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# Hacker Personality Profiles Reviewed in Terms of the Big Five Personality Traits

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**Abstract:** As well as possessing advanced computer skills, hackers are typically highly intelligent. However, it is commonly assumed that hackers have personality traits that tend to be negative and detrimental in their effect on society. Hackers fall into three main categories: white hat hackers, grey hat hackers and black hat hackers. The aim of this study is to determine hacker personality profiles in relation to these categories. To do so, the author uses a measuring instrument focusing on the 'big five personality traits' – that is, openness to experience, conscientiousness, extraversion, agreeableness and neuroticism. This study focused on 30 hacker subjects and utilized descriptive qualitative research: the data collection techniques used were in the form of personality trait rating scales, interviews and research documents. Based on the research results pertaining to the 30 hacker subjects, it can be deduced that the white hats demonstrate agreeableness as a dominant personality trait, black hats openness to experience, and grey hats neuroticism.

**Keywords:** Hacker, White Hat, Black Hat, Grey Hat, Big Five Personality Traits

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## 1. Introduction

### 1.1. Background of the Problem

In the modern era, technology is very important in people's lives. The development and advance of technology has produced many benefits, but there is a flipside. The abuse of technology can be abused for personal or group interests, to the detriment of others. Hackers are often at the centre of such abuse, creating malicious software, or engaging in cyber-crime.

Thus, hackers are perceived negatively by the greater community, and are generally associated with anti-social personality traits. This does not take into account the white, grey and black hat hacker classifications mentioned above, of which most people are unaware.

The big five personality traits that are core to the measuring instrument used in this study to throw light on the personality features of the three categories of hackers were first introduced by Goldberg in 1981. Extraversion and agreeableness summarizes interpersonal traits that determine what one does with and to others. Neuroticism might be considered the opposite of emotional stability, and includes

negative feelings such as anxiety, sadness, irritability and tension. Conscientiousness is an essential element in achieving goals and controlling drives as required in functional social life. Openness to experience describes the breadth, depth, and complexity of the mental aspects of experiences of life [18] (Pervin et.al, 2005).

### 1.2. Problem

The authors formulated the problem as follows: How does a hacker personality profile appear when viewed in terms of the big five personality traits?

### 1.3. Research Purposes

The purpose of this study is to determine the personality profiles of the three classifications of hackers (white, grey and black hats) by using a measuring instrument referencing the big five personality traits.

### 1.4. Hacker Definitions

Hackers are variously perceived, mostly negatively. In The New Hacker's Dictionary version of The Online Hacker Jargon File, version 4.2.0, January 31, 2000, editor by [19]

Raymond (1997) suggests that, as a rule, hackers love wordplay and are consciously very inventive in their use of language. They play language “games” for pleasure, demonstrate an almost unique combination of a neotenus enjoyment of such games with the discriminative language of education and a high level of intelligence.

### 1.5. Classification of Hackers

Wikipedia describes the three classifications of hackers thus: [23] ([http://en.wikipedia.org/wiki/Hacker\\_definition\\_controversy#Hacker\\_definition\\_controversy](http://en.wikipedia.org/wiki/Hacker_definition_controversy#Hacker_definition_controversy) and [http://en.wikipedia.org/wiki/Hacker\\_\(computer\\_security\)](http://en.wikipedia.org/wiki/Hacker_(computer_security))) are accessed on November 9, 2013):

- a White hat hackers, while still acting illegally, are ethical in their intentions, using hacking in a constructive, positive way. They focus on the security mechanisms of computer systems and networks and have become an important part of the security field. They operate under a code, which acknowledges that breaking into other people's computers is a clandestine, invasive and illegal.
- b Black hat hackers violate computer security for criminal personal gain [15] (Moore, 2005). They are stereotyped in popular culture as the epitome of all that the public fears in a computer criminal.
- c Grey hat hackers act in a variety of fields related to IT. As per the ambiguity connoted by the title, such people sometimes act illegally, although out of the good intentions, to identify vulnerabilities in the computing process. They do not generally hack for personal gain or have malicious intentions, but may be ready to break a few rules of exploitation of their technology to achieve better security outcomes.

### 1.6. Big Five Personality Traits Definition

These are often referred to as five-factor models or “the big five” ([6] Goldberg, 1992; [12] McCrae & Costa, 2003; [21] Wiggins, 1996).

