TRUITY

THE
BIG FIVE
PERSONALITY TEST

Technical Documentation

Molly Owens, MA

Truity Psychometrics LLC

Roseville, CA, USA

BACKGROUND

Summary: In this report, we examine the internal and external validity of Truity Psychometrics' Big Five assessment. In general, the assessment demonstrates a strong internal structure and can be used to predict real-world variables significantly above chance level.

The Five Factor Model, commonly referred to as the 'Big Five,' is considered by most experts to be the most scientifically rigorous formalization of human personality to date. As its name suggests, the model enumerates five statistically dissociable traits across which humans reliably demonstrate individual differences. Given that personality models capture latent variables, each trait can be arbitrarily decomposed into its own subparts, often referred to as facets. The five traits, each with its two major facets, are outlined here: openness (interest in ideas and aesthetics), conscientiousness (orderly and achievement-oriented motivations), agreeableness (prosocial motivations to be empathic and to comply with norms), extraversion (enthusiasm and assertiveness), and neuroticism (volatility and withdrawal) (see McCrae & Costa, 1987 for original conceptualization; Hirsh & Peterson, 2008 for discussion of facets).

One of the more scientifically attractive features of the Big Five personality model is what is referred to as its 'atheoretical' derivation. Whereas most personality assessments are developed from the ideas of one person or group, fundamentally, the Big Five assessment is no one's idea—it is simply the consequence of performing a factor analysis over vast lists of self-report descriptors. For example, administering self-report questionnaires with hundreds of personality-related questions (e.g., "I am tidy," "I respect authority," "I am a good listener") to thousands of people allows researchers to analyze the degree to which particular question ratings correlate both within and across participants (e.g., researchers find that people who self-report to respect authority also self-report to be a good listener). In this way, a far smaller set of latent statistical factors that underlie these descriptors can be extracted from the data. The five-trait result yielded from this kind of analysis has been replicated consistently. In other words, the constructs of openness, conscientiousness, extraversion, agreeableness, and neuroticism seem to capture the preponderance of the variance across an extremely wide variety of individual self-descriptions.

It has been demonstrated that measurements of personality using the Big Five assessment are moderately predictive of real-world outcomes, particularly as they relate to behavioral patterns in social contexts (cf. Komarraju et al, 2011; Madnawat and Mehta, 2012; Jokela et al, 2012, Klimstra et al, 2012). This is fairly strong evidence that the Big Five model 'taps into' variables that relate to relevant life outcomes, further supporting the utility of the model.

INTERNAL VALIDITY

CRONBACH'S ALPHA

Anonymous data from over 2.8 million users was used to conduct all of the following analyses.

Cronbach's alpha is a measure of the reliability of category structures used in psychometric assessments. For this assessment, each of the five traits in the model can be scored using Cronbach's alpha. Interpretations of the metric are also provided below.

Cronbach Alpha Criteria	Classification
$a \geq 0.9$	Very good
$0.8 \leq a < 0.9$	Good
$0.7 \leq a < 0.8$	Be accepted
$0.6 \leq a < 0.7$	Doubtful
$0.5 \leq a < 0.6$	Bad
$a < 0.5$	Not acceptable

Trait	Cronbach's Alpha
Openness	0.794
Conscientiousness	0.807
Extraversion	0.856
Agreeableness	0.757
Neuroticism	0.844

