Openness Divides: Factor Structure of the 50-item IPIP

Fae Tahimic, Erin C. Mullally, Marlen Ibarra, Joanne Angosta, and Kimberly A. Barchard

University of Nevada, Las Vegas

Abstract

The International Personality Item Pool (Goldberg, 1992) is a public domain set of personality items that can be used and modified for free. It includes a 50-item measure of the five factor model of personality (Ehrhart, Roesch, Ehrhart & Killian, 2008). The purpose of this research was to examine the factor structure of this test to determine if it has the intended five factors.

The 50-Item Set of IPIP Big-Five Factor Markers (Ehrhart, Roesch, Ehrhart & Killian, 2008) includes 10 items for each of the five dimensions of the model: Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. A total of 304 undergraduate students completed this measure as part of a larger online study in return for course credit. The study was divided into two testing sessions, which each took approximately 90 minutes.

We conducted a principal component analysis with multiple factors. The scree test, parallel analysis, and MAP test all indicated that there are seven factors. We selected the direct oblimin rotation with a delta value of 0, because it was the closest to the ideal of simple structure. The first four factors corresponded to factors from the five factor model. However, we did not recover the Openness factor. Instead, we found separate factors for Creativity, Abstract Ideas, and Vocabulary. Moreover, many items loaded onto multiple factors.

We compared men and women on the seven factors. On average, women obtained significantly higher scores on both Neuroticism and Agreeableness, while men obtained higher scores on Creativity.

The fact that we found seven factors instead of five is troubling. These results cast doubt on the validity of the 50-Item Set of IPIP Big-Five Factor Markers, especially because our research was based upon a relatively large sample size. However, this is only a single study. Future research should replicate these results and should ideally use confirmatory factor analysis to determine if a five- or seven-factor solution fits the data the best. If problems with the test persist, the test should be revised to better match the five factor model and to eliminate cross-loadings.

Introduction

When developing personality assessments, there is often a need to summarize large amounts of data into concise variables. Many items within large inventories can be correlated to latent factors in order to summarize the results of a personality assessment (Briggs & Cheek, 1986). Latent factors are the underlying concepts that connect the items together. The process of finding these latent factors is called factor analysis. Several methods of factor analysis exist. One method is confirmatory factor analysis (CFA). CFA evaluates if items truly correlate to the nature of its latent factor (Donnellan, Oswald, Baird, & Lucas, 2006). Factor analysis is imperative to the development of personality scales, such as the Big Five Factor Markers and the 50--item International Personality Item Pool (IPIP). This is because factor analysis provides a model that groups items together according to their construct validity and into a comprehensive set of terms and evaluates a personality assessment's applicability in real world situations (Goldberg, 1990). The many facets of personality are summarized into the Big Five factor markers using factor analysis.

The Big-Five factor representation begins with abbreviating scale labels. Choosing trait-descriptive adjectives is important for developing factor markers because the markers are a subset of variables that represent personality traits (Goldberg, 1992). The Big Five factor markers were created to represent an array of personality characteristics that later became the dominant model for today's researchers (Lim & Polyhart, 2006). The Five Factor markers show the most prominent dimensions of personality, which are Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism (McCrae & John, 1992); however, research has found that items can be unidimensional within an item-level factor model, meaning the items can measure one construct, but also found they can fit into more than five dimensions (Panter, Swygert, & Grant Dahlstrom, & Tanaka, 1997). While creating the model, personality psychologists aimed for a classification that was both comprehensive and identified themes that organized groups of traits from previous psychological questionnaires. This is to underlie the dominant dimensions that can be ascribed by assessment items that are chosen (Lim & Polyhart, 2006).

Personality measurement scales attempt to use items to measure the dimensions of personality. The IPIP classifies different items into the five dimensions of personality. Personality measurement scales can be developed from this cost-free inventory. With over 2000 items yielding 300 or more different types of scales, the 50-item IPIP is appealing to researchers because of its short length compared to other personality measurement scales (Ehrhart, Roesch, Ehrhart & Killian, 2008). Another unique quality of the IPIP scales is the researcher's ability to choose items from a public inventory as well as the order in which the items are presented. This makes the scale highly customizable (Goldberg et al., 2006). The 50-item IPIP contains 10 items for each of the five dimensions of personality. Participants score the accuracy of the items from one to five, and the scores are used to develop their overall measure on each of the big five personality traits (Ehrhart et al., 2009). The purpose of this poster is to conduct factor analysis to identify the factor structure of the 50-item IPIP.

