

Myers-Briggs and Four-Type Structure:  
A principal components and equimax study  
of the four dimensions of the Myers-Briggs Type Indicator

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Abstract

This study investigated the extent to which the Myers-Briggs Type Indicator (MBTI) dimensions (Extraversion-Introversion; Sensation-Intuition; Thinking-Feeling; and Judging-Perceiving) formed a tight 4-factor model similar to that of Costa and McCrae's Big Five model for openness, conscientiousness, agreeableness, extraversion. The study used a principal components analysis followed by an equimax rotation of the 74 dichotomous MBTI questions measuring type. Data used for the study came from 10,661 MBTI data sets collected from 95-98 percent of the students studying at a small Midwest liberal arts college between the years of 1989 and 2005. With an equimax rotation testing for four factors, all questions studied factored into the category they were keyed to measure, providing some support for the MBTI claim to measure basic, nomothetically distributed personality variables.

Myers-Briggs and Four-Type Structure: A principal components and equimax study of the four dimensions of the Myers-Briggs Type Indicator

Over the past few decades, personality psychology reached the consensus that the adjectives people use everywhere could be subsumed into five general constructs. The search for these began with Sir Francis Galton. Galton was the first individual to search the dictionary for personality-related terms, and published his findings in 1884. As far back as William McDougall (1932) noted that all personality could be measured by five traits: intellect, character, temperament, disposition, and temper. McDougall went on to add that these terms were in themselves categories, but yet concluded that these five factors could provide a comprehensive description for personality (1932).

Dixon (1977) argued that terms used to describe thinking, feeling, and acting were found in all recorded human languages. Rieman (1987) attributed this universality to genetics—the genes shared across races and cultures. Mischel (1968) argued that what people called personality was an artifact, not real, and perhaps even a misguided projection of personality psychologists. Allport and Odbert (1936) followed Galton using Webster's Second Dictionary, but shortened Galton's list considerably. When Norman (1967) turned to the third edition to supplement Allport and Odbert's (1936) lists, he found that he had an overwhelming 2800 personality traits (Norman, 1967), a number still far too large to mold into a concise theory. The list still needed narrowing.

Though Galton (1884) had recognized that many of his terms were related, it was not until L. L. Thurstone (1934), one of the pioneers of factor analysis, who reduced the number to five. In an essentially parallel effort, Raymond B. Cattell (1943) reduced Allport and Odbert's (1936) 18,000 terms to 171 scales and 35 bipolar variables. In 1970, Cattell, Eber, and Tatsuoka,

found sixteen primary and eight hierarchical second-order factors when they factor analyzed personality test data. When challenged by others (Thurstone, 1934; Fiske, 1949; Norman, 1967; and Tupes and Christal, 1961) to look for a smaller number of factors, Cattell admitted that there may be as few as twelve factors, but still preferred sixteen.

Despite Cattell's repeated insistence on nearly a dozen factors, as McDougall had predicted earlier, and Thurstone, Fiske, Norman, and Tupes and Christal concluded, only five factors stood the task of replication. It is possible that Tupes and Christal should have been credited with developing the Big Five (Goldberg, 1993), but as Tupes and Christal published in an obscure Air Force technical report, their discovery went largely overlooked. In 1972, Digman had argued that there were seven factors, and in a 1977 article, he advocated the existence of ten factors (Digman, 1990). When in 1981, he factor analyzed his model, Digman became convinced of the five factor model and joined Costa and McCrae in championing it (Goldberg, 1993; Digman, 1981; Digman, 1986; Digman, 1990).

Subsequently, Costa and McCrae's five-factor model, measured by the NEO Personality Inventory (NEO-PI), has been translated from English and used to demonstrate that roughly the same five factors show up in an analysis of personality in many cultures and many languages. The NEO-PI has been tested in Australia (Eysenck, 1983), Spain (Avia, Sanz, Sanchez-Bernardos, Martinez-Arias, Silva, & Grana, 1995), Germany (Ameleng & Borkenau, 1982; Hofstee, Kiers, DeRaad, Goldberg, & Ostendorf, 1997; Schnabel, Asendorpf, & Ostendorf, 2002), Israel (Birenbaum & Montag, 1986), France (Rolland, Parker, & Stumpf, 1998), Korea (Chae, Piedmont, Estadt, & Wicks, 1995; Hahn, Lee, & Ashton, 1999; Ashton, Lee, and Son, 2000), Poland (Szararota, Zawadzki, & Strelau, 2002), Denmark (Hofstee, Kiers, DeRaad, Goldberg, & Ostendorf, 1997), England (Hofstee, Kiers, DeRaad, Goldberg, & Ostendorf, 1997),

