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Scale- and Item-Level Factor Analyses of the VIA Inventory of Strengths

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Abstract

The VIA Inventory of Strengths (VIA-IS) has emerged as the primary instrument for gauging individual strengths and virtues. Prior studies have generated inconsistent results concerning the latent structure of the VIA-IS. The present study attempted to address some of these inconsistencies. VIA-IS results from a large sample (N = 458,998) of U.S. adults who completed the inventory online were subjected to a series of principal components and factor analyses. The sample was 66.46% female with a mean age of 34.36 years (SD = 14.13 years) and consistent with the general U.S. population in terms of geographic distribution. Information on ethnicity was not available. The size of the sample permitted both scale- and item-level analyses. The scale-level analyses produced findings similar to those of previous studies, but raised concerns about multidimensionality in the scales. Item-level analyses suggested an alternate set of 24 scales, 20 of which overlapped substantially with existing VIA-IS scales. A second-order analysis suggested five factors, including a new one labeled Future Orientation, versus the original six virtues proposed in the development of the VIA-IS. The results were used to speculate about elements of a second-generation model of strengths.

Keywords

VIA Inventory of Strengths, personal strengths, virtues, positive psychology

In recent years, interest in positive psychology in general, and in understanding the nature of strengths and virtues in particular, has exploded (e.g., Park & Peterson, 2009; Seligman, Steen, Park, & Peterson, 2005). Research on the latter topic has been aided by the development of the VIA Inventory of Strengths (VIA-IS; Peterson & Seligman, 2004),[1] which represents the dominant measurement instrument for the study of personal strengths. Peterson and Seligman initially identified six virtues that they found were common to the world's most influential cultural traditions, including Confucianism and Taoism from China; Buddhism and Hinduism from the Indian subcontinent; and Judeo-Christianity, Athenian Greece, and Islam from the West. They also identified 24 character strengths representing specific aspects of the virtues. The list of strengths and their descriptions was the product of a rigorous 3-year developmental process that involved input from more than 50 scholars and clinicians, extensive brainstorming, reviews of historical lists of virtues, and examination of popular literature and media (N. Mayerson, personal communication, June 23, 2011). The hierarchical model generated from this process is summarized in Table 1.

Using this model as their starting point, Peterson and Seligman (2004) developed the VIA-IS, a 240-item self-report instrument consisting of 24 scales representing the character strengths, each composed of 10 items. Items are completed on a 5-point scale from *very much like me* to *very much unlike me*. All items are keyed in the same direction, so that *very much like me* is always associated with more of the strength. Studies of the VIA-IS scales have been conducted demonstrating adequate internal reliability, test–retest reliability, and validity as gauged using ratings by significant others and indicators of well-being (Park, Peterson, & Seligman, 2004; Peterson & Seligman, 2004; Ruch et al., 2010). Though the original model guided the development of the VIA-IS instrument, the authors were aware that a different latent variable model might more accurately describe relationships among the strength scales (Peterson & Seligman, 2004). It is important to note that the term *VIA-IS* has been applied both to a hypothesized model inventorying strengths as outlined in Table 1, and to a multiscale inventory that was initially developed on the basis of that model.

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Table 1. The VIA Inventory of Strengths Model.

Virtues	Character Strengths
Wisdom and Knowledge	Creativity (originality, ingenuity)
	Curiosity (interest, novelty-seeking, openness to experience)
	Judgment and Open-Mindedness (critical thinking)
	Love of Learning
	Perspective (wisdom)
Courage	Bravery (valor)
	Perseverance (persistence, industriousness)
	Honesty (authenticity, integrity)
	Zest (vitality, enthusiasm, vigor, energy)
Humanity	Capacity to Love and Be Loved
	Kindness (generosity, nurturance, care, compassion, altruistic love, "niceness")
	Social Intelligence (emotional intelligence, personal intelligence)
Justice	Teamwork (citizenship, social responsibility, loyalty)
	Fairness
	Leadership
Temperance	Forgiveness and Mercy
	Modesty and Humility
	Prudence
	Self-Regulation (self-control)
Transcendence	Appreciation of Beauty and Excellence (awe, wonder, elevation)
	Gratitude
	Hope (optimism, future-mindedness, future orientation)
	Humor (playfulness)
	Religiousness and Spirituality (faith, purpose)

Note. Terms in parentheses are variants of the character strength according to Peterson and Seligman (2004).

Seven studies have now been conducted evaluating the latent structure of the 24 VIA-IS scales using exploratory factor analytic techniques (e.g., Brdar & Kashdan, 2010; Peterson, Park, Pole, D'Andrea, & Seligman, 2008). There were some notable similarities in the findings (see Table 2). Six studies identified a set of interpersonal or sociability strengths, usually involving some combination of Kindness, Leadership, and/or Teamwork. There was a reliable tendency for the strengths of Gratitude, Spirituality, Appreciation of Beauty, and Hope to converge. An intellectual or cognitive strengths factor was noted in five studies, with Love of Learning, Curiosity, and Creativity emerging as consistent markers. There was also a common factor variously referred to as restraint or caution that tended to load highly on Self-Regulation, Perseverance, Prudence, and Perspective.