INTERCORRELATION MATRIX

The second major internal validity analysis performed is an intercorrelation matrix of all questions in the assessment sorted by construct. Qualitatively, one will notice bright boxes clustered around each category, which is a statistical representation of the fact that within-trait question scores correlate significantly more strongly with one another than with question scores recorded from other trait constructs. The optimal result here would be within-trait question correlations of 1 and across-trait question correlations of 0.
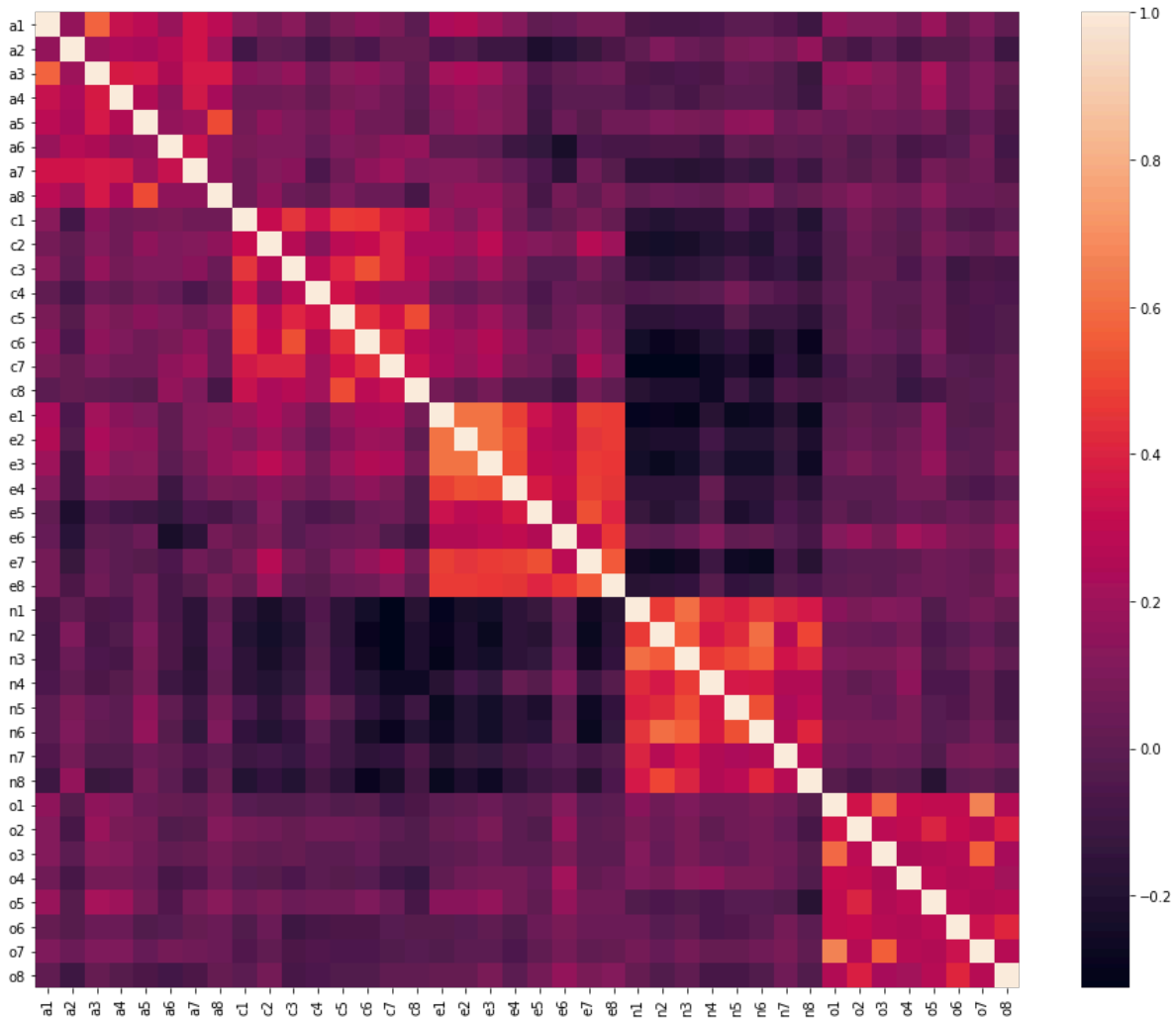
EXTERNAL VALIDITY

In order to assess the predictive validity of the Big Five measurements, machine learning analyses were performed to determine whether predictive models could be constructed that take user scores as input and output a numerical representation corresponding to participants' answers to simple demographic questions. If the model is able to learn a mapping from participant scores to, say, their level of educational attainment, this is strong evidence that the information being captured in the Big Five assessment is robust and displays real-world relevance.

