

The Big Five: Decoding Your Unique Personality Blueprint

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In contemporary psychology, the "Big Five" factors (or Five Factor Model; FFM) of personality are five broad domains or dimensions of personality which are used to describe human personality.

The Big five factors are openness, conscientiousness, extraversion, agreeableness, and neuroticism (common acronyms are OCEAN, NEOAC, or CANOE). The neuroticism factor is sometimes referred by its low pole - "emotional stability". Some disagreement remains about how to interpret the openness factor, which is sometimes called "intellect" rather than openness to experience. Beneath each factor, a cluster of correlated specific traits are found; For example, extraversion includes such related qualities as gregariousness, assertiveness, excitement seeking, warmth, activity and positive emotions.

The Five Factor Model is a descriptive model of personality; psychologists have developed a number of theories to account for the Big Five.

The five factors

The Big Five factors and their constituent traits can be summarized as (OCEAN):

Openness - (inventive/curious vs. consistent/cautious). Appreciation for art, emotion, adventure, unusual ideas, curiosity, and variety of experience.

Conscientiousness - (efficient/organized vs. easy-going/careless). A tendency to show self-discipline, act dutifully, and aim for achievement; planned rather than spontaneous behaviour.

Extraversion - (outgoing/energetic vs. solitary/reserved). Energy, positive emotions, surgency, and the tendency to seek stimulation in the company of others.

Agreeableness - (friendly/compassionate vs. cold/unkind). A tendency to be compassionate and cooperative rather than suspicious and antagonistic towards others.

Neuroticism - (sensitive/nervous vs. secure/confident). A tendency to experience unpleasant emotions easily, such as anger, anxiety, depression, or vulnerability.

The Big Five model is a comprehensive, empirical, data-driven research finding. Identifying the traits and structure of human personality has been one of the most fundamental goals in all of psychology. The five broad factors were discovered and defined by several independent sets of researchers (Digman, 1990). These researchers began by studying known personality traits and then factor-analyzing hundreds of measures of these traits (in self-report and questionnaire data, peer ratings, and objective measures from experimental settings) in order to find the underlying factors of personality.

The initial model was advanced by Ernest Tupes and Raymond Christal in 1961, but failed to reach an academic audience until the 1980s. In 1990, J.M. Digman advanced his five factor model of personality, which Goldberg extended to the highest level of organization (Goldberg, 1993). These five over-arching domains have been found to contain and subsume most known personality traits

and are assumed to represent the basic structure behind all personality traits. These five factors provide a rich conceptual framework for integrating all the research findings and theory in personality psychology. The Big Five traits are also referred to as the "Five Factor Model" or FFM (Costa & McCrae, 1992), and as the Global Factors of personality (Russell & Karol, 1994).

At least four sets of researchers have worked independently for decades on this problem and have identified generally the same Big Five factors: Tupes & Cristal were first, followed by Goldberg at the Oregon Research Institute, Cattell at the University of Illinois, and Costa and McCrae at the National Institutes of Health. These four sets of researchers used somewhat different methods in finding the five traits, and thus each set of five factors has somewhat different names and definitions. However, all have been found to be highly inter-correlated and factor-analytically aligned.

Because the Big Five traits are broad and comprehensive, they are not nearly as powerful in predicting and explaining actual behavior as are the more numerous lower-level traits. Many studies have confirmed that in predicting actual behavior the more numerous facet or primary level traits are far more effective (e.g. Mershon & Gorsuch, 1988; Paunonon & Ashton, 2001)

When scored for individual feedback, these traits are frequently presented as percentile scores. For example, a Conscientiousness rating in the 80th percentile indicates a relatively strong sense of responsibility and orderliness, whereas an Extraversion rating in the 5th percentile indicates an exceptional need for solitude and quiet. Although these trait clusters are statistical aggregates, exceptions may exist on individual personality profiles. On average, people who register high in Openness are intellectually curious, open to emotion, interested in art, and willing to try new things. A particular individual, however, may have a high overall Openness score and be interested in learning and exploring new cultures but have no great interest in art or poetry.

The most frequently used measures of the Big Five comprise either items that are self-descriptive sentences or, in the case of lexical measures, items that are single adjectives. Due to the length of sentence-based and some lexical measures, short forms have been developed and validated for use in applied research settings where questionnaire space and respondent time are limited, such as the 40-item balanced International English Big-Five Mini-Markers or a very brief (10 item) measure of the Big Five domains.

Openness to experience

Openness is a general appreciation for art, emotion, adventure, unusual ideas, imagination, curiosity, and variety of experience. The trait distinguishes imaginative people from down-to-earth, conventional people. People who are open to experience are intellectually curious, appreciative of art, and sensitive to beauty. They tend to be, compared to closed people, more creative and more

aware of their feelings. They are more likely to hold unconventional beliefs.

People with low scores on openness tend to have more conventional, traditional interests. They prefer the plain, straightforward, and obvious over the complex, ambiguous, and subtle. They may regard the arts and sciences with suspicion or even view these endeavors as uninteresting.

Sample openness items

- I have a rich vocabulary.
- I have a vivid imagination.
- I have excellent ideas.
- I am quick to understand things.
- I use difficult words.
- I spend time reflecting on things.
- I am full of ideas.
- I am not interested in abstractions. (reversed)
- I do not have a good imagination. (reversed)
- I have difficulty understanding abstract ideas. (reversed)

Conscientiousness

Conscientiousness is a tendency to show self-discipline, act dutifully, and aim for achievement against measures or outside expectations. The trait shows a preference for planned rather than spontaneous behavior. It influences the way in which we control, regulate, and direct our impulses.

Sample conscientiousness items

- I am always prepared.
- I pay attention to details.
- I get chores done right away.
- I like order.
- I follow a schedule.
- I am exacting in my work.
- I leave my belongings around. (reversed)
- I make a mess of things. (reversed)
- I often forget to put things back in their proper place. (reversed)
- I shirk my duties. (reversed)

Extraversion

Extraversion is characterized by positive emotions, surgency, and the tendency to seek out

stimulation and the company of others. The trait is marked by pronounced engagement with the external world. Extraverts enjoy being with people, and are often perceived as full of energy. They tend to be enthusiastic, action-oriented individuals who are likely to say "Yes!" or "Let's go!" to opportunities for excitement. In groups they like to talk, assert themselves, and draw attention to themselves.

Introverts lack the social exuberance and activity levels of extraverts. They tend to seem quiet, low-key, deliberate, and less involved in the social world. Their lack of social involvement should not be interpreted as shyness or depression. Introverts simply need less stimulation than extraverts and more time alone. They may be very active and energetic, simply not socially.

