimation) conducted in this study were carried out using the software LISREL 8.54 (LISREL 2003).

Following the recommendations of Kaplan and Ferguson (1999) all analyses utilized normalized Statistics Canada weights that were created by dividing the weights for each group of respondents by the average weight for their group. This was done to take into account the probability of selection while avoiding an artificial weight-induced increase in sample size.

The first step of the analysis compared the fit of two competing models of the Rosenberg Self Esteem Scale items. Model One was the one-factor model proposed by Marsh (1996). This model had all six items loading onto a single self esteem factor (SE). Model Two was the two factor model proposed by Tafarodi and Swann (2001). This model had questions five and four functioning as indicators of self liking and questions one, two, three, and six modeled as indicators of self competence.

Cronbach's alpha is directly influenced by the number of items in a scale and underestimates reliability when the assumption of tau-equivalence (the items load on the same construct exclusively and have loadings equal in magnitude) is violated (Bollen 1989). We therefore chose to compute an estimate of reliability that is consistent with the use of confirmatory factor analysis. Initially derived by Joreskog (1971), this coefficient of construct reliability is based on a definition of reliability as an assessment of the variance in the indicators explained by the common underlying latent construct. Gerbing and Anderson (1988) recommended using the following formula to calculate construct reliability:

Construct reliability

 $=\frac{[Sum(standardized loadings)]^2}{[Sum(standardized loadings)]^2 + [Sum(1 - standardized loadings^2)]}$ 

In the second step of the analysis, latent variable correlations between the self esteem factors and negative affect, anxiety and happiness were examined for evidence of discriminant validity. The purpose of this analysis was to determine if the two self esteem factors differed in their relationships with the indicators of negative affect, anxiety and depression. A series of latent variable regressions were used to compare the predictive power associated with using a single versus two dimensional representation of the Rosenberg Self Esteem Scale to predict negative affect, anxiety and happiness. The purpose of this analysis was to examine the variance in negative affect, anxiety and depression that could be explained by the self esteem factors.

# Results

# **Descriptive Statistics**

The response rate for the survey was 88% (Statistics Canada 1995) with 1,811 British Columbians 19 years of age and older participating. After list wise deletion of respondents with missing data, the effective sample size was 1,782. Women made up 52.2% of the final sample and the mean age of the respondents was 45 years (standard deviation=17). Total scores on the Rosenberg Self Esteem Scale ranged from 6 to 24 (M=20; SD=3) and were normally distributed.

Confirmatory Factor Analyses of Rosenberg Self Esteem Scale Items

A routine review of the residuals and modification indexes associated with the initial two factor model indicated that a substantially better fitting model could be achieved by switching the loading of question six from the self competence factor to the self liking factor (see Table 2). The Root Mean Squared Error of Approximation decreased from .072 to .028 and the Standardized Root Mean Square Residual decreased from .05 to .02. Because of this improvement in fit we included this model in subsequent latent variable analyses. This new two factor model, labeled Model Three, had questions one, two and three load onto a self competency factor while questions four, five and six loaded onto a self liking factor.

The results in Table 2 show that none of the models passed the  $\chi^2$  goodness of fit test though Model Three obtained the largest *p*-value. In terms of nested model comparisons using the  $\chi^2$  statistic, both Model Two and Model Three yielded sizable statistically significant improvements in fit compared to Model One  $((\chi^2_{Model One^{-Model Two} (1)}=95, p < .01); (\chi^2_{Model One^{-Model Three} (1)}=158, p < .01),$  respectively). An examination of the supplementary indices using cutoff criteria for relatively good fit (Root Mean Squared Error of Approximation ≤ .06, Comparative Fit Index≥.95 and Standardized Root Mean Square Residual≤.08) recommended by Hu and Bentler (1999) suggested that only Model Three could be classified as having a good fit.

#### Reliability

Although the values for Cronbach's alpha did not meet the recommended level of .80 (Nunnally and Bernstein 1994), the estimates of construct reliability suggest that all three models met the recommended standard (see Table 2).

### Latent Variable Regressions

Before conducting the latent variable regression analyses, a model composed of correlated constructs was tested to identify potential problems in the measurement models and to generate a correlation matrix of the latent variables (see Table 3). This model fit the data well according to the criteria for relatively good fit recommended by Hu and Bentler (1999), but did not pass the  $\chi^2$  goodness of fit test ( $\chi^2$ =115, p<.01). The  $R^2$  for the indicators was well above .50 for all but one item (Anxiety Q1). The construct reliability exceeded .80 for all constructs except Anxiety (construct reliability=.66).