Australia (Murray, Allen, and Trinder, 2002), Pakistan (Aziz & Jackson, 2000), Holland (Van Heck, Perugini, Caprara, & Froger, 1994), Holland (Van Heck, Perugini, Caprara, and Froger, 1994; De Fruyt & Mervielde, 1997; Tokar & Fischer, 1998), Sweden (Ghaderi & Scott, 2000), Switzerland (Vollrath, Knoch, & Cassano, 1999), Belgium (De Fruyt, Van De Wiele, & Van Heeringen, 2000), Canada (Cox, Borger, Asmundson, & Taylor, 2000; Yik & Russell, 2001), and the Netherlands (Van Der Zee, Buunk, Sanderman, Botke, & Van Den Bergh, 1999; Barelds & Luteijn, 2002). The NEO-PI has been tested and its structure replicated in every language and country within which it has been studied. Digman (1990) went so far as to say that the Big Five personality identified human instinctual patterns.

The NEO-PI structure has also been shown to appear across self and peer ratings (Norman, 1963; Goldberg, 1980; Johnson, 2000; Szararota, Zawadzki, & Strelau, 2002). It has accounted for nearly all the variance across observational data (Borgatta, 1964; Norman & Goldberg, 1966). On the last point, it has held even in the personality typing of animals including horses (Morris, Gale, & Buffy, 2002) and chimpanzees (King & Figuerdo, 1997). Similarly, it has been tested across a variety of personality instruments. For example, Tokar and Fischer (1998) found much overlap between the Big Five and Hogan and Prediger's RIASEC dimensions. Thus, with all of this evidence backing five replicable factors, the concept of the five-factor model was firmly established.

The five-factor model was actually one of two separate five-factor theoretical models. The NEO-PI was associated with Costa and McCrae (1985). The other model, popularized by Norman (1963, 1967, 1969), Goldberg (1980, 1981, 1990, 1993), and Digman (1981, 1986, 1990), was based on the lexical hypothesis. This purported that to understand and describe personality, one must have and use the terms contained within his/her language. Because

personality was necessary for interpersonal interaction, personality traits would have to be in every language for people to coexist. These models differed in the terms they used for the five factors, but both had five similar measures for personality dimensions.

Buss and Craik (1980, 1985) and Botwin and Buss (1989) have come to use behaviors to measure the factors. Their method came to be known as the act-frequency approach. It included self and peer reports of the frequency of certain actions performed over a period of time. And despite criticism (especially by Block, 1989, who claimed that these actions functioned similarly to inventory items and were too specific, so that the test's regular format was preferable), the act-frequency method was used successfully abroad in Germany to ascertain the following five factors that we know as the Big Five.

Another approach has been the "person versus situation" debate, which sought to account for the role of situations on an individual's decisions (Hendriks, 1996). This tested concrete behaviors and purported that situational contribution was achieved through a cost-benefit analysis on the part of the actor. Yet, Hendriks still credited two-thirds of the variation in individuals' actions on those factors measured by the Big Five. Van Heck, Perugini, Caprara, and Froger (1994) did a Dutch study using the same model. They reversed the relative importance of personality and situation in human behavior, and argued that the Big Five traits were less important predictors of behavior than the Big Five model asserted. To this point, Costa, Herbst, McCrae, Samuels, and Ozer (2002) noted that personality type membership was affected by situational variables. They also recognized that whereas all personality descriptions could be reduced to the Big Five structure, one might need more than five constructs to encompass the specifics of any given personality.

The first of the five factors was named Neuroticism or emotional stability. It included aspects of insecurity, temperamentalness, worrying, and self-consciousness, but it also included anxiety, anger, and depression, a factor measuring mental health in terms of normality- abnormality, not just some aspect of normal functioning or coping. Extroversion (Eysenck & Eysenck, 1967) or Surgency formed the second factor. It was characterized by being friendly, sociable, and outgoing. Some believed that it could be associated with impulsiveness (Eysenck & Eysenck, 1963; Hogan, 1983; Reville, Humphreys, Simon, & Gilliland, 1980). It also had a hint of value judgement in it as well, but seemed generally more accepted than the neuroticism factor. Openness to experience, the third factor, was similar to the fifth factor of culture according to McCrae and Costa (1987), but its overlap did not prevent it from being its own factor. Openness included being daring, original, open-minded, and imaginative. It involved being accepting of fantasies, feelings, and values. Agreeableness was the fourth factor. It was often contrasted with antagonism, which was characterized by narcissism, perfectionism, and arrogance. Agreeableness included aspects of trust versus skepticism and sympathy versus stubborn uncooperativeness. Horney (1945, 1950) had recognized the connections between antagonism and moving against people. Dembroski and MacDougall (1983) noted the link between antagonism and Type A personalities. Factor five, termed Conscientiousness, had also been contrasted with undirectedness. Amelang and Borkenau (1982) titled this factor self-control versus impulsivity. Cattell and colleagues (1970) noted the inhibiting agent connoted by this term, and entitled this factor superego strength. McCrae and Costa (1987) described this factor as an individual's abilities in persevering, striving for excellence, hard working, and exerting effort with a purposeful direction. As the adjectives included within the headings show, these factors