Sample extraversion items

- I am the life of the party.
- I don't mind being the center of attention.
- I feel comfortable around people.
- I start conversations.
- I talk to a lot of different people at parties.
- I don't talk a lot. (reversed)
- I keep in the background. (reversed)
- I have little to say. (reversed)
- I don't like to draw attention to myself. (reversed)
- I am quiet around strangers. (reversed)

Agreeableness

Agreeableness is a tendency to be compassionate and cooperative rather than suspicious and antagonistic towards others. The trait reflects individual differences in general concern for social harmony. Agreeable individuals value getting along with others. They are generally considerate, friendly, generous, helpful, and willing to compromise their interests with others. Agreeable people also have an optimistic view of human nature. They believe people are basically honest, decent, and trustworthy.

Disagreeable individuals place self-interest above getting along with others. They are generally unconcerned with others' well-being, and are less likely to extend themselves for other people. Sometimes their skepticism about others' motives causes them to be suspicious, unfriendly, and uncooperative.

Sample agreeableness items

- I am interested in people.
- I sympathize with others' feelings.

- I have a soft heart.
- I take time out for others.
- I feel others' emotions.
- I make people feel at ease.
- I am not really interested in others. (reversed)
- I insult people. (reversed)
- I am not interested in other people's problems. (reversed)
- I feel little concern for others. (reversed)

Neuroticism

Neuroticism is the tendency to experience negative emotions, such as anger, anxiety, or depression. It is sometimes called emotional instability. Those who score high in neuroticism are emotionally reactive and vulnerable to stress. They are more likely to interpret ordinary situations as threatening, and minor frustrations as hopelessly difficult. Their negative emotional reactions tend to persist for unusually long periods of time, which means they are often in a bad mood. These problems in emotional regulation can diminish the ability of a person scoring high on neuroticism to think clearly, make decisions, and cope effectively with stress.

At the other end of the scale, individuals who score low in neuroticism are less easily upset and are less emotionally reactive. They tend to be calm, emotionally stable, and free from persistent negative feelings. Freedom from negative feelings does not mean that low scorers experience a lot of positive feelings.

Sample neuroticism items

- I am easily disturbed.
- I change my mood a lot.
- I get irritated easily.
- I get stressed out easily.
- I get upset easily.
- I have frequent mood swings.
- I often feel blue.
- I worry about things.
- I am relaxed most of the time. (reversed)
- I seldom feel blue. (reversed)

History

Early trait research

Sir Francis Galton was the first scientist to recognize what is now known as the Lexical Hypothesis.

This is the idea that the most salient and socially relevant personality differences in people's lives will eventually become encoded into language. The hypothesis further suggests that by sampling language, it is possible to derive a comprehensive taxonomy of human personality traits.

In 1936, Gordon Allport and H. S. Odbert put this hypothesis into practice. They worked through two of the most comprehensive dictionaries of the English language available at the time and extracted 17,953 personality-describing words. They then reduced this gigantic list to 4,504 adjectives which they believed were descriptive of observable and relatively permanent traits.

Raymond Cattell obtained the Allport-Odbert list in the 1940s, added terms obtained from psychological research, and then eliminated synonyms to reduce the total to 171. He then asked subjects to rate people whom they knew by the adjectives on the list and analyzed their ratings. Cattell identified 35 major clusters of personality traits which he referred to as the "personality sphere." He and his associates then constructed personality tests for these traits. The data they obtained from these tests were analyzed with the emerging technology of computers combined with the statistical method of factor analysis. This resulted in sixteen major personality factors, which led to the development of the 16PF Personality Questionnaire.

In 1961, two United States Air Force researchers, Ernest Tupes and Raymond Christal, analyzed personality data from eight large samples. Using Cattell's trait measures, they found five recurring factors, which they named "Surgency", "Agreeableness", "Dependability", "Emotional Stability", and "Culture". This work was replicated by Warren Norman, who also found that five major factors were sufficient to account for a large set of personality data. Norman named these factors Surgency, Agreeableness, Conscientiousness, Emotional Stability, and Culture. Raymond Cattell viewed these developments as an attack on his 16PF model and never agreed with the growing Five Factor consensus. He refers to "...the five factor heresy" which he considers "...is partly directed against the 16PF test". Responding to Goldberg's article in the *American Psychologist*, 'The Structure of Phenotypic Personality Traits', Cattell stated, "No experienced factorist could agree with Dr Goldberg's enthusiasm for the five factor personality theory". This determined rejection of the FFM challenge to his 16 factor model is presented in an article published towards the end of his life and entitled 'The fallacy of five factors in the personality sphere', Cattell, R. B. (1995), *The Psychologist*, The British Psychological Society, May Issue pp 207-208.

Hiatus in research

For the next two decades, the changing zeitgeist made publication of personality research difficult. In his 1968 book *Personality and Assessment*, Walter Mischel asserted that personality tests could not predict behavior with a correlation of more than 0.3. Social psychologists like Mischel argued that attitudes and behavior were not stable, but varied with the situation. Predicting behavior by personality tests was considered to be impossible.

Emerging methodologies challenged this point of view during the 1980s. Instead of trying to predict single instances of behavior, which was unreliable, researchers found that they could predict patterns of behavior by aggregating large numbers of observations. As a result correlations between personality and behavior increased substantially, and it was clear that "personality" did in fact exist. Personality and social psychologists now generally agree that both personal and situational variables are needed to account for human behavior. Trait theories became justified, and there was a resurgence of interest in this area.

By 1980, the pioneering research by Tupes, Christal, and Norman had been largely forgotten by psychologists. Lewis Goldberg started his own lexical project, independently found the five factors once again, and gradually brought them back to the attention of psychologists. He later coined the term "Big Five" as a label for the factors.

