

An Analysis of the 16 Personality Factor (5th ed.) Questionnaire

Lisa K. Samuel

Ph.D. Candidate, Health Psychology

Abstract

This research paper describes the Sixteen Personality Factor Questionnaire 5th Edition (16PF) and its development from the 1930s to the latest version standardized in 2000. The standardization of the test, reliability, and validity are described as well as popular uses of the test for psychological purposes. The 16PF is compared and critiqued against popular tests and theories such as the Revised NEO Personality Inventory (NEO PI-R), Rorschach, Minnesota Multiphasic Personality Inventory (MMPI), and the Holland Types as well as exploring ethical and legal implications and applicability in research in the health psychology specialization.

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Psychological tests have been used for a variety of purposes ranging from measures of intelligence, psychopathology, to personality. Personality tests and measures often look to understand the factors, or traits, that explain human behavior. Psychologists are often interested in understanding if these traits result in predictable behavior or they look to further research in understanding the manners in which a person acts, thinks, or feels that results in his or her uniqueness (Cattell, 1956).

Cattell, R. B., Cattell, A. K., Cattell, H. E., Russell, and Karol (1994) explained that the 16 Personality Factor 5th Edition (16PF) test is a well known personality test used to measure normal personalities and it has been extensively researched in a variety of different applications, settings, and is available in over 25 languages. The 16PF test is administered in the form of a questionnaire with three possible answers for each question and it can be taken in a pen and paper format or electronically if desired. This test has 16 personality factors that take a bottom up approach to describing five large categories of personality which are referred to as the Big Five (Cattell, Cattell, Cattell, Russel, & Karol, 1994).

Description and History

The founder of the 16PF test was Raymond Cattell who came from a scientific background and held master's degrees in physical sciences from University of London (Noller, Law, & Comrey, 1987). The significant historical milestones associated with the development of the 16PF Questionnaire started in the 1930s with the development of a factor analysis method of studying human behavior lead by Cattell and Spearman in which Cattell furthered into personality structure research. Cattell started out designing

the 16PF in the 1940s with a belief in the concepts of a person having many wide ranges of personalities including personality, ability, and motivations and that these human characteristics could be found in personality roles, states, verbal or nonverbal behaviors, abilities, interests, thoughts, and actions (Noller, Law, & Comrey, 1987). Cattell began the process of collecting and categorizing data using three sources of information which were L-data (life record and life observation data), Q-data (questionnaire data and personal self-descriptive data), and T-data (objective measurement of behavior often collected in laboratory settings, experimental situations, or projective tests) (Cattell, 1956). Cattell (1956) gathered information from this research to create the primary traits of his test which were rated and described from a low range to a high range of occurrence.

The first publication of the 16PF test was in 1949 in the United States and then in 1952 in Great Britain. It has undergone four revisions dated in 1956, 1962, and 1968, with the Fifth Edition published in 1993 (Schuerger, 1994). Additionally, the test has been standardized in 2000 with a population of over 10,000 people. The latest version of the 16 primary traits are warmth (A), reasoning (B), emotional stability (C), dominance (E), liveliness (F), rule-consciousness (G), social boldness (H), sensitivity (I), vigilance (L), abstractedness (M), privateness (N), apprehension (O), openness to change (Q1), self-reliance (Q2), perfectionism (Q3), and tension (Q4). The traits are labeled with alphabetic designations (although some letters are missing due to updates) which represent traits derived from L-data and T-data and the last four traits are labeled Q1-4 as they were derived from questionnaire data (Schuerger, 1994). The 16PF test can be scaled upwards to create five second order global traits which are extraversion, anxiety,

tough-mindedness, independence, and self-control (Cattell, 1956). These global traits are very consistent with the “Big Five” which are extraversion, neuroticism, conscientiousness, agreeableness, and openness to experience. This multilevel factor structure allows for the specificity of the personality to be reviewed while having a larger overview of the person’s global personality (Noller, Law, & Comrey, 1987). Specifically, the second-order factors of the 16PF have been seen in meta-analyses to be correlated with the Big Five Factors.