However, differences in the results across studies were also notable. The number of factors retained varied between three and five, and there was substantial variability in the contents of and labels applied to the factors. These variations may in part reflect cultural issues, since the seven studies were completed in six different nations.[2] There were also a number of methodological differences across studies. These include variations in the methods used to determine the number of factors to retain, the factor analytic method, and the criterion for considering a structure coefficient meaningful.

One other factor that could contribute to instability in factor solutions is multidimensionality in the scales themselves. Examination of the character strength labels provided in Table 1 demonstrates the issue. The strength Teamwork is intended to encompass the very disparate concepts of good citizenship, a sense of social responsibility, and feelings of loyalty. Appreciation of Beauty also encompasses a sense of awe or wonder. The inclusion of items in a scale reflecting multiple facets of character strength results in multidimensional scales on which the latent variables underlying the instrument can vary in their loadings. Although it is true that Peterson and Seligman (2004) demonstrated adequate reliability for the VIA-IS scales, statistical reliability is not a sufficient indicator of statistical unidimensionality (Schmitt, 1996).

Findings from a recent study provide possible support for this conjecture. Noftle, Schnitker, and Robins (2011) described the failure to corroborate any latent structural model of the VIA-IS via confirmatory factor analysis (CFA). They considered several possible causes for this finding but omitted the most likely: the existence of what

Table 2. Summary of Prior Exploratory Factor Analytic Research on the VIA Inventory of Strengths Instrument.

	Brdar and Kashdan (2010)	Peterson, Park, Pole, D'Andrea, and Seligman (2008)	Macdonald, Bore, and Munro (2008)	Ruch et al. (2010)	Singh and Choubisa (2010)	Shryack, Steger, Krueger, and Kallie (2010)	Littman-Ovadia and Lavy (2012)
Sample	881 Croatian students	1,739 web completers	123 Australian students	1,674 Germans	123 Indian students	332 American twins	635 Israelis
Factor retention	MAP, interpretability	Kaiser	Kaiser, interpretability	Kaiser	Kaiser	PA, Scree, saturation	Kaiser, Scree
Factor extraction	ML, promax rotation	PCA, varimax rotation	PCA, varimax rotation	PCA, varimax rotation	PCA, varimax rotation	PCA, varimax rotation	PCA, varimax rotation
Factor 1	*Interpersonal*	*Interpersonal*	*Positivity*	*Emotional Strengths*	*Civic Strengths*	*Agency/Self-Assuredness*	*Strengths of Restraint*
	Fairness	Humor	Teamwork	Zest	Honesty	Creativity	Judgment
	Teamwork	Kindness	Love	Hope	Fairness	Curiosity	Perspective
	Kindness	Leadership	Hope	Bravery	Prudence	Perspective	Bravery
	Forgiveness	Love	Humor	Humor	Leadership	Judgment	Perseverance
	Love	Social IQ	Zest	Love	Teamwork	Learning	Self-Regulation
	Modesty	Teamwork	Leadership	Social IQ	Modesty	Bravery	Honesty
	Leadership					Zest	Prudence
	Gratitude					Social IQ	
	Beauty					Beauty	
						Hope	
Factor 2	*Fortitude*	*Fortitude*	*Intellect*	*Interpersonal Strengths*	*Self-Assurance Strengths*	*Sociability*	*Intellectual Strengths*
	Perspective	Bravery	Creativity	Leadership	Perseverance	Kindness	
	Judgment	Honesty	Beauty	Teamwork	Self-Regulation	Love	Learning
	Creativity	Judgment	Curiosity	Kindness	Hope	Leadership	Curiosity
	Social IQ	Perseverance	Learning	Forgiveness	Spirituality	Fairness	Creativity
	Bravery	Perspective	Social IQ	Fairness	Zest	Teamwork	Zest
		Self-Regulation	Perspective	Modesty		Forgiveness	
	Learning		Bravery			Gratitude	
						Humor	
Factor 3	*Vitality*	*Cognitive*	*Conscientiousness*	*Strengths of Restraint*	*Interpersonal Strengths*	*Conscientiousness*	*Emotional Strengths*
	Zest	Beauty	Self-Regulation	Prudence	Humor	Perseverance	Love
	Hope	Creativity	Perseverance	Perseverance	Social IQ	Honesty	Kindness
	Curiosity	Curiosity	Judgment	Self-Regulation	Bravery	Self-Regulation	Social IQ
	Humor	Learning	Honesty	Honesty	Kindness	Prudence	Leadership
			Prudence	Perspective		Modesty	Humor
Factor 4	*Cautiousness*	*Transcendence*	*Niceness*	*Intellectual Strengths*	*Intellectual Strengths*		*Interpersonal Strengths*
	Prudence	Gratitude	Modesty	Learning	Creativity		Teamwork
	Self-Regulation	Hope	Fairness	Creativity	Curiosity		Fairness
	Perseverance	Spirituality	Kindness	Curiosity	Learning		Forgiveness
	Spirituality	Zest	Forgiveness	Judgment	Judgment		Modesty
	Honesty		Spirituality		Perspective		
			Gratitude				
Factor 5		*Temperance*		*Theological Strengths*	*Theological Strengths*		*Theological Strengths*
		Fairness		Spirituality	Gratitude		Spirituality
		Forgiveness		Gratitude	Love		Gratitude
		Modesty		Beauty	Beauty		Beauty
		Prudence			Forgiveness		Hope