Validity of the Big Five

In a 1981 symposium in Honolulu, four prominent researchers, Lewis Goldberg, Naomi Takemoto-Chock, Andrew Comrey, and John M. Digman, reviewed the available personality tests of the day. They concluded that the tests which held the most promise measured a subset of five common factors, just as Norman had discovered in 1963. This event was followed by widespread acceptance of the five factor model among personality researchers during the 1980s. Peter Saville and his team, it has subsequently been claimed, included the five-factor "Pentagon" model with the original OPQ in 1984. Yet, according to Helen Baron, herself a senior member of the SHL team, in defending the OPQ against the criticisms of some of the UKs most influential psychometrically informed psychologists, stated that "attempt at confirmatory factor analysis (of OPQ scales) is misguidedthey are merely collections of scales which relate to different aspects of behaviour"(). In fact there is no reference at all to the Five Factor Model in the OPQ32 Manual, even under the headings 'OPQ32 and the OPQ model of personality' or 'OPQ development'. Even the supplement added to the OPQ Manual in 2005 recognises that "the OPQ was not developed specifically to fit the FFM model.". . The first FFM personality questionnaire to be published was the The NEO five-factor personality inventory, published by Costa and McCrae in 1985. The Hogan Personality Inventory (HPI), designed specifically for use in occupational assessments, had been used in occupational research by Robert and Joyce Hogan since the 1970s and was the basis of numerous organisational research papers presented at APA and SIOP conferences. Their research over two decades and their passionate advocacy for the use of personality assessment in Industrial and Organisational psychology had far reaching impact in reversing the influence of Walter Mischel and the situationalists as well as in promoting wide interest in the FFM model. The HPI was first published commercially in 1986.

One of the most significant advances of the five-factor model was the establishment of a common taxonomy that demonstrates order in a previously scattered and disorganized field. What

separates the five-factor model of personality from all others is that it is not based on the theory of any one particular psychologist, but rather on language.

A number of meta-analyses have confirmed the predictive value of the Big Five across a wide range of behaviors. Saulsman and Page examined the relationships between the Big Five personality dimensions and each of the 10 personality disorder categories in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV). Across 15 independent samples, the researchers found that each disorder displayed a unique and predictable five-factor profile. The most prominent and consistent personality predictors underlying the disorders were positive associations with Neuroticism and negative associations with Agreeableness.

In the area of job performance, Barrick and Mount reviewed 117 studies utilizing 162 samples with 23,994 participants. They found that conscientiousness showed consistent relations with all performance criteria for all occupational groups. Extraversion was a valid predictor for occupations involving social interaction (e.g. management and sales). Furthermore, extraversion and openness to experience were valid predictors of training proficiency criteria.

Selected scientific findings

Ever since the 1990s when the consensus of psychologists gradually came to support the Big Five, there has been a growing body of research surrounding these personality traits (see for instance, Robert Hogan's edited book "Handbook of Personality Psychology" (Academic Press, 1997).

Heritability

All five factors show an influence from both heredity and environment. Studies of twins suggest that these effects contribute in roughly equal proportion. Of four recent twin studies, the mean estimated broad heritabilities on self-report measures for the Big Five traits were as follows:

Domain Heritability

Openness to Experience 57%

Extraversion 54%

Conscientiousness 49%

Neuroticism 48%

Agreeableness 42%

Development

Many studies of longitudinal data, which correlate people's test scores over time, and cross-

sectional data, which compare personality levels across different age groups, show a high degree of stability in personality traits during adulthood. More recent research and meta-analyses of previous studies, however, indicate that change occurs in all five traits at various points in the lifespan. The new research shows evidence for a maturation effect. On average, levels of Agreeableness and Conscientiousness typically increase with time, whereas Extraversion, Neuroticism, and Openness tend to decrease. In addition to these group effects, there are individual differences: different people demonstrate unique patterns of change at all stages of life.

Gender differences

Cross-cultural research from 26 nations (N = 23,031 subjects) and again in 55 nations (N = 17,637 subjects) has shown a universal pattern of sex differences on responses to the Big Five Inventory. Women consistently report higher Neuroticism and Agreeableness, and men often report higher Extraversion and Conscientiousness. Sex differences in personality traits are largest in prosperous, healthy, and egalitarian cultures in which women have more opportunities that are equal to those of men. Both men and women tend to grow more extraverted and conscientious and less neurotic and agreeable as cultures grow more prosperous and egalitarian, but the effect is stronger for men.

Birth order

The suggestion has often been made that individuals differ by the order of their births. Frank J. Sulloway argues that birth order is correlated with personality traits. He claims that firstborns are more conscientious, more socially dominant, less agreeable, and less open to new ideas compared to laterborns.

However, Sulloway's case has been called into question. One criticism is that his data confounds family size with birth order. Subsequent analyses have shown that birth order effects are only found in studies where the subjects' personality traits are rated by family members (such as siblings or parents) or by acquaintances familiar with the subjects' birth order. Large scale studies using random samples and self-report personality tests like the NEO PI-R have found no significant effect of birth order on personality.

Cross-cultural research

The Big Five have been replicated in a variety of different languages and cultures, such as German, Chinese, Indian, etc. Thompson has demonstrated the Big Five structure across several cultures using an international English language scale.

Recent work has found relationships between Geert Hofstede's cultural factors, Individualism,

Power Distance, Masculinity, and Uncertainty Avoidance, with the average Big Five scores in a country. For instance, the degree to which a country values individualism correlates with its average Extraversion, while people living in cultures which are accepting of large inequalities in their power structures tend to score somewhat higher on Conscientiousness. The reasons for these differences are as yet unknown; this is an active area of research.

Non-humans

The big five personality factors have been assessed in some non-human species. In one series of studies, human ratings of chimpanzees using the Chimpanzee Personality Questionnaire (CPQ) revealed factors of extraversion, conscientiousness and agreeableness - as well as an additional factor of dominance - across hundreds of chimpanzees in zoological parks, a large naturalistic sanctuary and a research laboratory. Neuroticism and Openness factors were found in an original zoo sample, but did not replicate in a new zoo sample or to other settings (perhaps reflecting the design of the CPQ).

Criticisms

Much research has been conducted on the Big Five. This has resulted in both criticism and support for the model. Critics argue that there are limitations to the scope of Big Five as an explanatory or predictive theory. It is argued that the Big Five does not explain all of human personality. The methodology used to identify the dimensional structure of personality traits, factor analysis, is often challenged for not having a universally-recognized basis for choosing among solutions with different numbers of factors. Another frequent criticism is that the Big Five is not theory-driven. It is merely a data-driven investigation of certain descriptors that tend to cluster together under factor analysis.

Limited scope

One common criticism is that the Big Five does not explain all of human personality. Some psychologists have dissented from the model precisely because they feel it neglects other domains of personality, such as Religiosity, Manipulativeness/Machiavellianism, Honesty, Self-Awareness, Thriftiness, Conservativeness, Critical Judgement, Masculinity/Femininity, Snobbishness, Sense of humour, Identity, Self-concept, and Motivation. Correlations have been found between some of these variables and the Big Five, such as the inverse relationship between political conservatism and Openness; although variation in these traits is not well explained by the Five Factors themselves. McAdams has called the Big Five a "psychology of the stranger," because they refer to traits that are relatively easy to observe in a stranger; other aspects of personality that are more privately held or more context-dependent are excluded from the Big Five.