Table 2

Means (and Standard Deviations) for Men and Women

Factor	Men	Women	t-test
1	-.04 (0.96)	.03 (1.03)	$t(302) = 0.64$, $p = .53$
2	-.34 (0.93)	.26 (0.98)	$t(302) = 5.43$, $p = .00$
3	-.06 (0.98)	.04 (1.01)	$t(302) = 0.86$, $p = .39$
4	-.22 (1.01)	.17 (0.96)	$t(302) = 3.44$, $p = .00$
5	.14 (1.03)	-.10 (0.97)	$t(302) = -2.06$, $p = .04$
6	-.01 (1.02)	.00 (0.99)	$t(302) = 0.08$, $p = .94$
7	.07 (1.00)	-.05 (1.00)	$t(302) = -1.09$, $p = .28$

Factor 1 = Extraversion. Factor 2 = Neuroticism. Factor 3 = Conscientiousness. Factor 4 = Agreeableness. Factor 5 = Creativity. Factor 6 = Abstract Ideas. Factor 7 = Vocabulary.

Methods

Participants

A total of 304 (174 females and 130 male) undergraduate students completed this study. Their ages ranged from 18 to 50 years old. Their ethnicities, by their self-identification, were as follows: 7.6% African American, 11.2% Asian, 59.2% Caucasian, 12.8% Hispanic, 5.3% Pacific Islander, and 3.3% other.

Measures

The 50-Item Set of IPIP Big-Five Factor Markers (Goldberg, 1992) includes five 10-item scales that were designed to measure Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. Each scale includes both positively keyed items, where a high score indicates a high level of the trait, and negatively keyed items, where a high score indicates a low level of the trait. Participants responded to each item using a five-point response scale, where 1 = "Very Inaccurate" and 5 = "Very accurate". This scale is in the public domain and can be used for free.

Procedures

The 50-Item Set of IPIP Big-Five Factor Markers (Goldberg, 1992) was administered as part of a larger online study. The measures were divided into two testing sessions, which each took approximately 90 minutes.

Data Analysis

In order to determine the expected number of factors extracted, we used five criteria: theory, the Kaiser-Guttman Rule, scree test, MAP test, and parallel analysis. We conducted varimax, equamax, quartimax, direct oblimin with delta values of -1 and 0, and promax with kappa values of 2 and 4 rotations using this data set to determine the simplest factor structure with the lowest number of hyperplanar and complex loadings. We conducted an independent sample t-test to our data to determine the means and standard deviations of men and women on individual factors.

Results

The first step was to determine the number of factors. Goldberg designed the IPIP to have five factors. The Kaiser-Guttman Rule indicated that there are 11 factors. However, the Scree test, Parallel Analysis, and MAP test, indicated seven factors. Because the Kaiser-Guttman Rule typically over-estimates the number of factors and because the Scree test, Parallel Analysis, and MAP test are usually very accurate, we decided to extract seven factors.

We selected the direct oblimin with delta 0 rotation because it had the lowest number of complex variables and a large hyperplanar count. See Table 1 for the factor pattern matrix coefficients.

We calculated factor scores for these seven factors using the regression method. Next, we compared the factor scores for men and women. See Table 2. Women obtained significantly higher factor scores on Neuroticism and Agreeableness, and men obtained significantly higher factor scores on Creativity.

Discussion

The purpose of this research is to examine the factor structure of the 50-Item IPIP and determine if it measures the intended five factors. The 50-Item IPIP intends to measure Goldberg's FFM of personality in which only five factors should be measured (Goldberg, 1990), which is the dominant model for today's researchers (Lim & Polyhart, 2006), but we extracted seven factors and several complex item loadings using the direct oblimin rotation with a delta value of 0.

Of the seven factors extracted, we were able to recover four of the five dimensions of personality: Conscientiousness, Extraversion, Agreeableness, and Neuroticism; however, the dimension openness was not recovered. We found that the remaining three factors Creativity, Abstract Ideas, and Vocabulary correspond to Openness, which implies that one factor of personality may be split into three sub factors.

