

# Evaluation of the 16 personality factor questionnaire

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The 16 Personality Factor Questionnaire (16 PF) is a comprehensive self report questionnaire, invented by Raymond B. Cattell, that is used to provide in-depth evaluation of the human personality. Cattell et al. (1970) employed a statistical technique called the Multiple Abstract Variance Analysis (MAVA) to identify " surface traits", consistent behavioral responses, and " temperament and ability source traits", underlying variables that determine surface traits.

The 16 PF measures these traits by dividing the human personality into sixteen factors - warmth, reasoning, emotional stability, dominance, liveliness, rule consciousness, social boldness, sensitivity, vigilance, abstractedness, privateness, apprehension, openness to change, self-reliance, perfectionism, and tension. Each scale score is interpreted as being low score direction vs. high score direction.

By adding points for marked choices, factor by factor, raw scores can be obtained (Schuerger, 1992). Cattell et al. 1970) believed that all 16 factors were necessary for a comprehensive measurement of personality. The test has been modified throughout the years, with the 5th edition being the most recent version, and has now established itself as one of the best questionnaires to evaluate personality trait (Reilly, 1996). The 16 PF has overcome other psychological tests due to the following reasons: it has the ability to define basic personality without the need of regarding to how it is applied in different environments. In other words, it is universal and very applicable.

Its comprehensiveness, functional relation to personality structure, and simplicity of concepts allow the 16 PF to be applied in many different contexts such as clinical, educational, industrial, or basic research fields (Cattell et al. , 1970). The test is easy to administer, allowing the experimenter to familiarize with the use of apparatus easily; it is time saving, requiring no more than an hour to construct a personal profile (Schuerger, 1992); it is economical, allowing a wide range of practitioners to carry it out regardless of their financial resources.

Since the test administration is straight forward and no time limit is applied, it does not require particularly active supervision by the experimenter (Schuerger, 1992). With the evolution of technology, the 16 PF can now be taken on the internet and scoring can be done on computer, meaning a significant increase in the efficiency and practicability of the test.

Kitchenham and Pfleeger (2002) suggested that the result of a questionnaire must be useful to participants in order to create a motivation for taking the test. By giving feedbacks to subjects, the 16 PF allows them to come to an understanding of their psyche.

So as to maximize its adaptability to specific purpose of studies, the 16 PF was divided into several forms to provide equivalent forms to re-test the same subjects, suit subjects with various reading level and different socio-educational background, and offer different combinations to be used to fit different testing time (Cattell et al. , 1970). To sum up, the 16 PF offers the fastest way to measure primary personality factors, with good

comprehensiveness and predictive ability, regarding everyday life criteria in applied psychology (Cattell et al. , 1970).

In the context of sports, the 16 PF plays a significant role in psychological studies. By discovering innate traits, Ackland (1994) believed that elite athletes can be predicted and distinguished from the general population. Kroll and Peterson (1965) studied the personality characteristics of winning and losing football teams and discovered specific traits in the winning teams. Besides, the test could be used to determine the sport that an individual is best suited, discover one's psychological strengths and weaknesses, identify potential emotional or social problems, and assist clinical diagnosis and therapy planning.

The 16 PF was employed by Bacanac (2001) to study the characteristics of Yugoslav senior and junior successful boxers, in comparison to athletes of other branches of sport. It was concluded that a model of personality could be established for successful boxers and distinguished from athletes from other sports; as well, successful junior boxers were found to carry specific combination of psychological characteristics. Bacanac (2001) revealed that the 16 PF was chosen depending on the age of the athletes, the available time, the aims of the research, and the theoretical and practical direction of the experimenter.

Since the test was widely accepted in the study of athletes, the results obtained could be compared to the ones established in past studies. Other motives for using the 16 PF were its economical cost and simplicity for usage and processing (Bacanac, 2001). To further explain the reason that the 16 PF

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has been so popular, ranked among the highest in number of research articles (Graham and Lilly, 1984, as cited in Cattell and Schuerger, 2003, p. 16), it would make sense to examine its reliability and validity.

Reliability refers to the consistency of the result if the test is to be repeated on the same group of subjects (Shepard, 2003). Kitchenham and Pfleeger (2002) suggested that the reliability of a questionnaire can be looked at from many different perspectives. A test-retest reliability is measured by asking the same subjects to complete the questionnaire at different times. An alternate form reliability gives different versions of the questionnaire to the test-retest subjects. Internal consistency is measured by asking groups of questions that measure different aspects of the same concept.

Cattell et al. (1970) performed an alternate form reliability on form A and B of the 16 PF within a test-retest period of 4 to 7 days. He reported the coefficient on each factor and a mean of 74.4 was found for both form A and B. According to Kitchenham and Pfleeger (2002), this reliability is considered good as it is greater than 0.7. It is interesting to note that the consistency decreased, as a matter of time, to 0.48 in 6 years (Schuerger et al., 1989). This could be explained by the change in personality variables, the practice effect, and the small number of items per scale.