In many studies, the five factors are not fully orthogonal to one another; that is, the five factors are not independent. Negative correlations often appear between Neuroticism and Extraversion, for instance, indicating that those who are more prone to experiencing negative emotions tend to be less talkative and outgoing. Orthogonality is viewed as desirable by some researchers because it minimizes redundancy between the dimensions. This is particularly important when the goal of a study is to provide a comprehensive description of personality with as few variables as possible.

Methodological issues

The methodology used to identify the dimensional structure of personality traits, factor analysis, is often challenged for not having a universally-recognized basis for choosing among solutions with different numbers of factors. That is, a five factor solution depends on some degree of interpretation by the analyst. A larger number of factors may, in fact, underlie these five factors. This has led to disputes about the "true" number of factors. Big Five proponents have responded that although other solutions may be viable in a single dataset, only the five factor structure consistently replicates across different studies.

A methodological criticism often directed at the Big Five is that much of the evidence relies on self report questionnaires; self-report bias and falsification of responses are difficult to deal with and account for. This becomes especially important when considering why scores may differ between individuals or groups of people - differences in scores may represent genuine underlying personality differences, or they may simply be an artifact of the way the subjects answered the questions. The five factor structure has been replicated in peer reports. However, many of the substantive findings rely on self-reports.

Theoretical status

A frequent criticism is that the Big Five is not based on any underlying theory; it is merely an empirical finding that certain descriptors cluster together under factor analysis. While this does not mean that these five factors don't exist, the underlying causes behind them are unknown. Sensation seeking and cheerfulness are not linked to Extraversion because of an underlying theory; this relationship is an empirical finding to be explained.

Jack Block's final published work before his death in January 2010 drew together his lifetime perspective on the five factor model

He summarised his critique of the model in terms of:

the atheoretical nature of the five-factors
their "cloudy" measurement

the model's inappropriateness for studying early childhood
the use of factor analysis as the exclusive paradigm for conceptualizing personality
the continuing non-consensual understandings of the five-factors
the existence of various unrecognised but successful efforts to specify aspects of character not subsumed by the five-factors

He went on to suggest that repeatedly observed higher order factors hierarchically above the proclaimed five may promise deeper biological understanding of the origins and implications of these superfactors.

Further research

Current research concentrates on a number of areas. One important question is: are the five factors the right ones? Attempts to replicate the Big Five in other countries with local dictionaries have succeeded in some countries but not in others. Apparently, for instance, Hungarians don't appear to have a single Agreeableness factor. Other researchers find evidence for Agreeableness but not for other factors.

In an attempt to explain variance in personality traits more fully, some have found seven factors, some eighteen, and some only three. What determines the eventual number of factors is essentially the kind of information that is put into the factor analysis in the first place (i.e. the "Garbage in, Garbage out" principle). Since theory often implicitly precedes empirical science (such as factor analysis), the Big Five and other proposed factor structures should always be judged according to the items that went into the factor analytic algorithm. Recent studies show that seven- or eighteen-factor models have their relative strengths and weaknesses in explaining variance in DSM-based symptom counts in nonclinical samples and in psychiatric patients and do not seem to be clearly outperformed by the Big Five.

A validation study, in 1992, conducted by Paul Sinclair and Steve Barrow, involved 202 Branch Managers from the then TSB Bank. It found several significant correlations with job performance across 3 of the Big Five scales. The correlations ranged from .21 - .33 and were noted across 3 scales: High Extraversion, Low Neuroticism and High Openness to Experience.

Another area of investigation is to make a more complete model of personality. The "Big Five" personality traits are empirical observations, not a theory; the observations of personality research remain to be explained. Costa and McCrae have built what they call the Five Factor Theory of Personality as an attempt to explain personality from the cradle to the grave. They don't follow the lexical hypothesis, though, but favor a theory-driven approach inspired by the same sources as the sources of the Big Five.

Another area of investigation is the downward extension of Big Five theory, or the Five Factor

Model, into childhood. Studies have found Big Five personality traits to correlate with children's social and emotional adjustment and academic achievement. More recently, the Five Factor Personality Inventory - Children was published extending assessment between the ages of 9 and 18. Perhaps the reason for this recent publication was the controversy over the application of the Five Factor Model to children. Studies by Oliver P. John et al. with adolescent boys brought two new factors to the table: "Irritability" and "Activity". In studies of Dutch children, those same two new factors also became apparent. These new additions "suggest that the structure of personality traits may be more differentiated in childhood than in adulthood", which would explain the recent research in this particular area.

Rushton, Bons, and Hur (2008) argued that there is a single "general factor of personality" (compare general intelligence factor), based on the r/K selection theory as described in Rushton's book *Race, Evolution, and Behavior*, that underlies the Big Five. Rushton and different colleagues have in several more studies argued that this general factor is empirically supported. The factor was also related to emotional intelligence and humor. Amigó and colleagues also found support for the theory. Rushton and colleagues (2010) have also argued that this general factor of personality is a factor in personality disorders. Erdle and Rushton (2010) argued that the underlying biological mechanism for this personality factor may be differences in J. A. Gray's Behavioral Inhibition System and Behavioral Activation System, finding support for this from analyzing self-reported expectancies of reward and punishment, self-esteem, and positive and negative affect. Veselka and colleagues (2009) also found support for the general factor of personality and that it is partially heritable. Linden and colleagues (2010) found that the general factor of personality was a predictor of likeability and popularity among classmates.

Openness to experience

Openness to experience is one of the domains which are used to describe human personality in the Five Factor Model. Openness involves active imagination, aesthetic sensitivity, attentiveness to inner feelings, preference for variety, and intellectual curiosity. A great deal of psychometric research has demonstrated that these qualities are statistically correlated. Thus, openness can be viewed as a global personality trait consisting of a set of specific traits, habits, and tendencies that cluster together.

Openness tends to be normally distributed with a small number of individuals scoring extremely high or low on the trait, and most people scoring near the average. People who score low on openness are considered to be closed to experience. They tend to be conventional and traditional in their outlook and behavior. They prefer familiar routines to new experiences, and generally have a narrower range of interests.

People who are open to experience are no different in mental health from people who are closed to

experience. There is no relationship between openness and neuroticism, or any other measure of psychological wellbeing. Being open and closed to experience are simply two different ways of relating to the world.

Measurement

The NEO PI-R personality test measures six facets or elements of openness to experience:

Fantasy - the tendency toward a vivid imagination and fantasy life.

Aesthetics - the tendency to appreciate art, music, and poetry.

Feelings - being receptive to inner emotional states and valuing emotional experience.