Furthermore, the direct oblimin rotation with a value of delta 0 determines twelve complex items. The complexities indicate that some items fail to distinguish between factors by correlating with more than one factor and affirms another study's findings that some IPIP items can be unidimensional within an item-level factor model or can fit into more than five dimensions (Panter, Swygert, & Grant Dahlstrom, & Tanaka, 1997). This implies that Creativity, Abstract Ideas, and Vocabulary may relate to one another, but the way the items are designed causes a poor correlation and leads to three separate factors being measured.

Our study uses focuses on a relatively large sample size, but this is only one study. Also, we have used exploratory analysis for a confirmatory hypothesis. Future research should focus on attempting to replicate these results using confirmatory factor analysis.

The 50-Item Set of IPIP items was generated by correlating preexisting personality assessments' items and then choosing the highest and lowest correlating items for each factor (Goldberg et al., 2006). Future research should investigate whether items chosen using factor analysis would better represents Goldberg's FFM of personality.

Table 1

Optimum Rotation

	Factor							
Item	1	2	3	4	5	6	7	h^2
31 Talk to a lot of different people at parties.	**0.82**	0.04	0.11	0.10	-0.09	-0.11	0.04	-0.69
46 Am quiet around strangers.	**-0.76**	0.09	-0.04	0.01	0.16	-0.1	0.03	-0.62
21 Start conversations.	**0.74**	-0.05	0.18	0.15	-0.01	-0.16	0.04	-0.66
6 Don't talk a lot.	**-0.73**	-0.01	0.10	-0.05	0.03	-0.16	-0.04	-0.59
41 Don't mind being the center of attention.	**0.73**	0.06	-0.01	-0.07	0.18	-0.11	0.08	-0.61
1 Am the life of the party.	**0.70**	0.05	-0.07	-0.02	0.14	-0.18	-0.01	-0.55
11 Feel comfortable around people.	**0.66**	-0.09	0.13	0.13	0.04	-0.2	0.07	-0.57
36 Don't like to draw attention to myself.	**-0.63**	-0.04	0.12	0.25	-0.14	-0.12	0.13	-0.49
16 Keep in the background.	**-0.60**	0.17	0.06	0.08	0.11	-0.27	-0.03	-0.52
26 Have little to say.	**-0.55**	0.02	0.05	-0.14	0	**-0.42**	-0.10	-0.57
44 Get irritated easily.	0.04	**0.78**	-0.08	-0.15	0.11	-0.05	0.01	-0.65
39 Have frequent mood swings.	0.08	**0.76**	-0.04	-0.14	-0.1	-0.02	0.21	-0.65
29 Get upset easily.	0.02	**0.75**	0.04	-0.01	0.1	-0.04	-0.06	-0.57
4 Get stressed out easily.	0	**0.75**	0.20	0.13	-0.01	0.08	-0.10	-0.61
34 Change my mood a lot.	0.10	**0.73**	0.04	-0.05	-0.05	-0.04	0.18	-0.58
14 Worry about things.	-0.12	**0.59**	0.20	0.17	0.11	-0.06	-0.11	-0.48
49 Often feel blue.	-0.18	**0.56**	-0.09	0	-0.1	-0.02	0.12	-0.43
9 Am relaxed most of the time.	0.15	**-0.56**	-0.16	0.09	0.13	**-0.39**	0.14	-0.52
24 Am easily disturbed.	-0.04	**0.54**	-0.12	0.11	-0.01	-0.12	-0.01	-0.36
45 Spend time reflecting on things.	-0.03	**0.45**	0.01	0.23	0.26	0.16	0.09	-0.40