Psychometric Qualities of the Test

The 16 PF Questionnaire consists of 185 items across 16 scales and uses a 3 point Likert scale for a response system. Each item is scored a between 0, 1, or 2 as the questions are on a bipolar scale with one answer left as a question mark (?) for a desired response (Cattell, Cattell, Cattell, Russel, & Karol, 1994). The raw scores are then transformed to standard scores and then calculated in reference to the norm group. The questionnaire was restandardized in 2000 using a stratified sample of 10,261 individuals based upon the year 2000 census data in the United States to accurately reflect age, sex, and race. The 16PF 5th Edition has additionally been reassessed to have simpler and clearer language in the questions, increased the consistency in the response format, and decreased the amount of time associated with administering and taking the test to approximately 40 minutes (Dancer & Woods, 2006).

The internal consistency reliability was determined using Cronbach’s alpha ($n = 10,261$) in which a 0 denotes zero internal consistency and a 1 denotes perfect internal consistency. The results for the primary scales were warmth = .69, reasoning = .75, emotional stability = .79, dominance = .68, liveliness = .73, rule-consciousness = .77,

social boldness = .87, sensitivity = .79, vigilance = .73, abstractedness = .78, privateness = .77, apprehension = .80, openness to change = .68, self-reliance = .79, perfectionism = .74, and tension = .76. The overall mean for this reliability was .76 ($n = 10,261$) and, upon a two week test-retest interval, the mean was .80 ($n = 204$), and upon a two month test-retest interval, the mean was .70 ($n = 159$). The global scales (not calculated alone for internal consistency as they are a combination of the 16 primary factors) of extraversion, anxiety, tough-mindedness, independence, and self-control had a mean of .87 for the two week test-retest and a mean of .78 for the two month interval. All of this demonstrates high reliability which is one of the reasons for the popularity of the 16PF Questionnaire (Dancer & Woods, 2006).

The 16PF was constructed in a manner to ensure validity using factor analysis to ensure factors meant to be independent remained independent, an absence of significant correlation with other factors in the test, and equal loading for the factors when appropriate (Cattell, 1956). The validity of the 16PF test has been demonstrated in a variety of studies and is noted to have improved validity in the 5th edition versus the 4th. Musson and Francis (2002) noted that the 16PF, although widely used and well accepted, had fifteen scales that measured less than .71 alpha coefficients (which were A, B, C, E, F, G, I, L, M, N, O, Q1, Q2, and Q4) in version 4 of the test which is less than desired by many researchers. Although the importance of these factors falling below .71 was debatable by many researchers (as low alpha values reinforced Cattell's philosophy of the ability for the scales to encompass many meanings), version 5 has greatly improved the validity levels. For example, in a study conducted using a sample of members of the clergy in the Church of England ($n = 580$) the validity of the 16PF edition 4 and edition 5

were compared (Musson & Francis, 2002). Using a .2 level as demonstrating adequate validity, the 16PF4 had 89 items out of 171 that fell below the 0.2 level validity, whereas the 16PF5 had only 11 items out of 158 falls below the acceptable validity. This demonstrates that the latest version has improved validity while still using the same 16 bipolar scales.

Uses of the 16 PF Test

The 16PF questionnaire can be used in many settings to measure normal personalities and it can be administered to both adults and adolescents as it is written using a 5th grade reading level with a simple Likert-scale based set of answers (Burger & Kabacoff, 1982). An individual can have personal gain from the 16PF in that it allows a person with a non-psychopathological personality to gain self insight and view his or her scores with normative scores from a comparative point of view. Personality types have been the source of much research and the 16PF can be a tool that is used to support or disprove a variety of theories based upon assessing individual profiles of various populations (Burger & Kabacoff, 1982). Additionally, individual studies contribute to general research in developing and measuring construct validity over time (Briggs & Cheek, 1986).

In a counseling setting the 16PF can be beneficial to develop empathy and rapport with a client by discussion surrounding the entire picture of a client's personality. For example, a person's self-esteem, cognitive style, capacity for insight, openness for change, and capacity for empathy can be disclosed and addressed (Cattell & Nesselroade, 1967). This can assist with developing therapy plans for patients with normal range behavioral problems. Counselors can also use the 16PF to provide support for marital

therapy or to work with university students in understanding career paths in that compatibility, satisfaction, or potential conflict areas in both personal and career relationships may be assessed (Cattell & Nesselroade, 1967).

Furthering these concepts of application, personnel managers can use the 16PF for screening purposes, prediction for success in specific career fields, and placement services. This can be achieved through the 16PF's ability to reveal work related characteristics such as interpersonal trust, attitude towards authority, power dynamics, and coping style. Additionally, the 16PF has demonstrated the ability to act as a predictor of work-related superior performances. Specifically, a study by Lunenburg and Columba (1992) used step-wise multiple regression determine that the 16PF factors of dominance (E), abstractedness (M), self-reliance (Q2), and warmth (A) were predictors of superior performance for principals in the education field.