Actions - the inclination to try new activities, visit new places, and try new foods.

Ideas - the tendency to be intellectually curious and open to new ideas.

Values - the readiness to re-examine traditional social, religious, and political values.

Openness has also been measured, along with all the other Big Five personality traits, on Goldberg's International Personality Item Pool (IPIP). The Myers-Briggs Type Indicator (MBTI) measures the preference of "intuition," which is related to openness to experience.

According to research by Sam Gosling, it is possible to assess openness by examining people's homes and work spaces. Individuals who are highly open to experience tend to have distinctive and unconventional decorations. They are also likely to have books on a wide variety of topics, a diverse music collection, and works of art on display.

Psychological aspects

Openness to experience correlates with creativity, as measured by tests of divergent thinking. Openness is also associated with crystallized intelligence, but not fluid intelligence. These mental abilities may come more easily when people are dispositionally curious and open to learning. However, openness is only weakly related to general intelligence. Openness to experience is related to need for cognition, a motivational tendency to think about ideas, scrutinize information, and enjoy solving puzzles.

There are social and political implications to this personality trait. People who are highly open to experience tend to be politically liberal and tolerant of diversity. As a consequence, they are generally more open to different cultures and lifestyles. They are lower in ethnocentrism and right-wing authoritarianism.

Openness to experience was found to be associated with life satisfaction in older adults after controlling for confounding factors.

Genes and physiology

Openness to experience, like the other traits in the five factor model, is believed to have a genetic component. Identical twins (who have the same DNA) show similar scores on openness to experience, even when they have been adopted into different families and raised in very different environments. One genetic study with 86 subjects found Openness to experience related to the 5-HTTLPR polymorphism associated with the serotonin transporter gene.

Higher levels of openness have been linked to activity in the ascending dopaminergic system and the dorsolateral prefrontal cortex. Openness is the only personality trait that correlates with neuropsychological tests of dorsolateral prefrontal cortical function, supporting theoretical links among openness, cognitive functioning, and IQ.

Geography

An Italian study found that people who lived on Tyrrhenian islands tended to be less open to experience than those living on the nearby mainland, and that people whose ancestors had inhabited the islands for twenty generations tended to be less open to experience than more recent arrivals. Additionally, people who emigrated from the islands to the mainland tended to be more open to experience than people that stayed on the islands, and than those that immigrated to the islands.

People living in the eastern and western parts of the United States tend to score higher on openness to experience than those living in the midwest and the south. The highest average scores on openness are found in the states of New York, Oregon, Massachusetts, Washington, and California. Lowest average scores come from North Dakota, Wyoming, Alaska, Alabama, and Wisconsin.

Drug use

Psychologists in the early 1970s used the concept of openness to experience to describe people who are more likely to use marijuana. Openness was defined in these studies as high creativity, adventuresomeness, internal sensation novelty seeking, and low authoritarianism. Several correlational studies confirmed that young people who score high on this cluster of traits are more likely to use marijuana. More recent research has replicated this finding using contemporary measures of openness.

Conscientiousness

Conscientiousness is the trait of being painstaking and careful, or the quality of acting according to

the dictates of one's conscience. It includes such elements as self-discipline, carefulness, thoroughness, organization, deliberation (the tendency to think carefully before acting), and need for achievement. It is an aspect of what has traditionally been called character. Conscientious individuals are generally hard working and reliable. When taken to an extreme, they may also be workaholics, perfectionists, and compulsive in their behavior. People who are low on conscientiousness are not necessarily lazy or immoral, but they tend to be more laid back, less goal oriented, and less driven by success.

Personality models

Conscientiousness is one of five superordinate traits in the "Big Five model" of personality which also consists of extraversion, neuroticism, openness to experience, and agreeableness. Two personality tests that assess these traits are Costa and McCrae's NEO PI-R and Goldberg's NEO-IPIP. According to these models, conscientiousness is considered to be a continuous dimension of personality, rather than a categorical "type" of person. Scores in conscientiousness follow a normal distribution.

Conscientiousness is related to impulse control, but it should not be confused with the problems of impulse control found in neuroticism. People high on neurotic impulsiveness find it difficult to resist temptation or delay gratification. Individuals who are low on conscientious self-discipline are unable to motivate themselves to perform a task that they would like to accomplish. These are conceptually similar but empirically distinct.

The trait cluster of conscientiousness overlaps with other models of personality, such as C. Robert Cloninger's Temperament and Character Inventory, in which it is called self-directedness. It also includes the specific traits of rule consciousness and perfectionism in Cattell's 16 PF model. Many of the behaviors associated with conscientiousness fall under the broad category of emotional intelligence. Traits associated with conscientiousness are frequently assessed by self-report integrity tests given by various corporations to prospective employees.

Behavior

People who score high on the trait of conscientiousness tend to be more organized and less cluttered in their homes and offices. For example, their books tend to be neatly shelved in alphabetical order, or categorized by topic, rather than scattered around the room. Their clothes tend to be folded and arranged in drawers or closets instead of lying on the floor. The presence of planners and to-do lists are also signs of conscientiousness. Their homes tend to have better lighting than the homes of people who are low on this trait.

Conscientiousness is related to successful academic performance in students. Low levels of

conscientiousness are strongly associated with procrastination. A considerable amount of research indicates that conscientiousness is one of the best predictors of performance in the workplace, and indeed that after general mental ability is taken into account, the other four of the Big Five personality traits do not aid in predicting career success.:169 Conscientious employees are generally more reliable, more motivated, and harder working. Furthermore, conscientiousness is the only personality trait that correlates with performance across all categories of jobs. However, agreeableness and emotional stability may also be important, particularly in jobs that involve a significant amount of social interaction.

Although conscientiousness is generally seen as a positive trait to possess, recent research has suggested that in some situations it may be harmful for well-being. In a prospective study of 9570 individuals over four years, highly conscientiousness people suffered more than twice as much if they became unemployed. The authors suggested this may be due to conscientious people making different attributions about why they became unemployed, or through experiencing stronger reactions following failure. This finding is consistent with perspectives which see no trait as inherently positive or negative, but rather the consequences of the trait being dependant on the situation and concomitant goals and motivations.

Geography

Average levels of conscientiousness vary by state in the United States. People living in the central part of the country, including the states of Kansas, Nebraska, Oklahoma, and Missouri tend to have higher scores on average than people living in other regions. People in the southwestern states of New Mexico, Utah, and Arizona also have relatively high average scores on conscientiousness. Among the eastern states, Florida is the only one that scores in the top ten for this personality trait. The four states with the lowest scores on conscientiousness on average were, in descending order, Rhode Island, Hawaii, Maine, and Alaska.