Inconsistency can hardly be avoided as there is always variability on the subject, the experimenter, and the environment. For instance, failure of the subjects to cooperate would act as a major threat to reliability. The test-taking attitude is another big issue in the use of the 16 PF as many people's self-presentations change with the circumstances (Schuerger, 1992). In

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Bacanac's study (2001), for example, successful boxers may tend to highlight their mental strengths and hide their weaknesses, mainly due to the extreme competitive nature of the sport.

Salokun and Toriola (1985) conducted a study using the 16 PF to examine the personality characteristics of sprinters, basketball, soccer, and fielder hockey players; athletes were found to be more aggressive than non athletes, with hockey players being the most aggressive. In the study, the 16 PF was administered to all subjects together in a single session. The subjects might have perceived that they were being compared and judged on their responses. As a result, they might have provided social-desirable answers instead of answers that reflect the true self.

Additionally, the environment in which the 16 PF is taken would also have an effect on reliability (Cattell et al. , 1970). A test conducted in a counseling office could give different results to the one conducted in a casual setting. In a test that Thakur and Ojha (1981) conducted comparing personality traits of table-tennis, badminton, and football players, the 16 PF was administered to the players individually.

This could have made each subject more nervous and led to alternation of responses. Last but not least, the mood change effect could also influence reliability of the test (Cattell et al. 1970). Athletes taking the test after a victory would probably show higher confidence than athletes coming out of a defeat. The fact that a test is reliable does not necessarily mean that it is valid. Validity represents how well a test is measuring what it is meant to measure (Kitchenham and Pfleeger, 2002). According to Cattell and

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Schuerger (2003), there are three main forms of validity apart from face validity, which is the subjective and ill-defined review by untrained judges (Kitchenham and Pfleeger, 2002).

They are the direct concept validity, indirect concept validity, and concrete validity. The first one is seen to be the most significant as the other two are quite abstract and difficult to measure due to the complexity of human personality. Direct concept validity stands for how well a scale agrees with the construct found in the source trait that the test sets out to measure. As the 16 PF was developed by factor analysis, concept validity was provided by many past studies confirming its factor structure (Chernyshenko et al. 2001; Conn and Rieke, 1994; Cerbing and Tuley, 1991; Hofer et al. , 1997, as cited in Cattell and Schuerger, 2003).

In terms of the design of the questions, the 16 PF offers a middle choice of a question mark to eliminate the problem of " forced-choice format" so subjects will not be forced to try and give accurate answers (Cattell and Schuerger, 2003). The problem of tendency-to-agree is also eliminated by equalizing the number of items for which " yes" and " no" answers would contribute positively to the score of each factor (Cattell et al. 1970).

Although the 16 PF has been widely recognized as the most applicable measurement for personality, there are few factors that could act as threats to its validity. Studies have found that differences in age (Sealy and Cattell, 1966, as cited in Cattell et al. , 1970, p. 68), sex (Cattell, 1948b, as cited in Cattell et al. , 1970, p. 68), social status (Cattell, 1957b, as cited in Cattell et al. , 1970, p. 68), and national culture (Jalota, 1957, as cited in Cattell et al. ,

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1970) all demonstrated significant systematic differences in personality factor scores. Hence, it is important to keep these differences in mind.

Looking back at Bacanac's study (2001), he was aware of the impact of age differences and applied the HSPQ, a parallel test designed for younger age levels. Conversely, Thakur and Ojha (1981) were not aware of the differences in sex. In the table-tennis and badminton groups, both males and females were selected to take the test; however, only male subjects were chosen for the football group. This led to invalidity of the obtained results. Improvement could be made by including female footballers or presenting separate results for men and women (Cattell et al. , 1970).

Invalidity may also occur due to cross cultural diversity such as the differences in language. For instance, the same question in Thakur and Ojha's study (1981) in Indian could have a slightly different meaning compared to Bacanac's study (2001) in Yugoslavian or Salokun and Toriola's study (1985) in Nigerian. Furthermore, since the data collected in the 16 PF is self-evaluated, distortion can hardly be prevented.

The sources of distortion can be divided into three main types - deliberate sabotage, unconscious motivational distortion, and sheer ignorance about the true self (Cattell et al. 1970). Sabotage refers to the refusal from the subject to cooperate by answering the questions at random or with intent to mislead. In Thakur and Ojha's study (1981), since the number of subject was so small (30 in each sport), sabotage would have a large impact on the result and could act as a major threat to the validity of the study. Motivational distortion refers to situations when a subject assumes a test-taking role and,

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hence, making his response more suitable for a particular job (Cattell et al. , 1970).

Looking back to Thakur and Ojha's study, team captains from the football group might believe that it was more suitable for them to show confidence, leadership, self sufficiency, and discipline; this might result in higher scores in social boldness, self-reliance, and perfectionism. Thus, it is very important for experimenters to be aware of these validity threats when carrying out the 16 PF. Finally, it can be concluded that the 16 PF has become one of the best measuring devices in the study of human psychology not just because of its applicability, comprehensiveness, and simplicity, but also its reliability and validity.