are very broad and inclusive. They assumed that all other terms could be categorized under these five headings.

## **Big 5 Personality Factors** (McCrae, 1990, p. 402)

### **Extraversion**

Talkative  
Passionate  
Active  
Dominant  
Sociable

Unfeeling  
Passive  
Quiet

### **Openness**

Creative  
Imaginative  
Prefers variety

Uncreative  
Down-to-earth  
Prefers Routine

### **Agreeableness**

Good-natured  
Soft-hearted  
Trusting

Irritable  
Ruthless  
Suspicious

### **Conscientiousness**

Conscientious  
Hard-working  
Ambitious  
Responsible

Negligent  
Lazy  
Aimless  
Irresponsible

### **Neuroticism**

Worrying  
Emotional  
Vulnerable  
Anxious

Calm  
Unemotional  
Hardy  
Self-controlled  
Sense of well-being

While much work on the Big Five and Five-Factor models demonstrated replicability, the relation between the Big Five model of personality and other qualities or behaviors has also been studied. Studies tested the relationship between the Big Five and career or academic qualities such as grades and academic success (Furnham & Medhurst, 1995; Parker & Stumpf, 1998; Paunonen & Ashton, 2001), sleep and academic performance (Gray & Watson, 2002), emotional and academic intelligence (Van Der Lee, Thijs, & Schackel, 2002), job status (Mershon & Gorsuch, 1988), job performance (Mount, Wilt, & Barrick, 2000), and job satisfaction (Furnham, Petrides, Jackson, & Cotter, 2002).

Similarly, the Big Five has been associated with behavioral aspects including procrastination (Lay, Kovacs, & Panto, 1998), classroom behavior (Resing, Bleichrodt, & Dekke, 1999), self-reported delinquency (Heaven, 1996), perfectionism (Stumpf & Parker, 2000), vigilance (Rose, Murphy, Byard, & Nikzod, 2002), fatigue (DeVries & Van Heck, 2002), self-presentation strategies (Avia, Sanchez-Bernardos, Sanz, Carrillo, & Rojo, 1998), hypochondriasis (Cox, Borger, Asmundson, & Taylor, 2000) and conformity prediction (DeYoung, Peterson, & Higgins, 2002).

Further studies have sought to ascertain the links between the Big Five and various facets of health. Tests have compared Big Five results and overall health (Smith & Williams, 1992), as well as mental health. These include eating disorders (Ghaderi & Scott, 2000), risky behaviors and perceived susceptibility to health risks (Vollrath, Knoch, & Cassano, 1999), and social comparison processes during cancer treatment (Van Der Zee, Buunk, Sanderman, Botke, & Van Den Bergh, 1999). Other research has been conducted relating the Big Five to psychological needs (Craig, Loheidi, Rudolph, Leifer, & Rubin, 1998), thinking styles (Zhang & Huang, 2001),

sex-based neuroticism (Shafer, 2001), personality dysfunction (Larstone, Jang, Livesley, Vernon, & Wolf, 2002), and lacunae and likeableness (Cartwright, 1997). Still other studies have tested the relationship between the Big Five and various facets of personality, including Axis II personality disorders (Trull, Widiger, & Burr, 2001) and personality disorder symptomology (Axelrod, Widiger, Trull, & Corbitt, 1997).

Similar studies have tested Big Five and other personality and temperament models and characteristics, including the Holland RIASEC personality inventory (De Fruyt & Mervielde, 1997; Tokar & Fischer, 1998), Cloninger's Temperament model (De Fruyt, Van De Wielede, & Van Heerington, 2000), and circumplex approaches (Hofstee, de Raad, & Goldberg, 1992).