Extraversion and introversion

The trait of extraversion-introversion is a central dimension of human personality.

Extraverts (also spelled extroverts) tend to be gregarious, assertive, and interested in seeking out excitement. Introverts, in contrast, tend to be more reserved, less outgoing, and less sociable. They are not necessarily loners but they tend to have fewer numbers of friends. Introversion does not describe social discomfort but rather social preference: an introvert may not be shy but may merely prefer less social activities. Ambiversion is a balance of extrovert and introvert characteristics.

The terms introversion and extraversion were first popularized by Carl Jung. Virtually all

comprehensive models of personality include these concepts. Examples include Jung's analytical psychology, Eysenck's three-factor model, Cattell's 16 personality factors, the Big Five personality traits, the four temperaments, the Minnesota Multiphasic Personality Inventory, the Myers Briggs Type Indicator, and Socionics.

Extraversion and introversion are typically viewed as a single continuum. Thus, to be high on one is necessarily to be low on the other. Carl Jung and the authors of the Myers-Briggs provide a different perspective and suggest that everyone has both an extraverted side and an introverted side, with one being more dominant than the other. In any case, people fluctuate in their behavior all the time, and even extreme introverts and extraverts do not always act according to their type.

Varieties

Extraversion

Extraversion is "the act, state, or habit of being predominantly concerned with and obtaining gratification from what is outside the self". Extraverts tend to enjoy human interactions and to be enthusiastic, talkative, assertive, and gregarious. They take pleasure in activities that involve large social gatherings, such as parties, community activities, public demonstrations, and business or political groups. Politics, teaching, sales, managing and brokering are fields that favor extraversion. An extraverted person is likely to enjoy time spent with people and find less reward in time spent alone. They tend to be energized when around other people, and they are more prone to boredom when they are by themselves.

Introversion

Introversion is "the state of or tendency toward being wholly or predominantly concerned with and interested in one's own mental life". Introverts are people whose energy tends to expand through reflection and dwindle during interaction. Introverts tend to be more reserved and less outspoken in large groups. They often take pleasure in solitary activities such as reading, writing, music, drawing, tinkering, playing video games, watching movies and plays, and using computers, along with some more reserved outdoor activities such as fishing. In fact, social networking sites have been a thriving home for introverts in the 21st century, where introverts are free from the formalities of social conduct and may become more comfortable blogging about personal feelings they would not otherwise disclose. The archetypal artist, writer, sculptor, engineer, composer, and inventor are all highly introverted. An introvert is likely to enjoy time spent alone and find less reward in time spent with large groups of people, though he or she may enjoy interactions with close friends. Trust is usually an issue of significance: a virtue of utmost importance to an introvert choosing a worthy companion. They prefer to concentrate on a single activity at a time and like to observe situations before they participate, especially observed in developing children and adolescents. Introverts are

easily overwhelmed by too much stimulation from social gatherings and engagement. They are more analytical before speaking.

Introversion is not the same as being shy or being a social outcast. Introverts prefer solitary activities over social ones, whereas shy people (who may be extraverts at heart) avoid social encounters out of fear, and the social outcast has little choice in the matter of his or her solitude.

Ambiversion

Although many people view being introverted or extraverted as a question with only two possible answers, most contemporary trait theories (e.g. the Big Five) measure levels of extraversion-introversion as part of a single, continuous dimension of personality, with some scores near one end, and others near the half-way mark. Ambiversion is a term used to describe people who fall more or less directly in the middle and exhibit tendencies of both groups. An ambivert is normally comfortable with groups and enjoys social interaction, but also relishes time alone and away from the crowd.

Measurement

Assessing extraversion and introversion is normally accomplished through self reporting. A questionnaire might ask if the test-taker agrees or disagrees with statements such as I am the life of the party or I think before I talk.

Self-report questionnaires have obvious limitations in that people may misrepresent themselves either intentionally or through lack of self-knowledge. As such, it is also common to use peer reporting or third-party observation.

Another approach is to present test takers with various sets of adjectives (e.g., thoughtful, talkative, energetic, independent) and ask which describes them most and least. Psychological measures of this trait may break it down into subfactors including warmth, affiliation, positive affect, excitement seeking, and assertiveness/dominance seeking.

Causes

Jungian theory

According to Carl Jung, introversion and extraversion refer to the direction of psychic energy. If a person's psychic energy usually flows outwards then he or she is an extravert, while if the energy usually flows inwards, the person is an introvert. Extraverts feel an increase of perceived energy when interacting with a large group of people, but a decrease of energy when left alone.

Conversely, introverts feel an increase of energy when alone, but a decrease of energy when surrounded by a large group of people.

Eysenck's theory

Hans Eysenck described extraversion-introversion as the degree to which a person is outgoing and interactive with other people. These behavioral differences are presumed to be the result of underlying differences in brain physiology. Extraverts seek excitement and social activity in an effort to heighten their arousal level, whereas introverts tend to avoid social situations in an effort to keep such arousal to a minimum. Eysenck designated extraversion as one of three major traits in his P-E-N model of personality, which also includes psychoticism and neuroticism.

Eysenck originally suggested that extraversion was a combination of two major tendencies, impulsiveness and sociability. He later added several other more specific traits, namely liveliness, activity level, and excitability. These traits are further linked in his personality hierarchy to even more specific habitual responses, such as partying on the weekend.

Eysenck compared this trait to the four temperaments of ancient medicine, with choleric and sanguine temperaments equating to extraversion, and melancholic and phlegmatic temperaments equating to introversion.

Twin studies find that extraversion/introversion has a genetic component.

Biological factors

The relative importance of nature versus environment in determining the level of extraversion is controversial and the focus of many studies. Twin studies find a genetic component of 39% to 58%. In terms of the environmental component, the shared family environment appears to be far less important than individual environmental factors that are not shared between siblings.

Eysenck proposed that extraversion was caused by variability in cortical arousal. He hypothesized that introverts are characterized by higher levels of activity than extraverts and so are chronically more cortically aroused than extraverts. The fact that extraverts require more external stimulation than introverts has been interpreted as evidence for this hypothesis. Other evidence of the "stimulation" hypothesis is that introverts salivate more than extraverts in response to a drop of lemon juice.

Extraversion has been linked to higher sensitivity of the mesolimbic dopamine system to potentially rewarding stimuli. This in part explains the high levels of positive affect found in extraverts, since they will more intensely feel the excitement of a potential reward. One consequence of this is that extraverts can more easily learn the contingencies for positive reinforcement, since the reward

itself is experienced as greater.