Note. Some studies presented several models, but the summary is restricted to what seemed to be the authors' preferred model. Factor retention refers to the strategy used to determine the number of factors to retain for the model listed here. MAP = minimum average partial method; Kaiser = the Kaiser criterion (eigenvalue > 1.0); PA = parallel analysis; saturation refers to retaining factors if >2 loadings are highest for that factor; Scree = Scree test. Factor extraction refers to the method used to determine the factor structure; ML = maximum likelihood factor analysis; PCA = principal components analysis; Social IQ = social intelligence. Factors are labeled and strengths ordered as per the original publications.

will be referred to as secondary loadings, that is, structure coefficients large enough to be considered substantial but smaller than the largest, primary, loading for that variable. CFA typically involves setting all but one loading for each manifest variable to zero. If the manifest variables demonstrate substantial secondary loadings, no model is likely to meet standard CFA criteria for accuracy of fit. This explanation has been previously identified as a central problem for the application of CFA to the NEO Personality Inventory–Revised, which is similarly characterized by multiple secondary loadings (McCrae, Zonderman, Costa, Bond, & Paunonen, 1996).

The present study attempted to put some of the outstanding questions concerning the latent structure of the VIA-IS instrument to rest. It is unique in several ways. First, it uses a very large sample compared with prior studies. Second, because of the large sample size it was possible to evaluate the latent structure of the instrument at both the scale and item levels to determine whether the findings are consistent at the two levels.

Method

Participants

The sample used for this study consisted of 458,998 adults who completed the VIA-IS instrument online between 2005 and 2008 at the Authentic Happiness website, or between 2008 and 2011 at the VIA Institute on Character website. The sample was restricted to respondents who identified their location as the United States. The sample was 66.46% female with a mean age of 34.36 years (SD = 14.13 years). For respondents who provided zip codes, the proportion of the sample representing each of the nine geographic divisions of the United States defined by the Census Bureau was compared with the actual proportion of the population in each division in 2009. Though the sample proportions differed significantly from the population proportions, $\chi^2(df = 8, N = 457{,}601) = 25{,}749.94$, $p < .0001$, a finding that was not unexpected given the sample size, none of the sample proportions differed from the corresponding population proportion by more than 4.5%. Because the websites collect data from other countries where American conceptions of ethnicity are not relevant, information on ethnicity was not collected.

Procedure

Neither the Authentic Happiness nor the VIA Institute website actively recruits visitors. However, the sites are commonly mentioned in discussions of positive psychology written for the general public, and the former site is the official website of Martin Seligman. The number of site hits in the past 6 years is in the millions. Those who complete the inventory receive basic feedback about their strengths and virtues. It is possible that some individuals did not approach test taking seriously, but given the length of the instrument, their self-referral to the site, and the size of the sample, it is assumed that this represents a relatively minor threat to the accuracy of the results.

McGrath and Walters (2011) raised concern about the widespread practice of using structural modeling techniques that assume a categorical or dimensional latent model without first ensuring whether the data are better fit using a categorical or dimensional model. A prior study evaluated this question using a subset of the current sample (McGrath, Rashid, Park, & Peterson, 2010). Both taxometric analyses and cluster analytic methods suggested that a dimensional latent model demonstrated better fit than a categorical latent model for the VIA-IS scales, justifying the application of factor analytic procedures to these data.

The sample was randomly divided in two groups of 229,499 for purposes of exploratory and confirmatory analyses. Prior studies of the VIA-IS factor structure have generally used principal components analysis (PCA) with varimax rotation. Both of these practices have come under criticism in recent years (e.g., Bandalos & Boehm, 2008; Fabrigar, Wegener, MacCallum, & Strahan, 1999). In an attempt to address these concerns while evaluating comparability with previous findings, analyses were repeated using PCA and principal axis factor (PAF) analysis, with both varimax and promax rotation (power = 4).

Two methods that have proven particularly effective were used to determine the number of factors to retain (Hayton, Allen, & Scarpello, 2004; Velicer, 1976; Velicer, Eaton, & Fava, 2000; Wood, Tataryn, & Gorsuch, 1996). Parallel analysis (PA) involved creating 100 random data matrices with the same number of variables and cases as the raw data matrix. The true data matrix and each of the random data matrices were then submitted to PCA without rotation. For a component to be retained, the eigenvalue for the data matrix had to exceed 95% of the random matrix eigenvalues for the same component (Glorfeld, 1995). For example, if the eigenvalue for the fourth component in the data matrix exceeded 95% of the fourth eigenvalues for the random matrices, but the eigenvalue for the fifth component was not as large as 95% of the fifth component eigenvalues based on random data, then PA would suggest retaining four factors.

The minimum average partial procedure (MAP) involved sequentially partialing each PCA component from the data correlation matrix and computing the mean value for the resulting squared partial correlation matrix. Partialing a true component reduces common variance, so the mean should decline; when the component instead removes unique variance, the mean of the partial correlations should increase. Extraction stops when the mean squared partial correlation reaches a local minimum. Velicer et al. (2000) concluded that the procedure's accuracy could be improved by raising

the average partial correlation to the fourth rather than the second power.

Both PA and MAP analyses were conducted using SAS macros developed by O'Connor (2000). O'Connor's MAP macro provides estimates of the number of factors after raising the average partial correlation to both the second and fourth powers, so there were three separate tests of the number of components available across the two procedures.