The Big Five has been tested with a variety of other scales and temperaments. These include the imposter phenomenon and achievement dispositions (Chae, Piedmont, Estadt, & Wicks, 1995; Ross, Stewart, Mugge, & Fultz, 2001), the interpersonal adjective scales (McCrae & Costa, 1989b; Trapnell & Wiggins, 1990), conceptual structural complexity and indeterminacy in personality (Vassend & Skrondal, 1995), and child personality difference ratings (Mervielde, Buyst, De Fruyt, 1995). Averaged personality ratings of acquaintances (Johnson, 2000), and personality change during intensive outpatient counseling (Piedmont, 2001) have also been studied alongside the Big Five. Further studies have examined trait and maturational processes' interaction with NEO-PI personality typology (Hogansen & Lanning, 2001) and compared the NEO-PI to the Eysenck Personality Questionnaire, Social Desirability Scale, Beck Depression Inventory, and Social Avoidance Scales (Avia, Sanz, Sanchez-Bernardos, Martinez-Arias, Silva, & Grana, 1995). In addition, this study tested the links between the NEO-PI and scales for dysfunctional attitudes, interaction anxiousness, schizotypal

personality, assertion behaviors, and overall health attitudes and habits (Avia, Sanz, Sanchez-Bernardos, Martinez-Arias, Silva, & Grana, 1995).

The NEO-PI has also been used to successfully study birth order (Jefferson, Herbst, & McCrae, 1998), sex and relationship predictions (Shafer, 2001), sex-based descriptions (Schmitt & Buss, 2000), sex differences (Budaev, 1999), the extent to which family members' personalities are alike and different (Bratko & Marusic, 1997), and how personality as assessed by the Big Five related to assessment of the attractiveness of the opposite sex (Berry & Miller, 2001). Furthermore, it has examined the Big Five's interactions with attributional style and gender (Poropat, 2002), assessment of affect (Yik & Russell), and the links between personality factors of extroversion, neuroticism, and emotional regulation (Kokkonen & Pulkkinen, 2001).

Further studies have explored the dimension of mood and its relation to Big Five constructs. Huprich (2000) and Harkness, Bagby, Joffe, and Levitt (2002) studied the links between depressive personalities on the Big Five and such aspects of depressive personality as dysthymia, major depression and chronic minor depression, while Harkness, Bagby, Joffe, and Levitt tested Murray, Allen, and Trinder (2002) tested mood variability. These three researchers, along with Rawlings, tested mood seasonality with the Big Five in 2002.

Despite the general consensus on the Big Five, there were, and continue to be, those who call for fewer or more factors to adequately describe personality. Eysenck concluded that the correct number was three (1967, Eysenck & Eysenck, 1985), while others (Aziz & Jackson, 2000) thought Eysenck's Three left too much out, a argument probably made most clearly by Costa and McCrae (1985, 1992). Glickson and Abulafia (1998) felt that the Big Three lacked a term they called sensation seeking. They argued that while this was related to both extraversion and psychoticism, it was not evident that these two factors could account for this entire construct;

one that they claimed encompassed “non-impulsive socialized sensations” and “impulsive, unsocialized” ones. Some, like Block (1995), thought even five was too few.

The five-factor concept itself seemed not to be the problem, however. The real arguments centered on how one divided up those factors. It seemed that many people found six factors. They encompassed the basic five-factor model, but took what they believed to be an overgeneralized concept and broke it into two factors embedded within it. One contrarian argument comes from Becker (1999), who found that the NEO-PI was not comprehensive and needed a sixth factor that he named “hedonism” or “spontaneity.” He similarly noted that one could pull out higher order factors of mental health and behavioral control to produce a “Big Two,” (Becker, 1999). Despite these disagreements, he did admit the validity of the Big Five when matched with a circumplex structure (Becker, 1999). Ashton and Lee (2002) and Ashton, Lee, and Son (2000) believed that honesty was not adequately covered by the five dimensions, while Ferguson and Patterson (1998) agreed with the inclusion of the “openness” facet of personality, but found it to be better separated into “intellectual engagement” and problem solving. Jackson, Paunonen, Fraboni, and Goffin (1996) argued that conscientiousness needed to be broken into an achievement-oriented facet as well as a methodical dimension. McKensie (1998) also found fault with the openness factor, but his concern was not supported by his research findings. He argued that the label “openness” had less consensus and accounted for a large portion of the disagreement surrounding the Big Five.

Furnham (1996) compared the Big Five to the Myers-Briggs Type Indicator (MBTI) and found agreeableness to match with the thinking-feeling dimension, conscientiousness to be located between that dimension and partially in the judging-perceiving continuum, extraversion relating to extraversion, and openness correlating to all four dimensions of the MBTI, particularly the

sensing-intuition aspect. Neuroticism, however, was not supported, and had no corresponding aspect in the Myers-Briggs. Heaven & Shocket (1995) also studied neuroticism, finding that inventory items are less able to measure neuroticism than using natural language.