One study found that introverts have more blood flow in the frontal lobes of their brain and the anterior or frontal thalamus, which are areas dealing with internal processing, such as planning and problem solving. Extraverts have more blood flow in the anterior cingulate gyrus, temporal lobes, and posterior thalamus, which are involved in sensory and emotional experience. This study and other research indicates that introversion-extraversion is related to individual differences in brain function.

Behavior

Extraverts and introverts have a variety of behavioral differences. According to one study, extraverts tend to wear more decorative clothing, whereas introverts prefer practical, comfortable clothes. Extraverts are likely to prefer more upbeat, conventional, and energetic music than introverts. Personality also influences how people arrange their work areas. In general, extraverts decorate their offices more, keep their doors open, keep extra chairs nearby, and are more likely to put dishes of candy on their desks. These are attempts to invite co-workers and encourage interaction. Introverts, in contrast, decorate less and tend to arrange their workspace to discourage social interaction.

Although extraverts and introverts have real personality and behavior differences, it is important to avoid pigeonholing or stereotyping by personality. Humans are complex and unique, and because extraversion varies along a continuum, they may have a mixture of both orientations. A person who acts introverted in one scenario may act extraverted in another, and people can learn to act "against type" in certain situations. Jung's theory states that when someone's primary function is extraverted, his secondary function is always introverted (and vice versa).

Implications

Acknowledging that introversion and extraversion are normal variants of behavior can help in self-acceptance and understanding of others. For example, an extravert can accept her introverted partner's need for space, while an introvert can acknowledge his extraverted partner's need for social interaction.

Researchers have found a correlation between extraversion and happiness. That is, more extraverted people tend to report higher levels of happiness than introverts. This does not mean that introverts are unhappy. Extraverts simply report experiencing more positive emotions, whereas introverts tend to be closer to neutral. This may be due to the fact that extraversion is socially preferable in Western culture and thus introverts feel less desirable. In addition to the research on happiness, other studies have found that extraverts tend to report higher levels of self-esteem than

introverts. Others suggest that such results reflect socio-cultural bias in the survey itself. Also, according to Carl Jung, introverts acknowledge more readily their psychological needs and problems, whereas extroverts tend to be oblivious to them because they focus more on the outer world.

Extraversion is perceived as socially desirable in Western culture, but it is not always an advantage. For example, extraverted youths are more likely to engage in delinquent behavior. Conversely, while introversion is perceived as less socially desirable, it is strongly associated with positive traits such as intelligence and "giftedness." For many years, researchers have found that introverts tend to be more successful in academic environments, which extraverts may find boring.

Career counselors often use personality traits, along with other factors such as skill and interest, to advise their clients. Some careers such as computer programming may be more satisfying for an introverted temperament, while other areas such as sales may be more agreeable to the extraverted type.

Although neither introversion nor extraversion is pathological, psychotherapists can take temperament into account when treating clients. Clients may respond better to different types of treatment depending on where they fall on the introversion/extraversion spectrum. Teachers can also consider temperament when dealing with their pupils, for example acknowledging that introverted children need more encouragement to speak in class while extraverted children may grow restless during long periods of quiet study.

Geography

It is asserted that Americans live in an "extroverted society" that rewards extrovert behavior and rejects introversion. "American culture values extroverted qualities more, and people often feel like they've been given the 'short end of the stick' after receiving their results on extroversion/introversion tests." Other cultures, such as Central Europe, Japan or regions where Buddhism, Sufism etc. prevail, prize introversion.

Researchers have found that people who live on islands tend to be less extraverted (more introverted) than those living on the mainland, and that people whose ancestors had inhabited the island for twenty generations tend to be less extraverted than more recent arrivals. Furthermore, people who emigrate from islands to the mainland tend to be more extraverted than people that stay on islands, and those that immigrate to islands.

In the United States, researchers have found that people living in the midwestern states of North Dakota, South Dakota, Nebraska, Minnesota, Wisconsin, and Illinois score higher than the U.S. average on extraversion. Utah and the southeastern states of Florida and Georgia also score high on this personality trait. The most introverted states in the United States are Maryland, New

Hampshire, Alaska, Washington, and Vermont. People who live in the northwestern states of Idaho, Montana, and Wyoming are also relatively introverted.

Agreeableness

Agreeableness is a tendency to be pleasant and accommodating in social situations. In contemporary personality psychology, agreeableness is one of the five major dimensions of personality structure, reflecting individual differences in concern for cooperation and social harmony. People who score high on this dimension are empathetic, considerate, friendly, generous, and helpful. They also have an optimistic view of human nature. They tend to believe that most people are honest, decent, and trustworthy.

People scoring low on agreeableness are generally less concerned with others' well-being, report less empathy, and are therefore less likely to go out of their way to help others. Their skepticism about other people's motives may cause them to be suspicious and unfriendly. People very low on agreeableness have a tendency to be manipulative in their social relationships. They are more likely to compete than to cooperate.

Agreeableness is considered to be a superordinate trait, meaning that it is a grouping of more specific personality traits that cluster together statistically. There are exceptions, but in general, people who are concerned about others also tend to cooperate with them, help them out, and trust them. This dimension of personality was initially discovered in research using the method of factor analysis.

Agreeableness can be viewed as the opposite of Machiavellianism. It is also similar conceptually to Alfred Adler's idea of social interest.

Interpersonal relations

Agreeableness is an asset in a wide range of social situations. Agreeable individuals are biased toward liking others and viewing them in a positive light, whereas disagreeable people are more negative. Despite the label, there is no evidence that those high on agreeableness are more conforming, or influenced by others in making choices, than are their peers.

Because agreeable children are more sensitive to the needs and perspectives of others, they are less likely to suffer from social rejection. Specifically, the research indicates that children who are less disruptive, less aggressive, and more skilled at entering play groups are more likely to gain acceptance by their peers.

One study found that people high in agreeableness are more emotionally responsive in social situations. This effect was measured on both self-report questionnaires and physiological

measures, and offers evidence that extraversion and neuroticism are not the only Big Five personality factors that influence emotion. The effect was especially pronounced among women.

The research also shows that people high in agreeableness are more likely to control negative emotions like anger in conflict situations. Those who are high in agreeableness are more likely to use constructive tactics when in conflict with others, whereas people low in agreeableness are more likely to use coercive tactics. They are also more willing to give ground to their adversary and may "lose" arguments with people who are less agreeable. From their perspective, they have not really lost an argument as much as maintained a congenial relationship with another person.