Below, the results of four experiments are summarized, including each question users were asked, the possible responses users could have given, the chance-level predictive accuracy (i.e., the performance of a model that guessed randomly), and the trained model's predictive accuracy. Note that significantly fewer than the 2.8 million original respondents elected to complete this optional section of the assessment.

Question	Possible Responses	Chance-Level Predictive Accuracy	Model Predictive Accuracy
What is the highest level of education you have completed?	Some high school, high school graduate, two-year degree, four-year degree, graduate degree	20%	36.4%
What is your gender?	Male, female, other	33%	63.1%
How do you think your personality has affected your career success?	Hurt, neutral, helped	33%	59.1%
To what extent do you have a "work persona," or a different way of acting at work?	None, some, very	33%	67.6%

In all cases, the machine learning models are able to roughly double chance-level predictive accuracy, demonstrating that information latent in personality assessment scores can be used to predict real-world variables.

In order to get a better sense of the kind of data that the models are leveraging, the following plots have been generated, each demonstrating the average trait level of individuals within each categorical bucket.

Question: What is the highest level of education you have completed?
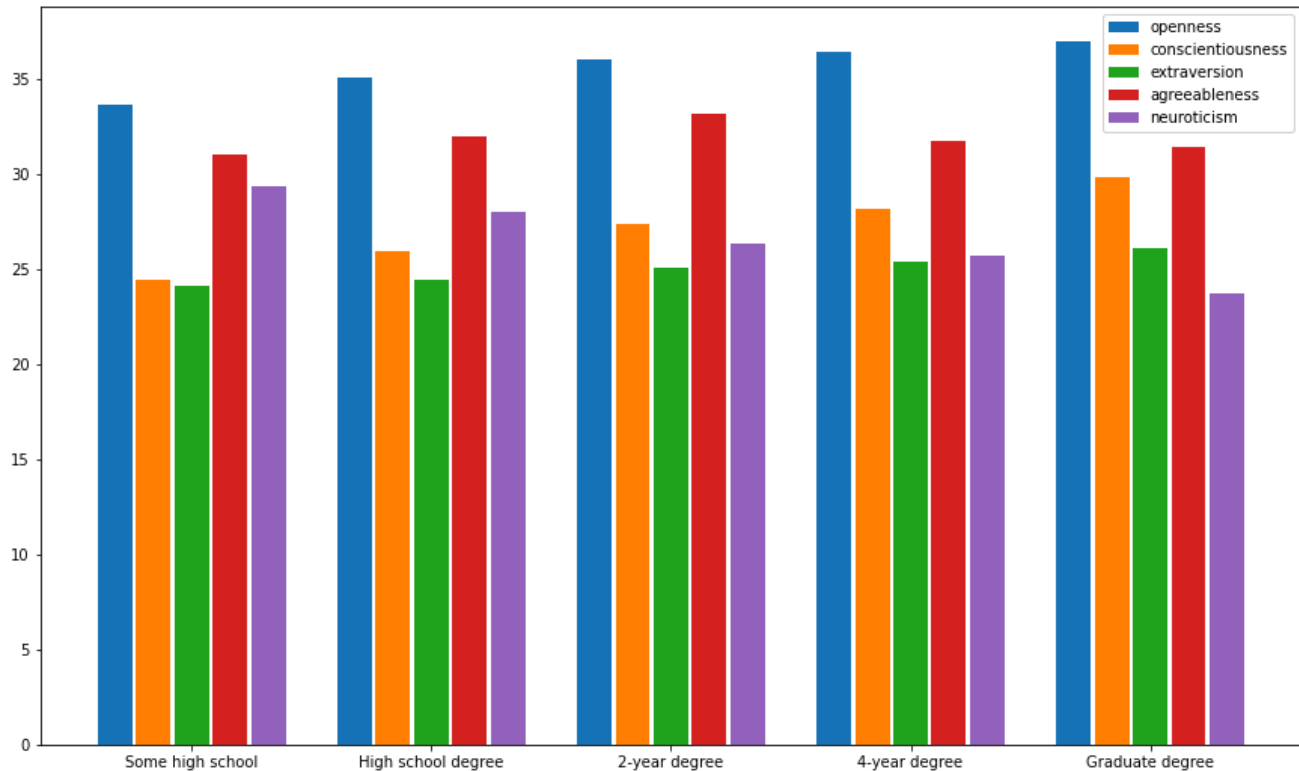
Here, we see that as the completed level of education increases, openness increases, conscientiousness increases, neuroticism decreases, extraversion slightly increases, and agreeableness appears unchanged. This makes sense to the degree that higher levels of education require increased capacity for engaging with complex ideas (loads on openness), working diligently (loads on conscientiousness and extraversion), and managing stressful situations (loads negatively on neuroticism).