The first factor is usually called extraversion, but there is a lot of variation in what is included under this term. Sometimes it seems to incorporate firmness, sometimes spontaneity and energy, sometimes dominance and confidence, and sometimes it may take the form of seeking excitement. It often refers to ease of socialization ([22] Watson et.al, 1992).

There are various interpretations (none unanimously agreed upon) on the meaning of the second factor, neuroticism or emotional stability, but at its is the subjective experience of anxiety and general stress.

The third factor is commonly called agreeableness, which is often characterized as reflecting a concern with maintaining relationships. It also can refer to the provision of nurturing and emotional support ([7] Graziano & Eisenberg, 1997).

The core of the fourth factor, conscientiousness, is also a little difficult to precisely pin down. The conscientiousness

label does not fully reflect elements of the fourth factor, such as planning, perseverance, and the struggle towards achieving target objectives ([4] Digman & Inouye, 1986).

There has been much disagreement on the nature of the last factor, which [10] McCrae and Costa (1985) in termed ‘openness to experience’. Cattell initially set about measuring aspects of intelligence to assess this personality trait, then changed his focus to “culture”. [17] Peabody and [6] Goldberg (1992) proved that even when intelligence-related measures were re-introduced when assessing ‘openness to experience’, the relationship of the trait to culture remained and had to be factored in. These researchers suggested that intellect was the most appropriate label to use when referring to the interrelated combination of intelligence-related and cultural aspects of the ‘openness to experience’ trait.

### 1.7. Factors Affecting the Big Five Personality Traits

In a person's personality, there are several factors that can influence the formation of personality traits [24] (<http://arsipkukuliahku.blogspot.com/2010/10/faktor-factors-which-mempengaruhi.html> accessed on December 1, 2013), as follows:

#### a. Genetic factors

Kazuo Murakami's research in Japan in 2007 showed that dormant genes can be stimulated and activated – that is, “woken up” - resulting in potentially positive or negative changes in personality.

#### b. Environmental factors

According to attachment theory, the failure of a child to form a strong attachment with one or more people in the first year of life is associated with the inability to form relationships with others in adulthood [2] (Bowlby, 1973).

#### c. Stimulating genes factor and ways of thinking

Murakami concluded that the personality is fully controlled by genes that exist within human cells. These genes may be dormant or inactive, or active. Dormant genes may be activated with positive thinking, which will then impact on the person's personality. Thus, genetic factors are not necessarily rigid and unchangeable.

### 1.8. Indicators of the Big Five Personality Traits

Each of the big five factor personality traits have indicators that are used as a measurement benchmark, and are [25] (<http://arsipkukuliahku.blogspot.com/2010/10/faktor-factors-whichmempengaruhi.html> and <http://www.psychometric-success.com/personality-tests/personality-tests-big-5-aspects> Htm accessed on December 3, 2013) as follows:

#### a Extraversion

- (1) Gregariousness: people who score highly on this scale are outgoing and enjoy engaging with others, both individually and in group interactions.
- (2) Assertiveness or outspokenness: those who score highly on this scale tend to demonstrate firmness in speaking, take charge, and direct the activities of others.
- (3) Activity or energy level: individuals who score

highly on this scale typically lead active and busy lives.

- (4) Positive emotions or mood: this aspect is measured in terms of a person's ability to experience positive feelings, including happiness, enthusiasm, optimism and excitement.

b Neuroticism

- (1) Self-consciousness or concern characterizes self-aware individuals sensitive (or over-sensitive) about what other people think of them.
- (2) Vulnerability or nervousness: high scores indicate a tendency to experience panic, confusion and a sense of helplessness when under pressure or stress.
- (3) Anxiety or fearfulness: in such individuals, the "fight or flight" response is too easily and too often engaged.
- (4) Sensitivity to stress or tension: High scores on this scale indicate difficulty in coping with stress.

c Agreeableness

- (1) Trust: those with a high trust rating assume that most people are fair, honest, and have good intentions.
- (2) Altruism: characterized by a willingness to help others.
- (3) Morality: those with high scores on this scale see no need to pretend or resort to manipulation when dealing with people.
- (4) Politeness: Those who score highly on this scale do not assume or claim superiority to others, or at least seek to give that impression.

d Conscientiousness

- (1) Orderliness and neatness: individuals who rate highly on this scale are by nature or behavioural choice orderly and well-organized.
- (2) Achievement-striving and perseverance: those who score highly on this scale work hard to achieve excellence.
- (3) Self-discipline: manifest in persistent engagement with difficult or unpleasant tasks to the point of completion.
- (4) Dutifulness or carefulness: This scale reflects the strength of an individual's sense of duty and obligation.
- (5) Self-efficacy: the confidence in one's ability to achieve desired outcomes.