Prosocial behavior

A central feature of agreeableness is its positive association with altruism and helping behavior. Across situations, people who are high in agreeableness are more likely to report an interest and involvement with helping others. Experiments have shown that whereas most people are likely to help their own kin, or when empathy has been aroused, agreeable people are likely to help even when these conditions are not present. In other words, agreeable people appear to be "traited for helping" and do not need any other motivations.

While agreeable individuals are habitually likely to help others, disagreeable people may be more likely to harm them. Researchers have found that low levels of agreeableness are associated with hostile thoughts and aggression in adolescents, as well as poor social adjustment. People low in agreeableness are also more likely to be prejudiced against stigmatized groups such as the overweight.

When mental illness is present, low agreeableness may be associated with narcissistic and anti-social tendencies. In theory, individuals who are extremely high in agreeableness are at risk for problems of dependency, but empirical studies show that many more problems are associated with low agreeableness.

Geography

In the United States, midwesterners and southerners tend to have higher average scores on agreeableness than people living in other regions. According to researchers, the top ten most agreeable states are North Dakota, Minnesota, Mississippi, Utah, Wisconsin, Tennessee, North Carolina, Georgia, Oklahoma, and Nebraska. These findings are consistent with well known expressions in these states, such as "southern hospitality" and "Minnesota nice." Because these states are generally less urbanized than the east and west coasts, people may be more likely to live in small communities and know their neighbors, and consequently, more willing to care about them and help them out.

Neuroticism

Neuroticism is a fundamental personality trait in the study of psychology. It is an enduring tendency to experience negative emotional states. Individuals who score high on neuroticism are more likely than the average to experience such feelings as anxiety, anger, guilt, and depressed mood. They respond more poorly to environmental stress, and are more likely to interpret ordinary situations as threatening, and minor frustrations as hopelessly difficult. They are often self-conscious and shy, and they may have trouble controlling urges and delaying gratification. Neuroticism is associated with low emotional intelligence, which involves emotional regulation, motivation, and interpersonal skills. It is also a risk factor for "internalizing" mental disorders such as phobia, depression, panic disorder, and other anxiety disorders (traditionally called neuroses).

Emotional stability

On the opposite end of the spectrum, individuals who score low in neuroticism are more emotionally stable and less reactive to stress. They tend to be calm, even tempered, and less likely to feel tense or rattled. Although they are low in negative emotion, they are not necessarily high on positive emotion. Being high on positive emotion is an element of the independent trait of extraversion. Neurotic extraverts, for example, would experience high levels of both positive and negative emotional states, a kind of "emotional roller coaster". Individuals who score low on neuroticism (particularly those who are also high on extraversion) generally report more happiness and satisfaction with their lives.

Measurement

Like other personality traits, neuroticism is typically viewed as a continuous dimension, rather than as a distinct type of person. People vary in their level of neuroticism, with a small minority of individuals scoring extremely high or extremely low on the dimension. Because most people cluster around the average, neuroticism test scores approximate a normal distribution, given a large enough sample of people. Neuroticism is one of the most studied personality traits in psychology, and this has resulted in a wealth of data and statistical analysis. It is measured on the EPQ, the NEO PI-R, and other personality inventories.

Neuroticism has also been studied from the perspective of Gray's biopsychological theory of personality, using a scale that measures personality along two dimensions: the Behavioural Inhibition System (BIS) and the Behavioural Activation System (BAS). The BIS is thought to be related to sensitivity to punishment as well as avoidance motivation, while the BAS is thought to be related to sensitivity to reward as well as approach motivation. Neuroticism has been found to be positively correlated with the BIS scale, and negatively correlated with the BAS scale.

Physiology

Neuroticism appears to be related to physiological differences in the brain. Hans Eysenck theorized that neuroticism is a function of activity in the limbic system, and his research suggests that people who score highly on measures of neuroticism have a more reactive sympathetic nervous system, and are more sensitive to environmental stimulation. Behavioral genetics researchers have found that a significant portion of the variability on measures of neuroticism can be attributed to genetic factors.

A study with positron emission tomography has found that healthy subjects that score high on the NEO PI-R neuroticism dimension tend to have high altanserin binding in the frontolimbic region of the brain -- an indication that these subjects tend to have more of the 5-HT_{2A} receptor in that location. Another study has found that healthy subjects with a high neuroticism score tend to have higher DASB binding in the thalamus; DASB is a ligand that binds to the serotonin transporter protein.

Another neuroimaging study using magnetic resonance imaging to measure brain volume found that the brain volume was negatively correlated to NEO PI-R neuroticism when correcting for possible effects of intracranial volume, sex, and age.

Other studies have associated neuroticism with genetic variations, e.g., with 5-HTTLPR -- a polymorphism in the serotonin transporter gene. However, not all studies find such an association. A genome-wide association study (GWA study) has associated single-nucleotide polymorphisms in the MDGA2 gene with neuroticism, however the effect sizes were small. Another GWA study gave some evidence that the rs362584 polymorphism in the SNAP25 gene was associated with neuroticism.

A 2009 study has found that higher neuroticism is associated with higher decreased brain size with increasing age.

Mental-noise hypothesis

Studies have found that the mean reaction times (RTs) will not differ between individuals high in neuroticism and those low in neuroticism, but that there is considerably more trial-to-trial variability in performance reflected in RT standard deviations. In other words, on some trials neurotic individuals are faster than average, and on others they are slower than average. It has been suggested that this variability reflects noise in the individual's information processing systems or instability of basic cognitive operations (such as regulation processes), and further that this noise originates from two sources: mental preoccupations and reactivity processes.

Flehmig et al. (2007) studied mental noise in terms of everyday behaviours using the Cognitive

Failures Questionnaire which is a self-report measure of the frequency of slips and lapses of attention. A slip is an error by commission, and a lapse is an error by omission. This scale was correlated with two well-known measures of neuroticism (the BIS/BAS scale and the Eysenck Personality Questionnaire). Results indicated that the CFQ-UA subscale was most strongly correlated with neuroticism ($r = .40$) and explained the most variance (16%) compared to overall CFQ scores which only explained 7%. The authors interpret these findings as suggesting that mental noise is "highly specific in nature" as it is related most strongly to attention slips triggered endogenously by associative memory. In other words, this may suggest that mental noise is mostly task-irrelevant cognitions such as worries and preoccupations.

Geography

Neuroticism, along with other personality traits, has been mapped across states in the USA. People in eastern states such as New York, New Jersey, West Virginia, and Mississippi tend to score high on neuroticism, whereas people in many western states, such as Utah, Colorado, South Dakota, Oregon, and Arizona score lower on average. People in states that are higher in neuroticism also tend to have higher rates of heart disease and lower life expectancy.