Pilot testing with a random subsample produced inconsistencies in the outcome across the three tests for the item-level data. To address this problem, 20 random subsamples of 23,000 cases were randomly selected without replacement and the tests were conducted for each subsample.

Across analyses, the standard used to identify meaningful loadings was varied to maximize interpretability of and coherence in the findings. The choice of labels for components and scales was biased toward terms used previously, either by Peterson and Seligman (2004) or in earlier research on the factor structure of the VIA-IS, to enhance comparability. However, variations in the meaning of the components and scales are discussed when relevant.

Results

Scale-Level Analyses

Given that previous studies have varied in the number of factors retained, and given the results reported below for the item-level analyses, the degree of consistency in the outcomes for factor retention at the scale level was striking. All 60 tests of the number of components (three tests across 20 subsamples) suggested five factors. In the U.S. population it would seem a five-factor solution is most appropriate for the original VIA-IS scales. It is noteworthy that this was also the most common outcome for the studies reviewed in Table 2.

Consistency between results from the PAF with promax rotation and other analytic methods was evaluated using the intraclass correlation (ICC) 3,1 statistic with absolute agreement (Shrout & Fleiss, 1979). Specifically, three ICCs were computed for each of the five PAF–promax factors: one with the loadings from the PCA–varimax solution, one with the pattern matrix loadings from the PCA–promax solution, and one with the loadings from the PAF–varimax solution. ICCs were also computed between the structure matrix loadings from the PAF–promax factors and the loadings from the PCA–varimax solution, the structure matrix loadings from the PCA-promax solution, and the loadings from the PAF–varimax solution. The result was 30 ICCs (six ICCs for each of five PAF–promax factors) indicating convergence across solutions.

There was some reordering of latent variables across analyses: Factor 2 from PAF clearly converged with Component 1 from PCA and vice versa, and the same occurred for Factors 4 and 5. With these caveats, results indicated substantial convergence. The mean ICC was .84 (SD = .12). Though interpretation of the findings is based on the results from the PAF–promax analysis, these statistics indicate that the conclusions would have been similar regardless of which analysis was used, including PCA with varimax rotation as used in prior studies.

It was therefore not surprising to find substantial overlap with components described in previous studies (see Table 3). Factor I mirrored what previous researchers have referred to as interpersonal strengths or sociability, with large structure matrix loadings on Fairness, Kindness, and Teamwork. Factor II overlapped with what has been described as an emotional strengths factor, associated with the Social Intelligence, Humor, and Bravery scales. Factor III largely replicated the previously identified Restraint factor, though Perspective demonstrated its strongest relationship with the emotional factor rather than with restraint. Factor IV was consistent with the previously described theological strengths factor after excluding Appreciation of Beauty, and Factor V with the intellectual or cognitive factor. The mean correlation between factors was .39 (SD = .11), suggesting that the factors are not trivially related to each other and raising questions about the use of orthogonal rotation methods with the VIA-IS.

The labels suggested for the factors are problematic, in that they imply a level of coherence within the scales not reflected in the loadings. As was true in prior studies, some of the relationships are unintuitive, for example, the convergence of Bravery with Humor and Social Intelligence is not consistent with the commonplace understanding of these constructs. All four solutions also resulted in a number of secondary loadings that were sizable. An additional 22 structure coefficients were ≥.50. This number increased to 46 using the more common and liberal criterion of .40. These findings support concerns raised earlier about the effect of scale multidimensionality on VIA-IS factor structure, and suggest the value of an item-level analysis of inventory structure.

Item-Level Analyses

Because of missing item data, 22 cases from the exploratory analysis sample were omitted from the item-level analyses. The factor retention tests at the item level demonstrated somewhat more variability than was found at the scale level. MAP tests with observed correlations suggested a range of solutions from 27 to 32 factors with a mean of 29.3. Out of 20 subsamples, 19 PA tests suggested 30 factors while one suggested 31. Taking these results in combination, a 30-factor model was analyzed initially.[3]

Though the scale-level analyses focused on factor loadings ≥.50, the diversity of the item set resulted in many items on which none of the factors loaded at this level. An item

Table 3. Scale-Level Factor Labels With Pattern and Structure Matrix Loadings.