Critique of the 16 PF Test

The 16PF questionnaire has a variety of strengths such as taking less time to administer than the MMPI-2 and having five global factors that correspond to the Big Five as well as having criticisms such as using an overeducated sample in the past or challenges associated with scoring the latest version (Schuerger, 1994). However, it is beneficial to view this test alongside many other comparable or popular tests such as the NEO PI-R, Rorschach, MMPI, and the Holland Types.

The NEO PI-R is a widely used personality measure that has a five-level high dimensional model similar to that of the 16PF. However, some researchers will argue that there is an advantage of 16PF model over this model in that the 16 primary factors were developed first and later correlated with the Big Five global factors rather than

being forced into five categories, as the NEO PI-R has been suggested as doing, for statistical convenience (Rossier, Meyer de Stadelhofen, & Berthoud, 2004). However, in the earlier versions of the test there were a variety of criticisms regarding the factor analysis studies and the ability to verify the primary factor level (16 factors) and evidence that the scales may have been unbalanced in how they were loaded which complicated the comparison between the 16PF and the Big Five (Eysenck, 1972). However, multiple indicator measurement models that performed factor analyses between the two tests have found that there is a substantial correlation between the two scales (Gerbing & Tuley, 1991).

The 16PF has been compared with a variety of additional personality tests that are both subjective and objective in nature. Greenwald (1991) reported in detail on her hypothesis, which was disproved, of the relationship between results from the Rorschach test with results from the 16PF test. Practitioners of the Rorschach test often refer to it as a method due to the perceptual and associative interpretive approaches to understanding this tests role in personality research (Acklin, 1995). When comparing the 16PF to the Rorschach, the quantitative approach of the 16PF can be a strength, whereas the inflexibility of interpretation of the results versus the flexible Rorschach is a limitation which may result in missed insights (Greenwald, 1991).

The MMPI is one of the most popular tests that can measure both normal and pathological psychological and personality profiles which is standardized using a much smaller population group (1,138 males and 1,462 females) in comparison to the 10,000 sample used in the 16PF (Hathaway, McKinley, & Butcher, 2004). This highly popular test can be used, similarly to the 16PF, to assess college and career recommendations,

assist marriage and family counselors, and develop psychological treatment studies and it has high validity and reliability scores. However, there is a great deal of cross over between the 16PF factor and scales and there is not a significant advantage of the fact that the MMPI test is often considered to be long and cumbersome in certain situations (Cattell & Bolton, 1969; Schuerger, 1994).

The Holland Types, measured using the Self-Directed Search (SDS), is a popular method to predict personality type as well as uncovering personal skills, talents, and the congruence of personality characteristics with jobs or career paths (Holland, Powell, & Fritzsche, 2004). Some example Holland types are realistic, investigative, artistic, social, and enterprising which are based upon matching an individual's characteristics with over 1,300 occupations. The 16PF has strength over the SDS in that the results of Holland's personality types can be gained as a subset of the 16PF and can actually predict the SDS codes (Pietrzak & Page, 2001). However the Holland types, when assessed alone, take less time for the test administrator and may be beneficial for school settings with budget limitations and time restraints.

Additionally, there are ethical and legal issues which are pertinent to the 16PF including social desirability such as faking "good" responses in an attempt to appear positive or faking "bad" responses to appear negative or giving random responses to the questionnaire to confuse the test-administrator. These challenges are not unique to the 16PF; they are seen regularly in psychometric tests that focus on personality for a variety of reasons (Irvine & Gendreau, 1974). People have a tendency to try and promote themselves in the most positive light possible which can result in answering test questions, in self-reporting situations, in a manner that a person believes is the answer

that will be best viewed by others. Alternatively, there are situations in which displaying personality traits negatively is desired such as a criminal that is facing a trial hoping to claim insanity (which is not predictable on the 16PF test as its metrics are all in the normal range).