e Openness to experience

- (1) Intellect and creativity: the two most important aspects of openness to experience. High scores on this scale indicate a propensity to play with new ideas. Intellect refers to cognitive intellectual style, not intellectual ability.
- (2) Capacity to express emotions: those with high scores on this scale have good access to awareness of their own feelings.
- (3) Imaginative: for highly imaginative people, the real world is often too plain and ordinary.
- (4) Artistic interest and originality: the love of beauty,

both in art and nature, is characteristic of those with high scores on this scale.

- (5) Adventurousness: those who score highly on this scale tend to be eager to try new activities, travel to foreign lands and experience different things.

## 2. Research Methods

### 2.1. Measuring the Big Five Personality Traits

There are several measuring devices that can be used to measure the Big Five Trait Factors, including the BFI (Big Five Inventory), the NEO-PI-R (NEO Personality Inventory-Revised) and IPIP (International Personality Item Pool).

### 2.2. Hacker's Personality Profile Reviewed in Terms of the Big Five Personality Traits

Each of the three types of hackers utilize their computer skills for different purposes. Based on this, the authors assume that white hat, black hat and gray hat hackers tend to have a different personality profiles.

### 2.3. Identification of Research Variables

In the case of this research, the hacker personality profile in terms of the big five personality traits is considered a variable.

### 2.4. Operational Definitions

Operationally defined variables are based on observed characteristics that allow researchers to conduct a careful observation or measurement of an object or phenomenon [9] (Hidayat, 2007). Operational definition of hacker personality profile in this research is the scores resulted from the big five personality traits scale.

### 2.5. Research Subjects

Purposive sampling is a sampling technique with particular considerations [20] (Sugiyono, 2011). The subjects in this study were a group of people whose actions and characteristics were typical of black, white and gray hat hackers.

The selection criteria for the subjects were as follows: a. Age: the subjects are 17 years of age or older; b. Gender: both genders are represented; c. Marital status: some subjects are married, others are single; d. Educational status: the subjects selected range from high levels of high school education (or the equivalent) to Bachelor level.; e. Hacking activity: the subjects have been actively as hackers for 1 year or more.

### 2.6. Data Collection Method

Data collection techniques used in this study are based on a scale that assumes that the subject understands themselves better than anyone else, and that the information they provide on themselves is therefore correct and trustworthy [8] (Hadi, 2000). Interviews are a data collection technique that also

privilege the subject as a reliable source of specific data. According to [16] Mukhtar (2013), the interview technique obtains information through requesting particulars directly from a first party who is deemed able and willing to provide information or answers to specified questions.

#### a. Big five inventory scale

The researchers used a big five inventory scale to reveal the personality traits of hackers. The subjects were asked to indicate their favorable attitudinal responses to questionnaire items by degree, as follows: a value of 5 for Strongly Agree, 4 for Agree, 3 when doubtful, 2 when Disagree, and 1 when Strongly Disagree. In the event that that the subject did not support the attitude object (Unfavorable), the following scoring system was used: the value of 1 for Strongly Agree, a value of 2 for Agree, the value of 3 for answers in Doubt, the value of 4 for Disagree, and the value of 5 for Strongly Disagree.

#### b. Interview guide

The authors also used a self-developed interview guide in conducting the interviews. The purpose of the interviews was to further investigate the specified research objectives and verify (or otherwise) the scale research results. The interview guide was based on the identity of the subject, the type of hacker category to which they belonged, and their opinion.

Based on the data collection techniques, the research on the hacker personality profile in terms of big five personality traits included in the descriptive qualitative research. According to [16] Mukhtar (2013), descriptive qualitative research is the study of social settings and subjects independently - ie, without making comparisons or connection with social settings and different subjects.

### 2.7. *Validity and Reliability Measurement*

The validity is the extent to which a measuring instrument is precise and accurate in performing the measuring function [1] (Azwar, 2003). There are some adaptations made in qualitative research related to the measurement of validity and reliability. One is Internal Validity, which refers to whether there is a good match between observations and the researchers' theoretical ideas [3] (Bryman, 2012). Internal validity tends to be very strong in qualitative research. Then there is External Validity, which refers to the degree to which findings can be generalized across social settings [3] (Bryman, 2012) and [26] ([http://www.academia.edu/4989941/penelitian\\_kualitatif\\_tahap\\_ahap\\_penelitian\\_kualitatif](http://www.academia.edu/4989941/penelitian_kualitatif_tahap_ahap_penelitian_kualitatif), accessed on 25 April 2014). This study applies Internal Validity testing.