Examination of the latent variable correlations (see Table 4) indicated that all correlations were in the expected direction. Both self esteem factors had negative correlations with negative affect and anxiety and positive correlations with happiness. However, the self liking factor had correlations that were substantially larger than the corresponding correlations associated with the self competence factor.

Tables 5, 6 and 7 contain the results of the outcome-specific latent variable regressions. Each row of the table contains the standardized coefficients,  $R^2$  indicating the amount of variance in the latent outcome explained and the model fit statistics. The first row in each table is a regression model using the six item one factor model of self esteem implied by the work of Corwyn (2000). The second row contains the results of a regression model containing only the self competence factor model containing only the self liking factor described in Model Three. The fourth

	Model One <sup>a</sup>	Model Two	P	Model Thre	ం
	One factor	Two factor	s	Two factor	s
Indices of model fit					
$\chi^2$ (df)	177 (9)	82 (8)		19 (8)	
<i>p</i> -Value	<.001	<.001		.014	
Root mean squared error of approximation	.102	.072		.028	
90% CI for root mean squared error of approximation	.090,.116	.058,.087		.012,.044	
Comparative fit index	66.	66.		1.00	
Standardized root mean residual	.06	.05		.02	
Standardized loadings for items		Competence	Liking	Competence	Liking
Q1 You feel that you have a number of good qualities.	.83	.84	)	.86	1
Q2 You feel that you're a person of worth at least equal to others.	.92	.93	I	.97	I
Q3 You are able to do things as well as most other people.	<i>TT.</i>	.78	Ι	.83	Ι
Q4 You take a positive attitude toward yourself.	.82	I	68.	I	.88
Q5 On the whole you are satisfied with yourself.	.78	I	.83	I	.83
Q6 All in all, you're inclined to feel you're a failure (reverse coded).	69.	.70	I	I	.73
Cronbach's Alpha	.84	<i>TT.</i>	.76	.80	LL.
Construct Reliability	.92	.89	.85	.92	.86
Interfactor Correlation	I	.87		.80	
All loadings and inter-factor correlations were significant ( $p$ <.05) and all est <sup>a</sup> Single factor model of self esteem implied by Marsh (1996) <sup>b</sup> Two factor model of self esteem composed of self liking and self competer	imates were essentially t ce as described by Tafa	he same when run with rodi and Swann (2001)	out using the st	atistical weights	

Table 2 Results of the confirmatory factor analyses of Rosenberg self esteem scale items

لي الح <u>الم</u> Springer ° Modified two factor model of self esteem composed of self liking and self competence

	Competence		Liki	ng		Nega	tive Af	fect	Anx	iety	Happiness <sup>a</sup>		
	Q1	Q2	Q3	Q4	Q5	Q6	Q1	Q2	Q3	Q1	Q2	Q1	
Loading	.85	.97	.84	.85	.82	.77	.78	.90	.95	.66	.74	.89	
t-value	38	56	36	49	43	35	44	57	54	23	27	_	
$R^2$	.72	.94	.70	.72	.68	.59	.60	.81	.91	.44	.55	.80	
Construct reliability	.92			.85			.91			.66		.79	

Table 3 Standardized loadings and construct reliability for correlated factors model

All loadings were significant (p<.05). Model fit: Satorra–Bentler Scaled Chi-Square=115, (p<.01), root mean squared error of approximation=0.03, 90% confidence interval for the root mean squared error of approximation=(0.02; 0.04), comparative fit index=1.0, standardized root mean residual=0.037

<sup>a</sup> The error variance for happiness was set to (1—reliability) and the loading was fixed to the square root of reliability. A reliability of .80 was used

row in each table contains the results of a regression model with both the self competence and self liking factors simultaneously predicting either negative affect, anxiety or happiness. The high degree of correlation between the self competence and self liking factors (.80) indicates a potential problem with multicollinearity. Following the recommendations of Marsh et al. (2004), the fifth row in each table contains the results of a regression model with both the self competence and self liking factors as simultaneous predictors with the constraint that their effects be equal.