In a study by Irvine and Gendreau (1974) these theories were put to the test by investigating attempts at faking good or bad responses by two populations which were college students and prisoners. A sample of thirty prisoners were used as the test group with thirty male undergraduate students as the reference group. Both groups were instructed to take the 16PF questionnaire twice. In the first attempt the college students and prisoners were instructed to try and make them look as good as possible and the second time they were instructed to try and make themselves look as negative as possible, lying in both tests as appropriate. The results for the motivational distortion scale (trying to look good) showed that the test administrators were able to detect 75% of the prisoner tests and 95% of the student tests that were faked. The results for the sabotage index (faking bad) were a detection rate of 80% for both the prisoner population and the student population. The authors concluded that with proper training the 16PF can not be faked without detection.

Additionally, the ability for a test-administrator to understand the temporal stability of personally tests should be taken into consideration when interpreting the results of the 16PF (Schuerger, Tait, & Tavernelli, 1982). Ensuring that the test administrator has appropriate training, which varies from state to state but typically consists of having a Masters Degree in Counseling or a Doctorial Degree in Psychology as well as completion of a test and measures course, is vital to the ability for the 16PF

questionnaire results to be analyzed and reported in an ethical and legal manner (Werner & Pervin, 1986).

Uses of 16PF in Health Psychology

The field of health psychology looks toward research to find relationships between a person's behavior and how that influences their physical and mental health. In addition to sociocultural factors, health psychologists look towards understanding attitudes, normative beliefs, and personality factors to determine how they impact health behaviors (Schneider, Gruman, & Coutts, 2005). Health problems associated with eating behaviors can result in a variety of challenges ranging from anorexia to bulimia, which are a self-induced starvation disease and a disease consisting of binge eating and then self-induced periods of vomiting, both which are often related to body image disorders (Adkins & Keel, 2005). In a study by Nagelberg, Hale, and Ware (1984) the 16PF questionnaire was used to assess the relationship between personality and bulimic symptoms. It was noted that most individuals suffering from bulimia do not demonstrate abnormal personality behaviors and therefore the 16PF can be a useful test for measuring self-reported personality behaviors. In their study results they used the 16PF to find that factor Q3, which was undisciplined self-conflict and now is referred to as perfectionism in the 5th edition, was statistically significant for those who binge and purge, $F(2, 28) = 3.62, p < .05$.

The 16PF has also been used in understanding the relationship between the health belief model and personality characteristics (Kawash, Wollcott, & Sabry, 1980). The health belief model theorizes that there is a relationship between a person's belief in the efficacy of treatments or behavior modifications to prevent or heal health related

problems and this results in the ability to predict whether or not a person will participate with recommended dietary changes, immunization programs, or smoking cessation programs (Abood, Black, & Fereal, 2003). Kawash, Wollcott, and Sabry (1980) demonstrated in a study of men who were at risk for cardiovascular disease that there was a correlation between the health belief model and several primary factors on the 16PF questionnaire. The multiple correlation demonstrated that low ego strength, high shrewdness, high guilt proneness, and high tension were statistically significant factors, ($r = .45, p < .01$).

Specifically, with the knowledge of the successful application of the 16PF questionnaire in a variety of health psychology related settings it would be interesting to combine it with additional cognitive related tests to explore the relationship between healthy and unhealthy eating behaviors such as high carbohydrate and high fructose concentrated diets versus high protein high complex carbohydrate concentrated diets. An understanding of how personality types predict eating behavior, or the ability to change eating behaviors, could be helpful with predicting disease pathology progression. Also, obesity related diseases such as diabetes type 2 could be assessed by understanding if a person has high or low openness to change (Q1), high or low self-reliance (Q2), or high or low apprehension levels (O) as an example (Williams & Ricciardelli, 2000).

Conclusion

The 16PF questionnaire is a tried and true psychometric test that has proven reliability and validity in a variety of settings with many unique populations. Additionally, this test has demonstrated benefits when used instead of many additional personality tests as well as in conjunction with these tests to measure normal behavioral

ranges. There are many opportunities for future application of the 16PF questionnaire. For example, using the 16PF could further existing research into how social anxiety personality traits interact with academic performance, present an understanding of how individualism affects decision making and team building processes in the work environment, or contribute to predicting health behavior for obesity prevention in children (Davies, 1982; Pietrzak, & Page, 2001; & Lunenburg, & Columba, 1992). Regardless, with its ability to demonstrate how the primary traits can be scaled upwards to address the Big Five factor structure or left at the primary level to address specific personality traits, the 16PF will be a valuable research tool for many years to come (Dancer & Woods, 2006).

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