The Big Five contained within it all of the adjectives used to describe personality. The five factors were the most general formulation of characteristics people used to describe personality. Yet, questions remained about whether more subdimensions need to be explicated. Merson & Gorsuch (1988) have found the 16 Personality Factor model to have better predictability, and argue that by only having higher order factors, necessary details were lost. Perugini & Galluci (1997) noted that while there is the most personality researcher support behind the five-factor concept, and it has been reproduced, if it were to include subfactors of central and peripheral terms associated with the main five factors, this would add meaning and clarity to our knowledge of the Big Five. And in terms of resiliency, it was more than thirty years ago that “five competent, independent investigators all...came to the same general conclusion: that [personality structure] could be adequately described by five superordinate constructs” (Digman, 1990, p. 420) that we have come to know as the five factors of personality.

The Myers-Briggs Type Inventory (MBTI) has also been used to assess personality. Developed in the 1940s by Isabel Briggs-Myers and her mother, Katharine Briggs, this model was based off Carl Jung’s personality theories (Geyer, 1995). Peter Geyer (1995) had the publishers of the MBTI, Consulting Psychologists Press in their 1994 catalog, claim the MBTI as the “most widely used and reliable normal personality inventory in history.” The MBTI has not only stood the tests of time and the English speaking public; it has been written in twenty languages, and has also been reworded in additional languages to preserve its main concepts (Reinhold, 2005). It has been found to replicate in Italian samples (Saggino & Kline, 1995). Yet,

despite its replicability, Geyer (1995) later noted that the public fails to highly regard this model, citing an overall lack of statistical data to back it up.

The MBTI assessment came after Myers realized that, through Jung's theories, differences among people are from four dimensions, or "preferences" (Reinhold, 2005). The first of these was based on how one directed his/her life energy, whether inwards, in introversion or outwards, in extraversion (Geyer, 2004). According to Jung, introversion was "normal," self-fulfilling, and not negative as it has come to be viewed (Geyer, 2004). Extraversion involved a preference for being in the company of others a good portion of the time. Notably, although a preference existed in each individual, it was normal for persons to desire, and even need, time to fulfill the other side of their personality.

A second category involved perception, and was based on how people preferred to deal with information (Geyer, 2004). "Sensing" individuals preferred clear, fact-based, current information, whereas "intuitive" individuals desired to deal with larger issues, meanings, and abstract concepts. Interestingly enough, Geyer (2004) found three times more sensors than intuitives, indicating that types were not always equally represented in the general population.

Judgment formed the third preference category, one that evaluated how a person preferred to make decisions (Geyer, 2004). "Thinkers" were logical and analytical. They took an objective, impersonal stance and emphasized final results. "Feeling" individuals were more subjective and value-oriented, considering how their decisions would impact others. This dimension tended to be evenly split in the overall population, although more males were thinkers and more females were feelers (Geyer, 2004).

The final dichotomy was between judging and perceiving. It dealt with how scheduled or flexible one preferred to be. "Judgers" wanted to be organized, and scheduled, and thus tended to

## Myers-Briggs Type Inventory Styles

### Extraversion (E)

- Learn best in action
- Value physical activity
- Like to study with others
- High verbal and interpersonal skills
- Reading and writing difficult
- Background sounds help them study
- Enjoy classes with discussion component

### Introversion (I)

- Learn best by pausing to think
- Value reading
- Prefer to study individually
- Feel below average in verbal expression
- Public speaking difficult
- Need quiet to concentrate
- Want faculty to give clear lectures

### Sensation (S)

- Seek specific information
- Memorize facts
- Value what is practical
- Follow instructions
- Like hands-on experiences
- Trust material as presented
- Want faculty who give clear assignments

### Intuition (N)

- Seek quick insights
- Use imagination to go beyond basic facts
- Value originality
- Create own directions
- Like theories that provide perspective
- Read between the lines
- Want faculty to encourage independent thinking

### Thinking (T)

- Want objective material to study
- Logic guides learning
- Like to critique new ideas
- Can easily find flaws in an argument
- Learn by challenge and debate
- Want faculty to make logical presentations

### Feeling (F)

- Want to be able to personally relate to course material
- Personal values important
- Like to please instructors
- Can easily find something to appreciate
- Learn through support and appreciation
- Want faculty to establish personal rapport with students