The standardized loadings for each indicator in the regression models were examined and found to change very little from the standardized loadings reported in Table 3. The self liking factor consistently explained substantially more variance in the negative affect, anxiety and happiness constructs than did either the one factor self esteem model or the self competence factor. Secondly, when both self liking and self competence were entered into the model simultaneously the sign of the standardized coefficient for self competence changed to a direction incompatible with existing theory. Self competence had a negative relationship with happiness and a positive relationship with negative affect and anxiety, and the  $R^2$  for the model increased substantially. In addition to the reversal of signs, the standard errors associated with the coefficients increased threefold. When the self competence and self liking coefficients were constrained to be equal, the standard errors were reduced though there was a significant decline in model fit. It is noteworthy that the

	Competence	Liking	Negative Affect	Anxiety	Happiness
Competence	1.0				
Liking	.80	1.0			
Negative affect	21	54	1.0		
Anxiety	08	36	.75	1.0	
Happiness	.32	.63	75	53	1.0

 Table 4
 Correlations among latent variables

All correlations significant (p < .05)

Model	Standardize (standard er	d coefficients ror)		Model fit statistics						
	$\beta_{1\text{-Factor}}$	$\beta_{COMP}$	$\beta_{\rm LIKE}$	$R^2$	$\chi^2(df)$	р	RMSEA	CFI	SRMR	
SE	-0.41 (.02)	_	_	16.5	282 (26)	<.001	.07	.98	.10	
COMP	-	-0.21 (.02)	_	4.4	17 (8)	.03	.03	1.0	.04	
LIKE	_	-	-0.55 (.02)	29.9	33 (8)	<.001	.04	1.0	.04	
COMP and LIKE	_	0.64 (.07)	-1.06 (.07)	44.2	60 (24)	<.001	.03	1.0	.04	
COMP and LIKE (constrained to be equal)		21 (.01)	21 (.01)	16.4	100 (25)	<.001	.04	.99	.09	

Table 5 Examining the relationship between dimensions of self esteem and negative affect

All loadings and standardized coefficients are significant (p < .05)

SE self esteem; COMP competence, LIKE liking, RMSEA root mean square error of approximation, CFI comparative fit index, SRMR standardized root mean residual

same pattern of results was found in an ordinary least-squares linear regression analysis of simple summary scores for each construct (data not reported).

### Discussion

The nested confirmatory factor analyses conducted in this study suggest that the six items from the Rosenberg Self Esteem Scale included in the National Population Health Survey represent two correlated factors. Similar to the conceptualization proposed by Tafarodi and Swann (2001), the first factor appears to represent an assessment of self competence. For example, responses to question two (You feel that you're a person of worth at least equal to others) could be interpreted as an assessment of one's competence in terms of financial resources. Question three (You are able to do things as well as most other people) could be viewed as measuring the

Model	Standardized (standard er	d coefficients ror)		Model fit statistics						
	B <sub>1-Factor</sub>	$\beta_{COMP}$	$\beta_{\rm LIKE}$	$R^2$	$\chi^2(df)$	р	RMSEA	CFI	SRMR	
SE	-0.23 (.06)	_	-	5.2	344 (19)	<.001	.10	.99	.07	
COMP	-	-0.08 (.11)	_	0.1	14 (4)	.007	.04	1.0	.02	
LIKE	_	-	-0.36 (.09)	12.7	7 (4)	0.16	.02	1.0	.01	
COMP and LIKE	_	0.57 (.12)	-0.81 (.17)	24.2	42 (17)	<.001	.03	1.0	.02	
COMP and LIKE (constrained to be equal)		-0.12 (.03)	-0.12 (.03)	5.2	73 (18)	<.001	.04	.99	.05	

Table 6 Examining the relationship between dimensions of self esteem and anxiety

All loadings and standardized coefficients are significant (p<.05)

SE self esteem; COMP competence, LIKE liking, RMSEA root mean square error of approximation, CFI comparative fit index, SRMR standardized root mean residual

Model	Standardi (standard	zed coefficien error)	nts	Model fit statistics							
	$\beta_{1-Factor}$	$\beta_{COMP}$	$\beta_{LIKE}$	$R^2$	$\chi^2(df)$	р	RMSEA	CFI	SRMR		
SE	.52 (.04)	_	_	26.6	316 (14)	<.001	.11	.99	.08		
COMP	- ` ´	.32 (.04)	_	10.3	4.95 (2)	.08	.03	1.0	.02		
LIKE	_	-	.63 (.03)	39.7	11.32 (2)	.003	.05	1.0	.02		
COMP and LIKE	_	-0.53 (.11)	1.05 (.10)	49.4	31 (12)	.002	.03	1.0	.03		
COMP and LIKE (constrained to be equal)		.27 (.02)	.27 (.02)	26.4	80 (13)	<.001	.05	.99	.06		