Reliability is one of the characteristics that determines the validity of a measuring instrument [1] (Azwar, 2003). A test said to be reliable if it always gives the same results when applied with the same group at a different time or in different circumstances.

Validity and reliability testing were conducted using the SPSS version 16. The results are presented in the following tables. Based on item discrimination testing conducted on the big five inventory used in this research, 29 items are valid. Based on the results of the reliability test, the Cronbach's Alpha score is 0.874. Since this result is higher than the critical value of 0.800, it can be concluded that this

measuring instrument has a good reliability rating.

### 2.8. *Data Analysis*

Patton [13] (Moleong, 2002) explains that data analysis is the process of arranging the order of the data, organized into a pattern, category and description of the basic unit.

## 3. Results

The study was conducted with a total of six hacker subjects, comprising three from each of the white, gray and black hat categories. Furthermore, 30 subjects were assessed using the big five scale, comprising 10 subjects representing each of the three categories hackers.

Results of interviews

### 3.1. *Subject Identity*

The six subjects of this study were all unmarried males, ranging in age from 19 to 28 years. All have an education background and competence in Information Technology. There were two subjects from each of the three hacker categories, one at beginner level, the other advanced. The respondents came from various educational levels, ranging from high school students to those undertaking Bachelor university degrees.

The research results showed that the white hats have high scores on the personality trait agreeableness. They were positioned in the middle in relation to the personality traits of extraversion, conscientiousness, neuroticism and openness to experience. On the other hand, the black hats scored highly on the personality trait of openness to experience, and were positioned in the centre in relation to extraversion, agreeableness, conscientiousness and neuroticism. The gray hats scores indicated a strong tendency towards neuroticism, while in the personality traits of extraversion, agreeableness, conscientiousness and openness to experience, they were centrally placed.

### 3.2. *The Results of the Interview on Each Subject*

Based on our research, it is known that the subjects have the following personality traits: the beginner white hat is extraversion, agreeableness, conscientiousness, neuroticism and openness to experience; the elite white hat is extraversion, conscientiousness and openness to experience; the beginner black hat is openness to experience; the advanced black hat is extraversion, agreeableness, and conscientiousness; the beginner gray hat is extraversion and neuroticism; and the advanced gray hat is conscientiousness and openness to experience.

### 3.3. *Discussion*

The results of previous studies indicate that the motivation to engage in hacker activities is attributable to personal factors, and partly to curiosity about information technology. The study subjects have been active hackers for three to ten years. They most commonly target websites.

Based on research conducted on the 30 subjects using a big five inventory scale, regardless of hacker category, hackers were positioned around the middle in relation to the personality trait of extraversion. It is known that the hackers keep up with evolving technology advancements and innovations, which indicates a high level of creativity. According to the following quote from the article, creative people tend to be positioned centrally on the extraversion scale:

“Creative people tend to be both extroverted and introverted. We're usually one or the other, either preferring to be in the thick of crowds or sitting on the sidelines and observing the passing show. In fact, in psychological research, extroversion and introversion are considered the most stable personality traits that differentiate people from each other and that can be reliably measured. Creative individuals, on the other hand, seem to exhibit both traits simultaneously”.

Most of the six subjects of this research scored highly on the extraversion scale, the exceptions being the beginner black hat and advanced gray hat, who were positioned in the middle.

Based on the big five research conducted on the 30 subjects, gray hats demonstrated neuroticism. This was evident in their hacking activities, which could sometimes be white, but could abruptly switch to black. An explanation for this sudden change in behavior may be suggested by Eysenck's comments: "Neuroticism refers to an individual's tendency to become upset or emotional... [it] is the major factor of personality pathology" [5] (Eysenck, 1981).

Only two of the six subjects of this study exhibited the personality trait of neuroticism – the beginner white hat and the beginner gray hat. The former rated highly on the big five inventory neuroticism scale and this finding was confirmed on interview. While the latter scored similarly on the big five scale, the findings were not confirmed on interview.