	Interpersonal		Emotional		Restraint		Theological		Intellectual	
	Pattern	Structure	Pattern	Structure	Pattern	Structure	Pattern	Structure	Pattern	Structure
Fairness	**0.76**	**0.82**	0.10	0.47	0.07	0.44	−0.11	0.36	0.14	0.39
Kindness	**0.63**	**0.75**	0.31	*0.57*	−0.13	0.28	0.10	*0.54*	−0.04	0.27
Teamwork	**0.61**	**0.74**	0.21	0.49	0.09	0.39	0.14	*0.51*	−0.23	0.10
Modesty	**0.61**	**0.58**	−0.33	0.06	0.35	0.42	−0.01	0.15	−0.07	0.06
Leadership	**0.54**	**0.73**	0.42	*0.65*	0.05	0.44	−0.02	0.48	−0.04	0.32
Forgiveness	**0.53**	**0.62**	−0.09	0.33	0.03	0.29	0.17	0.41	0.16	0.32
Social IQ	0.12	0.43	**0.75**	**0.78**	0.01	0.37	0.00	0.49	−0.07	0.32
Humor	0.18	0.40	**0.66**	**0.65**	−0.24	0.13	0.12	*0.50*	−0.10	0.21
Bravery	−0.11	0.28	**0.64**	**0.73**	0.16	0.44	0.07	0.46	0.05	0.39
Creativity	−0.17	0.14	**0.60**	**0.64**	−0.03	0.27	−0.10	0.27	0.39	*0.58*
Perspective	0.04	0.43	**0.54**	**0.74**	0.30	*0.60*	−0.03	0.43	0.15	*0.50*
Prudence	0.37	*0.53*	−0.30	0.21	**0.68**	**0.72**	0.00	0.19	0.08	0.26
Perseverance	−0.11	0.33	0.15	*0.52*	**0.67**	**0.72**	0.32	0.49	−0.16	0.17
Self-Regulation	−0.02	0.34	−0.02	0.41	**0.62**	**0.67**	0.30	0.42	−0.05	0.21
Judgment	0.10	0.38	0.25	*0.52*	**0.49**	**0.68**	−0.27	0.15	0.35	*0.58*
Honesty	0.32	*0.58*	0.29	*0.57*	**0.43**	**0.65**	−0.01	0.39	−0.11	0.25
Zest	−0.11	0.39	0.28	*0.71*	0.14	0.42	**0.62**	**0.80**	0.10	0.41
Hope	−0.07	0.41	0.21	*0.66*	0.29	*0.51*	**0.61**	**0.77**	−0.02	0.31
Gratitude	0.37	*0.66*	−0.07	*0.52*	−0.01	0.32	**0.56**	**0.74**	0.21	0.43
Spirituality	0.19	0.44	−0.15	0.35	0.12	0.30	**0.54**	**0.59**	0.10	0.26
Love	0.31	*0.54*	0.29	*0.56*	−0.13	0.20	**0.37**	**0.63**	−0.04	0.24
Learning	−0.05	0.19	−0.10	0.32	0.05	0.26	0.07	0.22	**0.81**	**0.78**
Beauty	0.28	0.43	−0.03	0.37	−0.20	0.13	0.15	0.37	**0.59**	**0.63**
Curiosity	−0.07	0.32	0.21	*0.63*	−0.02	0.32	0.32	*0.56*	**0.56**	**0.72**

Note. Factor labels are drawn from previous studies, but do not necessarily reflect the best names for each. Social IQ = Social Intelligence. Boldfaced values represent primary loadings as defined in the text. Secondary loadings ≥.50 are italicized.

was considered "meaningfully" associated with a factor when the PAF–promax factor pattern loading was the highest for that item and the factor structure loading was ≥.30.

The set of factors retained for interpretation was reduced further using the following criteria. Three factors were meaningfully related to less than three items. Second, examination of ICCs and overlap in the set of items meaningfully related to the factor revealed three more factors that were not reliable across the PCA and PAF analyses. These criteria reduced the final set of 24 factors that were considered stable and interpretable. Using the same sets of comparisons described for the scale-level analyses, the mean ICC for the item-level PAF–promax factors was .89 (*SD* = .11). However, there was substantial reordering of the factors across PCA and PAF solutions. Only six factors occupied the same cardinal position across all solutions.

Using items meaningfully related to the factor, Table 4 provides the labels, item numbers, and reliability for the new scales. All reliability estimates exceeded the commonly accepted standard of .60 for minimum acceptable reliability (Landis & Koch, 1977; Shrout, 1998) except for one. Out of 240 items, 27 items were not included in the scoring of any of the 24 new scales.

There are not only some notable similarities with but also notable differences from Table 1. To highlight the similarities, 21 original scale names were retained when a sizable portion of the items comprising a new scale came from one original scale. With the exception of Creativity, none of the new scales matched the original scales exactly in content. For example, the new Perspective scale included several items from the original Judgment and Honesty scales, whereas the new Honesty scale also included some items from the original Prudence scale. The new Love of Learning scale included some of the original Curiosity items. The new Curiosity scale consisted exclusively of items from the original scale having to do with the capacity to keep one's self occupied, suggesting the original Curiosity item set focused excessively on this correlate of being a curious person. The same concern can be raised about the new Self-Regulation scale, which consisted exclusively of items from the original scale, but only those items having to do with healthy personal habits such as exercise. One of the more

Table 4. Labels, Scoring Keys, Overlap With Original Scales, and Alpha Coefficients for New Scales.