Question: What is your gender?
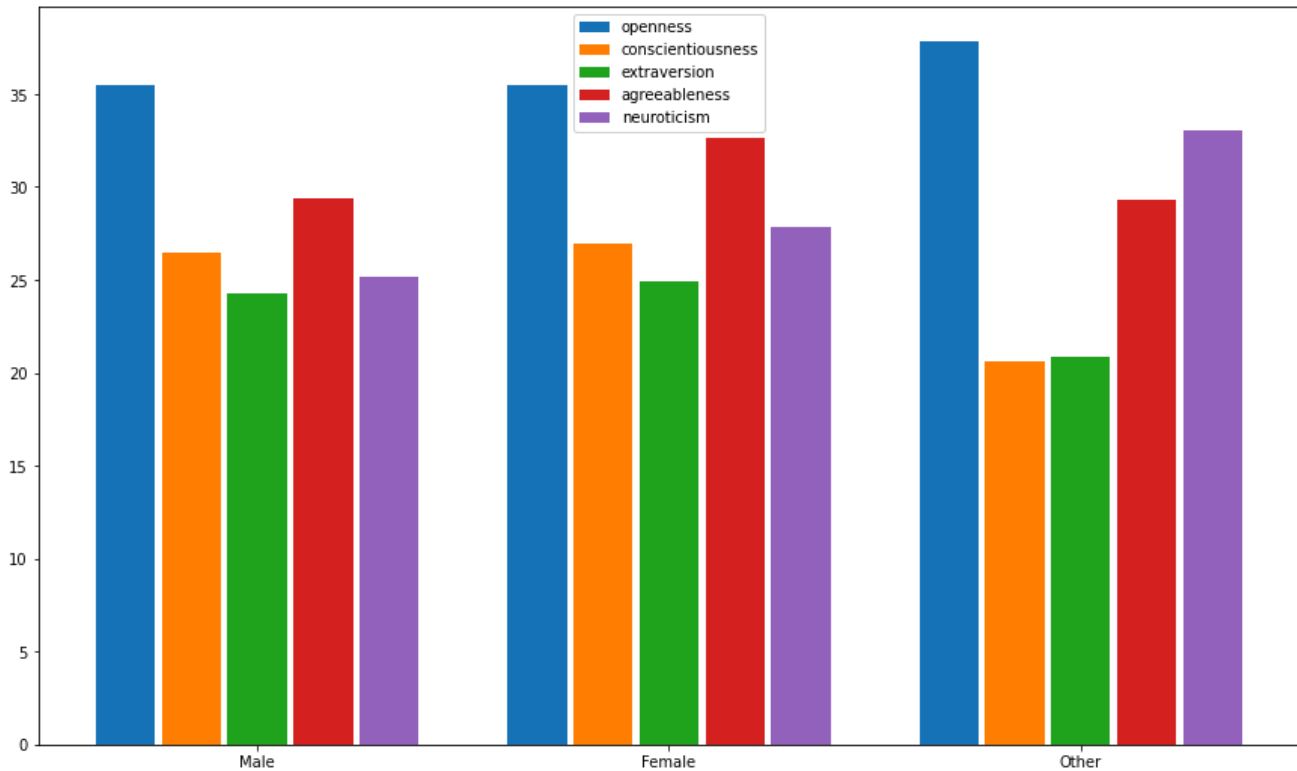
Comparing people who identify as male vs. female, we see no significant differences in openness, conscientiousness, or extraversion, while those who identify as female are significantly higher in agreeableness and neuroticism. This is a well-documented finding in the personality literature.