### Judging (J)

- Like formal instructions for problem solving
- Value dependability
- Plan work in advance, working steadily toward goals
- Like being in charge of events
- Drive toward closure
- Want faculty to be organized

### Perceiving (P)

- Like to solve problems informally
- Value change
- Work spontaneously and impulsively, in bursts of energy
- Like to adapt to events
- Stay open-minded to new information
- Want faculty to be entertaining and inspiring

be more responsible with time management and academic issues (Geyer, 2004). “Perceivers,” in contrast, were more flexible and spontaneous. They tend to be underrepresented in situations where organization and responsibility were important attributes, including school and the business/legal sectors (Geyer, 2004), places where this model has been most frequently used (Gonsowksi, 1999).

Despite psychologists’ general conception that little research has been done on the MBTI, several studies have been conducted to illustrate its validity. Gonsowksi (1999) found that the Big Five mapped to Wiggins’ Circumplex model. Saggino & Cooper (2001) converged the MBTI and validated its use, noting its particular relevance to the business settings that Gonsowski (1999) noted it has often been used in.

While McCrae and Costa (1989b) and Furnham (1996) expressed concern that the MBTI did not measure neuroticism, they agreed that the MBTI’s traits line up with the well-tested Five Factor Model, and concluded that the MBTI provided a comprehensive model for personality. Harvey, et. al. (1995), found that the MBTI definitions matched particularly well with the Big Five traits. Furnham (1996) added that the NEO-PI’s Agreeableness matched up with the MBTI’s Thinking-Feeling dimension. Similarly, Conscientiousness was related to Judging-Perceiving as well as Thinking-Feeling (Furnham, 1996). Extraversion was predictably related to the Extraversion-Introversion dimension (Furnham, 1996), and Openness correlated with all, particularly the Sensing-Intuitive dimension (Furnham, 1996). The Big Five’s Neuroticism, however, was not reliably matched with any other factor (Furnham, 1996).

The MBTI has also been subjected to a number of reliability and validity studies, as reviewed by Carlson in 1985. He found that it was satisfactorily reliable and valid, as seen in

1975 studies where the MBTI went through a series of split-half and test-retest studies (Carlson, 1985).

The investigator sought to test if the MBTI could fit a similar model to the Big Five. Even though some factor analytic studies have been run on the MBTI, the highest results still left what Bess, Harvey, and Swartz (2003) deemed as “significant room for improvement,” relative to Costa and McCrae’s five-factor model.

### Method

This research differed from previous studies in that we eliminated the scale items that did not function bidirectionally and we looked at the percentage of variance accounted for in the first four factors—something directed by the theory behind the MBTI. Earlier work had been done (McCrae and Costa, 1989; Harvey, Murry, and Markham, 1995; Saggino and Kline, 1996; Furnham, 1996; Gonsowski, 1999; Saggino, Cooper and Kline, 2001; Bess, Harvey, and Swartz, 2003; and Furnham, Moutafi, and Crum, 2003) that attempted to map or correlate the MBTI to the Big Five, but this study was the first to test the integrity of the model itself and verify the four-factor typology Jung had hypothesized.

### *Subjects*

The data studied were archival scores of 10,661 Myers-Briggs Type Indicator scores. This was 95-98% of the student body at a small liberal arts college in Minnesota between the years of 1989 and 2001, with some additional scores from 2002 to 2005. These scores were collected by Dr. Barbara Simpson during those years. Once collected, the data sets were formed into a single data set to make them suitable for researching.

*Procedure*

The scores were then subjected to a factor analysis using principal components analysis, followed by an equimax rotation of the remaining variables. In other words, the test's 96 scored variables were weaned to 74, composed only of dichotomous variables. The principal components analysis technique was used to study the correlations among our many variables by grouping them into meaningful factors. Once grouped, factor variables were more alike those they were grouped with, and the first variables accounted for the largest amount of spread. Rotation was required because initial factor development does not produce recognizable, interpretable factors. An equimax rotation served to load each factor mainly on one dimension and less on others, creating a more well-defined variable. It does so by rotating the factors on their planes, and ends up producing better correlations between variables.

*Results*

Originally, the principal components analysis defined 14 distinct variables, which collectively accounted for 75% of the variance between the scores. When forced into a four-factor model, as the Myers-Briggs Type Indicator is, we were able to account for 25% of the variance. Thus, we were able to show that there was a correlation among the variables in their dimensions. The selection of the initial choice answer—namely choice “1”-- indicated the initial, or default type in the dichotomous choices, namely extraversion, sensation, thinking, and judging. Some questions are scored in reverse order, when the question asks about characteristics of the non-default personality type. What our data found was that all four factors and all 74 questions studied factored into the category that the Myers-Briggs Type Indicator scoring manual had them keyed to measure.