Label	Items	Overlap	α
Positivity[a]	19, 30, 43, 47, 54, 67, 95, 115, 119, 143, 163, 187, 191, 193, 210, 211, 214, 215, 235	—	.91
Perseverance	8, 32, 56, 63, 71, 80, 104, 128, 152, 176, 183, 200, 224	10	.90
Kindness	10, 14, 34, 58, 77, 82, 106, 130, 138, 178, 197, 203, 226	8	.84
Creativity	4, 28, 52, 76, 100, 124, 148, 172, 196, 220	10	.89
Forgiveness	24, 48, 72, 96, 107, 120, 144, 168, 192, 216, 240	10	.87
Spirituality	20, 44, 66, 68, 116, 140, 164, 188, 212, 236	9	.91
Modesty	21, 45, 69, 93, 141, 153, 165, 189, 202, 213, 237	9	.83
Perspective	78, 88, 99, 102, 150, 158, 174, 198, 201, 219, 222, 225	6	.85
Beauty	17, 65, 89, 113, 137, 161, 185, 209, 233	9	.86
Judgment	3, 27, 51, 64, 75, 123, 136, 147, 171, 195, 208	8	.85
Bravery	7, 55, 79, 81, 103, 127, 129, 133, 177, 199	6	.82
Humor	22, 46, 70, 94, 118, 142, 166, 190, 238, 239	9	.87
Love of Learning	1, 23, 26, 50, 73, 74, 97, 98, 121	4	.86
Receptivity[a]	205, 206, 207, 229	—	.76
Intellectual Pursuits[a, b]	2, 122, 146, 170, 194, 217, 218	—	.82
Love	35, 59, 83, 131, 155, 179	6	.77
Teamwork	12, 36, 37, 53, 62, 84, 86, 132, 134, 156, 204, 228	7	.82
Self-Regulation	15, 39, 111, 135, 231	5	.71
Future-Mindedness[a]	91, 92, 139	—	.82
Honesty	9, 57, 60, 105, 160, 232	3	.75
Fairness	38, 61, 85, 109, 110, 181	4	.82
Prudence[c]	40, 112, 151(−), 175(−), 184, 223(−)	3	.58
Social IQ	6, 29, 101, 126, 149, 173	4	.71
Curiosity	25, 49, 145, 169	4	.71

Note. Social IQ = social intelligence; Overlap = number of items from the original scale on the new scale.
a. New scale names.
b. Includes six items from the original Love of Learning scale.
c. Includes three negatively keyed items.

interesting findings was that three items from the original Bravery scale were included as negatively keyed items on the new Prudence scale.

Four new scales were not adequately represented in the original VIA-IS model. Positivity emerged as the largest single component. Given that all items on the original VIA-IS scales were keyed positively, it is worth considering whether this is primarily a method factor. That interpretation did not fit the data in several ways, however. First, the factor did not load strongly on most VIA-IS items. Second, although the items used to score the new scale came from multiple original scales (primarily Hope and Zest), they were quite consistent in content. Every item included in the scoring key for Positivity had to do with feelings of enthusiasm, hope, and optimism. It is, therefore, more consistent with the data to suggest that hope and zest for life do not break out as distinct attributes in individuals.

A set of items reflecting Intellectual Pursuits broke out from the Love of Learning scale. More items from the original Love of Learning scale actually fell on the new Intellectual Pursuits scale than on the new Love of Learning scale. However, the Intellectual Pursuits items consistently had to do with activities associated with the acquisition of knowledge. The new Love of Learning scale, which combined items mainly from the original Learning and Curiosity scales, had to do with a claimed desire for learning, so the label seemed more appropriate to the latter. The new Receptivity scale is composed of items from several original scales having to do with openness to the input of others, whereas Future-Mindedness items reflected the tendency to think in terms of the long term.

The final step in the exploratory analysis involved a scale-level analysis of the new 24 scales. Again, MAP and PA tests replicated across the 20 random samples were used to evaluate factor retention. All 20 PA tests suggested five factors, as did the majority of MAP tests using both the second and fourth powers. The mean ICC for the new scale comparisons was .87 (SD = .11), with some variation in factor order again appearing across PCA and PAF.

Table 5 provides pattern and structure matrix loadings for each new scale, with the primary factor association for each scale bolded. The factors largely replicate those associated

Table 5. Second-Order Analysis of New Scales.

	Interpersonal		Emotional		Intellectual		Restraint		Future Orientation	
	Pattern	Structure	Pattern	Structure	Pattern	Structure	Pattern	Structure	Pattern	Structure
Fairness	**0.73**	**0.75**	−0.05	0.34	0.06	0.27	0.12	0.44	−0.08	0.35
Forgiveness	**0.66**	**0.66**	−0.16	0.27	0.17	0.31	−0.09	0.27	0.14	0.42
Kindness	**0.64**	**0.76**	0.41	*0.64*	−0.05	0.26	−0.04	0.36	−0.09	0.44
Receptivity	**0.63**	**0.66**	−0.01	0.32	0.02	0.22	0.10	0.39	−0.03	0.34
Teamwork	**0.63**	**0.76**	0.24	*0.54*	−0.14	0.18	−0.01	0.37	0.10	*0.52*
Modesty	**0.62**	**0.55**	−0.42	−0.02	0.00	0.09	0.29	0.43	−0.01	0.20
Love	**0.30**	**0.50**	0.22	0.46	−0.05	0.20	−0.08	0.22	0.28	*0.51*
Humor	0.25	0.48	**0.66**	**0.69**	−0.10	0.21	−0.16	0.18	0.03	0.42
Social IQ	0.07	0.46	**0.58**	**0.70**	0.03	0.36	0.26	0.49	−0.04	0.42
Creativity	−0.18	0.23	**0.56**	**0.64**	0.35	*0.56*	0.17	0.37	−0.08	0.31
Bravery	−0.02	0.40	**0.43**	**0.60**	0.02	0.33	0.36	*0.54*	0.07	0.43
Prudence	0.26	−0.02	**−0.55**	**−0.46**	**−0.04**	**−0.20**	0.13	0.00	−0.13	−0.25
Intellectual Pursuits	−0.04	0.15	−0.11	0.20	**0.78**	**0.73**	0.11	0.26	−0.06	0.15
Love of Learning	0.01	0.39	0.25	*0.59*	**0.58**	**0.74**	0.02	0.34	0.17	*0.50*
Beauty	0.29	0.41	0.09	0.39	**0.57**	**0.63**	−0.07	0.22	−0.11	0.25
Curiosity	0.03	0.38	0.07	0.46	**0.43**	**0.59**	0.01	0.31	0.36	*0.56*
Judgment	0.04	0.38	−0.12	0.25	0.21	0.38	**0.70**	**0.74**	0.01	0.29
Perseverance	−0.07	0.42	−0.03	0.37	−0.17	0.14	**0.55**	**0.67**	0.56	*0.66*
Perspective	0.12	*0.53*	0.39	*0.62*	0.00	0.34	**0.50**	**0.69**	−0.02	0.44
Honesty	0.29	*0.54*	−0.10	0.28	−0.08	0.17	**0.48**	**0.62**	0.18	0.44
Positivity	0.12	*0.59*	0.21	*0.66*	0.08	0.42	−0.06	0.36	**0.71**	**0.89**
Future-Mindedness	−0.09	0.32	0.18	0.43	−0.13	0.14	0.16	0.35	**0.55**	**0.61**
Self-Regulation	−0.02	0.27	−0.11	0.21	0.07	0.22	0.25	0.37	**0.39**	**0.43**
Spirituality	0.31	0.48	−0.07	0.30	0.08	0.26	−0.03	0.25	**0.38**	**0.52**