Table 7 Examining the relationship between dimensions of self esteem and happiness

All loadings and standardized coefficients are significant (p < .05)

SE self esteem; COMP competence, LIKE liking, RMSEA root mean square error of approximation, CFI comparative fit index, SRMR standardized root mean residual

respondent's current ability to perform specific actions. Question one (You feel that you have a number of good qualities) is somewhat more difficult to interpret. However, one could imagine that the phrase "number of good qualities" leads respondents to consciously review, rate and crudely count specific qualities they believe they possess. What appears to tie the items together is the requirement of individuals to assess or rate somewhat specific competencies (for example, the number of good qualities, the ability to do things and their sense of financial worth).

In contrast to the first factor, the second appears to represent the individual's overall internalized sense of self liking or satisfaction. For example, both question five (On the whole you are satisfied with yourself) and question six (All in all, you're inclined to feel you're a failure) explicitly emphasize the global nature of the required ratings. Although some researchers categorize responses to question six as an assessment of competency (Tafarodi and Swann 2001), the global nature of this internally oriented rating of feeling like a failure may be more driven by internal self liking.

The two factor model examined in this study is supported by the results of several investigations of the factor structure of the ten item version of the Rosenberg Self Esteem Scale. In a study examining data from 1644 adult participants in a general population survey, Dunbar et al. (2000) compared the fit of a single factor model, a two factor model composed of positively and negatively oriented factors, a single factor model with all error terms associated with negatively worded items allowed to correlate, and a single factor model with all error terms associated with positively worded items allowed to correlate. The single factor model with all error terms associated with positively worded items allowed to correlate was the best fitting model (Dunbar et al.).

More recently, Aluja et al. (2007) examined the fit of a similar set of factor models for a French version of the ten item Rosenberg Self esteem Scale in a sample of 447 university students. They found that single factor models that included correlated errors among positively worded items provided the best fit to the data and that the fit was substantially better than models without correlated error terms (Aluja et al.). Some authors have interpreted the need for correlated errors as evidence of a method effect related to item wording (e.g., Marsh 1996). However, we suggest that the need to include correlated error terms may also be interpreted as indicating that additional dimensions of self esteem are present among the items with correlated errors (Hayduk et al. 1995).

The correlations between the self-competency and self liking factors and happiness, negative affect and anxiety were examined to gather additional support for the uniqueness of the two factors. Despite having 64% of variance in common, the factors had substantially different correlations with ratings of happiness (competence=0.32; liking=0.63), negative affect (competence=-0.21; liking=-0.54) and anxiety (competence=-0.08; liking=-0.36). Although question six of the self liking factor could be considered an indicator of negative affect, anxiety and to a lesser extent happiness, it had the lowest standardized loading of the three items associated with the self liking factor. This suggests that the self liking factor interpretation should not be determined primarily by this item but rather by a latent concept common to all three indicators.

The last component of this study compared the predictive power associated with using a single versus two dimensional representation of the Rosenberg Self esteem Scale to predict negative affect, anxiety and happiness. Evidence of increased predictive power was found for the two factor model. The self liking factor consistently explained substantially more variance in the outcomes than did either the original six item single factor model or the self competence factor alone. However, when both self liking and self competence were included simultaneously in the regression model, the size of the standardized coefficient for self liking increased, the sign of the standardized coefficient for self competence changed to a direction incompatible with existing theory, and the overall model  $R^2$  increased. This pattern suggests the presence of a suppressor effect.

Suppression is generally indicated when a  $\beta_i$  coefficient falls outside the limits defined by  $r_{Yi}$  and 0 (Cohen and Cohen 1975). More specifically, net suppression is the situation whereby the correlation between the outcome and suppressor is less than the product of the correlation between the outcome and predictor multiplied by the correlation of the predictor and suppressor (assuming all correlations are positive). Additionally, if a  $\beta_i$  is of opposite sign from its  $r_{Yi}$ , as was the case for self competence, then this variable is serving as a net suppressor (Cohen and Cohen 1975). Additionally, a standardized coefficient exceeded 1.0 in the regression model when self liking and self competence were included simultaneously (for both happiness and negative affect). Cohen and Cohen (1975) demonstrated that while r may never exceed the limits of +1.0 and -1.0, under conditions of suppression  $\beta$ 's may do so. The results of the latent variable regressions met all three of the aforementioned criteria and thus suggest that self competence may function as a suppressor variable.