Comparing males and females to those who identify outside of this binary, we see gender non-conforming individuals to be significantly higher in openness, lower in conscientiousness and extraversion, and higher in neuroticism. Individuals who are gender non-conforming are less agreeable than females but more agreeable than males.

Question: How do you think your personality has affected your career success?
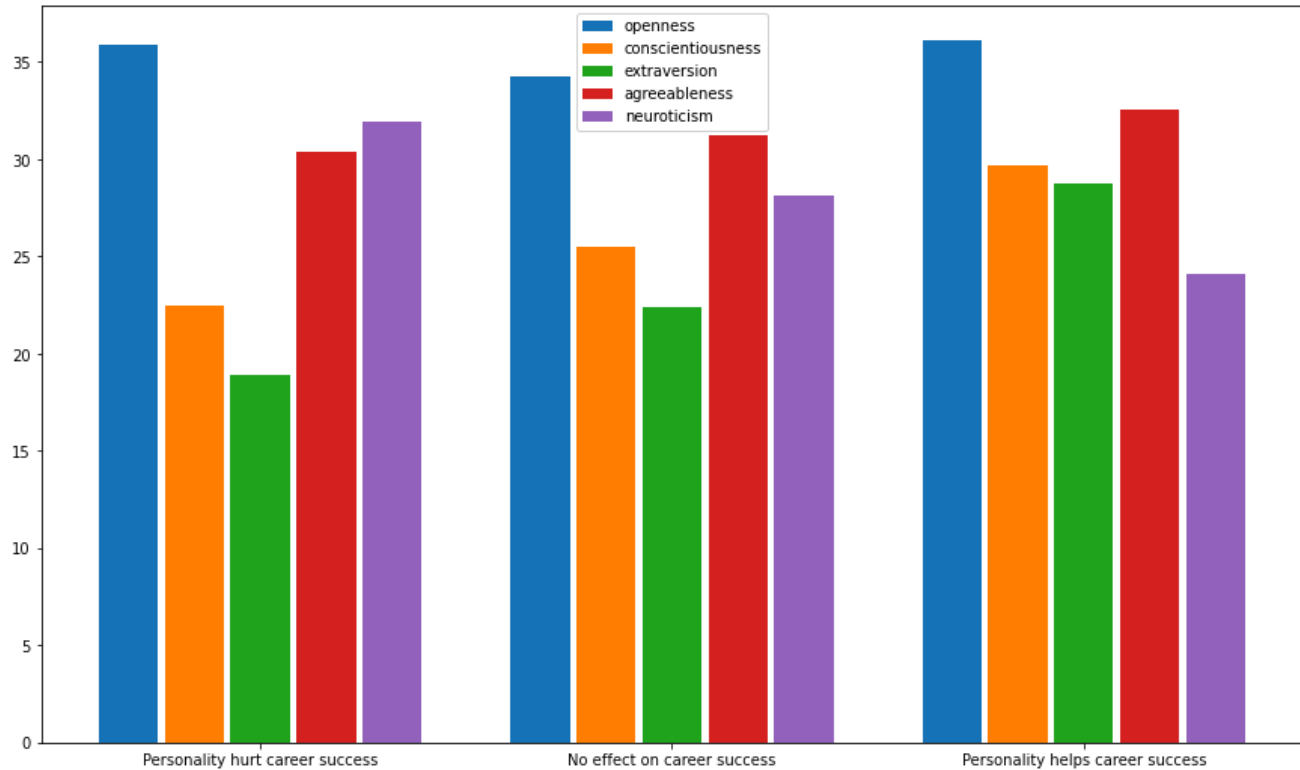
As the degree to which individuals believe their personality has helped their career success increases, conscientiousness, extraversion, and agreeableness increase, while neuroticism decreases. Interestingly, openness is highest among those who believe their personalities have hurt their careers and those who believe their personalities have helped their careers. All of these findings are in line with previous research that suggests that conscientiousness and extraversion positively predict career success, while neuroticism negatively predicts career success.