## Variance Explained

| <b>Component</b> | <b>% variance</b> | <b>Cumulative %</b> |
|------------------|-------------------|---------------------|
| 1                | 10.952            | 10.952              |
| 2                | 6.607             | 17.559              |
| 3                | 5.223             | 22.782              |
| <u>4</u>         | <u>3.870</u>      | <u>26.652</u>       |
| 5                | 2.350             | 29.002              |
| 6                | 1.884             | 30.886              |
| 7                | 1.706             | 32.591              |
| 8                | 1.631             | 34.222              |
| 9                | 1.567             | 35.789              |
| 10               | 1.525             | 37.314              |
| 11               | 1.486             | 38.800              |
| 12               | 1.466             | 40.265              |
| 13               | 1.418             | 41.684              |

## Factor Loadings for Myers-Briggs Type Indicator E-I Scale

| Q# | Question Stem  | Positive Loadings on Factor E                                  | Negative Loadings on Factor E   |
|----|--|--|---|
| 3  | Are you usually  | a good mixer, or   | rather quiet and reserved?  |
| 37 | Which word in each pair appeals to you more?                 | reserved   | talkative .621  |
| 10 | In a large group do you more often                           | introduce others, or   | get introduced?   |
| 19 | Do you   | talk easily to almost anyone for as long as you have to, or    | find a lot to say only to certain people or under certain conditions? |
| 31 | Which word in each pair appeals to you more?                 | hearty   | quiet   |
| 79 | Are you  | easy to get to know, or  | hard to get to know?  |
| 40 | Which word in each pair appeals to you more?                 | calm   | lively .523   |
| 90 | When you are at a party do you like to                       | help get things going, or                                      | let others have fun in their own way?                                 |
| 72 | Would you say you  | get more enthusiastic about things than the average person, or | get less excited about things than the average person?                |
| 26 | Do you usually   | show your feelings freely, or                                  | keep your feelings to yourself?                                       |
| 66 | Which word in each pair appeals to you more?                 | sociable   | detached  |
| 23 | Can the new people you meet tell what you are interested in  | Right away, or   | only after they really get to know you?                               |
| 7  | When you are with a group of people would you usually rather | join in the talk of the group                                  | talk with one person at a time?                                       |
| 75 | At parties, do you   | sometimes get bored, or  | always have fun? .376   |
| 16 | Among your friends, are you                                  | one of the last to hear what is going on,                      | full of news about everybody .363                                     |
| 13 | Do you tend to have  | deep friendships with a very few people, or                    | broad friendships with many different people? .335                    |
| 86 | Do you think the people close to you know how you feel       | about most things, or  | only when you have had some special reason to tell them?              |



**Factor Loadings for Myers-Briggs Type Indicator S-N Scale**

| Q# | Question Stem   | Positive Loadings on factor S                                     | Negative Loadings on Factor S  |
|----|---|---|--|
| 29 | Which appeals to you more?  | facts .573  | ideas  |
| 58 | Which appeals to you more?  | concrete .546   | abstract   |
| 2  | If you were a teacher would you rather teach                                | fact courses? .543  | courses involving theory?  |
| 42 | Which appeals to you more?  | theory  | certainty .516   |
| 33 | Which appeals to you more?  | statement .508  | concept  |
| 61 | Which appeals to you more?  | build .507  | invent   |
| 48 | Which appeals to you more?  | make .484   | create   |
| 44 | Which appeals to you more?  | literal .442  | figurative   |
| 9  | Would you rather be considered  | a practical person? .436  | an ingenious person?   |
| 5  | Do you usually get along better with  | imaginative people  | realistic people .442  |
| 71 | Which word in each pair appeals to you more?                                | known .436  |  |
| 25 | In doing something that many other people do, does it appeal to you more to | do it in the accepted way, or .413                                | invent a way of your own?  |
| 52 | Which appeals to you more?  | production .388   | design   |
| 67 | Which appeals to you more?  | punctual .388   | leisurely  |
| 50 | Which appeals to you more?  | sensible .384   | fascinating  |
| 83 | Is it higher praise to say someone has                                      | vision  | common sense .365  |
| 91 | Would you rather  | support the established methods of doing good, or                 | analyze what is still wrong and attack unsolved problems?                |
| 18 | Would you rather has as a friend  | someone who is always coming up with new ideas, or .306           | someone who has both feet on the ground?                                 |
| 11 | Do you admire more the people who are                                       | conventional enough never to make themselves conspicuous, or .293 | too original and individual to care whether they are conspicuous or not? |
| 69 | Which appeals to you more?  | accept .268   | change   |
| 65 | Which appeals to you more?  | theory  | experience .261  |