In spite of its positive correlation with the outcome, the function of a suppressor in a multiple regression model is primarily in suppressing a portion of the variance of the other predictor that is irrelevant to (uncorrelated with) the outcome (Cohen and Cohen 1975). Although the negative partial coefficients will always be associated with the initially smaller validity coefficient, the phenomenon is symmetrical. The decision regarding which variable to interpret as a suppressor should therefore be based on theory. In this study, it seems reasonable to conclude that the self competence factor is suppressing irrelevant variance in the self liking factor when predicting the outcome. Higher scores on the self liking factor imply higher levels of happiness and lower levels of anxiety and negative affect.

One explanation for this suppressor effect is that self competence and self liking are stable, correlated but unique traits representing two different facets of self esteem. When examining the relationship between self esteem and depression, self liking is a stronger predictor than self competence in terms of the variance explained. However, when both self competence and self liking are modeled together, self competence suppresses variance in common with self liking that is irrelevant to the prediction of depression. This increases the predictive power of the model. A hypothetical scenario producing such an effect might be that self competence and self liking are both determined to some extent by early childhood experiences. Depression and self liking are both determined in part by a common biological predisposition that is also established in early childhood. Use of self liking alone in a regression model predicting depression yields a sizable amount of variance explained because self liking and depression have a biological connection. However, when self competence is introduced into the model, it suppresses the common variance it shares with self liking that was due to early childhood experiences because the variance associated with early childhood experience in self liking is not related to depression.

Another explanation for the functioning of self competence as a suppressor comes from recent research work by Clark et al. (2003). They examined the relationship between personality measures and depression and concluded that many personality assessments tap both state affect and trait specific variance. With regard to the specific relationship between personality assessments and depression, Clark et al. reported that state-affect variance masked trait related variance in depressed patients. Although their research did not directly address the concept of self esteem, previous research has suggested that the concept of self esteem is strongly related to, and may to some extent be subsumed within higher order personality traits with a strong affective component such as extraversion and neuroticism (Judge et al. 2002; Robins et al. 2001). In this scenario, self competence might be considered a labile state that suppresses common state-related variance in self liking that is unrelated to depression. In this way the remaining trait-related variance in self liking that predicts depression gains predictive power.

### Conclusion

The nested confirmatory analyses presented in this study suggest that the six item Rosenberg Self Esteem Scale included in the National Population Health Survey measures two correlated dimensions. The first dimension appears to represent a measure of self competence while the second is interpreted as a measure of self liking. Subsequent tests of predictive power and discriminant validity supported this two factor interpretation. Self liking had substantially larger correlations with measures of happiness, negative affect and anxiety. In addition to differing correlations, latent variable regressions indicated that self competence consistently suppressed some variance in self liking when modeled to predict happiness, negative affect and anxiety. Although suppressor effects are rarely published, Maassen and Bakker (2001) demonstrated, that the probability of their occurrence is relatively high in latent variable models when the suppressed variable is corrected for measurement error. From a theoretical perspective, Collins and Schmidt (1997) found clear support in multiple studies involving personality domains for the existence of stable and consistent suppressors. They concluded that suppressor variables not only enhanced prediction but that our understanding of certain concepts might improve by examining what the invalid variance components are that are being partitioned out.

Given that the results of this study are preliminary and have yet to be replicated, self esteem researchers are advised to consider testing the performance of a two factor model defined by self liking and self competence. Although there was no evidence of multicollinearity (i.e., variance inflation factors <2.0) in the parallel non-SEM linear regression models, the high correlation between the latent factors suggests that multicollinearity may influence their usefulness when predicting outcomes other than those examined here. In situations where multicollinearity is suspected, the researcher is advised to model the factors separately rather than combine them into a single global self esteem measure. If researchers are using structural equation modeling in their analyses and they require a single measure of global self esteem, then they are advised to model a single second order factor (representing global self esteem) that predicts the first order factors of self competence and self liking.

Although the confirmatory factor analyses and tests of discriminant validity provide clear support for a two dimensional structure for the six items Rosenberg Self Esteem Scale included in the National Population Health Survey, it is important to note that the results do not necessarily apply to the full version of the scale. Further research is needed to replicate the confirmatory factor analyses results using all ten Rosenberg Self Esteem Scale items and to confirm the existence of the suppressor phenomenon. If confirmed, the accurate description and modeling of the suppressor effect presented in this study has the potential to enhance our understanding of the relationships between self esteem, anxiety, depression and happiness.

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