Question: To what extent do you have a "work persona," or a different way of acting at work?
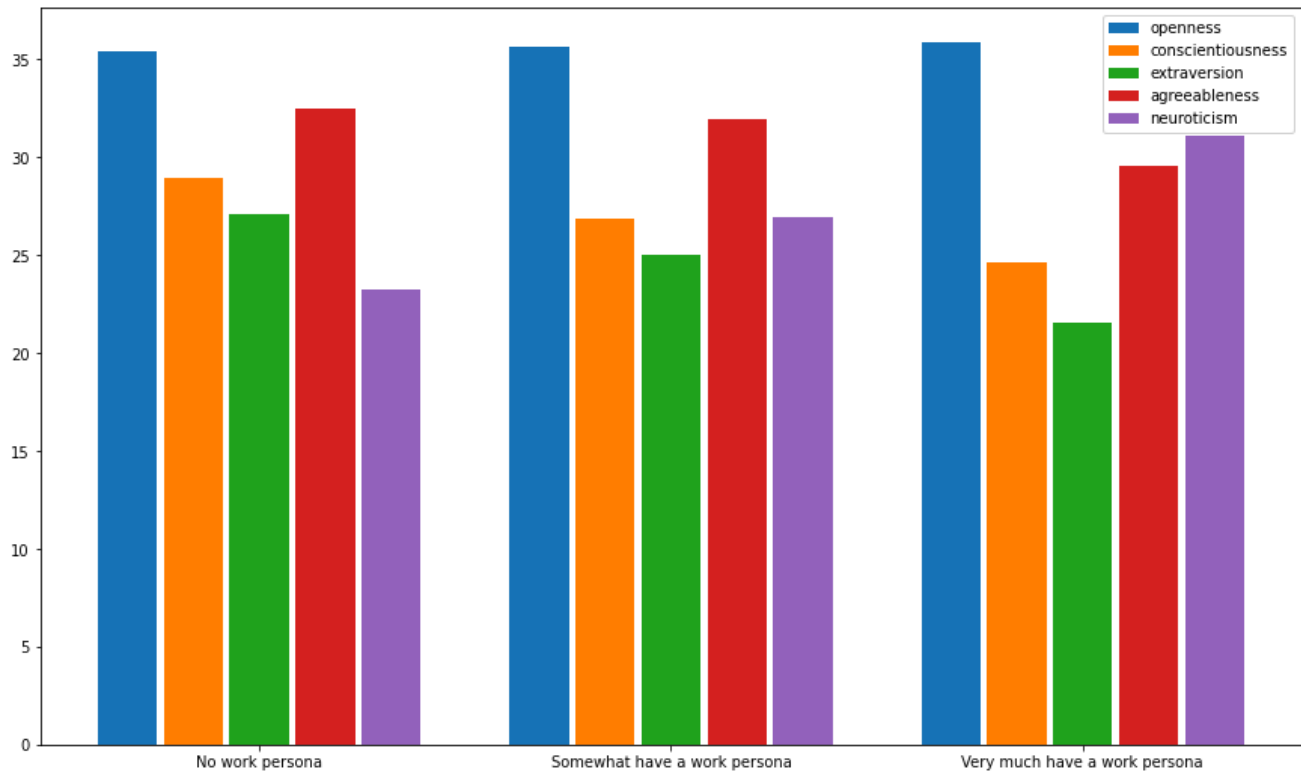
As the degree to which individuals believe they have a 'work persona' increases, neuroticism increases, while conscientiousness, extraversion, and agreeableness all decrease. Openness does not vary significantly. These results make sense insofar as individuals would have to 'put away' their neuroticism and disagreeableness in public spaces and accentuate their conscientiousness and extraversion. In other words, we might see those who answered 'no work persona' as having a sort of prototypically work-conducive personality, while those who require a work persona have a personality that is less naturally conducive to the workplace.