### Factor Loadings for Myers-Briggs Type Indicator T-F Scale

| Q# | Question Stem                                  | Positive Loadings on Factor T       | Negative Loadings on Factor T     |
|----|--|-------------------------------------|-----------------------------------|
| 30 | Which word a in each pair appeals to you more? | Thinking                            | feeling                           |
| 32 | Which word a in each pair appeals to you more? | speak.                              | write                             |
| 45 | Which word a in each pair appeals to you more? | firm-minded                         | warm-hearted                      |
| 21 | Do you usually                                 | value sentiment more than logic, or | value logic more than sentiment?  |
| 38 | Which word a in each pair appeals to you more? | compassion                          | foresight                         |
| 28 | Which word a in each pair appeals to you more? | gentle                              | firm                              |
| 15 | Is it a higher compliment to be called         | a person of real feeling, or        | a consistently reasonable person? |
| 41 | Which word a in each pair appeals to you more? | benefits                            | blessings                         |
| 56 | Which word a in each pair appeals to you more? | uncritical                          | critical                          |
| 6  | Do you more often let                          | your heart rule you head, or        | your head rule your heart?        |
| 43 | Which word a in each pair appeals to you more? | determined                          | devoted                           |
| 73 | Do you feel it is a worse fault to be          | unsympathetic, or                   | Unreasonable?                     |
| 60 | Which word a in each pair appeals to you more? | wary                                | trustful                          |
| 36 | Which word a in each pair appeals to you more? | justice                             | mercy                             |
| 87 | Would you rather work for someone who is       | always kind, or                     | always fair?                      |

**Factor Loadings for Myers-Briggs Type Indicator J-P Scale**

| Q# | Question Stem   | Positive Loadings on Factor J  | Negative Loadings on Factor J  |
|----|---|--|--|
| 27 | Which word in each pair appeals to you more?  | scheduled  | unplanned  |
| 12 | Does following a schedule   | appeal to you  | cramp you?   |
| 1  | When you go somewhere for the day, would you rather   | plan what you will do and when, or   | just go  |
| 20 | When you have a special job to do, do you like to   | organize it carefully before you start, or                                       | find out what is necessary as you go along?                                |
| 14 | Does the idea of making a list of what you should get done over a weekend                             | appeal to you, or  | positively depress you?  |
| 4  | Do you prefer to  | arrange dates, parties, etc. well in advance, or                                 | be free to do whatever looks like fun when the time comes?                 |
| 74 | Do you  | rather prefer to do things at the last minute, or                                | find doing things at the last minute hard on the nerves? .470              |
| 35 | Which word in each pair appeals to you more?  | systematic   | spontaneous  |
| 24 | When it is settled well in advance that you will do a certain thing at a certain time, do you find it | nice to be able to plan accordingly, or  | a little unpleasant to be tied down?                                       |
| 53 | Which word in each pair appeals to you more?  | who  | what   |
| 57 | Which word in each pair appeals to you more?  | punctual   | leisurely  |
| 84 | When you start a big project that is due in a week, do you  | take time to list the separate things to be done and the order of doing them, or | plunge in?   |
| 95 | Do you find the more routine parts of your day  | restful  | boring?  |
| 82 | Is it harder for you to adapt to  | routine  | constant change? .389  |
| 8  | Are you more successful   | at dealing with the unexpected and seeing quickly what should be done, or        | at following a carefully worked out plan? .387                             |
| 62 | Which word in each pair appeals to you more?  | orderly  | easygoing .377   |
| 39 | Which word in each pair appeals to you more?  | systematic   | casual   |
| 64 | Which word in each pair appeals to you more?  | quick  | careful? .352  |
| 17 | In your daily work, do you  | rather enjoy an emergency that makes you work against time, or                   | usually plan your work so that you won't need to work under pressure? .346 |



## Discussion

This study supported the Myers-Briggs Type Indicator and validated that its four factors could be replicated in data collected over 15 years and across more than 10,000 students. A further direction of research we have considered pursuing involves testing the non-scaled factors from the MBTI form F or G for evidence of the emotional stability/neuroticism factor found in the Big Five, a direction which has some support from Harvey, Murry and Markham (1995) and Bess, Harvey, and Swartz (2003).

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