From the results of the 30 subject research, it is known that, the white hats have personality traits of agreeableness. Based on observation, their hacking activities provided benefits for others and were motivated by altruism rather than self-interest. This is supported by the theoretical position on the agreeableness trait, as the following quote shows: "This trait is often characterized as reflecting a concern with maintaining relationships. It also can mean nurturing and emotional support, which requires inhibition of the negative influences" [7] (Graziano & Eisenberg, 1997). The research placed black and gray hats in the middle position in relation to the agreeableness trait.

However, the research results differed with the six subjects of this study. Based on interviews and the big five inventory scale, the beginner white hat and – surprisingly - the advanced black hat scored highly for the agreeableness trait, while all other subjects were in the middle position.

Based on the big five research conducted on the 30 subjects, the white, black and gray hats were positioned at the middle in relation to the conscientiousness trait. They were generally observed to demonstrate qualities of perseverance and self-efficacy, but did not like the prospect of holding down a regular job. This is not necessarily consistent with conscientiousness, a trait associated with openness to new

experience. However, of the six subjects in the current study, the results obtained using interviews and the big five inventory scale indicated that all but two scored highly on the conscientiousness personality trait. The exceptions were the beginner black hat, whose conscientiousness rating was in the middle position, and the beginner gray hat, who had a low score on the scale research, but demonstrated conscientiousness in the interview.

It can be concluded from the 30 subject study that the black hats have the personality traits of openness to experience. It is generally observed that black hats are intellectually predisposed to new ideas and things, as well as creativity, adventurousness and challenge. Costa and McCrae's observation is relevant here. They stated: "Openness involves active imagination, aesthetic sensitivity, attentiveness to inner feelings, preference for variety, and intellectual curiosity [11] (McCrae and Costa, 1992)". However, in the case of black hats, the personality trait of openness can sometimes manifest in negative ways, as is noted in the following:

Problems related to high openness that can cause problems with social or professional functioning are excessive fancifulness, peculiar thinking, diffuse identity, unstable goals and nonconformity with the demands of the society" and "High openness is characteristic to schizotypal personality disorder (odd and fragmented thinking), narcissistic personality disorder (excessive self-valuation) and paranoid personality disorder (sensitivity to external hostility).

In the 30 subject study, white and gray hats received a middle rating for openness to experience. The findings of the current six subject study were somewhat different. The only subjects that did not rate highly for openness to experience on the big five inventory scale and when interviewed were the advanced black hat, who was positioned in the middle, and the beginner gray hat, who rated low.

## 4. Conclusion

Based on the results of research and discussion on the 30 hacker group, it can be deduced that the white hats have personality traits of agreeableness, black hats openness to experience, and gray hats neuroticism.

The six subjects of that study shows not so clear-cut. The beginner and elite white hats shared the traits of extraversion, conscientiousness and openness to experience, but the former also rated highly for agreeableness and neuroticism. The beginner black hat had the personality trait of openness to experience, whereas the advanced black hat demonstrated extraversion, agreeableness and conscientiousness. The beginner gray hat rated highly for extraversion and neuroticism, the advanced gray hat for conscientiousness and openness to experience.

## 5. Suggestion

The results of the 6 subject study do not have a high correlation with those of the 30 subject group, so at best only

generalizations can be made in relation to the personality traits of each of the three broad hacker types. Positive expectations may be held about white hat hackers. They typically adhere to the existing code of conduct, and direct their skills in a manner that is beneficial for the computer community. Gray hats tend to seek to reduce anxiety and stress by ignoring conflicts, and trying to focus on positive things, which of course creates a feeling of calmness and happiness. When gray hats cannot avoid a sense of anxiety and stress they tend to engage in negative activities. The natural curiosity and creativity of black hats and their desire for adventure can result in their misdirecting their skills to negative effect, potentially resulting in harm both for themselves and others, but these same traits can potentially be harnessed to produce positive outcomes. If the traits of black hats types are to be manifest in beneficial behaviors in the future, the government needs to pay more attention and respect to creative children who excel at school. There have been many instances in Indonesia of young creative people achievements not being appreciated, as a result of which many either move to other countries where their skills are appreciated and rewarded, or worse, lose respect for their own country and governance system. Young people with this sort of mindset may violate existing rules. Black hat hackers are a case in point. Often very creative, many do not feel appreciated by the government, so they express their resentment and frustration by hacking government sites. Governments tend to lack trust in the ability of young people in their own countries, yet many, including black hat hackers, actually have the potential and skill sets to contribute positively to the development of their nations. In order to tap into and harness this potential, there is scope for other researchers to develop this study with a far greater number of research subjects, and broaden the research parameters.

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