Note. Social IQ = social intelligence. Primary loadings are boldfaced, secondary loadings ≥.50 are italicized.

with the original scales. However, the theological factor has been replaced by one better conceptualized in terms of an orientation toward the future, and characterized by a positive outlook, hopefulness, and an interest in healthy living. The number of additional loadings that exceeded .50 was reduced to 15, whereas 34 loadings were ≥.40, suggesting some improvement in the differentiation of factors than in the original model. The emergence of a negative loading for Prudence on the Emotional factor provides additional evidence of greater differentiation between the scales than was demonstrated in Table 3. The mean correlation between factors was .41 (*SD* = .09).

Confirmatory Factor Analysis

As a final step, three models were evaluated using both the exploratory and confirmatory samples (with 14 cases omitted from new scale analyses because of missing data). The first was the original model presented by Peterson and Seligman (2004) composed of six factors (see Table 1). Note that the model provides no basis for estimating cross-loadings, so only one factor was allowed to load on each of the 24 strength scales. The second model was that described in Table 3, while the third was the latent structure for the new scales described in Table 5.

To maintain consistency with the exploratory analyses, the models were evaluated using *exploratory factor analysis within the CFA framework* (Jöreskog, 1969), which has been suggested as a method for evaluating overall fit for models derived from exploratory techniques (e.g., Vassend & Skrondal, 2011). This involves a CFA model in which (a) one anchor item is selected for each factor on which only that factor is allowed to load, (b) all loadings for other items and covariances between factors are allowed to vary freely, and (c) variances of factors are set to 1.0. For each factor, the item with the largest loading was used as the anchor.

The SAS CALIS procedure was used to estimate parameters and fit. The analyses were conducted for both the exploratory and confirmatory samples. In addition to the familiar goodness-of-fit and adjusted goodness-of-fit indices (Jöreskog & Sörbom, 1999), three commonly recommended fit indices—the comparative fit index, the standardized root mean square residual, and the root mean square error of approximation—were computed (Hu & Bentler, 1998; Marsh, Hau, & Grayson, 2005).

Table 6. Goodness of Fit for Confirmatory Factor Analysis Models.

	Exploratory sample			Confirmatory sample		
	Table 1 model	Table 3 model	Table 5 model	Table 1 model	Table 3 model	Table 5 model
GFI	.67	.87	.91	.67	.87	.90
AGFI	.60	.78	.84	.60	.78	.84
SRMR	.10	.05	.05	.10	.05	.05
RMSEA	.14	.09	.08	.14	.10	.08
CFI	.69	.90	.90	.69	.89	.90

Note. GFI = goodness-of-fit index; AGFI = adjusted goodness-of-fit index; SRMR = standardized root mean square residual; RMSEA = root mean square error of approximation; CFI = comparative fit index. Values for GFI, AGFI, and CFI >.90 and values for SRMR and RMSEA <.08 are considered indications of acceptable fit.

As expected, the original model used in the development of the VIA-IS demonstrated the poorest fit (see Table 6). The Table 3 model, based on factor analysis of the original scales, approached standard criteria for acceptable fit. However, the final model consistently met those criteria except in the case of the adjusted goodness of fit. This pattern was consistent across both samples.

Discussion

The VIA-IS model was a very well-crafted starting point for understanding the structure of strengths and virtues and for developing a measurement instrument, but it was never intended as the endpoint in that process (Peterson & Seligman, 2004). The failure of any study of VIA-IS structure to generate results approximating the original virtue model must raise concerns about the use of this model, at least as a measurement model for strengths. The focus on conceptually complex strengths in that model in particular resulted in the development of multidimensional scales, which has made it difficult to identify an optimal latent model for the instrument.