19 Seldom feel blue.	0.22	**-0.35**	0.03	-0.08	0.17	**-0.35**	-0.07	-0.33
33 Like order.	-0.13	0.11	**0.72**	-0.01	0.04	-0.02	0.08	-0.56
23 Get chores done right away.	0.13	0.03	**0.70**	-0.04	-0.05	-0.11	-0.10	-0.51
3 Am always prepared.	-0.15	0.01	**0.70**	-0.02	0.02	-0.09	0.17	-0.55
43 Follow a schedule.	0.14	0.16	**0.66**	0.02	0.04	-0.13	-0.01	-0.50
28 Often forget to put things back in their proper place.	-0.06	0.12	**-0.61**	0.02	0.19	-0.28	0.09	-0.55
8 Leave my belongings around.	0.06	0.07	**-0.54**	0.24	-0.01	-0.22	0.26	-0.48
18 Make a mess of things.	-0.07	**0.34**	**-0.5**	0.03	0.07	-0.29	0.01	-0.51
48 Am exacting in my work.	-0.02	0.13	**0.39**	0.14	0.14	-0.13	0.20	-0.31
38 Shirk my duties.	-0.09	0.04	**-0.38**	-0.1	0	-0.29	0.17	-0.31
17 Sympathize with others' feelings.	-0.06	0.06	0.01	**0.77**	0.12	-0.11	-0.06	-0.64
37 Take time out for others.	0.07	0.03	0.06	**0.76**	-0.14	-0.03	0.13	-0.61
42 Feel others' emotions.	0.04	0.11	-0.03	**0.70**	0.18	-0.09	-0.08	-0.60
27 Have a soft heart.	-0.10	0.03	-0.02	**0.68**	0.08	-0.26	-0.01	-0.52
22 Am not interested in other people's problems.	0.01	0.01	0.05	**-0.56**	0.02	**-0.39**	-0.01	-0.50
32 Am not really interested in others.	-0.26	-0.03	0.03	**-0.52**	-0.07	**-0.38**	0.09	-0.57
2 Feel little concern.	0	0.09	0.05	**-0.46**	0.13	**-0.30**	-0.09	-0.34
7 Am interested in people.	**0.32**	0.08	-0.01	**0.44**	0.11	0	0.09	-0.40
12 Insult people.	0.10	0.28	-0.08	**-0.42**	0.01	-0.16	0.26	-0.37
47 Make people feel at ease.	**0.30**	-0.05	0.03	**0.38**	0.21	-0.09	0.02	-0.38
50 Am full of ideas.	0.09	-0.04	-0.03	0.01	**0.76**	0.05	0.11	-0.65
15 Have a vivid imagination.	0.03	0.10	-0.03	0.06	**0.73**	0.05	-0.08	-0.56
25 Have excellent ideas.	-0.05	-0.08	0.07	-0.03	**0.69**	-0.05	0.15	-0.53
30 Do not have a good imagination.	-0.06	-0.02	0.09	0.01	**-0.68**	**-0.43**	0.17	-0.64
13 Pay attention to details.	-0.10	-0.01	**0.34**	0.11	**0.36**	-0.09	0.16	-0.34
20 Am not interested in abstract ideas.	0.01	0.09	0.03	-0.01	-0.29	**-0.66**	-0.11	-0.54
10 Have difficulty understanding abstract ideas.	0.01	**0.33**	-0.14	0.01	-0.22	**-0.58**	**-0.30**	-0.64
40 Use difficult words.	0.04	0.14	-0.03	-0.11	-0.02	0.06	**0.78**	-0.65
5 Have a rich vocabulary.	0.04	0.06	-0.07	-0.03	0.04	0.18	**0.75**	-0.60
35 Am quick to understand things.	0.04	-0.20	0.19	0.16	0.11	0.03	**0.40**	-0.31

Factor Intercorrelations	1	2	3	4	5	6	7
Factor 2	-0.19	1					
Factor 3	0.01	-0.04	1				
Factor 4	-0.11	-0.03	-0.12	1			
Factor 5	0.17	0.03	0.08	0.22	1		
Factor 6	-0.05	-0.14	-0.05	-0.09	-0.03	1	
Factor 7	0.07	0.09	-0.01	0.09	0.17	-0.05	1

Note. h^2 = communality. Salient factor pattern matrix coefficients are in boldface. No items were reverse-scored for this analysis. Factor 1 = Extraversion. Factor 2 = Neuroticism. Factor 3 = Conscientiousness. Factor 4 = Agreeableness. Factor 5 = Creativity. Factor 6 = Abstract ideas. Factor 7 = Vocabulary.