This is not to say that the new set of scales and latent factors introduced via the item-level analyses is a sufficient basis for a revised model of character strengths and virtues. In particular, it must be remembered that the new model reflects the latent structure for the mix of items that comprises the VIA-IS instrument. Although that mix is likely to have reasonable external validity as a representation of cross-culturally relevant strengths, there is no basis to believe that the inventory developers planned for the distribution of items to reflect the relative importance of different strengths. The new Curiosity and Self-Regulation scales provide examples of the limits of the new model as guidance for revision of the inventory. Instead, the new scales and components generated in this study are best used to draw some conclusions about an optimal revised model of strengths.

One important theme that emerged from this study was the potential independence of items reflecting self-description versus behavior. This was most evident in the emergence of two scales having to do with learning. The new Love of Learning scale consisted of items reflecting a desire to learn and an interest in learning. Intellectual Pursuits on the other hand consisted of actual learning activities such as visiting museums or reading books. Similarly, the new Self-Regulation scale represented a cluster of items reflecting health behaviors rather than a general sense of self-control. These findings suggest that personal identification with a strength need not converge with actions considered representative of that strength. This issue should be seriously considered when rethinking how strengths will be represented in future inventories, particularly if the goal is to enhance the criterion-related validity of the instrument.

Four scales from the original model disappeared completely. The absence of a Leadership scale may well reflect an inherent quality of the construct. Good leadership requires a variety of strengths, including willingness to listen to the opinions of others, social intelligence, and critical thinking. These strengths do not necessarily covary, at least no more than other strengths tend to do. From this perspective, a good leader is someone who happens to be exemplary on a variety of strengths relevant to the role (though the use of the term *happens to be* is not intended to suggest such exemplary status on multiple strengths is necessarily accidental). From a strength-based perspective, potential as a leader may be more effectively predicted based on simultaneous elevation on several scales rather than elevation on any one scale.

Zest and Hope disappeared, with a majority of the items from each scale appearing on the new Positivity scale. This finding suggests insufficient discrimination between the two. Although zest and hope may be conceptually distinct, at the personal level they tend to collapse into an overall sense of a positive attitude. Gratitude is also gone, with most of the items disappearing from the scoring key. This

finding suggests that the original set of items was insufficiently cohesive to survive factor analysis. In fact, the items reflect a variety of facets of gratitude that may not hang together, such as a willingness to express thanks to others, a sense of appreciation about life, and an appreciation of generosity as a personal strength.

Positivity is one of several unexpected scales that merit further consideration for an updated model of strengths, with Receptivity and Future Mindedness representing potentially useful additions to the catalog of strengths as well. It may be the case that high scores on the Positivity scale at times reflect unrealistic positivity rather than appropriate optimism, an argument similar to the one raised earlier about Positivity as a method factor. It is important to remember that the attribution of unrealistic evaluations rests not on whether an individual generates very positive evaluations but rather on whether an individual's evaluations are markedly more positive than those of informed observers (e.g., Colvin, Block, & Funder, 1995), that is, inaccurate positivity is determined by relative rather than by absolute valuation. Accordingly, whether a high-score Positivity is an accurate self-representation or a response bias cannot be addressed without comparative data.

Two of the new scales are particularly problematic as guides for revising the VIA-IS model and instrument. The emergence of a cluster of items from the Curiosity scale that seems to have to do with the ability to keep one's self occupied suggests too strong an emphasis on this aspect of being a curious person, since the capacity for self-occupation need not even indicate a true sense of curiosity. Similarly, the redefinition of Self-Regulation in terms of dedication to healthy habits likely represents an overly specific emphasis in the items selected for inclusion in the original scale.

Although the original VIA-IS model remains a viable basis for understanding cultural conceptions of virtues and strengths, further consideration of what would represent an optimal measurement model is warranted. The present findings offer some interesting suggestions for a second-generation model of strengths. However, factor analysis only takes the process so far. A good deal of conceptual analysis is also needed if these findings are to be used effectively for the development of a new model of positive functioning and a new instrument; previous comments are intended to spur such analysis. It also remains an open question to what extent the self-characterization of strengths is predictive of behavioral tendencies that one would expect to be associated with those strengths. The finding that in several cases self-perception and behavioral aspects of strengths separated into two factors in the present study highlights the importance of criterion-related validation of self-reported strengths.

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Notes

1. VIA originally stood for Values in Action but has since become an orphaned acronym.
2. The study by Peterson et al. (2008) was distinctive in that it used an international sample of individuals completing the instrument online. However, the sample was 72% American, so should be culturally similar to the sample used by Shryack, Steger, Krueger, and Kallie (2010).
3. When setting the number of factors underlying a set of polytomous items, as in the case of the VIA-IS, concerns have been raised about the potential for retaining factors that reflect nothing more than similarities in item difficulties (e.g., Bernstein & Teng, 1989). To evaluate this possibility, the factor retention strategy can be replicated using the matrix of estimated polychoric correlations rather than the observed correlations (Garrido, Abad, & Ponsoda, 2011; Panter, Swygert, Dahlstrom, & Tanaka, 1997). Results for PCAs based on polychoric correlations generated using the SAS polychor macro were consistent with those from the raw data, while MAP mean estimates of the number of components were greater, suggesting that the large number of components retained could not be explained by item distributions.

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